

Chapter 5

Cultural Ecosystem Services



Zita Izakovičová, Dagmar Štefunková, Jana Špulerová, Dominika Kaisová, Gréta Vrbičanová, Peter Mederly, František Petrovič, Matej Močko, Martina Turanovičová, Barbora Šatalová, Simona Gusejnov, Tomáš Kováč, Ján Černecký, and Viktória Ďuricová

Abstract The chapter provides the analysis and assessment of **three cultural ES**: *C1, Recreation and Tourism: Physical Use of Nature and Landscape*; *C2, Landscape Aesthetics: Aesthetic Values*; and *C3, Natural and Cultural Heritage: Intellectual and Scientific Values*. All ES are described in the unified structure: definition and brief characteristics, methods used for identification and assessment, main types of landscape and ecosystems providing given ES, the importance of ES in terms of nature and landscape protection and ES assessment for the territory of Slovakia. Spatial assessment is provided as a map of the landscape capacity for a given ES provision. For all ES, short conclusions and overview of input data for further assessment of the ES capacity, demand and flow are also given.

Z. Izakovičová (✉) · D. Štefunková · J. Špulerová · B. Šatalová
Institute of Landscape Ecology of the Slovak Academy of Sciences, Bratislava, Slovakia
e-mail: zita.izakovicova@savba.sk; dagmar.stefunkova@savba.sk; jana.spulerova@savba.sk;
barbora.satalova@savba.sk

D. Kaisová · G. Vrbičanová · P. Mederly · F. Petrovič · M. Močko · M. Turanovičová
S. Gusejnov · T. Kováč
Faculty of Natural Sciences, Constantine the Philosopher University in Nitra, Nitra, Slovakia
e-mail: dominika.kaisova@ukf.sk; greta.vrbicanova@ukf.sk; pmederly@ukf.sk;
fpetrovic@ukf.sk; matej.mocko@ukf.sk; martina.turanovicova@ukf.sk;
simona.stasova@ukf.sk; tomas.kovac@ukf.sk

J. Černecký
Faculty of Natural Sciences, Constantine the Philosopher University in Nitra, Nitra, Slovakia
State Nature Conservancy of the Slovak Republic, Banská Bystrica, Slovakia
Institute of Landscape Ecology of the Slovak Academy of Sciences, Bratislava, Slovakia
e-mail: jan.cernecky@sopsr.sk

V. Ďuricová
State Nature Conservancy of the Slovak Republic, Banská Bystrica, Slovakia
Faculty of Natural Sciences, Matej Bel University, Banská Bystrica, Slovakia
e-mail: viktoria.duricova@sopsr.sk

5.1 Recreation and Tourism: Physical Use of Nature and Landscape (C1)

5.1.1 Definition and Brief Characteristics of ES



Natural ecosystems provide us with almost endless opportunities for spiritual enrichment, mental development and leisure. Nature is an important source of inspiration for science, culture and art and provides many opportunities for education and research (Gallagher 1993).

Two views are emerging when defining recreation in relation to the ES, in particular to cultural ES. The first considers recreation as an ecosystem service, while the second refers to recreation as a benefit. This is based on an inconsistent understanding of service and benefit terms in the ES context. Boyd and Banzhaf (2007) and Fisher et al. (2009) are in favour of claiming that recreation is only a benefit consisting of multiple inputs (human, social and economic capital) and the ES, which can contribute to the production of recreational benefits and can be present in a number of ecological elements such as forests and meadows.

On the other hand, there are scientists who see recreation as an ES and define it as *the restoration and stimulation of the human body and soul through exploration and interaction with living organisms in their natural environment* (Beaumont et al. (2007)) or *the pleasure which people obtain from natural and cultural ecosystems* (Nahuelhual et al. 2013).

Recreation seen as an ES is one of the cultural ES where ecosystems provide non-material benefits to people (Lankia et al. 2015), and we understand it in terms of user movement, as the service demand is closely related to the presence of people in ecosystems (Nahuelhual et al. 2013). People choose their place of leisure based on the state of the natural and cultivated landscape in the given area (MEA 2005). The role which the ecosystems have in maintaining mental or physical health is highly recognized, despite the difficulties in its measurement (TEEB 2013).

5.1.2 Methods Used to Assess and Identify ES

The value of cultural ES varies from one individual to another. Sociocultural assessment is used most often for the assessment of recreation and tourism. This includes qualitative methods, for example documents/photos analysis from Panoramio that was used in Israel's national study (Lotan et al. 2018) and from Flickr social network in Luxembourg (Becerra-Jurado et al. 2016), or quantitative methods (e.g.

questionnaires) used in a case study in Slovakia (Považan et al. 2015) or Great Britain (Schmidt et al. 2016).

As part of the economic assessment, the *contingent valuation* is preferred: willingness to pay/willingness to accept (WTP/WTA) is understood as the hypothetical cost of entering protected areas and costs of accommodation, meals, fuel or tickets in public transport. This method was applied in case studies in Slovakia (OZ Pronatur 2014; Považan 2013; Považan et al. 2014a; Getzner 2009; Fűzyová et al. 2009). Travel cost method (real consumer costs associated with accommodation, food, transport and entrance fees) was used in Italian protected areas (Schirpke et al. 2018). The economic assessment of recreation by means of value transfer has been applied by Frélichová et al. (2014) in the CR. This method is cost-effective but is susceptible to generalization errors for a number of input variables.

In some cases, ecological (biophysical) methods, such as *biodiversity indicator development*, are also used to assess recreation and tourism. These methods analyze environmental variables to indicate biodiversity status and changes. According to SEA, the key indicators for tourism in Slovakia include, for example, tourism destinations, erosion caused by tourism or a number of protected areas threatened by tourism (available online: www.enviroportal.sk/indikatory). The use of models can significantly contribute to spatial data representation; such an approach was proposed in the CR (Vačkář et al. 2014).

Other methods are also used in various studies, which can generally be used to assess the cultural ES. Many of them are described in the assessment of the next ES C2.

5.1.3 The Main Types of Landscape and Ecosystems Which Provide ES

Every natural or seminatural ecosystem (landscape unit) can provide several cultural ES. From a societal and cultural point of view, grasslands (meadows and pastures) help maintain the viability of rural communities as an important source of employment, improving rural tourism and recreation (Kemp and Michalk 2007). They offer suitable conditions for ecotourism and education (nature trails, hiking with expert guide).

In a natural as well as human-modified landscape, the rivers, water bodies and other water elements (e.g. fountains or small ponds in recreational areas of cities or in private gardens) play an important aesthetic value. They are also intensively used for recreational purposes (bathing, boating, rafting, canoeing, sport fishing, photography or ecotourism).

Mountain ecosystems provide countless cultural ES. Along with the rich dissection of the relief, they have year-round importance for the development of recreation and tourism. They are particularly important in terms of winter sports development; in summer they are used mainly for hiking, forest fruit harvesting and so on



Fig. 5.1 The recreational use of landscape is one of the most important functions of mountain ecosystems (mountain hut – Chata pod Borišovom, Veľká Fatra), author: D. Kaisová

(Fig. 5.1). The attractiveness of these sites is increasing with the development of ecotourism, which aims at education and nature protection (Vandewalle et al. 2009).

In addition to its primary production function, the agricultural landscape has been developing as a tourist destination in recent years. It offers opportunities to learn about the historical, cultural and natural potential of the landscape. An example of the intersection of agriculture and tourism is agro-tourism (Palkechová and Kozáková 2015).

