



Landscape Aesthetics Capacity as a Cultural Ecosystem Service

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Abstract

This chapter explores established theoretical and empirical work to identify possible indicators to represent landscape aesthetics capacity (LAC) in landscape planning. Throughout this chapter we argue that visual concepts from landscape perception/preferences studies (formed either on an individual or collective basis), together with experiences from implementing Landscape Character Assessments (LCA) throughout Europe, might help in developing frameworks for the assessment of Cultural Ecosystem Services (CES). When compared to provisioning or maintenance/regulating ecosystem services (ES), frameworks for the application of CES are lagging in development. Landscape aesthetics capacity is conceptualized here as delivered ES, which are central to the everyday life of people. The concepts we focus on are derived from landscape preference studies. The empirical cases explored are from LCAs in the United Kingdom

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C. von Haaren et al. (eds.), *Landscape Planning with Ecosystem Services*, Landscape Series 24, https://doi.org/10.1007/978-94-024-1681-7_15

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(UK) and Hungary, from the Landscape Preferences Spatial Framework in Portugal, and from a formal method for mapping and assessing the visual landscape in Germany. There is also a brief overview of current methodological approaches and suggested indicators regarding the utilization of CES. Finally, the chapter emphasises the ways in which landscape aesthetics capacities can be incorporated into planning, by selecting a group of robust indicators (based on theory as well as on our case studies) that could be applied in different European countries.

Keywords

Landscape aesthetics · Cultural ecosystem services · Landscape character assessment

15.1 Introduction

Landscapes, by the simple fact of being out there, provoke feelings in people. The ability of a particular landscape to fulfill human aesthetic needs and desires is described here as Landscape Aesthetics Capacity (LAC). It encompasses a set of immaterial and material landscape characteristics or features that fulfill a common core set of people's aesthetic values (non-use values in the terminology of Chap. 4).

LAC is unarguably one very important aspect of Cultural Ecosystem Services (CES). Different authors have shown that the perception and appreciation of nature or natural elements in general, and of beautiful landscapes in particular, has positive impacts on human health and well-being (e.g. Russel et al. 2013; Abraham et al. 2009; Kaplan 2001; Kahn et al. 2008). In addition to being regarded as one class of CES, the visual landscape with its aesthetic quality provides the setting for all outdoor recreation activities. It therefore influences the benefits people obtain from it. Furthermore, research has shown that people can highly value a landscape, simply because it exists, even though they never visit, or cannot visit because for example, of restricted access (e.g. Boll et al. 2014).

When addressing LAC we need to deal with two interwoven dimensions. The first is the perspective of the users: the aesthetic perception and preferences of people, which may or may not differ from individual to individual depending on the use they make of the landscape. Individual, subjective preferences may be triggered by different landscape usage for instance by a farmer or a tourist, or by individual dispositions and experience e.g. appreciating landscape from out of an office window. In addition, very similar landscape preferences may be held amongst communities (collective preferences e.g. landscape identity or stewardship cared-for landscapes) and core preferences may even be common to all humans – with cultural variations. For example, Steinitz (2010) shows that residents and tourists in the Valencia region of Spain share common preferences.

The second dimension is the actual physical landscape attributes that may be appreciated or appeal to some people but not to others.

The LAC of physical landscapes can be assessed either by the individual, local users themselves (user-centered evaluation) or modelled, based on knowledge about collective preferences without including the actual users. The best option in landscape planning would be to combine both dimensions and relevant methods are discussed later in this chapter.

Humans need to have the opportunity to be in an aesthetically pleasing landscape. This is a necessity for human well-being and health. Green spaces, for example, contribute to a healthy living environment (Croucher et al. 2007; Waltert et al. 2011; Schipperijn et al. 2010). LAC is also a precondition for visual amenities linked to outdoor recreation. In the context of this book, landscape aesthetics capacity is considered as a delivered Ecosystem Service (ES) whereas recreation is considered as a utilized ES.

The multiple relationships between people and their surrounding physical landscape settings, as well as the subjective meanings people associate with these physical settings, can offer valuable knowledge for enhanced planning and management. This, in turn, increases support for including CES such as aesthetics into planning (Opdam et al. 2001; Antrop 2005; von Haaren et al. 2008).

There is a vast body of research addressing landscape preferences, but it is specifically framed at the local scale. This fact raises concerns about the generalizability (Cassatela and Peano 2011) of landscape-based indicators between different scales of analysis. However, a multi-scale assessment of people's preferences would be challenging (van Zanten et al. 2014). In spite of these limitations, the rich theoretical and empirical work on landscape preferences/perceptions, as well as on the different Landscape Character Assessments (LCAs) throughout Europe, should not be thought of as just a collection of case studies. We argue instead, that exploring the diversity of methods for assessing landscape preferences expressed in the literature, might aid in the development of a suitable framework for assessing the roles and values of landscapes and their 'material and immaterial' elements in the provision of CES.

Previous work has shown that visual concepts such as stewardship (Ode Sang and Tveit 2013), historicity, ephemera, coherence/disturbance, diversity (Ode and Miller 2011), and naturalness (Ode et al. 2009), are important drivers of landscape preferences/perceptions (Daniel 2001; Dramstad et al. 2006; Tveit et al. 2006).

The authors of this chapter consider it important to distinguish between perceptions and preferences. Preferences by people, either individual or collective, are based on pre-cognitive responses to landscape features, elements or characteristics which generate feelings of like or dislike (Antrop 2000; Surova and Pinto-Correia 2008; Swanwick 2009; Carvalho Ribeiro et al. 2013). Landscape preference studies throughout Europe have shown that preferences for certain landscape characteristics, or landscape attributes, are likely to differ depending on the use of the landscape (e.g. the preferences of someone picking berries may be different from the same individual's preferences for walking – the functional use shapes our preferences) (Tahvanainen et al. 2001).

Perceptions, on the other hand, are cognitively based. Perception is the requirement of aesthetic judgment, which results in decisions about preferences. Antrop

(2000:19) defines perception, “as a complex learning process ... [Perception] analyses the observation immediately and interactively and links the results with our knowledge and past experience”. Figure 15.1 schematically shows the processes embedded into perception/preferences by analyzing the mechanism of aesthetical judgement. According to Szerdahelyi (2003), perception builds upon an individual’s sensorial and cognitive system to ‘read’ a certain phenomenon. However, as Fig. 15.1 shows, preference and perception are neither synonyms nor two separate dimensions. Indeed, perception is the cognitive basis that influences our preferences. Both perception and preferences are subjective, mental constructions.

It is important to point out, that perception – the way people perceive landscapes – is influenced but not determined by physical landscape elements (Jacobs 2011). On the contrary, preferences are more straightforward in their relationship to physical landscape characteristics (such as liking or disliking a certain characteristic/attribute of the landscape dependent on the use e.g. sightseeing, hunting, picking mushrooms, bird watching).

However, landscape perception and landscape preferences are not only based on subjective factors. Biological, cultural, and individual factors each influence a person’s landscape preferences and perceptions (Bourassa 1999). Biological factors are intersubjective as they are based on evolutionarily developed innate dispositions, which means they are the same for everybody (e. g. prospect refuge theory by Appleton (1975)). This justifies, for example, human preferences for savannah like landscapes (Wilson 1986). Cultural factors are based on social values and cultural norms, which are likely to differ amongst societal groups. Individual factors are based on previous individual experiences, expectations, needs, hopes, fears, values and moods.

Following on from this therefore, compared to the other ecosystem services which are mostly measurable, CES such as aesthetics are hard to quantify. There are consequently difficulties in applying quantitative, universal assessment standards for CES which would allow assessments based on strong data types such as a ratio scale. This is why aesthetic capacity, contrary to its importance, often lacks attention in ‘formal’ planning as normally the data are ordinal scaled and often only locally valid.

