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1 Introduction

1.1 Sustainable Landscape Development

Landscape is a functional resource and is considered to be one of the most important pre-conditions for the health and well-being of communities. Furthermore, landscape generates socio-economic opportunities, offering employment in sectors linked to the territory, education, and the wider environment, such as farming, forestry, military training, recreation, water supply, mining and quarrying.

In recent decades there have been massive changes in European landscapes which have resulted in a reduction of its quality, especially in urbanised societies. There has been an impoverishment and deterioration in many landscapes, especially those on the coast, in mountain areas and in rural-urban and peri-urban zones.

It is widely recognised that land use and land cover degradation are leading to multiple undesirable social, economic and environmental impacts. Examples include flooding, deforestation, drainage of wetlands, the loss of biodiversity and the fragmentation of ecological habitats. The evergrowing rate of urbanisation, and development of infrastructure networks coupled with our changing climate, are phenomena contributing to the decrease in landscape quality.

Awareness of the diversity of landscapes, visual enjoyment of our surroundings, and respect and sensitivity to the natural or heritage dimensions are all values that reinforce the social fabric and dignify communities. Notwithstanding this, it is generally agreed that there are a lack of sustainable landscape development policies and resources at local, regional, national and international levels to protect and enhance these values (Priour, 2006; Nogue et al., 2010).

Landscape planning and assessment are important tools for maintaining and enhancing landscape quality, for informing more sustainable practices and developments within landscapes, and for raising public awareness about the added-value that landscapes can give to communities' and citizens' health and well-being.

Landscape planning and management are fast moving fields. New approaches and applications are emerging, and being debated worldwide. However, in practical applications landscape issues are being poorly taken into account (Haaren et al., 2008). Further, landscape planning and assessment theory is lagging behind with environmental issues being considered in a traditional and sectoral way (e.g. water, soil, air), failing to appreciate the added value and holistic and systemic view that a landscape perspective could provide (REC, 2007). It is therefore becoming apparent that the gap between theory and practice for sustainable landscape planning and management is widening.

1.1.1 Challenges and Tasks

The scope of landscape management has broadened and diversified in response to international calls for greater landscape protection, and to existing and new challenges, such as those relating to *climate change adaptation, biodiversity protection and the Natura 2000 network, flood protection, environmental health, environmental information, awareness raising, education and participation*. Though the scope of these challenges goes beyond landscape-specific issues, they nevertheless do impact and/or have implications on landscape planning and management. A brief synopsis of some of these interrelated challenges is subsequently presented.

Climate change has become an environmental challenge that is affecting landscape in different ways, for example, by affecting the biogeochemical processes that shape landscapes resulting in extensive changes to landscape structure, image, scenery, characterisation and composition. Although the effects of climate change across the world and regions are different, its adverse effects on socio-economic and natural systems are becoming increasingly significant and are requiring an active intervention. The fact of increasing intensity and speed of climate change has become alarming. Changes in climatic conditions are one of the reasons leading to overall changes in the human environment, to changes in the natural and cultural landscape. The problem arises if people are not adequately prepared for altered environmental conditions when the probable scenarios of landscape development are not predicted. In this respect, the environmental impact assessment process is an absolutely appropriate tool within the planning process that provides room for identifying potential risks that may occur in the landscape and may have an impact on the population and its health.

The World Economic Forum Global Risks Report 1 (2013), which regularly evaluates the 50 top global threats in terms of their effects, probability and interactions, ranks climate change among the five top risks, with the need to reduce greenhouse gas emissions in order to avoid potentially catastrophic effects, considered urgent. The fifth IPCC Assessment Report (IPPC2, 2013) confirms that global warming is happening, and that it is happening at a rate faster than predicted, with global temperatures expected to rise between 1.5 to 4.5°C by 2100 against pre-industrial global temperature averages¹. The Report assesses the impacts of climate change, the vulnerability of human and natural systems, and the ways in which impacts and risks associated with climate change can be reduced and managed through adaptation and mitigation measures, and the appropriate vulnerability assessment of individual environmental components, including landscape. The importance of climate change

¹ The report also says that the concentrations of atmospheric carbon dioxide, methane and nitrous oxide have risen over the last 800,000 years, mainly as a result of human activities with emissions produced from fossil fuel combustion, land use change and deforestation.

is underlined by the emphasis included in other policy documents. Climate change was part of the 6th Environmental Action Programme (EAP, 2002), and is also part of the 7th Environmental Action Programme covering up to 2020 (EAP, 2013) with the subtitle “Living well, within the limits of our planet“. The key feature of the 7th programme is the protection and improvement of natural capital, the promotion of a better use of today’s resources and an accelerated transition to a low-carbon economy. One of the priority objectives of the 7th EAP is to provide sufficient resources and investment to support environmental and climate protection policies. Related and equally important objectives are also to strengthen the sustainability of cities in the EU and to ensure the use of state-of-the-art knowledge in environmental policy making.

Many studies estimate the potential impact of climate change independently without taking into account other environmental changes. In reality, however, climate change is in the background of other global changes, such as urbanization, change of landscape utilization, population growth, etc. These changes affect the landscape and its inhabitants independently, and it is assumed that the negative impacts are multiplied when in interactions with climate change (Haines et al., 2006 In Pauditšová, 2014).

Biological diversity not only provides directly or indirectly goods and services indispensable to human survival, but it also plays an essential role in the functioning of ecosystems and in the characterisation of landscapes. Natural resources contribute in many ways to the development of human culture and civilisations. However, human actions are in turn, fundamentally and to a significant extent irreversibly, changing the diversity of life on Earth. Natural resource consumption and exploitation, pressures on land use driven by human activities and urbanisation, various forms of pollution (e.g. air, water and soil contamination) within the context of a changing climate, are threatening biodiversity in unprecedented ways (REC, 2007). Several policy initiatives have therefore been set up to protect biological diversity. These include, among others, the establishing of ecological networks, as recommended by Agenda 21, the UN Convention on Biological Diversity, the Pan-European Biological and Landscape Diversity Strategy, EECONET under the European program of IUCN, Natura 2000 and the European Landscape Convention. It is based on the idea that the fragmentation of habitats can be counteracted by creating buffer zones to protect the surviving natural areas, which can then be connected by stepping stones and corridors. These corridors can then allow species to move freely in their search for food or a mate, and to colonise new areas (REC, 2007). Within the European context, several ecological networks now exist, such as the Pan-European Ecological Network, the Emerald Network, the Natura 2000 Network, the European Green Belt and the Alpine Network of Protected Areas. Internationally, the IUCN maintains a useful database on ecological networks, providing information on the location, size and characteristics of networks, on the legal status of the network and on the processes for establishing a network, with linkages to existing international legal instruments or initiatives.