Geological formations and geomorphological phenomena represent a unique aesthetic element of the landscape in terms of cultural ES, which form the main attraction for establishing educational trails or for active leisure – climbing or speleotourism (Hanley et al. 2002).

The phenomenon of a healthy lifestyle also brings forward the active use of spaces of urban parks and other urban vegetation, especially for physical activities such as running, walking, skating or cycling. Maintained greenery, water areas, playgrounds and other green space equipment create suitable conditions for recreation, which, thanks to the relatively simple accessibility (in the city), is widely used for spending leisure time (Santos et al. 2016).

5.1.4 Importance of ES in Terms of Nature and Landscape Protection in Slovakia

Recreation and tourism are associated with different types of landscapes. However, it is important for all types of landscape to have something to offer to visitors, whether it be natural wealth or cultural-historical sites. That is why many

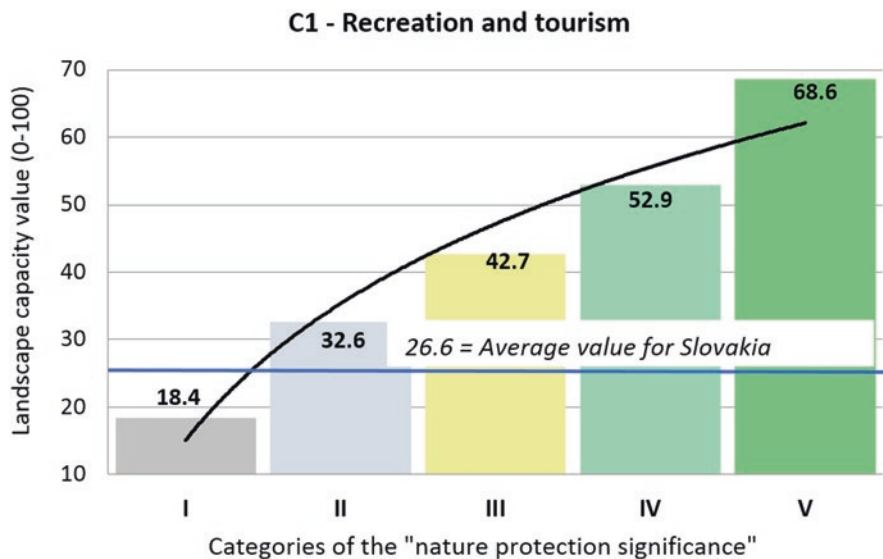


Fig. 5.2 The relationship between ecosystem service C1 and the significance of the territory of Slovakia in terms of nature and landscape protection

holidaymakers seek recreation and tourism in areas which are unique with their species richness or landscape structure. These areas are often subject to some level of territorial protection. Figure 5.2 shows a direct correlation between the significance of the territory of Slovakia in terms of nature and landscape protection and the landscape's capacity for recreational ES.

Visitor's activities in protected areas are regulated by Act No. 543/2002 on Nature and Landscape Protection, which sets limits and restrictions on the movement of visitors from the second degree of protection. Increasing the degree of protection also increases the degree of limitations for visitors. These limitations aim to provide sufficient species and territorial protection for the most valuable parts of the landscape. Unregulated movement of visitors could result in irreversible disturbances of ecological balance in protected areas, for example, disturbing game at the time of breeding and bringing their young out or by trampling on the habitats of protected plant species. The increase of visitors can lead to loss of soil on the hiking trails, the widening of trails and secondary trails and changes in the species composition of vegetation. In addition to maintenance, the solution could be in the form of regulation of number of visitors. However, the situation is complicated by complex legislation, property ownership relationships, demanding implementation and non-understanding from the general public (Vološuk et al. 2016; Piscová et al. 2018).

On the other hand, recreation and tourism can help preserve valuable areas, for example, with entry fees, from which various educational and training events can be financed within protected areas or to cover the costs of protected area management. By visiting such areas, visitors can learn about fauna, flora, important geological features and cultural-historical objects through educational trails, which contributes to public education about nature and landscape protection (Fig. 5.3).



Fig. 5.3 Flagship species (interesting for ordinary people who know them) are a form of enrichment of tourism and nature observation but also an essential component of ecosystem functioning, author: J. Černecký

The integration of soft forms of tourism, which include ecotourism, agro-tourism and rural tourism (Pásková 2008, Pourová 2000), into the decision-making process of municipalities and nature and landscape protection administration bodies plays a particularly important role because some of the cultural ES is very difficult, even impossible, to replace. These include services directly affected by intensive, mass tourism (e.g. aesthetics, natural and cultural heritage).

5.1.5 ES Assessment for the Territory of Slovakia

To calculate the value of recreation and tourism in a specific territory (e.g. protected areas), it is possible to apply procedures according to the manual (Považan et al. 2014b); however, this approach is currently not applicable at a national level due to the absence of the necessary data.

The travel cost method can be used for economic evaluation. The V_{RT} value of recreation/tourism is based on contingent assessment and visitor statistics. The average cost per person per day and the average length of a visitor's stay are usually assessed in the form of a visit survey. *Total travel costs* can be calculated based on the following formula (Považan et al. 2014b): $TC_a = N_a * D_i (TC_{i,1} + TC_{i,2}) * M_a$, where TC_a means the total travel costs of visitors per year a , N_a is the number of visitors per year a , D_i is the average length of stay of visitors i , $TC_{i,1}$ are travel costs in terms of purely travel costs (transport), $TC_{i,2}$ means other costs associated with

the visit (e.g. expenses for accommodation or souvenirs) and M_a is the average number of visitors who only come to see the territory.

For a clear assessment of recreation and tourism as an ES at national level, it is important to allocate areas which provide recreational opportunities while taking into account territorial and species protection, which partially represents limits. In this step, it is necessary to use all suitable spatial information (e.g. maps of landscape structure and use, important natural and cultural-historical sites), so that we can allocate suitable and attractive places for recreation. This data may be supplemented by statistical data showing the number of accommodation and restaurant facilities and the number of beds and parking spaces (at municipal or district level).

It is also important to include in the assessment the environmental limits, such as environmental quality assessment and assessment of selected negative factors, for example mining areas, industrial sites, damaged areas, polluted air, noise and contaminated watercourses. Climate data (number of sunny days per year, number of days with snow cover) and hydrological data may be also included in the assessment. Input data are shown in Table 5.1.

