Ingrid Belčáková, Paola Gazzola, Eva Pauditšová
Landscape Impact Assessment in Planning Processes

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Foreword

Growing social and economic needs exert major pressures on landscapes, challenging preserved landscape values and the regional significance of places. As a result, the scope of landscape management has broadened and diversified in response to international calls for greater landscape protection, and to existing and new challenges and tasks. Within this context, landscape impact assessment and more general landscape planning has been regarded as effective mechanisms for promoting sustainable landscape development.

Set within the European context, this book aims to provide a contemporary review of landscape impact assessment theory and practice, looking at both the project and planning levels.

The monograph is divided into five parts. Chapter 1 presents the formal baseline for the assessment of impacts on the landscape in the context of sustainable landscape development at national, European and global scales. It explains the basic principles and approaches of landscape impact assessment and understanding the definition of a landscape within the framework of both planning and assessment tools. The Chapter further underlines the role of landscape impact assessment in the context of environmental health and climate change.

Chapter 2 addresses the issues of assessing impacts on landscape as part of environmental impact assessment and strategic environmental assessment in land use planning. Special attention is given to the interaction between planning and assessment processes. It also proposes a list of basic steps for incorporating landscape issues in impact assessment and land use planning.

Chapter 3 is dedicated to methods and techniques for taking into account landscape issues in impact assessment. Chapter 4 examines the importance and the role of public participation for a better and more transparent decision-making process for sustainable landscape management and planning. Chapter 5 brings some interesting case studies supplemented by a number of tables and illustrative materials to illustrate the theoretical and practical information presented in this book.

This book will be of interest to professionals involved in the day-to-day application of landscape impact assessment, as well as scholars and teachers working in the broad area of landscape planning and management.

It is based on and directly linked to over twenty years of local and international experience of authors in both environmental assessment and sustainable landscape management. Landscape impact assessment is a field where information quickly becomes dated. As far as possible, the authors have tried to present their latest position.

Paola Gazzola, Ingrid Belčáková, Eva Pauditšová

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 (Prieur, 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 averages[1]. 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

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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 prevention[2]. 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): combate 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).

- 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.

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).

- "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.

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.

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).

- *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.

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).

- 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).

- *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).

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 aknowledge 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" (Cilek, 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	"an objectively given "organic entity", a ''harmonic individuum of space" (Troll, 2007, p.74)
	"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)
	"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)
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 primary[3] (abiotic elements), secondary[4] (human-made or altered landscape elements) and tertiary[5] (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 (Mörtberg 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 landscpae 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 asessments. 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 stability[6].

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 asessment, 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 Oťaheľ, 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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Paola Gazzola, Ingrid Belčáková, Eva Pauditšová

2 Landscape Within The Framework Of Environmental Assessment At Project And Planning Levels

2.1 Introduction

Landscape (and visual) impact assessment (LIA) is an instrument used to identify and assess the significance and the effects of change resulting from development proposals on both the landscape, as an environmental resource and on people's views and visual amenity (LI and IEMA, 2013). As discussed in this chapter, when carried out LIA as part of an EIA or SEA, the interrelationships with other environment-related topics such as climate, fauna and flora, human beings, soil, noise, cultural heritage, air, water and others are also considered.

According to the LI and IEMA (2013, p.9), "*impact*" is the action being taken and *the effect* is a change resulting from that action; The EIA/SEA Directives put the emphasis on *likely significant effects* including all types of effects, for example positive/beneficial, negative/adverse, direct/indirect, long term/short term and cumulative effects (EC, 2001; EC, 2014).

LIA is an effective tool for the achievement of sustainable landscape development. Since it was first introduced, the scope of landscape impact assessment has broadened and diversified. This was in response to international calls for greater landscape protection (and management), and to the emergence of existing and new challenges, such as those relating to environmental health and climate change.

The link between landscape impact assessment and environmental health is widely acknowledged. According to Fredrickson (1998), positive emotions such as those that a landscape can generate, 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 (Frederickson, 2001).

Landscape impact assessment should also take into account climate change, particularly in terms of the impacts that a proposed development is likely to have on both, mitigation and adapatation efforts (LI and EMA, 2013). The production of prediction models and landscape development scenarios (for example models presenting air quality change, air temperature change, hydrological regimes change, scope of dry areas) offer ideal outputs based on which it is possible to determine predicted landscape impacts within the overall framework of an environmental assessment. Assessing the forecasted effects of climate change on landscape, is important for both strategic and project level assessments.

2.2 Landscape Impact Assessment At Project Level Within The EIA Process

2.2.1 Environmental Impact Assessment – Concept, Implications And Wider Context

Environmental Impact Assessment (EIA) can be defined as a systematic process in which potential environmental impacts of a planned activity are considered. More in detail, it is a process for evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse, prior to a decision being made on whether or not the proposed project or development should be approved (CBD, 2017). There are a number of features that could be extracted from these definitions, which help further outline the nature and aims of EIA.

EIA is anticipatory, in that it needs to look into the potential consequences of project developments at the earlier stages of decision-making prior to a decision being made (Partidário, 1993). This contributes to making EIA a decision-making support tool, rather than a decision-making tool. Following notions of positivism and scientific rationality, it is assumed that EIA can support and assist in making better decisions, if the process is informed by objective data evaluated according to a systematic and structured procedure (Weston, 2004). As acknowledged by Weston (2004, p.315), "the language of rationalism and EIA is indistinguishable", and EIA's process mirrors that of rational planning processes (Lawrence, 2000; Elling, 2009). This entails collecting information about the affected environment, and using that information effectively so that the planned objectives can be met (Elling, 2009; Weston, 2010). This in turn, emphasises another feature, which is that EIA is objective. The rigour with which it is supposed to be conducted, and the evidence-basis on which evaluations are made have given EIA the status of a scientific tool which aims to enhance knowledge about the environmental effects of proposals (Owens and Cowell, 2002; Bartlett and Kurian, 1999) through the collection of both, qualitative and quantitative data. However, as argued by some, the scientific and objective nature of EIA can also be used to legitimise planned developments or decisions that have already been made (Bühr, 2009; Wood, 2003), or to mitigate negative effects rather than lead to the abandonment of certain proposals (Jay et al., 2007).

The objectivity of EIA, and the level of rigour with which the process should be conducted, requires that the data collected and the evaluations undertaken are summarised in a report describing the significance of likely impacts on the environment, and open to public scrutiny. This helps enhance the transparency of the process, and make EIA a participatory environmental management tool, which relies on and recognises, consultation and public participation, as an established step to carry out and a way of bringing communities into the process (Elling, 2009). Early and continuous communications between developers, statutory consultees, interest groups and members of the public with an interest in, or who might be affected by a proposed development, can in effect enhance the evidence basis of an EIA by providing advice and information; and assist in the evaluation of potential impacts, by providing local knowledge or values and perceptions that help to identify features valued by communities (Shepherd and Bowler, 1997). The importance of involving the public in environment policy- and decision-making is widely acknowledged, as reflected in numerous legal EIA requirements of different countries or international conventions, such as the Aarhus Convention, who recognise EIA as being instrumental for providing access to justice, and for empowering public rights to information and greater democracy in decision-making (Gonzalez et al., 2008; Creighton, 2005). However, as noted by Shepherd and Bowler (1997), public participation can make EIA costly and time-consuming, sometimes resulting in public involvements and consultations being conducted as a mere procedural exercise, still today (Morgan, 2012).

EIA is also considered an advocate tool for (the protection of) the environment, as one of its aims, or "proximate aims" as noted by Jay et al. (2007), is to identify environmental impacts and take them into consideration in decision-making (Cashmore et al., 2004). While it cannot be assumed that the resulting decision will be more environmentally-friendly, it is believed that by systematically assessing environmental information, a process of learning will take place and attitudes towards the environment will improve (Jha-Thakur et al., 2009; Jay et al., 2007; Cashmore et al., 2004; Weston, 2010). However, as EIA does not require decision-makers to give any weighting to the environmental information taken into account, political considerations or weightings often prevail (Jay et al., 2007), making EIA's claim of being an advocate tool for the environment rather weak (Benson, 2003; Owens and Cowell, 2002; Wood, 2003).

More recently, EIA is being perceived as a tool that can help design and plan more sustainable forms of development (Glasson et al., 2005). Its approach to the environment, which includes socio-economic, cultural and human-health impacts; the focus on impacts, including cumulative ones; and its participative nature requiring local views and knowledge, can help facilitate both, intragenerational and intergenerational equity (Lee and George, 2000; Bruhn-Tisk and Eklund, 2002). However, the extent to which this is actually happening is debateable with the environmental focus in EIA still dominating the way in which this decision-making support tool is perceived (Cashmore et al., 2004; Jay et al., 2007).

EIA is mandatory and formalised. Since it was first instituted in the United States via the National Environmental Policy Act of 1969 (NEPA), EIA has been introduced in legislative frameworks around the world (Wood, 2003), with many countries, international organisations and banks developing their own EIA systems (Lee and George, 2000), incorporating formal procedures into either planning or other areas of environmental decision-making. The formalisation of EIA has progressed and been consistent over the years, and EIA is now "recognised in international conventions, protocols and agreements, including the Convention on

Transboundary Environmental Impact Assessment; the Convention on Wetlands of International Importance; the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters; the United Nations Framework Convention on Climate Change; the United Nations Convention on the Law of the Sea; the Protocol on Environmental Protection to the Antarctic Treaty." (Morgan, 2012, p.6). As noted by Morgan (2012) a search carried out in 2011 found that 191 of the 193 members of the United Nations either had EIA legislation or references to EIA, or to an equivalent process in their legislation. EIA's strong legislative basis has therefore contributed to making it one of the most, if not universally and formally, recognised and practiced assessment tools for achieving environmental protection and solving environmental problems (Jay et al., 2007; Morgan, 2012).

The main features and aims of EIA presented so far, including the EIA report or Environmental Statement summarising the findings of the assessment, can be applicable to other forms of impact assessment and to different levels of decision-making. Yet, in most jurisdictions, EIA is commonly understood to apply to the project level, which refers to concrete development projects. Within the EU context, Article 1(2) of the EIA Directive defines "project" as: "the execution of construction works or of other installations or schemes, other interventions in the natural surroundings and landscape including those involving the extraction of mineral resources." Further, the Directive specifies the project categories for which developments ought to be subjected to an EIA, which are listed in Annex I and II (see Directives 2011/92/EU and 2014/52/EU). However, a review of the effectiveness of the application of the EIA Directive in EU member states revealed that in practice it can be difficult to establish whether an individual project fits a project category and should be subjected to an EIA or not. A number of court cases have prompted the EU to issue further guidance to assist with the interpretation of definitions of project categories of Annex I and II and provide key principles clarifying the purpose of the Directive deriving from case law of the Court (EC, 2015). To a certain extent, the academic literature has also attempted to grasp what a project is, and how it compares to a policy, plan or programme. As indicated by Wood and Dejeddour (1992), the meanings of these different levels of impact assessment application vary considerably, with some countries calling "policies" "plans" and other countries referring to "plans" as "policies". Within the context of an iterative forward planning process, which starts with the formulation of policies at the upper level, followed by plans, programmes and projects, they consider a policy "as the inspiration and guidance for action, a plan as a set of co-ordinated and timed objectives for implementing the policy, and a program as a set of projects in a particular area" (ibid., p.8). Within this framework, projects refers therefore to the definition of actual developments.

Following this introduction, the next two sections explore EIA in more detail, looking particularly at the consideration of landscape in EIA and at the procedural steps for carrying out landscape impact assessment in EIA.

2.2.2 Application Of Landscape Impact Assessment Within EIA

Since EIA first came to the fore in the 1970s, other forms of impact assessment have been introduced, often in response to different needs (Petts, 1999a) or, as argued by Morgan (2012) to address weaknesses arising from EIA practice. Under the umbrella term of EIA, specific forms of impact assessment are becoming increasingly established. Among many others, these include: Social Impact Assessment (SIA), which evaluates the impacts of a proposed development on humans and on the ways in which "people and communities interact with their socio-cultural, economic and biophysical surroundings" (IAIA, 2017); Health Impact Assessment (HIA), which the World Health Organisations defines as "a means of assessing the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative and participatory techniques" (WHO, 2017); or Strategic Environmental Assessment (SEA), which evaluates the impacts of a proposed policy on the environment. Its strategic nature is what makes SEA distinct from EIA, which as previously suggested, focuses on assessing the environmental impacts of development proposals at the project level. SEA and the consideration of landscape in SEA will be explored in more detail later in this chapter. There are also forms of impact assessment that focus on specific environmental receptors, for example, Water Impact Assessment (WIA), Ecological Impact Assessment or Landscape and Visual Impact Assessment. The latter is subsequently explored more in detail.

Landscape has long been considered in EIA and/or in land use planning. As summarised by Knight (2009), assessments conducted up to the 1980s generally focussed on the designation of areas of landscape quality, prompting the areas non-designated to be pursued by developers. In the 1980s landscape assessments focused on identifying what makes one landscape distinct from another, setting the foundations for the concept of landscape character, now central to landscape assessments, and a change of "emphasis from landscape as 'scenery' to landscape as 'environment'" (ibid., p.123). While conventional EIA practice has been often based on the assumption "that landscape issues are passive mitigation, to be added after project design"; there is also growing recognition that a more positive approach to EIA is needed, thus one that considers landscape and visual effects as essential to project design for which impacts should be avoided, rather than "simply" mitigated (Hankinson, 1999, p.347). Ratifications of the European Landscape Convention are expected to enhance the consideration of landscape in EIA, at the very least, by providing a definition of landscape (Antonson, 2011). However, some scholars have raised criticisms about the way in which landscape is considered in EIA. Wood (2008) for example, raises questions about the use of, and lack of consistency in, expert judgements in EIA when determining the significance of landscape impacts, describing it as "an opaque or black box exercise" (p. 25). However, it is also worth noting that landscape considerations are probably the most subjective of impacts typically considered in an EIA, which presents added challenges as well as the need for qualitative approaches (Morris and Thérivel, 2009; Knight, 2009). Hankinson (1999) emphasises common technical problems, which include the excessive reliance on computer generated outputs, problems relating to access and timescale, and the resistance to accept that not all changes to landscape are negative. Further, Bond et al. (2004) note how in EU practice there has been limited consideration of cultural heritage in EIA, often restricted to the consideration of the built heritage, and excluding the consideration of cultural values, including those associated with landscape. When reflecting on the consideration of landscape in the Swedish EIA process, Antonson (2011) concludes that knowledge of landscape according to the terms of the European Landscape Convention appears to be limited in EIA practice and among the participants to the EIA process, including EIA professionals.

The consideration of landscape in EIA is required in a number of legal systems. For instance, the European Union EIA Directives require that the impacts of a project on the population and human health, and on material assets, cultural heritage and the landscape, and on the interrelationship between all these aspects, should be identified, described and assessed (art 3, Directive 2014/52/EU, EC, 2014). This therefore includes the consideration of both, direct and indirect effects of a project on physical and human features, as well as the consideration of effects on landscape, including inherent changes in landscape character, regardless of whether visual effects take place (Hankinson, 1999). Fulfilling and complying with this requirement is a core part of the EIA process for member states of the European Union and for many developed countries. In addition to EIA legislation, practice of project-level landscape EIA is also supported by legislation which usually relates to landscape quality designations. For instance, internationally, the European Landscape Convention provides a framework for legislation for addressing landscape issues in the ratifying countries. Nationally, in the UK for example, the 1949 *National Parks and Access to the Countryside Act* designates National Parks as well as Areas of Outstanding Natural Beauty (AONB) in England and Wales with equivalent legislation in Scotland (*the National Parks (Scotland) Act*). Other relevant legislation can be associated with planning rather than landscape designations, e.g. greenbelts in the UK. Neither the EU Directives nor international or national legislation prescribe a methodology for how landscape effects should be assessed in EIA (Wood, 2008). International guidelines are also not available, hindering the development of good practice particularly in developing countries (Tahsildar and Flannery, 2012). Numerous guidelines have however been produced, with the joint effort of the UK's Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA) being one of the most well-known and cited, possibly justified by the extent to which project level landscape impact assessment is widely practiced in the UK (ibid). The *Guidelines for Landscape and Visual Impact Assessment* (GLVIA3) published in 2013 is at its third edition, with the latest edition set within the context of the European Landscape Convention and including an increased emphasis on green infrastructure, ecosystem services, and developments in landscape character assessments, seascape character assessments, and historic landscape characterisations. As stated in the guidelines, landscape and visual impact assessment (LVIA) can be conducted either formally as part of an EIA, or informally as part of a development proposal or planning application, though the core approach is similar in both cases (LI and IEMA, 2013). In the first case, the LVIA is carried out as a separate theme, and covered in the Environmental Statement or Report. In the second case, the approach is more informal and flexible, though the key stages of an LVIA still apply. A flow chart representing the EIA and LVIA process is provided in Figure 2.1.

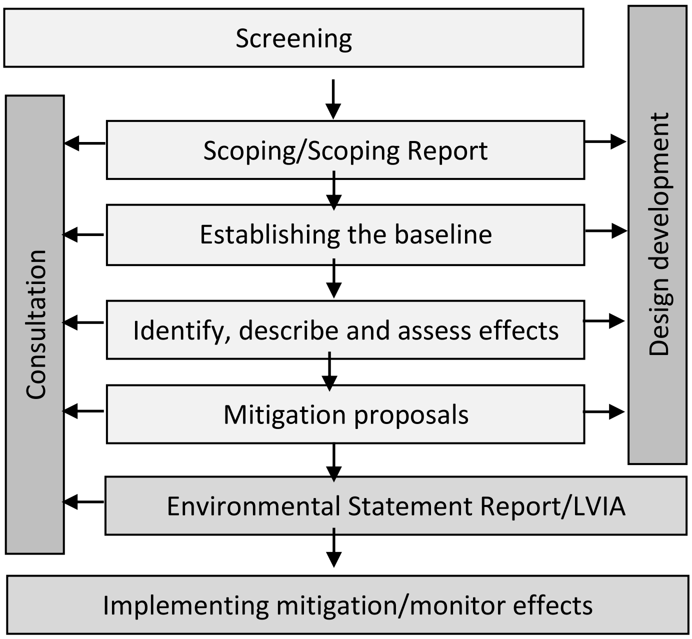

Figure 2.1: The EIA and the LVIA process. Adapted from LI and IEMA (2013, p.29).

The participative nature of EIA and the European Landscape Convention's strong emphasis on seeking opportunities for public participation (Antonson, 2011), strengthen the definition of landscape as a cultural and social construct, which include the consideration of aesthetic and perceptual factors, as well as natural, social and cultural factors (Knight, 2009). The requirement to include in the assessment the effects of a potential development proposal on the interrelationship between people and place means that landscape cannot be a matter for experts only. Individual and community experiences of, and relationships to, landscapes are also important, and should feed into EIA processes. According to Antonson (2011), the public's values and views should be weighed on par with expert views. Landscape value could be recognised by experts through landscape designations, either via planning or environmental legislation, but it could also be valued by people for its tranquillity, wilderness, for its cultural associations, for conservation issues or other perceptual aspects, thus, without an official designation status needing to be in place. The public also holds local landscape knowledge which could be beneficial to both, project design and to the EIA process itself, which further supports Antonson's view. Other interest groups who should be involved in the process are the regulatory/competent authority, for example the local planning authority and its landscape officers; statutory consultees, thus those organisations who must be consulted according to the law; non-statutory consultees, thus other interest groups which might include conservation bodies or residents who should be consulted because they might either have an interest in, or be affected by the potential development proposal.

2.2.3 Landscape Impact Assessment Procedure Within Environmental Impact Assessment in Selected European Countries

As mentioned in the previous section, under the overarching tool of EIA, different forms of impact assessment have developed, such as landscape impact assessment undertaken within a conventional EIA process. As such, the process follows the well-known steps of EIA (see Fig. 2.1), and adopts similar methodologies and terminologies. Within the context of the EU Directives, following Morris and Thérivel (2009) and Hankinson (1999), these procedural steps normally include:

Screening: it is a very early and essential step in an EIA procedure, which aims to determine whether an EIA is required or not. It entails a preliminary assessment which normally seeks to answer two questions: (a) whether the proposed development will impact the environment; including the consideration of landscape change and visual impacts; and (b) whether the potential impacts are likely to be significant. If the answer to the second question is yes, then an EIA is required and the proposed development must be formally subjected to an EIA. If the answer is no, then an EIA is not required. Within the EU, the EIA Directives identify the projects for which an EIA is essential, and those for which an EIA might be required through case-by-case decisions based on three criterion: (1) characteristics of a project; (2) location of a project, and the environmental sensitivities of the area (including landscape rarities and areas of particular historical, cultural or archaeological value or designated to be of interest under legislation); and (3) characteristics of the potential impacts determined in relation to the first two criterion.

Scoping: the aim of this step is to identify the key receptors, impacts and project alternatives to consider, the methodologies to apply, and who should take part in the consultation process. Normally conducted at the early stages of project design, the findings of this step are then summarised in a scoping report, made available to all participants to the EIA process. In relation to landscape, this step determines whether there is a need for a landscape and/or visual impact assessment, or not. If it is required, then the scope of the landscape and/or visual impact assessment needs to be defined. Issues likely to contribute to defining the scope of the landscape and visual assessment include: (a) a description about the proposed site and of its surrounding landscape; (b) a description of the proposed development; (c) an initial draft of the issues to cover in the baseline studies; (d) the alternatives considered; (e) the impacts pre-determined during the screening process; (f) the proposed assessment methodology and (g) mitigation measures.

Baseline studies: they concern the description and evaluation of the baseline conditions of the area likely to be impacted by a proposed project. It constitutes the evidence-basis of the assessment, and includes socio-economic, environmental and any other relevant information concerning the likely impact area, some of which might be available or might need to be collected through site visits or field work. The findings of this step should not only outline limitations of the baseline study conducted, for example in relation to data accessibility or accuracy, but also provide an initial assessment of the value of key receptors and their sensitivity to impacts. In relation to landscape, different methods can be used to collect the baseline data in support of the landscape and/or visual assessment. These might include a landscape character assessment (see Box 2.1), desktop studies based on available and accessible published data (e.g. geology and soil maps, ordinance surveys, aerial photographs, existing policy, plans and legislation which set out designations of different types and land uses/covers/forms, but also literature, paintings or historical data to determine associations of a cultural value); and field studies, including site and landscape surveys, with photographical records, sketches, and survey sheets. Visual assessments in particular often make use of computer-aided systems to explore the impact significance of a proposed development from different viewpoints and generate a zone of theoretical visibility (i.e. definition of the area with potential visual implications).

Impact prediction and assessment is the step in which the potential impacts of a proposed project on the environment are taken into account, including those on landscape. The impacts could be of different types, direct or primary, indirect or secondary, cumulative and synergistic, thus resulting from impact interactions. In addition, impacts can be positive or beneficial; negative or adverse; short, medium or long-term; reversible or irreversible; and permanent or temporary. The severity of impacts is defined in terms of magnitude, and both, qualitative and quantitative methods can be used to establish impact magnitudes. The approach set out in the UK's guidelines for LVIA (LI and IEMA, 2002) is summarised in table 2.1. During this step, the significance of impacts is also determined, which is an assessment of an impact's magnitude in relation to the value, sensitivity or recoverability of the (environmental) receptor impacted determined during the baseline studies step. In relation to landscape, the assessment stage will focus on establishing the potential impacts of a development activity on: (a) the site's and local landscape's character; (b) the extent to which the landscape is able to cope with the implementation of the proposed development and the changes resulting from it; and (c) on the local communities and existing developments on the site and surrounding area. In relation to visual assessment, this step explores: (a) theoretical and potential visibilities; (b) the views impacted and the viewers affected; (c) the degree of visual intrusion or obstruction; (d) distance of the views, and (e) impacts on the character and quality of the view. This process is represented in Figure 2.2.

Table 2.1: Definitions of landscape and visual impact magnitudes. Aadapted from Knight (2009, p.135-136, originally in LI and IEMA, 2002).

Impact magnitude	Definition of landscape components/ character	Definition of visual impact
High	An evident change in landscape components, character and quality of landscape	The development has a defining influence on the view and becomes a key focus of the view
Medium	Discernible but not obvious changes to landscape components, character and quality of landscape	The development is clearly visible in the view and forms an important but not defining element of the view
Low	Minor changes in components, character and quality of landscape	The development is visible, but forms a minor element of the view
No changes	No changes in landscape components, character and quality of landscape	The development is not visible

Mitigation, specifically the identification of those measures that can help avoid, reduce, remedy or even compensate significant adverse effects of predicted negative impacts, including those of the main alternatives considered, resulting from a proposed project. Different measures will be needed to mitigate the effects of the adverse impacts on environmental components and receptors. When identifying mitigation measures it is good practice to apply the precautionary principle, meaning that measures should be in place even in the absence of strong evidence confirming that a negative impact will occur. In addition to mitigating impacts, good practice also recommends that opportunities for enhancing the environment, including an improvement in environmental conditions or features should be sought, emphasising the advocative nature of EIA previously discussed. As argued by Hankinson (1999), most landscape impacts could be avoided or reduced in significance by amending the project design; this would entail that the consideration of landscape be an integral part of project design through an initial landscape assessment, resulting in a more positive approach to project design. This is in contrast to looking at mitigation as a problem to solve or moderate (ibid) through an EIA based approach conducted after the project design stage, yet before the approval stage.

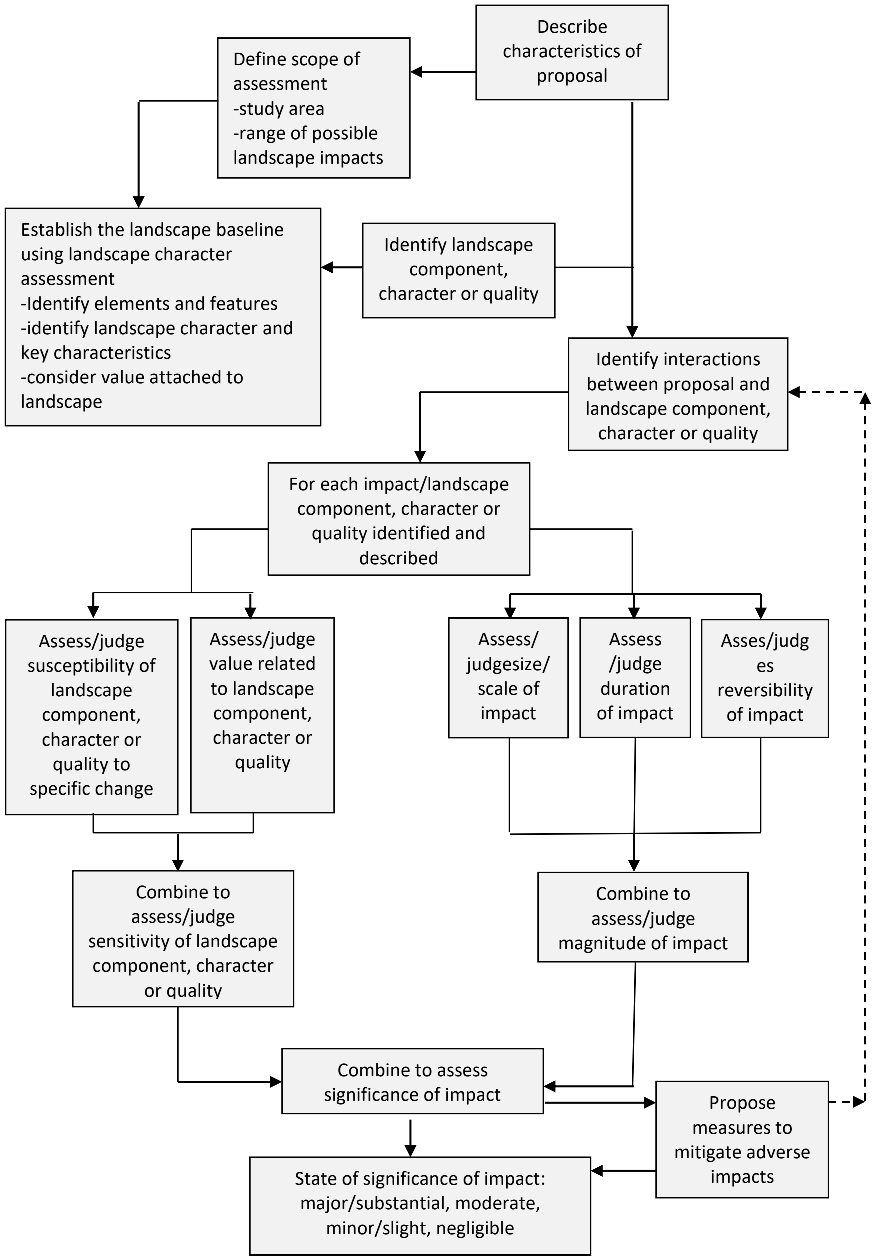

Figure 2.2: Assessing the significance of landscape impacts. Adapted from LI and IEMA (2013,p.39,71) and Knight (2009, p.139).

Monitoring: within the context of landscape EIA, the monitoring of landscape and visual impacts has had limited practice to date. This is because unlike other receptors or thematic issues like noise, water or air quality, landscape quality cannot be monitored on a quantitative basis. Where practiced, monitoring has typically consisted of a process of quality control, ensuring that development proposals have been implemented as approved, and that the impacts have not been more significant than what was reported in an Environmental report or statement. Local residents might practice informal monitoring, particularly if the visual impacts associated with the implementation of a project are greater than expected or what they had initially deemed acceptable. Though not originally required by the EU Directive, the newly amended EIA Directive (2014/52/EU) (entered into force on 15 May 2014 to simplify the rules for assessing the potential effects of projects on the environment), now formally requires developers to take the necessary measures to avoid, prevent or reduce the occurrence of adverse effects. The monitoring procedure is to be established by individual EU member states. The deadline for transposing the rules introduced by the latest amendment to the EIA Directive, including monitoring requirements, was May 16, 2017.

Environmental Statement: it is not a procedural step as such, but an output of an EIA process. It is a report or Environmental Report which summarises the EIA findings and proposals. It should include a non-technical summary so that the report can be fully understood by non-experts and subjected to public scrutiny. Where a landscape and visual impact assessment is conducted as part of, and within an EIA, the findings of the LVIA normally appear as either separate or combined sections of the environmental statement or report. If the LVIA was conducted as a standalone exercise, then the findings are normally presented as a separate report in support of a planning or project application. Whether produced as part of an environmental statement or as a standalone report, the findings of the LVIA should be presented in a manner to facilitate widest dissemination, legibility, and accessibility, making cross-referencing of files, documents and tables easy to understand and follow.

In most EU member states landscape-based EIA tend to follow the procedural approach outlined by the European EIA Directives, with wording in EIA legislation often mirroring the wording of the EU Directives. What might distinguish European practices is the way in which landscape is understood in more conceptual terms; thus, as a result of different countries' planning traditions and cultural approaches to landscape, which go beyond procedural aspects and predate the EIA Directives and the European Landscape Convention, as briefly illustrated in the following examples.

The UK, for example, has a long tradition of taking into account landscape considerations that goes back to Victorian times, with the creation of botanical gardens, urban parks, architectural gardens and landscapes. Since then, the way in which landscape is understood in the UK has evolved to reflect "the relationship between people and place, providing the setting for our day-to-day lives" (Knight, 2001, p.121). In more detail, in England, the UK's Department for the Environment, Food and Rural Affairs (DEFRA) and Natural England emphasise the unique combination of elements and features that determine the way in which landscape is perceived, experienced and valued by people. These elements and features include "topographic features, flora and fauna, land use, sights, sounds, touch and smells, cultural associations, history and memories" (Natural England and Defra, 2014). In Scotland, Scotland National Heritage (SNH) defines landscape as "more than just the view'". They go on to suggest that it is about how people relate "to places and to nature - what they value about it, and how they respond to changes in the landscape" (SNH, 2015). The timeless and unique features or characters of a landscape aptly expressed over centuries through the works of poets, writers and painters (Tudor, 2014), have been particularly appreciated in the UK and resulted in the development of numerous studies exploring what gives a landscape its unique character. In England, these studies started in the 1980s; they set the foundations for the "countryside character programme" of the early 1990s and evolved into a guide to best practice approach, namely "Landscape Character Assessment: Guidance for England and Scotland" (2002). This approach is now widely adopted across the UK's nations, and further afield (e.g. Keun-Ho and Pauleit, 2007; Jellema et al., 2008). It is further explained in Box 2.1.

Italy is another EU country that has a long lasting tradition of addressing landscape, though from a different starting point than other countries. Just like in other countries, "landscape" as a term which can encompass different meanings, is still evolving. Instruments for "controlling" or preserving the integrity of landscapes were introduced in Italy as early as 1909 and 1939, with laws on natural beauty aimed at safeguarding in particular national landscape heritage, and laws aimed at protecting elements of landscape that present artistic, historical, archeological or ethnographic value, including villas, parks and gardens. The development of regional landscape plans was then made compulsory in 1985. The need to protect the natural beauty of landscapes is also strongly reflected in the Italian constitution (Ventura, 2008), and still today, though a more modern and sophisticated understanding of landscape that appreciates its complexities exists, a protectionist approach aimed at safeguarding built and natural landscapes in the public and national interests remains. With the 2000 European Landscape Convention, landscape plans in Italy have further evolved to account for issues of identity and for public perceptions of landscapes (De Montis, 2016), with the principles of the European Landscape Convention being transposed into the country's codes for cultural and landscape assets (*Codice dei BeniCulturali e del Paesaggio*) (Legislative Decree n.42, January 22nd, 2004) or urban codes (*Codici Urbani*). Today, the urban codes portray landscape as an expression of territorial identity, which is the result of natural and man-made actions and interactions. The codes go on to legislate that it is those aspects and characters that constitute material and visible representations of cultural value that should be protected as expressions of national identity. The aim of landscape protection should be to recognise, safeguard and where necessary, recover those cultural values that landscapes express through a process of valorisation of both, areas that need requalifying because degraded or compromised, and news areas of landscape value which should be sought and established in a coherent and integrated way (Legislative Decree n. 4246, January 22, 2004).

Box 2.1: Landscape Character Assessment in the UK.

It is widely acknowledged that landscapes vary. They are more than just a visual image, which could be perceived by different people in different ways. Landscapes are history; they are the result of different physical and socioeconomic considerations, including their geology, soils, topography, land cover, hydrology, nutrient cycles, carbon fluxes, climate, customary laws, economic activities and cultural developments (Selman, 2012; Tudor, 2014). It is the interrelationship between each of these considerations that determines a landscape's character, making it distinct from any other landscape. Subsequently, a Landscape Character Assessment (LCA) is "the process of identifying and describing variation in the character of the landscape. It seeks to identify and explain the unique combination of elements and features (characteristics) that make landscapes distinctive" (Tudor, 2014, p.8), and for monitoring and managing changes in landscapes providing the basis for informed value judgements and decision-making. Consequently, it is essential that both, communities of place, of practice and communities of interest, are involved and engaged in a LCA process. As a process, LCA is increasingly used to inform the planning of natural, rural and urban areas, and more recently, its scope of application is extending to coastal and marine areas, with the development of Seascape Character Assessments (SCA) (Natural England and Defra, 2014). Both LCA and SCA consist of a four stage process (Natural England and Defra, 2014; Tudor, 2014; The countryside commission and Scottish Natural Heritage, 2002):

1. Define the purpose and scope of the assessment, thus, the area it will cover, the scale at which it will be carried out, the levels of detail, resources required (including skill sets), stakeholder engagement etc.,
2. Conduct a desk-study, thus, collect and review relevant background documents, spatial data, and other forms of information, such speaking to stakeholders and communities involved with the landscape,
3. Conduct a field survey, thus, to test the findings of the previous stage and draft areas of common character to develop an understanding of the landscape's aesthetic, perceptual and experiential qualities, and
4. Classification and description, thus classify, map and describe the landscape's character areas, types and characteristics. This stage will have been informed by the previous two stages and by stakeholder engagement exercises.

Once completed, the LCA will provide a document detailing the character of a landscape and an annotated map showing the character areas or types. It will most likely be complemented by photos, illustrations, diagrams and other survey data collected, enhancing its value as a decision-making support tool that can provide robust evidence for the baseline studies step of an EIA, linked to place and to those characteristics that contribute to creating a sense of place.

As suggested by the Italian example, signing and ratifying the European Landscape Convention is helping to align European countries' understandings of landscape, with many countries opting to follow the ELC's definition in the absence of national legislation. In Sweden, for example, the definition of landscape is increasingly shifting towards an understanding that appreciates landscape also as a social construct, and recognising the need for public participation. The official definition of landscape in Swedish road planning is now one that encompasses "both natural and human features, experience, identity and character (Antonson, 2011, p.195), with landscape "no longer a matter solely for experts" (ibid.). This process of bringing existing legislation and guidelines in line with the ELC is still ongoing, and is bound to make every day practice of EIA difficult, due to inconsistencies in terminologies and references to different concepts, or understandings of landscape. It is only when the ratification processes will be complete across EU Member States, that the implications for EIA practice will become clearer. It might well be that the final outcome of this process results in the aligning of definitions of landscape and of principles for landscape protection and management informing EIA practices across ratifying countries, in the same way that the EU EIA Directives standardised (to a certain extent) EIA procedures.

2.3 Landscape Impact Assessment And Land Use Planning Within The SEA Process

2.3.1 Land Use Planning[7]

Land use planning can be defined as an interdisciplinary and comprehensive approach aimed at balancing regional development and the physical coordination of space, based on an overall strategy. It gives geographical expression to the economic, social, cultural and ecological policies of society (*Council of Europe, European Regional/Spatial/land use planning Charter, CoE 1983)*. Or put more simply, land use planning can be defined as the management and development of space to create places that meet the needs of society, of the economy and of the environment in the quest for sustainable development. It relies on methods that are largely used in the public sector to influence the future distribution and rational organisation of development activities (EU Compendium of Spatial/land use planning Systems and Policies, CEC, 1997).

In many countries land-use planning represents a continuous and systematic activity which covers complex issues of spatial development at the zonal, local, regional and national levels throughout various procedural stages, including inventories, analyses, planning, decision-making and monitoring. It follows

7 due to the very large extent of this topic the authors do not consider land use planning instruments within the context of other planning framework and their supporting instruments such as strategic planning, spatial planning, communicative planning or rational planning. This subchapter analysis is focused just on land use planning in relation to both landscape planning and landscape impact assessment.

organisational rules, as well as the physical and temporal co-ordination of buildings and of other activities influencing the development of the area. Furthermore, it is intended to be inclusive and informed by the public. As such, land use planning can be considered an instrument for sustainable development, as it not only ensures that spatial conditions are met, but it also aims to ensure access to social and technical infrastructure, good quality of environment and guarantee the prioritisation of social goals, based on the views of the wider public.

Land use planning is normally practiced following the principles of subsidiarity and planning sovereignty of the basic spatial planning units, which tends to be municipalities or local planning authorities. This requires requires co-ordination of various interests among different decision-making tiers (e.g. between the municipality and the region), but also between economic (water management, agriculture, transport and others), public services (health care, social welfare, education, trade) and the private (including business for profit and non-profit) sectors, and individual citizens.

Land use planning creates conditions for effective public and private investments, influencing public spending to ensure equal access to education, social and technical infrastructure, employment opportunities and suitable housing as basic precondition of social equity.

The actual planning tool of land use planning consists of planning documentation usually represented by national spatial development strategies, regional plans, local plans and zoning plans. The value system of a society is projected into the legally defined priorities and objectives embedded in planning documentation, which is then subjected to approval. Planning approval of the plan is normally a decision made by the competent planning authority and has legal effect. According to the principle of subsidiarity, planning approval, including its objectives, is conditional to the plan‘s accordance and compliance with objectives, rights or principles guaranteed by the state. Often, national governments act as guarantor of the public interest, and can overrule the planning sovereignty of municipalities and or other planning subjects.

The practice of land use planning varies considerably, but usually include the following four stages (Wood, 1992):

a) formulation of goals and objectives,
b) survey, prediction and analysis,
c) generation and evaluation of alternative plans, and
d) decision, implementation, monitoring .

Land use planning is in many countries closely coordinated *with landscape planning*. Linkages between land use planning and landscape planning differs from country to country, as illustrated in Table 2.2. The range of possible approaches go from landscape planning as an optimising method of spatial arrangement of landscape based on the respect of landscape ecological conditions; to landscape planning approaches that focus mainly on landscape character and landscape scenery; to landscape planning

Table 2.2: Linkages between land use planning and landscape planning in selected countries. Source: Belčaková (2013).

Country	Planning level	Landscape planning	Land use planning	Scale of maps
Germany	State (Land)	Landscape development programme (nature conservation and environmental principles, land wide focal points of conservation and development)	Land development plan (Economic and social principles, land-wide focal points of spatial development)	1:500 000 to 1:200 000
	Region	Landscape framework plan (regional environmental quality standards, regional environmental focal points of conservation, development and redevelopment)	Regional plan (regional economic and social objectives, regional focal points of development – development axes, central sites, etc.)	1:50 000
	Town/community	Landscape plan (communal nature conservation and environmental objectives and measures, contribution to an environmentally sound land use development)	Land use plan (Urban master plan) (communal nature conservation and environmental objectives and measures, contribution to an environmentally sound land use development)	1:10 000 to 1:5000
	Part of town/ community	Open space structure plan (zoning conception, ecological design of sites and buildings, ascertainment of compensation measures)	Local development plan (local development concept in terms of technical, construction, financial aspects, etc.)	1: 2 500 to 1:1000
Austria	Federal	Not required	Austrian spatial development concept (Strategic policy document general orientation/vision)	
	State	Not required	State development plans	1:500 000 to 1:200 000

Country	Planning level	Landscape planning	Land use planning	Scale of maps
	Supra - local	Landscape framework plan (displays supralocal requirements, concepts and measures in the context of cultural landscapes)	Regional development plans (State development plans and regional development plans have the status of decrees, regional development plans are binding for spatial planning at local level by municipalities)	1:50 000
	Municipality	Not requited	Local development scheme (varies from state to state, drawn up for the entire territory of the municipality) Zoning plan (determines the permissible use of land, drawn up for entire territory of the municipality) and Building regulation plan, that determines the use of building land	1: 10 000 to 1:5000 1: 2 500 to 1:1000
Czech Republic	State	Not required	Spatial Development Policy (sets the national development policy, definition of planning priorities, specific public investments)	1:500 000 to 1:200 000
	Region	Regional landscape plan (non obligatory)	Regional Plan (define the most relevant areas for development within the territory within the administrative region, location of the most important investment projects, the main transport corridors, etc.)	1:50 000
	Town/community	local landscape plan (non obligatory)	Local Plan (define the overall planning concept for a municipality, establish specific conditions for the development of certain areas)	1:10 000 to 1:5000
	Part of town/ community		Zoning regulation plan (define specific land uses for the area within a municipality	1: 000 to 1:500

Country	Planning level	Landscape planning	Land use planning	Scale of maps
Slovak Republic	State	Not required	Spatial development perspective of Slovakia (define the principles for urban development (polycentricity	1:500 000 to 1:200 000
	Region	Regional landscape ecological plan (optimal spatial arrangement of human activities based on landscape ecological conditions at regional level	Regional Plan (define the principles for urban development (polycentricity)	1:50 000 to 1:25 000
	Town/community	Local landscape ecological plan (optimal spatial arrangement of human activities based on landscape ecological conditions at regional level)	Local Plan (designate the areas to be developed and those where construction is restricted, locate transportation infrastructures, public utilities and protected areas)	1:10 000 to 1:5000
	Part of town/ community	Not required	Zoning regulation plan (regulate land uses in more detail, building conditions, links with public utility works)	1: 1000 to 1:500

as a tool for the protection of cultural heritage; or to landscape planning reflecting predominantly nature protection efforts. Landscape planning usually provides aims and principles for nature conservation and landscape management for land use planning procedures. Landscape plans identify measures for mitigation and/or compensation of significant adverse effects on nature and landscape of those actions proposed in land use plans. Haaren et al. (2008) pointed out that a close coordination of land use planning and landscape planning can only be utilised if landscape planning is drawn up at different levels and on different scales, just like the overall land use planning system or other sectoral planning of a spatial nature.

2.3.2 Land Use Planning And SEA

Stategic environmental assessment (SEA) is an environmental management tool that refers to the environmental assessment of plans, policies, programmes or legislation. SEA is deemed an essential mechanism for decision-making at the highest levels and contributes to sustainable development. Thérivel et al. (1992, in Thérivel and Partidário, 1996, p.4) defined SEA as "the formalised, systematic and comprehensive process of evaluating the environmental effects of a policy, plan or programme and its alternatives, including the preparation of a written report on the findings of that evaluation, and using the findings in publicly accountable decision-making".