Flooding is a natural phenomenon that has not only detrimental impacts on people and goods but also on water quality, as large volumes of water can transport

contaminants into water bodies. The reduction of pressures on water resources and on the use of floodplains for urban growth (or sprawl) would no doubt be beneficial (Haaren et al., 2008). As a strategy for dealing with this challenge, *flood prevention* aims to reduce the vulnerability and exposure of humans to floodrisk. Modern approaches to flood prevention distinguish between periodic natural flooding and severe or catastrophic flooding, often made more severe by channelisation and other flood prevention measures introduced in the past. The impact of flooding on agriculture and forestry is widely recognised, resulting in the development of a number of recommendations for sustainable flood prevention². These include the promotion of site-adapted agriculture and forestry, the use of flood plains as grassland, and the avoidance of large clear-cutting. A number of recommendations have also been introduced at the transnational level, including calls for strengthening international cooperation in the management of shared river basins, and in the preparation of risk analyses and flood forecasts, and exchanges of information (REC, 2007).

The promotion of *health of all people* and the unification of health policy at the global level was mentioned in 1978 at an international conference in Alma-Ata. These ideas have been since further articulated by the Gothenburg strategy through its four priorities (WHO, 1999 In Pauditšová, 2014): combat climate change, ensure sustainable transport, address threats to public health and promote the responsible use of natural resources. The concept of environmental health was first created by merging the terms human health and public health. According to the World Health Organization (WHO), human health refers to a state of physical, mental and social well-being (Payne et al., 2005), while public health refers not only to the quality of healthcare services, but also to economic, social, psychological and environmental factors. On this basis, environmental health can therefore be considered a reflection of how successful or unsuccessful the human body is in reacting to changes in the environment and is able to adapt these changes (Dubos, 1987). The determination of *environmental health* is based on the consideration of non-environmental risk factors, such as poor nutrition, unsafe sex, lack of physical activity, intake of drugs and smoking (Adams, Bartram and Chartier, 2008); and the consideration of levels of environmental pollution and potential threats that are likely to affect environmental quality. Put more simply, environmental health depends on the interaction of physical, chemical, biological, cultural and social environmental factors (Goldman, 2005). The link between landscape and environmental health is widely acknowledged. According to Fredrickson (1998), positive emotions such as those that a landscape can generate,

² In 2004, the European Commission released a communication related to Flood Risk Management: Flood Prevention, Protection and Mitigation, which underlines that the way agricultural and forestry areas are used is important for flood prevention and protection. The EC also acknowledges that it is necessary to improve the capacity of soil and plants to retain water, for instance by promoting soil protection and the maintenance of permanent pastures.

contribute to the mental and physical well-being of humans. They are stored in the “cache” memory of humans, and act as an antibody against negative emotions and poor health (Fredrickson, 2001).

Raising environmental awareness and education have been identified as priority areas by Agenda 21 for progressing towards sustainable development. They help promote public participation in decision making and determine the direction of development and the state of the environment (REC, 2007). Education for sustainable landscape development is closely linked to environmental awareness since it is a learning process that increases people’s knowledge and awareness about the landscape and associated challenges. The accelerated changes that have taken place recently in the economy and society in past decades, mainly the globalization of markets and finances and the surge in the use of information technologies; combined with the increasing distance of citizenship from governments and from political activity, have both contributed to calls for *more involvement in public decision-making* (Nogue et al., 2010), emphasising the importance of raising environmental education and awareness. New opportunities for landscape sustainable development could be opened by adequate education, awareness raising, training and research. The use of new technologies as information and communication media can substantially support the participation process. In particular, the use of geographic information systems, the further processing of data for presentation or analysis purposes and the provision of data on the internet open up diverse opportunities for communicating information and for participation.

1.1.2 Landscape In An International And European Legal Context

International conventions and agreements have a particular importance in sustainable landscape development. For more effective landscape protection, planning and management, the adoption and ratification of the *European Landscape Convention* (hereinafter referred to as the Convention) bears major importance. It was adopted on 20 October 2000 in Florence at the meeting of the Committee of Ministers of the Council of Europe and entered into force on 1 March 2004. The Convention reflects the tendencies to combine cultural heritage with natural heritage as a result of the complexity and interdependence of man and nature. As it is clear from the Preamble of the Convention, the objective of the Council of Europe, as the promoter, is to achieve greater unity in implementing the outlined ideals and principles concerning landscape as common European heritage (Tab. 1.1). The necessity to adopt and ratify the Convention resulted from the ever accelerating adverse changes in landscape occurring across Europe (and beyond) caused by the effects of agriculture, forestry, industry, mineral production, regional development and spatial planning, transport, infrastructure, tourism and recreation, as well as general changes in the global economy.

Table 1.1: A European perspective on the importance of landscape. Source: Council of Europe (2000).

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- landscape has an important public interest role in the cultural, ecological, environmental and social fields, and constitutes a resource favourable to economic activity and whose protection, management and planning can contribute to job creation;
 - landscape contributes to the formation of local cultures and it is a basic component of the European natural and cultural heritage, contributing to human well-being and consolidation of the European identity;
 - landscape is an important part of the quality of life for people everywhere: in urban areas and in the countryside, in degraded areas as well as in areas of high quality, in areas recognised as being of outstanding beauty as well as everyday areas;
 - landscape is a key element of individual and social well-being and its protection, management and planning entail rights and responsibilities for everyone.
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The Convention aims to promote landscape protection, management and planning and to systematize European cooperation and practice in this field. In response, signatories to the convention are expected to legally recognize landscape as an essential environmental component, to implement landscape policies with broad public participation and to integrate landscape into regional and local policies, including land use/spatial planning and other policy areas that have either direct or indirect implications on landscape. The signatories to the Convention also undertake to apply measures for the care of landscape, including natural, rural, urban and suburban areas, areas of land, inland waters and marine areas, i.e. not only of extraordinary landscapes, but they are expected to care also for the everyday and degraded landscapes.

