



Perceived Landscape Qualities: A Case Study of Snæfellsjökull National Park

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Perceived Landscape Qualities: A Case Study of Snæfellsjökull National Park

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60 ECTS thesis submitted in partial fulfilment of a
Magister Scientiarum degree in Environment and Natural Resources

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Abstract

Several different frameworks for landscape analysis have been developed. Following the institution of the European Landscape Convention in the year 2000, the role of human perception and of aesthetic qualities has been underlined, making it clear how certain aspects of the holistic concept of landscape have been long overlooked and ignored. This thesis recognises the need for an integrated approach to landscape analysis, which tackles the perception of qualities found within a specific landscape. Basing its framework on an adapted version of the Norwegian Landscape Analysis and the Landscape Character Assessment developed in Scotland and England, an attempt was made to provide an integrated overview and evaluation of landscapes of the Snæfellsjökull National Park. The results showed a generally high value of landscapes in the area analysed. Complex interconnections between different features found within each area affect landscape perception. A particularly high value was found in the coastal areas, underlining the need for a strong effort to protect and conserve these unique landscapes.

Keywords:

Landscape, Landscape Perception, Snæfellsjökull National Park, Landscape Analysis

Ágrip

Nokkrar mismunandi aðferðir fyrir landslagsgreiningu hafa verið þróaðar. Í Landslagssamningi Evrópu, sem gerður var árið 2000, var lögð áhersla á hlutverk mannlegrar skynjunar og fagurfræðilegra eiginleika. Með honum varð ljóst að tiltekin atriði sem eru mikilvæg í þeirri heild sem landslagshugtakið felur í sér hafa orðið útundan. Í þessari ritgerð er lögð áhersla á samþætt vinnubrögð í landslagsgreiningu, þar sem mat á tilteknu landslagi er byggt á fjölþættri skynjun á sérkennum þess. Stuðst var við aðferð frá Noregi ásamt landslagsgreiningaraðferð sem þróuð var í Skotlandi og Englandi til að veita samþætt yfirlit yfir landslag í þjóðgarðinum Snæfellsjökli og leggja mat á gildi þess. Almenn gáfu niðurstöðurnar til kynna hátt landslagsgildi svæðisins sem kannað var. Margþætt tengsl milli mismunandi atriða á hverju svæði fyrir sig hafa áhrif á skynjun á landslaginu. Strandsvæði þjóðgarðsins fengu sérstaklega hátt landslagsgildi, sem undirstrikar þörf fyrir að vernda og varðveita þetta einstaka landslag.

Efnisorð:

Landslag, Upplifun af landslagi, Þjóðgarðurinn Snæfellsjökull, Landslagsgreining

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1 Introduction

1.1 Landscape

The term ‘landscape’ is highly controversial, mainly due to its difficult definition (cf. Wu, 2013). For this reason, landscape research developed within several different disciplines, which have yet to converge into a fully interdisciplinary science (Antrop, 2000). Due to the exclusion of aesthetic qualities within disciplines such as landscape ecology, landscape studies have diverged into different branches (Tveit, 2007; Gobster et al., 2007). In fact, while several biological indicators have been developed throughout the years in order to monitor landscape changes, the creation of indicators assessing the visual quality of landscapes has been a slow process, especially in a European context. A few attempts are found in previous literature (e.g. Zube et al., 1982; Antrop, 1999), but the inclusion of such qualities into landscape analysis has been problematic, furthering the need for trans-disciplinary research. In recent years, the common ground between ecological and aesthetic indicators has been recognized and underlined, especially with the institution of the European Landscape Convention in the year 2000. As a consequence, several landscape analysis frameworks, such as the well-known Landscape Character Assessment developed in England and Scotland, have been developed with an explicit multi-criteria approach (Fry et al., 2008; Ode et al., 2008; Gobster et al., 2007; Wascher, 2005). This interdisciplinary method is deemed necessary when tackling a holistic and continuously evolving concept such as landscape, and can be identified as the theoretical basis of the thesis.

Considering the increased interest when it comes to the utilization of natural resources within protected areas for a wide range of purposes, this thesis recognises the need of an integrated approach towards landscape and its perceived qualities. Hence, this thesis attempts to produce an integrated overview and evaluation of the landscape’s visual, ecological and geological characteristics in order to facilitate and spark discussion on the many values of landscape, utilising an adapted version of the Norwegian Landscape Analysis framework (2010) and the UK Landscape Character Assessment (2009).