SEA follows the concept of EIA as a procedure of identification, prediction, assessment and mitigation of relevant effects on the environment. According to Lee and Walsh (1992) and Wood and Dejeddour (1992), SEA was first developed as a response to the limitations of EIA, as EIA was being applied too late in the process, and alternatives and impacts of the proposed development, were not being adequately taken into account and assessed.

As a process, SEA is directly linked to decision making and an integral part of the development of all policies, plans and programmes, with policies setting the framework for plans, which in turn set the framework for programmes, which finally set the framework for project level development and decisions (Thérivel et al., 1992; in Jones et al., 2005). This is commonly known as a "tiered forward planning process"; it can apply to all levels of decision making (from national, to regional, and local)[8], and to land use planing and sectoral actions (Wathern, 1992).

Evolution of SEA concepts, systems and approaches in land use planning

As indicated in the previous section, the formal introduction of environmental assessment of land use plans took place in the United States in the 1970s, with the adoption of the National Environmental Policy Act (NEPA) in 1969. NEPA did not

8 it starts with formulation of a policy at the upper level followed by a plan, by a programme and then a project differentiate between SEA and EIA, nor did it use the term "strategic environmental assessment" explicitly. It did however, introduce the term EIA as an impact assessment tool of "any major public decisions on new regulations, plans, programmes or projects" (Jones et al., 2005; Partidário, 2004), encompassing project level decisions as well as the more strategic decisions, such as those undertaken in land use planning, but without explicitly making a distinction between project- and strategic- level assessments. The widening of the scope of environmental assessment from EIA to more strategic assessments is reflected in practice, particularly in the methodological approach to the assessment of land use plans, known as "Programmatic EIA" and EIS (Environmental Impact Statement), also referred to as regional, cumulative or generic EIS.

Following the USA, environmental assessment was then introduced in Canada (1973), Australia (1974), West Germany (1975) and France (1976), though none of these systems offered a systematic approach to SEA. Within the EU the development of environmental assessment in land use planning was influenced by individual European countries' initiatives and practices. It was not until the second half of the 1980s that environmental assessment practice in planning expanded (Wood and Dejeddour, 1992), with the creation of well established systems in California, Western Australia, New Zealand, Canada, South Africa, and many European countries, such as the Netherlands, Italy, Germany, Finland and the UK (Fischer, 2007). The term "Strategic Environmental Assessment" was first used by Wood and Dejeddour (1989) in a study commissioned by the European Commission (EC), which then led to the formal introduction of SEA as a new EIA tool for policies, plans and programmes (the later European Directive reduced the scope of SEA to plans and programmes only).

In comparison to EIA, SEA was intended to be more flexible, less quantifiable and more suitable to the reality and nature of land use planning. Two different approaches to SEA emerged: an "EIA-based" approach, which applies the EIA procedure and rationale to strategic documents, as the only fundamental difference between the two tools is the level of application (Thérivel and Partidário, 1996); and a "plan–based" approach, designed to respond to the comprehensive and multiple purposes, forward looking, and uncertain nature of spatial/land use planning (e.g. Lee and Walsh, 1992; Thérivel et al., 1992; Wood and Dejeddour, 1992; Sadler and Verheem, 1996; Thérivel and Partidário, 1996; Partidário, 2000; Partidário, 2004). Other terminologies associated with the plan-based approach were coined, and include Regional EIA, Strategic Environmental Assessment Analysis, Environmental Appraisal of Development Plans, Sustainability Appraisal of Regional Planning, Strategic EIA, Programmatic Environmental Assessment (Partidário, 2004).While the EIA-based model is mostly applied in the USA, Netherlands, Italy, South Africa, California and Germany; Canada, New Zealand, the UK and the Scandinavian countries have adopted the strategic plan-based approach (Verheem, 1992).

The most dynamic expansion of SEA applied to land use planning occurred in Europe in the 1990s, when the EU's 5th Environmental Action Programme was approved in response to the perceived failure of existing regulatory measures to achieve the European Community‘s environmental standards. Draft versions of SEA frameworks were therefore developed, with mostly accession countries (including Poland, Hungary, Czech Republic, Slovakia, Slovenia, Estonia, Latvia, Lithuania) taking part in numerous pilot SEA projects of regional development programmes, often a condition for accessing structural funds resources. Since then, SEA has been applied in various countries, with differences in sectoral areas of application, in the range of information collected, in public participation requirements and in the way in which SEA findings are taken into account in decision- policy, plan and programme-making and approval processes, resulting from different countries‘ legislative and planning frameworks (Lee and Walsh, 1992; Sadler a Verheem, 1996; Thérivel and Partidário, 1996; CEC, 1998; Elling, 2000; Kleinschmidt and Wagner 2000; Platzer, 2000; ICON 2001). These differences also extend to different countries having different decision-making cultures and traditions, particularly in terms of the way in which environmental issues are taken into account. But these differences suggest that for better and more effective decision-making SEA should always be tailored to context-specific planning needs.

Non EU countries have also introduced formal requirements for land use planning SEA – including China, South Korea, Norway, and NIS countries (Russia, Belarus, Ukraine, Kazakhstan, Turkmenistan, Armenia, Georgia, Moldova, Azerbaijan, Kyrgyzstan, Tajikistan, Uzbekistan). The NIS countries in particular have SEA elements that are based on the State Environmental Review (SER) system, established in USSR in the mid 1980s together with the so called OVOS (assessment of environmental impact requirements). Only Ukraine shows a high compatibility with the EU approach outlined in the SEA Directive (Cherp, 2001; Klees et al., 2002). The driving forces behind the development of SEA in NIS countries came mainly from international banks (World Bank) and international initiatives, such as the Sofia Initiative which aimed to demonstrate the benefits of applying SEA to business development, the community and the environment.

One of the important milestones in the development of SEA within Europe and beyond, is the adoption of the European Directive 2001/42/EC dated June 27 on the assessment of the effects of certain plans and programmes on the environment (the so called SEA Directive). The Directive does not use the term SEA explicitly; it instead refers to the environmental assessment of all kinds of land use plans, establishing a framework for future development consent of projects. The Directive also requires SEA for plans subjected to assessment under the Habitats Directive, though it excludes minor modifications to existing plans and programs and small area plans not having significant environmental effects. Further, the SEA Directive recognizes the concept of tiering and establishes procedural steps that mirror those outlined in the EIA Directive(s); like scoping, the consideration of alternatives, consultation and public participation requirements (including transboundary consultation), environmental report preparation, the consideration of assessment results in decision

Table 2.3: Overview of SEA systems in EU member states and outlines the above mentioned differences. Source: Belčáková (2016).

Country	Spatial/land use planning decision making levels	Formal requirements (separate EIA/SEA legislation or within planning legal instruments)	Scope of application in spatial/land use planning	SEA approach	Changes after SEA Directive transposition
Austria	National, state (lander), district/ regional, municipal	No legal requirement	Local land use plans, supra-local land use plans	EIA based	Amendment to land use planning sector
Belgium	National, regional, local	No explicit environmental evaluation	To some extent, Regional land use plans in Brussels and Flanders region	EIA based	Amendment to existing EIA regulation – EIA and SEA Decree in Flanders
Bulgaria	National, regional, local	EIA Regulation No.1(1995)	National development programmes, all level land use plans	EIA based	Amendment to existing EIA legislation
Cyprus	National, regional, local	No legal requirement at all			Explicit SEA legislation – Law No. 102 (I) 2005
Czech Rep.	National, regional, local	Provisions for some form of SEA in EIA Act No 244/92	Regional and local land use plans, national development plan	EIA based	Amendment to existing EIA regulation – EIA Act No. 100/2001 Coll., different procedure for SEA of land use plans, SEA reflection in Law on Construction and Land Use Planning is under preparation
Denmark	National, regional/county, municipal	Some provisions in Prime Ministers Office Circular since 1997, voluntary basis since 1990	Regional and municipal land use planning documentation, local plans, national plan statements	EIA based	Explicit SEA legislation – Act on Environmental Assessment of Plans and Programmes
Estonia	National, regional, local	Provisions for some form of SEA in the Law on EIA and Environmental Audit	Local plans, national development plans or programmes	EIA based	Amendment to existing EIA regulation – Environmental Impact Assessment and Environmental management System Act

Country	Spatial/land use planning decision making levels	Formal requirements (separate EIA/SEA legislation or within planning legal instruments)	Scope of application in spatial/land use planning	SEA approach	Changes after SEA Directive transposition
Finland	National, regional, local	Building and Planning Act, EIA Act	Land use plans at all decision -making levels	EIA based	Explicit SEA legislation and also within land use planning regulations – Act and Decree on the assessment of the Impacts of the Authorities, Plans, Programmes and Policies on the Environment, Land Use and Building Act and Decree
France	National, regional, local	Decision of the French Parliament	Certain land use plans	EIA based	Amendment to environment code – one part specifically relates to spatial planning
Germany	Federal, state, regional (county), local	Formal landscape planning system - Federal Environmental protection Act, 1976	Local land use plans, local and regional landscape plans and programmes, state development plans,	EIA based + landscape planning approach	Amendment to existing EIA regulation – Act for Introducing SEA, also Federal Spatial Planning Act, Federal Construction Law
Greece	National, regional	No SEA legislation, but “EIA” of small scale land use plans took place	Small scale land use plans	EIA based	No SEA legislation,
Hungary	National, county, municipal	Environment Act (1995)	Regional development plans	EIA based	Amendment of EIA Act in 2004 and Government Decree on the Environmental Assessment of Certain Plans and Programmes in 2005
Ireland	National, local	Government decision of 1978 No formal procedure	National land use plans, little experience with Master plans, local area plans	EIA based	Explicit SEA legislation – Environmental Assessment of Certain Plans and Programmes Regulations 2004, Planning and Development (SEA) Regulations 2004

Country	Spatial/land use planning decision making levels	Formal requirements (separate EIA/SEA legislation or within planning legal instruments)	Scope of application in spatial/land use planning	SEA approach	Changes after SEA Directive transposition
Italy	National, regional, local	Some formal SEA requirements, regional planning legislation (e.g.Regional Planning Law No.20/20	Regional spatial plans	EIA based approach	Amendment to environment code – Act on Environmental matters, April 2006
Latvia	National, regional, local	Provisions for some form of SEA in EIA Law	Regional and local plans, national development plans		Amendment to existing EIA regulation – EIA Act on 26 February 2004
Lithuania	National, regional, local	Provisions for some form of SEA in EIA Law (1996) and territorial planning law of 1995	County comprehensive plans, district comprehensive plans, national development plans	EIA approach	Amendment to environment code – Law on Environmental protection of the Republic of Lithuania, Law on Territorial Planning
Luxembourg	National, regional, local	No SEA legislation			No SEA legislation
Malta	National, regional, local	No SEA legislation	Regional development plans	EIA approach	Explicit SEA legislation
Netherlands	National, regional, local	No SEA legislation, but “EIA” of small scale land use plans took place, several informal SEAs	Local land use plans	EIA based and integrated	Amendment to environment code – Environmental Management Act, revised in July 2006,
Poland	National, regional, local	Provisions for some form of SEA in the Law on Access to Information on the Environment, Its Protection and EIA (2002)	Regional and local land use plans, national development plans	EIA based	Amendment to existing EIA regulation / Act on Access to Information about the Environment and its Protection and on the Environmental Impact Assessment, and also Environmental protection Law

Country	Spatial/land use planning decision making levels	Formal requirements (separate EIA/SEA legislation or within planning legal instruments)	Scope of application in spatial/land use planning	SEA approach	Changes after SEA Directive transposition
Portugal	National, regional, local	Non standard approach to plan making, SEA not applied	regional and local land use planning and spatial programmes submitted to EU Structural Funds	EIA and policy based	SEA legislation is still under preparation
Romania	National, regional, local	Environmental protection Law No.137/1995	All land use plans	EIA based	Law on urban and territorial planning + Government Ordinance (2004)
Slovakia	National, regional, local	Provisions for some form of SEA in EIA Act No.127/1994, amended 2000)	Regional and local land use plans, national development plan	EIA based	Amendment to existing EIA regulation / New Act No.24/2006
Slovenia	National, regional, local	Provisions for some form of SEA in Environmental Protection Act (1993)	Regional and local land use plans, national development plan	EIA based	Environmental Protection Act
Spain	National, regional, local	Part of EIA legislation	Regional land use plans		Explicit SEA legislation / SEA law of April 2006
Sweden	Regional, local	National Resources Management Act	Local land use plans – mostly at municipal level	Integrated land use planning	Amendment to environment code, 2004
UK	National, regional, subregional, local	No statutory form of SEA, various non statutory measures at national level	Structure plans, local land use plans	Sustainability appraisal-policy based	Environmental assessment of Plans and Programmes Regulations 2004 (England and Wales – Planning and Compulsory Purchase Act of 2004 Scotland – Environment Assessment (Scotland) Bill)

making, monitoring and follow-up requirements (Jones et al., 2005). Similarly to EIA, the SEA Directive also requires the development of a sufficient quality report, including a "statement summarising how environmental considerations have been integrated into the plan and how the environmental report and the results from public consultations have been taken into account." (EC, 2001).

According to Dalal-Clayton and Sadler (2005), the SEA Directive is probably the best known SEA framework law, and together with the SEA Protocol and the Espoo Convention (UN ECE, 2003) it influenced not only EU countries but stands as a "reference point" for countries in Asia, Africa and South America. The biggest influence of the SEA Protocol has probably been in the UNECE countries.

The implementation of the SEA Directive was accompanied by complications, illogicalities and duplications as many EU countries had pre-existing SEA approaches and experiences, and as already stated, different planning systems. According to Partidário (2004 and 2012), the approved version of the SEA Directive eliminated the efforts and expectations for a more planning and policy oriented evaluation tool, thus, a truly strategic instrument for EU member states. Instead, the Directive clearly represents a highly structured and technically oriented EIA-based model, as it mostly follows the procedural nature and layout of the EIA Directive. The Directive was also not very strict or prescriptive in telling individual member states how SEA should be introduced, thus, whether as an amendment to EIA legislation, or via separate SEA legislation or within planning legislation (ibid). However, Annex 1 of the Directive did "strictly" list the information that should be considered and elaborated upon in the required Environmental report.

EU member states were obliged to implement the Directive by the end of July 2004. In many countries this meant modifying existing legislation with the preparation of guidelines. With the exception of Portugal, Greece and Luxembourg, the Directive was implemented in all EU countries by June 2006 (Fischer, 2007). The second implementation report on Directive 2001/42/EC noted that the Directive does not lay down any measurable environmental standards. It is rather a process directive, which establishes certain steps that Member States must follow when identifying and assessing environmental effects. The report further stated that all EU member states had transposed the SEA Directive into their legal and administrative structure and arrangements (for example through specific national legislation or integration into existing provisions). Since 2007, more than half of EU member states have amended their national legislation transposing the SEA Directive to ensure that their national provisions fully comply with the Directive and to resolve cases of incorrect application.

The transposition of the Directive occurred in different ways in different countries, setting the legal foundations for different types of SEA systems. The nature of legal requirements used for the transposition of the Directive vary – from ministerial decisions to official regulations at the national, regional and local level, depending on the degree of centralisation/decentralisation of land use planning in different countries. Following Fischer (2007), these include:

- Explicit SEA-specific framework laws: UK, Denmark, Spain, Ireland, Malta, Cyprus, Finland and Hungary (the latter two not in combination with land use planning),
- Amendments to existing EIA regulations: Belgium, Estonia, Latvia, Czech Republic,
- Amendments to existing EIA regulations in combination with amendments to land use planning legislation: Slovakia, Poland and Germany,
- Amendments to an Environment Code: The Netherlands, Slovenia, Italy,
- Amendments to an Environment Code in combination with amendments to land use planning legislation: Sweden, Lithuania, France,
- Amendments to land use planning: Austria.

Several countries prepared their specific guidelines for land use planning SEA– e.g. UK, Sweden, Finland, Denmark, Poland, Ireland and Hungary. Thanks to the activities of development banks (World Bank), international aid organisations (UNDP, OECD) and donor agencies, vast experience with SEA has developed in more than 30 developing countries (Dalal-Clayton and Sadler, 2005).

SEA practice in land use planning is now well-established, with the literature populated by practice reviews and numerous case-studies covering different sectoral applications, emphasising different procedural aspects or requirements, or more simply, practice in different regions across the globe. Evaluations of European SEA practice have also been conducted by the EU, with the first evaluation reports focusing on the Directive’s formal requirements (Lee and Hughes, 1995), and more recent evaluations on SEA quality and effectiveness. The evaluations conducted by Jones et al. (2005), for example, differentiate between the so-called process input and output criteria. While the first are represented by evaluations of legal, institutional arrangements, SEA procedures and methods; the latter refers to the evaluation of SEA against the goals set or SEA contributions to good land use planning practices. The very recent evaluation on the effectiveness of the SEA Directive has been adopted by the Commission in 2017, following the previous report published in 2009. The 2017 report examined the application of the SEA directive across EU Member States using five criteria: effectiveness, efficiency, relevance, coherence and EU-added value (https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3481432_en#initiative-details).

2.3.3 SEA And Land Use Planing – Rational And Potential Benefits

SEA can assist land use planning in many ways. Sustainable development is the common objective for both, land use planning and SEA, which are also instrumental for achieving sustainable development (Partidário, 2000). As noted by Wood (1992), land use planning is an area of application to which environmental assessment is most commonly applied to. SEA can deliver environmental improvements and raise environmental awareness in land use planning, and it can also help reduce the negative and enhance positive environmental impacts associated with the implementation of spatially relevant plans (Jones et al., 2005). Other reasons for applying SEA to land use planning are (Brown and Thérivel, 2000; Sadler, 2001a; Sadler, 2001b; Owens and Cowell, 2002; Thérivel, 2004 in Jones at al., 2005; Partidário, 2004):

- SEA can evaluate the consistency and compatibility between aims, strategies and policies of a particular plan, stressing potential linkages, while identifying potential conflicts and interactions,
- SEA can improve the environmental quality of planning policies,
- SEA can raise awareness of environmental impacts,
- SEA can inform stakeholders of the environmental impacts of strategic decisions,
- SEA can help to avoid delays in plan implementation by highlighting how environmental issues have been taken into account during decision making,
- SEA can identify issues to be monitored during the implementation of plans,
- SEA can improve the green image of planning authorities,
- SEA can facilitate the earlier consideration of environmental impacts, the examination of a wider range of potential alternatives, generation of mitigation measures and the potential to address a wider range of impacts,
- SEA has the potential to streamline the EIA process by focusing on the most significant project issues.

Often, planning practitioners claim that land use plans already meet many of SEA's requirements. This can partly be true, as many national and European environmental and nature conservation legislation do overlap, leading to confusion in planning and approval procedures and in waste of time and money (Hoppenstedt, 2003). As noted by Wood (1992), in many countries land use planning systems already included a number of elements relevant to SEA within their respective plan-making processes, prior to the introduction of the Directive. These include for example, the statutory recognition of environmental goals within the broad plan making context, planning documentation already containing baseline analysis, indication of future prospects and alternatives, policies for environmental improvement, public participation procedures as well as consequent revision of the plan during subsequent stages of the planning process. Planning practitioners also claim that when conducting land use planning SEA, conflicts between environmental protection and sectoral or developmental interests can emerge, but cannot be solved within the SEA process. While SEA can enhance the transparency and comprehensiveness of decision-making and make these conflicts explicit, they ultimately require political solutions. The systematic, documented and evidence-based nature of SEA should help inform decision-making, even if the decision made is a political one.

2.3.4 Application Of Landscape Impact Assessment Within SEA And Land Use Planning

Following LI and IEMA (2013), the principles for landscape impact assessment practice determined at project level EIA can be applied to the plan (programe, policy) level, and therefore to SEA. An advantage of conducting landscape impact assessment in SEA is the consideration of cummulative effects of potential development proposals at very early stages of land use planning. There are several approaches of landscape impact assessment in SEA, which depend on the planning traditions and frameworks of individual countries. The approach described by LI and IEMA (2013) and SNH (2007) is based on the *identification of landscape change and of the forces underpinning* that change.

When conducting a LIA in SEA, a land use plan (programe or strategy) is evaluated against criteria relating to:

- the conservation and enhancement of a landscape‘s character and scenic value,
- the protection and enhancement of the landscape everywhere and particularly in designated areas,
- the protection and enhancement of diversity and of a landscape‘s local distinctiveness,
- the improvement of the quantity and quality of publicly accessible open space,
- the restoration of landscapes degraded as a consequence of past industrial activity.

In SEA it is not possible to assess landscape change with the same level of detail required in an EIA. At the strategic level, the scope of SEA is limited to identifying potential broad changes in landscape characteristics such as landform, land use and land cover, the relationship between landform and land use, field pattern and boundaries, buildings and structures in the landscape, settlement patterns as well as landscape visual quality (SNH, 2007). However, similarly to EIA, Landscape Character Assessment (LCA) can be embedded within the SEA process, as it provides a baseline against which change can be assessed and monitored. Landscape capacity and sensitivity studies are also influential in informing baseline studies of landscape impact assessment within SEA.

Other approaches used in landscape-based SEA are *associated to different forms of landscape planning* conducted as part of a land use planning process (or a separate landscape planning procedure that is consistent and in compliance with the land use planning procedure). According to Haaren et al. (2008) and others (Hoppenstedt, 2003; Schmidt et al., 2005), landscape planning belongs to a set of instruments that supports the effective consideration of landscape in SEA. In these cases, landscape planning can significantly contribute to the application of SEA-based landscape impact assessment by providing guidance on the current status and future landscape development of a particular spatial area.

The requirements of the SEA Directive with landscape planning documentation do overlap to a certain extent. In many countries[9], landscape planning is dependent on objectives from, and embedded within, other environmental and/or sectoral planning (e.g. water management, agriculture, air pollution, supply and disposal). In addition to setting objectives for nature conservation, landscape planning also acts as a framework for assessing all relevant environmental objectives to establish a more consistent and coherent system of objectives. Another task of landscape planning is to develop scenarios for site identification (for example residential development or soil degradation) and to take them into consideration.

Hanusch and Fischer (2011) reviewed possible linkages and benefits between SEA and landscape planning instruments in Germany, Canada, Ireland and Sweden. The analysis focussed on objectives, contents, methods and procedures; their findings are that:

- landscape plans and SEA act as advocate instruments for the environment,
- SEA and landscape planning aim at integrating considerations on the environment, nature, biodiversity and landscape into decision-making and planning,
- there are many overlaps regarding the contents of an SEA environmental report, such as the collection of environmental baseline data, the outline of environmental objectives and the assessment of likely significant effects; and the baseline data included in landscape plans. As such, landscape plans can function as a comprehensive information source for SEA,
- landscape planning can contribute to impact analysis and evaluation as well as alternatives assessment and compensation measures,
- there is a range of procedural linkages between SEA and landscape planning, for example timing of planning procedures, alternatives, public participation and monitoring.

2.3.5 Procedural Steps In Landscape Impact Assessment Within Strategic Environmental Assessment Of Land Use Plans

Similarly to EIA, landscape impact assessment can be conducted as part of Strategic Environmental Assessment. The SEA and EIA procedures are very similar, but there are some *differences* (EC, 2017**)**:

- SEA requires *environmental authorities* to be consulted at the screening stage,
- SEA requires an assessment of reasonable *alternatives* (under the EIA the developer chooses the alternatives to be studied),
- the SEA Directive obliges EU member States to ensure that environmental reports are of a sufficient *quality*.

9 for example Germany, Austria, Slovak Republic, Czech Republic, Slovenia, Switzerland

Figure 2.3 provides a flow chart of the SEA and landscape impact assessment process.

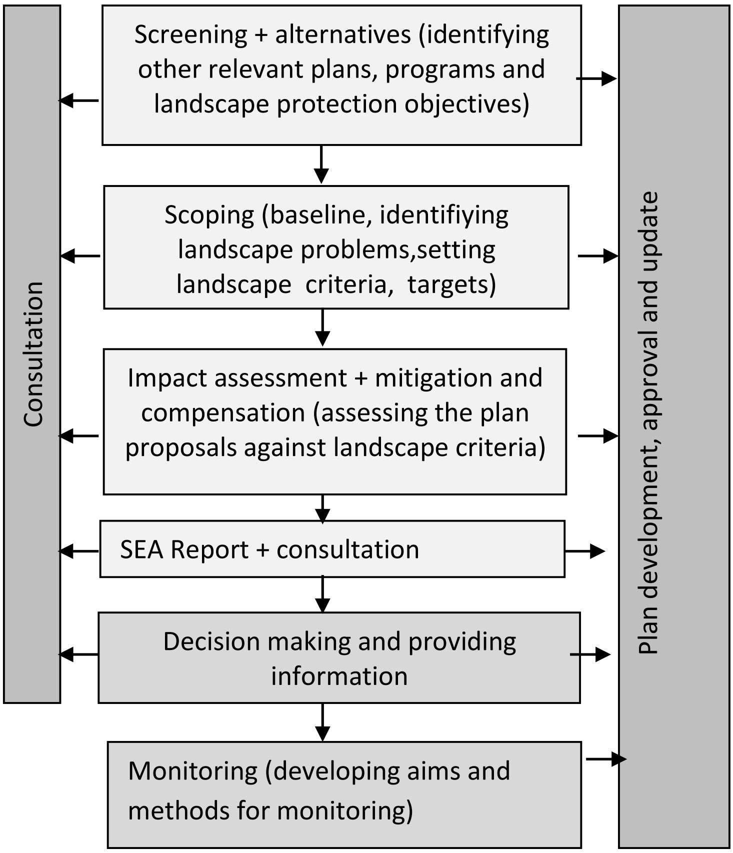

Figure 2.3: The SEA and the LVIA process. Adapted from EC (2017) and CCW (2007).

Following the SEA Directive, the process of landscape impact assessment within the SEA process includes the following procedural stages (Jones et al. 2005; SNH 2007; CCW, 2007):

Screening: it aims to consider whether SEA is required or not. To answer this question, it is helpful to look at the purposes of a land use plan and at expected impacts. Within the EU, Article (3) (4) and (5) of the SEA Directive establishes the process of determining whether plans are likely to have significant environmental effects and thus require a SEA. Member States have to take into account the significance criteria set out in Annex II and presented here in Box 2.2.

Box 2.2: Screening criteria according to SEA Directive. Source: Official Journal of the EC (2001).

Criteria for determining the likely significance of effects referred to in Article 3(5)

1. The characteristics of plans and programmes, having regard, in particular, to
— the degree to which the plan or programme sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions or by allocating resources,
— the degree to which the plan or programme influences other plans and programmes including those in a hierarchy,
— the relevance of the plan or programme for the integration of environmental considerations in particular with a view to promoting sustainable development,
— environmental problems relevant to the plan or programme,
— the relevance of the plan or programme for the implementation of Community legislation on the environment (e.g.plans and programmes linked to waste-management or water protection).
2. Characteristics of the effects and of the area likely to be affected, having regard, in particular, to
— the probability, duration, frequency and reversibility of the effects,
— the cumulative nature of the effects,
— the transboundary nature of the effects,
— the risks to human health or the environment (e.g. due to accidents),
— the magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected),
— the value and vulnerability of the area likely to be affected due to:
— special natural characteristics or cultural heritage,
— exceeded environmental quality standards or limit values,
— intensive land-use,
— the effects on areas or landscapes which have a recognised national, Community or international protection status.

This stage also aims at examining the goals and objectives of the plan and its purpose against landscape criteria considering several questions: a) are the environmental problems in the plan area related directly or indirectly to its landscape? If so, does the plan make a significant contribution to resolving those problems or does it significantly exacerbate them? b) what is the magnitude and spatial extent of effects on the landscape, including the geographical area likely to be affected? c) what is the magnitude and spatial extent of effects on people's enjoyment of the landscape, including the number of people likely to be affected in the context of their sensitivity to change in the landscape? d) what is the value of the landscape likely to be affected and its vulnerability to change due to its special natural characteristics or cultural heritage (e.g. wildness)? e) what are the effects on areas or landscapes which have a recognised local, regional, national, EC or international protection status? f) What is the probability/likelihood or risk of these effects on the landscape occurring and being significant if they occurred?

The involvement of the public and other stakeholders is an integral part of the screening step.

Scoping/baseline studies/objectives and targets: Scoping is the stage of the SEA process that determines the content and extent of the matters to be covered in the SEA report to be submitted to a competent authority. Considerations about whether a plan meets requirements of relevant policies, landscape protection objectives, international targets, etc. are included.

Defining landscape objectives, indicators and checklists is a critical element within the scoping stage. It is the setting of the environmental 'objectives' and subsequent 'tests' against which the emerging plan will be assessed. The environmental objectives are usually adopted from international, EU and national policy frameworks and by objectives tailored to more local landscape policy frameworks.

Alternatives to a proposed land use plan should be identified, and assessed in terms of their costs, benefits and landscape impacts. Key landscape issues should also be identified. During this stage a series of landscape impact assessment objectives/ criteria are developed against which the plan's performance is predicted. Very often targets and indicators based on landscape (environmental) criteria can be used for monitoring the implementation of a plan. Data about the present state of landscape conditions are gathered and analysed.

Impact prediction/assessment: Impact prediction is based on landscape impact assessment objectives and criteria. Predictions should be made with the help of baseline landscape data. Impact prediction very often involves subjective and objective assessment. Mitigation measures are part of this stage.

Annex 2 of the SEA Directive recommends assessing impacts in terms of a number of criteria listed in Box 2.2, which can then result in a more detailed classification of impacts according to pre-defined criteria. Table 2.4 provides an example of such classification.

The intensity of impacts is one of the most frequently described indicators, which is often expressed numerically. Some other examples of landscape impact assessment are provided in Tables 2.5 – 2.8. Table 2. 5 in particular shows an example of a hierarchy of intensity of effects on the landscape, and possible combinations of intensity of impacts with the nature of impact on the landscape. Table 2.6 is an example showing the impact on landscape scenery based on the sum of (mathematical sum of intensity values) the likely impacts on landscape image, scenery and characteristic landscape appearance. The impact is expressed by the degree of impact. The resulting expected impact on the landscape scenery presents therefore either a visual collision rate of new objects with the landscape's current appearance, or a measure of positive contribution to the landscape's scenery.

The visibility of individual objects in a landscape panorama and the extent to which they contribute to visual perceptions of the territory are important aspects to consider when assessing impacts on scenery, as illustrated in Table 2.7. The example of levels of significance of potential impacts on the landscape image are illustrated in Table 2.8.

Table 2.4: Classification of impacts on the landscape according to selected criteria. Source: Pauditšová (2014).

Classification criteria of impact		Impact
1.	Impact based on its substance and probability	Positive Negative neutral (resp. without prediction)
2.	Impact based on its original occurrence	Primary Secondary
3.	Impact nature	Direct Indirect
4.	Impact magnitude	Temporary Permanent
5.	Impact frequency	regular or irregular Continual
6.	Impact reversibility/irreversibility	short –term (less than 6 months) mid-term (6-12 months) long-term (more than 12 months)
7.	Impact spatial area	Local Regional National Global
8.	Impact intensity	very important negative impact Important negative impact low important negative impact no impact low important positive impact very important negative impact very important positive impact
9.	Impact degree	Individual Synergic Cumulative

Table 2.5: Numerical expression of an "intensity of the impact" and possible combination of intensity of impact with the nature of the impact on the landscape. Source: Pauditšová (2014).

Predicted impact intensity	Numerical expression	Impact nature
		Direct impact (DI)/Indirect impact (II)
Very important negative impact	- 3	DI/II
Important negative impact	- 2	DI/II
Low important negative impact	- 1	DI/II
No impact	0	-
Low important positive impact	+ 1	DI/II
Important positive impact	+ 2	DI/II
Very important positive impact	+ 3	DI/II

Table 2.6: Summary impact on the landscape scenery. Source: Pauditšová (2014).

Expected impact on the landscape scenery		Interval of sum of intensity impact values: A+B+C	Degree of impact
Visual collision with new objects	Essential to critical; extreme degradation of landscape scene of a regional scale, visible from long distances and from all observation points	⟨- 9; - 8)	- 5
	Very important; strongly visible degradation of landscape scene (regional or local scale), visible from long distances from most observation points	⟨- 8; - 6)	- 4
	significant; degradation of landscape scene is clear, but is visible only from certain observation points, good weather conditions are needed for good visibility	⟨- 6; - 4)	- 3
	Less significant; changes in landscape scene are of local nature, visible from short distances, good weather conditions are needed for good visibility	⟨- 4; - 2)	- 2
	negligible; visual changes in landscape scene are minimal (local scale) and are visible only from minimal number of observation points	⟨- 2; - 0)	- 1
	No visual collision of new objects; positive visual contribution of new objects – none	0	0
positive contribution of new objects for landscape scene is	negligible (local scale); visible only from minimal number of observation points	⟨2; 0)	+ 1
	Less significant (local scale); visible from short distances, good weather conditions are needed for good visibility	⟨4; 2)	+ 2
	significant (regional or local scale); visible only from some observation points, good weather conditions are needed for good visibility	⟨6; 4)	+ 3
	Very important (regional or local scale); visible from long distances, from most of observation points	⟨8; 6)	+ 4
	Essential (regional scale); visible from long distances and from all observation points	⟨9; 8)	+ 5

A = impact on landscape image; B = impact on scenery; C = impact on characteristic landscape appearance

Table 2.7: Degrees of impacts of the plan according to the intensity of visual influence on the scenery. Source: Pauditšová (2014).

Level of intensity of expected impact	Numerical expression of impact intensity	Characteristics of the impact of activity (plan) on the scenery
Highly significant negative impact	- 3	Object(-s) well visible, in the landscape panorama they are often outstanding, representing dominating feature, are extremely disturbing regardless of the weather conditions (except when exceptionally the visibility is minimal)
Significant negative impact	- 2	Object(-s) well visible, in the landscape panorama are prominent and are disturbing; intensity of their negative perception depends on the quality of the weather conditions
Less significant negative impact	- 1	Object(-s) less visible, in landscape panoramas they do not make such an impact, often are partially covered by visual barriers – other landscape elements; under certain weather conditions the objects under assessment are difficult to distinguish; visually they are about the same level as most of other landscape features around
No impact	0	Object(-s) not visible, in landscape panorama do not make quite an impact
Less significant positive impact	+ 1	Object(-s) hardly visible, minimum contribution to the attractiveness of landscape panoramas; often are partially obscured by visual barriers, other landscape features; under certain weather conditions the objects under assessment are hardly distinguishable; visually they are about the same level as most of other landscape features around
Significant positive impact	+ 2	Object(-s) well visible, contribute to the attractiveness of landscape panoramas, not disturbing; the intensity of their visual perception depends on the quality of weather conditions
Very significant positive impact	+ 3	Object(-s) constitute a major dominating element in the landscape that radically changes the landscape panorama in a positive way, contributing to its increased attractiveness; object(-s) very well visible in the landscape panoramas (except when in exceptional weather conditions the visibility is minimal)

Table 2.8: Degrees of impact of plan according to intensity of visual effects on the landscape image. Source: Pauditšová (2014).

Level of intensity of expected impact	Numerical expression of impact intensity	Characteristics of the impact of activity (plan) on the landscape image
Highly significant negative impact	- 3	Object(-s) well visible, clearly visually distinguishable from other features of the landscape, are significant negative landmark of the landscape, which radically changes the landscape image; it is visible from many observation points and a distance of over 20 km; visibility of such objects in the landscape cannot be substantially alleviated
Significant negative impact	- 2	Object(-s) established in the landscape image very clearly, their negative visual expression can only be partially influenced or mitigated by other, mostly larger or otherwise conspicuous elements of the landscape in the surrounding area
Less significant negative impact	- 1	Object(-s) in the landscape image applied negatively only partially, are only visible from certain observation points, or only part of the activity (plan) is visible; mostly hardly distinguishable in the landscape, their negative visual impact is shown only under ideal visibility, when slightly noticeable
No impact	0	Object(-s) almost not make any impact on the landscape image, hardly distinguishable in the landscape, visually blend into the existing landscape features
Less significant positive impact	+ 1	Object(-s) in the landscape image applied positively only partially, visible only from certain observation points or only part of the activity (plan) is visible; mostly hardly distinguishable in the landscape, their positive visual impact is demonstrated only under ideal visibility, when slightly less noticeable
Significant positive impact	+ 2	Object(-s) established in the landscape image clearly and unequivocally, their positive visual expression is reduced, because from certain observation points are covered by other, mostly larger or otherwise conspicuous elements of landscape of the surrounding area
Highly significant positive impact	+ 3	Object(-s) representing action (plan), are well visible, clearly visually distinguishable from other landscape features and is a major positive landmark in the landscape, which radically changes the landscape image; object(-s) prominent and visible from many observation points, to a distance of over 20 km, visibility in the landscape not needed to be eased, on the contrary, positively enliven the landscape mosaic

Environmental report: According to the SEA Directive a publicly available SEA report should be prepared to document the main findings of landscape impact assessment within SEA together with a non-technical summary. The report should be available for public inspection being a part of land use planning documentation. The minimum requirements for SEA report content includes a description of plan proposals and its alternatives; a description of baseline environment; the significant environmental impacts of plan proposals and alternatives; the timescale of predicted impacts; mitigation measures; comments on assessment problems and uncertainities. As indicated in the previous section, landscape planning can contribute to impact analysis and evaluation as well as alternatives assessment and compensation measures (see Box 2.3).

Box 2.3: Contents of SEA Directive (Apendix 1 of SEA Directive) and regional landscape plan - a comparison. Adapted from Hoppenstedt (2003) and Haaren et al., (2008).

SEA Report	Regional landscape plan
a)an outline of the contents, main objectives of the plan or programe and relationship with other plans and programmes b)the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programe c) the environmental characteristics of areas likely to be significantly affected	a)an outline of environmental relevant objectives (e.g. priority areas and reservation areas as well as spatial-relevant projects) of the regional land use plan) b) landscape analysis regarding aspects of soil, water, air/climate, fauna/flora, natural scenery and cultural assets, prognosis of the likely evolution of the state of the environment without implementatio of the plan c) assessment of the sensitivity of an area on the basis of the landscape analysis and as a condition for spatial development and project alternatives

Monitoring: Monitoring allows for the results of the environmental assessment to be compared with the outcomes from the implementation of plans and programmes, in particular the significant environmental effects. The SEA Directive does not prescribe the exact arrangements for monitoring the significant environmental effects, the frequency of the monitoring, its methodology or the bodies in charge of monitoring. Monitoring can be based on standard monitoring indicators, sometimes set in the national legislation, or be on a case-by-case basis. Environmental monitoring arrangements set up in other Directives, such as the Water Framework Directive, the Habitats Directive, and the Industrial Emissions Directive can be helpful in this stage.

2.4 Landscape Impact Assessment In The Context Of Environmental Health And Climate Change

Landscape impact assessment *in the context of environmental health* should be part of the assessment of environmental impacts of policies, plans, or projects. The concept of environmental health was created from the terms human health and public health. Public health of the population is determined not only by the quality of health care services, but also by economic, social, psychological and environmental factors.

As already noticed, there is a link between landscape impact assessment and environmental health. The World Health Organization, when defining environmental health, takes as a basis the quality of life of an individual: "It is the individual perception of one's position in life, in the context of culture and of the value system, in which the individual lives. Quality of life expresses the relationship of individuals to their own objectives, expected values and interests. It includes, in a comprehensive manner, the somatic health of an individual, mental state, level of independence from the surroundings, social relationships, an individual's faith, and that all in relation to the main characteristics of the environment." (The WHOQOL Group, 1995).

According to the International Association for Impact Assessment the assessment of impacts on health is part of environmental impact assessment, which includes impacts on landscape. They define Health Impact Assessment (HIA) as a combination of procedures, methods and tools that can be used for assessing policy, plan, programme or project in different economic sectors on the basis of potential effects on the entity under assessment on the health of the population using quantitative, qualitative and participatory techniques (IAIA, 2006).

Knowing that the policies and strategies of the various sectors can have a serious impact on health, occurrence or prevention of diseases, has lead to a more integrated approach to the consideration of health in the countries of the European Union. The aim of HIA is to improve the understanding of the potential impact of a policy, programme or project on health and to present adequate information to managing entities and people affected by the given programme or project (activity). The result should be to adapt the proposed policy, programme, or project in order to reduce or minimize the likely negative effects, and on the other hand, if possible, to increase positive effects (Halzlová and Drastichová, 2014).

From such a perspective the evaluation of expected impacts on the landscape is a substantial step in both spatial policy making and planning and requires standardization of the assessment procedure.

Despite the international efforts, the assessment of impacts on the health of population remained on the level of national interests. HIA is voluntary at the European level, though EU member states can set their own requirements[10].

In the process of EIA and SEA, landscape represents a separate item, whether within the territorial characteristics or in the stage of identifying the predicted impacts. In other respects, however, the landscape mirrors a space where all the processes of the individual components of the environment are under way. For this reason, the cumulative effects on landscape need to be emphasized in assessing the impact of projects (plans) on the landscape in terms *of climate change impacts*. In addition, the climate phenomena has the intersectoral impacts, so the effect on the individual parts of the landscape overlap. The landscape is a pointer where the impacts can be put together and can be determined in detail at a component level.

On this basis, and as reflected in national legislation of many European countries, it makes sense for landscape impact assessment to encompass the risks arising from climate change. The revised EIA Directive adopted by the European Commission in 2012 (October 26, 2012), for example, includes an appeal for integrating climatic change and biodiversity into environmental impact assessments. The idea of assessing scenarios of biodiversity development within the context of a changing climate, directly supports the idea of landscape assessment as a space where all processes take place and impacts are assessed.

The EIA Directive shows not only how climate change is clearly referenced in the legislation, but that it should be given more weight in light of the Directive's preventive intent or 'spirit'. It also discusses the benefits and challenges of integrating climate change into EIA. The EIA Directive contains a number of principles that provide the basis for considering climate change in EIA, even though it does not refer to either term explicitly. In line with Article 191 of the Treaty on the Functioning of the European Union (The Treaty on the Functioning of the European Union, 2010, p. 47), the Directive clearly sets out to prevent damage to the environment rather than merely counteract it. The EIA Directive has a wide scope and a broad purpose (Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment, 2013) and therefore needs to be interpreted as such. The 2012 Commission proposal for the revised EIA Directive (Proposal for a Directive of the European Parliament and of the Council amending Directive 2011/92/EU) strengthened the provisions related to climate change and biodiversity.

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10 For example, since 2014, Slovakia strengthened its legal system in matters of impact assessment on public health, with the Decree of the Ministry of Health of SR no. 233/2014 Coll. In the UK, planning practice guidance clearly states that planning has an important role in promoting the health and well-being of communities, and the importance of this role is emphasised by the number of links between planning and health in the National Planning Policy Framework.

Assessing the risk of climate change as well as the resilience and vulnerability of a project or plan to climate change, is important and should take into account:

a) the specific geographic area (local impacts) in which the proposed project is to be implemented (eg. whether the area is susceptible to erosion, landslides, earthquakes, etc.); b) the specific climatic events that have taken place in the past (e.g. extreme precipitation/storms, wind, extreme temperatures, as well as temperature changes); c) the characteristics of a specific project or plan.

Both climate change and landscape involve complex systems and interact with people. Since we cannot fully understand all aspects of complex systems at the point in which we make decisions, we need to be able to use what we have (e.g. available studies, reports, databases and other sources of information).

After identifying the specifics of the territory, it is necessary:

- to evaluate the current state of the risks and to assess the future state of the risks, meaning what can be expected in the future regarding climate change and how will the proposed project or plan respond to climatic changes, which risks can be expected (type, intensity, frequency, and possibly a worst and best case scenario),
- to identify and to assess possible adaptation measures, such as how well a project or plan is adapting to the implications of climate change (e.g. by developing an emergency plan of what to do in a climate event, whether particular considerations need to be made in the construction phases or in the choice of materials used),
- to identify how the operation and maintenance of the project, plan or programme adapts to climate change/risk, and whether specific requirements should be proposed.

The aim of this procedure is to reduce the risks and to integrate the adaptation plan into the development of a project/plan, subjected to environmental assessment.

Climate change and landscape issues should be included into EIA and SEA processes during both *screening* and *scoping* stages. The issues and impacts relevant to a particular EIA or SEA will depend on the specific circumstances and context of each project/plan (e.g. location, characteristics of the environment, etc.). Three steps are particularly important (McGuinn et al., 2013):

- to identify key issues early on, with input from relevant authorities and stakeholders,
- to determine whether the project (plan) may significantly change greenhouse gas emissions, and if so, then the scope of necessary greenhouse gas assessments (climate mitigation concerns) should be defined,
- to be clear about the climate change scenarios used in the EIA or SEA, so that the key climate change adaptation concerns can be identified, as well as how they interact with other issues considered withinan EIA or SEA.