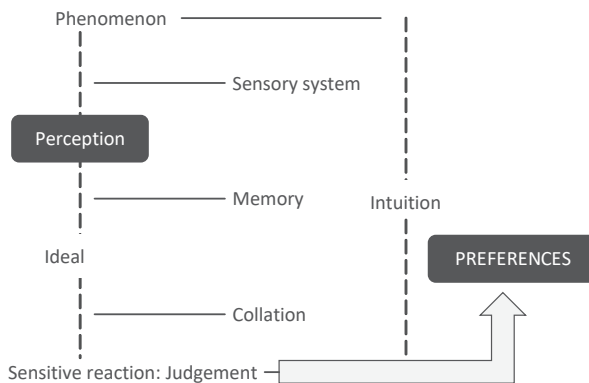


Fig. 15.1 Mechanisms of aesthetical judgement. (Adapted from Szerdahelyi 2003)

15.2 Integrating Landscape Aesthetics Capacity into Multi Scale Planning and Policy

Besides the European Landscape Convention, in the European Union (EU), both the Common Agricultural Policy (CAP Pillar II) and the EU Biodiversity Strategy to 2020 recognise societal demand for CES by calling for the “maintenance, restoration and upgrading of the cultural and natural heritage of villages, rural landscapes and high nature value sites” (CAP Pillar II). However, despite such policy acknowledgment, CES are not explicitly identifiable as policy instruments, but rather, tend to be embedded within the landscape concept (Paracchini et al. 2012). There is no attempt, for example, to link the maintenance of specific CES to landscape payments. There is however a European *landscape state and diversity indicator* framed on the basis of IRENA (Indicator Reporting on the Integration of Environmental Concerns into Agricultural Policy), launched after the publication of the COM (2001) report on ‘Statistical Information needed for Indicators to monitor the Integration of Environmental concerns into the Common Agricultural Policy’. The proposal for the *landscape state and diversity indicator* is presented in the Report EUR 25114 (Paracchini and Capitani 2011). The indicator itself is structured in three components: the first concerns the degree of naturalness, the second landscape structure, and thirdly the societal appreciation of the rural landscape (Paracchini et al. 2012; Jones et al. 2016). The third dimension builds on proxy indicators such as protected areas, certified products and farm tourism (Jones et al. 2016).

This limitation certainly contributes to a lack of reliability in assessments of the contributions of ‘material’ qualities embedded into different CES, such as aesthetics. The failure¹ to agree upon methods for assessing CES and how they can be integrated into planning is a consequence of several interrelated factors (see Warnock and Griffiths 2015). In view of this, it is important to highlight the sharp divide between approaches focusing on the visual interpretation (related to human perceptions/preferences) and the more operational spatial landscape concepts. This split emphasises the lack of accord between the current strong focus on ecological and environmental objectives and human perceptions/preferences.

Such a division does not occur because human values and ecological processes are by nature contradictory. A major cause is the lack of specificity of the EU regulations in the field of ES. Another issue relates to the scale that human preferences/perceptions are framed – the perceptible realm (Gobster et al. 2007) – while ecosystems usually operate at other spatial scales and in other delineations (Carvalho Ribeiro and Lovett 2011). One possible solution is to use different landscape areas for the analysis and present the objectives (responses) at the scale of decision making (administrative spatial units).

The mismatch between spatial scales, at which environmental processes operate and are measured and at which land management operates, also applies to planning and policy institutional scales. Policy and planning framed for one scale of governance may have consequences for the delivery of CES at other scales.

¹In most European countries (exceptions can be found for example in the German Länder).

Therefore, there have been important calls for the application of multi-scale approaches to policy setting and monitoring (Cash et al. 2006; Dick et al. 2014; Lefebvre et al. 2015).

Several approaches exist to access and map landscapes at different scales of governance (European, national and regional level). To our knowledge there is only one European landscape map named LANMAP 3. This is a pan-European landscape map illustrating the different landscape types across the continent, based on climate, topography, parent material, and land use (Mücher et al. 2010). This overview approach is useful at the European level and has several applications for European projects and policy initiatives. It is a result of the ELCAI project (European landscape character assessment initiative). LANMAP, however, is not suitable for LP on local or regional scale as it does not include subjective landscape dimensions and only works with physical layers (e.g. parental rock, land cover).

In addition to the work conducted at the continental scale, several European countries have implemented methods for identifying landscape quality objectives (under the European Landscape Convention 2000) and to capture the character of their 'local' landscapes. The concept of landscape character has been further developed within the approaches of Landscape Character Assessment (LCA: Swanwick 2002) and Historical Landscape Characterization (Fairclough 2004). Both stress that it is the character which distinguishes landscapes from each other. Since its introduction in the UK in the 70s, LCA has been widely used throughout Europe.

The next section explores the approaches employed in four different European countries to assess landscape qualities. Both the UK (Sect. 15.3.1) and Hungary (15.3.2) have used LCA, although, as shown below, there are differences between them in the application of the method. Section 15.3.3 discusses the Landscape Preferences Spatial Framework developed in Portugal. Finally, in Sect. 15.3.4, the general approach for assessing landscape aesthetic quality (by modeling supra-individual core-preferences) used in Germany is presented. Building on these four case studies and relevant literature, a proposal is then presented for a preliminary set of indicators that can be used to gauge landscape aesthetics capacity on a pan-European basis.

15.3 Methods for the Assessment of Landscape Aesthetics Capacity

15.3.1 Landscape Character Assessment in England, Scotland and Wales

For a variety of reasons, we start with a description of Landscape Character Assessment (LCA) approaches in England, Scotland and Wales. Not only has LCA had a long tradition in the UK, starting in the early 1970s with landscape evaluation, to landscape assessment during the 1980s, and then to the emphasis on landscape character from the mid-1990s onwards (cf. Swanwick 2002 for a detailed overview of the evolution of landscape character assessment in the UK). The UK approach to

LCA has also influenced LCA methods across Europe and can provide a framework for spatial units of cultural services at various scales.

Particularly in Scandinavia and parts of the Baltic, LCA approaches have followed the British example. In Sect. 15.3.2 it is possible to see how LCA practices in Hungary descend from a similar tradition to the British approach. The UK approach also reflects the principles of the European Landscape Convention (ELC) (Council of Europe 2000). It promotes public involvement and acknowledges that the character of an area is the result of interactions between natural and human factors and how the area is perceived by people. Similarly to the ELC, the goal is to describe the distinctiveness of different landscapes rather than categorize landscapes according to their aesthetic quality (for this see the German example in Sect. 15.3.4). Accordingly, the four key principles of the current British LCA approach are (Swanwick 2002:8):

- “the emphasis placed on landscape character;
- the division between the process of characterization and the making of judgements to inform decisions;
- the roles for both objectivity and subjectivity in the process, and
- the potential for application at different scales.”

In order to reconcile planning procedures across scales (highlighted as important earlier) the LCA encompasses different scales such as national/regional, local authority and local site scale (see Fig. 15.2). Swanwick (2002) refers to the metaphor of a camera zooming in, from the broad view to the detailed small-scale frame. Natural England, the current non-departmental public body of the UK government responsible for nature conservation and landscapes, has comprehensively characterized all of England into National Character Areas (NCA). NCA number 36 is the ‘South Pennines’. The South Pennines area however, encompasses a range of smaller-scale landscape types and areas. ‘Moorland Hills’ is an example of a character type within the South Pennines and ‘Rombalds Hills’ is an example of a character area of the Moorland Hills type. If there were to be a development proposal, a new planning policy or any other landscape project within the Rombald Hills (e.g. a wind farm on Romblads Top), the local authority or their planners, the developer, community groups, land owners or private practices/consultants could prepare a LCA at local scale to inform discussion of the proposed activity. Any of these scales could provide the unit for an assessment of CES.

It is important to note that the LCA process distinguishes two stages: the *characterization*, which is supposed to be as value-free and objective as possible (cf. Sect. 15.3.3), and the second stage, which contains the subsequent *judgements* about landscape character and aesthetics. As already implied in the introduction, there has been a long-standing debate about the role of objectivity and subjectivity in the assessment of landscape. It may be argued that this is one of the key distinctions among the various approaches in Europe.



Fig. 15.2 The Landscape Character Assessment spatial hierarchy – an example of the relationship between the different levels. (Swanwick 2002)

Box 15.1 explains the main steps in an LCA based on Tudor (2014) and Swanwick (2002).

Box 15.1: Landscape Character Assessment Method in England, Scotland and Wales

Step 1: Defining the scope. All LCAs need to have a clearly defined purpose as this will critically influence the scale and level of detail of the assessment, the extent to which other subject areas are integrated, resources required, and the ways in which stakeholders can be involved in its preparation. Then, it is suggested to draft a project plan and brief including the nature of the outputs. With increasing LCA coverage, determining how far existing LCAs are up-to-date is also suggested as well as providing an appropriate scale, level of detail and stakeholder involvement to be considered.