To assist in these tasks, the Convention provides a working definition of landscape, which is understood as “an area as perceived by people, whose character is the result of activity and interactivity of natural and human factors”. Whilst this definition is broad enough to express diverse understandings of landscape; it is however, (deliberately) too limited for achieving a common understanding (Hanusch and Fischer, 2011). It stresses humankind’s relationship with the environment (CoE, 2000) and reflects the idea that landscapes evolve through time and that it forms a whole, where natural and cultural components are taken together. It is because of the necessity to account for cultural and emotive aspects, that a one-fits-all definition to landscape cannot exist. The problem is not the loose definition itself, but the possible ways in which it can be interpreted within academia, policy and practice (Miklós, 1996 and 2016). Within the European context, the Convention provides a framework for landscape professionals who consider landscape as a phenomenon of the “shape/scape” of the land with cultural-heritage value. These professionals do not always make reference to other conceptual understandings of landscape which look at landscape as a geosystem or in terms of the physical structure of elements (Breuste et al., 2009). The implication of this is that scientific knowledge may not always be used to inform practice, resulting in the emergence of tensions between credibility,

saliency and legitimacy of acceptance of scientific information (Tress and Tress, 2001; Cash et al., 2003; Nassauer and Opdam, 2008).

The Convention further identifies key terms that are intended to complement the definition provided (see Table 1.2).

Table 1.2: The Convention’s understanding of landscape terminologies. Source: Council of Europe (2000).

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- “Landscape policy” refers to general principles, strategies and guidelines that permit the taking of specific measures aimed at the protection, management and planning of landscapes;
 - “Landscape quality objective” for a specific landscape, refers to the formulation of the public’s aspirations for the landscape features of their surroundings;
 - “Landscape protection” refers to actions that aim to conserve and maintain the significant or characteristic features of a landscape, defined by its natural configuration and/or from human activities;
 - “Landscape management” from a perspective of sustainable development, refers to actions that aim to ensure the regular upkeep of a landscape, so as to guide and harmonise changes which are brought about by social, economic and environmental processes;
 - “Landscape planning” is a strong forward-looking action to enhance, restore or create landscapes.
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Furthermore, the Convention determines general and specific measures for landscape management that are binding for all Parties, which are summarised in Tables 1.3a and 1.3b.

Table 1.3a: General measures for landscape management under the European Landscape Convention. Source: Council of Europe (2000).

Each Party undertakes:

- a. to recognise landscapes in law as an essential component of people’s surroundings, as an expression of the diversity of their shared cultural and natural heritage, and as a foundation of their identity;
 - b. to establish and implement landscape policies aimed at landscape protection, management and planning through the adoption of the specific measures set out in Article 6;
 - c. to establish procedures for the participation of the general public, local and regional authorities, and other parties with an interest in the definition and implementation of the landscape policies mentioned in paragraph b above;
 - d. to integrate landscape into their regional and town planning policies and in their cultural, environmental, agricultural, social and economic policies and in any other policies that are likely to directly or indirectly impact landscape.
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Table 1.3b: Specific measures under European Landscape Convention. Source: European Landscape Convention (2000).

A Awareness-raising

Each Party undertakes to increase awareness of the value of landscapes, their role and changes to them, among the civil society, private organisations, and public authorities.

B Training and education

Each Party undertakes to promote:

- a. training in landscape appraisal and operations for specialists;
- b. multidisciplinary training programmes in landscape policy, protection, management and planning, for professionals in the private and public sectors and for associations concerned;
- c. the work of schools and university courses which, in the relevant subject areas, address and promote landscape values, and address potential issues raised by landscape protection, management and planning.

C Identification and assessment

1 With the active participation of the interested parties, as stipulated in Article 5.c, and with a view to improving knowledge of its landscapes, each Party undertakes:

- a. to identify landscapes across their territory;
 - i. to analyse their characteristics and the forces and pressures transforming them;
 - ii. to take note of changes;
- b. to assess the landscapes identified, taking into account the values assigned by the interested parties and the population concerned;

2 These identification and assessment procedures shall be guided and supported by exchanges of experience between the Parties at the European level pursuant to Article 8.

D Landscape quality objectives

Each Party defines landscape quality objectives for the landscapes identified and assessed, after public consultation in accordance with Article 5.c.

E Implementation

To put landscape policies into effect, each Party introduces instruments aimed at protecting, managing and/or planning the landscape.

In addition to the European Landscape Convention, a selection of further key conventions worth noting is presented in Table 1.4. and a review of selected understandings of landscape in international policy is summarised in Table 1.5.

Table 1.4: The consideration of landscape in international conventions. Source: REC (2007).