Table 5.1 Input data for assessment of ES recreation and tourism – physical use of nature and landscape

Input data/ES	C1 – Recreation and tourism
Capacity	Map of locations of European network NATURA 2000 (SAC and SPA)
	Map of protected areas (small scale, large area)
	Map of important habitats and habitats of protected plant and animal species
	Map of cultural and historical monuments and reservations
	Map of hiking trails, bike paths, ski resorts, cross-country skiing and running trails
	Statistical data on the number of accommodation facilities per unit area
	Statistical data on the number of restaurant facilities per unit area
	Number of beds (for leisure) per unit area
	Map of hunting and fishing grounds
	Assessment matrix – the relationship between CLS units and recreational ES
	Accessibility of territories from cities (e.g. from regional centres)
	Data about environmental limits (e.g. environmental quality)
	Climatological and hydrological data – temperatures, solar radiation, cloud cover, snow cover
Demand	Map of the current landscape structure – significant and attractive elements of CLS
	Substrate and relief map – attractive shapes and forms of relief and geological environment
	Data on population distribution – urban settlements and densely populated areas
	Map of tourism-related infrastructure (location of hotels, restaurants, car parks, recreational areas)
Flow	Photos on social networks – number of visits and attractiveness of selected areas
	Visitor's statistics for selected territories (e.g. number of overnight stays per unit area per time; number of cave tickets sold; tickets for cultural-historical monuments per unit of time; number of fishing permits per unit area per time; amount of sport equipment rented – bicycles, skis, scooters – per unit of area per time; number of ski passes sold and lift tickets per unit of time)

From the point of view of the spatial expression of the assessed landscape capacity for provision of this ES, it is clear that the most favourable values are typical for the alpine and mountain areas of Slovakia with significant natural conservation values (Fig. 5.4) – especially the areas Vysoké Tatry, Nízke Tatry, Malá Fatra, Poľana and Malé Karpaty. Other important areas include larger areas of hydric ecosystems – especially the area of Podunajsko, the Latorica area and large water reservoirs. On the contrary, the lowest values of recreational potential are typical for large-scale lowlands and basins – especially the Východoslovenská nížina lowland, parts of the Podunajská nížina lowland and Juhoslovenská kotlina basin (Fig. 5.5).

Slovakia has a rich potential for the provision of recreational services and tourism. These services are used by domestic visitors, but foreign tourists are also significantly involved in using this potential. The demand for recreation and tourism is strongly dependent on subjective factors – the various interests of visitors. Demand for recreation and tourism is also influenced by many factors characterizing human potential – social status, education, place of residence, income and so on. Low-income groups do not have the opportunity to develop recreational activities and tourism, as these activities are often associated with certain financial expenses. A similarly important role in the demand for this ES is also played by the place of



Fig. 5.4 Turňa Castle Hill is part of the Slovenský kras National Park, which attracts tourists every year, author: J. Černecký

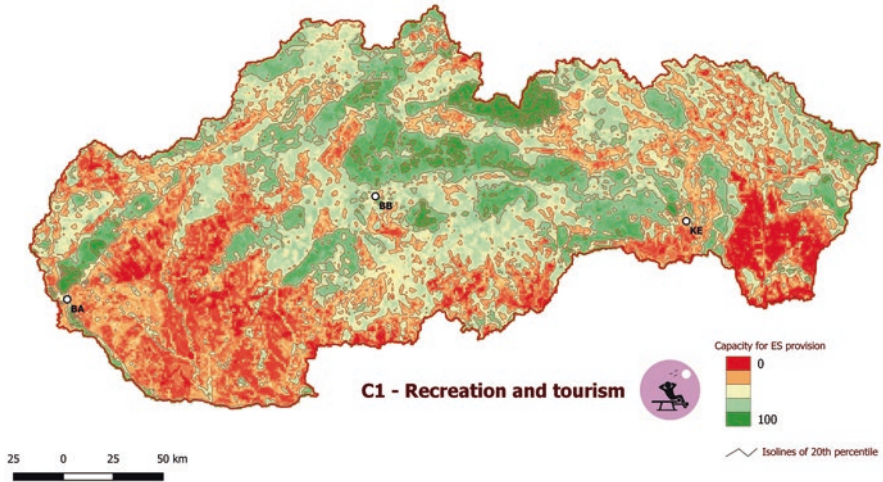


Fig. 5.5 Capacity of the landscape to provide ES recreation and tourism – physical use of nature and landscape

residence, with the urban population having more interest in tourist activities and recreation. The rural population shows less interest in tourism and recreation, as its life is more connected with nature in the form of relaxation and work in the backyard gardens, the performance of self-supply food production and the like. Backyard gardens, orchards and vineyards are also often part of rural homes, which in many cases replace nature.

The real use of ES recreation and tourism – physical use of nature and landscape – is quite difficult to assess objectively, as number of visitors is not monitored in all locations. Suitable indicators for monitoring the use of this ES include statistical data on number of visits to selected areas (e.g. number of overnight stays per unit area per time; number of cave tickets sold; tickets for cultural-historical monuments; number of fishing permits; amount of sports equipment rented – bicycles, skis, scooters; number of ski passes sold and lift tickets; the number of tickets for swimming pools and aquaparks). Demand for free tourism, forest fruit harvesting, walks, etc. is harder to assess in cases where a number of visits is not recorded. Often, these activities are also linked to climatic conditions. Interest in tourism and water sports is also increasing with increasing temperatures and changing climate. Similarly, winter sports are limited by the duration and quality of snow cover. Therefore, the most suitable method to determine the demand and real use of this ES includes the questionnaire methods and various other ways to determine the preferences of residents and visitors.

5.2 Landscape Aesthetics: Aesthetic Values (C2)

5.2.1 Definition and Brief Characteristics of ES



The assessment of the aesthetic values of the landscape and the perception of its beauty is based on an interdisciplinary approach to landscape research, which understands the landscape as a material system with its measurable objects and processes (ecosystem approach), but also evaluates the intangible dimensions of the landscape characteristic of a holistic understanding of the landscape. Landscape perception has a physiological and psychological aspect. The landscape is perceived on the human scale. It provides a view from horizontal observation points (Oťahel' 1999, 2003) determined by environmental properties and the observer.

Depending on the field of science, approach and method, the current terminology base in Slovakia includes most frequently the following terms – *aesthetic quality of the landscape*, *landscape image*, *landscape scenery*, *visual quality of the landscape*, *landscape character or characteristic landscape appearance* (Mišíková 2002; Wöbse 1991; Drdoš 1995; Oťahel' 2003; Štefunková 2004). In Slovakia, the preferred term is the *characteristic landscape appearance* (CLA). The CLA identification and assessment methodology published (Jančura et al. 2010) defines CLA as a set of characteristics which distinguish one landscape from any other.

The visual attractiveness, landscape image and landscape scenery, as well as other cultural ES, are among the ES with the most prominent influence of subjectivity in the assessment process. On the other hand, these ES have their value and play an important role in encouraging public support for ecosystem protection (Daniel et al. 2012). The visual quality of landscape and ecosystems affects the quality of life or the aesthetic enjoyment of people from ecosystem and landscape observation (Burkhard et al. 2014). It also has a special relationship to other cultural ecosystem services, as it greatly supports their value – strong aesthetic effect of ecosystems determines the realization of recreational activities and tourism; strong sensual (aesthetic) experience positively affects the assignment of moral and spiritual values to the perceived place by residents or visitors.

Service beneficiaries – residents, visitors and stakeholders – have different individual and collective value profiles and requirements and the nature of relationships to the perceived image and scenery (Zube et al. 1982). The properties of ecosystems which are measurable and suitable for assessing their attractiveness are filtered through observer personality, psychological and physiological state and cognitive schemes in the process of landscape perception. An important factor in the perception of the landscape also includes the properties of the environment, such as the current and seasonal climatic conditions and the position and distance from the observed scenery (Štefunková 2004; Nohl 1991; Krause 1991). The psychophysical

paradigm in the research of the perception of the landscape is based on the link between the material/spatial arrangement of the landscape (the elements comprising it) and the observer's assessment (Zube et al. 1982).

5.2.2 *Methods Used to Assess and Identify ES*

There are several concepts in the current assessment of this type of ES. An *expert-based approach* (Zube et al. 1982) is an assessment of the visual characteristics of selected types of landscape or its parts by trained professionals. The biophysical properties of the landscape are transformed into formal features (e.g. lines, textures and colours) and the relationships between them (e.g. diversity, unity, harmony), by applying professional methods and procedures to evaluate the landscape's own aesthetic effect.