Step 2: Desk study. The desk study includes the gathering of baseline data on a) natural factors, b) cultural factors, c) perceptual/aesthetic factors and c) cultural associations. Natural factors benefit significantly from the use of a Geographical Information System (GIS), a computer-based system to manage data input and to map, analyze and present geospatial data. GIS can particularly help in the assessment of natural factors in a LCA but it is also limited by the quality of available data. A GIS database is not a substitute for

(continued)

Box 15.1 (continued)

the LCA because the experiential part is underrepresented in GIS. That said, GIS can be a useful tool to facilitate stakeholder engagement. It is recommended to consider involving the public early on, particularly with regard to the aesthetic and cultural factors.

Step 3: Field survey. Field data are collected in a rigorous way to review the desk study findings but also to record new aesthetic/perceptual and experiential aspects. There is still need for creative methods of collection, e.g. through social media, film or citizen science.

Step 4: Classification and description. The output of the characterization process is refined and finalized by classifying the landscape into landscape character types and/or areas; mapping their extent, based on all the information collected and describing their character.

2. Application of Landscape Character Assessment

Using LCA to inform decisions. The European Landscape Convention (ELC) defines three categories of action, i.e. landscape management, landscape planning and landscape protection. LCA has an important contribution to make in all three of these categories. In addition to landscape character, landscape decision can relate to landscape quality, landscape value, landscape sensitivity, landscape capacity, landscape function and landscape objectives.

Applications. Within the three categories mentioned in the ELC, numerous applications refer to the LCA, for example: landscape strategies and management plans, green infrastructure plans, catchment management plans (landscape management); planning policies, Strategic Environmental Assessment and Environmental Impact Assessments, village design statements and masterplans (landscape planning); landscape designations and National Park management plans (landscape protection).

Step 2, Desk Study, and Step 3, Field Survey, consider not only a wide range of physical landscape characteristics but also perceptual/aesthetic and cultural/social factors and cultural associations (see box above). It has become best practice in the UK to describe these features in short profiles with summaries of the most important characteristics in bullet points, a map of the position and extent of the landscape character type/areas, this illustrated through photos, sketches and diagrams. It may be argued in favour of this LCA approach that these qualitative descriptions are particularly powerful in the description of aesthetic and perceptual factors and also well suited for public involvement.

Although perceptual, cultural and social factors are often easier to collect in a field survey, some relevant datasets do exist at regional and even national scales in England, Scotland and Wales. The Campaign to Protect Rural England (CPRE) compiled so-called 'Dark Skies' maps mapping light saturation for each square kilometer in England. 'Tranquility' maps for England and Wales (Fig. 15.3) and a series of national 'Intrusion' maps for the 1960s, 1990s and 2007 were also created.



National map with 2001 regional boundaries

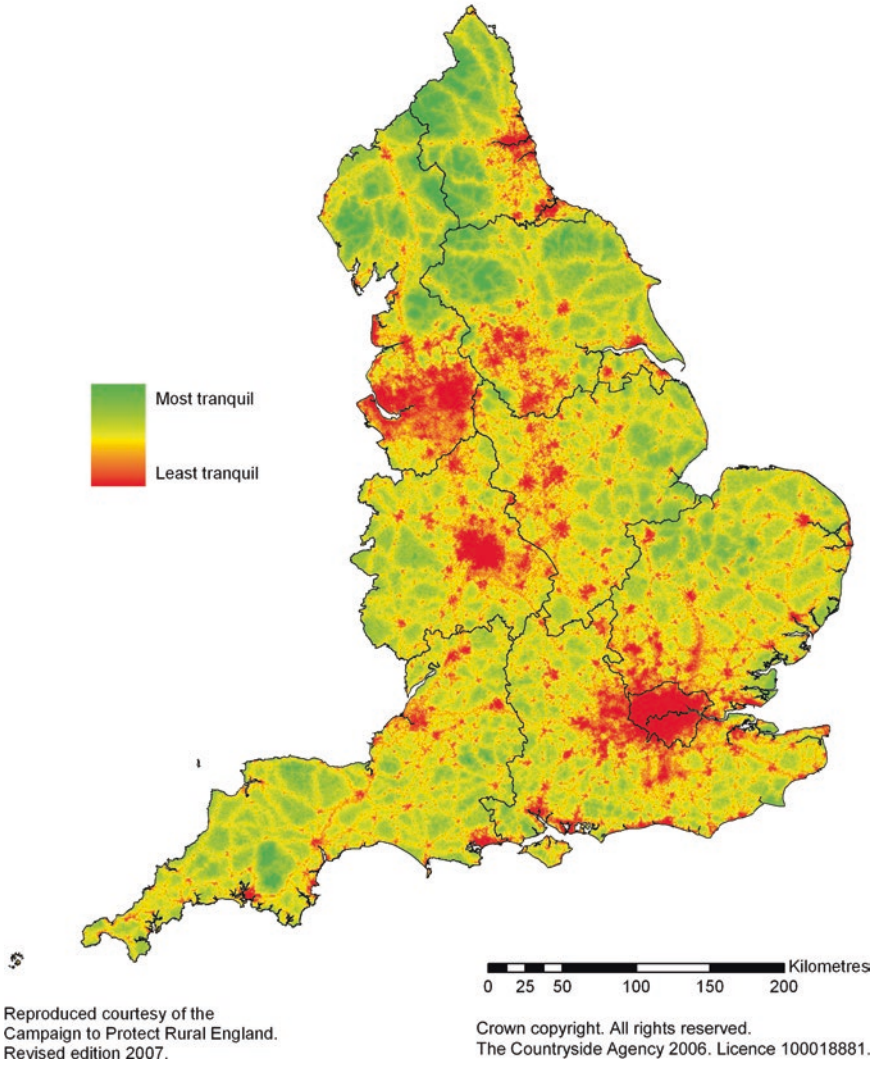


Fig. 15.3 National tranquility map with regional boundaries of 2001. (CPRE 2007)

The national Intrusion maps quantitatively and visually compared the distribution and the amount of land classified as disturbed. Scottish Natural Heritage has mapped areas classified as wild for Scotland. In Wales, LANDMAP contains both visual and sensory information about Welsh landscapes.

Various applications of LCA have evolved. Landscape management strategies, planning policies, design guidance and protecting valued landscapes are common approaches following on from an LCA. Recent LCAs have demonstrated striking versatility. For instance, they informed the development of green infrastructure plans, forestry strategies, river catchment planning and many other policy documents (Land Use Consultants 2011). Considering aesthetic qualities, judgements by both experts and lay people will touch on the concept of landscape value and cultural services (Swanwick 2002). Well-established landscape-related indicators used to determine landscape values are *landscape quality*, *scenic quality*, *rarity*, *representativeness*, *features of cultural interest*, *wildness and cultural associations* and *tranquility*, which is a composite indicator. Particularly in large-scale infrastructure projects, such as the new high-speed rail network HS2 and in terms of the cumulative impacts of wind farms, tranquility has received growing interest in the UK.

Additionally, of particular interest in the context of this chapter are capacity studies, i.e. studies of “the degree to which a particular landscape character type or area is able to accommodate change without significant effects on its character, or overall change of landscape character type” (Swanwick 2002:53). A capacity study is specific to a certain type of development, e.g. a wind farm, and interestingly, wind farms have been the main driver for capacity studies in recent years. Capacity studies benefit from public perception studies and some of them have successfully adopted the scenario method to assess landscape capacity under different development options. That said, a debate has started about whether capacity is still an appropriate factor to look at. Land Use Consultants (2011) suggest shifting the emphasis from capacity, as the main criteria, towards sensitivity. On the other hand, it may be argued that examples calculating capacities of natural resources for sustainable development are shifting in the opposite direction, emphasizing capacity even more (see Rockström et al. 2009). This issue cannot be solved here but this book may provide important contributions to the debate.

Several research studies have explored new ways of facilitating public involvement in LCA. These are based on a conceptual framework grounded in perception as a phenomenological experience of landscape, Butler and Berglund (2012) assess 52 British LCAs, dating from 2007 to 2011, to see how public involvement has been considered. They conclude that only a quarter of all assessments involved the public. Butler and Åkerskog (2014) suggest that, despite a lack of participation and the common misconception that awareness-raising about landscape is a top-down process, the LCA method does have the potential for mutual knowledge exchange and collaboration. They conclude that the first step is to acknowledge the values and aspirations attached to a landscape and consequently, mutual public involvement will alter how landscape is perceived. Those who experience a landscape need to be facilitated in expressing their values – which brings us back to the entangled topics of perception and preference.