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- *The Convention on Biological Diversity* is the first global agreement addressing all aspects of biological diversity. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.
 - *The Convention on International Trade in Endangered Species of Wild Fauna and Flora CITES* aims to ensure that international trade in specimens of wild animals and plants do not threaten their survival.
 - *The Convention on the Conservation of Migratory Species of Wild Animals* (CMS, or the Bonn Convention) aims to conserve terrestrial, marine and avian migratory species. Parties to the CMS work together to conserve migratory species and their habitats by providing strict protection for the most endangered migratory species, by concluding regional multilateral agreements for the conservation and management of specific species or categories of species, and by undertaking cooperative research and conservation activities.
 - *The Convention on the Conservation of European Wildlife and Natural Habitats* (known as the Bern Convention) is a binding international legal instrument in the field of nature conservation which covers all natural heritage on the European continent and extends to some States of Africa. Its aims are to conserve wild flora and fauna and their natural habitats and to promote European cooperation in that field.
 - *The Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (known as the Ramsar Convention) provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Convention covers all aspects of wetland conservation and wise use, recognising wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.
 - *The United Nations Convention to Combat Desertification* (UNCCD) recognises that desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world. To combat desertification and mitigate the effects of drought, particularly in Africa, the Convention focuses on improving sustainable management of land and water, and preventing the long-term consequences of desertification, including mass migration, species loss, climate change and the need for emergency assistance to populations in crisis.
 - The primary mission of the *Convention on the protection of the World Cultural and Natural Heritage* (WHC) is to identify and conserve the world's cultural and natural heritage by drawing up a list of sites whose outstanding values should be preserved for all humanity and to ensure their protection through closer cooperation among nations.
 - *The Alpine Convention* is a convention setting general principles and obligations that provide the legal structure within which the parties to the Convention function. The Convention determines a comprehensive policy on the protection and sustainable development of the Alps. The primary goal of the Convention is to have common mountain policies for tourism, transport, forest management, agriculture, land use planning, economics, protected areas and energy.
 - *The Carpathian Convention* aims to help to achieve the protection and sustainable development of the Carpathian Mountains region. Similarly to Alpine Convention, the Carpathian Convention determines sustainable development-based policies for tourism, transport, forest management, agriculture, land use planning, economics, protected areas, energy, cultural heritage and traditional knowledge, monitoring and early warning, awareness raising, education and public participation.
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Table 1.5: Landscape definitions based on international policy and agreements. Source: CoE (2000), EC (2014) and EC (2001).

International agreement	Definition
European Landscape Convention	“landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”
European Directive EC/2001/42 (SEA Directive) and UNECE Protocol on SEA	“landscape” is one out of a range of factors that jointly compose “the environment”. Other factors include human health, biodiversity, fauna, flora, soil, water, air and cultural heritage
World Heritage Convention	“cultural landscapes are cultural properties and represent the combined works of nature and of man”
World Conservation Union (IUCN)	“the harmonious interaction of people and nature over time has produced an area of distinct character which makes it possible to identify the areas to be protected, in particular for their landscape interest”

Environmental assessment legislation also contributes to the legal framework for landscape. The consideration of impacts on landscape resulting from the development of proposed activities or policies is legally required in most European countries as a result of the adoption of EU environmental assessment Directives.

Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment of 27 June 2001 (the so-called “SEA Directive”) provides for the compulsory assessment of plans and programmes, which predetermine the framework for future permitting of specific development projects in the field of agriculture, forestry, fisheries, water management, energy, industry, transport, waste management, telecommunications, tourism, and spatial planning, and which affect protected areas under NATURA 2000 (EC, 2001). The mandatory assessment applies to all plans and programmes with significant effect on the environment, regardless of the hierarchical level of public administration (national, regional, local) including plans and programmes co-financed by the European Community.

Directive 2014/52/EU of the European Parliament and the Council on the assessment of the effects of certain public and private projects on the environment (codified) of 16 April 2014, amending the Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the so-called “EIA Directive”), refers to the assessment of the effects of those public and private projects, which are likely to have a significant effect on the environment (EC, 2014). Projects are

understood as implementation of construction works or other equipment, plans and interventions into the natural environment and the landscape, including those involving the extraction of mineral resources.

Within the EU context, the European directives therefore formally set out the basic assessment principles and the required procedural steps, which – as a standard – include the detailed description of the proposed plan, programme or investment project, the current state of the environment, identification and assessment of potential impact, design of mitigation and compensation measures and presentation of results of the assessment process. Landscape is specifically identified as a topic to be considered in both the EIA and SEA Directives, as “*one of a number of factors, which together with other factors make up the environment*”. Other factors include population and health, biodiversity with special emphasis on species and habitats protected under other directives (see Tab. 1.6), soil, water, air, climate, material assets, and cultural heritage. When looking at the factors mentioned separately, one cannot help but notice their multiple overlaps (e.g. biodiversity overlap with soil, water,

Table 1.6: Landscape impact assessment – EU related Directives. Source: Belčáková (2013).

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- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
 - Council Directive 97/62/EC adapting to technical and scientific progress Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora
 - Council Directive 2009/147/EC on the conservation of wild birds, It replaces Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds
 - Commission Decision of 25 January 2008 adopting, pursuant to Council Directive 92/43/EEC, a first updated list of sites of Community importance for the Alpine biogeographical region
 - Directive 2008/1/EC of the European Parliament and of the Council concerning integrated pollution prevention and control
 - Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste
 - Council Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy
 - Regulation (EEC) No 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)
 - Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances
 - Council Directive 90/313/EEC of 7 June 1990 on freedom of access to information on the environment
 - Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC
 - Council Decision 2006/957/EC of 18 December 2006 on the conclusion, on behalf of the European Community, of an amendment to the Convention on access to information, public participation in decision making and access to justice in environmental matters
 - Council Directive 2008/26/EC of 13 November 2007 adopting, pursuant to Council Directive 92/43/EEC, the list of sites of Community importance for the Pannonian biogeographical region (notified under document number C(2007) 5404)
-

climate, as well as the landscape), which facilitate the requirement to assess the interactions between all environmental factors. However, which aspects in particular should be assessed in relation to landscape are not clearly identified, resulting in the emergence of different approaches in different EU Member States.

Landscape requirements within environmental impact assessment (EIA) in many European countries are enshrined in country-specific law and/or regulations, yet harmonized at the European level by the relevant Directives and international conventions.

International conventions and treaties contributing to enriching the legal context for environmental assessment, include the consideration of impacts on landscape in both, EIA and SEA. The Rio Declaration on Environment and Development of 1992, The UNECE Convention E/EEC/1250 on impact assessment in a transboundary context of 25 February 1991 (*Espoo Convention*) and the UN ECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental matters of 25 June 1998 (*Aarhus Convention*) are other essential international requirements for ensuring that potential impacts on landscape are taken into account within environmental impact assessment. The Protocol on strategic environmental assessment to the UNECE Convention on Environmental Impact Assessment in a Transboundary Context (*SEA Protocol*) is also imperative for the implementation and application of SEA. These conventions are briefly explained in Table 1.7.

Table 1.7: Environmental impact assessment - international conventions. Source: Belčáková (2013).