The essence of methods based on measuring the perception of the landscape (Daniel 2001) or subjective methods (Barčáková 2001) is that they focus on the assessment of the quality of the landscape by an observer – whether it is a tourist or a resident who permanently lives in the landscape or uses it in different ways. These behavioural approaches include, for example, structured and unstructured questionnaires, semantic differential and mental maps.

Combined approaches have been used after lower reliability has been confirmed in using one of the previous approaches. The approach of inventory and scenario assessment and visual landscape quality is based on parallel expert and behavioural assessment, which is subsequently compared and assessed for validity (Daniel 2001).

The aesthetics and beauty of ecosystems and landscapes are most often assessed by methods of indirect monetary evaluation (e.g. willingness to pay) or by nonmonetary quantitative assessments such as preferential assessment, number of visitors and psychometric scales (Daniel et al. 2012). Economic indicators such as property prices can be also used for the assessment (Milcu et al. 2013).

An example of the use of nonmonetary quantitative methods is the research of the visual quality of a part of the Tuscan landscape (Sottini et al. 2018), implemented in three steps: landscape classification into landscape mosaic types (from mostly urbanized mosaics to predominantly natural mosaics), research of respondent's perception (public) on the basis of photographs of these types of land sites and statistical analysis and assessment of sociological research results.

The capacity of the territory (ecosystems) to provide an aesthetic experience is often assessed through the physiognomic structure of the landscape, based on criteria directly derived from the structural and physiognomic characteristics of the landscape (e.g. vegetation cover, length of the borders) or indirectly derived criteria including an aspect of the expected impact on the personality of the perceiver (e.g. harmony, attractiveness, uniqueness). The US Department of the Interior Bureau of Land Management developed a guide for landscape visual quality assessment which uses seven indicators – relief, vegetation cover, colour, water features, adjacent scenery, scarcity and cultural transformation character (Brown 1994).

Research of viewshed analysis and the identification of scenic viewpoints and sceneries in the landscape are an important part of either normative or combined research. For example, Oľahel' (1999) assessed the location of recreational facilities based on the assessment of the optimal view of the High Tatras. Štefunková and Cebecauer (2006) assessed the visual quality of selected areas by modelling the potential viewshed and visual dominance of the landscape in the GIS environment in combination with the assessment of the aesthetic quality of landscape features.

Analysis of photographs – landscape, its individual elements, structures, scenery through respondents (visitors or residents of the studied territory), or a specific view on which they are located – is also a frequently used method. If the photo is placed directly at the place where it was taken and the place is publicly accessible, the respondent directly expresses the demand for or benefit from the use of ES with its assessment.

Analysis of the so-called big data such as Panoramio photos (Giglio et al. 2019; Lieskovský et al. 2017) can involve a much larger number of respondents and thus carry out assessments at the national or continental level. It directly expresses the benefits of the visual perception of the given place or landscape. The results are strongly influenced by accessibility to scenic sites. Most photos are taken at a place where people live or go on vacation, but as the authors of the study comment, the demonstration of the use of and benefit from the ES is relevant.

In order to eliminate the level of subjectivity, the assessment of the visual (aesthetic) quality of the landscape performed by experts uses multicriterial decision analysis (MDCA) procedures to assess conflicting ES.

5.2.3 The Main Types of Landscape and Ecosystems Which Provide ES

There are a number of studies conducted with an assessment of the aesthetic/visual/scenic quality of the landscape in different scales and at different levels. Most of the time authors choose an area which is attractive to residents and visitors, whether it is a landscape heritage and traditional agrarian landscape, protected natural area, river floodplains and coastal landscapes or distinct geomorphological unit. On a local scale, selected landscape sceneries which represent a group of ecosystems in a specific composition and combination are most frequently assessed. Combinations of natural dominants with barrier-free foregrounds are attractive (such as a view of Vysoké Tatry from the grasslands of the Liptovská kotlina basin or the scenery of forests with a water surface or meadow in the foreground). The prerequisite for the real use of this ES is its valuation in the form of, for example, the high number of visitors in the city park, the river promenade, the location of the lookout towers, new residential areas, recreational areas and hiking trails. One can see a preference of certain types of landscape, which are most preferred by the general criteria and for which high visual-aesthetic quality (Fig. 5.6) has been proven by previous research. These types of landscapes are also highly valued by experts in the methods and classifications they design.



Fig. 5.6 The aesthetic landscape character of rural settlements in remote regions is becoming increasingly attractive for domestic and foreign visitors (Detvianske lazy), author: J. Černecký

The result of measurement of Corine Land Cover classes contribution to aesthetic experience in a selected region of Germany (Koschke et al. 2012) has shown that the maximum contribution – the highest potential – comes from mixed forests, transitional woodland/shrub, watercourses and water bodies, wetlands and deciduous forests. Significant values have also been achieved by the following classes: a mosaic of fields, meadows and permanent cultures, coniferous forests, pastures and agricultural areas with a significant proportion of natural vegetation.

In behavioural research by Lieskovský et al. (2017), who assessed the attractiveness of landscape types by the Panoramio photos, the most attractive landscape types were sub-mountain and mountain meadows and urbanized landscapes in the river basin and highland relief. These mainly included the highest-elevation tourist locations with panoramic views in the Vysoké Tatry and cultural heritage sites such as Spiš Castle, Oravský Podzámok and Červený Kláštor. Similar visitor preferences were shown by another study (Othman 2015), where respondents prefer the forest landscape, hilly terrain, and architectural heritage objects the most. The water bodies and waterfalls were not the most preferred here, which could have been caused by environmental pollution. In light of the above, the authors said that scenic beauty can be an indicator of the good environmental conditions of the considered landscape. In the assessment of forests, there are known efforts to assess the non-production functions of the forests, where, for example, forest parks, therapeutic (spa) forests and recreational forests with a specific structure, composition and representation of visually attractive tree species meet the highest criteria of visual

attractiveness (Supuka and Vreštiak 1984). Locations significant in terms of ES provision include urban and suburban forests and parks and riversides with natural sceneries due to high number of visitors, which expresses the demand and benefit of the visual aesthetic effect of natural and seminatural ecosystems on humans.

5.2.4 Importance of ES in Terms of Nature and Landscape Protection in Slovakia

Proper setting and planning of a nature protection strategy in important habitats and visually highly attractive sites are necessary as the limits for the number of visitors of tourist trails in these territories are highly exceeded (Švajda 2009) and this damages significant habitats (Hrnčiarová et al. 2018). To wisely plan the number of visitors, it is necessary to redirect visitors to less vulnerable ecosystems or to provide them with a scenically attractive experience from viewing points located outside the threatened habitats. Above all, it is important to know the motivation of visitors to these sites (Švajda et al. 2018; Považan et al. 2015), as well as to know all the risks endangering the habitat status near to highly used tourist routes (Špulerová et al. 2014). Forests of protected areas do not differ from commercial forests if they do not have any sustainable management (Považan et al. 2014a). Although most forests in protected areas are not state property, protected areas administration organizations may provide comments on the forest management plans. However, as Švajda and Fenichel (2011) showed, effective ecological management of protected areas in Slovakia is hampered by the lack of authority of these administrations.