Involving relevant authorities and stakeholders at an early stage of the assessment process will make it possible to capture the most important issues and establish a consistent approach for assessing impacts and for formulating solutions, or better recommendations. Following McGuinn et al., (2013), making use of the knowledge and opinions of environmental authorities and stakeholders can help to highlight potential areas of contention and areas for improvement in a timely and effective way. Furthermore, it can provide information on relevant forthcoming projects, policies and legislative or regulatory reforms, other types of assessments that should be considered when analysing evolving baseline trends; and finally, it can help collect suggestions for building climate change mitigation and adaptation measures and/or landscape quality (ecological quality, visual quality etc.) enhancement schemes into the proposed project or plan from the very beginning.

When addressing climate change adaptation concerns as part of EIA and SEA, climate data and scenarios must be taken into account. A clear description of the climate change scenarios facilitates discussion on whether the expected climatic factors should be considered in the project (plan) design. Also, it is important to review any existing adaptation strategies, risk management plans and other national or sub-regional studies on the effects of climate change, as well as proposed responses and available information on expected climate-related effects relevant to a project or strategic plan. Figure 2.4 shows the steps of EIA and SEA processes with a set of questions related to specific climate change topics.

Addressing climate change in EIA/SEA makes it easier to comply with the EIA/SEA Directives and relevant national laws. Member States are also likely to have a suite of legislative instruments relevant to climate change and landscape protection (e.g. planning policies that avoid developing flood prone areas).

Europe’s infrastructure needs to be adapted to better cope with natural phenomena caused by climate change and with negative impacts for landscape. This means considering that the parameters identified at a project’s inception may no longer be valid at the end of its potentially long lifespan. This idea is important for a shift in thinking, from the traditional assessment of environmental impact to taking possible long-term risks into account. The plans and projects need to be assessed against an evolving environmental baseline. SEA and EIA should show an understanding of how the changing baseline can affect a plan or project and how they may respond over time. The EIA and SEA processes are particularly important since they can help set the context for identification of potential climate change impacts (including disaster risks in landscape).

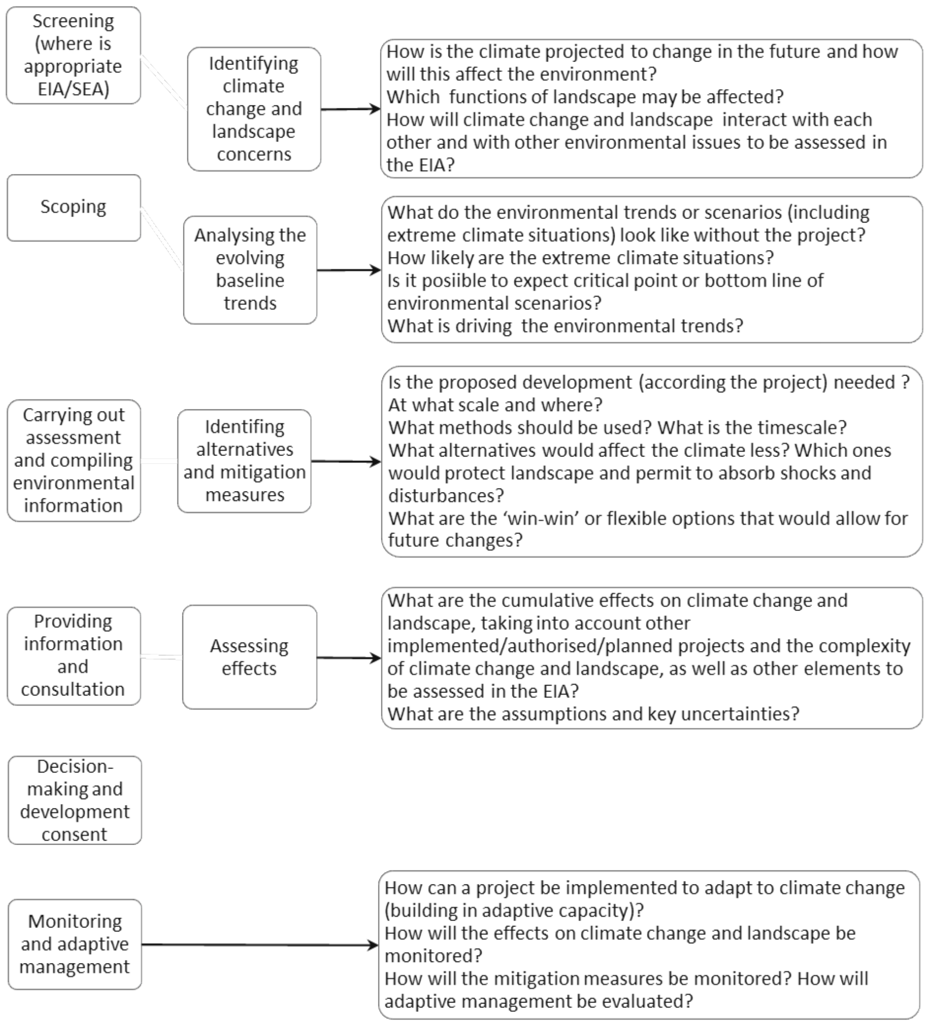

Figure 2.4: Integrating climate change and landscape into EIA. Modified from McGuinn et al., (2013).

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Ingrid Belčáková, Eva Pauditšová, Paola Gazzola

3 Methods And Techniques In Landscape Impact Assessment

3.1 Introduction

Many years of EIA and SEA practice have resulted in the development of a wide range of methods that can also be used in landscape impact assessment. These range from methods and techniques that are applied frequently (such as analogs, checklists, expert opinions, mass balances, matrices and interaction diagrams, overlay mapping, photographs/photomontages or qualitative models), to those that are used moderately (such as decision-focused checklists, indices or indicators, laboratory testing, literature reviews, networks, quantitative models) and to those that are used sometimes only (such as environmental cost-benefit analysis, expert systems, baseline monitoring and field studies monitoring, risk assessment, scenario building, trend extrapolation, etc.).

Given the multidisciplinary nature and understanding of landscape, a lot of professionals including ecologists, geographers, environmental experts, planners and architects, artists, psychologists, economists and others are engaging in studies of landscape assessment and perception. As a result, they have introduced and explored the application of different sets of methods representing their own disciplinary perspectives, contributing to making the literature in this area, extensive and vast.

This chapter introduces and briefly explains the most commonly used methods and techniques in landscape impact assessment. An overview of moderately used methods and techniques is also provided. The type method and technique to use is determined based on the stage of the assessment process, geographical scale, the hierarchical level or the specifics of the assessed development proposal.

The most commonly used methods and techniques in landscape impact assessment include:

- *baseline description, surveys and analysis methods,* which include baseline data and field surveys which allow for the subsequent landscape evaluation and generation of follow-up data for monitoring purposes,
- *impact identification and prediction methods,* which include checklists, visual quality models, integrated landscape management models, landscape-ecology based models and scenarios, multi-criteria evaluation method and landscape ecological stability methodology. These methods also serve as a reference basis for assessing the significance of impacts,
- *impact assessment and monitoring methods* which include matrices and interaction diagrams, criteria, thresholds and indicators,

- *presentation techniques* which have become important in recent practice and are now considered an integral part of landscape impact assessment procedures.

In this chapter, special attention is given to the application of geographic information systems (GIS) as a technique used in all steps of EIA and SEA procedures and at all decision-making levels. GIS as a tool in itself, or as a basis for the application of other tools, can be helpful for analysing, predicting and/or assessing impacts on the landscape. GIS can in effect support the application of visual quality models, overlay mapping, landscape environment management models, landscape ecology-based models, scenario development and other spatially relevant methods. At the same time, GIS can be a very efficient method for presenting the results of a landscape impact assessment process, along with other presentation tools such as maps, photographs, photomontage, videomontage and/or 3D visualization. As a method therefore, it can be considered instrumental for baseline analysis, impact identification and prediction, impact assessment and monitoring, and for presenting information and findings. As such, it makes sense to explore GIS separately, prior to reviewing the other classifications of methods and techniques.

3.2 Geographic Information Systems And Their Assistance In Landscape Impact Assessment

Geographic information systems (GIS) represent a very common tool used in various approaches of landscape impact assessment. Using functionalities of GIS software, it is possible to interpret landscape features and determine real or potential qualitative characteristics of a landscape. Nowadays, GIS can be considered as a carrier of information about landscape, society and their cross interactions. Simultaneously, GIS is also a tool for generating new information, knowledge and approaches for decision - making.

The application of GIS in landscape assessment allows faster and more exact elaboration of outputs and detects interrelations and interconnections between particular landscape units or phenomenon and processes. From a cartographical aspect, GIS technology allows more efficient data processing and visual interpretation.

In GIS the majority of data is related to spatially located objects, patterns, phenomena or processes (Maguire et al., 1991), and are presented in the form of maps, digital images and tables of geocoded data items (Bonham-Carter, 1994). According to Kolář (1997), the term “geographic information systems” is the most often used term indicating a wide spectrum of systems processing the data of a spatial character. Defining GIS requires a systematic and integrative approach. It implies the relation of spatial elements (entities) to the Earth’s surface (geo), their visual (graphic) expression using computer graphics and work with data and information. It produces a complex, spatially oriented system serving to collect, store, manage, analyse and present spatial data in order to describe and model (simulate) surrounding space as well as to gain new information for the rational utilization of this world.

The most important components of GIS are unequivocally graphic and non-graphic (attribute) data. Other authors also acknowledge the "organizational context" or infrastructure for GIS, which refers to the set of users, supporting elements.

3.2.1 Graphic Components Of GIS

Dynamic objects on the Earth's surface are expressed in geoinformation systems in the form of static graphic entities. In general, two types of data models can be distinguished, namely vector and raster (see Box 3.1). Within the vector model, three basic types of spatial data are distinguished which are point, line and polygon; within the grid model spatial data is referred to as a grid cell (spatial unit). Grid models (maps) are primarily used to show the area data (continuous fields) expressing dynamic phenomena taking place on the Earth's surface.

Box 3.1: Raster and vector models of GIS. Source: Authors.

Raster model

The raster model is based on the principle that space is a regular grid divided into single parts – cells (pixels) – representing the smallest, usually indivisible spatial units. Raster is thus a set of cells defined as a matrix or field in n-dimensional place. In order to illustrate geographic objects on the Earth's surface, we most frequently use the 2- dimensional grid where each cell is defined by a rectangular unit, often by a square. Grids can also have an irregular mosaic of cells, which have various dimensions and geometry, continuously changing in space. A basic cell in a 3-dimensional grid, often used in geology and meteorology, is called a voxel (i.e. 3-dimensional pixel); it may be of a cube or a rectangular parallelepiped shape.

Vector model

Vector data models can illustrate any objects on the Earth's surface with the help of simplified geometric shapes. Besides the three essential types of graphic entities, some software also uses other geometric shapes – for example, ArcInfo uses, among others, a polyline, arc, circle, ellipse, rectangular object, rectangular object with round corners and so on. The following terms in vector graphics are significant – vertex – representing an inflexion point of a polyline or a polygon; and node – representing an intersection point or a contact point of two entities.
Every vector entity is defined in GIS by its geographic position, geometry and typology. Geographic position is one of the most important attributes in the GIS structure. In astrict sense, it is impossible to consider as GIS what is not unequivocally defined by geographic coordinates.

3.2.2 Attribute (Non-Graphic) Component Of GIS

Every GIS should aim to ensure the interconnectedness of its graphics and non-graphic components. In the majority of vector-oriented GISs, it is possible to join the graphic entities with the tables through mutual relations; this is known as a relational database. When inputting records into the relational database, various attributes (or descriptive data) are attached to the graphic entities. In the grid data structure, numerical values to the smallest allocable units – grid cells, are normally inputted. Numerical values are determined to perform analytical operations within spatial data, and not to archive or manage data on spatially located objects. This is why relational databases are not referred to within the context of a grid data model.

3.2.3 Application Of GIS To Landscape Impact Assessment

The introduction of GIS in impact assessment was driven by the wider introduction and application of computer-based techniques in scientific procedures and practices during the 1970s and 1980s. It is during that time that the first commercially accessible software were put on the market. Since then, specialized software products have been developed, serving among other things, to create information systems utilizable also for the needs of planning and design.

It is possible to use GIS in planning and landscape assessment processes for cartographic presentations, production of geographic databases or as a tool for comprehensive area based analyses and modeling (Goodchild, 2002; Clarke, Parks and Crane, 2000). When elaborating on cartographic outputs to analyze, select, model and assess landscape elements and their interrelations in any structure of landscape, it is advantageous, in terms of efficiency and accuracy, to create a geographic information system as a spatial data model. In this context, the application of GIS to land use planning may be conceived as a projection of map elements with all their characteristics into a spatial information system.

With planning and project design procedures, the whole team of experts from diverse branches, departments or institutions work together. GIS is a platform to which all involved specialists can contribute, share existing databases and interpret information.

When adopting GIS as a method, Chapin and Kaiser (1985) also point out the importance of determining a work programme with individual steps to pursue. They recommend the following steps:

1. to identify the key data to include into a future spatial information system. Such data can be data on land use (recreational areas, industrial zones, residential areas, etc.), environmental data (geological substratum, pedological characteristics, data on inundated territories, types of vegetation growths,

climatic characteristics etc.), data on the communication and transport systems, demographic data, economic indicators,
2. to determine specific data of particular significance for building an information system (e.g. plots, addresses etc.),
3. collection of data (primary or secondary),
4. archiving and updating of data,
5. conversion of data, database operations and analyses,
6. presentation of outputs.

The so called Land Information System (LIS) is one of the application possibilities with current GIS, which is utilizable in the processes of area-based comprehensive planning. Another application of information systems is the so-called city information systems (CIS), which is de facto a variation of an LIS. The specificity of a CIS is the object of interest, which is an urban organism, formed by a digital map of the city (DMC) – however this is not merely one map, but a whole set of maps or information layers. The map should be set up in such a way so that it is possible to add descriptive (attribute) data from other subsystems.

The application of GIS to the processes of landscape impact assessment at both project and planning or more strategic levels has increased the possibilities for more effective, accomplished and precise work. The comprehensive information system on the territory represents a strong tool for practical managing, decision-making and planning activities: a territory may be presented in a detailed way from diverse thematic viewpoints; changes in a territory can be monitored and tracked through time, shedding light on potential interdependencies and relations among single phenomena, processes and factors. Owing to that, the quality of research on the spatial structure of territorial units becomes higher.

One of the main GIS functions for landscape impact assessment is to gather data that will result in the creation of a database, where the data can be subsequently manipulated and analysed (Gontier et al., 2010; Majorošová, 2016). Such databases are useful for elaborating land cover maps, topographical maps (digital elevation model or digital model of relief), conservation or protected – areas maps, soil maps, geology maps, climate maps, erosion-accumulation models, models of various natural dynamic phenomena demonstrated in the form of continuous physical fields obtained by the interpolation of input points. In addition, GIS can be used to produce more advanced analysis of outputs, such as connectivity or fragmentation analysis at different scale levels as well as the production of ecosystem and biodiversity maps (Mörtberg, 2004).

Collecting data of different character through an information system can provide a range of advantages. For instance, if one was looking for data about a specific concrete lot, it would be sufficient to input the lots' details, with GIS then providing information about the zone in which the lots are included, the lots' proprietors, the planned utilizations etc. The created database may be always updated, allowing for the continuity of works into the future, and into future planning exercises. An inseparable part of GIS is formed also by the production of prognostic models serving to evaluate expected situations in the future.

In the context of planning and design, landscape visual quality assessments are sometimes considered not important because they lack substantial evidence or because of the level of subjectivity inherent in this type of assessment. In this context, a GIS-based land use map or 3D landscape model might be used to emphasise the aesthetic changes in an environment or landscape, strengthening therefore the evidence-basis of a visual quality assessment. Moreover, land use maps and 3D landscape models can be used to measure landscape quality, replacing to a certain extent, the need to use real images.

A GIS system can be used for landscape evaluation and advanced geographic analysis (geo- processing) as well as for the creation of thematic maps such as gradient of relief, micro-catchment – contributing areas, length of the slopes, vulnerability to water erosion, etc... (see Fig.3.1 and 3.2).

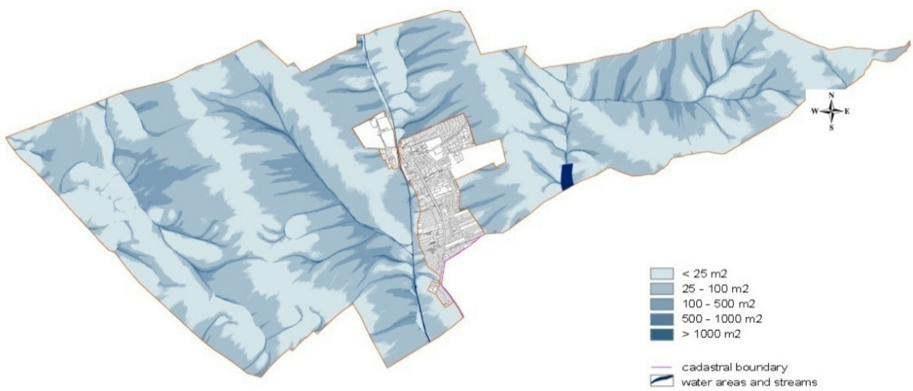


Figure 3.1: Slope orientation – important characteristic for assessment of visibility objects in landscape. Source: Pauditšová (2007).

The development of information technology makes it possible to continuously improve the models created. Using them we can better express and describe certain phenomena, relationships, structures, systems and/or components of the real world. Models are transformed from a 2D plane into a three-dimensional understanding, thus increasing human imagination and consequently, the level of decision-making in a landscape-based environmental assessment. 3D modelling has over the past 15 years advanced from a purely visualization tool into a multipurpose tool that is being used in land use planning. At present, landscape models in 3D are understood to be intelligent tools with an enormous database of information. The standardization of 3D geographic information systems highlights the importance of sharing information as well as the use of semantic information in the creation of a representation of environmental objects such as buildings, greenery, water elements and others (Aien et al., 2013; Gröger and Plümer, 2012; Zhu et al., 2011; Macura et al., 2016; Ivan et al., 2016).

Moreover, 3D visualisation technologies offer the potential for comparing impacts between different development scenarios or alternatives as required in landscape impact assessment processes. They are powerful tools that can be helpful for consultation and communication purposes in assessment processes (LI and IEMA, 2013).

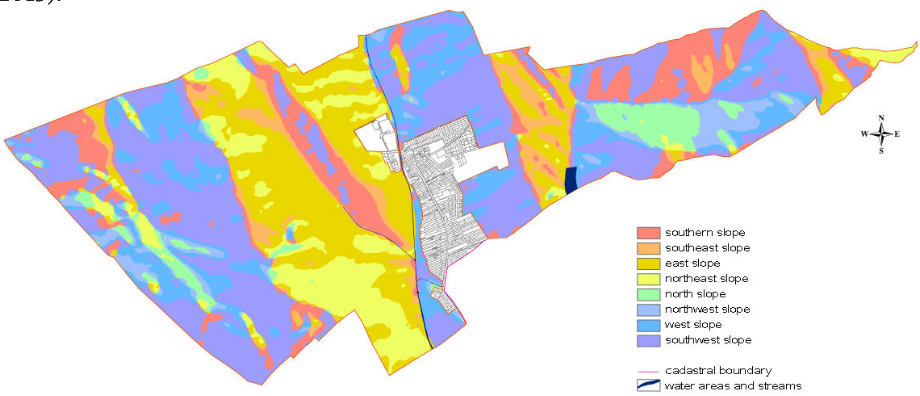


Figure 3.2: Micro-catchment areas – an example of an analytic map for landscape impact assessment within EIA/SEA processes. Source: Pauditšová (2007).

3.3 Baseline Description, Surveys And Analysis

In landscape impact assessment the actual (existing) condition of nature and the landscape is determined and assesssed based on legal and functional objectives and standards. In order to do so, a lot of data and information about landscape is necessary and surveys are therefore undertaken.

The aim of a baseline description is to identify the current state of a landscape; the data collected will then form the basis against which the landscape and visual impacts are assessed and monitored (Thérivel and Partidário, 1996). The level of detail should be appropriate to the scale of the proposed project or plan and to the stage of the assessment process. Furthermore, the baseline description will vary according to the planning tier and the availability of appropriate data (LI and IEMA, 2013; Thérivel and Partidário, 1996).

The risks of getting lost in the endless options available to acquire information and collect baseline data, therefore spending unnecessary time and resources, are quite real. What information is needed as well as by when and by whom are useful “check” questions to address before embarking on data acquisition. Another aspect to consider is that the process of collecting baseline data needs to take into account the uniqueness of each landscape, and it should facilitate the identification of those features that give a locality its "sense of place".

Experience to date has shown that baseline data commonly included in statements and more generally, taken into account in assessment exercises, aim to describe the performance and function natural resources and the balance and relationship between nature and landscape. Examples of datasets commonly adopted in landscape baseline studies are presented in Box 3.2.

Box. 3.2: Example of a data set useful for landscape baseline studies. Source: Authors.

a) relevant legal and planning framework – this is an essential starting point for most landscape management activities

b) landscape framework documentation such as Landscape Character Areas (LCA), Landscape Heritage Assessment (LHA) or landscape plans at all planning levels – these provide the framework reference based on which the analysis and prediction of landscape and visual impacts can be easier

c) functional characteristics of the territory – location components (siting, accessibility, geographical context); geo-morphological components (relief structure, hydrological system, topography, geology); bio-physical components (soil, climate, vegetation and associated habitats, wildlife and ecosystems); socio-economic components (settlements, infrastructure networks, land use, demographics, economic activities and flows); historical and cultural components (built and land-based heritage, land ownership, land custodians)

d) perceptual dimensions – visual and other sensory aspects (patterns of landform, lines, structures, colours), perceptual aspects (scales of perception, points of observation), values (involvement of local communities); specific potential receptors of landscape and visual impact (important components of landscape, visitors, residents, travellers through the area, other groups and viewers)

Baseline information is often available and provided by environmental authorities, nature conservation organisations and planning authorities; it is normally based on pre-existing data and field work, and collected and analysed via desk-study exercises. Additional data is collected through specific field surveys, with the data then collected made available in both text and map formats (see Fig.3.3).

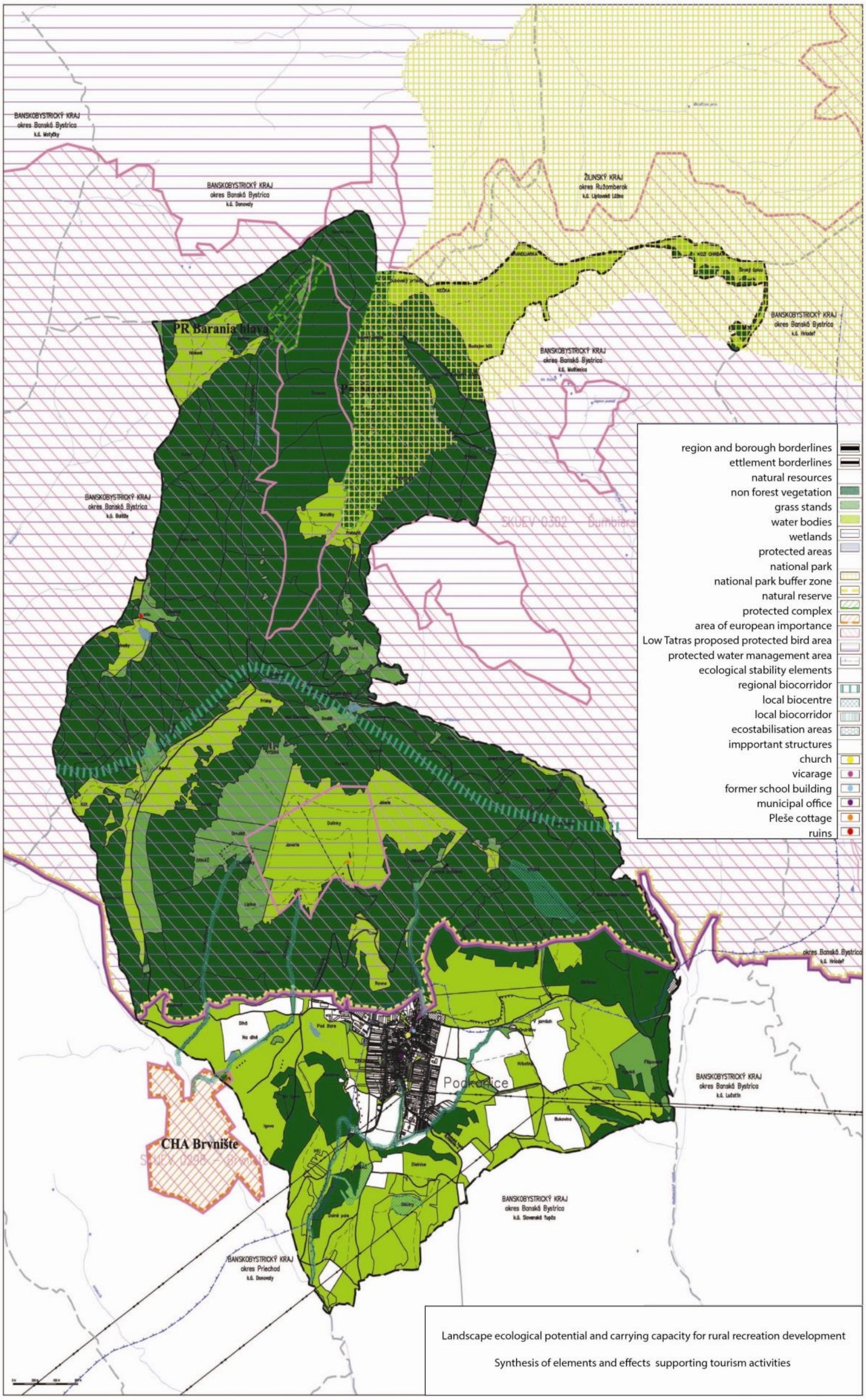


Figure 3.3: An example of biotope map. Source: Belčáková (2011).

3.4 Impact Identification And Prediction Methods

3.4.1 Checklists

Checklists have been described as an ad-hoc method (Sadar, 2006), within which, prescribed lists of parameters are used. The potential benefits of checklists are (Sadar, 2006):

- to apply a simple method for identifying relevant environmental factors for consideration in both, EIA and SEA,
- to encourage discussion during early stages of the assessment process.

Checklists may range from a simple list of environmental factors (see Tab. 3.1) to a list that incorporates mathematical modeling. An exhaustive approach should be followed to ensure that the list of factors included is as comprehensive as possible. Different types of checklists exist that fulfil different purposes, from those that aim to describe and identify impacts to those that aim to support decision-making. Decision-focused checklists represent lists of environmental factors, including information on measurement, impact prediction and assessment. They are useful for the comparative evaluation of alternatives, and can be used for ranking environmental factors and associated impacts in order of importance. They provide a basis for selecting the prefered course of action.

The checklist presented in Table 3.1 represents the outcomes of expert judgement on the hierarchy of objectives under SAPARD Plan. The actual environmental assessment has been conducted at two levels: a) the general objectives and the specific objectives of SAPARD Plan b) the specific objectives and the measures of SAPARD Plan. From the table below it is evident that priorities of SAPARD Plan and appropriate measures are drafted in a cohesive and coordinated way as far as concerns the environmental factors.

There are also limitations when using checklists. For example, checklists are unable to discover interdependencies, connectivities or synergisms between interacting environmental components, nor are they able to describe variations in environmental conditions. Furthermore, they do not provide information on specific data needs (Belčáková, 2008), and are highly subjective.

Table 3.1: A simple checklist example taken from the SEA of Slovak National Plan for Agriculture and Rural Development under SAPARD. Source: Belčáková (2000).

1. Correspondence between the general and specific objectives of the Slovak National Plan for Agriculure and Rural Development

General objectives **Specific Objectives**	**1. To help the creation of competitive agrifood sector, capable of full integration and operation in the EU area in a developed multifunctional agriculture.**	**2. The improvement of the quality of life of the rural population, provision of a sufficient number of jobs and adequate income even for agricultural less favoured regions (need for ecological approach and sustainable development of rural areas).**
Priority No.1		
1. By supporting investment in technologies, to achieve restructuring and enhance efficiency in agricultural production	+++	
2. To ensure further development of individual branches of the food industry with conditions valid in EU	+++	++
3.To support the establishment, formation and simplification of administrative operations for producer groups	++	+
Priority No.2		
4.Preserve and improve the balance of economic opportunity and social conditions for the rural population	+++	+++
5. Development of economic and environmental functions of forest management in rural areas	++	+++
6. to acquire sufficient experience to be able to prepare an agri-environmental programme and to deliver management training through five pilot projects	+++	+++
7. Development and implementation of land consolidation projects	+	+++

General objectives **Specific Objectives**	**1. To help the creation of competitive agrifood sector, capable of full integration and operation in the EU area in a developed multifunctional agriculture.**	**2. The improvement of the quality of life of the rural population, provision of a sufficient number of jobs and adequate income even for agricultural less favoured regions (need for ecological approach and sustainable development of rural areas).**
Priority No.3		
8.To provide farmers with and others with necessary skill by training in different spheres relevant to agricultural and rural development	+++	+++
9. To support the process of alignment of the farming sector and rural areas, interactive programming and planning including territorial planning and preparation of studies for farmers and rural areas	+++	+++

Level of correspondence: +++: High ++: Medium +: Low

1. Correspondence between the specific objectives and the measures of Priority 1

Specific Objectives Measures	**1. By supporting investment in technologies, to achieve restructuring and enhance efficiency in agricultural production**	**2. To ensure further development of individual branches of the food industry with conditions valid in EU**	**3. To support the establishment , formation and simplification of administrative operations for producer groups**
Measure .1.	+++	++	
Measure .2.	+++	+++	+++
Measure .3.	+	++	+++

2.Correspondence between the specific objectives and the measures of Priority 2

Specific Objectives Measures	1.Preserve and improve the balance of economic opportunity and social conditions for the rural population	2. Development of economic and environmental functions of forest management in rural areas	3. to acquire sufficient experience to be able to prepare an agri-environmental programme and to deliver management training through five pilot projects	4. Development and implementation of land consolidation projects
Measure 4	+++	+		
Measure 5		+++		
Measure 6			+++	++
Measure 7	+++	+	+	+++

3. Correspondence between the specific objectives and the measures of Priority 3

Specific Objectives Measures	1. To provide farmers with and others with necessary skills by training in different spheres relevant to agricultural and rural development	2. To support the process of alignment of the farming sector and rural areas, interactive programming and planning including territorial planning and preparation of studies for farmers and rural areas
Measure 8	+++	
Measure 9		+++

Level of correspondence: +++: High ++: Medium +: Low

3.4.2 Visual Quality Models

Numerous models have been developed to evaluate visual landscape quality. Visual landscape quality assessment are conducted by professionals from many disciplines, and as a result, different models have emerged (Daniel and Vinning, 1983), which can be classified in different ways. For example, Briggs and France (1980) make reference to *direct and indirect* methods. *Direct* landscape evaluation consists of analyzing and describing a set of landscape features, in order to obtain a value representing the total scenic quality, obtained by the sum of the parts. Regardless of the skills and knowledge of each observer, it is commonly accepted that landscape quality derives from the interaction between a landscape‘s biophysical characteristics, the perceptive processes and the experiences and knowledge of the observer (Loures et al., 2015; Canter, 1996). According to Mazure and Burley (2005), integrated landscape assessments, which take into account aesthetic, economic and ecological variables, show that there is a direct relationship between the different characteristics and components of a landscape. In *indirect* landscape evaluations, the demand for and use value of a specific environmental amenity is used to assess the quality of a landscape, giving landscape an economic value which in turn informs the development of effective management policies.

Arthur (1977) split models into *descriptive inventories and public preference models*, with both categories being further split into non-quantitative and quantitative models. In this context, non-quantitative models refer to descriptive models where relevant information is utilised to address the implications of actions that can result in changes to environmental components. Quantitative models are represented by mathematical models that are used specifically for addressing expected changes in environmental media or resources. They range from simplified to very complicated models (for example three dimensional computer-based models) that may require extensive data input. In most cases, models are used for the description or prediction of changes in properties of the system over a time period. Quantitative modeling is most effective when environmental factors are easily quantifiable, so that they can easily be assigned a mathematical value.

Descriptive inventories include ecological and formal aesthetic models, which are mostly applied by experts in an objective manner. *Public preference models*, such as psychological and phenomenological, are often undertaken using questionnaires, and are unavoidably linked to seeking consensus among the public. Quantitative holistic techniques use a mixture of subjective and objective methods and include psychophysical and surrogate component models.

It is important to examine the reliability and validity of visual quality assessment models and to identify any assumptions central to the models. Internal and external validity are of concern in the development of any landscape visual assessment system. External validity reflects, in part, how well the system-generated assessments correspond to other known measures of visual quality. Internal validity reflects how well the system‘s internal logic withstands testing and violation of assumptions (Buhyoff et al., 1995).

Arthur (1977) and others (Jacques, 1980; Hamill, 1985) have summarized the following methodological problems when using the above mentioned models:

– numerical ratings of landscape beauty represent people’s preferences for a landscape and/or people’s judgements of scenic beauty of a landscape. While public preferences tend to give a measure of “value” of a landscape, “quality” is discerned through judgement. When asked to indicate their preference for various landscapes, observers tend to apply criteria for use of those areas (recreation, residence, etc.) rather than for the landscapes’ inherent beauty,
– some persistent errors in the evaluation of landscape: incorrect use of numbers derived from place in a classification; incorrect use of numbers to stand for words; use of spurious numbers in simple mathematical operations; use of incorrect data in complex mathematical and statistical operations; use of data that does not satisfy requirements of the model; use of numbers to support, derive, or demonstrate meaningless, spurious or useless concepts; and use of concepts without adequate operational definitions.

3.4.3 Integrated Landscape Management Models

Integrated landscape management models identify how land and natural resources are used, and the demands for future land and resource use. They aim to help ensure the protection of the landscape (environment) and the fulfilment of developmental needs. This implies that all possible land use options must be considered. An example of integrated landscape management model is LANDEP, i.e. the landscape ecological planning model, recommended by *Chapter 10 of Agenda 21*. LANDEP aims to facilitate the integration of environmental components such as air, water, land and other natural resources (UNCED, 1992), into plan-making, so that the conservation of valuable habitats in defined areas is ensured and appropriate nature management activities can be established for these sites. LANDEP’s essential objective is to propose an ecologically optimal spatial organisation of territory, utilisation and protection of landscape.

The LANDEP methodological procedure consists of the following steps (Miklós, 1995):

I. Landscape-ecological analyses

The principal objective of analyses is to select, quantify and describe the main properties of abiotic, biotic and socio-economic complexes determining the landscape-ecology basis and spatial organisation of existing land uses. These include conducting analyses of:

- geomorphologic, geological, hydrological, soil and climatic conditions, thus of properties of the abiotic complex of a territory,

- fauna and flora and of their respective conditions, thus of properties of the biotic complex of a territory,
- socio-economic activities, including their positive and negative influences, thus of properties of the socio-economic complex of a territory.

The outcome of this step is the elaboration of a set of cartographic representations concerning the characteristics of the of abiotic and biotic properties and of the socio-economic elements in a given territory.

II. Landscape-ecological syntheses

Landscape and ecological syntheses are based on the superimposition of selected indicators regarding abiotic and biotic properties and socio-economic complexes in the territory. The aim of the syntheses is to create homogeneous areas characterised by various combinations of abiotic, biotic and socio-economic indicators, known as integral geosystems.

III. Landscape-ecological interpretations

The outcome of this step is the creation of functional landscape indexes, which can be divided into four fundamental groups:

- localisational (technological-abiotic) indexes – resulting from the interpretation of physical conditions for the realisation of different activities,
- selective (ecological-biotic) indexes – resulting from the interpretation of different aspects for the maintenance of ecological stability and biodiversity of a landscape, and for the maintenance of nature and natural resources,
- realisational (socio-economical) indexes – resulting from the interpretation of aspects expressing the active influence of human activities on the environment and various aspects of environmental care,
- indexes of human requirements, including different priority categories – resulting from the interpretation of society‘s demands on the use of a territory.

IV. Landscape-ecological evaluations

This step represents a comparison between the values of landscape indexes and the requirements of and for human activities. The process of ecological evaluations consist of the following steps:

- determination of the functional suitability values (especially ecologically limited and determined values) of individual indexes for each human activity,
- determination of the weighted coefficients of individual indexes for each human activity,
- determination of the total suitability value of each geosystem for each human activity.

V. Landscape-ecological propositions
This step aims to propose a landscape-ecologically-optimum of the spatial organisation and utilisation of landscape. The ecological propositions cover two aspects: aspect of spatial organisation expressing an optimum land use; and the technological aspect expressing the application of landscape-ecology technologies used in a landscape. The result is a proposal for the spatial and functional optimization of a given area and the determination of measures ensuring the appropriate utilisation of territory from a landscape-ecological viewpoint.
In addition to the methodological steps, LANDEP is typically complemented by a series of maps:
- map of landscape-ecological complexes i.e.homogeneous landscape-ecological units of spatial and functional land use,
- map of environmental problems i.e. specification and identification of environmental problems resulting from stress factor effects on nature, on natural resources and on the environment,
- map of alternative ecological selection. A set of feasible activities is defined for each area, i.e. of activities that are not limited by landscape-forming components,
- map of ecologically optimal land use, representing the ideal activities for a given area including the ecostabilizing measures.

Figure 3.4 below expands on these points and provides a simplified and general flow chart of LANDEP

Overall, LANDEP is considered an essential tool for sustainable land use because it regulates socioeconomic development with natural, human, cultural and historical landscape potential. Based on an analysis of territorial conditions, it proposes the best possible ways for territorial exploitation/land use; it secures a respectful use of nature, of natural resources, and the conservation of biodiversity and the support for ecological stability. The decision-making process informed by LANDEP is based on matching the offer of resources within a given territory with the demand for growth and development expressed by communities. Any discrepancies between an offer and demand, signify not only a lack of respect for landscape resources, including their properties, but also the rise of both, environmental and human problems.

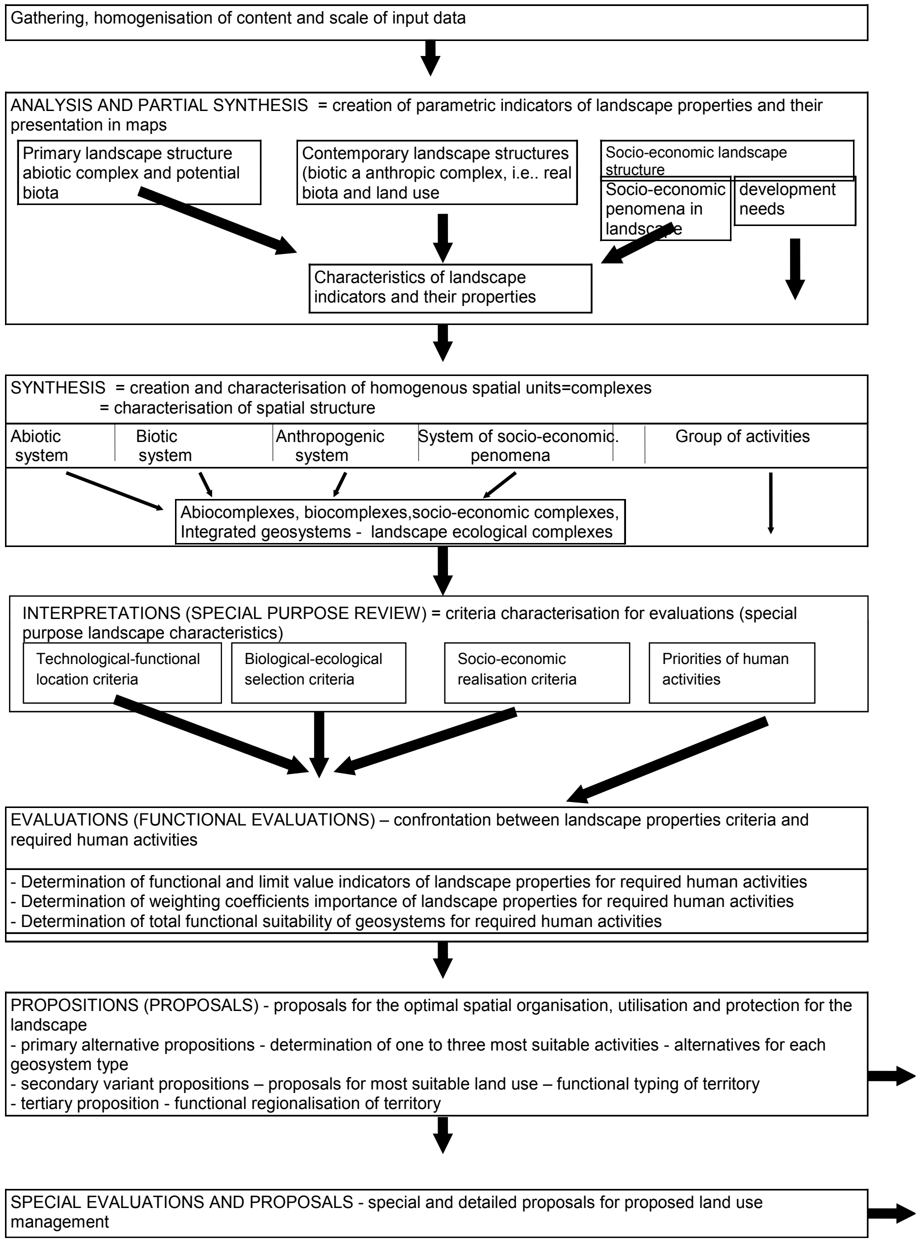


Figure 3.4: LANDEP Sheme. Source: Miklós (1995).

3.4.4 Landscape Ecology-Based Models And Scenarios

A number of landscape-ecology based models have been developed and are applied in landscape impact assessment. Though not exclusive to GIS applications, when combined with GIS, landscape ecology based models and scenarios have opened up new possibilities for qualitative and quantitative predictions for analysing and predicting impacts on biodiversity, habitat loss and other ecosystem services. Their practical application "translates into practice certain concepts of landscape ecology related to ecological dynamic or spatial and temporal scales" (Gontier, 2006, p. 345-346). Gontier further argued that landscape ecology based models can serve as a platform for integrating other spatial landscape components, including recreational and cultural components.

When applied within the context of a GIS, landscape ecology models can be used for analysing land change, including vegetation growth and land uses changes (Izakovičová et al., 2017). Further, these models can be used for analysing habitats, including the prioritisation of biodiversity components taking into account aspects of habitat usitability and landscape connectivity (e.g. Gontier et al., 2006; Hepinstall et al., 2008). They can also be used for analysing neighbourhoods or specific localities, by taking into account different types of human activities within landscape, such as recreational local uses.

The development of landscape ecology-based models, such as habitat distribution models and biodiversity assessment models, are relevant for landscape impact assessment (Guisan and Zimmermann, 2000: Lehmann, Overton and Austin, 2002) because they are precise, ecologically sensible, interpretable, generalisable and fully data defined, and can be expressed in a spatial framework. According to (Mörtberg, 2004), their predictive nature establishes a relation between species occurences and environmental variables in an attempt to characterize habitats suitable for specific species. In more detail, following Gontier´s (2006) review, Habitat Suitability (HS) models are applied mainly to individual species but can also be applied at the community level (US Fish and Wildlife Service, 1981). Other habitat-suitability methods includes the Generalized Linear Model (GLM) and the Ecological Niche Factor Analysis (ENFA) (Hirzel, Helfer and Metral, 2001) using empirical data. Verboom et al (2001) have introduced an approach combining species-distribution data, population-viability analysis and landscape indices using the Landscape Ecological Analysis and Rules for the Configuration of Habitat (LARCH) decision-support system. Another type of expert based ecological model is represented by the Landscape Ecological Decision and Evaluation Suport System (LEDESS), developed for the evaluation of development scenarios at the landscape level (Knol and Verwij, 1999).

Problems and limitations to the implementation of ecological modeling, whether with GIS assistance or not, are associated with issues of data accessibility. It is in response to this limitation that Gontier (2006) advocates for more open and technically easier access to existing data as well as for the harmonization of databases at the national and international levels. Another obstacle relates to the reproducibility and robustness of ecological modeling for its further implementation in planning and assessment procedures (Goodchild, 2002).