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- *The Rio Declaration on Environment and Development* states that EIA, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and that are subject to the decision of a competent national authority.
 - *The Convention on Environmental Impact Assessment in a Transboundary Context* sets out the obligation to assess the environmental impact of certain activities at an early stage of decision making. It also lays down the general obligation on states to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across borders and establishes concrete procedures to follow.
 - *The Protocol on Strategic Environmental Assessment* requires parties to evaluate the environmental consequences of their official draft plans and programmes. The protocol also provides for the possibility to assess environmental effects of policies and legislation. It will also ensure consultations with not only environmental, but also health authorities in various stages of SEA and extensive public participation in government decision making in a number of development sectors.
 - *Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters*, known as the Aarhus Convention guarantees the right of the public to active and passive access to information, and regulates in detail the procedures for applying for information, conditions for refusing a request, and the measures for ensuring the collection and dissemination of information by public authorities. In addition, the general provisions of the convention require the promotion of environmental education and awareness among the public (see Chapter 4 for more details).
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1.1.3 Landscape Management Tools

Sustainable landscape development represents a set of legislative requirements and practical steps or procedures, the main purpose and mission of which is the protection, development and reconnection of natural and man-made elements of whole landscapes. An equally important role is also taken by *baseline and preventive tools* that are typically part of a *broader system of environmental management*.

1.1.4 Baseline Tools

The main objective of *baseline* tools is to achieve the coordination and optimization of development activities in the landscape through various forms of *landscape planning instruments*, such as landscape plans, river basin management plans, forest management plans, forest care schemes, landscaping, landscape care and operational programmes. The status of landscape planning in the sphere of landscape management is specific. On the one hand it has to represent a separate legislative requirement to ensure that key environmental issues are taken into account and the resilience and ecosystem services across widespread landscapes are both promoted and enhanced. On the other hand, it has to be integrated into strategic conceptual, planning and programming – *in land use planning, regional and sectoral development plans, programmes*, as landscape care (management) requires professions within both the humanities and the sciences to take a dynamic view of landscape.

Landscape planning is the basis for negotiations and decision-making for landscape protection and environmental care, at different decision-making levels (Kiemstedt, 1993; Bruns, 2003; Hanusch et al., 2005). Whilst assisting and informing other (sectoral) planning instruments, some argue that landscape planning is facing its own contemporary challenge defined by profound disconnections between humankind and nature, and that a landscape reconnection agenda should be set and put forward (Selman, 2012). This understanding is already being recognised by various governments, with the UK Government for example, advising in favour of multifunctionality, connectivity and continuity of landscapes across administrative boundaries (Parliamentary Office of Science and Technology, 2009; Department for Communities and Local Government, 2016); and the UK's Landscape Institute arguing that green infrastructure can be instrumental in meeting the needs of a landscape reconnection agenda (2009).

Various forms of landscape planning are applied and exist; they mostly give a detailed picture of the current state of landscape conditions, of the potential risks to landscape quality, and provide information about ownership, identity, character and quality, and physical morphology of landscapes. Globally, approaches to landscape planning vary in scope, content, by definition or understanding of

landscape and in the overall concept of landscape planning. This is the result of historical, political and cultural differences defining the planning systems and traditions of EU member states. In Europe, landscape planning is particularly well developed in Germany, France, UK, Ireland, Italy, Luxembourg, the Netherlands, Spain, Sweden, Switzerland, Austria, Poland, Slovakia, Slovenia and the Czech Republic. In each of these countries, however, the objective, formal requirements and scope somewhat differ (Herberg, 2000). Germany so far is the only European country where a landscape plan is developed at all planning levels. Beyond Europe, landscape planning is also practiced in the US and Canada (Marsh, 2005), and in Russia (Meissner and Koppel, 2003).

In Europe the most advanced form of landscape planning is the landscape plan, or the landscape-ecological plan. In Germany, Slovakia, Czech Republic, Switzerland, Poland and Russia it is applied as a formalized tool for the evaluation, planning and optimization of the landscape. In Slovakia for example, the development of a landscape-ecological plan is a requirement of legislation on land use planning and building regulations. Generally speaking, the main tasks of a landscape plan are to carry out an *analysis and evaluation of landscape conditions; an assessment of the existing and the expected status of landscape in a defined planned area; and the identification of expected conflicts and impacts associated with the future potential use of landscape, on setting the limits and potential for further development, as well as the measures and proposals for the enhancement of landscape structure, protection of scenery horizons*. It provides a significant *reference framework* for the assessment of landscape impacts in spatially relevant processes, particularly in spatial and/or land use planning.

1.1.5 Preventative Tools

The most practiced preventative tools include environmental assessment instruments such as Environmental Impact Assessment (EIA) or a Strategic Environmental Assessment (SEA). As previously mentioned, while EIA applies to the project level, SEA applies to concepts, policies, plans and programmes (though within the context of the EU Directive, SEA applies to plans and programmes only).

Vanclay and Bronstein (1995) define environmental assessment, including various forms of environmental assessment, as a systematic process of evaluation and information on the potential, capacity and functions of natural systems and resources, to assist the planning of sustainable development and decision-making process, and to anticipate and manage adverse effects and implications of proposed developments.

The consideration of landscape can be taken into account through a landscape impact assessment as a part of both EIA and SEA. Despite the existence of some differences between various forms of environmental assessment – whether SEA,

EIA or landscape impact assessment, they all aim to inform public authorities and other stakeholders as soon as possible about the anticipated impact of proposed developments on the environment (including landscape and health), and to ensure preventive environmental and landscape care at all decision-making levels.

1.2 Landscape As An Object Of Landscape Impact Assessment

1.2.1 Definitions And Understanding Of Landscape

The term “landscape” can be *defined in several ways*, with different definitions giving form to different interpretations. In practice these definitions correspond to different professional perspectives, understandings and approaches to landscape, all with different terms of content (Forman and Godron, 1986; Haase, 1991; Naveh, 1995; Hard, 2001; Nohl, 2001; Tress et al., 2001; Haaren, 2004; Marsh, 2005; Musacchio et al., 2005; Jensen, 2006; Antrop, 2006; Butler, 2014). The range of definitions is an exemplar of the complex nature of landscapes, and of the extent to which different specialisms can influence the way in which landscapes are understood. A selection of landscape definitions is presented in Table 1.8.