How can ecosystem services facilitate such a process of two-way public awareness-raising and involvement? It has been argued that ES are an important communication tool for uncovering the benefits of aesthetic capacities of different landscapes. A first step then could be the use of Landscape Description Units (LDU)

as suggested in the Living Landscapes approach, which is based on the LCA method for England, Scotland and Wales.

LDUs are distinct and relatively homogeneous units of land, each defined by a series of definitive attributes, so called because they define the extent of each spatial unit. There are four definitive attributes at Level 1—Physiography and Ground type which describe the underlying natural dimension of the landscape, and Land-cover and Cultural pattern (reflecting settlement pattern and farm structure) which describe the cultural dimension of the landscape (Warnock and Griffiths 2015:265).

According to Warnock and Griffiths (2015), ES can be applied to a variety of geographical units – ecosystems themselves, catchment areas, landscape character areas or types, the particular features and attributes of landscapes, and areas of green infrastructure.

15.3.2 Landscape Character Assessment in Hungary

Arising from the British LCA method (Swanwick 2002), the application in Hungary has considered natural, cultural and aesthetic characteristics. The landscape character types were initially tackled at the micro/regional scale and the assessment placed an even greater emphasis on fieldwork and aspects of perception.

After defining the landscape character types on-site, the detailed micro-regional assessment was adapted for larger areas and the expert judgements validated by factual, mapped information. Furthermore, the relevant and consistent landscape attributes, which represent the uniqueness of the landscape character types, were defined.

An important task is assessing how to map the quantitative and qualitative information, identifying the most appropriate indicators. In Hungary, three main attributes in a hierarchical system were chosen. The first two are complex indicators and the third is a simple factual characteristic.

1. The *relief type* reflecting geomorphology, geology and hydrology that is defined by the physical setting, based on thematic maps.
2. The *human impact* – expressing the intensity and heterogeneity of the land use from the natural state towards the highly transformed urban areas, based mainly on field work. This is the attribute that contains the information on aesthetical/perceptual aspects.
3. *Land cover dominance*, a clear, measurable feature but nevertheless, a very strong characteristic. It is based on CORINE Land Cover maps. It is obviously connected to the first two attributes but also gives highly relevant additional information on the land use, landscape quality, and helps to define the real ‘face’ of the landscape.

Relief and land cover dominance can be derived from cartographic datasets, but human impact is both a quantitative and qualitative attribute. The definition of

human impact has been based mainly on perceptual information gained by field work. This is a crucial part of the method as it allowed the inclusion of qualitative information into a complex attribute and into GIS systems. It needed both expert judgement and accurate knowledge about the individual areas.

When applied in a study area of 2634 km² spanning the Austria-Hungary border the combination of the three attributes resulted in the identification of 65 character types. This is an extremely high level of variability. Although these patches are relevant mosaic units of the landscape, and their uniqueness should therefore be taken into account, further aggregation was still considered necessary. The spatial distribution of these mosaic units made possible their aggregation by expert judgement, which resulted in 13 landscape character types in the study area (see Fig. 15.4). Figure 15.5 shows examples of Hungarian character types.

In summary, LCA in Hungary places a greater emphasis on expert judgment, while that in the UK puts more efforts on public engagement. In Hungary more

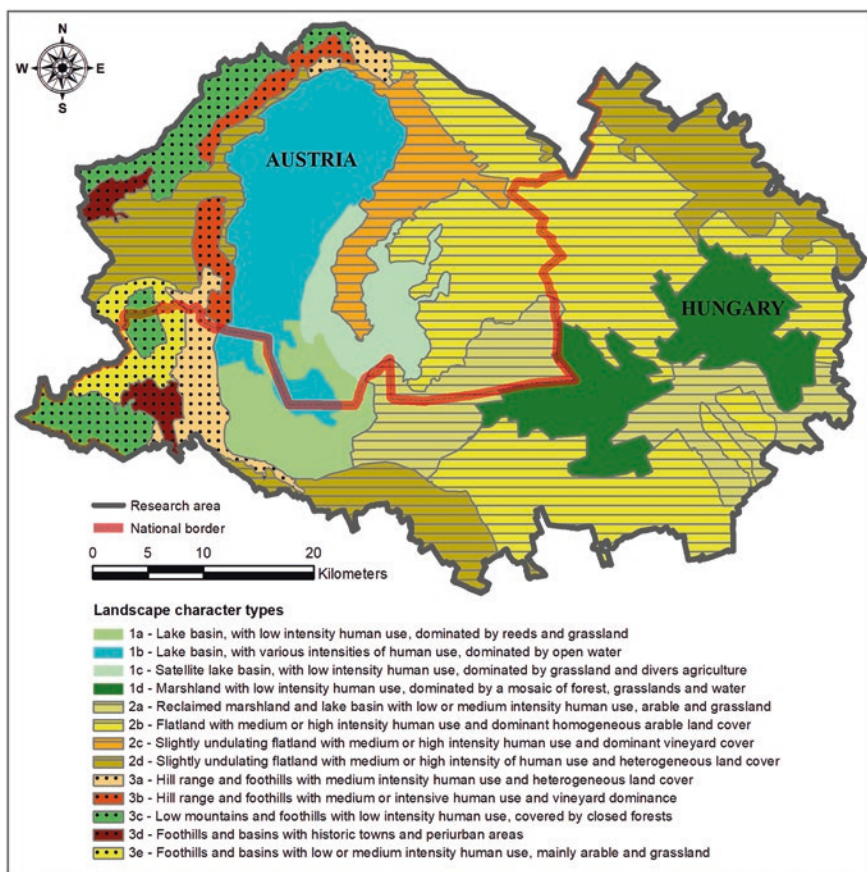


Fig. 15.4 Landscape character types in the Austro-Hungarian study area Fertő-Hanság

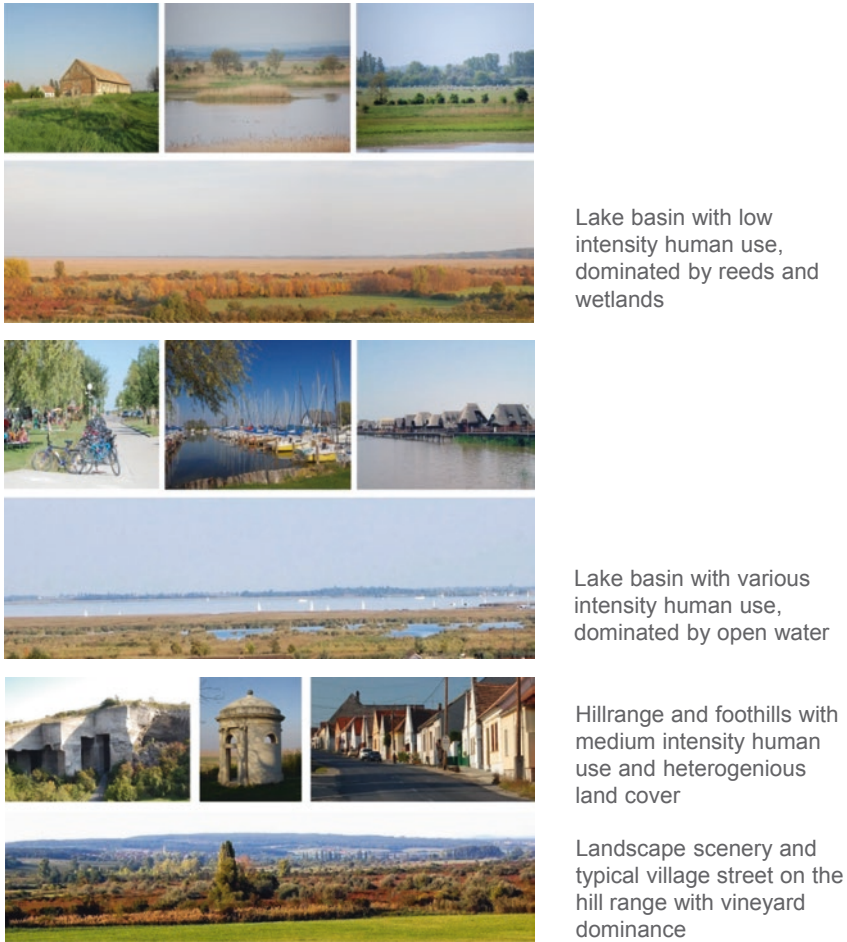


Fig. 15.5 Examples of Hungarian landscape character types

emphasis has been put on the perception factors at the local scale of the analysis. Nevertheless, when upscaling to the larger regional or national scale, some of the detailed perception aspects are aggregated and lost.