While a number of European countries have committed themselves to providing adequate funding to protected areas, Slovakia is still lagging behind, and ES benefits are being reduced compared to the potential economic benefits of intensive tourism development in protected areas, especially in national parks. Research in the three national parks of Slovakia has shown that they are all highly sought after and visited for recreation and tourism purposes. The aesthetic (visual) attractiveness of the landscape is an important condition for the motivation of tourists to visit such areas. Therefore, it is necessary to deal with the assessment of this ES within protected areas, to set the price of the service and subsequently achieve an effective consensus of service management with the owners, stakeholders and the public. A clear positive correlation between the significance of the territory in terms of nature and landscape protection and the capacity of the landscape to provide ES landscape aesthetics – aesthetic values – is documented in Fig. 5.7.

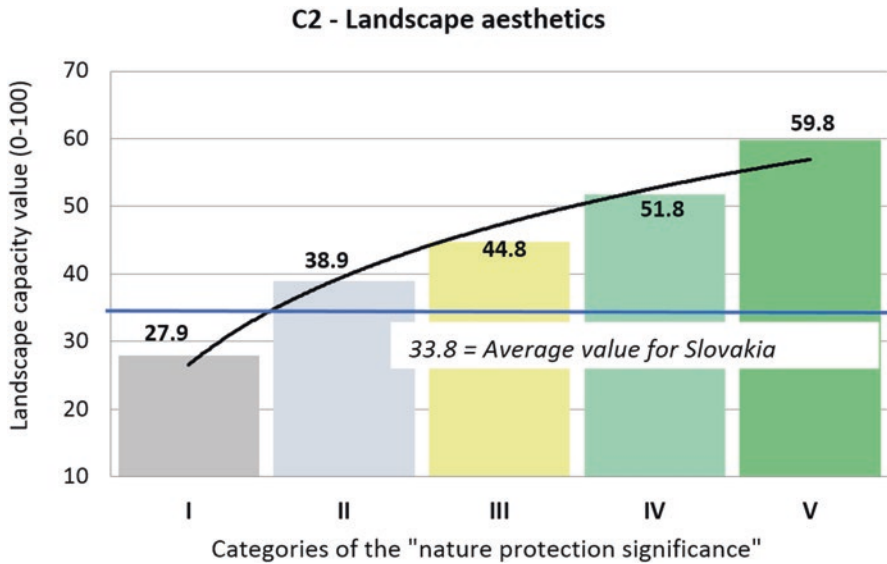


Fig. 5.7 The relationship between ecosystem service C2 and the significance of the territory of Slovakia in terms of nature and landscape protection

5.2.5 *ES Assessment for the Territory of Slovakia*

In the field of scientific assessment of the visual (aesthetic) quality of the landscape at the national level, we know only of a few examples. An older study on the socio-economic assessment of vegetation was published by Jurko (1990) – the assessment topic was the aesthetic significance of vegetation formations. Selected criteria included increasing the quality of the landscape by spatially dividing the areas, facilitating orientation and aesthetic experiences (colouring of flowering, foliage and fruit in autumn), shading or masking of negatively acting objects and the attractiveness of nature observation in terms of its diversity.

In more recent national assessments, the authors focused on viewshed analysis or the so-called big data analysis. Jakab and Petluš (2013) created a map of the potential visual exposure of the landscape relief of Slovakia in the GIS environment. The best category includes, for example, the important tourist points – Záruby on the main ridge of the Malé Karpaty, Zobor in the Tribeč mountains, Babia Hora in the Oravské Beskydy, Gerlachovský štít in Vysoké Tatry.

Regional and national surveys, in contrast to local studies, are based more on the assessments performed by experts, as it is difficult to implement such extensive research through respondents. The only behavioural-oriented national research based on Panoramio photographs was performed by Lieskovský et al. (2017).

In the research carried out by experts focusing not only on the potential but also on the demand and benefit of the perception of ecosystem beauty, it is recommended, in addition to identifying the visual (aesthetic) value of ecosystems, to

analyze whether and to what extent these ecosystems can be perceived from sites with high number of tourists or residents. Such an assessment is already conceptually linked not only to the identification of tourism hotspots and their availability but also to the identification of all other transport nodes with a high concentration of movement or stay of people, such as highways and 1st-class roads in elevated positions, with a view on visually landscape elements. Also, the locations of spas, recreational houses and cottage areas are an indirect expression of the demand and benefit from perceiving the beauty of ecosystems in their surroundings. However, in such an assessment method, the aesthetic value may overlap with the value of tourism and recreation – another cultural ES.

Based on the available underlying databases, the assessment of the aesthetic (visual) quality of ecosystems was based on the importance of CLS (classification in terms of aesthetics and attractiveness), the occurrence of special landscape structures (traditional land use) and the attractiveness of relief. The following was chosen as supplementary criteria: quality of forest ecosystems (forest type and age), visual diversity of the landscape (dissection and slope inclination of the microbasin), significant aesthetic elements of the landscape, historical and cultural monuments, historical vegetation and other natural attractions (Fig. 5.8). The list of data used for the assessment of ES landscape aesthetics – aesthetic values – is shown in Table 5.2.

The spatial expression of the landscape's capacity to provide this ES (Fig. 5.9) highlights the importance of the diversity of the landscape structure and the diversity of natural conditions – the highest values are achieved in mountain areas (especially in regions of Vysoké Tatry, Nízke Tatry, Veľká Fatra, Malá Fatra, Slovenský raj, Slovenské Rudohorie, Strážovské vrchy, Javorníky, Štiavnické vrchy, Malé Karpaty). Lower mountain, submontane and basin areas mostly reach a moderate capacity. Finally, the lowest capacity values are typical for larger areas of lowlands and river basins.

Demand for ES landscape aesthetics – aesthetic values – depends on the interest of the population in beauty, aesthetics, visual quality of the landscape and so on. The perception of the visual quality of the landscape is influenced by a variety of factors, such as composition, structure, attractiveness, uniqueness and land management. An important role is played by the subjective factor – individual experience.



Fig. 5.8 An attractive view of the natural panorama of the Cigánka nature reserve in the Muránska Planina National Park, author: J. Černecký

Table 5.2 Input data for assessment of ES landscape aesthetics – aesthetic values

Input data/ ES	C2 – Landscape aesthetics – aesthetic values
Capacity	Map of current landscape structure – significant and attractive elements of CLS, reclassification according to aesthetic effect
	Land use – occurrence of specific cultural and historical landscapes (traditional method of use, dispersed settlement areas, wine-growing areas, mining landscape)
	Specific features of the landscape – historical parks, spas
	Forest ecosystems – reclassification by structure and age, type of vegetation
	Relief – attractive shapes and forms of relief
	Relief – dissection and slope of microbasins (visual diversity of the landscape)
Demand	Data on population distribution – urban settlements and densely populated areas
	Data on the number of visitors – municipalities, regions
	Infrastructure map (location of hotels, restaurants, car parks, recreational areas and so on)
Flow	Photos on social networks – number of visits and attractiveness of selected areas
	Statistical data on the number of visits to selected areas – as in the case of C1