Miklós (2016) identified three landscape concepts. The first, is the “*geosystem concept*” of the landscape, which has been applied mainly in scientific circles around the German geographical/landscape ecological school, including scientific centres in Central Europe (Neef et al., 1973). Miklós further argues that “a geosystem concept has a different normative effect than the characterisation of landscape as “beauty”, which is much more subjective as it depends on each individual, angle of view, etc. It does not mean at all that the aesthetic-visual characteristics and other similar values are not important indices of the landscape. The second is the “*Ecosystem concept*” which has been presented mainly by scientists from Western European and the American landscape ecological school focusing on the *structure of land cover and its spatial pattern* (e.g. Tjallingii and de Veer, 1981; Forman and Godron, 1986; Risser et al., 1984; Turner, 1990; Nassauer, 1997). The third concept of landscape prefers the understanding of landscape as a “*scape/shape*” of the land, *mainly* in terms of the perception presented by a very broad group of professionals from the social sciences, architecture and the arts. It is important to acknowledge that different conceptualisations of landscape offer a variety of possibilities for their application in planning and assessment processes, and are not intended as antagonistic.

The existence of a diversity of opinions on landscape is nothing new. According to Naveh and Lieberman (1994), landscape is historically perceived in two ways: as a tangible *material reality* and as an intangible *mental and artistic experience, even as a way of life*.

Table 1.8: A selection of landscape definitions and professional/disciplinary perspectives

Approach/Professional field	Definition
Geography	“a specific part of the land surface of the planet which forms the entity qualitatively different from the rest of the landscape sphere. It has natural limits, distinctive visual aspects, individual internal structure, certain behavior (performance) and specific development” (Demek, 1983, p.27)
History	“territory that has developed identically both politically and culturally for a certain period of time” (Čilek, 2002, p.11)
Economy	“territory that has experienced certain economic development and is intended to serve to particular economic orientation in the future” (Ružička, 2000, p.18)
Architectural/Urban design	“territory that is included in comprehensive consolidation of a certain environment (agglomeration, set of agglomerations)” (Nortberg-Schultz, 1994, p.13)
Landscape Ecology	<p>“an objectively given “organic entity”, a “harmonic individuum of space” (Troll, 2007, p.74)</p> <p>“a section within the uninterrupted earth-wide interconnection of geofactors which are defined as such on the basis of their uniformity in terms of a specific land use, and are thus defined in an anthropocentric and relativistic way” (Neff, 1973, p.38)</p> <p>“a heterogeneous land area composed of a cluster of interacting ecosystems that is repeated in similar form throughout, whereby they list woods, meadows, marshes and villages as examples of a landscape’s ecosystems, and state that a landscape is an area at least a few kilometres wide” (Forman and Godron, 1986, p.18)</p>
Administration	“the physical reality of the environment around us, the tangible elements that give shape and diversity to our surroundings. But landscape is also the environment perceived, predominantly visually but additionally through our senses of smell, touch and hearing. Our appreciation of landscape is affected, too, by our cultural backgrounds, and by personal and professional interests” (CCW, 2007, p.5)

In terms of practice, different understandings of landscape are informing the way in which landscape assessment is conducted, resulting in a range of possible approaches, also influenced established traditions and legal frameworks in the protection, development and management of landscape. Nowadays, at least three main approaches to landscape assessment can be identified: (a) *holistic approach*

based on the *geosystem concept*, (b) *landscape-ecology-based approach*, and the (c) *visual characteristics and cultural heritage or value and perception based approach*.

(a) The critical aspect of the *geosystem approach* to landscape assessment is the characterisation of the primary³ (abiotic elements), secondary⁴ (human-made or altered landscape elements) and tertiary⁵ (socio-economic phenomena and processes) landscape structures, including their functions and vertical and horizontal relations (Miklós and Izakovičová, 1997). The most recognised authors of the *geosystem* theory define a geosystem as a set of components or elements of a geosphere and their relations (e.g. Chorley and Kennedy, 1971; Sochava, 1978 In Miklós, 2016). From a spatial, material and time point of view, the concept of geosystems overlap with other frequently used terms such as landscape, ecosystems, geographic complex, but also other relational concepts such as environment and territory. When considered within the context of adopting a holistic approach, the geosystem concept helps recognise the status of landscapes in terms of their structure, quality, values, the “shape/scape” (however perceived), and the type of land use allocated to each land unit or landscape spot (Zonnenveld, 1989; Haber, 1990 and 2008). These units or spots create the shape of the land in a choric dimension.

(b) The *landscape-ecology-based approach*, also known as *landscape ecological assessment* (LEA) has been developed by landscape ecologists (Mörthberg et al., 2007). LEA provides a structured framework for the assessment of biodiversity impacts of alternative development scenarios in relation to specified biodiversity targets. LEA is primarily based on landscape ecological knowledge which also defines the scale of the assessment (Geneletti, 2005). A basic assumption in LEA is that biodiversity can be maintained through the preservation of habitat networks. This thinking is endorsed by landscape ecological research and required by climate change adaptation efforts. In this context, Gontier et al. (2010) argued that both ecology and landscape are already included in the scope of EIA, SEA and landscape impact assessment processes, but the content and level of depth of analysis of ecological and landscape issues is different if compared to a bespoke approach, such as an LEA. Landscape impact assessment, or the consideration of landscape in EIA and SEA, focuses mainly on the aesthetical and cultural-historical values of a landscape, with the more ecology-related issues to be taken into account in specific ecological assessments. In order to achieve sustainable

³ abiotic elements are physically more volatile; their behaviour is unchangeable or partially changeable and their reaction to disturbance is difficult to control

⁴ these refer to current flora and fauna, anthropogenic structures and materials, elements of land use

⁵ though do not physically exist, they are represented in regulations, laws, standards and legal constraints including plans, strategies, agreements, conventions, legally declared zones, categories of protected areas

landscape management (Gontier et al., 2006; Balfors et al., 2010), there are calls for adopting a more holistic approach and for integrating landscape with ecology-related approaches, mainly by improving the quality of landscape impact assessment within EIA and SEA (Treweek, 1996; Treweek et al., 1993; Thompson, Treweek and Turling, 1997; Atkinson et al., 2000; Byron et al., 2000).