3.4.5 Multi-Criteria Evaluation Method

GIS-based impact prediction models and techniques allow not only the integration of scientific knowledge of the planning process, but facilitate also a priority setting of development proposals for planners and stakeholders. For this purpose, a suitable tool is represented by *spatial multi-criteria analysis (SMCE),* which includes a family of techniques to identify and compare solutions to a spatial problem based on the combination of multiple factors that can be represented by maps (Malczewski, 1999). This method takes advantage of both the capability of GIS to manage and process spatial information and the flexibility of SMCE to combine factual information (e.g. fragmentation, indicators) with value-based information (e.g. expert opinion, quality standards, participatory surveys). Taking into account both factual elements and peopleś values and perceptions is essential to identify options for building consensus around a decision and for reducing conflicts.

Geneletti (2005) noted that there are limitations on the practical use of multi-criteria evaluation methods because they focus on description, discussion and measurement of indicators but rarely link to a value judgement that can be directly utilised by planners and decision-makers. In this context, the author suggests making better use of expert opinions so that once collected they can be formally linked to the output of the spatial analysis. The author further suggests that indicators and scientific knowledge should be intelligible to strenghten the evidence-basis and potential impact of landscape ecological assessment (ibid).

3.4.6 Landscape-Ecological Stability Method

The ecological stability of a landscape as a whole, is one of the key concerns of landscape ecology-based impact assessment. It is generally agreed and accepted that species and/or communities of species can become threatened and their ecological functions impaired or rendered impossible if their living conditions are unfavourable or if they are *spatially isolated* (e.g. Odum, 1975). It is therefore paramount that suitable living conditions and *spatial interconnectivity* between ecological systems is maintained.

To survive, humans need a variety of ecosystems, which include stable, insufficiently stable and unstable man-made, modified agro-ecosystems, as well as newly created systems with settlements, transport and industry. These are present in specific areas of the landscape in the form of elements of landscape structure (land cover) resulting from the exploitation of territory (hereinafter "the elements of current landscape structure – CLS"). The goal is to preserve the ecological stability of the landscape as a whole, despite the presence of differently stable - including unstable - elements of land cover. The prerequisite for maintaining such "stability", in addition to the *internal ecological quality* (stability) of the most stable elements of the CLS, is maintaining the *interconnectivity* across territories (as a whole). Naveh and Liebermann (1993, p.8) argue that "we want to achieve a landscape which could be locally unstable, but globally stable". It is clear that this goal cannot be achieved by simply protecting isolated ecosystems, but it can be achieved by instituting a spatial system of interconnected, ecologically stable elements of the CLS.

The starting point and basic criterion for assessing the spatial stability of a landscape is the internal *ecological quality – stability of ecosystems*. Ecological stability is defined differently by different authors. One acceptable definition is "the ability of ecosystems to persist during the action of disturbance, to keep and reproduce their essential characteristics under conditions of interference from the outside" (Míchal, 1992, p.26). This ability expresses *resistance*, i.e. minimal changes during the operation of disturbance or resilience, including the ability to return to the baseline condition. *Spatial ecological stability of a* landscape is therefore a dynamic measure of the ability to maintain the current landscape structure, of both vertical and horizontal ecological relations, at an acceptable conventional (model) level, even if the landscape is formed by various ecosystems with low levels of ecological stability. Preserving the spatial ecological stability of the landscape is *the purpose of creating ecological networks.*

Spatial ecological structure is often considered the core scope of landscape ecology. Many authors have conducted research into spatial relations of ecosystems, including the spatial arrangement and spatial impact of ecosystems on their surroundings. These investigations strive to demonstrate the significance of ecologically stable landscape elements and their spatial influence. Spatially interconnected, ecologically stable landscape elements are generally referred to as *ecological networks***.** The theory of island biogeography (MacArthur and Wilson, 1967) later developed by Opdam et al. (1995) and Hanski (1999) in the metapopulation theory, provides a theoretical basis for forming views addressing the issue of habitat fragmentation and the concept of ecological networks.

The metapopulation theory deals with the behaviour of the populations in the landscape with fragmented habitats inhabited also by smaller subpopulations. It treats basic demographic trends (natality, mortality, migrality, etc.) as indicative monitoring characteristics of each population. Furthermore, it emphasises the importance of communication between subpopulations and considers the possibility of replacing locally extinct subpopulations. Metapopulation theory also addresses the necessity of preserving or restoring interconnectivity of landscape elements in the anthropogenic landscape.

The fragmentation of habitats affects various types of organisms differently. The metapopulation theory explains the impact of fragmentation on different populations. Increasing anthropogenic pressure in fragmented agricultural landscapes, for example, can result in reduced size and quality of patches and increased resistance to the colonisation of new species (eliminating of hedgerows), which consequently upsets the balance between the rate of extinction and recolonisation, to the extent where, on average, fewer patches are colonised. As the proportion of empty patches grows, the probability of species subsistence decreases. Current trends and research confirms the relevance of the theoretical basis for the concept of ecological networks in the landscape.

Forest fragments in farmland or isolated wetlands may be considered pseudo-islands, as they are governed by rules that are similar to those that govern true islands. In addition, the size of a natural element, shape or even distance from the nearest similar habitat and species diversity contribute to likening forest fragments in farmland or isolated wetlands to true islands. The surrounding landscape also plays an important role as it is prone to change induced by anthropogenic activities. The theory of island biogeography aims to quantify these relations. One of the major factors affecting species diversity of true and pseudo-islands is the size of the habitat fragment (direct correlation) and the degree of isolation (inverse correlation). Ecological networks are designed to preserve the minimum area required for survival of natural communities or target vulnerable populations and mitigate the isolation effects resulting from the isolation of landscape elements in the anthropogenic landscape, for example, by means of designating biocorridors, and, in extreme cases, by technical solutions, such as ecoducts.

Evaluating the stability of landscape structure elements (land cover) means taking into account the variety and arrangement of elements and the strengths of their internal links. The higher intrinsic environmental quality an element of the CLS has based on its biological, ecological, as well as other utilitarian functions, the higher is its ecological quality, and the larger is its positive influence on the area, for example having higher water-retention, anti-erosion, filter capacity, higher protective, hygienic, aesthetic functions. In order to express landscape ecological stability, several methodological approaches are used in practice (e.g. Löw., 1995; Míchal, 1992). Most of these approaches are based *on calculating the coefficient of ecological stability (CES) as a numerical indicator using a specific formula*. According to this formula, landscape elements can be classified into five different degrees of ecological stability (Pauditšová and Reháčková, 2007):

- 1stdegree: without importance (e.g. built-upon areas and roads with asphalt or concrete surface),
- 2nd degree: minor importance (e.g. large-block fields, intensive vineyards, hop-growing, etc.),
- 3rd degree: medium importance (this is attributed to intensified meadows, extensive use of permanent crops, etc.),

- 4^{th} degree: high importance (e.g. extensively used grassland, mixed forests, etc.),
- 5^{th} degree: very high importance (especially indigenous and natural forests, natural herbaceous communities, wetlands, peat bogs, rivers and areas with natural bottom and sides characteristic of the aquatic and riparian communities).

By processing the classification of the ecological quality of each component of the area's CLS, ecologically important segments of the landscape can be identified. Subsequently, the overall ecological stability can be calculated to establish the coefficient of ecological stability (quality) of the territory (Pauditšová and Reháčková, 2007):

$$C_{ES} = \sum_{1}^{n} \frac{a_i . D_{CLS_i}}{a}$$

where: $\mathbf{C_{ES}}$ – coefficient of ecological stability of the area of interest,
$\mathbf{a_i}$ – total area of individual types of elements of landscape structure (ha),
$\mathbf{D_{CLSi}}$– degree of ecological quality of the i-th element of CLS,
a – total area of the area of interest (ha),
n – number of elements of landscape structure in the area of interest.

An example of areas of individually mapped elements of the CLS, their degree of ecological quality (D_{CLSi}) and the coefficient of ecological stability of the territory (C_{ES}) are presented in Table 3.2. The presented figures come from a case study in Myjava in Slovakia and they represent the coefficient of ecological stability calculation based on the above presented formula.

Table 3.2: Areas of individual elements of CLS in the study area and the relevant values of CES. Source: Pauditšová and Reháčková (2007).

Elements of CLS	Area [ha]	Ci	CES
Forests	0.3315	3	0.002
Arable land	564.9226	1	0.912
Permanent grassland areas	22.2802	3	0.108
Gardens	0.3409	2	0.001
Water areas	4.5126	2	0.015
Built-up areas	4.4822	1	0.007
Other areas	22.525	2	0.073
Total	**619.395**	-	**1.117**

Based on the above, the value of C_{ES}, was calculated which in the example provided in Table 3.2 had a value of 1.117. According to Table 3.3, this corresponds to a landscape *with very low ecological stability* (see Tab. 3.3). In the case of the example provided, this value is caused by a high proportion of arable land and a small proportion of eco-stabilizing elements in the area of interest. What might be the implication of this, is that management measures aimed at improving the quality of the area should be recommended.

Table 3.3: Interpretation of C_{ES} and degrees of ecological stability. Source: Puditšová and Reháčková (2007).

Assessment of landscape	Coefficient of ecological stability	Degree of ecological stability	Ecological measures
Landscape with very low ecological stability	1.00 –1.49	1	high need to implement new eco-stabilizing elements and eco-stabilizing management measures
Landscape with low ecological stability	1.5 – 2.49	2	need to implement new eco-stabilizing elements and eco-stabilizing management measures
Landscape with medium ecological stability	2.5 – 3.49	3	conditional necessity to implement new eco-stabilizing elements, or application of appropriate management measures
Landscape with high ecological stability	3.5 – 4.49	4	implementation of appropriate management measures
Landscape with very high ecological stability	4.5 – 5.00	5	implementation of maintenance management

As illustrated in Table 3.3, when the particular degree of ecological stability is attributed to individual elements of the current landscape structure, it is always necessary to take into account the actual species composition of the vegetation, which reflects the quality of vegetation cover. Then, a proposal of general measures to increase or maintain the ecological stability of landscape can be determined.

Generally speaking, this approach for determining the coefficient of ecological stability is similar to that developed by other authors, albeit with some differences. For example, Löw (1995) follow the same principles but their five degrees of ecological stability are 1) degraded; 2) disturbed; 3) balanced; 4) landscape with predominant natural components; and 5) natural landscape. Míchal (1992) evaluates the ecological stability of a landscape according to the ratio of relatively stable and unstable areas, with four categories of ecological stability being defined according to the level of disruption of landscape natural components. Jurko (1985) and Miklós (1990) use the landscape-ecological significance of landscape components for evaluating the ecological quality of a landscape. The input data for calculating the coefficient of ecological stability are the data on components of the CLS and the coefficients of landscape ecological significance of components of the CLS. The calculation of the coefficient of ecological stability is based on four degrees, illustrating a low, average, high or very high landscape ecological quality.

3.5 Impact Assessment Methods

3.5.1 Matrices And Interaction Diagrams

Matrices usually take the form of a grid diagram or of a two-dimensional table for cross-referencing a list of actions with environmental impact parametres. Activities associated with various phases of a project or strategic action can be listed along one axis, with environmental components listed on the other. Inputs into a matrix can either be qualitative or quantitative. The simplest matrices indicate only the occurence of an impact without any references to magnitude or significance (see Fig. 3.5). In more sophisticated matrices, quantitaive estimates of impact magnitude and significance can be combined with a weighting scheme, leading to an "impact score". The advantages of using matrices have been described by Sadar (1996), and include:

- a visual description of the relationship between two sets of the proposal being assessed,
- an identification of the impacts of different phases of a project or strategic action,
- an identification of separate site-specific impacts affecting a region as a whole (even though it may be better to describe different aspects of a proposal, using separate matrices).

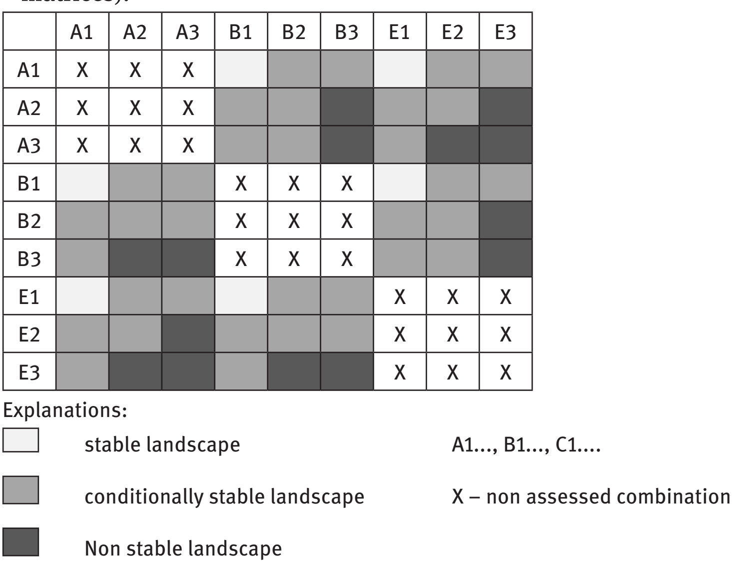


Figure 3.5: An example of a landscape stability matrix expressed through double combination of partial landscape stability. Source: Pauditšová (2014).

Several types of matrices have been used in environmental assessment practice, e.g. Leopold matrix, Peterson matrix, Component Interaction Matrix. Leopold matrix is probably the best known example. This matrix was designed for the assessment of impacts associated with most types of construction projects, listing 100 different project actions along one axis and 88 environmental characteristics and conditions along the other, including aspects of both, the biophysical and socio-economic environments. Also, it involves qualitative as well as quantitative information about cause and effect relationships.

3.5.2 Criteria, Thresholds And Indicators (Indices)

Indicators comprise selected features or parameters of environmental media or resources, representing broader measures of the quality/quantity of such media or resources. Indicators may specifically refer to either, numerical or categorized information which can be used in describing the affected environment and impact prediction and assessment (Canter, 1998).

Indicators, criteria and thresholds are used also for landscape visual and amenity assessment. Important information can be aggregated into overall scores. Landscape impacts include direct and indirect impacts of actions upon landscape elements and features, as well as impacts on the general landscape, character and quality of surrounding area.

Landscape indicators need to be targeted on measurable attributes. In this context, it is possible to define landscape characteristics that are measurable in a qualitative if not quantitative way. Landscape is taken to include both countryside and townscapes. Indicators need to provide a good indicator of change in landscape structure or character, have resonance (capture public attention), be capable of measurements and use meaningful data. The setting of objectives, targets and indicators should take place as part of the scoping stage of an EIA or SEA before baseline surveys are completed.

Landscape indicators that are based on a pressure–state–response framework have been quite often used within the framework of the so-called Landscape Heritage Assessment (LHA) and Landscape Character Assessment (LCA), especially in England, Scotland, Wales and Northern Ireland.

Figure 3.6 provides an example of transnationally approved indicators for a regional plan case study in Germany and Table 3.4 presents an example of agri-environmental indicators used in a Rural Development Plan in Slovakia.

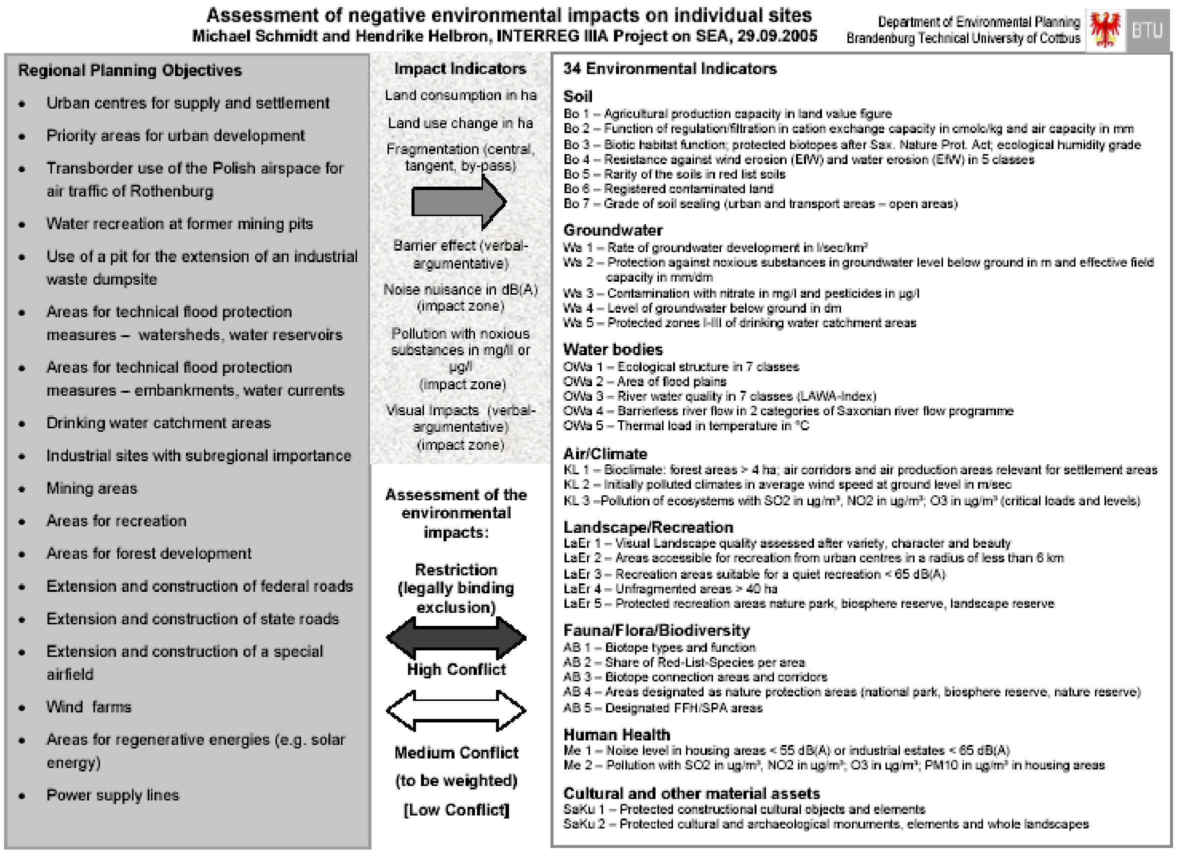


Figure 3.6: An example of transnationally approved indicators for a regional plan case study in Germany. Source: Helbron (2005).

Table 3.4: Agri-environmental indicators for project assessment. Source: Belčáková (2000).

Driving-Forces: Agricultural Investment Activities	Pressure: Indicators of Environmental Pressure	Pressure: Quantification of Indicators for Environmental Pressure
New agricultural buildings	Direct Impacts - Soil quality on the building site - Groundwater quantity on the building site - Atmospheric pollution - Landscape composition - Living conditions Indirect impacts - Water quality - Protected and planned protected areas - Other valuable areas - Endangered species	- removal of soil in m3 - decrease in water level in m1 - production NH4 in kg/yr - reduction of openness in m1 - number of related persons - eutrophication of ground- and surface waters by N and P mg/l - reduction in areas with high natural values in ha - idem - reduction of species in nr.of species
Land improvement, incl. reparcelling of land	Direct impacts - Water quantity - Soil quality - Protected and planned protected areas - Other valuable areas - Endangered species - Landscape - Living conditions Indirect impacts - Water quality - Soil erosion	- decrease in water level in m1 - loss of valuable soils in m3 - loss in areas with high natural values in ha - idem - reduction of species in nr - scale of landscape in m1 - number of related persons - eutrophication of ground- and surface waters by N and P in mg/l - loss of soil materials in m3
Irrigation/drainage sector	Direct impact - Water quantity - Water quality - Soil quality Indirect impacts - Protected and planned protected areas - Other valuable areas - Endangered species	- loss of surface water in irrigated areas in m3 - eutrophication and chemicals in ground- and surface waters in mg/l for N, P and pesticides - total salt accumulation in kg/ha - loss in areas with high natural values (wetlands) in ha - idem - reduction of species in nr.

Driving-Forces: Agricultural Investment Activities	Pressure: Indicators of Environmental Pressure	Pressure: Quantification of Indicators for Environmental Pressure
Water retention works (reservoirs)	Direct impacts - Water quantity Indirect impacts - Water quality - Protected and planned protected areas - Other valuable areas - Endangered species - Landscape	- reduce of discharge flow in m3 - eutrophication by increase retention period in P and N mg/l - loss in areas with high natural values (wetlands) in ha - idem - reduction of species in nr. - scenic value of landscape (qualitative measure)
Re-afforestation	Direct impacts - Water quantity - Water quality - Soil quality - Protected and planned protected areas - Other valuable areas - Endangered species - Landscape	- decrease in water level in m1 - increase in water quality in mg/l N and P - change of chemical loading of soil in heavy metals in ug/l - loss in valuable grassland ecosystems in ha - idem - change in species composition in nr of species - change in landscape pattern (qualitative measure)
Domestic water use	Direct impacts - Water quality - Health conditions	- reduction in N and P in mg/l - improvement in drinking water quality in nr. Persons
Local infrastructure/tourist facilities	Direct Impacts - Protected and planned protected areas - Other valuable areas - Endangered species - Landscape - Living conditions	- loss in areas with high natural values in ha - idem - reduction of species in nr. - scenic value of landscape (qualitative measure) - improvement of living conditions

Furthermore, management indicators can be useful for the assessment and monitoring of land use and land resource processes. Indeed, quality, value and functions of lands can evolve, as well as the benefits society gains from land. Some indicators have been defined in the framework of chapter 10 of Agenda 21, according to:

• land use change, which highlights changes in the productive or protective uses of land resources to facilitate sustainable land use planning and policy development,
• changes in land conditions, which measure changes in the productive capacity, the environmental quality, and the sustainability of the national land resource,
• decentralized local-level natural resource management, which represents the extent to which resource management is in the hands of landholders or other de facto local resource controllers; and partially represents whether local resource controllers and others with direct impact on resources have incentives to conserve them.

The World Bank, in collaboration with UNEP, UNDP, FAO and the Consultative Group on International Agricultural Research (CGIAR), has developed a Land Quality Indicators programme which seeks to develop a set of national and regional integrated indicators for national decision makers, taking into account spatial differences and national disparities. They are intended to monitor the effects of agricultural policies, the level of development of institutional capacities, the durability of land management, and other factors. At the regional level, the objective is to measure the performance and the impact of agricultural projects.

3.6 Presentation Techniques And Methods

Frequently used presentation techniques for landscape and visual impact assessment include *zone of theoretical visibility maps, photographs* to record the baseline visual resource, *diagrams* to provide a technical information (scale, shape and position) and *photomontages* or video-montages.

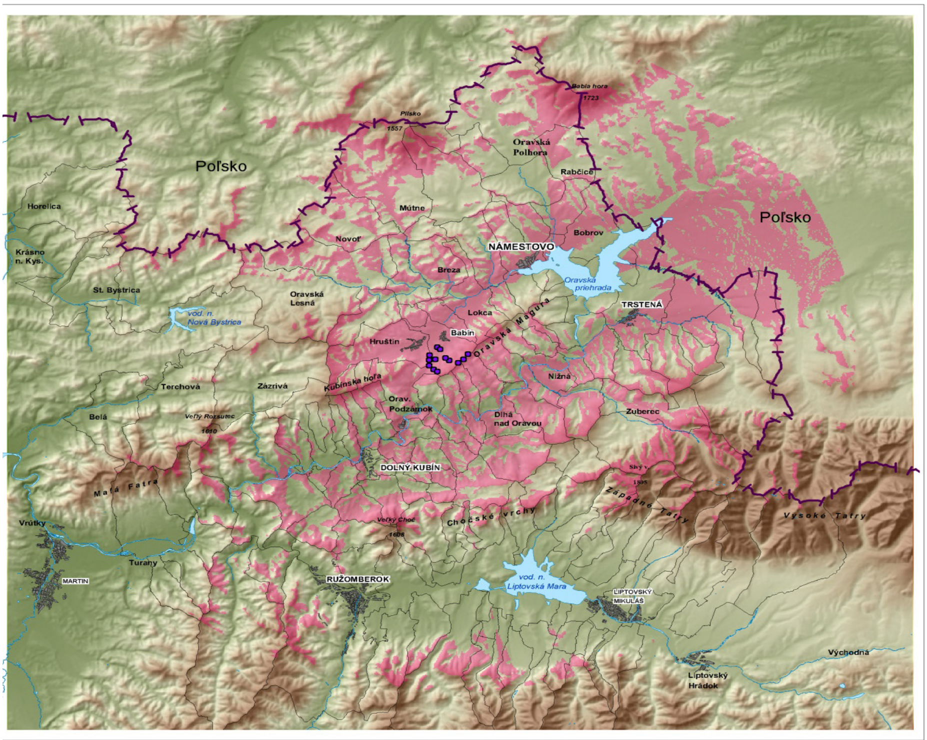
Photographs and photomontages are visualisation methods related to landscape evaluation (Canter, 1998) that can be applied in order to describe affected environments, as well as for impact prediction. They can be helpful to analyse the visual quality of the project site/affected area and the potential visual impacts of proposed actions. Their advantage is that they can show the development within real landscape and from known viewpoints. Various CAD systems help with their application. Photomontages are actually the superimposition of an image onto a photograph in order to create a realistic view of proposed potential visual changes. Figure 3.7. shows examples of computer generated photomontages.

When conducting baseline analysis of potential visual impact of a development, it is important to look at the visual characteristics of areas that are particularly sensitive to aesthetic impacts including the so called “*zone of theoretical visibility (ZTV)*“. These are areas of exceptional scenic quality that have some distinct or unique visual or cultural attributes, and/or areas that have a recognized natural or historical value (LI and IEMA, 2013). Sensitive locations and receptors within the ZTV are identified and presented on ZTV maps. The objective here is to illustrate how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the loss of existing elements of the landscape or intoduction of new elements (LI and EMA, 2013).

Within the context of a landscape impact assessment process, the visibility zone may represent a key factor in the decision about whether the project/plan shall be considered as having a cross-border impact. Figure 3.8 shows an example of the calculation of a visibility zone of wind power plants, where the visibility of these objects goes beyond the borders of the country carrying out the impact assessment.

Figure 3.7: An example of computer – aided photomontage of study area before and after windturbines installations. Source: Pauditšová and Pauditš (2007).

When conducting baseline analysis of potential visual impact of a development, it is important to look at the visual characteristics of areas that are particularly sensitive to aesthetic impacts including the so called "*zone of theoretical visibility (ZTV*)". These are areas of exceptional scenic quality that have some distinct or unique visual or cultural attributes, and/or areas that have a recognized natural or historical value (LI and IEMA, 2013). Sensitive locations and receptors within the ZTV are identified and presented on ZTV maps. The objective here is to illustrate how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the loss of existing elements of the landscape or intoduction of new elements (LI and EMA, 2013).



N

0 10 20 km

state border

boundary of cadastral territory

wind power plant

An area where the wind power plants (P1-P8+BH1-BH5) of height 179m are visible in relation to relief.

Figure 3.8: Calculation of the zone of potential visibility the windturbines in the cross-border area. Source: Pauditšová and Pauditš (2010).

To effectively present the visual transformation of a landscape in an environmental assessment process, it is appropriate to use digital animations. Software outputs permit to view the evaluated projects within a given environment or landscape in 3D, from different angles and from different cardinal directions. The models of the assessed objects are inserted into orto-photographic maps thus positively supporting imagination and helping in the decision-making process (see Fig. 3.9).

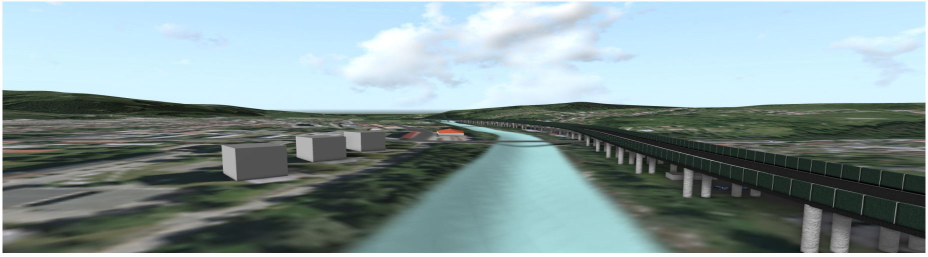


Figure 3.9: Visualization of planned line object (highway) in landscape. Source: Pauditšová et al., (2017).

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Ingrid Belčaková, Paola Gazzola, Eva Pauditšová

4 Public Participation And Sustainable Landscape Management

4.1 Introduction

Landscape is perceived differently by various stakeholders, as their experiences and understandings of landscape differ. In the assessment process, an expert evaluation should not be the only one which counts, as how individual stakeholders or a community perceive the landscape is equally important. For a community, landscape can represent the character, faith, and a vision of the past, present or future. A community in turn can be passive or active and anticipative in the way in which it expresses its perceptions about a landscape.

According to Prieur (2006), landscape is a space of daily scenes of day-to-day life of people and it plays a role in the human sense of belonging to a specific place and to a specific community. Those who discover landscape as visitors or as part of their work or day-to-day living, experience and develop their own impressions of a local landscape's character, which will then determine whether their experience was positive or negative. Furthermore, whether it enhances their quality of life or not, whether there are any conflicts and issues, and whether what they are experiencing is the kind of landscape that they would like in the future.

Public participation in landscape management plays a fundamental role in providing a mechanism, by which the *public exercises its rights to live in an environment that is adequate in terms of health and well-being* and fulfils their duty to protect both the landscape and the wider environment. In addition, public participation can *improve the quality and implementation of decisions and contribute to raising public awareness on the issues of landscape quality*. It can *promote accountability and transparency* in environmental decision-making processes.

Public participation in EIA and SEA is an essential requirement for *effective landscape impact assessment practice*, for *spatially relevant planning processes and programmes of conservation, planning and management of landscape*.

This chapter considers public participation in relation to landscape impact assessment within environmental assessment procedures at both, the project and planning levels. First it provides a review of definitions of public participation and of different forms of public participation, and of formal international requirements. Methodological issues in landscape impact assessment are then explored. Finally, recommendations for good public participation practice in landscape impact assessment are presented.

4.2 Background

4.2.1 Definition And Typology Of Public Participation

The term “participation” refers to an organized process by which the public communicates its needs and values, and by which the public can influence institutionalized power (Laurian and Shaw, 2008). It involves members of the public working in partnership with public authorities (and/or other stakeholders) to reach an optimal result in decision making. As noted by Meyer (2011), when applied to landscape planning and design, public participation is the working application of the justice aspect of sustainability, as it seeks to recognize and communicate the perceptions, needs and interests of all members of society, including those that are marginalized.

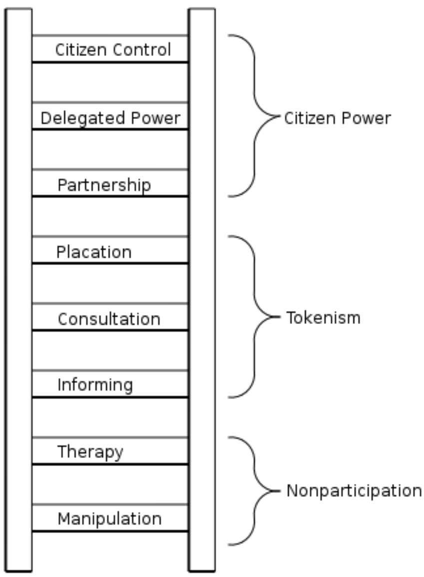
The importance of public participation is widely acknowledged; it seeks to influence decision-making, ensure accountability from public officials (Arnstein, 1969; Juarez and Brown, 2008), solve conflicts, and adjust or engage in the development of alternatives to established institutional and social power relationships (Crewe, 1997; Aschemann, 2004). Within a landscape based EIA or SEA process, public participation aims to (Glasson et al., 1994; Westman, 1985; Wood, 1995; Heiland, 2005):

- provide accessible and valuable information about the intent of activities and strategic development proposals, by informing landscape impact assessment and helping to identify weaknesses in impact assessment documentation,
- give voice to directly concerned groups or organizations about the impacts of a proposed development,
- reduce the risk of later time losses due to litigations or protest activities, by identifying and addressing potential issues at an early stage of an impact assessment process,
- result in innovative and publicly acceptable proposals for mitigation measures or alternatives development,
- educate citizens by increasing their involvement and awareness of shared responsibilities for the environment,
- ensure a more democratic way of decision-making that can lead to greater acceptance of a proposed activity, policy, plan or programme,
- enhance confidence in the planning process, making the next stages simpler and faster.

White (1996) noted that participation does not have a single underlying philosophical tradition or consensus of meaning. Without an explicit and shared framework of definitions and standards, many people can speak of “participation” but mean different things. The variety of ways participation is conceptualized is presented by examples of public participation typologies or levels in the text below. In this context Jones (2007) argued that the effectiveness of public participation is dependent on the degree to which the authorities allow real involvement by the public and different interest groups. A well known public participation typology is the one developed by Sherry Arnstein (1969) claiming that everyday citizens need more power. She has developed a typology of eight levels of participation (see Fig. 4.1). The eight types are arranged in a ladder pattern with each rung corresponding to the extent of citizens' power in determining the end product. Arnstein (1969) acknowledges that the model only recognises the differences between types of participation and does not analyze the reasons why these differences exist.

Similarly, Pretty (1995, p.1251) identified seven types of participation (Tab. 4.1), ranging "from manipulative and passive participation where people are told what is to happen and act out predetermined roles; to self-mobilization, where people take initiatives largely independent of external institutions". Pretty emphasizes that great care must be taken over using and interpreting the term participation (Jones, 2007).

Selecting and using only one type or approach to participation can be critical, because a single form may not be adequate to meet all of the requirements and demands of a differentiated public. The public in turn, should also take responsibility for its own positions and opinions, for the correctness and seriousness of their own attitudes to decision-making and for complying with the adopted decisions.



Levels 1 and 2- Manipulation and Therapy
-levels of "non-participation" and their real objective is not to enable people to participate in project or plan making, but to enable powerholders to "educate" or "cure" the participants.
Levels 3 and 4- Informing and Consultation
-citizens may indeed hear and be heard, but under these conditions they lack the power to ensure that their views will be heeded by the powerful
Levels 5 Placation
-token representation, watchdogs and rubberstamping by public
Level 6 Partnership
-Partnership that enables them to negotiate and engage in trade-offs with traditional power holders
Level 7 Delegated Power
-citizens have dominant decision-making authority over a plan. They trust there will be accountability. Power-holders start the bargaining to make changes
Level 8 Citizen Control
-participants or residents govern a plan, and negotiate the conditions under which non-residents or users can make changes

Figure 4.1: Ladder of participation. Source: Arnstein (1969).

Table 4.1: Typology of participation in development programs. According to Pretty (1995).

Type of participation	Description
Manipulative participation	Pretentious (make believe) participation with public representatives in official authorities, these representatives are not elected and have no decision-making power.
Passive participation	Public participates by being informed about what decision has been taken or what was already done. This includes the unilateral notification of the authority or the project manager without hearing the public's opinion. The information is shared only among external professionals.
Consultative participation	Public participates in a way that the issue is being consulted with it or it answers a questionnaire. The external agent defines the issue and the information-gathering process and thus reviews the analysis. Such a consultation process does not allow any sharing of decision-making and professionals are not expected to accept the public's opinion.
Participation for material benefits	Public participates by contributing to the resources, e.g. work for food, for financial rewards or for other material incentives (farmers can offer ground and/or work but they are not involved into experimentation or learning). This is very often called participation but there is no guarantee of continuing the activity when the material benefits are stopped.
Functional participation	Participation is organized externally as a means to achieve the project objective, especially at a lower price. Public can participate by creating groups in order to meet the predefined goals. Such involvement can be interactive and includes sharing decisions but tends to be applied only after the most crucial decisions have already been made externally. Or, at most, the public is invited to just identify external objectives.
Interactive participation	Public participates in joint analyzes, in development of action plans and in formation and/or strengthening of local institutions. Participation is perceived as a right, not as a means of achieving the project's intent. The process includes interdisciplinary methods that seek out multiple perspectives and use a systematic and structured learning process. Groups keep control of the local decisions and determine what resources are available for use, so the public has a share in maintaining the structure or activity.
Internal mobilization	Public participates by independently taking over the initiative to change the system from the external institution. Public develops contacts with external institutions in order to get advice on the resources and technical assistance it needs and it also maintains control over how these resources are used. Internal mobilization is widespread where the responsible authorities and non-governmental organizations provide framework support. The initiation of internal mobilization may or may not be a challenge to the existing distribution of prosperity and power.

4.2.2 International Context And Key Formal Requirements

Adopted by the United Nations General Assembly, resolution 37/7 of 1982, the *World Charter for Nature* is a soft-law document encouraging the world community, *inter alia*, to involve the public in environmental decision making. It states that the public should have the opportunity to participate in the formulation of decisions that directly concern their environment. This document has served as a starting point for many multilateral environmental agreements and is referred to in their preambles.

Similarly, Principle 10 of the *Rio Declaration on Environment and Development* recognises the importance of public participation in environmental decision making: "environmental issues are best handled with the participation of all concerned citizens, at the relevant level."

The *Convention on Environmental Impact Assessment in a Transboundary Context (known as the "Espoo Convention"),* shows the link between public participation and EIA. Article 2 states that members of the public potentially affected by proposed activities, irrespective of their state of residence, should have an equal opportunity to participate in environmental impact assessment procedures related to these activities. Furthermore, relevant EIA documentation should be distributed to the public within a reasonable time before the final decision is taken, and comments should be considered.

More specific obligations can be found in the *Protocol on Strategic Environmental Assessment to the Espoo Convention* which stresses in Article 8 that parties shall endeavour to provide early, timely and effective opportunities for public participation in the strategic environmental assessment of plans and programmes, ensuring that the public can express its opinion on the draft plan or programme and on the environmental report within a reasonable time frame.

Significant international position in global trends in public participation is attributed to the *UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters* of 25 June 1998 (*known as the "Aarhus Convention")*, which entered into force on October 30, 2001. Many European countries ratified the Convention in 2005. The Aarhus Convention (UN ECE, 1998) grants rights to the public, and imposes on Parties and their public authorities, obligations concerning access to information, public participation in decision-making and access to justice regarding the environment. The Convention operates from the premise that sustainable development can be achieved only through the involvement of all stakeholders, and links environmental and human rights, and environmental protection and government accountability. It focuses on interactions between the public and public authorities in a democratic context and particularly on accountability, transparency and responsiveness, within and between governments. The Almaty Guidelines on Promoting the Application of the Principles of the Aarhus Convention in International Forums were adopted in June 2005 with the primary purpose of providing general guidance to parties in applying the principles in the work of international organisations, which includes convention bodies (ECE/MP.PP/2005/2/Add.5).

The Aarhus Convention enhances the rights of the public in the creation and implementation of environmental policy and supports citizens and non-governmental organizations in pursuing their rights in environmental matters. Most of the countries of the UN Economic Commission for Europe worked on the preparation of this Convention and the preparatory process culminated in the signing of this Convention in Aarhus, Denmark. The adopted document sets the *minimum standard for the right to information, public participation in the decision-making process and justice in environmental matters*, which are based on the fact that everyone has the right to a healthy environment in accordance with sustainable development principles. This does not exclude, however, that the signatories move this standard further. This is what the national governments were invited to do by the representatives of non-governmental organizations during the Aarhus Conference.

According to the Aarhus Convention, the public concerned should be involved in decision making:

- relating to specific activities,
- concerning plans, programmes and policies,
- during the preparation of executive regulations and/or generally applicable legally binding normative instruments.

Within the context of environmental assessment, Articles 6, 7, 8 and 9 of this Convention are of particular importance with regard to public awareness, access to information, assessment of activities with trans-frontier effects and access to justice in environmental matters. Article 7 is particularly important in relation to public participation in processes concerning development plans, programmes and policies. The Article states that, “each Party to the Convention must take appropriate practical and/or other provisions ensuring public participation during the preparation of plans and programmes relating to the environment, in a transparent and fair framework, having provided the necessary information to the public. The public, which may be involved, must be determined by the competent public authority, taking into account the objectives of the Convention. Each Party shall, within reasonable limits, provide opportunities for public participation in preparation of policy (concept) related to the environment“.

As stated by the Implementing Guidelines to the Aarhus Convention (Stec, Casey-Lefkowitz, Jendroska, 2000) Article 7 makes a clear distinction between plans and programmes on the one hand, and policies (concepts) on the other. Aarhus Convention does not define the terms “plans“, “programmes“ and “concept“ (policy) and these terms are used without definition also by the Espoo Convention. It draws on their general common meaning. Concept (policy) can be understood as a “principle, plan (programme), as directing the activities“. Concepts are less specific than plans and programmes (the concepts relating to the environment). Plans include land use plans and regional development strategies, sectoral plans in transport, tourism, energy, industry, water management, health care, etc. But they may also include government initiatives to improve the environment, for example, aiming at the reduction of pollution, voluntary recycling programs, comprehensive strategies, such as national and local environmental action programs, health protection and others.

In the case of public participation in decision making on specific activities and when national laws related to the environment are infringed, access to justice rights should be exercised as foreseen in Article 9 of the Aarhus Convention.

The rules established by the Aarhus Convention and the SEA Protocol, and in the case of activities with potential transboundary effects, the Espoo Convention, should be followed. For instance, Articles 6 to 8 of the Aarhus Convention establish certain public participation requirements for decision making, including:

- timely and effective notification of the public concerned,
- reasonable timeframes for participation, including provision for participation at an early stage,
- a right for the public concerned to inspect information which is relevant to decision making free of charge,
- an obligation on the decision-making body to take due account of the outcome of public participation,
- prompt public notification of the decision, with the text of the decision and the reasons and considerations on which it is based, being made publicly accessible.

Another important policy to take into account, is the *European Parliament and Council Directive No. 2003/35/EC on public participation in the formation of certain plans and programmes relating to the environment,* which with regard to public participation and access to justice amends the Council Directives 885/337/EEC and 96/61/EC of 26 May 2003. This Directive implements the Aarhus Convention into EU law. In terms of public participation, the *Directive of the European Parliament and Council 2003/35/EC* is an essential legislation for all EU Member States. The Directive *provides for public participation in the drawing up of certain plans and programs relating to the environment*. It aims to promote accountability and transparency, and to strengthen public participation in decision-making. Both documents are based on three basic pillars (see Tab. 4.2). Overall, the Implementing Guideline (Stec, Casey-Lefkowitz, Jendroska, 2000) and Directive No. 2003/35/EC recommend that plans, programmes and concepts:

- provide tools to identify the public who should participate,
- establish clear procedures for submitting comments in writing or orally (e.g. during public hearings),
- establish clear rules for the public's involvement in the process,
- establish mechanisms for public announcements,
- establish guidelines and requirements (standards) on the quality of the information requested,
- monitor how public institutions respond (take into account) to comments received,

- provide some flexibility for public participation within the timeframe of the entire process.

Table 4.2: Basic pillars of the Aarhus Convention. According to UN ECE (1998).

1. FIRST PILLAR – public access to environmental information – this pillar declares the right of the public to access environmental information. The purpose of this pillar is therefore to ensure that the public has enough information to comment on environmental matters associated with development proposals in order to:
a) understand what is happening,
b) participate actively and with knowledge in the decision-making process, and in other activities.

2. SECOND PILLAR – public participation in the decision-making process – this is about enabling public participation prior to a decision being made, so that different possibilities can be scoped. The Aarhus Convention requires public input on:
a) decisions for particular significant activities,
b) decisions for plans, programmes and policies (substantial development concepts),
c) the development and approval of laws of general application that may have significant effects on the environment.

3. THIRD PILLAR – public access to justice in environmental matters in the decision-making process. It creates guarantees for those whose environmental rights have been violated, by offering a fair assessment through independent authorities (for example, by courts). Access to justice is not only seen in relation to the first two pillars; it also lays down certain other rights for the public to influence the proceedings of public institutions, individuals and legal entities on matters of environmental protection, and public access to justice.

The *European Landscape Convention* (Council of Europe, 2000) within the national general measures stipulates an obligation to "create conditions for the participation of the general public, of local and regional authorities and of other parties interested in defining and implementing landscape policies aimed at protecting, managing and planning the landscape“.

The Convention determines general obligations for public participation under Arts. 1, 5 and 6 (see Tab. 4.3). Prieur and Durousseau (2006) stated that ‘‘as perceived by people’’ implies that the views of all groups should be included, not just the views of academics or of the political elite. The author explained further that landscape protection, management and planning are hence to be concerned with the characteristics of the landscape that the involved population wish to give recognition to in their surroundings. Specific measures that the signatories are obliged to undertake include the identification of landscapes and analysis of ‘‘their characteristics and the forces and pressures transforming them’’; and assessment of landscapes, ‘‘taking into account the particular values assigned to them by the interested parties and the population concerned’’.

Table 4.3: Public participation according to the European Landscape Convention. Source: Council of Europe (2000).