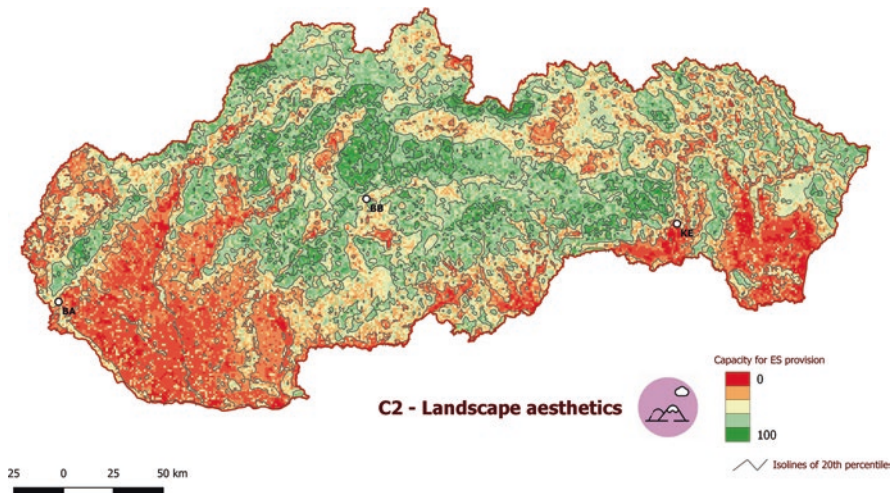


Fig. 5.9 Capacity of the landscape to provide ES landscape aesthetics – aesthetic values

Beauty, aesthetics and visual quality are perceived differently by individuals. One may find something very interesting, with someone else perceiving it as very common. Each of us prefers a different type of landscape and landscape character. Demand for this ES can therefore also be assessed from a number of perspectives – from the perspective of visitors (number of visitors), from the perspective of residents (preference of landscape types for housing), from the perspective of researchers (number of realized assessment studies) and from the perspective of artists (the

number of works of art produced). Demand for this ES can also be linked to the demand for another cultural ES and cannot be clearly separated from them.

Assessment of the real use of this ES is very difficult, as subjectivity plays an important role here. In general, landscape types with high visual quality are freely available, in most cases without a fee, and so an objective tracking of number of visitors and their interest is not possible. For the assessment of real use, indirect methods may be used in particular, such as landscape scenarios based on photographs and various forms of sociological surveys – structured and unstructured questionnaires and personnel interviews. It is also possible to carry out a targeted counting of the visitors in a given location, which is however not systematic. It does not take place regularly, and in all aesthetically valuable locations, it is often associated with the use of other cultural ES, and thus, it is not possible to carry out reliable comparisons of individual sites.

5.3 Natural and Cultural Heritage: Intellectual and Scientific Values (C3)

5.3.1 *Definition and Brief Characteristics of ES*



The cultural ES also include the ES natural and cultural heritage. According to MEA (2005) and TEEB (2013), this service is associated with the existence of a traditional landscape formed by a specific relationship of people and nature (e.g. specific forms of dispersed settlements, vineyards, orchards, artificial water bodies and ponds, traditional agriculture, etc.). Cultural and natural heritage represents our past legacy, our current lives today and what we pass on to future generations. It includes mainly the tangible objects which were produced and used by previous generations, from small home tools to large buildings, monuments, places and landscapes. It also includes intangible elements – symbolic products of human creativity and imagination such as music, art, poetry and prose, knowledge and know-how which contribute to understanding of the heritage of the society or any partial group (UK NEA 2011).

Heritage is a broad and general term. It includes the value which an individual or society considers valuable and worth being preserved, protected, catalogued, displayed, restored and admired (Kersel and Luke 2015). The heritage is often artificially divided into natural and cultural components. Importantly, these two components are closely related, and their value overlaps in several directions.

Natural heritage defines a set of natural components and geographical structures. The value of natural heritage is important in particular in terms of biodiversity conservation, ecosystem functionality, conservation of plant and animal species and their communities and the preservation of valuable natural ecosystems. From this aspect, the most valuable ecosystems include the natural ecosystems with a rich presence of rare and endangered plant species, their communities, and animal species associated with them. Many are part of protected areas. In Slovakia, there are 9 national parks, 14 protected landscape areas and 1097 small-scale protected areas, 4 biosphere reserves, 642 special areas of conservation and 41 protected bird areas. Furthermore, the international status is represented by the RAMSAR areas and the UNESCO heritage sites.

Cultural heritage is usually defined as the heritage of biophysical functions, material and non-material attributes of a group or society which are inherited from past generations and maintained at the necessary quality for the benefit of the next generation (Czeczynski 2008). Cultural heritage forms an integral part of the historical relationships between people, society and ecosystems. The landscape originates from long and complex relationships between natural and anthropogenic factors which interact with and still modify the landscape in space and time (Reynard and Coratza 2016). Cultural landscapes represent cultural values and contribute to community identity (Stephenson 2008). Culture is not static and is often an important indicator of ecosystem and landscape change. Many elements of cultural heritage are declared cultural monuments. As of 4 November 2019, there were 9990 immovable cultural heritage monuments and 15,169 movable cultural heritage monuments (available online: <http://www.pamiatky.sk/sk/page/pamiatkovy-fond>) registered in the SR.

Only a summary of natural and cultural values gives each landscape the importance of a heritage which leads to community support for its conservation and improvement (Aplin 2002). Natural and cultural heritage sites are represented most commonly by national parks and protected areas, mountain areas, caves, mineral and thermal spring sites, cultural-historical conservation sites and zones, folk architecture reservations, national cultural landmarks, nature museums and the like. Cultural heritage also includes traditions, rituals, performing arts, social customs, festive events, knowledge and experiences about nature and society, which can be collectively referred to as *intangible cultural heritage* or *living heritage*. ES assessment of the intangible cultural heritage is not realized due to its nature and the lack of definite boundaries.

5.3.2 *Methods Used to Assess and Identify ES*

The importance of cultural ES, including natural and cultural heritage, is widely accepted, but given their *intangible* and *subjective* nature, their biophysical or monetary valuation is relatively complicated. As reported by Schröter et al. (2019), most cultural ES are difficult to measure, monitor and model. The value assigned to

natural and cultural heritage services often depends on individual and cultural assessment of their contribution to well-being (Charles and Dukes 2007). Ecological and natural resources, or aspects which form an integral part of cultural heritage, are often public goods and therefore do not have a market price that reflects their value (Daniel et al. 2012; Hølleland et al. 2017). Therefore, noneconomic assessment methods are used to assess these services, in particular sociocultural methods with the use of participatory methods such as stakeholder workshops, questionnaires and personnel interviews, where the population's attitude to these valuable structures is ascertained. The perception of the significance of these structures by individual stakeholder groups is assessed, with the answers evaluated by different statistical methods. In order for the values to be effectively translated into policy-making and decision-making processes, it is important to identify also natural landscape features which are valuable from a stakeholder perspective, and multifunctional assessments need to be implemented. One of the frequently used ways of assessment of the ES natural and cultural heritage is a deliberative discussion facilitated by experts, allowing cultural and ecological values to be taken into account, as well as local and traditional stakeholder knowledge and attitude without monetary valuation (Daniel et al. 2012). For the assessment of the ES natural and cultural heritage supply, a frequently used method is the mapping of the presence of areas of visitor's interest. In particular, photo-series analysis, online map surveys and mobile phone applications are used. Often the so-called contingent valuation method is used which consists of directly assessing people's willingness to pay or accept compensation for a change in the ES in a hypothetical market (Farber et al. 2006).

Natural and cultural heritage as one of the cultural ES has also been included in several national ecosystem assessments, for example in Spain, Hungary or France. At the same time, France has chosen a specific approach in relation to natural (and cultural) heritage by separating natural heritage from the cultural ES. Natural heritage is not considered in France to be an ecosystem service with use value – on the contrary, its value is non-use (existential, altruistic). The place of service or benefit is considered one of the aspects of identity or identification (including elements of spiritual or symbolic value) between ecosystems and society. In the French assessment, alternative methods of documenting and describing the value of certain elements of ecosystems are proposed for the assessment of natural heritage. Alternatively, the assessment may also take the form of a national inventory of natural heritage features (Tibi and Therond 2017). It is rather questionable whether this analysis, description and inventory can be considered as ES assessments of natural and cultural heritage.