(c) The *visual characteristics and cultural heritage, or value and perception* based approach focuses on assessing potential changes in landscape, in terms of both, scenic quality and character. Further, it looks at the extent to which major development activities, including strategic policies, plans and programmes, may affect the view or visibility of a landscape, its sense of place, and elements or characteristics of a conservation interest (Hankinson, 1999). Within this context, Shuttleworth (1980) questioned whether landscape has objective beauty that is measurable or whether scenic beauty is a value that can only be subjectively attributed to a specific landscape. Acknowledging therefore that landscape can be considered and looked at as an object which can be viewed according to different sets of values informed by different subjective perceptions about a landscape, is important when applying any approach to landscape assessment, particularly when adopting *the expert based and perception-based methodologies*.

Expert-based assessments aim to define landscape scenery qualities and attributes following an objective approach, taking into account physical, tangible and visible attributes such as a landscape's shape, height, structure and colour, morphology, vegetation and civilization attributes. These attributes can be then further qualified in terms of specific properties, which help to describe landscape in terms of variety, unity, uniqueness and distinctedness. An expert based assessment can classify landscape into landscape with low, medium and high aesthetic value (Daniel, 2001). The advantage of this approach is its practical efficiency, as it is less-time consuming and less expensive in comparison to the perception-based approach. *Perception-based assessments* are based on the assumption that landscape may change over space and time, and that as a result, communities' preferences and perceptions of that landscape may also change. This approach can therefore be quite resource intensive.

1.2.2 Landscape Perception

Perception of landscape is understood as a process by which an individual receives, selects, organizes and interprets information to create a meaningful picture of the landscape (Tveit et al., 2012). Landscape is mainly *perceived* by sight, but also by smell, or silence or sounds that influence and inform our impressions of a given location. Perceptions about landscape are influenced by knowledge, needs, feelings

and one's ability to observe. According to Drdoš et al. (1995) the perception of a landscape from the perspective of an evaluator is influenced by the following factors:

- (1) age, gender, education, employment, residency, workplace;
- (2) personality (extroverts, introverts, sociability, ability to feel nature emotionally);
- (3) structure of a human experience (resulting from an occupation or interests, eg. climbers, gardeners, swimmers, foresters, farmers);
- (4) other factors (the residents, the visitors, the urban people, the rural inhabitants).

Grosjean (1986 in Drdoš et al., 1995) discusses three types of user profiles:

- profile A – a natural type, the visitor preferring undisturbed nature;
- profile B – a traditional type, a family with children, preferring a harmonious rural cultural landscape with the possibility of undemanding recreational activities; and
- profile C – an active type, a sportsman/sportswoman who enjoys the various winter or summer sports activities that landscapes can offer.

Other scholars describe user profiles according to other criteria. For example, Antrop (1996) and De Lucio et al. (1996) speak of different gender perceptions. Marenčák (1996) suggests that peoples' attitudes depend on their direct contact with landscape, on their focus on different phenomena, and on the purpose of their visit. There are at least three aspects describing an observer's aesthetic experience: 1) the state of mind of the observer (his/her attention/in attention to the landscape); 2) context of the landscape observation (eg. work, vacation); 3) the character of the landscape itself (eg. lowland, mountain). As the perception of landscape depends on an individual's sensory abilities, the emotional quotient is considered a unifying factor for the perception.

Humans value and appreciate landscape for various reasons. It provides them a place to live and is also testimony of human's changing and evolving ways of life. Landscape may also bear social and societal values that contribute to the identity of a given location. For many people it means the general environment or space for recreation. Landscape thus becomes a source of living standards and experience. In a broader sense it also includes health benefits. For many people, factors such as peace, comfort, wealth of fauna and flora or natural character of landscape are significant, refreshing or uplifting. Landscape can also be a source of inspiration for music, literature, visual arts, language, customs. The considerable economic value of landscape also deserves a mention, such as its attractiveness for people and visitors seeking distinctive qualities. In this context, the diversity of landscape in certain places and times should be taken into account.

1.2.3 Understanding Of Landscape In Assessment Practice

Within the European context, the most common understanding of landscape is a phenomenon that largely depends on geological and soil conditions, topography, archaeology, history of the country, its use and management, ecology, architecture, and cultural context. In assessment landscape is also understood as a visual phenomenon, i.e. the appearance of landscape, including the shape, texture and colours, reflecting the way in which the different components combine and create specific features and influence the perception and evaluation of landscape.

Landscape structure (and/or land cover) with its horizontal and vertical interrelationships, landscape stability (and/or vulnerability), biodiversity, characteristic landscape, landscape scenery and landscape image are aspects often considered in landscape assessment practice.

A *landscape structure* consists of landscape elements, and depending on the size and variability of arrangement of landscape elements, one can refer to the structure as a mosaic. When assessing the potential effects of a development proposal on the structure of landscape, it is important to take into account the effects on the arrangement of landscape elements and on their quality within the context of a landscape mosaic. The existing and planned uses of the area should also be considered. The analysis of landscape elements in an area under assessment refers to their current state, though they can also be analysed according to different time periods. This is because the implementation of proposed projects, strategies, plans or programmes, could influence the spatial arrangement of landscape elements, or facilitate the return of some extinct elements. Using old maps, plans, postcards, paintings, engravings, and vistas can assist with this exercise.

When assessing the likely effects on the structure of a landscape, observations are key issues. Ideally, a landscape should be best observed from high spots (for example, a hilltop, observation tower). These should be complemented by maps such as orthophoto maps, which provide a better understanding of landscape structure, mosaic and land uses. Aerial pictures represent a targeted examination of an area of interest, which can be used to describe mosaic variability and the spatial arrangements of landscape features that reflect land uses. Though useful, they must be used with caution, as the increase or reduction of a landscape feature or surface area is not sufficient to explain why and how the change occurred, and to establish the extent to which a proposed development may further affect the area or landscape feature.