15.3.3 Assessing Landscape Aesthetics Capacity in Portugal

In 2004 Portuguese landscapes were classified into landscape units ‘*unidades de paisagem*’ based on cartographic layers such as relief and vegetation and a considerable field work effort. This project developed through a partnership between the Portuguese planning ministry and the University of Évora (Abreu et al. 2004). Figure 15.6 shows that there are 28 classes, further divided into several subclasses.



Fig. 15.6 Landscape Units (Carta Unidades de Paisagem) in Portugal. (Source http://www.dgterritorio.pt/sistemas_de_informacao/snit/cup (accessed 20 June 2018))

In Portugal, although the landscape scale is commonly referred to within legislation, the Portuguese planning system is very hierarchical within individual sectors such as forestry and urban development. Therefore, there are as yet no comprehensive landscape scale planning approaches nor are there any formal methods to assess LAC. In 2015 the National Policy in Architecture and Landscape (PNAP Política Nacional Arquitetura e Paisagem) *Diário da República*, 1.^a série – N.º 130 – 7 de julho de 2015 was formally enacted. This piece of law was contested by the Portuguese Association of Landscape Ecology (APEP) and other stakeholders. The reason for disagreement was the narrow vision of the policy that were thought to favour the architecture discipline and missed the opportunity to address landscape

in a transdisciplinary manner focusing on all landscapes (not only the ones with cultural value) as is the premise of the European Landscape Convention (ELC).

In such an unsettled legislative situation different research projects and initiatives by civil society dealing with landscape issues have developed in a variety of ways. All these initiatives acknowledge that landscapes (all landscapes, not only the ones with cultural and natural value) in Portugal are very important to everyday life. These initiatives and projects, some of them sponsored by the government, address the ways in which Portuguese landscapes satisfy multiple societal demands.

In addition to a national assessment by Abreu et al. (2004), regional partnerships have occurred amongst official planning bodies (particularly in the agriculture and forestry domains) and universities or research centres. In this context, in southern Portugal, the Instituto de Ciências Agrárias e Mediterrânicas (ICAAM) assessed both i) the ways in which different people described their surrounding landscape to others outside the region and ii) which land cover patterns related to landscape aesthetics capacity (see Carvalho Ribeiro et al. 2013).

The study examined which physical landscape components relate to subjective landscape dimensions such as landscape aesthetics and scenic beauty. The physical components with the strongest associations included the so-called montado agro forestry system and heritage sites (castle, churches), in addition to relief and topography (hilly landscapes). There were also other immaterial landscape aspects such as tranquility, smells, and colours that respondents associated with physical landscape attributes so that they could be mapped. In fact, the argument used by different people to justify how and why they composed their preferred land cover patterns, was that of landscape aesthetics capacity (Fig. 15.7).

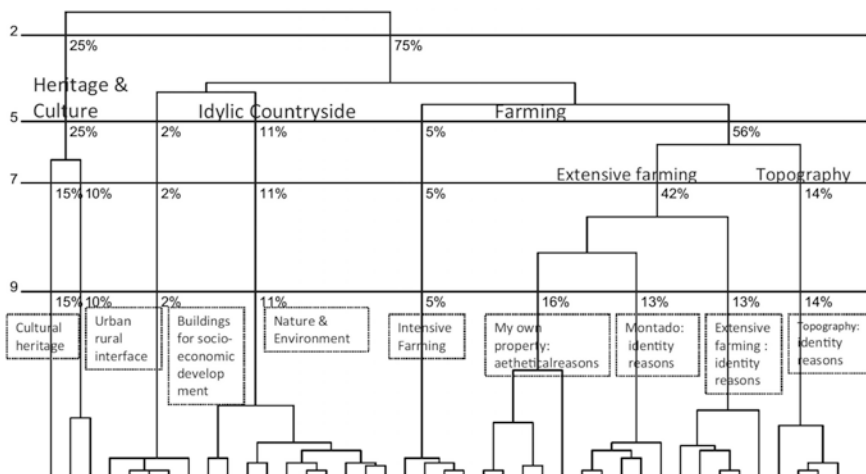


Fig. 15.7 Clusters of responses from Multiple Correspondence Analysis (see Carvalho Ribeiro et al. 2013)

In the majority of landscape preference studies, photo questionnaires are used with real photos or photomontages. In these cases the respondents have to make selections on the basis of the 'existing' landscape. In ICAAM, through the development of the Landscape Preferences Spatial Framework respondents were asked to compose their preferred 3D 'block diagram' of land cover categories and then areas in the real landscape that matched these patterns were mapped (Carvalho Ribeiro et al. 2013). This method was important to explore which land cover patterns were in line with landscape aesthetics capacity. It also created a bridge between personal preferences and mapping which could be used as a basis for landscape planning approaches.

15.3.4 Mapping and Assessing Landscape Aesthetics Capacity in Germany: Formal Methods Adapted for Landscape Planning and Environmental Impact Assessments

15.3.4.1 The Tradition of Landscape Aesthetic Assessment in Germany

Landscape aesthetics assessments have a long tradition in Germany as they are an important part of landscape planning and environmental impact assessments. The German Federal Nature Conservation Act of 1976 earmarked landscape planning as the principal instrument for safeguarding beautiful landscapes and developing the recreational value of landscapes. The purpose of the aesthetic assessments is to identify beautiful landscapes or landscape elements which should be protected, further developed for recreational use or where infrastructure for recreation should be improved. The assessment methodology of landscape planning is also used for comparing the impacts of plans and project variants on landscape aesthetics, in the context of environmental impact assessments, or in order to define landscape adapted compensation needs (as demanded by the German Federal Nature Conservation Act). The first formalized (repeatable) method for transparently and intersubjectively assessing the diversity of the landscape was developed by Kiemstedt in 1967. The method followed a multicriteria benefit analysis approach. In addition, general landscape preferences of the population were also explored (e.g. Hanstein 1967), which could substantiate the formal assessments.

At present there are numerous methods for assessing the visual landscape in Germany. They are usually adapted to different planning scales, from the federal state, to the regional and the communal level. The formal assessments, which are based on general landscape preferences of the German population but do not include the specific perspective of the actual local landscape users, are called user-independent methods. The resulting landscape evaluation is used for designing landscape conservation areas, for considering valuable landscapes and landscape elements in municipal development or infrastructure planning and for improving beautiful landscapes for tourism.

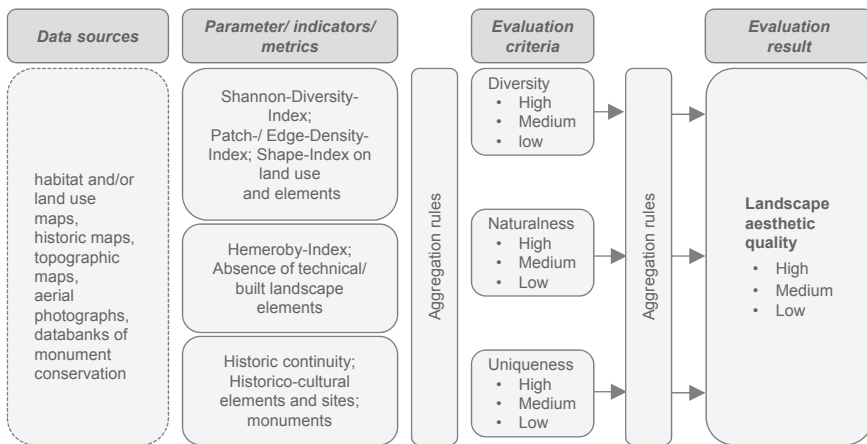
These formal methods can and should be supplemented by user-dependent methods, which capture the actual utilization of the landscape and local landscape

preferences. In particular in local scale landscape planning, the specific perception and landscape use of individuals should be included. However, in German landscape planning a systematic user-dependent assessment is not very common because of the time-consuming methodologies. However, the standard procedure does include gathering of user opinions during citizen meetings as part of the participation process. Recently, in interactive or at least web-based landscape planning (e.g. interactive landscape plan Koenigslutter, <http://entera-online.com/>), it is much easier to collect user preferences, e.g. by participatory GIS tools. Resulting information on how locals see and use the landscape can be used to integrate specific local needs into landscape planning, which may differ from or add to the general landscape valuation.