The assessment of the ES natural and cultural heritage is also closely linked to intellectual ES, such as science, research and education. There are many indicators for the assessment of cultural and natural heritage in the context of scientific and intellectual values, for example, the occurrence of cultural and historical monuments; number of field trips and school activities; number of seminars, workshops and conferences; occurrence of educational facilities; the number of scientific publications and studies in the territory; number of television and radio programs; number of books and information materials; and number of educational trails and panels.

Other measurable indicators include, for example, number of visitors in a given territory (per year), willingness to pay for entrance/events and admission price, the spatial extent of important areas and habitats (for birds, etc.), the occurrence of protected species and accessibility of territory. These are indicators that can be acquired and subsequently assessed in a given territory (monument, site, traditional landscape, national park, natural area).

5.3.3 The Main Types of Landscape and Ecosystems Which Provide ES

Essentially, all types of ecosystems (aquatic, forest, agroecosystem, urban ecosystem) can include and provide a natural and cultural heritage which can be further studied or explored, providing space for learning and education. Each ecosystem and each cultural landscape are in its own way unique and specific, showing a certain stage of development and thus becoming subject to ES research linked to natural and cultural heritage. Some ecosystems and landscape structures are more significant than others. Therefore, the assessment of ecosystems from this aspect is taking place at all levels, in all ecosystems and in all types of landscapes.

The types of landscapes providing this ecosystem service include territories which individuals or society consider intellectually enriching and have a footprint or legacy from the past. According to MEA (2005), this benefit is particularly provided by historically significant landscapes – cultural-historical structures of landscape. The ecosystems which provide this service are mostly related to the existence of a traditional landscape created by the specific relationship of people and nature. Based on this relationship, many specific regions have been established, such as mountain landscape in Portugal or the Alps, pastures in temperate zones of Europe, the concept of small-scale agriculture and forestry in Japan, wine regions in France, Tuscany in Italy, Napa Valley in the United States and dispersed forms of settlement in Slovakia and Romania. These landscapes represent the region as a whole and act as a trademark for a tourist offer or marketing products produced in these locations. It is the representation of the region as a whole that can be considered as a benefit of the cultural ES (Daniel et al. 2012).

5.3.4 Importance of ES in Terms of Nature and Landscape Protection in Slovakia

Cataloguing and preserving cultural and natural sites of particular importance as the common heritage of mankind is the goal of the UNESCO World Heritage Program and should be important for every society. Natural and cultural heritage includes a mixture of natural and cultural values, giving each landscape its specificity and

importance, leading to the promotion from the society and the preservation of values for future generations. MEA (2005) recognizes that many societies place a high value on maintaining historically important landscapes (cultural landscapes). The preservation of cultural heritage can bring considerable synergies with the preservation of other ES, one of the motives introduced by agri-environmental programs in the European Union and the United States and the recent Satoyama Initiative in support of the United Nations Convention on Biological Diversity (Takeuchi 2010).

In Slovakia, there is quite a lot of attention devoted to the sites of natural and cultural heritage, which are legally protected (Fig. 5.10). Less attention is paid to sites and regions representing historical landscape structures with a traditional way of management, especially farming. Maintaining such forms is very demanding, and Slovakia does not have sufficient financial, technical nor human potential to maintain these forms of farming (Špulerová et al. 2017).

It is important to understand the relationship between the use of valuable land and its protection. From the point of view of protecting these values, it is necessary to respect the limits and regulations, whether set by legislation or administrators and users – visitor rules, movement in the territory and so on. The benefits provided by this kind of ES say that the different aspects of protection, use and promotion of valuable sites are all closely linked. A visitor who is interested to spiritually fuel up and observe the natural and cultural monuments is certainly not interested in the object of his interest to be devalued and otherwise destroyed. Therefore, the intention of the support of ES natural and cultural heritage is consistent with the protection of the elements which provide this service.



Fig. 5.10 The Východné Karpaty Biosphere Reserve is part of Slovakia's natural heritage, author: S. David

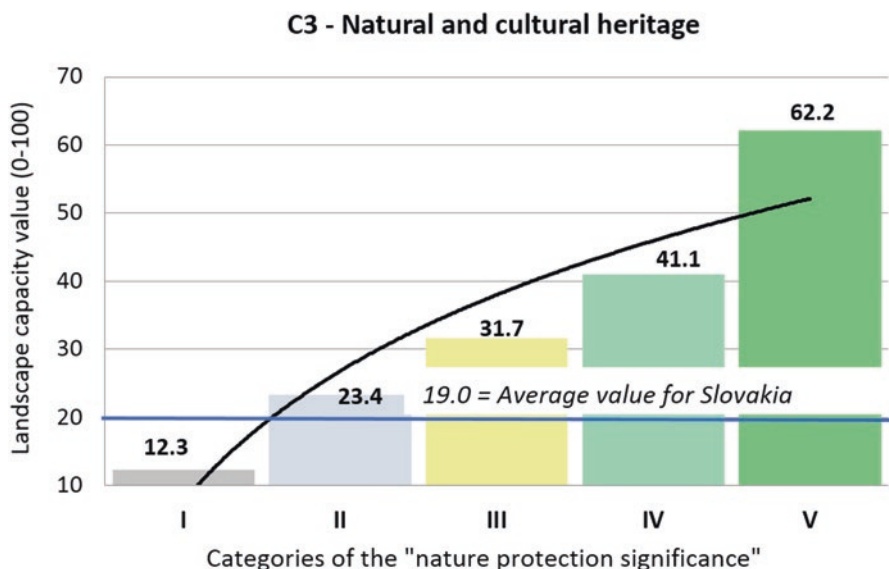


Fig. 5.11 The relationship between ecosystem service C3 and the significance of the territory of Slovakia in terms of nature and landscape protection

Figure 5.11 shows a clear positive correlation between the capacity of this ES and the significance of the territory of Slovakia in terms of nature and landscape protection. Therefore, it can be stated that the protection of nature and landscape is of key importance for the support of the ES natural and cultural heritage.

5.3.5 ES Assessment for the Territory of Slovakia

Although Slovakia is spatially small, it is naturally a very diverse landscape. In this territory, we can find a number of valuable natural and cultural sites which are being visited and directly or indirectly provide spiritual enrichment to visitors. Natural and cultural heritage has many forms of legal protection. The oldest and best-known legal instrument is the UNESCO Convention for the Protection of the World's Natural and Cultural Heritage.

In Slovakia, these are the following cultural heritage sites included in the UNESCO list: Vlkolínec Folk Architecture Reservation; Levoča, Spiš Castle and related cultural monuments (Spišská Kapitula, Spišské Podhradie, Church of the Holy Spirit in Žehra); historical town of Banská Štiavnica (Fig. 5.12) and technical monuments in its surroundings (Hodruša-Hámre, Štiavnické Bane, Banská Belá, Voznica, Vyhne, Banský Studenec, Počúvadlo, Kopanica, Kysihýbel, Antol, Ilija and 23 water reservoirs – tajch); Bardejov Town Monument Reserve and Jewish suburbium; and wooden churches in the Slovak part of the Carpathian arch



Fig. 5.12 The town of Banská Štiavnica, together with the technical monuments in the surrounding area, was added to the UNESCO List of World Cultural and Natural Heritage Sites in 1993, author: D. Štefunková

(Hervartov, Tvrdošín, Leštiny, Kežmarok, Hronsek, Bodružal, Ladomirová, Ruská Bystrá).