Assessing *landscape stability* helps determine the state of the environment and changes occurring as a result of influences from both natural and anthropogenic factors. Landscape stability consists of the abiotic environment, biotic environment

and ecological stability. It should be emphasized that the ecological stability of the landscape is not synonymous with the term landscape stability⁶.

Determining the stability of the abiotic environment is a complex process involving knowledge of geomorphology, physical geography, hydrology, basic geology, engineering geology, hydrogeology, pedology and other fields. It is therefore necessary that appropriate links are made between landscape impact assessment and other assessment factors relating to the geological characteristics, geodynamic phenomena, hydrological and soil conditions, including susceptibility to erosion, physical and chemical soil degradation, vulnerability to landslides/slope movements, and the threat of flooding, etc.

The stability of the biotic environment can be expressed through the quality of a habitat. That means that the main task consists of conducting a habitat mapping and a qualitative assessment. If available, zoological and botanical data can significantly help determine the degree of stability of an abiotic environment. One of the methods that can be used for this task is the bio-indication characteristics of organisms, as applied in the works by Naveh and Lieberman (1994); Jongman (1995); Forman (1990) and others. Knowing the stability of the biotic environment can then help know the ecological stability of the area, thus, the level of ecological balance.

In order to adequately integrate biodiversity in landscape assessment, landscape ecological expertise is required to gather knowledge on *patterns and dynamics of ecosystems* and their vulnerability to interventions and change. It is particularly important to analyse how ecosystem services can be optimised, and how resilient social ecological systems can be designed to deal with disturbances, interventions and change.

Mörtberg et al. (2007) noted that in landscape impact assessment *effects of habitat loss and fragmentation, threats to biodiversity and other ecosystem services* must be analysed. Since ecological processes, such as species persistence and dispersal often work on large scales, a site-based approach would be inappropriate. There is a need to consider the quality, quantity and spatial cohesion of natural habitats and persistence requirements of species and communities in the landscape, therefore a regional based approach would be more appropriate.

Characteristic landscape is a term that has been used in practice in recent years, mainly since the European Landscape Convention (2000). Landscape characteristic can be of a natural, cultural and aesthetic nature. Historical landscape developments are also important, as they contribute to shaping the character of a particular area and land use. The Convention does not define how to evaluate characteristic

⁶ Ecosystem or ecological stability is the ability of an ecosystem to maintain a steady state, even after a stress or disturbance has occurred. In order for an ecosystem to be considered stable, it needs to have mechanisms in place that help it return to its original state after a disturbance occurs (Miklós and Izakovičová, 1997).

landscape. It is value-laden, and informed by knowledge, social and culture. When assessing the effects of proposed developments on the characteristic landscape, the following should be taken into account: a) natural values and dominating elements in the landscape; b) cultural values and dominating elements in the landscape; c) historically valuable objects, areas and units; d) traditional methods of land use; e) harmony of relations in the landscape; f) the scale of the landscape.

Landscape scenery and landscape image are an expression of visual perception of landscape physiognomy. Scenery is seen as an aesthetic effect of parts of a landscape, as intensively perceived by observation points (see Chapter 5 for more details). To a certain extent, scenery can also include the observation of certain objects in the landscape that are in the immediate vicinity. By contrast, a landscape image presents an aesthetic composition of a landscape's structure consisting of specific physical features, which can be the objects of observation.

When observing landscape and its related features one can perceive the size, shape, colour, material nature, as well as the external structure and diversity of objects or features that can contribute to describing and informing various experiential landscape values. In landscape perception it is not possible to separate the properties that we perceive with other senses as they all affect the human psyche (for example: odour/smell, stuffy/freshness, effect of wind and storms, silence/sounds, etc.). Equally significant in observing the landscape is the fact that people perceive their surroundings in a selective manner. In their imagination they create images, which they subconsciously believe to be real. The truth is that it is only a set of selected attributes that one acquires in their own mind based on "internal rules" that are inherent within each observer. Therefore, a set of attributes of a landscape segment under observation can be interpreted in different ways, depending on the level of knowledge of the observer, and on the psycho-social structure of their personality influenced by age, gender, etc. Objects, such as wind farms, ski resorts, cooling towers of nuclear power plants, are significant and dominant objects that cannot be overlooked when observing a landscape, partly because of their size but also because of their nature and functionality. Depending on an observer's perceptual abilities, these objects will be perceived in different ways, regardless of their size. They could be perceived positively, perhaps as objects that enliven a landscape; or negatively, as objects that disturb a landscape's image. When assessing the landscape scenery, therefore, it is impossible to ignore the subjectivity of the evaluation (Brush and Palmer, 1979; Krause, 2001; Dramstad et al., 2006).

When assessing impacts on the landscape scenery, the subjectivity of evaluators cannot be ruled out, especially when applying sociological approaches, such as questionnaire surveys. They include images (photographs, collages, models), through which respondents express their opinion on the potential impacts of an assessed activity. They are likely to compare the current appearance of a landscape without the proposed development with pictures of the same landscape including the proposed development. The respondents are likely to complete the questionnaires

based on their feelings which are influenced by their background (age, gender, level of education, knowledge of the area, mood, relationship/experiences with the landscape under assessment, and other). To increase the objectivity of impacts assessment on landscape scenery, objective indicators are often used. These can include: the distance from which the objects are visible; points (that can be clearly localized) from which the objects can be observed; models of potential visibility of objects and landmarks of the landscape respecting the relief, landscape cover, visual barriers; the elevation of landscape features located in the vicinity of activity under assessment, etc. (Pauditšová, Salašová and Ořahel, 2010).

Landscape image is something that we perceive with our senses, especially sight (Bechmann and Johnson, 1980 In Drdoš, 1995). It consists of a set of specific landscape characteristics, based on which it is possible to talk about landscape as normal, typical, unique, etc. these characteristics are in turn influenced by experiential landscape values, including the perception of sizes, forms, colours, structure, materials, diversity and landscape changes. Landscape landmarks, whether of natural or anthropogenic origin, are among the most important features contributing to landscape image. Their function in the landscape and intensity of visual impacts depends on many factors. These include the elevation of a given object, its overall size, shape and materials from which the object is made and naturally, the distance between the relevant landmark and points of observation (Pauditšová et al., 2010).

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