Article 1—Definitions Art. 1 a. "Landscape" means an area, *as perceived by people* . . . Art. 1 c. "Landscape quality objective" means, for a specific landscape, the formulation by the competent public authorities of the *aspirations of the public* with regard to the landscape features of their surroundings.
Article 5—General measures Art. 5 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 . . . landscape policies . . . .
Article 6—Specific measures C Identification and assessment Art. 6 C 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: i) to identify its own landscapes throughout its territory, ii) to analyse their characteristics and the forces and pressures transforming them, iii) to take note of changes, b) to assess the landscapes thus identified, taking into account *the particular values assigned to them by the interested parties and the population concerned*. D Landscape quality objectives Art. 6 D. Each party undertakes to define landscape quality objectives for the landscapes *identified and assessed*, *after public consultation in accordance with Article* 5.c.

Articles 5.*c* and 6.*d* of the European Landscape Convention highlight the need to put in place procedures for participation. The reason behind is to give legal recognition to the special features of landscape (landscape exists because it is visible). A landscape policy which involved only experts and administrators, would result in landscapes that are imposed on the public, similarly to when landscapes were produced by and for the elite.

Democratisation of the landscape is not just a question of the new scope introduced by the European Landscape Convention; it is also reflected in the collective and individual appropriation of landscapes, through the requirement that there be direct participation for all, in all phases of decision-making (Sarlow-Herlin, 2003; Prieur and Durousseau, 2006) .

In relation to the European Landscape Convention, several proposed activites should be implemented by signatories, such as landscape awareness and education, training and research in landscape matters and in the procedures for participation and the integration of landscape protection in different sectoral policies.

4.3 Public Participation Methodology

Public participation in landscape impact assessment is undertaken within both, project related assessment and strategic environmental assessment following the regulation of the European EIA (EC, 2014) and SEA (EC, 2001) Directives.

Various forms of public participation do not take place separately from the procedural stages of an environmental assessment procedure; rather, they should go hand in hand as a way of ensuring quality control and public accountability (Jones et al., 2005; Fischer, 2007). When considering the methodological approach to adopt, questions about who should participate, when participation should occur, and how or with which methods are important (Aschemann, 2004).

4.3.1 Who Is The Public And Who Should Participate?

In deciding who has the authorization to enter participatory decision-making, Jones (2007) lists several groups: the officials, groups of entrepreneurs, the professionals and the general public; men, women children; the residents, the visitors; the inhabitants, the immigrants; the different ethnic groups. According to Prieur and Durousseau (2006), the term 'public' should be taken to mean "civil society in the broad sense". Diamond (1994, p.62) defines civil society as "the citizens who collectively act in the public sphere, expressing their feelings, ideas, exchanging information, achieving common goals, making demands on the government, and calling public officials to behave responsibly. Civil society represents an intermediary sphere standing in between the private sphere and the state". Putman (2007) sees the importance of a civil society as a help in building trust between citizens, and in strengthening beliefs in common values that form the basis for co-operation on common goals that could then feed into the political sphere.

The public cannot be regarded as a monolithic or unchanging entity. Rather we can say that it is a constantly changing set of people, who are grouped based on a common understanding of interest. It is therefore necessary to accept that there are different types of public and that these different types can have different numbers of members. The basic trend is that the number increases in parallel with a growth of interest and involvement on a specific issue. This is because citizens are involved and participate when they feel that an issue affects them (they do not participate if they believe that they are not affected or if they think that their participation is unlikely to influence matters or have an impact on the decision-making process).

When designing procedures for public participation it is very useful to consider two fundamentally different positions of the public. These are the public as a *vehicle for information* and the public as a *recipient of information* and commenting entity.

– Public as a vehicle for information

In this position, the public's role is that of an expert on local conditions who can precisely and with a great deal of responsibility assess the implementation of specific projects or plans (programmes). A public which has its own way of collecting information and is in contact with the local reality, can enrich the knowledge base of planning and the evidence basis of impact assessment. Citizens' opinions, beliefs, feelings and values ought to be recognized and respected to foster a state of cooperation, rather than a state of distrust and alienation. A state of distrust could be very dangerous and result in lengthy debates which could lead to the mobilization of activists and mass media, who can occasionally dominate the field. Experience and knowledge of the people, their memories and feelings are therefore invaluable information that can represent an essential guarantee for successful and good practice.

– Public as recipient of information and commenting entity

In this position, which we encounter more often, the public acts as one of the participants in the processes of planning, environmental assessment and decision-making. This position is contingent on the amount of data and availability and accessibility of information on all issues relating to a proposed development, and on their consequences. In this context, the public operates in an atmosphere of partnership, whereby public input is no longer restricted to the consideration of consequences or adverse effects, and expressed as a manifestation of "rebellion". Rather, as a recipient of information and commenting entity, the public will enter into manifestations of conscious involvement with positions worthwhile defending.

What follows on from the above is that when designing or planning public participation exercises, it is important to distinguish between the various subdivisions of the public. These may include:

- individuals who are directly affected by the potential resolution of identified issues,
- individuals who are potentially interested in the same issues,
- individuals or groups who may become concerned, if they are supplied with additional information,
- officials in management and self-governing bodies affected by the given issue,
- individuals who have been informed about the issue, but have decided that they will not be participating (as yet).

Although the public includes every citizen, all citizens are not participating citizens. As public participation processes never reach the entire public, it is more appropriate to talk about involving the public, rather than citizens. The process of actively engaging a citizen towards the consideration of public concerns may vary according to different countries' national specificities, resulting for example, from the level of maturity of a democracy or from the degree of respect that the principle of citizenship may have in different countries.

Who should be involved in landscape planning and assessment depends on the decision-making level as well as on the relevant topics and focal problems identified in each individual policy, plan, programme or project. As specified by Haaren et al. (2008), the regional or supra-regional level is mainly aimed at officials in the government administration. At the local level the members of public (or spokespersons of user groups) are involved to a greater extent. Involving the public in the decision-making processes of local authorities is a challenging and difficult task. At the same time, it can be a rewarding experience which enhances both the legitimacy of decision making and the value of the decision taken.

4.3.2 When And How To Involve?

Public participation exercises should take place in the early stages of an environmental assessment or planning process, or when a conclusive decision has not yet been made. The timescale for public participation should be long enough so that the public can become familiar with the development proposal, and give input at various stages of the environmental assessment or planning process (Heiland, 2005).

The scope of participation is extremely wide and takes in very different stages of decision making. The participation arrangements and stage may vary according to whether a question is national or local. *The identification and assessment processes* should be part of it, as is the *setting of landscape quality objectives* followed *by establishment of proposed criteria and actions* (see Fig. 4.2 and Tab. 4.4).

Within the EU context, the EIA and SEA Directives specify the steps and activities in which the public should be involved in:
• screening,
• scoping,
• during the preparation and consultation of the environmental report,
• providing information on the decision and about the approval of the proposed plan or programme or plan.

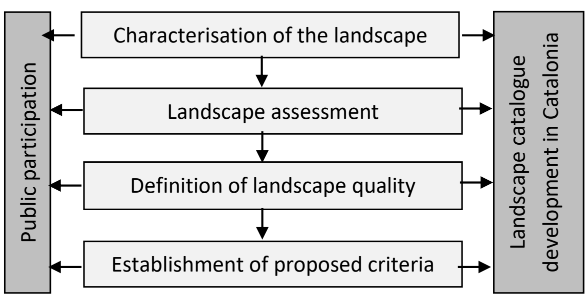


Figure 4.2: The example of public participation at each stage of developing the landscape character types (landscape character catalogue) in Catalonia. Adapted from Nogue et al., (2010).

Table.4.4: Description of stages of developing the landscape character types (landscape character catalogue) in Catalonia. Adapted from Nogue et al.,(2010).

Step 1 Characterisation of the landscape
Goal: Identification of territorial areas with similar characteristics as well as the more subtle and symbolic elements which define it (analysis of the distinctive features of the landscape).
Result: Division and classification of the land into areas with the same character, which are known as landscape units (or landscapes); theya re areas characterised by a number of elements which make them different from the rest of the territory and contribute to making them unique in their own way.

Step 2 Landscape assessment
*Goal: S*tudying the threats and opportunities for the landscape, taking into account its configuration, evaluating the dynamics and factors which have an influence, as well as looking into how it may change in the future.
Result: Participation in this stage played a role in improving the landscape assessment carried out by the team who developed the catalogue and in noticing distinctive features of the local environment that may get missed out in a more general study. Participation also helped to reflect on the importance of the threats and opportunities that were detected.

Step 3 Definition of landscape quality
*Goal: D*efining landscape quality objectives, which are the expression of the landscape preferences of a society, after understanding its state, values and risks.
Result: Quality objectives were determined based on the opinions gathered during the participatory processes, from citizens and from the main social and economic agents in each territory (what kind of landscape do we want).

Step 4 Establishment of proposed criteria
Goal: Proposals of criteria and actions for each landscape unit that will put into effect the landscape quality objectives defined in the previous stage.
Result: The proposed criteria and actions are prepared to be incorporated into spatial planning via landscape directives made by the Ministry of Town and Country Planning and Public Works. Participatory processes related to establishing criteria and actions were carried out, but it was necessary to help the participants that were not experts in this subject.

Both Directives require that the assessment is done early and in a transparent manner to ensure public accountability, but the level of participation is limited to the obligation to inform and involve the "public concerned". It is the appropriate authority who determines the relevant procedural details, including the details about the methods for informing and consulting the public as well as the range of bodies and/or institutions that deal with the protection of the environment.

However, as stated by Wood (1995), often participation and disclosure occur before the end of the approval process and in some environmental assessment systems, public participation is part of screening and scoping procedures. For example, in the Netherlands public participation focuses on the scope of the evaluation and and on the assessment of the Environmental Report. In Germany, public participation occurs mainly during the screening scoping stages. In Slovakia, public participation public participation is often reduced to commenting on the draft plan or project based on the

Environmental Report. More details about public participation in the Slovak Republic are provided in Table 4.5.

Table 4.5: Public participation in environmental assessment in the Slovak Republic. Source: Authors.

Communication on strategic document, or intent
During this stage, public participation occurs in the forms of information and consultation:
- The public is informed about the communication on a strategic document, respectively on the intent by the municipality concerned and may get acquainted with it within the specified period,
- Within the specified period from displaying the notice on a strategic document, respectively intent by the municipality the public can submit written comments.

Screening procedure
During this stage, the public's involvement is restricted to receiving information:
- The public is informed about the final decision without undue delay,
- By studying the document, the public can verify acceptance of their comments,
- In decision-making within the screening procedure, the opinions of the public are taken into account.

Scoping assessment and, where appropriate, also the timetable for the next stages
In this step public participation occurs through information and consultation exercises:
- The public is informed about the scope of the assessment without undue delay
- By studying the document, the public can verify acceptance of their comments
- The competent authority may consult the scoping document, and where appropriate, also the timetable for next stages
- In scoping, the opinions of the public are taken into account
- The public may submit comments on the scoping document.

Environmental Report
As required by law, the public is both informed and consulted on the Environmental Report:
- In the actual preparation of the Assessment Report there is much scope for consultation with the public and/or obtaining information from the local experts
- The public is informed about the Assessment Report by the responsible competent authority
- The Report is displayed within the given period of time at a specified place at the responsible competent authority
- The public may send comments on the Assessment Report
- By studying the document, the public can verify acceptance of its views

Public hearing on the Assessment Report
As the very name suggests, in this step the public is informed and consulted:
- The affected municipality in cooperation with the applicant must hold a public hearing (or the municipalities may agree on a joint public hearing)
- Oral or written comments from the public are included in the records of the public hearing

Expert opinion
During this stage, the public is neither fully informed nor consulted. A summary of the public's views must be taken into account and contribute to informing the experts' opinion:
- The expert opinion must take into account evaluated views, opinions and comments from the public
- If necessary, the author of the expert opinion may consult with the public

Final Opinion
In this step the public is only informed:
- The public is informed about the final opinion by the responsible competent authority concerned
- The final opinion must be based also on the views of the public
- The public may control the extent of acceptance of their comments and opinions by studying the document

Publishing the results of an environmental assessment, is an organic component of a participatory process, as it is only making the results available for a sufficient length of that effective public participation can be expected. Choosing the correct approach to publishing the results, in terms of when, where and what should be published based on the established customs of a given environmental assessment system, is also important.

The practice of public participation whilst expected in project level EIA, can be more challenging in SEA, in terms of both, design and expected outcomes. This is because strategic intents, expressed in the forms of policies, plans or programmes, are more abstract and their consequences are more difficult for the public to grasp. Due to the more reactive and site-specific nature of projects, evidence from practice indicates that the public tends to be more active in EIA processes. Projects that fall within the remit of an EIA, such as the development of a power plant, landfill or highway, are more tangible, making the description of the potential impacts on the environment, on the economy and on the well-being of a specific community or locality easier to identify and describe. However, the site-specific nature of EIA and the more tangible effects of a proposed project development, can make public participation exercises in EIA vulnerable to the so-called NIMBY (Not In My BackYard) and LULU (Locally Unwanted Land Uses syndromes). Both LULU and NIMBY-isms can occur because of context-specific circumstances, which might reflect particular cultural, socioeconomic or political dynamics. In these cases, the dilemma for the responsible competent authorities is that whilst on the one hand they require the public's input; on the other hand, the public's input might be uncontrollable, costly and slow the planning process (Pretty, 1995).

The differences in the public's behaviour in participatory exercises in EIA and SEA have been described by Heiland (2005) as a "participatory paradox". Despite SEA providing the public with a greater opportunity to influence proposed plans and programmes and shape future development activities at the project level, the public's interest lessens. Thus, in SEA the public's interest in participating decreases as the strategic content of the proposed development increases. In these cases, seeking input from the "qualified public" could be of some assistance, with representatives of the public likely to include NGOs and experts (Lee, 2006).

Finding ways to ensure the effectiveness of public participation exercises, and overcome the participation paradox or NIMBY and LULU behaviours (Buchecker, Hunziker, Kienast, 2003), is important. On this basis, reflecting on what might be preventing the public from participating and on how to motivate the public to participate might be of assistance.

In many cases, however, despite the existence of information and efforts to engage the public, the public remains in the position of a "silent majority". In fact, the public can choose if they want to participate and when. They can choose whether they want to be part of a voicing minority or of a silent majority. It is worth noting that a silent majority can also act as a voicing minority, as whilst remaining silent, the public can revise its position at any time and choose to become actively engaged and participate in the decision-making process.

4.3.3 Public Participation Tools And Techniques

Techniques of participatory planning, facilitation and mediation and more general procedures for activating individual responsibilities can stimulate one's interest to become actively engaged in an environmental assessment process. The choice of appropriate tool and/or technique for engaging the public is very important. It is necessary to carefully consider which one would be best suited to a particular situation, to the nature of the subject and object of the assessment. Further, it is helpful that the appropriate tool and/or technique is selected and applied by trained and unbiased experts. A list example of the most widely used techniques for engaging the public is provided in Table 4.6.

In relation to public information, many tools and techniques are available that are used as a *one way communication channel*. These include the use of media (e.g. newspapers, radio, TV, magazines, information boards), printed materials (e.g. brochures, press releases, promotional materials, leaflets) or electronic form (e.g. bulk E-mails, websites). Tools and techniques which generate a *two-way information* channel enable the public to act as "recipients" of information, and to fulfil a more active role as "carriers of information". The most widely used methods include meetings such as round tables or workshops with experts, press conferences or exhibitions, which are mainly used at the conceptual stages of an assessment process, for example, when formulating alternatives to the proposed development.

There is no exact formula for selecting a method or technique. Different methods and techniques require different time scale and resources (e.g. the establishment of an Internet line is relatively cheap, but TV advertising can be very expensive). Managing and updating a website requires a lot of time, but publicly accessible map documentation can be implemented fairly quickly. When selecting a method or technique, one has to keep in mind the environmental and demographic profile of the public to engage in the process, and the nature of the proposed development, and its potential impacts on the environment, economy, and community, as well as the technological, organisational and resource implications associated with different methods and techniques.

Table 4.6: Example of tools and techniques for public participation. According to UNEP (2002), Risse and Rauschmayer (2005), Heiland (2005) and Aschemann (2004).

Method	**Description**	**Application**
Deliberate voting	aimed at ascertaining as accurately as possible the views of the public on a particular issue. It takes place in the form of a questionnaire before and after the selected group has received relevant information related to the open issue. In the meantime, between the two questionnaires the group can discuss the newly acquired information.	support for significant decisions at national and international level.
Delphi	discussion of selected participants taking place without their personal meetings by filling out a questionnaire on the open issue. The questionnaire is distributed to all participants repeatedly. With each round there in a deeper discussion in order to seek and reach a consensus.	predicting trends, formulating the desirable state or looking for means for its achievement.
Open Doors	a public meeting that can be attended by citizens at any time within a predetermined period in a prearranged room; there is information available as well as people who are aware of the topic are ready to discuss it. Citizens can be informally informed and at the same time present their ideas to address the specific issue.	activities for general public with the opportunity to speak to each person separately; the public will get information rather than comment on the issue.
Focus Group	a planned structured discussion with a small number of participants; managed by an experienced facilitator in a safe environment; the objective is to get information about the preferences and values of people related to the given topic; the method can be understood as a combination of a targeted interview and a discussion group. It can also be an on-line meeting.	identifying people‘s views on issues, market research, identifying views on politics, etc.
Future search conference	the planning process during which different opinion groups meet to discuss the common past, present and, in particular, the future.	strategic participatory planning in municipalities, non-profit organizations and in companies; little time - big group - many trends.
Interactive exhibition	a combination of informative and consultative (or even decision-making) tools for working with public. The exhibition should, in particular, inform about the given topic. At the same time, it can be a forum for surveys and/or interviews for collecting views on a specific issue.	spatial planning, plan of an important project with a significant impact on inhabitants (bypasses, reconstruction, etc.)

Method	Description	Application
Consensual conference	public group discussion on a socially controversial topic; the selected group has an opportunity to consult with experts and then discuss so that it results in a consensual opinion as the basis for a political decision.	appropriate when addressing issues related to the use of new technologies.
Methods of mapping public areas	the territory is analyzed and/or mapped with the participation of citizens and incentives for its revitalization are collected; the effort is to describe the territory from different angles and then share the views. The group of methods include: city walk, mental mapping, perception mapping and sensual maps.	revitalization of square, city park, school garden and others, suitable for analyzing the perception of the place.
Panel of experts	a method for summarizing and synthesizing a wide range of data and information and creating a final report that is a set of recommendations for solving the issue being studied. Alternatively, a general overall vision related to the issue may be designed.	panels are used as consultative bodies of government, ministries, etc.
Planning cell	evaluation of public opinion by working with smaller, randomly selected groups that discuss the chosen topic over a longer period of time. Its result is a civic report that is submitted as a basis for decision-making in the issue.	used abroad for governmental decisions at national, regional and local levels.
Planning of creation and revitalization of public areas	one of the most common ways of involving the public in decision-making processes; its result is visible in relatively short time; there are several techniques that can be used for public engagement in planning public areas, these techniques can also be applied in other participative projects.	identifying the current use of the area under consideration, collection of public views on possible improvements.
Work group	the basic public engagement techniques; a group of 5 to 15 people repeatedly meet to resolve the given project, topic or intention; an important element for the functioning and outputs of the work group is its composition that should correspond to individual interest groups concerned by the issue being discussed.	problem solving, policy-making at all levels of public administration.
Citizen’s jury	a smaller group of citizens / jury addressing a particular issue; presents to the authorities the basis for a decision; experts and representatives of different opinion streams can be asked to appear before the jury as “witnesses“ at hearings; the jury discusses possible solutions and tries to achieve a consensual conclusion.	learn the public opinion on a specific controversial topic.

Method	Description	Application
Round table	one of the most traditional and most common methods of group discussion; the key principle is the equality of participants that is symbolically anchored by a circle; this can be achieved by arranging the debating participants as well as by a well-balanced discussion facilitated by an experienced moderator.	widespread form of group discussion.
Open Space Technology	a very informal and democratic method allowing the sharing of personal experiences and insights into the chosen topic; the detailed content of the meeting - a specific topic for discussion - is formed by the participants themselves and they themselves are the engine and facilitator of the whole process.	structuring of conferences, professional associations; it requires openness and individual approach, voluntary and active participation.
Scenarios for the future	based on the narrative, a description of possible future situations; it is not an estimate or a plan for the future but a description of a possible development that is determined by key trends and/or events; it is about creating alternatives that can inspire strategic decisions and planning.	analysis of complex events and events with a relatively long time horizon.
Creating a community vision	a method aimed at creating a long-term plan for development of a municipality or territory with the simultaneous selection and progressive implementation of the topics with short-term priority.	combining views of citizens in terms of the long-term development of the municipality, strengthening the responsibility for partial changes in the municipality.
Public hearing / discussion	it allows presentation and discussion of major projects and intentions; the presentation is provided by responsible persons - designer, official, etc.; a facilitated and documented discussion and a collection of oral and written comments on the project/intention could also be parts of these hearings.	major projects and intentions.
World Café	allows a medium to large groups of participants to share experiences, opinions and search for answers to predefined questions; the method can be used alone or as part of a larger action or process.	personal dialogue with people in a larger group, opening vague opinions, method applicable e.g. as part of a conference, a planning meeting.

4.4 Good Practice Principles In Public Participation With Regard To Landscape Issues

As noted in the previous sections, public participation plays an important role in the assessment of impacts on the landscape. It is essential for reaching a common understanding and agreement on key issues of landscape that are often subjective, or neglected, as participatory exercises can identify local interests and values that otherwise can be very easily overlooked.

The basic principles for public participation in both, landscape planning and assessment processes, clearly include the *aspect of democracy* which allows for the inclusion of the broad public and of other entities. The opinions and comments of the public should be respected at all stages of assessment, planning and decision-making processes, based on a working partnership inspired by fairness and by the mutual cooperation and compliance with the agreements adopted (Hanusch and Fischer, 2011; IEA and LI, 1995; Heiland, 2005).

Another significant principle is *making the public interested*. Public participation entails accepting the public as an immediate and equal entity to other planning and assessment stakeholders, with whom a relationship based on dialogue and communication is necessary. In this context Jones (2006) summarized the following basic principles:

- fairness for all participants,
- identification of needs of specific groups,
- protecting the interests of the local community,
- recognizing the complexity of property rights while maintaininglandscape diversity,
- achieve modus vivendi among the interests of visitors,
- listening to immigrants in environmental matters.

Another principle to take into account, is mantaining the public engagement through time. Apathy on the part of the general public is a commonly experienced problem in planning and assessment processes. So once secured and engaged, it is essential to cultivate the public's interest, so that their enthusiasm can be used as a resource for voluntary work (Jones, 2007), or to feed into other decisionson projects, plans or landscape initiatives that might concern them.

The use of new technologies, such as information and communication media, can substantially support participatory processes. In particular, the use of geographic information systems (GIS) for both, presentation and analysis purposes, and the provision of data on the internet, open up diverse opportunities for communicating information and for participation. The take-up of digital technologies are further contributing to making public participation not only smarter, but also more wide-reaching and more cost- and time-efficient. However, it is worth acknowledging that going smart can also narrow the parameters defining who can participate, as it restricts participation to those who have access to the appropriate technology (whether a computer, smart phone or handset) and to those who are IT-literate. Examples of good practices regarding promoting public participation can be very useful (see Tab. 4.7).

The landscape participation is not possible without the commitment and involvement of planners, politicians and members of the administrations. The provision and maintenance of information on the internet, the target group-specific and topic-specific presentation as well as the organisation, implementation and technical accompaniment of the participation process involves additional work and services which take up the time of the landscape management authorities or the planning consultants engaged to draw it up, especially at local level (Haaren et al., 2008). Local governments need to actively support the involvement of the public in planning, legislation, implementation and at the assessment stage to provide feedback to specialists in landscape planning and assessment, understand the positions and competences of involved individuals and groups as well as identify potential conflict situations as early as possible.

Table 4.7: Example of public participation process during Catalonia landscape catalogue development. Source: Nogue et al., (2010).

Tool	Stages of Catalonia landscape catalogue preparation	Main target	Advantages	Disadvantages
Telephone survey	Characterisation and assessment	To get an initial sense of how citizens perceive the landscape and where they stand in relation to it. To find out about the values which people attribute to landscapes, both the tangible (historical, social) and the intangible ones (aesthetic, symbolic, identity- based).	Conclusions can be drawn about a larger percentage of the population given the representativity of the sample target of the study. Enables a high level of control over answers as it guarantees the usefulness and facilitates the analysis of the data obtained from the structured questionnaire. Generates a significant volume of information.	Does not create the space for debate or interaction between agents. Does not encourage reflections and in-depth analysis. Does not allow for any other facts beyond what is confined to the questions in the survey to be reflected on. Makes it difficult to understand the more experiential dimension of the landscape.
Opinion poll	Characterisation and assessment	To get an initial sense of how the population, experience and value the landscape, as well as their aspirations for it.	Reaches people who would not otherwise have participated using more voluntary methods. Generates a large amount of information Enables a high level of control over answers as it guarantees the usefulness and facilitates the analysis of the data obtained from the structured questionnaire. Takes into account the emotional dimension of the landscape. Makes it possible to link social and demographic aspects to the perception of landscape. The use of a semi-structured questionnaire includes a high percentage of open questions which allows for a richer analysis.	Does not create space for debate or exchange of ideas between interviewees. Does not encourage reflections or in-depth analysis. Does not encourage consensus in the perception of landscape. Does not allow for any facts beyond what is confined to the questions of the survey.

Tool	Stages of Catalonia landscape catalogue preparation	Main target	Advantages	Disadvantages
Public consultation via the web	Characterisation, assessment and determination of landscape quality objectives	To get a sense of their perception of the landscape, to identify values and to contrast some of the results obtained by the team who developed the catalogues.	It is possible to get a large number of contributions at a relatively low cost. Photographs and maps can be used, which help to illustrate the landscape catalogue or make answers to the consultation easier. Information about the consultation can spread by word of mouth, for example by forwarding the web link of the consultation by email Access is simple; it only requires a computer with internet connection. The landscape unit format brings the scale of study closer to citizens in general. The virtual platform that is created can be used for subsequent consultations, which means that the cost of each new consultation goes down.	Does not allow for dialogue and communication between participants. Does not give an overview of a representative sample of the population of the area. It is difficult to reach all age groups, given that the older sector of the population (over65) cannot easily access the internet and are therefore almost completely excluded. Does not enable participants to give very in-depth answers.
Interviews with agents	Characterisation and assessment	To find out their opinion on key issues, values, characteristics and challenges related to the landscape.	Makes it possible to get in- depth information on the landscape. Makes it possible to get in- depth information on the landscape. The content of the interview can be modified as it goes along, according to what is of interest in the conversation.	Does not create space for debate Reaches a small number of people.

Tool	Stages of Catalonia landscape catalogue preparation	Main target	Advantages	Disadvantages
Discussion groups	Assessment and determination of landscape quality objectives	To exchange and analyse ideas in order to create a group discourse, qualitatively different in content from the sum of individual discourses.	Forges communication through dialogue and debate between agents If it is used in the middle stage of the participatory process, the discussion group helps with the work of subsequent procedures, given that it widens the range of recorded discourses and it engages people in debate so as to build consensus. Achieves a high degree of in- depth contributions by the groups and it enables people to get to know each other.	Makes it difficult to control certain types of personality(dominant or shy characters, favouritism). It is difficult to ensure that the conversation gets to a truly effective place, given that it takes a lot of skill to lead the group towards mutual empathy in the minimum time possible. Requires an extra effort in planning the sessions due to working with a group, given the difficulty of ensuring assistance for each invitation.
Workshop with agents	Determination of landscape quality objectives and establishment of criteria and actions	To stimulate debate between various landscape agents with completely different visions on the same subject.	Stimulates debate between agents. Makes it possible to identify areas of consensus and of disagreement.	Does not guarantee that those who are shy or are not used to speaking in public will contribute. Makes it difficult to reach people not very knowledgeable in the subject.

Tool	Stages of Catalonia landscape catalogue preparation	Main target	Advantages	Disadvantages
Workshop with individuals	Assessment and determination of landscape quality objectives, establishment of criteria and actions	To debate on the values, key issues and challenges to the landscapes of the territorial areas.	Points of view emerge that do not come out in individual interviews. It shows how attitudes and opinions arise and change. Opens up the range of approaches and values that emerge when dealing with landscapes. It blends technical and experiential knowledge in order to reach a richer collective analysis, while generating group- based knowledge. Encourages social learning about the landscape.	Only reaches a limited amount of people. It becomes an expensive method if the whole area of the landscape catalogue is to be covered. Restricting it to a limited territorial area has its risks. Requires an extra effort for planning group sessions, having to make sure every time that those invited will be able to assist.
Open workshop	Characterisation and assessment	Open to all those interested in the landscape catalogue, introducing the catalogue, explaining at what stage it was at, and collecting the opinions of those attending.	Makes it possible to reach a large number of people. Generates debate among those who participate in the workshops. Can be linked to the initial stage of giving out information about the participatory processes.	Doesn’t make it possible to go into depth on certain subjects given that the workshops take place at the start of developing the landscape catalogues.

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Eva Pauditšová, Peter Pauditš, Paola Gazzola, Ingrid Belčáková

5 Case Studies

5.1 Introduction

The case studies presented in this chapter are illustrations of the approaches and methods introduced mainly in chapters 1 and 3. The cases are very different in nature and purposes, with the three Slovak cases reflecting EIA/SEA consultation practice of the authors. A total of five case-studies are presented, namely: a visual impact assessment of new ski resort objects in the Low Tatras mountains in Slovakia, a visual impact assessment of a wind park in southern Slovakia, a landscape and visual impact assessment of a new residential complex in Piešťany - Banka in Slovakia, a landscape character assessment in County Durham in the UK and a landscape-led approach to a major rail infrastructure project (HS2) in the UK. While the first three cases focus on methodological issues and illustrate the practice of landscape and visual impact assessment; the latter two cases look at the wider planning, assessment and decision-making processes in which landscape is taken into account.

The visual impact studies in Slovakia were developed to assess the effects of proposed activities on the landscape in terms of scenery and image, and to establish the extent to which the characterising features of a landscape would be affected by the proposed development. Different assessment techniques were used in each presented Slovak case study.

The County Durham Landscape Character Assessment (LCA) brings different context, and it can be easily applied within both SEA and EIA processes. This case showed the importance of evidence, and of the development of a GIS system which was not only used for the LCA, but for a number of other planning strategies and applications. This case is often cited in the UK as an example of good practice (LCN, 2006; LI, 2015).

The Buckingham District Council landscape-led approach to HS2 (UK) represents a positive example of a decision-making process that is sensitive to landscape. It shows how different participants to the process, who have different values and views about landscape and about the proposed high-speed rail link, can work together, co-produce or co-develop a solution that meets different agendas.

5.2 Case Study 1: Assessment Of Visual Impacts Of New Ski Resort Objects In The Low Tatras Mountain (Slovakia)

5.2.1 Background

The Low Tatras mountains in Slovakia represent a very attractive natural environment that is intensely used for recreational purposes. Two of the most popular ski resorts "Chopok – North" and "Chopok – South" that have been providing their services for several decades are located in this mountain range (see Fig. 5.1). The existing ski centres are frequently visited and are popular among both local and foreign visitors. Many sport events, including world cup competitions in alpine disciplines, have taken place here. Moreover, the two Chopok centres have the potential of offering long-term and short-term tourism not only in winter, but also in the summer. There has been a proposal for an investment project designed to connect these two ski resorts – "Chopok – North" and "Chopok – South" in this part of the Low Tatras. Part of the project was to enhance the existing ski resort area called Jasná (in Chopok – South) to emphasize its current recreational significance, and to build several new buildings, located on visually exposed locations. Overall, Tatra Mountain Resorts, as the developer, planned to restore the historic interconnection between the Northern and Southern parts of Chopok using modern facilities, to modernize the current system of mountain transport facilities on both the Northern and Southern sides of Chopok, to enhance the range of downhill tracks, renovate the snow system and construct the complex of accommodation and catering facilities and additional services. The proposed project was subjected to an environmental assessment within a landscape study in order to identify potential visibility impacts on the landscape.
The new objects featuring in the development proposal include (see Fig. 5.2):

Chopok – North (Chopok – Sever)
- Pistes for downhill skiing (Ostredok, Rodinná, SKI IN-SKI OUT),
- Departure rescue track,
- Cable cars and lifts (Lúčky – Priehyba, Lúčky – Priečno),
- Poly-functional building Lúčky,
- Technical and operating nodes (Priehyba and Chopok),
- Poly-functional complex Centrum1 and Centrum2,
- Housing complex Liptov (hotel, flat houses, apartment building),
- Toboggan run,
- Construction of or reforming of the snow-making system,
- Snowblocks.

Chopok – South (Chopok – Juh)
- Departure rescue track,

- Cable cars and lifts (Krupová – Chopok, Krupová – Jelenia lúka, Jelenia lúka – Zadné Dereše, Jelenia Lúka – Predné Dereše),
- Poly-functional building Krupová,
- Cycling tracks,
- Maxiland,
- Snow-making system.

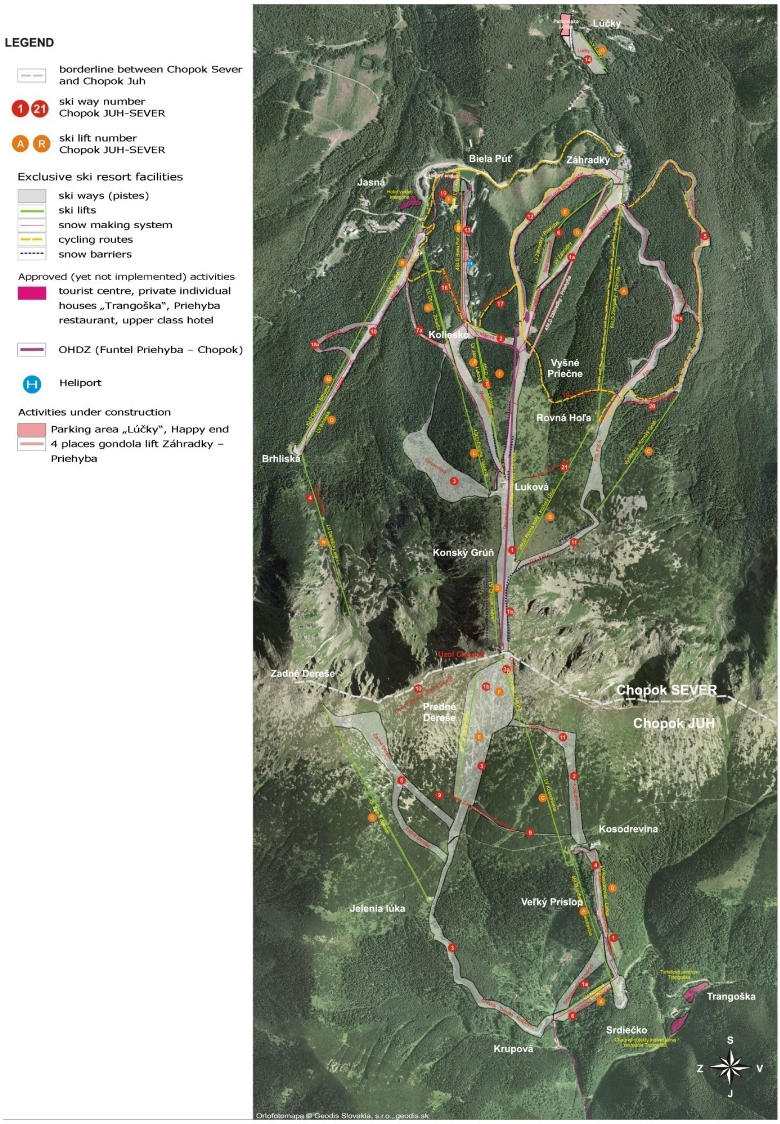


Figure 5.1: Ski centres before the development proposal implementation (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová and Pauditš (2010).

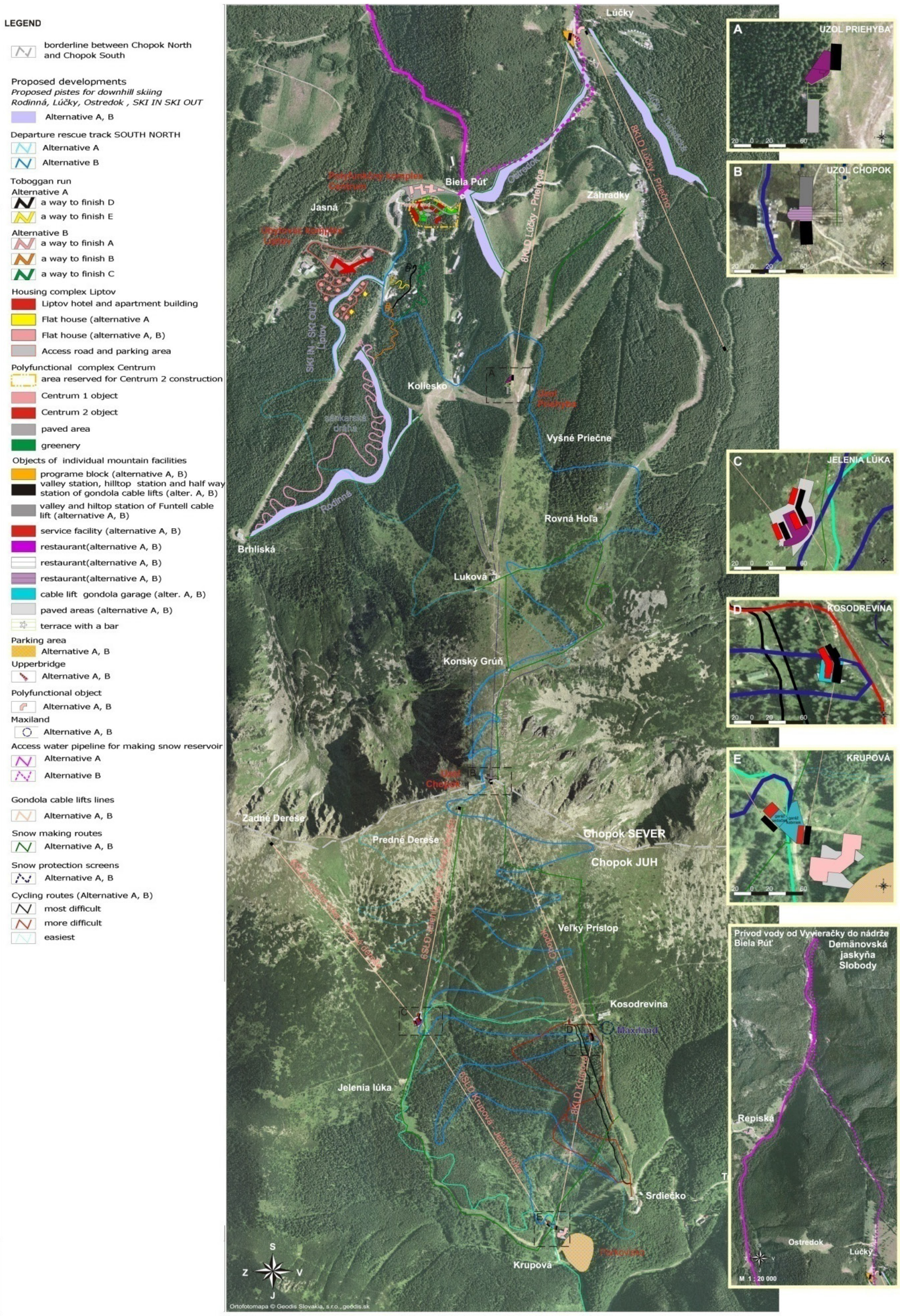


Figure 5.2: New proposed objects in ski centres (new construction objects and technical works). (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová and Pauditš (2010).

The aim of the assessment was to show from what area the new development proposals would be visible, and the extent to which it would impact the landscape. The proposals for locating new development activities were therefore examined through landscape and visualization studies.

5.2.2 Area Description

The development proposal is located in the National Park of Low Tatras (Slovakia). From an administrative point of view the territory is situated in two regions, two districts and two cadastral territories: Demänovská Dolina (Demänovská Valley) and Horná Lehota in the districts of Liptovský Mikuláš and Brezno, respectively.

In terms of relief, the area consisted of extremely rugged alpine mountains. This is an important factor to consider when calculating the visibility range. The geology of the territory is formed by granite and schist and also by dolomite, limestone and other sedimentary rocks. The extensive Demänovská karst area and part of Ďumbier karst, are connected to the limestone complexes of the Low Tatras. Demänovská Valley belongs to the most important karst areas in Slovakia. Rendzinas, leptosols, cambisols, podzolic and lithic soils are present in the study area.

The Demänovka river, with its three main tributaries (Priečny potok, Zadná voda and Otupnianka) flows through the territory of Demänovská Valley. The middle part of the river basin passes through the karst area. Vrbické mountain lake, a natural pool of glacial origin, is located there.

Positions above 1,500 m asl are characterized by a very cold climate with average temperatures in January of -7 to -8°C, and on the main ridge of about -9°C (Climatic Atlas of Slovakia, 2015). The area is in a very humid district, the average amount of precipitation in the mountain areas reaches 800-1,500 mm per year. The annual rainfall exceeds 1,400 mm in the mountainous areas and reaches 1,600 mm at the highest peak, Chopok. Snow cover lasts about 100 to 200 days, depending on the precise location (Climatic Atlas of Slovakia, 2015). Because of the extensive precipitation, there are therefore a large number of windy days with a harsh climate, with cold winters. Throughout the year there are only a very few days when the weather could be considered ideal for observation of the surrounding landscape. Even good visibility can radically change during the day, which is typical for an alpine region. The evaluation of visual quality of the examined area is therefore based on the prerequisite of there being good conditions for landscape observation.

The Low Tatras mountain range is among the areas with the highest number of plant species in Slovakia. The timber line extends to an altitude of 1500-1550 m asl, with the mountain pine subalpine zone reaching an altitude of 1800-1850 m asl, and the alpine zone above that. The composition of vegetation is affected by humans. Intensive forest management is reflected in changes in the forest structure, particularly by an absolute dominance of spruce (Michalko et al., 1987).

The diverse habitats and varied topography have conditioned high fauna species richness, including many rare, endangered, endemic species of vertebrates (e.g. marmot, chamois) and invertebrates of cave spaces.

The study area is part of the Low Tatras National Park and its buffer zone since 1978, and is under the 2nd and 3rd levels[11] of nature protection (Regulation of SR No. 182/1997, Regulation of SSR No. 119/1978). The area of national park of 728 km^2 and its buffer zone of 1,102 km^2 makes it the largest national park in Slovakia. The territory of the Demänovská Valley study area contains one National Nature Reserve (Demänovská Valley), and two National Natural Sites (Demänovská caves and Vrbické Lake). The caves of the Demänovská Valley were included in the list of wetlands of international importance under the Ramsar Convention on Wetlands in 2006 under the number 1647. Next to the planned facilities, there are NATURA 2000 sites and several other sites are listed as important for the protection of species.

5.2.3 Methodology

Key factors to consider in visualisation studies of landscapes with dominant features are relief and landscape structure. Relief is typically defined as the difference in height between the high point and the low point on a landscape, measured in metres. It represents therefore the extent of visibility of a landscape, including its constituting features. If the relief area is less rugged, with minimal differences in terrain altitude, it is quite likely that the dominant objects will have very high visibility. If the relief is rugged with significant height differences, the visibility of landmarks from different observation points will not be clear. In the case of a flat landscape, without terrain obstacles, the visibility of a proposed development under assessment is very high.

The case study reviews the visibility impact assessment of proposed new objects and facilities in the existing ski resort. The relief pattern of the area represented a significant limit for calculating the visibility of objects in landscape (Bishop, 2003; Blake and Sekuler, 2005; Hlavatá and Pauditšová, 2001; Snowden, Thompson and Troscianko, 2012). The second most significant limiting factor for visibility is the weather representing the current state of atmospheric conditions. In this respect the assessment of the visual quality of the assessed area was based on the theoretical assumption of good conditions for landscape observation.

11 The Nature and Landscape Protection Act in Slovakia specifies five levels of nature protection. These levels have a clear linkage with the protected areas management categories. The extent of restrictions increases depending on the increase of the level of protection. The Act defines 5 basic and two additional protected areas management categories, namely protected landscape area (2nd level), national park (3rd level), protected site (4th level), nature monument and nature reserve (5th level)

The visibility range of a landscape represents the "visual connectivity" of a landscape area. It determines which part of the landscape is visible from a designated point, under certain horizontal and vertical angles, and which part of the landscape is hidden from the observer's vision. When establishing the visibility of individual elements in the landscape, the factors that are most often taken into account are: position of the observer in relation to the surroundings; dynamic/static position of the observer; morphometric characteristics of the relief; climatic and light conditions; visibility of selected objects and phenomena in the landscape in terms of their salience; curvature of the Earth (in terms of ellipsoid parameters used in the current cartographic representation).