15.3.4.2 User-Independent, Formal Assessment

In the formalized landscape aesthetics assessment, the landscape is evaluated by three basic criteria using lists of indicators (usually landscape features). The three most widely-used criteria are diversity, naturalness and specific landscape character (uniqueness) (Fig. 15.8). These criteria are supported by the German Federal Nature Conservation Act, which mentions diversity, uniqueness and beauty as integrating properties. The act also mentions the capacities for recreation and natural and

Non user-related evaluation (delivered service) landscape aesthetic quality



User-related evaluation

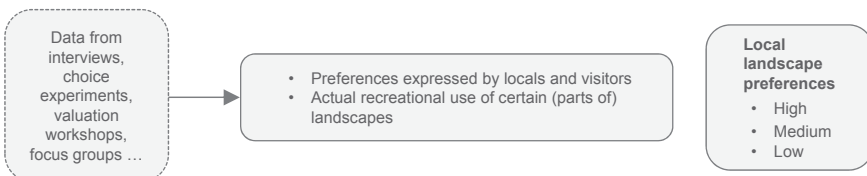


Fig. 15.8 Workflow, criteria and parameters for evaluating landscape aesthetic quality in Germany

historic landscapes as valuable properties and assets to be conserved (BNatSchG §1 (1) 3 and (4)). Furthermore, the criteria are based on preference studies in different landscapes, which have shown that there is a core of basic common landscape preferences. Only this core is measured in the landscape aesthetics assessment. Individual preferences of landscape users, which may be influenced by a diversity of individual preconditions, are neglected in the user-independent methods. The inventory of such individual preferences is left to the user-dependent approaches.

Within the group of user-independent formal assessments, different combinations of objective landscape metrics are used as valuation parameters (see Hermes et al. 2018a). The criterion diversity is understood as the variety and distribution of landscape components (land use-types and landscape elements). It can be measured using a variety of metrics. For example, the Shannon Index represents the number and proportional distribution of different landscape components in a given area. However, it does not indicate their proximity and spatial correlation and therefore, does not indicate the complete composition of the landscape components. For this, the index has to be combined with other indicators such as the Patch Density Index, which calculates the number of single patches per area. Other indices like the Shape Index or Edge Density Index account for the shape of landscape component types, which leads to differences in the perceived structural diversity of a landscape, even though the composition may be the same. Other indices that have been found to be significant when tested with social-empirical methods are the forest/open-landscape ratio and arable/grassland ratio. Next to land cover, relief diversity most influences the visual impression of a landscape. It can be expressed, for example, as roughness or relief energy. Examples of these latter indices can be found in Herbst et al. (2009), Roth and Gruehn (2006), Ode and Miller (2011), Roser (2011), Frank et al. (2013), Hermes et al. (2018b).

Naturalness is measured using the *hemeroby index*, a qualitative scale describing the degree of human impact on the landscape. It expresses the distance of the current state from a constructed potential natural landscape, if all human impact stopped (hemeroby, according to Sukopp 1976; Blume and Sukopp 1976) (see also Walz and Stein 2014; Rüdissler et al. 2012; Kowarik 2006). As this also accounts for irreversible changes, it seems to be more appropriate than using a historic 'natural' state as reference. Such a state is also very difficult to define. Despite its origin in ecology and biodiversity research, the index can be included in assessments of aesthetic values of landscapes, as shown by Frank et al. (2013) and Paracchini et al. (2014). In this context the indicator 'naturalness' should be adapted to better represent the human perception and experience of naturalness (Hermes et al. 2018b). Uniqueness is measured by the occurrence of landscape features that are rare in a nationwide comparison and thus characteristic compared to other landscapes. An analysis of the occurrence of landscape features in different landscapes on a national scale can be used as a basis for judging the degree or rareness of landscape elements. People in local communities, confronted with such uniqueness maps, have been very interested to learn which landscape elements in their municipality are rare elsewhere and thus constitute a uniqueness that they can identify with. However, in Germany the data situation does not yet allow a sound analysis of rareness on

national scale because many relevant data sets are available only in the federal states and not in a nationally comparable format. Next to improving the data availability the assessment of uniqueness could be enhanced by extending social-empirical studies to name places or landscape elements that are characteristic for a region or have a high symbolic or recognition value as perceived by people (cf. Steinitz 2010). In the context of uniqueness, historic landscape characteristics and elements/ensembles are also considered. They are included by using, for example, lists of perceptible cultural and natural historic landscape elements such as dolines, ‘village lime trees’, megalithic tombs, historical fish ponds or sunken roads, which bear testimony to historical landscape continuity. Another way to distinguish historic continuity is to compare current and historic maps (according to Nohl 2001, the historic maps need to be at least 50 year old). All in all, the criterion uniqueness relates to the landscape character in the LCA.

The three criteria, diversity, naturalness and uniqueness, are assessed separately and ultimately combined into the evaluation of landscape aesthetic quality. An example of such output for the Hannover region is shown in Fig. 15.9. Depending on the scale of the analysis (e.g. if the planning area is very small), it might also be relevant to include indicators for sense of taste and the sense of touch (Nohl 2001).

Delineation of spatial valuation units may be performed by identifying landscapes which are perceived to be homogenous in structure and composition of landscape components by the visitor. The differentiation of landscape units is similar to the approach used in LCA. The size of the landscape units is dependent on the scale

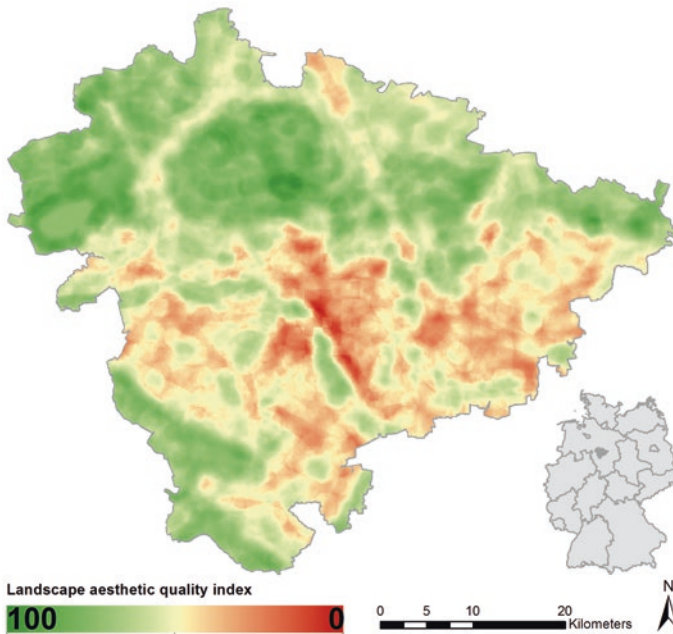


Fig. 15.9 Characterization and assessment of visual landscape in the Hannover region

of the planning area and the character of the landscape itself. However, this method is not very transparent as it greatly depends on individual decisions made by the planner. Furthermore, the method can only be automated with great difficulty. It is much easier to use a GIS to perform an assessment on the basis of grid cells. If needed for planning purposes, grid cells with similar characteristics can be identified and aggregated into more or less homogeneous landscape zones. The problem of very inhomogeneous grid cells can be solved by choosing relatively small grid cell sizes and applying neighborhood analysis tools.

In a reflection of the DPSIR approach (Chap. 3), other existing or proposed landscape disturbances (pressures) and their impact on recreational landscape qualities are also assessed. This includes the impact the disturbances have on the visual landscape as well as disturbances by noise or smell. The disturbances have to be analyzed to determine their intensity and the amount of area affected by them.

The spatial extent of such disturbances is calculated by visibility analysis (e.g. viewshed analysis in GIS software), air pollution and noise propagation models. The affected areas can also be mapped by simple standardized methods such as defining noise bands along streets according to DIN 18005-1 'noise abatement in town planning'. The evaluation of the impact is classified on an ordinal scale and based on German legislation about acceptable emission levels for different user groups. For example, noise standards exist for residential areas or areas with health facilities.