The second category is represented by the *natural heritage* which in Slovakia includes the following: caves in Slovenský kras and Aggtelekský kras and Carpathian beech primeval forests - cross-border territory with Ukraine (Slovak: Havešová, Rožok, Vihorlat, Stužica-Bukovské vrchy; Ukrainian: Stužica-Uzok, Čornohora, Maramoroš, Svidovec, Kuzij-Tribušany, Uhoľka-Široký Luh) (Kureková 2016).

Based on the legislation in force, other categories can be distinguished in Slovakia, where important elements of the natural and cultural landscape intersect (Hrnčiarová 2004):

- Monuments of historical vegetation (alleys, arboretums, cemeteries, city parks, parks, ornamental gardens) – declared under Act No. 49/2002 Coll. but include values of natural and cultural-historical character
- Protected areas (arboretum, botanical and other gardens, parks) and protected trees – declared under Act No. 543/2002 Coll. but also include values of a cultural-historical character

All these areas present a close link with history and the ecological, landscape and aesthetic values of the territory. They contribute to the preservation of the biological

and cultural diversity of the territory, the diversity of conditions and forms of life and to the preservation of Slovakia's natural and cultural heritage.

In addition to the aforementioned elements, which are declared under the applicable laws, the cultural and historical monuments in the territory of Slovakia can also include legislative unprotected *historical landscape structures with a traditional way of management*, such as the following (Hrnčiarová 2004):

- Traditional wine-growing landscape (small-scale vineyards, terraces, stone walls, wine cellars and sheds)
- Traditional agrarian landscape (mosaic landscape structures consisting of complexes of narrowband fields, agrarian forms of relief – boundaries, terraces, walls, meadows, pastures, small woods and shrubs with scattered dwellings, hay-lofts, sheepfolds, sheds)
- Traditional mining landscape (adits, heaps, sinkholes, artificial water bodies – tajchs)
- Traditional landscape with various small technical structures (water mills, saw-mills, forest railways, smitheries)
- Traditional fish pond landscape (small fish husbandry, fish ponds, tajchs)
- Traditional forms of settlement with original folk architecture (dispersed settlements – *lazy, kopanice, štále*)
- Traditional landscape with spa function (sanatoriums, springs, spas)

For the territory of Slovakia, the greatest attention in the area of cultural services related to natural and cultural heritage is paid to the assessment of areas with traditionally managed agricultural landscape and to the ES assessment in protected areas. The assessment of the ES in various types of traditional landscape was investigated by Špulerová et al. (2014) and Žarnovičan et al. (2018). Krnáčová et al. (2013) focused on the examples of permanent cultures of orchards and vineyards, and Petrovič (2005) focused on areas of dispersed settlements. In these model areas, among others, the importance for science and research was also assessed. This focused particularly on the ES: the use of natural systems for school excursions, research and the like.

A special example is the assessment of the ES in protected areas of Slovakia, with several studies carried out in the national parks, namely, the Vysoké Tatry NP, Slovenský raj, Veľká Fatra, Muránska planina and Malá Fatra (for a list of citations, see Chap. 1).

For the assessment of this ES for the territory of Slovakia, we have actually used several basic input layers – in addition to the landscape structure and the way of land use, these mainly included data on important natural and cultural-historical values (see Table 5.3). According to the realized assessment, the highest potential of natural and cultural heritage is concentrated in several areas – especially Vysoké Tatry, Slovenský raj, Slovenský kras, Východné Karpaty, Štiavnické vrchy and Poľana. Higher values are also achieved by the core parts of the Nízke Tatry, Malá Fatra, Veľká Fatra, Slovenské Rudohorie, Malé Karpaty and other lower mountain ranges, as well as the Podunajsko Region. As with other cultural ES, the lowest

Table 5.3 Input data for assessment of ES natural and cultural heritage

Input data/ ES	C3 – Natural and cultural heritage
Capacity	Map of current landscape structure – reclassification of selected units
	Nature and landscape protection – reclassification of the significance of all types of nature conservation areas
	UNESCO World Heritage Sites
	Other significant natural resources – watercourses, natural healing resources, forest areas
	Important geological and geomorphological localities
	Land use – occurrence of specific cultural and historical landscapes (traditional use, dispersed settlements, vineyards, mining landscape)
	Specific features of the landscape – archaeological sites, historical and cultural monuments, historical parks
Demand	Data on population distribution – urban settlements and densely populated areas
	Data on the number of visitors – municipalities, regions
	Infrastructure map (location of hotels, restaurants, car parks, recreational areas and so on)
Flow	Photos on social networks – number of visitors and attractiveness of selected areas
	Statistical data on visits to selected territories – as in the case of C1

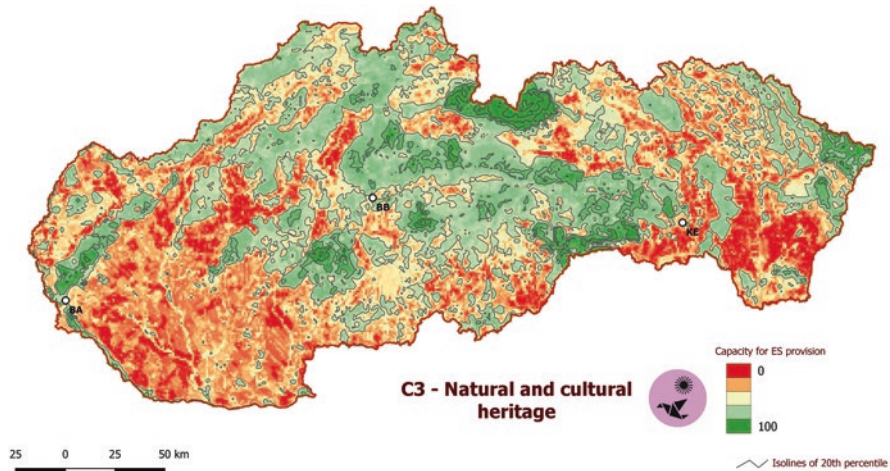


Fig. 5.13 Capacity of the landscape to provide ES natural and cultural heritage

values of the landscape’s capacity are typical for the larger lowlands and basins of Slovakia (Fig. 5.13).

Slovakia has a significant potential for the provision of ES natural and cultural heritage, as there are a number of cultural and natural sites in the area. Demand for this ES is differentiated, which is largely due to the significance of the site (uniqueness, attractiveness, cultural-historical and nature-preserving value, etc.) but also

due to the state of preservation and maintenance and the infrastructure built to support the site accessibility. Appropriate promotion of natural and cultural heritage also significantly supports the demand for this ES. On the other hand, the limiting factor for the use of these sites, especially natural sites, is their legislative protection.

Real use (flow) of this ES can be assessed by several indicators – similarly to previous cultural ES, it is mainly the available statistical data on number of visits to selected areas (e.g. the number of tickets sold to cultural and historical monuments, the number of visitors to UNESCO sites, the number of overnight stays). Use of the ES natural and cultural heritage can also be assessed on the basis of indirect indicators, such as the area of traditional forms of farming, which, in addition to this service, are also used to provide production services, and the area of protected areas also used for research and education. An additional indicator can also be in the form of the number of photos on social networks.

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