The case study calculated the visibility for each element of the proposed development in the Jasná Resort Low Tatras. The visibility range distance was set at 20 km. Given the characteristics of the Jasná Resort Low Tatras, from a spatial point of view, this distance allows to determine which buildings do not impact the landscape's image. Studies of landscape visibility most often work with distances of a 15-35 km range. Distances greater than 35 km would be irrelevant, because observing objects in detail would be impossible (Pauditšová and Pauditš, 2010).

The process of visual impact assessment of planned objects in the Low Tatras resort had four basic stages:

- Preparation of raster map data,
- Preparation of vector map layers,
- Calculation of the visibility range of objects,
- Interpretation of visibility maps of assessed objects in the landscape.

The visibility of new objects was calculated using the GRASS GIS software, using r.los (line-of-sight analysis program) module, algorithm to calculate the visibility without the curvature of the earth factor (Izraelewitz, 2003; Khawaja, 2008). Individual outcomes were then linked using the r.patch and r.mapcalc modules. The input for the calculation and topographic contour data came from the digital elevation model from the NASA CGIAR-SCI Shuttle Radar Topography Mission (SRTM) database, version 4.1 from 2000-2004 (Farr et al., 2004; Rodrigues et al., 2005) with a resolution 3" (approximately 90 m). Visibility analysis therefore presents a status that would arise, if we examined the objects under assessment without any barriers in the terrain, whether natural or anthropogenic. Elements of the current landscape structure therefore did not enter the calculations, as these indicators were not critical given the nature of the territory and the dimensions of the objects.

To calculate the visibility range in GRASS GIS the input parameters for the r.los software included the following (Pauditšová and Pauditš, 2010): cartographic coordinates of objects under assessment (X, Y) in S-JTSK; digital model of the relief; relative altitude of points entering the calculations above ground, and radius – the distance from the object being observed, within which the visibility range was calculated (selected distance was 20 km in all directions). The results of visibility calculations are raster maps with cell values 1 or 0. Those with 1 represent places visible from the given observation point, and vice-versa, values with 0 are locations hidden from the sight of the observer. Each raster cell, where the calculated value is 1, is visible from the given point or the assessed object is visible from the area given by the raster cell. 12 separate calculations were made in total. Objects that were assessed are illustrated by Figure 5.3.

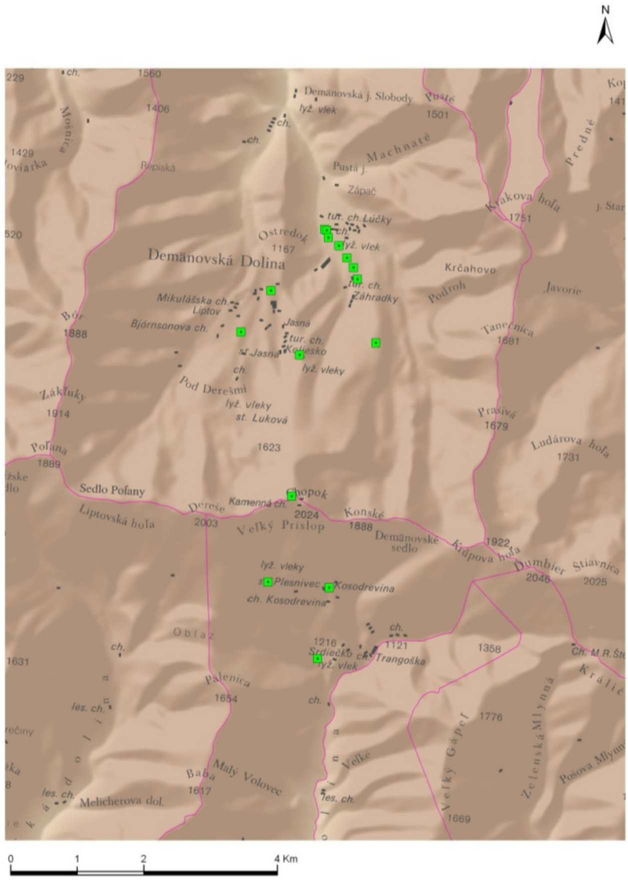


Figure 5.3: Points, from which visibility was calculated for assessed objects. Adapted from Pauditšová and Pauditš (2010).

By applying the above methodology, the visibility was calculated for the following objects and locations:

- Objects at Lúčky site (the highest objects: bridging and multipurpose object, altitude 12 m),
- Valley station of gondola cable lift Lúčky – Priečno (height of the highest object: 3.5 m),

- Hilltop station Lúčky – Priečno (the height of the object is 3.5 m above the ground),
- Objects at Priehyba site (height of the highest object: 6 m),
- Objects at Chopok site (height of the highest object: 11 m),
- Objects at Liptov site (height of the highest object: 26.4 m),
- Downhill track Ostredok (height of the object 1 m above the ground),
- Objects at Jasná (centre) (height of the highest object: 24 m),
- Objects at Krupová (height of the object 15 m above the ground),
- Objects at Jelenia lúka (height of the object 10.5 m above the ground),
- Objects at Kosodrevina (height of the object 15 m above the ground),
- Objects at the Jasná Resort (North and South).

In visibility calculations, besides the standard parameters resulting from the methodological procedure, the height of the highest object in the given location was taken into account.

5.2.4 Assessment Results (Outputs)

Figures 5.4 to 5.15 indicate the areas from where the relevant assessed object or a set of objects will be visible. Based on findings of the visibility analysis, it can be stated that the visually more affected areas are in Chopok – South (these correspond to the locations of Kosodrevina and Jelenia lúka). In Chopok – North, the presence of deep valleys with surrounding slopes and ridges represent a natural visual barrier to the distribution of visibility over longer distances. All calculated visibilities relating to the area of Chopok – North, because of the rugged relief, have local importance.

Surface area, from which the future objects in the part Chopok – South will be visible (minimally up to a distance of 20km, or even more) is quite extensive (Fig. 5.13). Again, this is due primarily to relief conditions. In this part of the area the relief is not as rugged as in the North, the valleys are not cut-in to the same extent and the slopes are not as steep. On the contrary, Chopok – South features large flat slopes covered by scrubs, which do not act as a visual barrier.

The key visual barrier is the main ridge of the Low Tatras. The highest occupancy of an area, from which it is expected that the new object is observable is illustrated in Figure 5.6, showing the visibility of the top station of an 8-seat gondola cable lift located on Chopok. This graphical output confirms that the best view is at the highest elevation point above sea level. In this case, the only factors limiting visibility are the weather conditions. As mentioned above, ideal atmospheric conditions occur only for a few days in a year. Figure 5.15 shows the calculated visibilities for the area.

The findings confirm the key position of the relief as an input parameter in the calculations of visibility of objects in the landscape. On the basis of exact calculations, it can be stated that due to the rugged relief the negative visual effect of new objects in Jasná Resort Low Tatras, will be minimized.

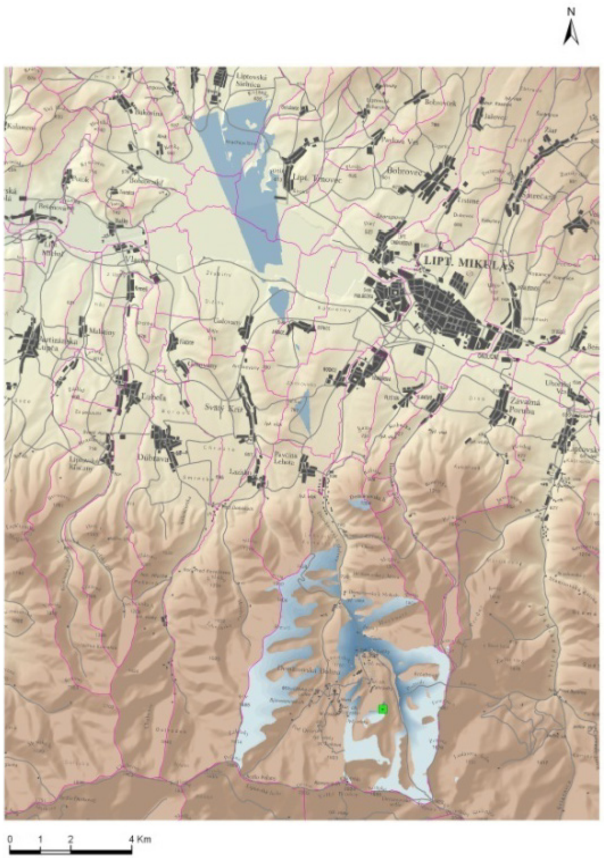


Figure 5.4: Area from which objects in Lučky site are visible (the highest objects: bridging and multifunctional building, height: 12m). Adapted from Pauditšová and Pauditš (2010).

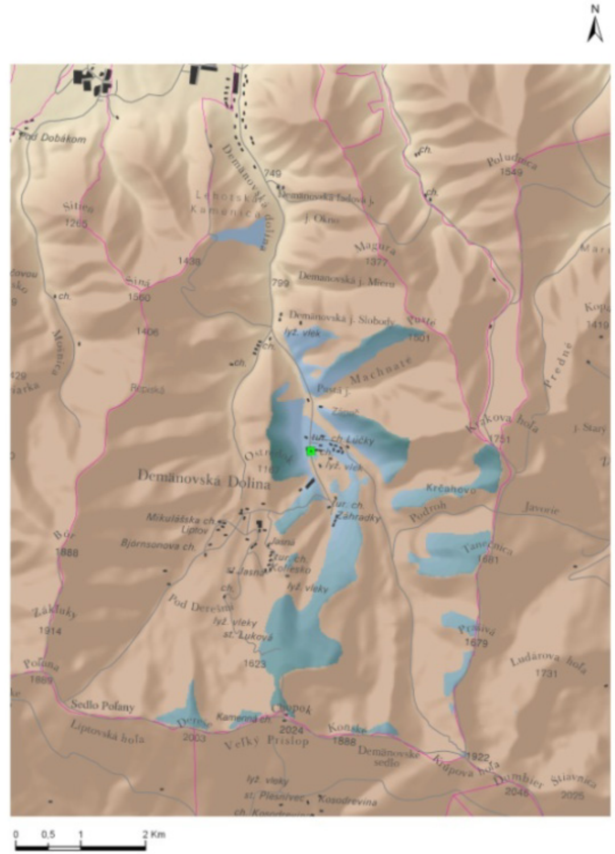
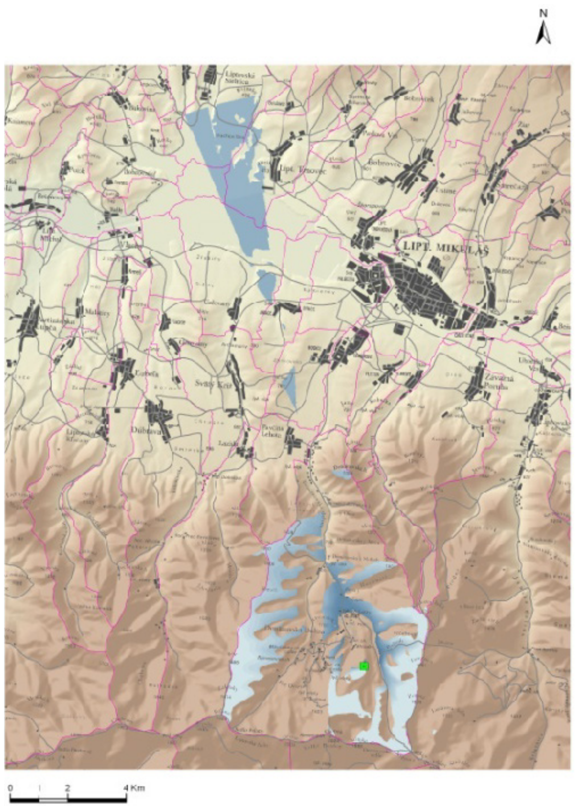


Figure 5.5: Area, from which valley station of cable lift Lučky-Priečno will be visible (height of the highest object: 3.5m) Adapted from Pauditšová and Pauditš (2010).



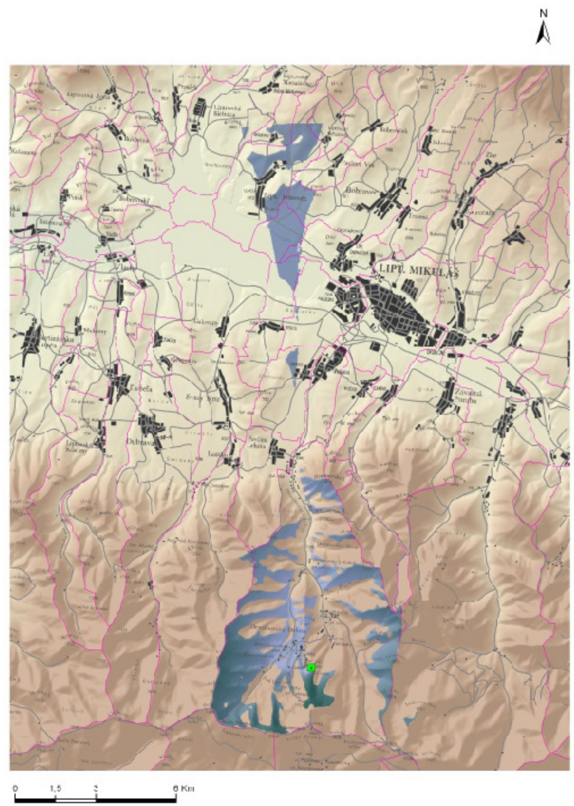


Figure 5.6: Area from which the top station Lučky – Priečno will be visible (height of the object: 3.5 m above the ground). Adapted from Pauditšová and Pauditš (2010).

Figure 5.7: Area, from which objects in the Priehyba site are visible (height of the highest object: 6 m). Adapted from Pauditšová and Pauditš (2010).

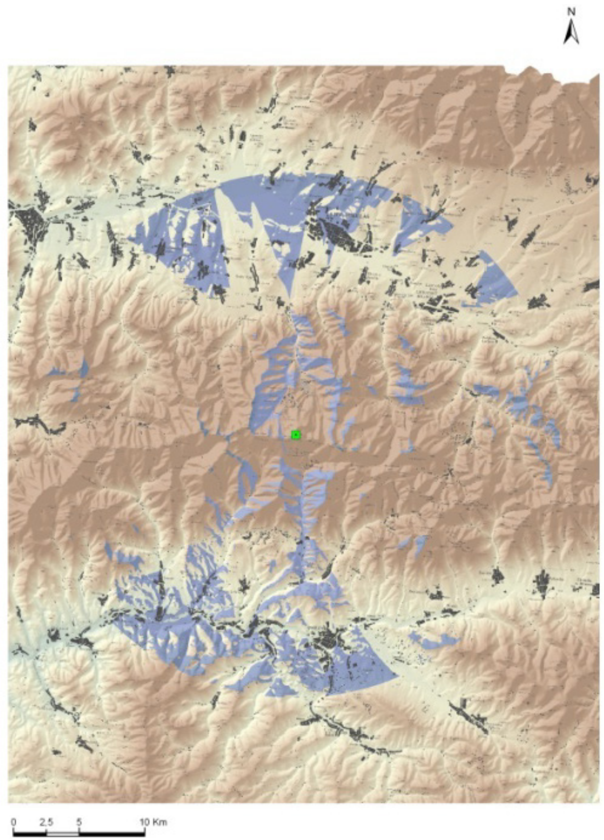


Figure 5.8: Area from which objects in the Chopok site are visible (height of the highest object: 11m). Adapted from Pauditšová and Pauditš (2010).

Figure 5.9: Area, from which objects in the Liptov site are visible (height of the highest object: 26.4 m). Adapted from Pauditšová and Pauditš (2010).

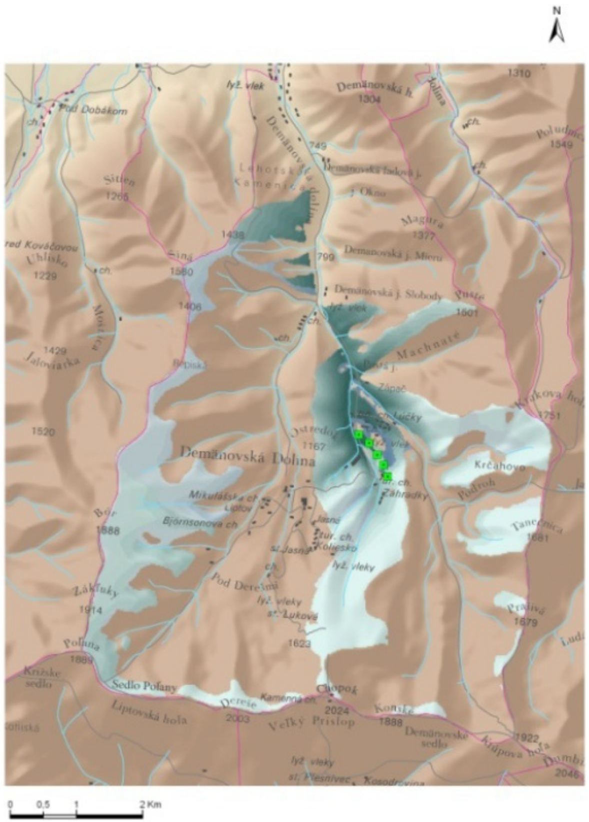


Figure 5.10: Area from which the downhill piste Ostredok will be visible (height of the highest object: 1m above the ground). Adapted from Pauditšová and Pauditš (2010).

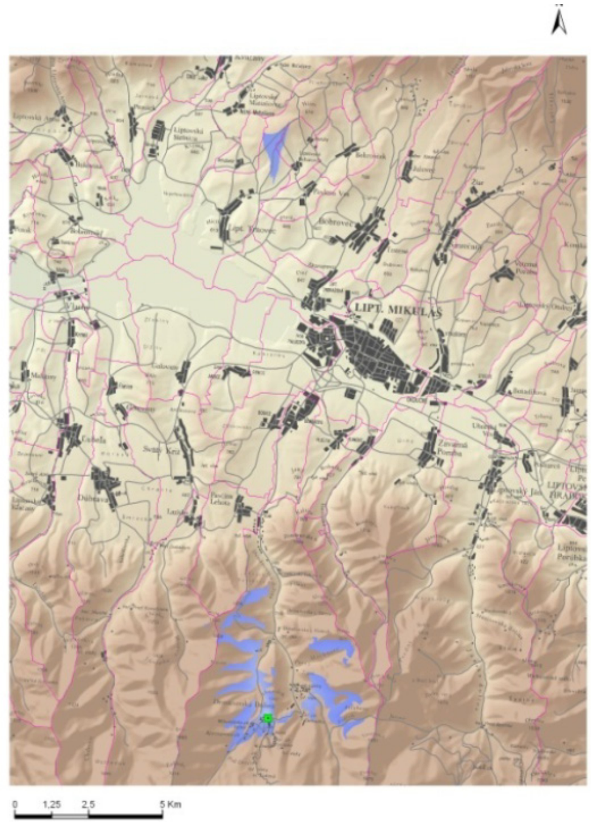


Figure 5.11: Area, from which objects in the Jasna (centre) are visible (height of the highest object: 24 m). Adapted from Pauditšová and Pauditš (2010).

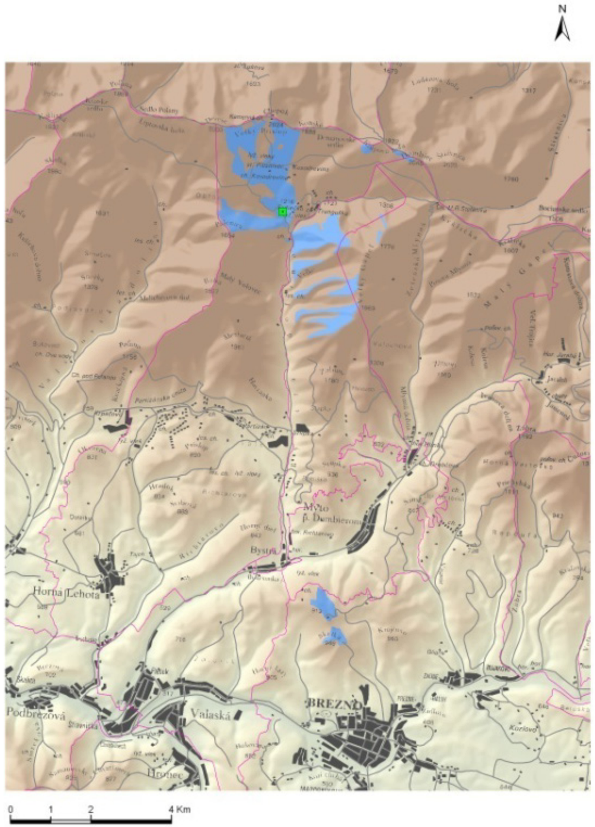


Figure 5.12: Area from which objects in the Krupova will be visible (height of the object: 15 m above the ground). Adapted from Pauditšová and Pauditš (2010).

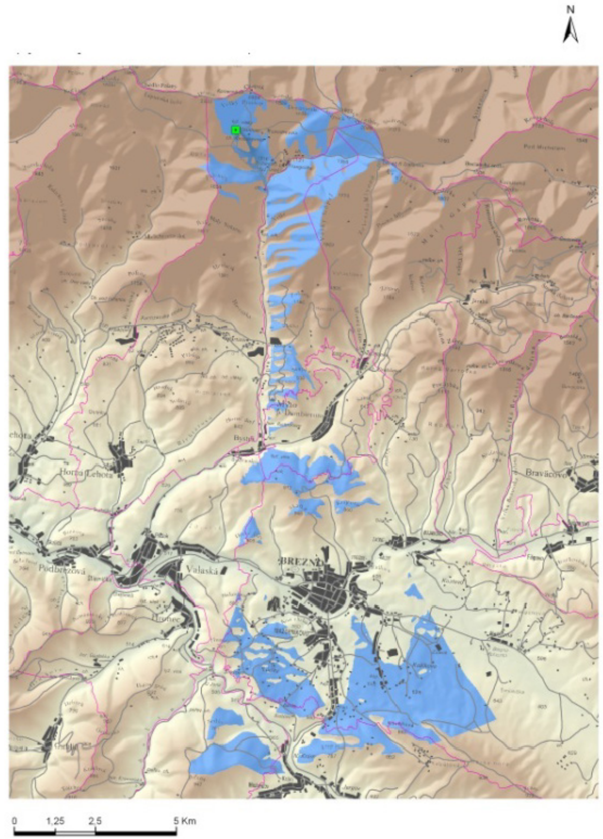


Figure 5.13: Area, from which objects in the Jelenia lúka site will be visible (height of the object: 10.5m above the ground). Adapted from Pauditšová and Pauditš (2010).

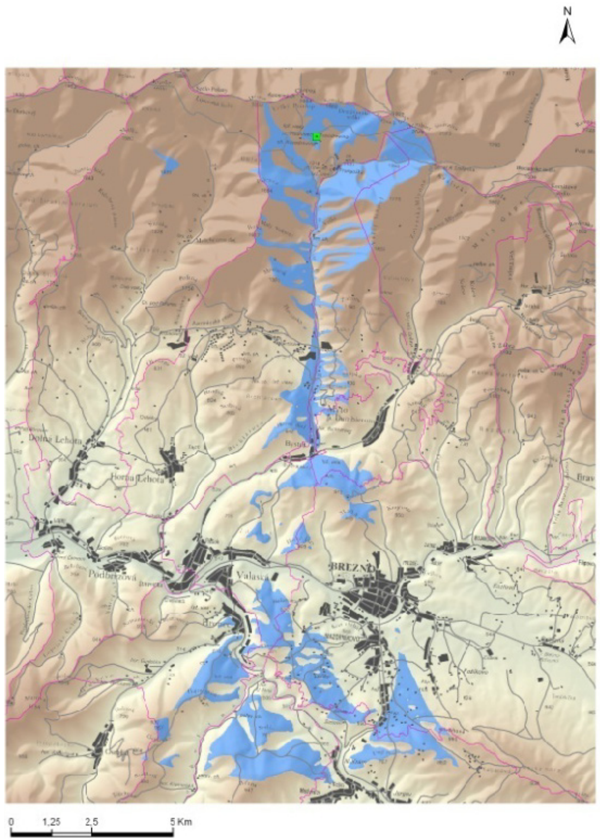


Figure 5.14: Area from which objects in the Kosodrevina site will be visible (height of the highest object: 15 m above the ground). Adapted from Pauditšová and Pauditš (2010).

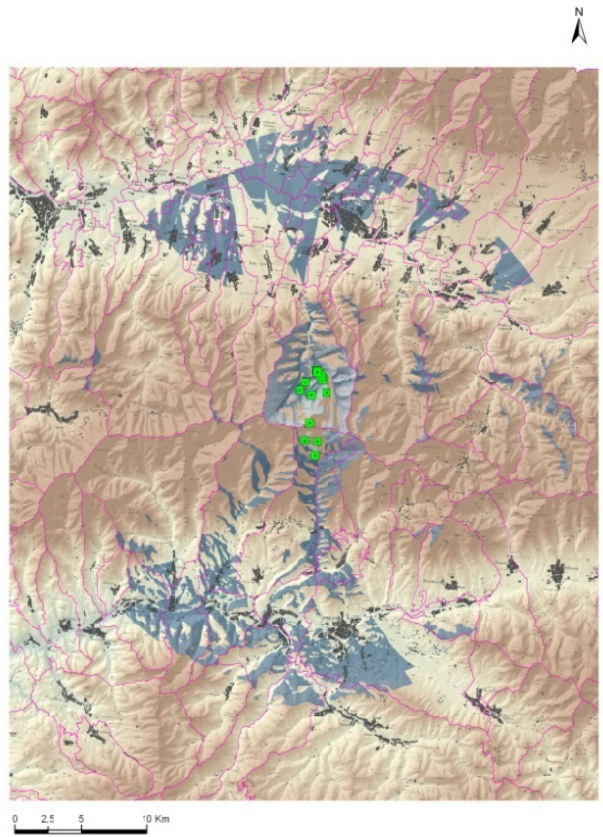


Figure 5.15: Area, from which new objects in the Jasna resort will be visible (North and South). Adapted from Pauditšová and Pauditš (2010).

By sensitively integrating the structures (valley and hilltop stations of the gondola cable lift, boarding and lodging facilities, etc.) into the landscape, their building and construction design, design and colour range, it is possible to contribute in some way to increasing the attractiveness of the area, not only in visual landscape terms, but also in terms of functional land use and long-term use of the recreational potential of the area.

Provided that there is good visibility in the area, an observer's perceptions can become significant and detailed, taking notice of the architectural design of buildings (form, shape, design), colour ranges, used materials, etc. In protected alpine landscapes it is particularly important to use nature-friendly materials, such as stone and wood, so that the structures match and fit into their surroundings. These structures could have different purposes, including recreation, tourism and more in general, activities related to leisure. Therefore, any proposed development, regardless of their purpose or function, should not be visually disturbing to the area. By contrast, they should induce a feeling as if they were already there. For this purpose it is useful to develop visualization models that reflect different demands on appearance, mass structure and attractiveness in a more realistic way.

Many of the proposed developments subjected to the assessment of visual quality serve a specific function which influences their design as technical requirements might need to be taken into account. This applies to the hilltop cable rope lift. Nevertheless, the aesthetic integration of these structures in a protected area cannot be discounted. Notwithstanding this, opportunities for creativity exist, for example when combining the different elements of the proposed development (e.g. cable cars, lift stations, restaurant, technical facilities, garages etc.).

Although the study primarily focused on the assessment of visibility of objects in the landscape, the perception of these objects at a closer range was also important (Ode, Hagerhall and Sang, 2010; Oťaheľ, Drdoš and Štefunková, 2007). For example, visitors of the ski resort might notice the materials and type of surfaces used in the developments. It is for this reason that materials, such as wood, natural stone (such as granite), or other lining materials resembling natural materials, are used.

Many of the architectural designs of buildings meet the demands for exposed positions and respect the continuity of construction in the case of pre-existing developments (Nijhuis, 2011). Facades of buildings are usually designed so that stone or wooden structures are used, if feasible. The colours of the outer facades of the buildings are selected so that they do not disturb the nature of the nearby landscape. The preferred shades are green, grey, brown, but also black. Many facades of the buildings will be glazed. Though this choice seems to reflect a current trend, it also allows visitors to appreciate the landscape from enclosed spaces. The aim is to make the visitors feel that they are part of the environment and of the landscape, even when inside the buildings.

Another important aspect to take into account is the way in which proposed developments are integrated into an environment characterised by steep slopes. This should be done in a sensitive manner to create the least visual disturbance possible and should be done by positively using the terrain morphology.

5.2.5 Conclusions

By implementing the proposed objects in the Low Tatras ski resort the landscape will gain new landmarks that will change its image and scenery. In visual terms, the potential impacts are likely to relate not only to landscape image, but also to the vertical and horizontal structures of the landscape. Due to the rugged topography of the area, the visibility range of the planned objects in most cases is not high. The main visual barrier is the main ridge of the Low Tatras. As a result, the current landscape structure of the affected area should be complemented by many new technical works (Fig. 5.2). In addition to the proposed built-up areas (buildings, transport areas – access roads, parking areas), areas with altered habitats, small areas of ruderal communities should also be considered.

Many of the planned objects will involve significant landscape features that cannot be overlooked when viewing the environment. Depending on the observer's perceptual abilities these objects will be perceived very differently. Technical objects of a large size could be seen as positive, as elements that enliven the landscape, another group of observers could potentially see those same features as negative and disturbing to the landscape. When evaluating the scenery therefore it is impossible to ignore the subjectivity of the issues investigated. For this reason, it is particularly important to take into account the opinions of the local population, or of those groups that frequent the area. This point is also underpinned by the European Landscape Convention (2000), which suggests that the "quality" of a landscape should be "defined" by the public, and in the case of this study, the visitors of the ski resort Tatras could be considered as the "public".

The conditions for recommending the planned activities to be implemented, as mentioned in the conclusion of the independent expert report, are implied by the production capacities of the planned facilities and by the fact that this is a territory in a national park with level 3 of territorial nature protection with several sites defined with level 4 and even level 5 of territorial nature protection.

5.3 Case Study 2: Visual Impact Assessment Of Wind Park In Slovakia

5.3.1 Background

The proposed wind park was subjected to an environmental impact assessment, as an intelligent[12] wind farm for the production and storage of electricity. The planned

12 Individual parts of the wind power plant are manufactured by the producer as separate building blocks. All these modules are transported to the site and assembled locally on the spot. This method of assembly makes it convenient to take the facility back to pieces either after the end of its life or when one of the components needs to be repaired.

Wind Park is located in a lowland area in southern Slovakia, which is part of the Trnava region and the district of Dunajská Streda. The area of interest includes the cadastral area Mad, Horný Štál and the northern part of the cadastral area of Padáň (see Fig. 5.16).

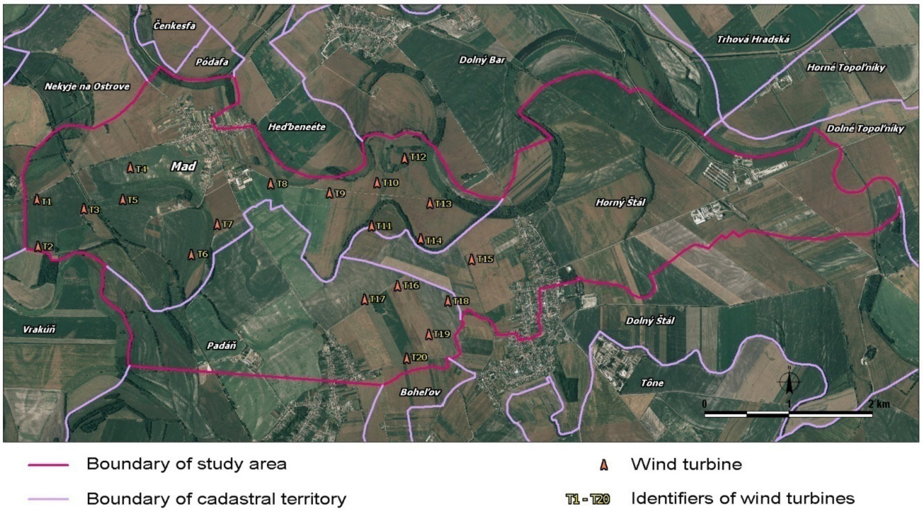


Figure 5. 16: Localisation of the wind farm. (Ortophotomap cEurosense, s.r.o.). Adapted from Pauditšová (2009).

The proposed wind park consists of the following objects:
- 20 solitary wind turbines (T1 to T20),
- underground power lines of 22kV,
- transformer station 110/22kV,
- communications system.

The wind park consists of turbines, the towers of which are 100m in height and the radius of rotors is 50 m with total output of up to 80MW. The proposed GE 2.5 MW 100 wind power plant (see Fig. 5.17) consists of a full-metal tower terminated by a gondola and a permanent magnetic AC generator with a three-set rotor. Each wind tower is anchored in a 20x20x4 m concrete base covered by a one-meter thick layer of soil so that it is aligned with the surrounding terrain.

Selected technical data related to the wind turbines are listed in Table 5.1.

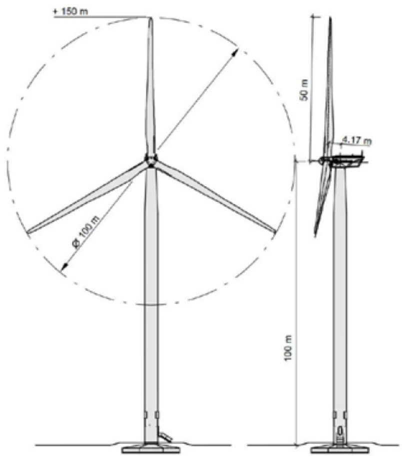


Figure 5.17: Wind turbine GE 2,5 MW with a 100 m high tower. Adapted from Pauditšová (2009).

Table 5.1: Key technical parameters of wind power plants for landscape visual assessment. Adapted from Pauditšová (2009).

Tower	
Construction	Steel conic mast
Hub height	100 m
Assembly parts	5 pieces
Diameter at the base of the tower	4.15 m
Diameter at the top of the tower	2.3 m
Rotor	
Diameter	100 m
Number of sheets	3

In the proposed development the solitary wind turbines (T1 to T20) are spread across the smallest administrative units (cadastral territories, hereafter "c.t.") as follows (see Fig. 5.18):
- C.t. Mad – wind turbines: T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14,
- C.t. Horný Śtál – wind turbine T15,
- C.t. Padáň – wind turbines: T16, T17, T18, T19, T20.

The individual objects of the park are located outside a built-up area. The distance of the wind turbines from the living areas is at a minimum of 600 m (Fig. 5.19). Wind power plant T8 is the closest to the built-up area. The 600 m zone extends to the built-up areas, yet, in this part of the municipality housing is not the main land function.

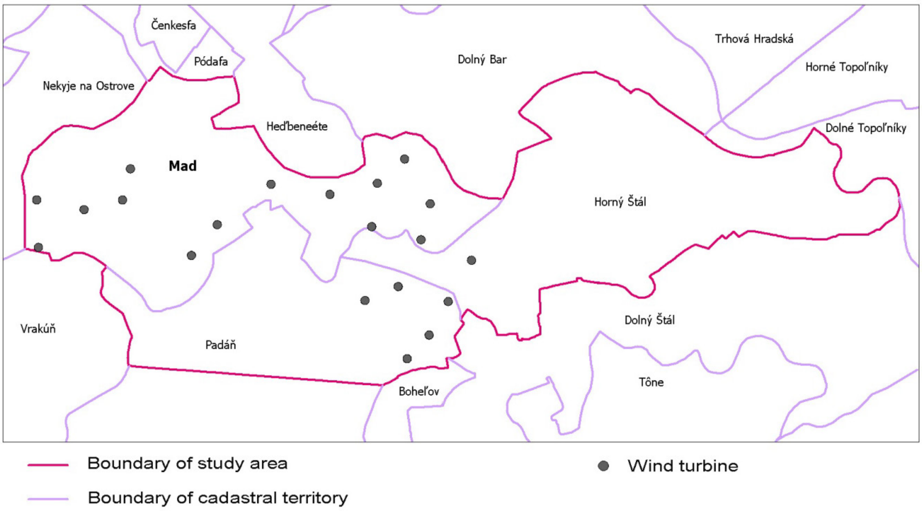


Figure 5.18: Localisation of wind power plants within cadastral territories. Adapted from Pauditšová (2009).

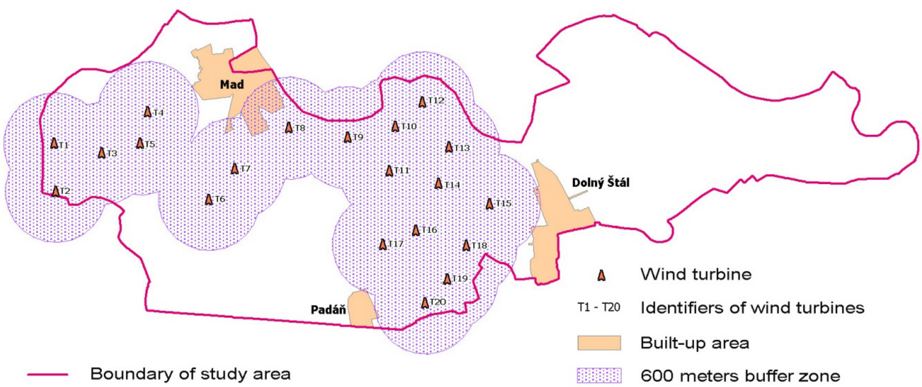


Figure 5.19: Zone 600m between the wind park Mad and the built-up areas. Adapted from Pauditšová (2009).

The construction is designed to use the wind-power potential in the given territory for the purpose of producing ecologically clean electricity. The advantage of wind power plants, is the fact that they produce electricity without discharging harmful substances, without using fissile materials and/or without burning fossil fuels. A wind power plant does not produce waste water and waste.

The development proposal was compliant with the draft resolution of the Government of Slovak Republic to the draft of the energy policy of Slovak Republic. According to its Annex 3, it is reasonable to assume under current conditions a production of 200 GWh electric powers from wind energy by 2010.

The development proposals aimed to construct new wind parks and increase the capacity of current wind parks. The developer presented this development proposal as a single option (alternative) only. The "Study of visual impacts of the Mad wind park on landscape scenery" was commissioned to professionally assess the impacts of the proposed activity on the structure of landscape and its use (Pauditšová, 2009). Further, it aimed to assist with the environmental impact assessment.

The visual impact of wind power plants is affected by both subjective and objective factors. The most common are: distance of the observer from the turbines; number, size and colour of the wind turbines, weather, visibility but also the intensity of object perception, how often and where the observer encounters the specific objects, etc. The impact of wind power plants on landscape and scenery is often the only limit for the localisation of these plants in a given territory.

The previous example (ski resort) addresses the detection of visibility of objects using modelling based on mathematical calculations. This case study example shows the process of identification of the assumed effect on scenery using the photo mount method.

5.3.2 Area Description

The proposed wind park is located in Podunajská lowland, the area is predominantly flat and within the territory of the Danube plain. The altitude varies between 112 and 115 metres above sea level. This means that the area is characterised by fluvial accumulation aggraded plains and riverside floodplains (Mazúr and Lukniš, 1986).

The key climatic factors taken into account in the visual impact assessment study of the wind power plants - are the number of foggy and sunny days, and the frequency and intensity of precipitation, as these meteorological conditions are often associated with reduced visibility in the country.

The climate of the area is warm and dry, with mild winters and long hours of sunlight (Lapin et al., 2002). The average temperature ranges between 9 to 10°C. July is the warmest month with an average temperature of 19.8°C, whilst the coldest month is January with an average temperature of -1.7°C. The annual amount of sun in the area ranges between 2,000 and 2,500 hours. It culminates in August and is at its lowest in December. Fog in the region is a winter phenomenon, though not a very common one.

The maximum levels of precipitation are in the summer season, often as a result of local storms. The lowest precipitation activity is in winter. The main precipitation deficit is in the vegetation period when there are heavy rainfalls but at the same time it is also the period of the highest vaporisation (800 mm per year). The deficiency of humidity in the soil is further intensified by strong and frequent winds. The area presents maximum precipitation deficiency during the growing season, with maximum precipitation and evaporation, making the area one of the driest in

Slovakia. The cumulative annual volume of rainfall/snow fall in this area is around 48 to 590 mm. In the grass-growing season the average rainfall is only 300 mm.

In terms of wind, the territory is among the windiest in Slovakia with prevalence of northwest-southeast winds. March brings the strongest winds; December the weakest. The average wind speed is at 3-5 m/sec.

In terms of landscape typology, the territory is considered a cultural cultivated landscape. It is a modified anthropogenic area within which human activities are carried out in accordance with natural conditions. The ecological balance is well maintained and the landscape potential is properly used particularly in relation to agriculture.

From a geomorphologic point of view, the area is an intramountainous lowland landscape with a limited relief articulation of up to 10 metres. These conditions have enabled the natural emergence of meandering rivers and branches in the area. A historical map from 1835 shows diversity of linear water elements, with fields farmed in large blocks grass-growing (Fig. 5.20). Despite the long-term intensive soil farming, traces of meandering rivers can still be seen today.

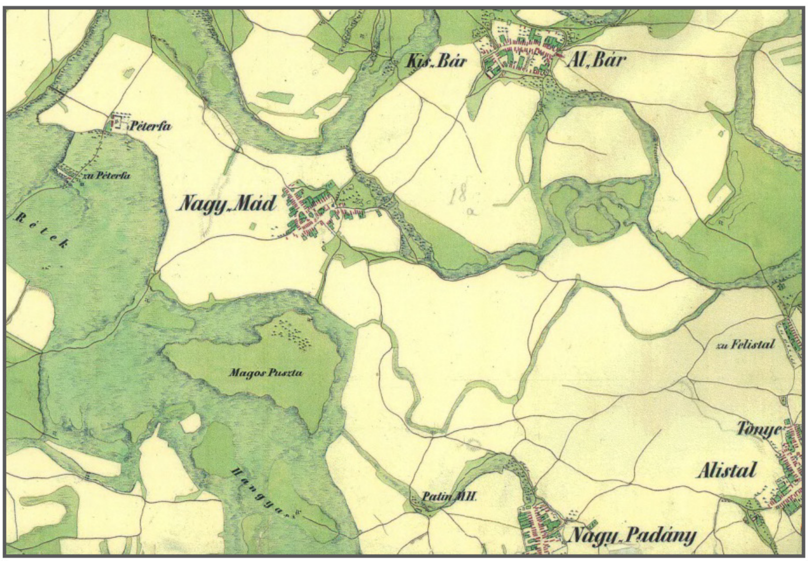


Figure 5.20: The surroundings of the village of Mad, a section of the 1835 historical map (http:// geoportal.gov.sk/sk/map?wmc, last view August 2017).

The structure of the current landscape has resulted from long historical developments. It reflects the degree of anthropogenic transformation of the area brought about by changes in human exploitation of the land. It is manifested in the landscape through concrete physiognomic mosaic landscaping elements. The area has been intensively farmed for centuries. In the past, it was more covered by wooded vegetation, particularly to the east and south of the village of Mad. The earlier presence of a stream or river branch is evident by the presence of a linear vegetation element, probably a remnant of a riparian vegetation. A comparison of the land use in 1835 with the current state also reveals a change in the linear, probably riparian vegetation between the villages of Padáň and Mad. The historical map shows their incessant continuity, as opposed to the present state.

The areas of vegetation have gradually diminished particularly as a result of the development of residential settlements and of the practice of large-block methods of land management. The original lowland landscape of floodplain forests with the associated abundant vegetation and water features has turned into deforested and intensively exploited agricultural landscape. Original habitats have disappeared from the landscape, to be only preserved locally as small fragments.

The area is characterised by a high proportion of arable land (Fig. 5.21). Territories with such a limited heterogenity of landscape features are referred to as a monotonous landscape of limited appeal and, in terms of ecological stability, as substandard.

Figure 5.21: A view of the flat, farmed area (c.t. Mad). Photo by Pauditšová (2009).