As a basis for mapping the visual landscape, relevant information can be extracted from existing maps such as habitat or land use maps, topographic maps, aerial photographs and other information in order to reduce field mapping efforts. Once in the field, further relevant landscape characteristics and elements need to be mapped. A standard list of landscape elements can be used as the basis for mapping.

15.3.4.3 Landscape Features Required for Specific Recreational Activities

Aesthetic quality is an important component of the natural capacity of a landscape for CES provision. For the more general/unspecific types of landscape enjoyment, the aesthetic quality may even be the only relevant or most important component. However, there are more specific kinds of recreational landscape uses that focus on particular elements and features. These include for example, rivers and lakes, which provide opportunities for all kinds of water-related activities. Additional examples are specific relief forms, which are the precondition for activities such as outdoor-skiing and climbing, or habitats and interesting species that allow for nature observation. Next to natural elements, historic-cultural elements and sites also need to be considered. The density of such features and elements, in a given area, can be used as a metric to map their availability in different landscapes. If possible, it is desirable to include data sources that better represent such assets rather than mere land use/cover data. Such data sources might, for example, indicate the quality of a feature/element, inherent value or suitability for specific recreational use. For nature observation, for example, this includes habitat quality, species richness or population size. Other examples are the quality of bathing waters or the preservation status

of certain areas and elements. Such elements should be given specific attention in planning of responses and may lead to an upgrading of the respective patches in the landscape aesthetics assessment results.

15.4 From Delivered CES to Utilization: Determinants for Outdoor Recreation?

For outdoor recreation, not only is the landscape aesthetic quality relevant but there are also large overlaps with other CES. For example, with the group of physical and experiential interactions with ecosystems and their components, as well as some aspects of cultural and natural heritage or education. As the differentiation of these factors is difficult and for some of them no assessment methods are at hand, the following section regarding methods for assessing and mapping CES utilization will focus on outdoor recreation. However, this should not lead to a marginalization of other important CES that are more difficult to assess (Milcu et al. 2013).

The landscape aesthetic qualities and types of properties listed in Table 15.1 are preconditions for activities such as hiking, bike riding, bird watching or rafting. Consequently, these attributes are the most important aspect of a landscape's recreation capacity. Mapping how they are used can be done concurrently. The differentiation between LAC and their actual utilization is a valuable means of deducing response measures for CES (Chap. 24).

Table 15.1 Examples of landscape features and infrastructures relevant for specific activities

	Features	Infrastructure	Data
Suitability for bird watching	Quantity: Area of habitat for interesting species	Observation towers, hides, information boards; guided tours	Official land use data; thematic maps (e.g. bird monitoring)
	Quality: Population size of interesting species; number of different interesting species; rarity of species		
Suitability for hiking/cycling	Scenic views/no noise	Quantity: Density of paths and roads without traffic; benches; number of viewpoints; restaurants and lodging for longer trips	Official land use data; online mapping sources such as OpenStreetMap; hiking maps; tourist information
		Quality: Marked/quality controlled hiking trails/cycling routes; furnishing	
Suitability for rafting	Length of suitable river(s)	Special facilities in the river; rental stations, guided tours	Tourist information

Data to measure and assess actual outdoor recreation is often scarce. Therefore, we need to use a mixture of proxies and scattered direct evidence to model the utilization of the landscape. Important proxies for outdoor recreational activities are the ‘human inputs’ (i.e. infrastructure) which are needed. Furthermore, demand, accessibility, and information about local and individual preferences are determinants of actual utilization. Empirical data about visitor numbers and actual activities, as well as survey results about the effects of recreation on people, can validate modelling results – if available. Figure 15.10 presents an approach for modeling CES utilization based on capacities, recreational infrastructure and accessibility.

15.4.1 Recreational Infrastructure

A certain amount of recreational infrastructure is needed to harness the natural capacities of a landscape. Recreational infrastructure can be understood as human input that enables, supports, or enhances the utilization of CES and the benefits obtained from them. It includes such things as paths for accessing an area, map and sign trails, furnishing (benches, picnic areas, shelters and information boards), viewpoints, and infrastructure for specific activities such as campsites, restaurants, lodging and other services. The recreational infrastructure determines if and how well the capacity can be utilized. This consequently has a big impact on the material and immaterial benefits that can be obtained from an area. When mapping the availability of recreational infrastructure, their density in a given area is the most significant measure. This can also be combined with additional information regarding the quality of the infrastructure, e.g. to distinguish between marked hiking trails or scenic roads and simple agricultural or logging roads whose primary purpose is not for recreation. In Germany, the Digital Landscape Model (ATKIS Basis-DLM) contains a great deal of information referring to recreational infrastructure. Internationally, data from OpenStreetMap (www.openstreetmap.org) represents a

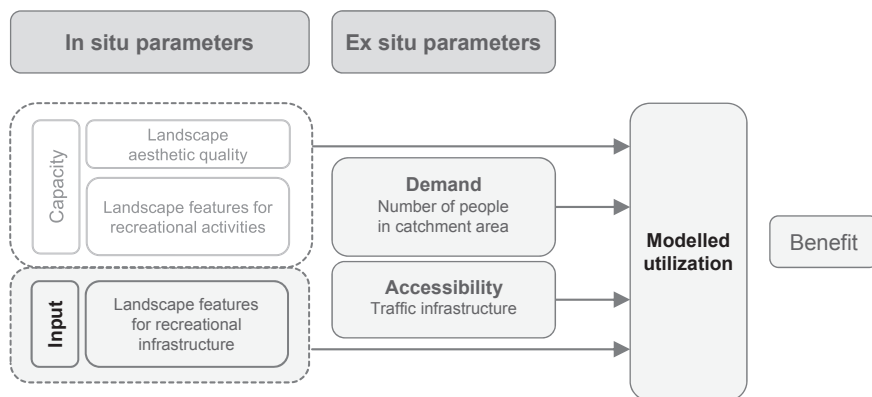


Fig. 15.10 Workflow and parameters for modelling utilized cultural ecosystem services

valuable alternative source, especially when official data are not available. Further information can be gained, for example, from hiking, cycling or tourist information maps. It must also be noted that the role of infrastructure availability varies between different kinds of activities, as some are more dependent on certain infrastructure than others.

15.4.2 Accessibility and Demand

The degree to which potentials are exploited by recreationists depends on their accessibility. Remote areas may be less utilized and thus generate less (economic) benefits from CES than areas with the same or even lower potential, which are located closer to cities and urban areas. This is because the latter areas are accessible to more people. A simple proxy to measure accessibility is the linear distance of an area suitable for recreation to settlement areas (where a demand for recreation opportunities exists). To be more precise, accessibility also relates to travel costs (time and money). Travel costs are determined by travel distances and traffic infrastructure. Travel time/cost maps, for different modes of transport, can be used to characterize recreation sites according to their accessibility (e.g. Sen et al. 2014), where increasing travel time is used as a proxy for decreasing accessibility. Thresholds for travel time are often set to defined areas e.g. for nearby recreation around population centres. Such thresholds need to take into account different kinds of recreation (nearby recreation, day or overnight trips), so that an acceptable relation remains between travel time and duration of the recreational activity. Usually only urban areas of a certain minimum size are considered in such assessments. This is because (a) access to recreation opportunities outside cities is considered to be more relevant in urban than in rural areas (where access is usually assured anyway), and (b) using accessibility from every settlement would not lead to a useful differentiation of landscapes in relatively densely populated countries. Finally, the number of people for whom an area is accessible can be used as a proxy for demand when modelling utilization. The demand relates to the quantity of people likely to utilize the CES in an area and benefit from them. Nevertheless, it is important to note that this proxy does not reflect that the demand can vary depending on user knowledge about the qualities of an area, the extent of substitute destinations that are available and various other factors.

Evaluation of aesthetic qualities and specific activity relevant landscape elements can be undertaken by referring to 'core' preferences. The evaluation of actual utilization however, depends on individual and possibly local collective preferences, as well as the accessibility of the attractive landscape features, and on specific user requirements. Such preferences and requirements differ between socio-demographic groups, between recreationists that perform different activities, and according to different kinds of recreation (nearby visits, day or overnight trips). The differences influence the relative importance of the main determinants (aesthetic quality, recreational infrastructure, and accessibility). In an assessment this can be reflected by using different weightings for the determinants or by adjusting aggregation rules.