Apart from the arable large-block land, additional elements of the current landscape structure of the territory include:

- arable small-block land,
- vineyards,
- gardens – located directly in the settlements or in their contact zones with farmed land,
- forest fragments,
- non-forested wooded vegetation – riparian vegetation, small areas of growth on arable land and roadside linear plantations - herbal grasslands and areas with ruderalised surfaces,
- water canals and surfaces (gravel pits),
- built-up areas – individual construction objects outside urban zone,
- built-up areas in towns – consisting mainly of family housing,
- elements of road infrastructure – paved and unpaved roads; significant road passes through the villages of Dolný Bar and Dolný Štál, the section between Dunajská

Streda and Veľký Meder contains road I/63 leading from Bratislava to Komárno. Unmarked cycle route 25 m passes through the villages of Mad, Padáň and Dolný Štál leading, via Gabčíkovo a Dunajská Streda, to Kolárovo,
- technical infrastructure elements – overhead power and telephone lines, transformers,
- elements of agricultural production – plant production prevails in the area; the crops that are cultivated here include, in particular corn, cereals, fodder and oil plants, and vegetables; animal farming mainly includes pig farming and cattle raised for milk and meat,
- landfills and waste dumps.

An observer might note a number of dominant landmarks in the area, particularly church spires from the surrounding towns that are visible even from a greater distance. The following are landmark cultural objects: two churches in the village of Mad – a Reformed Tolerant church from 1788 and Roman-Catholic neo-classicist church from 1869. The village of Padáň has similar landmarks – a Reformed church from 1787 with a spire completed 1816. Those in the village of Dolný Štál include, apart from the 15th century St. Martin's Roman-Catholic church that is a national cultural heritage site, a Protestant church from 1786. Churches represent pointed vertical landmarks. Other cultural-historical landmarks include, in the village of Dolný Štál, two folk houses (No. 70 and No. 71). Made of mud bricks, they are artefacts of folk construction of the 19th century (the house No. 71 dates to 1837). The houses are listed as national cultural heritage sites (under No. 2286 and No. 2287). The village of Mad has a folk house (street No. 161) that is listed in the central registry of heritage sites (under No. 2290), which is also made of mud brick; it dates to 19th century. The consideration of these landmarks is, however, insignificant in the visibility assessment of vertical dominance.

There are no natural landmarks (either spot or linear) in the area that would determine the unique character of the landscape. The farmed land can be considered a horizontal landmark; they represent large scale fields from a distinctive landscape mosaic of South Slovakia. From this perspective it is a distinct scenery, yet not unique, with a limited presence of natural elements, as only fragments of lowland floodplain forests have been preserved. The landscape mosaic is, in part, enriched by artificial water reservoirs, a network of interconnected drainage canals and elements of non-forest wooded vegetation. Residential areas, road networks and a railway complete the landscape scenery of the area.

The area contains a number of vertical landscape elements, though none of them cause significant negative effects on the scenery of the landscape. Electric power masts (Fig. 5.22) have a negative visual effect. Since terrain modelling in the territory is negligible, the electric masts represent a visual barrier and, together with the overhead high voltage lines, they are negative visual elements in terms of landscape scenery.

Figure 5.22: Wind turbine GE 2,5 MW with a 100 m high tower. Photo by Pauditšová (2009).

5.3.3 Methodology

Graphical visualizations using photomontage techniques provide a good basis for assessing impacts on the landscape's visual characteristics. Therefore, impact assessment had the structure of a qualitative assessment.

In order to assess the visibility of objects on landscape using photomontage techniques it was necessary to identify observation points with direct visibility of the assessed landscape. Three observation points were selected. The criterion for selecting these points was the presence of natural landscape elements (e.g. elements of vegetation) in the viewing angle (see Fig. 5.24) with a potential to reduce the visibility of anthropogenic objects, in our case wind power plants. An important methodological step was to take pictures from the observation points showing representative views on the territory of interest with the subsequent addition of the new wind power plant objects by using advanced graphical software tools. The assessment of changes in landscape scenery was performed by comparing the photographs – the state before and after the potential implementation of the wind farm, see Fig. 5.24 to 5.27.

Visual impact assessment is a fairly subjective exercise. This is because it is an aesthetic and sentimental assessment that clearly depends on the individual and on their profile (e.g. mood, education, sex, etc.).

Wind power plans will always be significantly visible elements in a landscape (see Figure 5.23). The justified distance to assess visual impact in the areas with excellent visibility is maximum 30-35 km. This is because the eye physiology in a healthy human does not allow detailed observation of objects from greater distances. Colour coating (grey) of the turbines contributes to reducing the visibility of technical landmarks, such as a wind farm, in the landscape.

Figure 5.23: View of the future wind farm Mad with 20 wind power plants (Google Earth, 2009). Adapted from Pauditšová (2009).

Current weather conditions naturally affect the visibility of objects in the landscape. In extremely adverse conditions the visibility in the area and surroundings can decline rapidly. The fairly limited topography, an absence of forest and limited representation of non-forest wooded vegetation can create natural conditions that do not significantly support the diversity of the landscape, hence the highly limited variability of the mosaic landscape structure. The landscape of the proposed wind farm development essentially consists of large blocks of fields in places visually interrupted by elements of vegetation, silhouettes of settlements and traffic lines. The potentially disturbing technical elements and negative landmarks include the network of power lines, and the high and low voltage masts.

A dynamic element, such as the spinning of the wind turbine rotor, is more visible and more striking in a landscape, if compared to static elements of similar dimensions (Bishop, 2002). When it comes to a flat landscape without visual terrain obstacles or monumental elements of a landscape structure (landscape dominants) that are comparable in size to wind power plants, the visibility of wind power plants is enormous.

The perceived attractiveness of the wind farm can be improved, for instance by arranging individual turbines into geometrical shapes. Turbines placed in constant distance in direct line look quite stern. Yet if, for example, they follow the landscape line, they can have a far more pleasing flair. A simple organisational structure can be used in a more varied landscape. If turbines follow, say, the altitudinal line (contour lines) or other distinct features of the landscape, they usually offer a better visual impression.

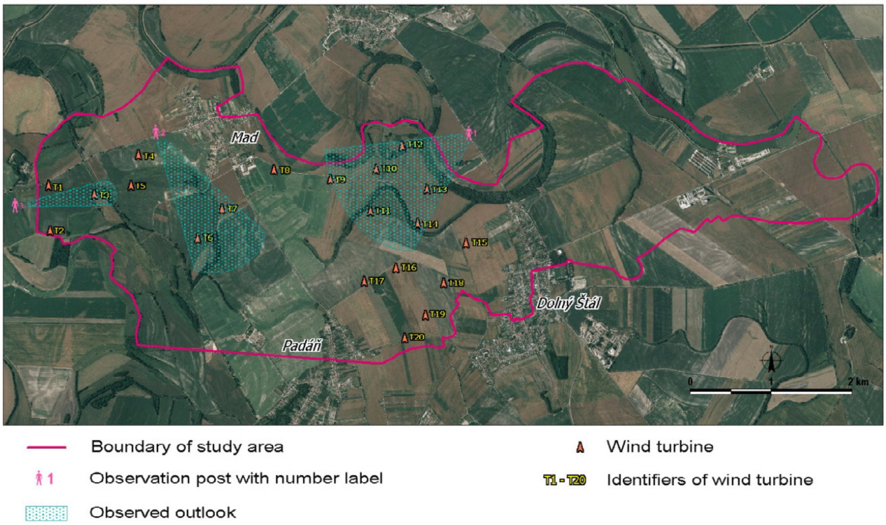


Figure 5.24: Observation posts of visualisation of the wind farm. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2009).

Figure 5.25: A view of the area where the T9 to T14 wind power plants are to be located (observation point 1). Adapted from Pauditšová (2009).

Figure 5.26: A view of the area where the T6 and T7 wind power plants are to be located (observation point 2). Adapted from Pauditšová (2009).

Figure 5.27: A view of the area where the T3 wind power plant is to be located (observation point 3). Adapted from Pauditšová (2009).

5.3.4 Assessment Outputs

The development of a wind farm in an open farmed countryside is likely to become a significant landmark that changes the outlook of the landscape in the area. The altered scenery and the impact on the landscape image will be significant, but it will become acceptable over time. The life expectancy of wind farms is limited; the termination of operation is associated with the dismantling of the wind turbines. The negative perception of the construction of the wind farm might be thus reduced by the fact that the presence of wind power plants is only temporary in comparison with constructions such as bridges, viaducts or other large-scale objects.

In terms of landscape scenery, the transport of electricity to the transformer plant has been handled in an attractive manner by placing 22 kV power cables underground in total length of 22 km. The cables are expected to be placed at least 1.2 m underground, thus with no effect on the landscape.

While some might perceive large scale technical objects such as wind farms in open space as something disturbing, others may consider them to be positive elements that enliven the landscape, representing interesting contemporary architectural structures and, with their smooth, steady flow, create a new emotional atmosphere in the area.

During the construction and operation of the wind farm, the current landscape structure of the area will be complemented by the introduction of spot and linear technical objects, such as the foundations of the wind power plants and traffic areas. The area will also experience growth of ruderal vegetation resulting from the lack of farming up to the edge of the farmed fields.

The findings of the visualisation study of the proposed wind farm on landscape scenery of the area, identified that:

- the incorporation of such a landscape element into the area introduces a new landscape feature, the shape and size of which are new to the landscape and, given the flat terrain, also visually striking,
- in terms of landscape scenery, the construction of wind power plants represents a change, visual horizons will be complemented by new objects, the visibility of which will depend on atmospheric conditions and, in part, (from visual perspective) on the quality of the equipment (colour and surface coating),
- after the completion of the life cycle of the wind power plants, the landscape can be brought virtually to its original state.

5.3.5 Conclusions

Despite the scientific support for renewable wind technology, wind-farm developments are often met with local opposition. There is an established recognition nationally and internationally that ground-based wind farms can affect landscape values.

As shown by the results of the assessment, the potential implementation of the Mad wind park in an open agricultural landscape would change the landscape in this territory. Lifetime of wind parks is limited, the end of operation is linked to the removal of wind turbines, which may serve to mitigate the negative perception of the wind park implementation.

At the time of the study the proposals for locating and constructing wind parks were a new phenomenon in Slovakia. Therefore, this study was one of the first professional assessments of visual impacts of a wind park on the landscape. The presented study served as a basis for the decision of the Ministry of the Environment on recommending or not recommending the implementation of the wind park.

Based on the results of the overall environmental impact assessment process the Ministry of the Environment issued the final statement with a negative record, i.e. the development proposal is not to be implemented. When preparing the final statement the Ministry of Environment took into account the environmental impact statement assessing the proposed activity, the expert opinion, opinion views to the environmental impact statement, the record from public hearings and its own knowledge.

5.4 Case Study 3: Development Proposal For New Residential Complex - Landscape Impact Assessment Study In Banka Municipality In Slovakia

5.4.1 Background

The aim of the proposed development project was to build a new attractive residential area with a high proportion and quality of greenery accompanied by the appropriate infrastructure in Banka municipality. The present land use of the area is in line with obligatory land-use planning documentation. It is an urban zone with a residential area designated for the construction of family houses and apartment buildings.

The development proposal of the new residential zone named "Banka –Šindlerov diel" included a set of new family houses and residential buildings intended for permanent living. The proposed area shown in Figure 5.28 was sectioned into plots within which the houses are to be located (Fig. 5.29). The total area of the site is 18.25 ha.

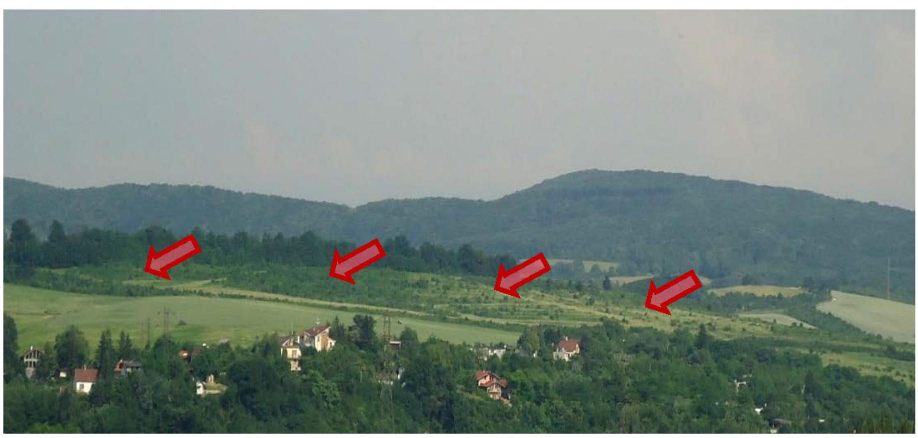


Figure 5.28: The site of the future residential zone Banka – Šindlerov diel, Slovakia. Adapted from Pauditšová (2015).

Figure 5.29: Plots of residential area Banka – Šindlerov diel, Slovakia. Adapted from Pauditšová (2015).

5.4.2 Area Description

The study area is located in Banka, an attractive part of the world-famous spa town of Piešťany in Slovakia (Fig. 5.30). The construction of the residential zone is to be realised on land that is geomorphologically bounded by the Banka – Červená veža ridge from the east. The western edge of the future residential zone consists of an allotment garden and part of the built-up area of the Banka village. The area has a dominant slope orientation to the west. The slope is mostly moderate in the western part, steep in the eastern part, and it is moderated by the artificially created terraces built in the past in support of agricultural land use.

The current land cover consists of grass-herbaceous vegetation, non-forest woody vegetation, uncultivated vineyard, line woody vegetation, unpaved road. At present, the area has the appearance of a green area at vegetation succession stage (Fig. 5.31).

As it can be seen from Figures 5.32 and 5.33, in the 18th and 19th centuries the area was covered by vegetation and it was not farmed because of the poor quality of agricultural land. The nature of the area changed significantly in the 1950s, when the Sĺňava water reservoir was built. It was built between 1956 and 1959 on the site of dead river branches, floodplain forests and alluvial meadows. In 1980, part of the water reservoir from the Krajinský bridge was awarded the status of a protected study area, and from 2008 the water reservoir is part of the special bird protected area.

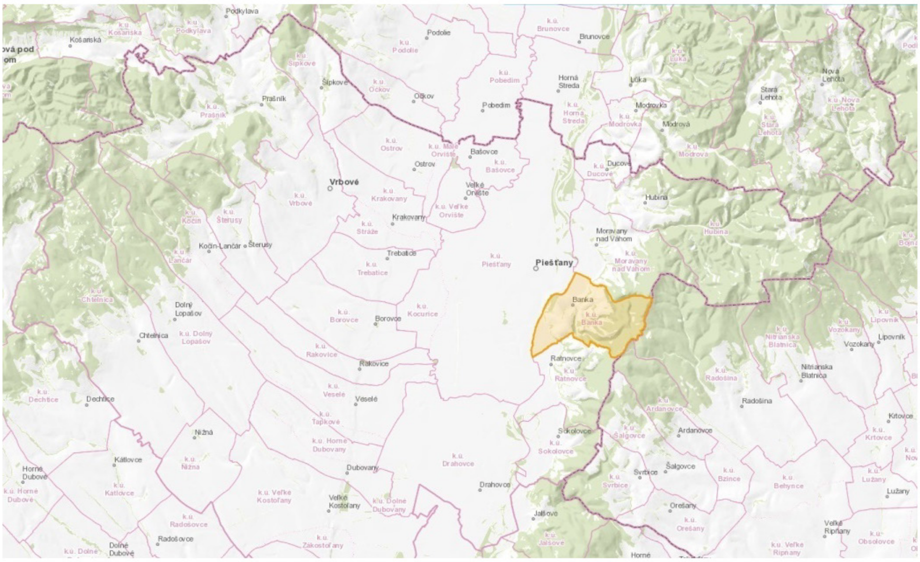


Figure 5.30: Cadastre borderline of Banka site (http://www.geoportal.sk, last viewed August, 2017).

Figure 5.31: Greenery succession stage at study area – Banka site. Photo by Pauditšová (2015).

The land use of the area has gone through several changes, from forest cover in the 18th and 19th centuries, to agricultural land in the 20th century. Then, as arable land (Figs. 5.32, 5.33), followed by vineyards (Fig. 5.34). At present, the area is not farmed (Fig. 5.37).

The area of interest is characterized by a relatively low natural and landscape protection potential. The original ecosystems are significantly altered by anthropogenic activity.

There are animals protected by the CITES Convention (common buzzard, common kestrel). Other species are protected by the Bonn and Bern conventions, e.g. common house martin, common swift, common buzzard, barn swallow and others. Many of them are endangered species.

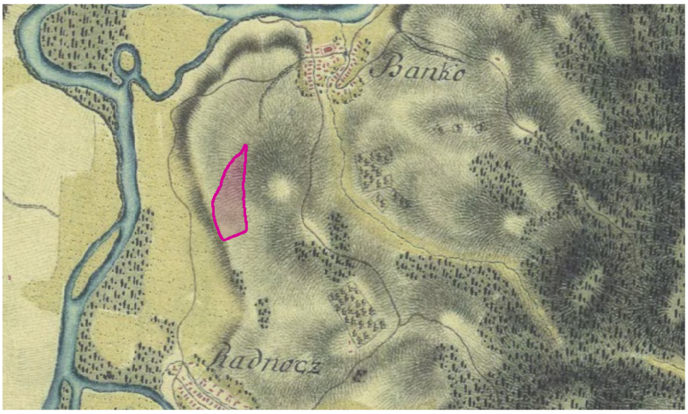


Figure 5.32: The first military mapping -1764-1787(http://geoportal.gov.sk/sk/map?wmc, last viewed August 2017).

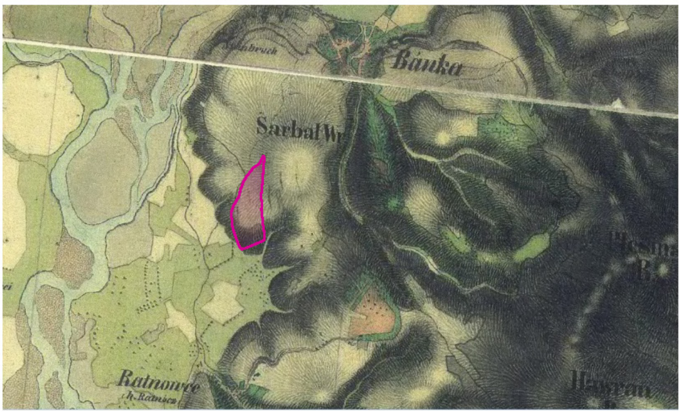


Figure 5.33: The second military mapping - 1810-1869 (http://geoportal.gov.sk/sk/map?wmc, last viewed August 2017).

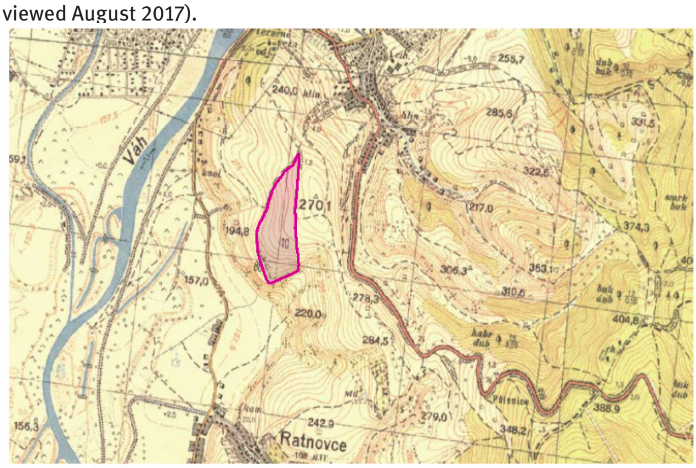


Figure 5.34: Study area in 1952 (http://www.geoportal.sk, last viewed August, 2017).

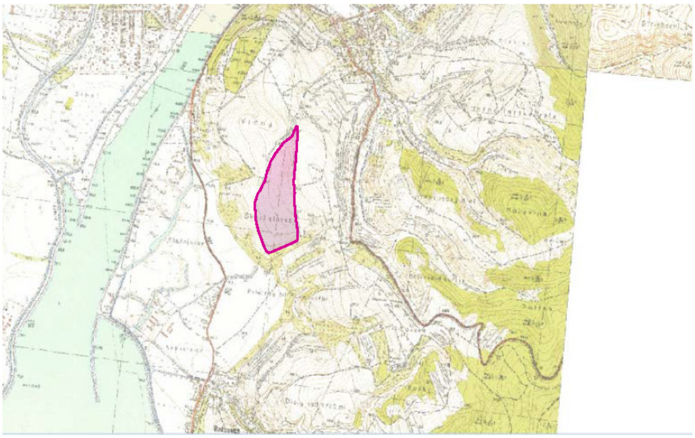


Figure 5.35: Study area in 1970 (http://www.geoportal.sk, last viewed August, 2017).

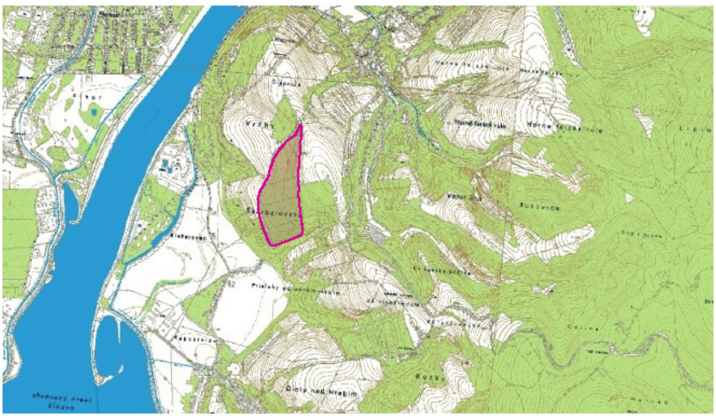


Figure 5.36: Study area in 1980 (http://www.geoportal.sk, last viewed August, 2017).

Figure 5.37: Study area in 2014 (Ortophotomap©Eurosense, s.r.o.).

The special bird protected area of Sĺňava is part of Banka municipality, which belongs to the European system of protected areas (Natura 2000). The purpose of the protection is to ensure the favourable status of habitats of bird species of European importance and habitats of selected migratory bird species; and to ensure the conditions for their survival and reproduction.

There are no cultural and historical monuments directly in the area concerned, no archaeological and palaeontological findings, as well as no significant geological sites.

The observed landscape is perceived as a landscape scenery bounded by the silhouette of the distant horizons and the sky-line. Generally speaking, each landscape has individual visual properties such as size, visibility, the angle of open view etc. In the case of identifying a characteristic landscape, it is necessary to identify and categorize all significant views.

In the case of the construction of the residential complex of Banka – Šindlerov diel, the west-east view (Fig. 5.38), the south-east view (Fig. 5.39) and the north-south view (Fig. 5.40) can be considered to be significant ones.

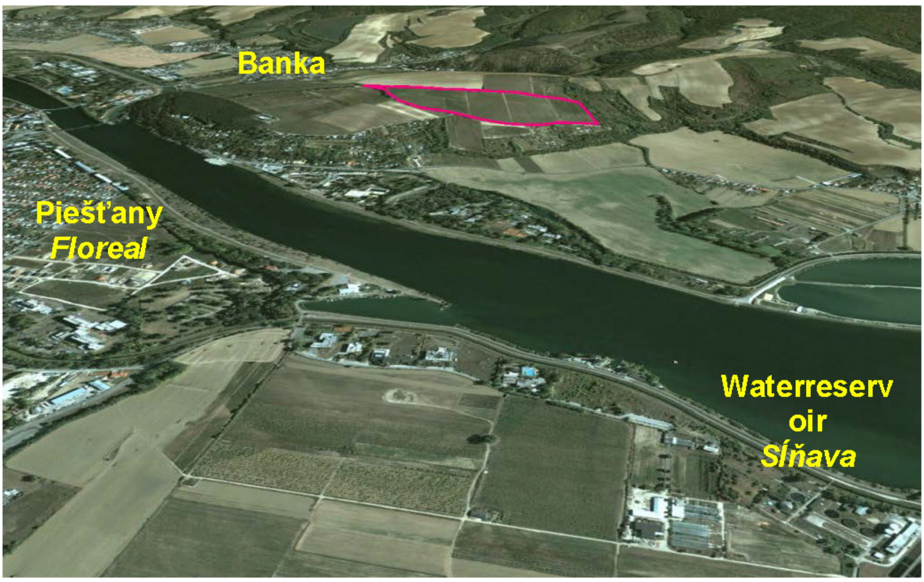


Figure 5.38: South-north view of the area. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

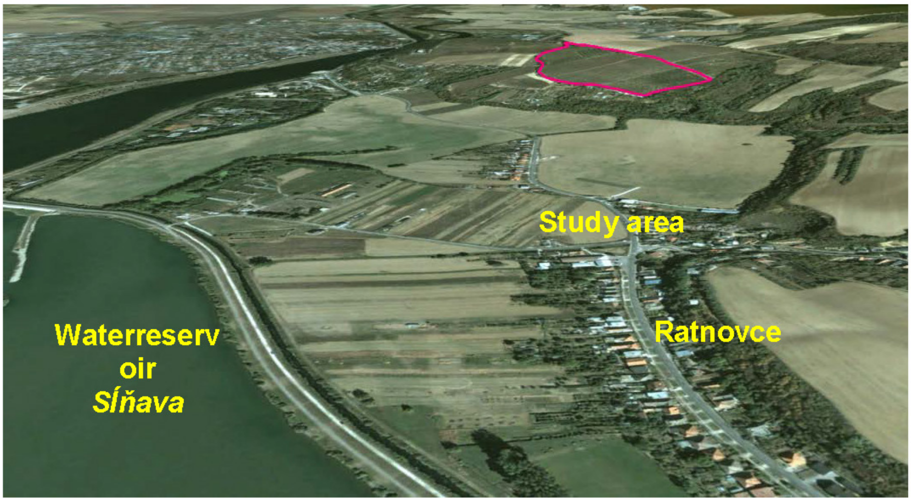


Figure 5.39: South-east view of the area. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

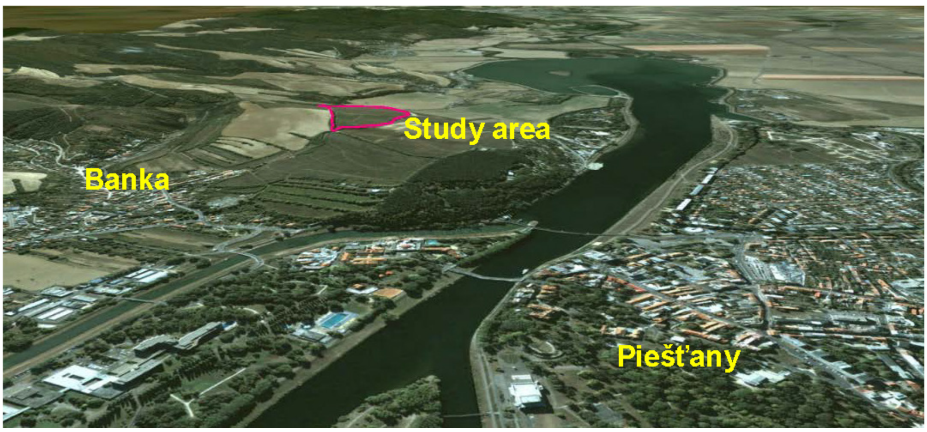


Figure 5.40: West-east view of the area. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

5.4.3 Methodology

The European Landscape Convention (2000), which integrates the protection of natural and cultural heritage, uses the term "the landscape character and landscape characterisation types". This term is closely related to the assessments of landscape scenery being the determining indicator of the landscape character. The aim of this case study is to assess the impact of the development of the Banka residential area–Šindlerov diel on both the landscape scenery and landscape character.

In this case study, the landscape character assessment was based on the identification of components that contribute to the scenery. The methodology is based on the identification of the characteristic features of the landscape as a system. It examines the structure, functions and significance of landscape components in the study area. The individual landscape elements are determined with parts of the landscape differing from the whole territory; basic differential units are identified as so-called features, and the properties of the basic differential units are characterised and then compared with other features. The methodology is focused mainly on the visual arrangement of the elements in the landscape. Landscape is, in the sense of this methodology, understood to be a set of characteristic elements representing features that are defined as the basic differential units of the landscape. The principle is to look for the occurrence of landscape features and their combinations. The features with defined typological names, properties and characteristics recognized in the landscape are divided into the following categories:
- reference features – a set of all the features from which the landscape is composed of typical features – the presence of similar, repetitive features,
- specific features – which create an individual landscape difference, originality, uniqueness (the unrepeatability) of the specific features of the landscape, therefore making the area valuable and unique.

The features occur or are present in the landscape next to each other, regardless of whether they are neighbouring or not, but still relating to each other. The features in the landscape can be defined by their size (measures), proportions, texture and colour. They complement each other and create consistency if the landscape is arranged harmoniously. The landscape features create a variety of landscape relationships and associations. To develop an understanding of the contexts for the assessment of landscape visual features, the most important relationship is between relief and landscape elements. This relationship determines the basic framework in which the features are identified.

In order to assess the perception of the landscape, it is necessary to select the observation points from which the landscape image is analysed and subsequently evaluated on the basis of the characteristics of the landscape elements and their spatial arrangement. As noted in Chapters 1 and 2, when observing a landscape image, it is necessary to accept the physiological capabilities of the observers, because eye movements and fixation of the observer's eyesight on the features under observation are of great importance. From the virtual angle of the observer watching objects located in the landscape, three distinct fields of vision may be considered (Hlavatá and Pauditšová, 2001):
- field of sharp vision (angles: 1-6° to 10-11°),
- detailed observation (at an angle of 22° to 27°),
- normal or ordinary vision (at an angle of 11° to 60°).

The readability and visibility of landscape features can be divided into the following range (scope) if the feature is:
• sharp with details that are obvious and clearly identifiable,
• recognizable and appropriately visible,
• slightly visible,
• not bright, blurred or even invisible.

The distance between different objects, and the estimation of distance and size of objects are classified as follows:
• 1st category of distance (close-ups): clear visibility and detail recognition up to ca 1.0; 1.2 km
– details of the human figure 100 m
– building details, tree leaves, wire of overhead power lines 200 m
– trees, utility poles, building windows 1 km
• 2nd category of distance: the area of adequate visibility, ca. 1.2; 5.0 km
– structure of the land cover
– recognition of individual building objects
– building objects (e.g. houses, buildings, roads) up to 5 km
– building silhouettes, rising chimneys and other dominants
– horizon silhouettes and silhouette objects
• 3rd category of distance – low visibility area 5.0; 15.0 km
– large areas
– recognition of large objects and groups of objects
– silhouettes of field formations (forest, large groups of stands)
• 4th category of distance (long view): (15.0; 25.0) km
– visibility of multiple objects, (18.0; 25.0) km (VE, slopes)
– geomorphological units and their parts (hills, valleys etc.), 30 km
– visibility (25-100 km) according to atmospheric conditions
– mountain silhouettes of 100.0-150.0 km.

To identify the characteristic elements and features of the landscape, observation points were selected. The observation points (Tab. 5.2) were set at the 1st and 2nd category of distance from the objects. As the proposal aimed to build a residential area with the prevalence of family houses, which is assumed to be not more than two floors above-ground, and of residential houses with not more than three floors, the observation points were set at more than 5 km away (Fig. 5.41). The second criterion for selection of observation points was the localization of houses. The direction of the observation points was set based on the usage of the area by residents and visitors from Piešťany city. Table 5.2 shows the localization parameters of the observation points.

Figure 5.41: Localization of the observed points. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

Table 5.2: Basic parameters of the selected observation points. Adapted from Pauditšová (2015).

Observation point	Name of the site	Latitude	Longitude	Orientation of the view	Direct distance of the observation point from the site [m]
P1	Sihoť	48°35‘44,20“	17°50‘33,59“	NW-S	2 000
P2	Biskupicky canal – bank near City park, Nabr. I. Krasku	48°35‘32,06“	17°50‘25,91“	NW-S	1 700
P3	Kolonádový bridge	48°35‘19,56“	17°50‘23,26“	NW-SE	1 300
P4	left bank of Sĺňava (known as Floreál)	48°34‘52,15“	17°49‘49,14“	W-E	1 130
P5	road from Ratnovce to Banka	48°34‘17,84“	17°50‘14,64“	SW-NE	420
P6	centre of the Banka municipality	48°34‘56,35“	17°50‘59,64“	N-S	550
P7	the southern edge of the built-up area of Banka municipality, Topoľčianska street	48°35‘21,53“	17°49‘55.70“	E-W	570
P8	Piešťany city centre	48°34‘34,40“	17°51‘51,48“	WNW-ESE	1 650

In accordance with the two defined distances in which the area of interest is observed and its visibility is evaluated, two visual zones were used. The first consists of a visual zone in which the objects are clearly visible, with details visible by an observer's eye within the 1st category of distance. The second visual zone was based on the objects being clearly distinguishable and visible according to the 2nd category of distance. In both zones it is possible to quantify visual characteristics of the landscape and identify them through measurable data, i.e. in terms of their size, the angle of open view, the length of the observed objects, as well as the distances with respect to the viewing conditions. The visibility of the area of interest – the future residential area Banka – Šindlerov diel – was evaluated from the selected observation points (Tab. 5.3) according to the following scale:

A – excellent visibility, without visual barriers, under suitable atmospheric conditions
B – very good visibility, with possible visual barriers whose height is not constant (e.g. vegetation)
C – good to conditionally good visibility depending on atmospheric conditions; the presence of visual barriers is possible, but the vertical visual barriers do not reach the above-standard dimensions
D – low visibility; in the foreground there are visual barriers covering the view or narrowing the viewing angle; vertical visual barriers reach large dimensions that are essentially unchangeable
E– objects are not visible; objects and complexes are covered by visual barriers resulting from the type of relief or landscape elements.

Table 5.3: Visibility of the residential complex Banka – Šindlerov diel from the selected observation points. Adapted from Pauditšová (2015).

Observation point	Type of visibility of the observation point	Direct distance from the site [m]	Presence of distinctive visual barriers
P1	C	2 000	Yes
P2	D – E	1 700	Yes
P3	E	1 300	Yes
P4	B	1 130	partly yes
P5	A – B	420	partly yes
P6	E	550	Yes
P7	E	570	Yes
P8	E	1 650	Yes

A graphical representation of the projected residential complex from individual observation points is shown in Figures 5.42 -5.47.

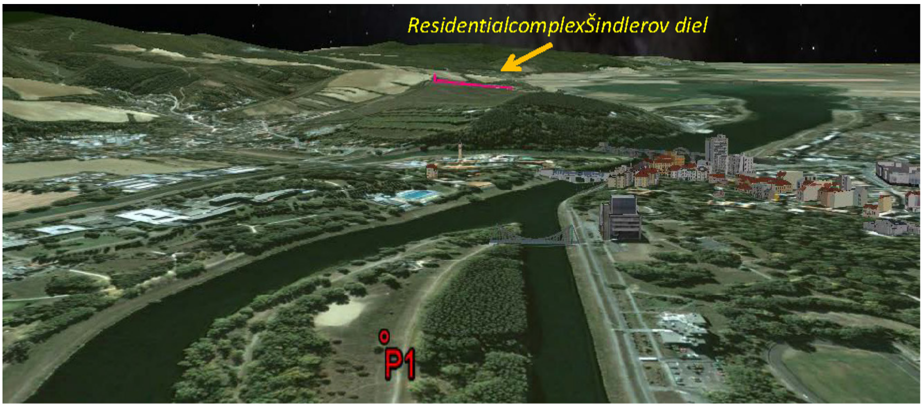


Figure 5.42: Good to conditionally good visibility (lowered depending on particular atmospheric conditions); visual barriers include relief, elements of landscape structure with fixed dimensions; from the observation point P1 it is possible to clearly see the silhouettes of the objects that will be located in the residential area of Šindlerov diel; the distance of the observation point P1 from the object under observation is sufficient to eliminate the visual barriers, i.e. from the observation point P1, the residential complex is better visible than from the closer localized observation points P2 and P3. (Ortophotomap ©Eurosense, s.r.o.).

Figure 5.43: Minimal to no visibility of the future residential complex from the observation points P2 and P3, the presence of visual barriers - relief. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

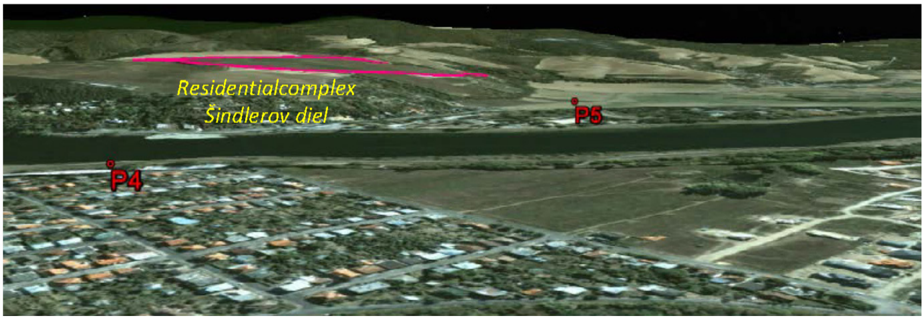


Figure 5.44: Very good to excellent visibility of the future residential complex from the observation points P4 and P5. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

Figure 5.45. The residential complex of the Šindlerov diel will not be visible from the observation point P6, the observed object is covered by the visual barrier that represent the relief and partly also the objects located in the built-up part of the municipality (landscape elements). (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

Figure 5.46: The Šindlerov diel residential complex will not be visible from the P7 observation point, the observed objects will be covered by a visual barrier– a relief. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

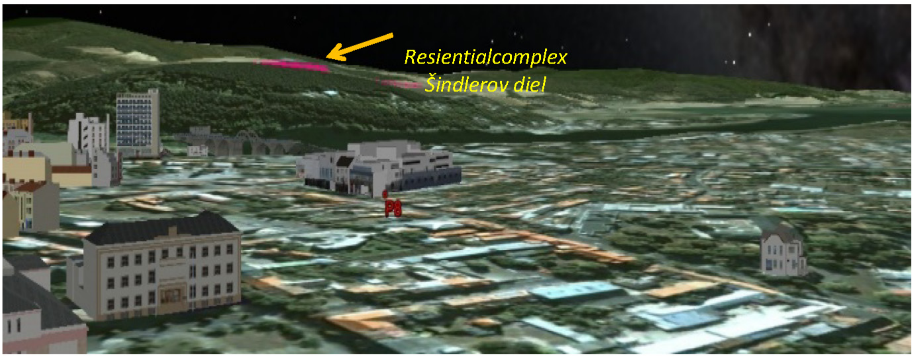


Figure 5.47: Low visibility of the future residential complex from the observation point P8, the visual barrier is the Aupark shopping center Piešťany together with other surrounding buildings and vegetation cover on the slope in the forefront of the residential complex. (Ortophotomap ©Eurosense, s.r.o.). Adapted from Pauditšová (2015).

5.4.4 Assessment Results (Outputs)

In the assessment of the visibility of the future residential complex, the observation points were selected from all cardinal directions. In terms of total potential visibility, it can be concluded that from more than 60% of the visual fields, the residential complex will be hidden to observers due to the relief segmentation and the presence of landscape elements with a certain height. These visual fields represent the observation points P6, P7, P8, but also P2 and P3. From the other assessed observation points (P1, P4, P5), the new residential complex will be visible. The crucial visual fields where the residential area will be best visible are the observation points P4 and P5.

The crucial visual field is the zone resulting from the optometric parameters of the observation point P4. This is the 1^{st} visual zone with a visibility of up to 1000 m and based on the evaluation in Table 1, it is also a crucial visual sector. This visual field provides a viewing angle for a residential complex that can best represent the visual characteristics of the object. At the time of the visual assessment of the area, there was no target visual appearance of the residential complex in the project documentation, so it is not possible to clearly state the degree of disturbance of the current landscape appearance when the residential complex will be fully developed. However, following the European Landscape Convention, landscape characterisation types should not be evaluated because the original appearance of the area has changed several times. At present, we can assess what will be the most appropriate for the development of the area in a wider context.

The landscape features have been identified and visualized using maps, ortophotomaps, photos, panoramas informed by a field survey (representing a 2D vertical projection) and by a visualization of the relief (2.5D models, simulations of views from observation points).

Visual exposure is understood as the value of the landscape or of the observed object in certain characteristic sites. It is determined by the visibility and dominance of objects. Exposure is conditioned by the visibility and meaning of the observed object; the meaning is given by the presence of valuable, unique or interesting objects or parts of the landscape.

Landscape observed from a specified visual field is visually exposed. This is mainly due to geomorphological conditions. The residential complex is planned on a slope with a western orientation, in the background of which is a well-visible part of the panorama of the Považský Inovec mountain range. Interesting elements on the horizon include an alley that will be partly covered by new homes. Positive visual elements in the visual field include greenery, consisting of areas of non-forest woody vegetation, green areas in a built-up area, and an allotment to be located in the forefront of a future residential complex. The bank vegetation of the River Vah also extends to the visual field.

No valuable or extinct historical landscape structures have been identified, and there are no historical objects that would increase the visual exposure of the area. The special protection area of Sĺňava enters the visual area.

The visual exposure of the evaluated visual field is documented in Figure 5.48. Landscape features are visualized in Figure 5.49-5.56.

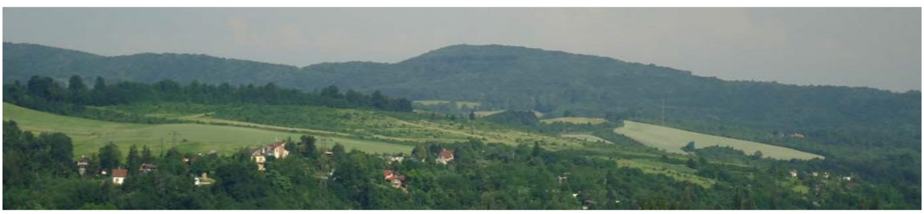


Figure 5.48: Panoramic view of the area of the future residential complex from the critical visual field - a zone based on the optometric parameters of the observation point P4. Photo by Pauditšová (2015).

Figure 5.49: Panoramic view of the area of the future residential complex from the access road to the allotment. Photo by Pauditšová (2015).

Figure 5.50: A panoramic view of part of the area of the future residential complex from the western border of the affected area. Photo by Pauditšová (2015).

Figure 5.51: Panoramic view of the area of the future residential complex on the Sĺňava water reservoir and the city of Piešťany. Photo by Pauditšová (2015).

Figure 5.52: A panoramic view of a part of the area of the future residential complex from the south, in the background is the alley at the eastern boundary of the assessed area. Photo by Pauditšová (2015).

Figure 5.53: View of the city of Piešťany from the area of the future residential complex. Photo by Pauditšová (2015).

Figure 5.54: View of the Sĺňava water reservoir from the area of the future residential complex. Photo by Pauditšová (2015).

Figure 5.55: View of the area of the future residential complex, the alley is located in the background. Photo by Pauditšová (2015).

Figure 5.56: View of the slope – the area of the future residential complex. Photo by Pauditšová (2015).

There are no cultural and historical monuments in the studied area. The nearest monument is the Early Gothic Roman Catholic Church of Sts. Martin from the 13th century in the municipality of Banka. Before the church stands the Lurd cave with Virgin Mary. There is also a statue of Saint Vendelin, a patron of farmers and shepherds from 1885.

No geomorphological shapes of anthropomorphic relief, geomorphological relics and anomalies were identified in the area. Historic landscape structures and substructures of landscape cover have also not been identified in the area. Meadows, fields are not valuable archaic agro-cultures. There is no historical park and landscaping forms indicating the composed landscape in the studied area. Also, there are no technical formations and objects in the area. An attractive and unique feature is the alley of sycamore maple situated on the north-eastern border of the area of interest. From the slope there is a view of the Sĺňava water reservoir, which from the visual point of view represents an attractive landscape element, creating together with the surrounding elements an interesting landscape mosaic.

Elements of the landscape structure and their properties determine the aesthetic potential of the observed territory and may visually (positively or negatively) affect it. A method using a modified photo was applied to the interpretation of the landscape features. Figure 5.57 shows a landscape on which individual elements and signs of the evaluated area are identified and visualized. They include the alley at the border of the area of interest, fields, non-forest woody vegetation, the panorama of Považský Inovec Mountains. The selection of landscape signs was selected using this photo. A key element is the alley and the key visual sign is the panorama of Považský Inovec. They are both line dominants.

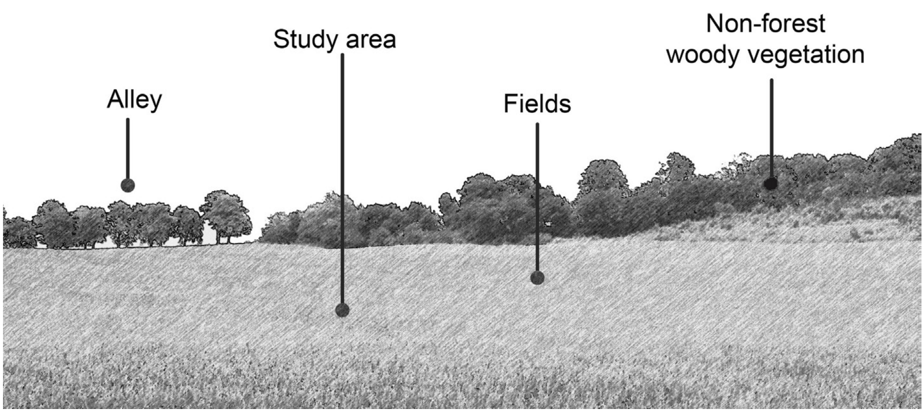


Figure 5.57: Individual elements and signs of the evaluated area. Adapted from Pauditšová (2015).

5.4.5 Conclusions

The natural elements (relief, vegetation) and anthropogenic elements are involved in shaping the landscape image of the studied area and its surroundings. The main limit in the visual perception of the landscape is the relief that determines the dimension of views.

Due to the terrain and the slope, the study area is in a visually exposed area, near which there are no significant visual barriers. The dominant line signs of the assessed landscape sector are the alley and the panorama of Považský Inovec. These dominants contribute to the uniqueness of the area. The residential area to be built is not an area that will contribute significantly to the diversity and uniqueness of the landscape. Together with the surrounding areas of agricultural land it is rather a homogeneous way of land use, especially in relation to when the vineyard was cultivated in the area. Vineyards represented large farmed blocks without fruit trees and shrubs, which, in addition to the function of secondary production, divided a visually homogeneous area, fulfilling aesthetic and landscape formation functions as well.

In the assessed area, elements with nature character that are in the contact zone with the settlements can be identified. Thanks to the identified line dominants and the relief of the area, the landscape image is perceived positively, without the presence of significant visual barriers and negative dominants. In the landscape structure of the area, the vegetation elements predominate, especially non-forest vegetation, fields, remains of the vineyards and areas with vegetation succession. In the adjacent parts of the area directly affected by the planned construction, there are huts and family houses under the slope. A compact built-up area is situated around an existing road.

The construction of the residential complex will change the landscape structure as well as the landscape image. Based on the analysis of the potential landscape image from the selected observation points, the largest visual change of the scenery will occur from the south and southwest direction. Because of the intention to construct a residential complex with the predominance of family houses, it is not assumed that there will be a formation of extreme high dominants that would create a distracting line both visually and at greater distances. With the intention of construction of a residential complex, emphasis is placed on the sufficiency of greenery between the planned houses. It is well known that vegetation stands reduce negative impacts on a landscape image. The visual barrier effect of appropriately localized greenery can make a significant positive contribution to improving the quality of the landscape image.

It can be stated that if the project of the future residential complex will accept buildings with a maximum of 3-4 floors above-ground and appropriate vegetation will be planted, the scenery will change but the “new” landscape image will not be negative.

5.5 Case study 4: County Durham's Landscape Character Assessment, UK

5.5.1 Background – Landscape Character Assessment (LCA)

As introduced in Chapter 2, understanding and defining the character of a landscape is a key and consolidated concept in landscape impact assessments, whether part of an EIA or as a standalone report. The Countryside Agency and Scottish National Heritage define character as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse" (Countryside Agency and Scottish National Heritage, 2002b). Different features can contribute to creating a landscape's character, including biodiversity features such as trees, hedges, woodlands, flowers of old meadows or pastures; geodiversity features such as landforms, soils or geology; and human features such as human settlements, structures, activities or land uses, whether historical or contemporary. As stated by Knight (2009), engaging with the concept of landscape character entails therefore a shift in understanding from landscape as "scenery" to landscape as "environment", and the systematic consideration of all of its components or features.

This concept was first introduced in the UK by the former Countryside Commission, currently Countryside Agency and Natural England, who in the 1980s sought to identify what makes a landscape distinct and different from one another, including the different services and benefits that landscapes provide. This led to the development of a project in the mid-1990s that mapped the variations in landscape and characteristics of the English Countryside. The result was "The Characteristics of England: landscape, wildlife and national features" map, which provides a national framework for decision-making about landscape and biodiversity. Strengthened later with contributions from Natural England, English Heritage and Defra (Department for Environment, Food and Rural Affairs) and by a number of local, county and district authorities, the map identifies 181 Countryside Character Areas, which are broad regional landscapes, and 120 Natural Areas, which are broad bio-geographic areas. The map was further supplemented with the publication of Natural Area Profiles, describing the ecology of the areas; and of Character Area Descriptions, detailing landscape characteristics. In the case-study area of County Durham there are five Natural Areas and six Countryside Character Areas.

It is worth acknowledging that the landscape characterisation process via maps, and area profiles and descriptions contribute to the baseline studies step of an LCA and EIA, as they constitute evidence collected in a value-free process. It is the subsequent assessment or evaluation of potential impacts that requires a value-judgement about the character and quality of landscape informed by, and based on, knowledge gained from landscape character maps, profiles and descriptions (Knight, 2009). The LCA process in turn, involves the mapping, classifying and describing of variations in landscape character and an analysis of the triggers or forces of change that could result from the implementation of a potential project, policy or programme. Two types of landscapes can be identified: (1) landscape character types, which are landscapes that present similar features and patterns and can be found in different places, and (2) landscape character areas, which are unique areas having their own individual identity and sense of place, though they might share characteristics with landscapes belonging to the same type.

As a decision-making support tool, a LCA is instrumental in a number of ways. It can assist and inform decision-makers about the potential changes that could occur as a result of a potential development, and about how these changes could/should be best managed. It can also contribute to the development of new planning policies, for example in relation to housing or wind energy. LCA can assist developers with project design, by helping to decide the location and form and shape of a potential development; it can help inform farmers' or foresters' day-to-day decisions in land management; assist with agri-environmental schemes or help identify priorities for landscape and/or biodiversity conservation, restoration or enhancement.

5.5.2 County Durham Landscape Character Assessment

The development of this case is largely based on a summary of County Durham's Landscape Character Assessment[13], prepared between 2002 and 2003 by Durham County Council with the assistance of the Countryside Agency, and formally adopted in 2008 (Durham County Council, 2008), and on the information published on the Durham County Council website (see http://www.durhamlandscape.info/article/10009/County-Durham-Landscape-Character). The LCA is part of a portfolio of documents that aim to assist decision-makers in better supporting the sustainable management and conservation of landscape and valorisation of countryside, whilst accommodating growth and change. These documents include the County Durham Landscape Strategy, which provides a framework for the conservation, restoration and enhancement of the County's landscapes; and the Landscape Guidelines, which provide technical guidance on different types of landscape issues. Other documents include the Durham Biodiversity Action Plan (DBAP) and the County Durham Geodiversity Audit. They acknowledge the inextricable links between landscape and biodiversity, as often characteristics that define the uniqueness/character of a landscape can be important for its conservation value. The consideration of landscape as a cultural construct means appreciating the history and evolution of a landscape

13 Largely based on information published in the County Durham Landscape Character Assessment by Durham County Council, and available on their website, http://www.durhamlandscape.info/article/10431?Layer=54 that contribute to defining the historical identity of a place, as represented in the County Durham and Darlington Historic Landscape Character Assessment led by English Heritage.

5.5.2.1 Area Description

County Durham is a county in the northeast of England, covering an area of 2,721 km^2 and a population of 855,900 (estimate from mid-2015). As illustrated in Figure 5.58, County Durham borders with Northumberland to the north, Tyne and Wear to the northeast, the North Sea to the East, North Yorkshire to the south and Cumbria to the west.

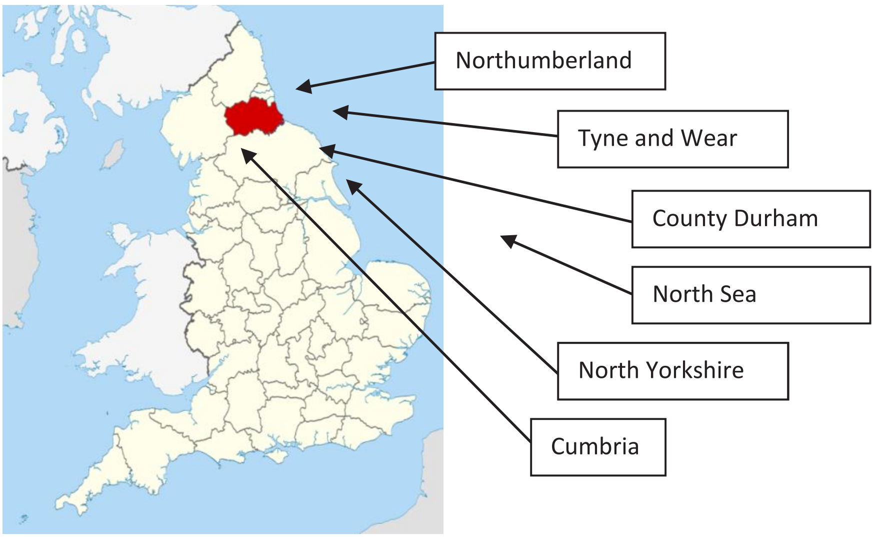
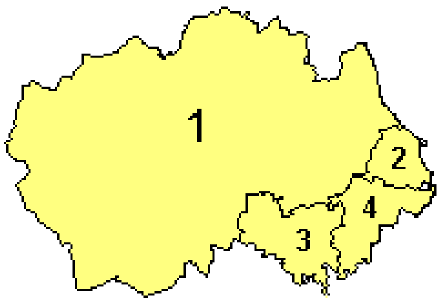


Figure 5.58: County Durham within the UK. Adapted from Nilfanion - Ordnance Survey OpenData: County boundaries and GB coastline; and National Geospatial-Intelligence Agency Irish, French and Isle of Man coastlines, Lough Neagh and Irish border, CC BY-SA 3.0. (https://commons.wikimedia.org/w/index.php?curid=12131836).

The County takes its name from its principle town, which hosts the designated UNESCO World Heritage site made up of Durham Cathedral and Durham Castle. Other major settlements include Darlington, Hartlepool and Stockton on Tees. County Durham is a unitary authority, an administrative division with one tier of local development that is responsible for the provision of all local government services within a district. Within the County of Durham there are four districts (see Fig. 5.59).



1. County Durham Council
2. Hartlepool
3. Darlington
4. Stockton on Tees (north of the River Tees)

Figure 5.59: Unitary authority of County Durham. Adapted from Keith Edkins – Own work, derived from File: Durham Ceremonial Numbered.png, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=6222495.

From a physical perspective, as described in the introduction to the LCA and in the first section of the report: "The Durham landscape is one of enormous contrast and diversity. From its western boundary high in the summit ridges of the North Pennines, to the limestone cliffs of the North Sea coast, remote moorlands and pastoral dales give way to fertile settled farmlands. This diversity is a product of both natural and human influences. The varied rocks, landforms and soils of the county, and differences in climate between the exposed uplands and sheltered lowlands, have influenced both the natural flora and fauna of the landscape, and the way it has been populated, managed and exploited by its people over the centuries." (Durham County Council, 2008).

Mining and industries have had a significant impact on the character of the County's landscape and the way in which it is perceived, inspiring artists and writers to capture the unique sense of place and the spirit of mining communities. On the one hand, as the industries declined, the perception of the landscapes changed, with mines and quarries becoming accepted and valued as cultural and rich industrial heritage. On the other hand, the declining of industries left problematic legacies affecting the quality of landscapes, the state of the environment and the perception and image of the County from those outside the area. The County Council has so far reclaimed over 44 square miles (70 km^2) of land since the 1960s.

As indicated in the LCA report (p. 26-32), there are also a number of designated landscapes in the County, with respective policies, which must be taken into account in the LCA. These include:

- the North Pennines Area of Outstanding Natural Beauty (AONB) also known as "England's Last Wilderness", which is shared with parts of Northumberland and Cumbria. The aim of the AONB is to conserve the landscape's natural beauty defined by settled pastoral dales and open moorlands; the areas is also valued for its cultural and biodiversity heritage,

- Areas of High Landscape Value (AHLV), which include undeveloped landscapes within the major river valleys and along the coast. Their designation in local plans allows for the development of policies to ensure their protection,
- Environmentally Sensitive Areas, such as the Pennine Dales, which include significant wildlife habitats, valuable archaeological resources and an overall landscape character strongly influenced by traditional farming practices,
- Heritage Coast, such as the Durham Coast, whose designation status is helping its recovery from the environmental damage caused by colliery waste,
- Historic Parklands are numerous in the county. English Heritage has recorded 13 Parks and Gardens of Special Historic Interest, some of which are also designated as Conservation Areas,
- Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are designated under the EU's Habitats and Birds Directives, and together they form a network known as Natura 2000 sites. All sites in the County have also been registered as Sites of Special Scientific Interest (SSSI),
- SSSIs are designated by Natural England under the 1981 Wildlife and Countryside Act, amended by the 2000 Countryside and Rights of Way Act. There are 91 SSSIs in the County,
- National and Local Nature reserves (NNR and LNR): while the first are established by English nature or approved bodies such as Wildlife Trusts, the latter are established by local authorities, such as Durham County Council. They are designated to protect valuable areas of wildlife habitat and geological formations,
- Local sites are designated by Durham County Council in consultation with English Nature and other conservation bodies. They are sites with nature conservation value which are protected via Local Development Plans,
- County Geological sites (CGS) are managed by Local Development Plan conservation policies. They include sites such as old mines, quarries, and glacial features,
- World Heritage Sites, are internationally recognised sites of outstanding natural, environmental and cultural importance designated by UNESCO. Durham's Cathedral and Castle have been recognised as UNESCO sites in 1986,
- Conservation Areas: there are 94 Conservation Areas in the County, including areas of special architectural or historical interest, such as urban market places, village greens, dale villages, terraced housing and historic parklands,
- Common Land, which include open moorland and small village greens. They are usually privately owned, with certain rights in common with some individuals. These rights can include the right to graze livestock, take peat or turf for fuel,
- Access Land, include areas of common land, land owned by the Forestry Commission, and mountain, moor or heath lands.

5.5.2.2 Methodology

As indicated in the introduction, what is particularly exemplary in this case-study is the GIS based methodology that it relied on. The methodology adopted for County Durham's LCA is based on a two-stage methodology. The first stage consisted of information gathering, and the development of the landscape database to assist with the process of landscape characterisation. An integrated GIS database was developed and used to subdivide the landscape of the county into 7,000 mapping units or landscape description units (LDUs). For each LDU, information was recorded on a range of attributes influencing the character of a landscape. As listed on page 5 (Durham County Council, 2008), the attributes that populated the ArcView GIS database initially included:

- Geology: solid,
- Geology: drift,
- Soils,
- Landform,
- Land use,
- Field pattern,
- Field scale,
- Boundary type,
- Tree cover,
- Woodland pattern,
- Settlement type,
- Settlement pattern,
- Origins,
- Relics: Prehistoric,
- Relics: Roman,
- Relics: Medieval,
- Relics: Post-medieval,
- Wetlands.

Data was drawn from existing datasets, such as Ordinance Survey data, published geology and soils maps, satellite data, and archival materials. The majority of the mapping was carried out using aerial photographs. As new data became available or new topics were explored, the data was revisited and revised.

The second stage consisted of classification and description of landscape characters. During this stage, the data collected was analysed to identify patterns of attributes which could potentially affect the character of a landscape at different scales. This process was complemented by data collected during field observations, which also recorded subjective, aesthetic and perceptual factors. As described in the report, a hierarchical approach to classifying the landscape was adopted, with landscape character types and areas identified at regional (i.e. County Character Areas), sub-regional (Broad Landscape Types and Broad Character Areas), and local (Local Landscape Types and Sub-types) levels.

To strengthen the robustness of the classification process and of the descriptive material, expert judgements were complemented by the views of the public collected through a series of stakeholder workshops. The feedback received was then used to inform revisions.

5.5.2.3 The Landscape Classification

Within the County Durham LCA, as previously explained, a GIS based database of landscape elements was used to identify landscape types and areas (approximately 7000 for which a range of attributes influencing the character of landscape have been recorded for each unit) at a number of different levels: regional, sub-regional and local.

Regional level, County Character Areas

County Character Areas are broad landscape zones, and are based on Natural England's Countryside Character Areas, though with refined boundaries and a more detailed approach to the assessment. There are 6 County Character Areas in the case-study area which include the North Pennines, the Dales Fringe, West Durham Coalfield, Wear Lowlands, East Durham Limestone Plateau and Tees Plain.

Sub-regional, Broad Landscape Types and Broad Character Areas

As stated in the LCA report (p. 34), Broad Landscape Types "are landscapes with similar patterns of geology, soils, vegetation, land use, settlement and field patterns". As the transition between one type of landscape to another is gradual, and therefore difficult to precisely identify, the boundaries are loosely set. While a type of broad landscape can be found in different places, Broad Character Areas are unique, "geographically discrete examples of a particular landscape type".

Broad Character Areas can consist of physically separate landscapes, or they can encompass a larger area to account for variations in character of landscapes within a broad type (i.e. act as geographical units of Broad Landscape Types).

Local, Local Landscape Types and Local Sub-Types

Local Landscape Types include lands with similar combinations of soils, land use, field boundaries, tree and woodland cover. They can be found either within one Broad Landscape Type or across different landscapes. Local Sub-Types are used to identify landscape variations within Local Landscape Types.

Interactive maps of Local Landscape Types and Sub-Types by County Character Area can be viewed here:

- North Pennines, http://www.durhamlandscape.info/article/10431?Layer=4,
- Dales Fringe, http://www.durhamlandscape.info/article/10431?Layer=50,
- West Durham Coalfield, http://www.durhamlandscape.info/article/10431?Layer=51,
- Wear Lowlands, http://www.durhamlandscape.info/article/10431?Layer=52,

- East Durham Limestone Plateau, http://www.durhamlandscape.info/article/10431?Layer=53,
- Tees Lowlands, http://www.durhamlandscape.info/article/10431?Layer=54.

5.5.2.4 Applications Of The Study

The County Durham LCA is frequently cited for its methodology, and for the way in which GIS was used beyond the needs of the LCA, and as an investment into baseline studies in support of other uses or applications. As noted by the Countryside Agency and Scottish National Heritage (2002a), the use of GIS was considered essential for the identification and classification of landscapes exercise. It was instrumental for assimilating and processing the rich amount of data available from existing GIS datasets, whilst also allowing for the collection of new data and recordings of landscape attributes, and/or qualitative information collected via stakeholder workshops. The GIS database facilitated the interpretation of large amounts of data, particularly when coupled with other data rich sources, such as the Landscape Strategy, and it made sense for the Durham County Council to develop it into an Internet GIS portal, which can be accessed via the Council's website. As noted by Landscape Character Network (2006), the availability and accessibility of the GIS site meant that not only the LCA could be best viewed through a GIS (rather than a published report), but that the LCA could be complemented with other resources such as historical maps or aerial photographs, making the link between landscape character areas and the objectives of the Landscape Strategy visible, more explicit and clearer (ibid).

Since County Durham's LCA, the Internet GIS portal has remained live and active, with new information and updates being added to the site. This has enhanced the longevity of the database, but it has also increased its usefulness for a wide range of potential users and applications, and for participative local governance initiatives. Developers are using the site to understand the potential impacts of development proposals within certain areas characterised by certain landscapes, and then using this enhanced understanding to complete planning applications, or to amend project design or draft mitigation measures. Countryside rangers, tree wardens and advisers for agriculture schemes are also consulting the GIS portal to gain information about species, woodland types or land management practices. The fact that different user groups are now able to access relevant and appropriate information as and when needed has also resulted in a reduction of queries to the County Council responding to request for information (Landscape Character Network, 2006). As mentioned, the life of the GIS database has been extended to go beyond the County's LCA and be combined with other datasets to evaluate the capacity of landscapes to accommodate changes, and different types of developments. As listed by The Countryside Agency and Scottish Natural Heritage (2002a, p.13), these include:

- developing landscape strategies at different levels (e.g. spatial strategy and village appraisals),

- landscape sensitivity mapping for a regional Wind Energy Capacity Study,
- landscape sensitivity mapping for the county Waste Local Plan,
- landscape sensitivity/opportunity mapping for a County Woodland Strategy,
- Intranet access through ArcIMS for general use in Durham County Council and district councils,
- extranet access for schools through ArcIMS as an educational resource,
- internet access for the public at large combining ArcIMS mapping and the text-based information of the Landscape Assessment and Landscape Strategy on the web.

5.5.2.5 Conclusions

The Durham County LCA not only shows how a landscape's character can be understood at different levels, but also how a purposeful and suitable methodology can help ensure that the process of landscape characterisation and the data collected is done at the appropriate level. Some local authorities might use multi-purpose LCA processes to gain an understanding of landscape character at different scales. Durham County Council's GIS-integrated methodology has allowed them to systematically collect data and information about landscape types and characters across scales, and to develop a tool that is proving to be useful to the needs and interests of different users (whether experts or none) and applications (for example, public participation exercises, modelling landscape capacity for wind energy or housing developments, or for providing useful information for developers or community groups).

5.6 Case Study 5: A Landscape-Led Approach To HS2, UK

5.6.1 A Landscape-Led Approach To HS2 In Buckinghamshire And The Colne Valley (UK)

This case-study provides an interesting case of how concerned stakeholders can support decision-making by providing constructive suggestions to ensure that the development of a linear infrastructure, such as a High Speed rail link, is designed in response to place and in a way that is sensitive to landscape. According to the UK's Design Council (2012, p.5), this means adopting a "Holistic design thinking at the outset ...[which] can help mitigate the planning risks". Further, it means taking into consideration the geographical context so as to ensure that proposed projects " ... respond well to the setting, speak a confident, architectural language based on their purpose and function and allay concerns of the local community". The need for a design-led approach is also reflected in UK policy, with the National Planning Policy Framework (Department for Communities and Local Government, 2012) indicating that "Good design is a key aspect of sustainable development, is indivisible from good planning and should contribute positively to making places better for people."

5.6.2 The Proposed Development

There is no doubt that high speed rail is taking up place across Europe, with a number of EU member states investing considerably in the development of new lines. The UIC, the International Union of Railways (2016), portrays high speed rail as the transport mode of the future. While it acknowledges the role that it can play in "achieving territory integration" and contributing to the development of "socio-economically balanced societies", it also recognised that investing in a high speed rail system is very demanding in technological, economic, political, social and environmental terms. In 2009, the UK's Department for transport reported that there were 5,600 km of high speed line in operation within Europe, 3,480 km under construction and 8,500 planned (DfT, 2009). As of April 2015, there 29,792 km of high speed lines in the world (UIC, 2016).

According to the EU Directive 96/48/EC Appendix 1, high speed lines comprise:
- Specially built high-speed lines equipped for speeds equal to or greater than 250 km/hr;
- Specially upgraded high speed lines equipped for speeds of 200 km/hr;
- Specially upgraded high speed lines which have special features as a result of topographical, relief or town planning constraints, on which the speed must be adapted to.

Thus, both the UIC and the EU clearly recognise the potentially controversial nature of such type of infrastructure development, and that trade-offs might need to be made.

High speed rail was introduced in the UK in 2003, with the opening of High Speed 1 (HS1), which is a 108 km rail link that connects London to the Channel Tunnel. The intention of the UK Government to expand and make further investments in high speed is reflected in a number of policy documents, with the proposal of a second line, HS2, formally put forward in 2009 (DfT, 2009). The government's argument was that most of the country's railway line needed remodernising, both in terms of infrastructure, as a significant portion of the network was constructed in Victorian times, and in terms of service and performance, as the existing infrastructure and stock could reach a maximum speed of 200 km/hr. Further, it was argued that existing lines had reached capacity, as both, passenger traffic and freight traffic had increased by 50% and 40% respectively. In an article published in 2008, The Economist supported the case for HS2 presented by the government, but warned that political enthusiasm for high speed must be matched by commercial viability. Without this, though appealing, this "grand project" might be exceptionally risky.

HS2 was given the official go ahead in January 2012 by the Secretary of State for Transport (DfT, 2012). It will consists of a high speed rail network linking London, the West Midlands, Manchester and Leeds, with Birmingham at its heart. In the future the Government says it plans to extend the line to Scotland. As illustrated in Figure 1, the HS2 line is to be built in a "Y" configuration, with London on the bottom of the "Y", Birmingham at the centre, Leeds at the top right and Manchester at the top left. HS2 will be built in two phases. The first phase entails a construction of a 140 mile line between London and Birmingham by 2026. The second phase concerns the lines to be built from Birmingham to Leeds and Manchester by 2033.

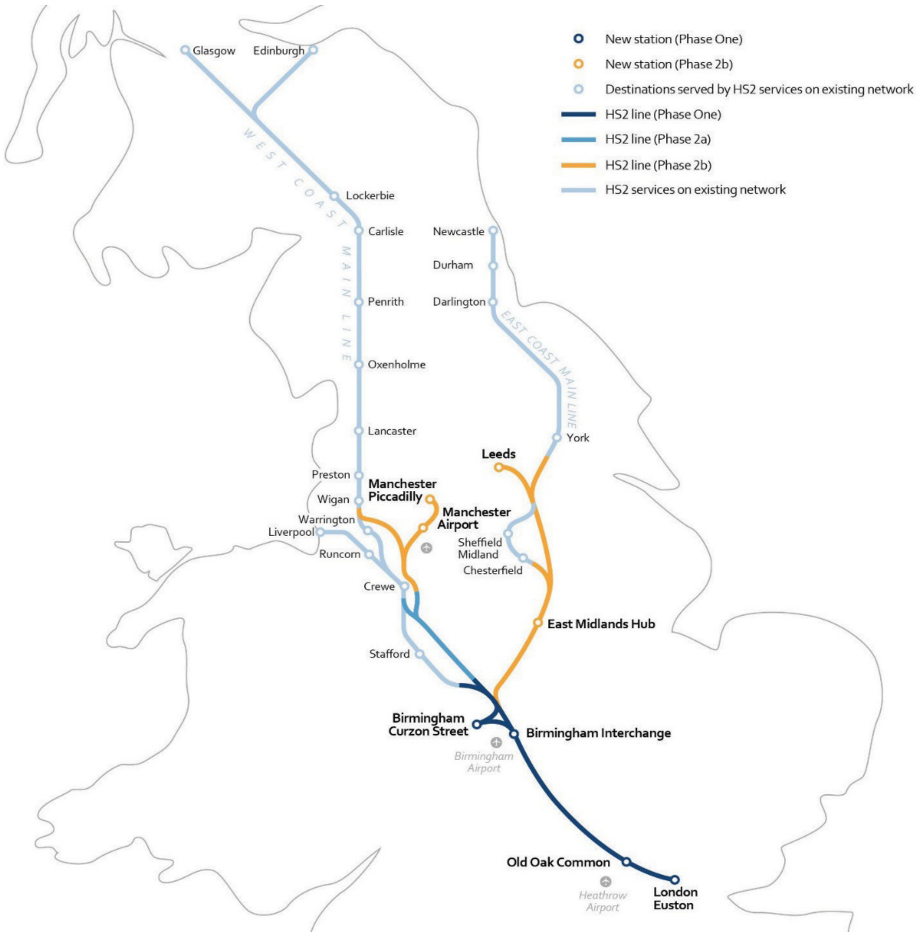


Figure 5.60: HS2: the Y network. Adapted from Department for Transport (November 2016).

The key points of this project are outlined by the Department for Transport (2012) and summarised in the following table.

Table 5.4: The case supporting the approval of HS2. Adapted from DfT (2012 and 2016).

- HS2 will significantly increase passenger capacity along key transport corridors of Britain; it is anticipated that up to 26,000 extra passenger seats will be on offer each hour, reducing therefore congestion on existing intercity rail, road and air routes.
- HS2 is expected to reduce travel times between Britain's cities, e.g. a journey from Birmingham to Leeds should be reduced from 2 hours to 57 minutes; the Manchester to London journey from 2 hours 8 minutes to 1 hour 8 minutes; Birmingham to London journeys will be reduced from 1 hour 24 minutes to 45 minutes.
- cities and towns off the HS2 network will be connected to, and served by high speed trains, extending capacity and speed to stations on the HS2 network.
- there are no credible, long term and sustainable alternatives to a new railway line.
- a high speed line will deliver £6.2 billion more of economic benefits than a line running at conventional speed - and around £3.5 more revenues - at a cost of £3 billion more than building a conventional speed equivalent. HS2 will cost a total of £32.7 billion.
- the benefit cost ratio (including wider economic benefits) for HS2 is £1.80-2.50 benefits for every £1 spent on the cost of the project.
- a commitment to reducing the effects of HS2 will see 79 miles of the 140-mile line between London and Birmingham running in tunnels or cuttings.
- HS2 runs through 13 miles of the Chilterns Area of Outstanding Natural Beauty (AONB) but less than two miles will be at or above surface level.
- HS2 will benefit rail, road and air users. It will free up capacity on existing rail routes for more commuter, regional and freight services. It will take an estimated 9 million journeys off the road network and cut up to 4.5 million air journeys each year.
- HS2 will deliver value to the UK taxpayer and passenger, and set new standards for passenger experience.
- HS2 trains will be up to 400 metres long with 1,100 seats, travelling at speeds of up to 250 mph. Double decker trains could be introduced to run on the HS2 network and would be compatible with HS1 and the Channel Tunnel. Services using HS2 and existing rail lines will use standard-size non-double decker high speed trains.
- HS2 will be designed, built and operated according to world class health, safety and security standards.

Based on the key points outlined in the above table, it is clear that the Government's main argument is centred on an economic case. In brief, the main points behind the need for HS2 is to enhance rail capacity and connectivity, and to free up rail lines to improve local and regional networks. There are also claims of job creations with a range of knock-on benefits including increased economic growth overall and a reduction in the north-south divide, potentially resulting in a more balanced UK economy (UK Parliament, 2011; DfT, 2016) and strengthening the UK's position as a leader in construction and engineering (DfT, 2016).

On the other hand, HS2 is facing strong opposition by the 70 constituencies that the planned route will pass through, with their concerns mainly focused on environmental and community impacts. A group of 18 local authorities that has joined together in a national campaign to actively challenge the HS2 rail project. The group is known as "51 m" because that represents how much HS2 will cost each and every Parliamentary Constituency, £51 million (51 m, 2016). Campaign groups to stop HS2 question the government's claims and argue that the planned rail link will by contrast increase the north-south divide, with the London economy benefitting at the expenses of the north of England and the Midlands. Many argue that the government has lost the environmental case as well, with the Department for Transport recognising that a high speed rail link is likely to cause more harm to the environment and landscape than a conventional rail link (Department for Transport, 2013). Evidence reported by various studies indicates that HS2 will actually increase carbon emissions, pushing up electricity and carbon consumption by around 100%. Questions have also been raised about the economic plan, as the current budget for delivering this grand project is 17% higher than originally estimated. The capacity aspect has also been questioned, particularly the need to decongest the West Coast Main Line, which, as shown in Table 5.5. appears to have lower load factors than other long distance routes from London. The November 2016 report from the Department of Transport also indicates that once HS2 will be in operation, existing intercity services to London would be reduced (DfT, 2016), prompting "Stop HS2" campaigners to argue that the government's capacity claims about a constrained network were misleading, as "freeing up capacity" meant losing existing trains worth £8.3 bn of cuts to support HS2's business case (BBC, 2016).

Table 5.5: West Coast Main Line. Adapted from Network Rail London and South East Route Utilisation Strategy (July 2011).

Long distance services into London	Load factor, based on 3 hour morning peak, 2010
Paddington (main line and other fast trains)	99%
Waterloo (South West Main Line)	91%
St. Pancras (Midland main line)	80%
Liverpool Street (Great Eastern Main Line)	78%
Victoria (fast trains via East Croydon)	72%
Kings Cross (ECML long distance	65%
Euston (long distance)	60%
St Pancras (HS1 domestic)	41%

There have been a number of legal challenges submitted to courts against HS2. In March 2012 Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust submitted a complaint to the European Commission, claiming that the UK government failed to carry out a SEA ahead of the decision for phase one of HS2. In April 2012 a group of claimants including HS2 Action Alliance and the 51m Group, submitted requests for judicial review claiming that the government did not carry out a proper SEA and that it provided inadequate information during public consultation (BBC, 2012). In 2013 a ruling was made on the cases, and in paragraph 843 of the judgment it was concluded that “The consultation process in respect of blight and compensation was all in all so unfair as to be unlawful“ (HS2 Action Alliance, 2013). The formal publication of the HS2 route in November 2016 confirmed the government’s chosen option (DfT, 2016), and has led to oppositions in Yorkshire. The proposed route is now open for consultation and will go through the parliamentary process, but if approved, a recently built estate will have to be cleared to make way for HS2.

5.6.3 HS2 And Buckinghamshire And The Colne Valley

HS2 represents a major challenge for the county of Buckinghamshire, as it is the county most affected by the planned rail network. Buckinghamshire is a county in South East England which borders with Greater London to the south east, Berkshire to the south, Oxfordshire to the west, Northamptonshire to the north, Bedfordshire to the north east and Hertfordshire to the east. A large part of the Chiltern Hills, an Area of Outstanding Natural Beauty (AONB), runs through the south of the county and attracts many walkers and cyclists from London. The major feature of this AONB “is a northwest facing chalk escarpment rising to some 250m, behind which the dip slope is cut by a series of deeply dissected valleys” (Lee et al., 1999, p.25). The designation of the area as an AONB recognises the landscape of the area as being of national importance with a view to conserving and enhancing its natural beauty, while acknowledging the needs of the local community and economy. The 1949 National Parks and Access to the Countryside Act defines natural beauty as “including the preservation or, as the case may be the conservation of its flora, fauna and geological or physiographical features”. AONBs are designated under the Countryside & Rights of Way Act (2000), and represent the best national landscapes and finest examples of countryside in England and Wales. Based on EIA legislation in England, AONBs are considered sensitive areas and this increases the likelihood of development proposals to be classified has having significant impacts, and for an EIA to be required (DCLG, 2011). As the government has yet to give the final go ahead to HS2, the EIA process has yet to be completed. The EIS for phase one has been completed in 2013, while the EIS for phase two is still in progress (HS2 Ltd, 2013).

The proposed HS2 route will run approximately 60 km through the County from south-east to north-west, thus from the Colne Valley in south Buckinghamshire to Turweston and Mixbury in the north (Buckinghamshire County Council, 2016). It will cut through the distinctive landscapes of the Colne Valley, the nationally designated Chilterns AONB, the Vale of Aylesbury and the Ouse Valley (Buckinghamshire District Councils et al., 2015), having significant damage to the metropolitan green belt. In addition, no tangible benefits for the county, place or people of Buckinghamshire are evident in HS2's Environmental Statement, with the proposals put forward being considered inadequate by stakeholder groups (ibid), as it fails to consider the strong contrasts and subtle variety of the county's landscape depicted by Reed (1979). On this basis, Buckinghamshire County Council, as many other local authorities affected maintain their opposition to the scheme. However, Buckinghamshire County Council are also of the view that no matter what the outcome is, the interests of the residents of the county must be preserved. To deliver on this promise, rather than working against the proponents, together with a wide range of environmental and countryside organisations they have sought to work with HS2 Ltd to ensure that if the proposed HS2 route does go ahead, then the very best mitigation measures are put in place, thus, "seeking the best, if it comes to the worst" (Buckinghamshire County Council, 2013). This resulted in the development of "Buckinghamshire's Mitigation Blueprint for HS2", which includes a range of mitigation proposals, including measures needed to maintain mitigation in the future. Following the publication of the form Environmental Statement, this group of stakeholders maintaned their opposition in principle and developed a second part of the Blueprint, this time with the contribution of communities, representative groups and environmental organisations. Part 2 identifies specific key mitigation and compensation measures, and the stakeholder group's responses to the draft Environmental Statement consultation (Buckinghamshire County Council, 2014). As stated by the county council leader:

> "the first Blueprint helped to inform the Government, the Department for Transport and HS2 Ltd what Buckinghamshire was (and was not) willing to accept. This second Blueprint builds upon this, setting out key, clear and reasonable expectations from the Councils, communities and other stakeholders within Buckinghamshire. We trust that Government and Parliament will engage with us on this." (ibid, p.1)

Building on the Blueprint documents, the stakeholder group composed of Buckingham District Councils and others developed the report "A landscape-led approach to HS2", which identify landscape principles for HS2 in the county and guidance on mitigation measures in response to specific landscape settings and characters. Their approach is presented in more detail in the following section.

5.6.4 Methodology: A Landscape-Led Approach

This section is largely based on a document jointly produced by a stakeholder group which includes Buckingham District Councils, Three River District Councils in Herts, Buckinghamshire County Council, Chilterns Conservation Board, the National Trust and the Colne Valley Community Interest Company, which reports on the impacts of HS2 (Buckinghamshire District Councils et al., 2015). According to the authors of the report, a landscape-led approach to HS2 would require an approach to infrastructure design that is responsive to places and communities, and sensitive to the distinct character of landscapes. This would require taking into consideration technical and geographical issues, as well as the concerns and aspirations of local communities.

The approach put forward by Buckinghamshire District Councils et al (2015, p.4) proposes a four stage methodology (Fig. 5.61).

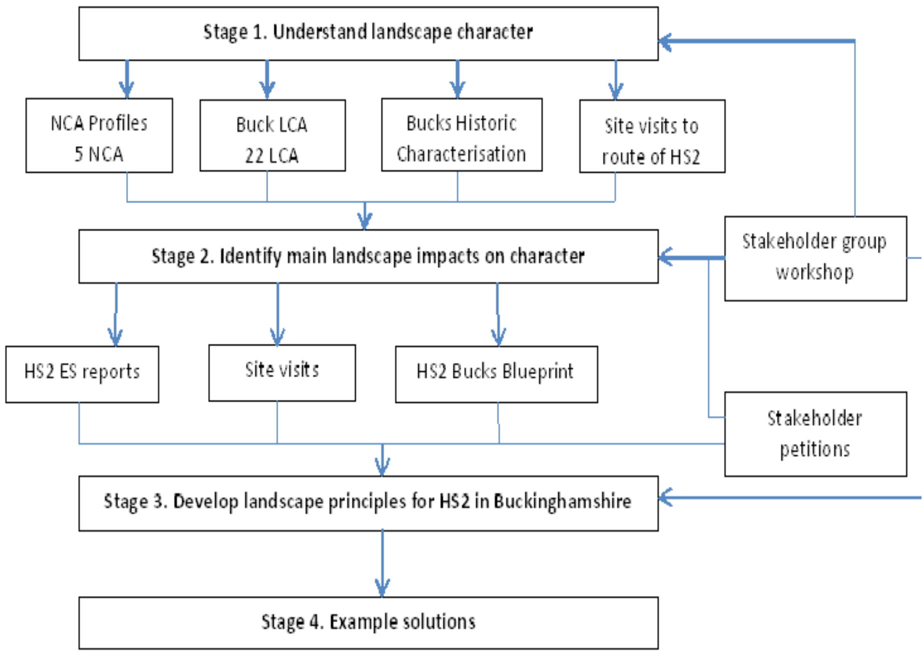


Figure 5.61: A landscape-led approach methodology. Adapted from Buckinghamshire District Councils et al. (2015).

The first stage emphasises the importance of developing an understanding and appreciation of the place's distinctive character, using landscape as a starting point. Natural England, who advises the UK government on the natural environment, has identified 159 distinct natural areas in England, known as National Character Areas (NCAs). Each NCA is distinctive, in that it is the result of a "unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity", which are defined based on natural lines of the landscape rather than sharp administrative boundaries (Natural England, 2014). The distinctive character of each NCA is defined in NCA profiles which, as illustrated in Table 5.6, provide a wide range of information and data about the area.

Table 5.6: National Character Area profiles. Adapted from Natural England (2014).

- topography
- geology and soils
- rivers and coastal features
- trees and woodland
- field patterns and boundary features
- agricultural uses
- semi-natural habitats
- species closely associated with the area
- history of the area
- settlement and development patterns
- roads, railways and rights of way
- commonly used building materials and building design
- tranquillity and remoteness
- the main facts and data about the area
- information about change in the landscape
- the main attributes of the landscape
- assessment of provisioning, regulating and cultural ecosystem services

There are five National Character Areas (NCAs) that are present in Buckinghamshire that are proposed to be crossed by HS2. These are the Thames Valley and Chilterns, the Chilterns, the Upper Thames Clay Vales, the Midvale Ridge and the Upper Thames Clay Vales, and the Cotswolds, Bedfordshire and Cambridgeshire Claylands. Within the context of the five NCAs, Buckinghamshire's Landscape Character Assessment (see section X in chapter X) identified 22 local character areas affected by HS2. Other data used to inform the understanding of place are findings from Buckinghamshire's Historic Character Assessment (which aims to identify and provide an understanding of the historic development of landscapes by looking at how past historic processes contribute to making the character of a landscape as a whole (Historic England, 2016) and site visits and observations along the proposed route of HS2. Given the distinctive nature of the five NCAs, the design solutions and mitigation measures proposed are tailored to, and responsive to, the unique sense of place of each NCA.

The second stage consisted of identifying the areas where particular harm and potential impact to the place, and to the sense and character of place, might occur as a result of the development of HS2. These impacts are then described and mapped. The impacts are identified in terms of direct impacts, indirect impacts and perceived impacts.

- The direct impacts are those that are likely to occur as a result of HS2, which include the direct loss, destruction or change of landscape assets and features that contribute to defining the character of the landscape,

- The indirect impacts include those that occur as a result of construction activities or ancillary interventions required to mitigate the impacts of HS2 but nevertheless are likely to result in changes of landscape character. Finally,
- The perceived impacts include perceived changes to the sense of place, as a result of noise, disturbed tranquillity, movements and lightings resulting from the construction and operation of HS2.

Informed by the understanding of character and impacts gained from the previous two stages and with key contributions from stakeholders and from Environment Statement (ES) reports from EIAs of HS2 and responses to the ES documented in Buckinghamshire's mitigation Blueprint documents, the third stage aimed to develop and propose place-led principles for each of the NCAs with distinct character to better guide the development of HS2. The final and fourth stage consisted of suggesting possible solutions for minimising impacts and landscape character change, and for ensuring that better integration between HS2 within the distinctive places and characters identified can be negotiated and opportunities for creating more positive and constructive landscape change offered.

The report is structured according to the five NCAs of Buckinghamshire, and for each area the report provides the results of a landscape-led approach to the assessment of the impacts of HS2 following the four stages outlined above.

Overall, the landscape principles for each of the five areas examined in the report suggest that to protect the contrast and subtle variety of the Buckinghamshire landscape, HS2 "should be in a fully bored tunnel throughout the designated area of the Chilterns AONB and the Colne Valley and that in all instances it should be designed to such a standard that it complements rather than detracts from the natural beauty of the county. It should be fully integrated into and not imposed on the landscape; enhance and not eradicate character; connect and not cut the landscape." (Buckinghamshire District Councils et al., 2015, p.3).

5.6.5 Conclusions

This report is meaningful for its findings, the rigorous and innovative approach to the methodology adopted and for the collection of a wide range of evidence informed by landscape assessment tools, such as landscape character assessments at a both national and local level and heritage landscape assessments, and stakeholder views. But this report and the working of this stakeholder group is also meaningful because it shows how impact assessment approaches can be exemplary for bringing to the surface civil society discourse and for gathering knowledge that is place-based, and for negotiating solutions that are also place-based. This case shows how affected stakeholders who disagreed with many of the claims put forward by the government justifying the need for HS2, expressed their opposition by gathering evidence in support of their cause. Further, despite maintaining their opposition, they were able to see that a solution was needed and proposed alternatives to the proponents with a view of “seeking the best, if it comes to the worst.” (Buckinghamshire County Council, 2014). As stated by the leader of the Buckinghamshire County Council, “it is critical to secure the very best possible outcomes and mitigation for communities and businesses, should the scheme proceed.” (ibid., p.1).

Looking at HS2 as a case-study, Rozema and Bond (2015) reflect on the extent to which impact assessment-led approaches can accommodate the different discourses that a controversial infrastructure development such as HS2 may mobilise. Their findings indicate that impact assessment may prove more effective in advancing discourses by those stakeholders who focus on how the proposed development can be made sustainable, provided that certain provisions are met. They conclude that this is because of the restricted mandate of impact assessment, which is “to deal with the underlying justification for project development, and its inability to conserve (protected) landscape when trade-offs are made.” (Rozema and Bond, 2015, p.71). Buckinghamshire District Councils et al. (2015) offer constructive and positive suggestions that appear to go beyond the assumed apolitical nature of impact assessment (Bartlett and Kurian, 1999), and accept that if HS2 must go ahead, then there are ways to ensure that this controversial project of a national interest can “provide a bench mark of landscape sensitive design – taking the landscape as its cue and demonstrating the highest possible standards of design and construction … which fits within and responds to the unique Buckinghamshire context.” (Buckinghamshire District Councils et al., 2015, p.3).

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