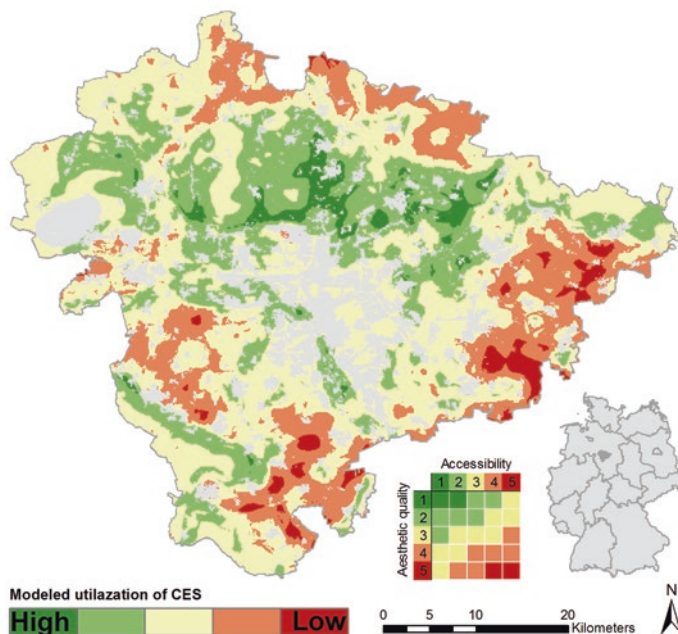


Fig. 15.11 Map of modelled utilization of CES in the Hannover region

Figure 15.11 shows an example of such modelled utilization for the Hannover region. Knowing about these differences and reflecting them in maps for specific types of user, enables planners to respond to them with adequate measures. However, while this is highly desirable it can also be very time consuming to undertake and is not always possible.

Assessments of people's preferences concerning CES require social empirical research such as questionnaire surveys. There are two main approaches that are commonly used, namely revealed preference and stated preferences methods. Revealed preferences methods are based on the observation of actual behavior or individual real life choices. In the case of recreation, the choice to visit a specific site and/or to undertake a specific activity reveals a respondents' preference for certain attributes at the site. Such attributes can include the availability of recreational infrastructure and landscape elements (e.g. visual appearance), as well as, for example, distance from respondents' homes (i.e. the determinants discussed above). A revealed preference approach for economic valuation of recreation benefits is the travel cost method. It is based on the premise that the monetary recreational value of a site is partly expressed through the amount of time and money respondents expend to travel to the site (Whitten and Bennett 2002; Martín-López et al. 2009). In stated preference methods people are asked to rank and/or judge a site's or landscape's attributes or to choose from hypothetical choice sets that are characterized by different combinations of attribute levels, some of which can also be monetary (Adamovicz et al. 1994). As both approaches have their strengths and

weaknesses, a combination of both approaches is a desirable option. Finally, the results from such preference analysis can be used to inform the attributes incorporated in spatial analysis to determine and map the aggregated potential for outdoor recreation. For more detailed information on preference analysis and economic valuation see TEEB (2010) and Chap. 20.

While modelling is a valuable and commonly used technique, there are also approaches that focus more directly on the actual use of CES (e.g. Plieninger et al. 2013; Bieling and Plieninger 2013; Wood et al. 2013; Casalegno et al. 2013; Martínez Pastur et al. 2015). Such approaches can be used to supplement and/or validate modelling approaches.

15.5 Indicators for Integrating Landscape Aesthetics Capacity into Planning

As discussed earlier in this chapter, England, Hungary, Germany and Portugal have developed different ways to assess LAC. However, all the described methods include three different components to some degree, namely natural, cultural and perceptual characteristics. Incorporation of these components can provide valuable knowledge for enhanced planning and management, and particularly for including CES such as aesthetics into planning (Opdam et al. 2001; Antrop 2005; von Haaren et al. 2008). Table 15.2 outlines the natural, cultural and perceptual indicators used in the different case studies and presents a summary of other relevant criteria from the literature.

It is apparent that there are differences in how much characteristics other than physical features are considered. In contrast to the other case studies, assessment processes in England, Scotland and Wales usually consider peoples' perception/preferences as at least as important as purely physical aesthetic characteristics. Examples are the concepts of tranquility or wilderness and intrusion. This is also shown in the case of Hungary, where much emphasis is placed on the perceptual dimension. In contrast, with Portuguese landscapes greater emphasis has been placed on the way the physical landscape might contribute to immaterial dimensions (for example how land cover patterns can contribute to perceptual dimensions such as colours and smells).

In German landscape planning the user-independent methods for assessing the aesthetic quality of landscapes are well-developed and widespread in practice. Basically, the criteria diversity, uniqueness and naturalness are used to assess the visual landscape in user-independent methods. User-independent and user-related methods are applied for different planning purposes. In German practice, the application of methods for assessing actual recreational use and economic valuations of CES are less common, but when they are used create a considerable added value for informing landscape planning responses.

Regardless of the different approaches in European countries, Table 15.2 shows that there is much common ground. There is considerable agreement on the set of natural, cultural and perception indicators that satisfy people's aesthetic needs and

Table 15.2 Natural, cultural and perceptual indicators for assessing landscape aesthetics capacity

Case study/ criteria	Indicators		
	Natural	Cultural and social	Perceptual and experiential
LCA in England, Scotland and Wales	Geology, landform, air and climate, hydrology, soils, land cover, flora and fauna	Land use, settlement, enclosure, land ownership, time depth	Tranquility, light pollution, intrusion, perceived character, wilderness
LCA in Hungary	Relief, geomorphology Land cover dominance	Human impact, heterogeneity and intensity	Smell, sound memories, sense of place
Formal delivery assessment and use oriented assessment in Germany	(Perceived) naturalness/hemeroby, geomorphologic characteristics, characteristic fauna and flora, natural preconditions for specific activities	Heterogeneity of land cover; uniqueness/historicity (landscape character) Rare and characteristic landscape elements e.g. single trees, alleys etc. – historic cultural landscape elements such as castles.	Individual preferences, actual recreational use; perceived disturbances (visual e.g. settlement, buildings and other artificial structures), noise, smells etc.)
Landscape Preferences Spatial Framework (LPSF) in Portugal	Relief, low input land covers e.g. natural forests	Cultural heritage castles, bridges Montado agro forestry churches	Colours, smells and sounds, landscape identity, stewardship
(EU scale) Societal awareness of landscape	Protected areas	High quality traditional products (e.g. Denominazione di origine protetta – DOP), farmland tourism	
Other possible indicators cited in European literature			
(Low) disturbance	Hemeroby		
Historicity		Heritage buildings	
Visual scale	Size of viewsheds		Viewpoints
Imageability			Stones with undefined formats
Diversity		High number of land cover classes per view shed	
Ephemera	Specific land covers, flowering plants		
Coherence			The whole landscape mosaic is greater than the sum of the individual parts
Cared for landscapes		Hedges cared for	
Stewardship			

desires. Additionally, the indicators used in the different case studies are often cited in the wider literature on landscape preferences in Europe (see the lower part of Table 15.2).

15.6 Conclusions

Although the role of ES is recognized in policy and management, CES are not commonly integrated into spatial planning and related decision making processes across Europe. This is arguably due to their supposed ‘subjectivity and immaterialness’ (Carpenter et al. 2009; Kushner et al. 2012).

This review highlights the different ways in which several European countries have dealt with the assessment of LAC. Despite the differences in methods, the case studies presented here reveal that there are similarities in the indicators used to capture aesthetic capacities. Although perceptual, cultural and social factors are often easier to collect in field surveys, some relevant datasets are being developed that represent such factors, without the necessity of mapping them. At the European scale, for example, the Eurostat LUCAS survey (<http://ec.europa.eu/eurostat/statistical-atlas/gis/viewer/?myConfig=LUCAS-2012.xml>) includes photographs of each data point that contributed to the classification of European landscapes according to perceptual dimensions. It is still not known whether this dataset is adequate to create indicators of LAC in a systematic manner. However, it is worthwhile to explore the possibilities of such an extensive dataset.

This chapter has aimed to summarise both theories and empirical work conducted in four different European countries regarding the assessment of LAC. The indicators listed in Table 15.2 provide a basis for enhancing European-wide frameworks. We acknowledge, however, that there is still a long way to go to comprehensively include Landscape aesthetics capacity into planning all over Europe.

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