1.2 Operational Definition

The definition of landscape to be utilised throughout this study is the one included in the European Landscape Convention (ELC). Landscape is thereby defined as “an area, as perceived by people, whose character is the result of the action and interaction of natural and/or social factors” (Council of Europe, 2000). The ELC’s definition focuses its attention on both the ecological factors inherent in the term landscape as well as the social, cultural and visual. The definition emphasises the role of human perception, as well as the influence that a society has on the environment and its components.

1.3 Aims and goals of the research

The general aims of this research are:

- To assess the landscape qualities within the Snæfellsnes National Park.
- To generate an evaluation of the perceived landscape qualities.
- To facilitate and enhance the discussion about landscape qualities and the many values of landscape.

The results of the landscape analysis produced in this thesis are expected to provide important information for the development of future policies and land development plans within the protected area.

1.4 Structure of the thesis

The thesis is divided into nine chapters. Following this introduction, Chapter 2 offers an outline of the evolution of landscape analysis. In the second section of the chapter, the main difference between landscape *evaluation* and *characterisation* is outlined. Criteria for landscape evaluation and key concepts of landscape are then defined. Chapter 3 presents a review of the main existing frameworks for landscape analysis in Europe and their main differences. Chapter 4 presents an overview of landscape studies and existing landscape analysis frameworks in Iceland. Chapter 5 outlines the methodology utilised throughout this study, its main characteristics and the main steps

followed. A list of the utilised data is also presented. Chapter 6 presents an initial description of the study area and its characteristics. Particular emphasis is put on the historical references, vegetation, geology and fauna present in the western end of the Snæfellsnes peninsula. Chapter 7 outlines the results of the study, outlining and describing the features found in each sub-region and presenting photographic evidence of the fieldwork conducted. Within the chapter the final ranking scale is presented and analysed. Chapter 8 discusses the results of the study as a whole and the main findings. This chapter also outlines the shortcomings and possible future research in the field of landscape analysis. Finally, chapter 9 presents concluding remarks.

2 Landscape Analysis

2.1 Landscape Studies

Classification is, perhaps, the basic procedure by which we impose some sort of order and coherence upon the vast inflow of information from the real world (Harvey, 1969, p. 326).

As humans, we are always driven towards the need to classify and describe the world that surrounds us. Early examples of landscape description can be identified since the 15th century, when the first paintings on the subject appeared (Olwig, 2002; Antrop, 2000). The first major input for a systematic analysis of landscape is to be found within the work of Carl Troll, who developed, in the 1930s, a new holistic approach towards the study of landscape (Troll, 1939; Antrop, 2000). Making use of the then new technology of aerial photography, Troll introduced the concept of landscape ecology as an *Anschauungsweise* or a conjunction between geography and biology (Zonneveld, 1995). Since then, a plethora of attempts have been made at landscape description (Muir, 1999). In particular in 1947, with the Town and Country Planning Act, Great Britain moved the attention towards “the identification and management of scenic resources” (Zube et al., 1982, pp. 1-2). This interconnection with policy development led the path towards a rationalistic and quantitative approach to landscape studies, which, in turn, caused a division into different scientific branches of studies, and a diminished interest when it came to the inclusion of aesthetic qualities within the research field (Muir, 1999). The emphasis was now on producing evaluation tools that could be repeated by different observers, making the results consistent and reliable (Robinson et al., 1976). In the specific, during the 1970s, behavioural geography contributed to the field of landscape research by trying to assess the perception of landscape by different viewers.

The need for a more integrated and holistic approach to landscape was highlighted in the 1980s when an interdisciplinary meeting took place in Veldhoven, which rebuilt the link between landscape assessment and the traditional landscape ecology as defined by Troll in 1939 (Antrop, 2000). The new approach, however, was focused primarily on landscape ecology, which emphasised the impact of humans on

the flora, fauna and cultural components of a landscape, but not the aesthetic qualities or perception of such qualities (Fry et al, 2008; Wu, 2013). The problem was that, even though landscape ecology was born as an interdisciplinary research field, its main theoretical background was based only on natural sciences.

It is only during recent years that scholars have started to stress the need for the establishment of a common ground between aesthetic and ecological characteristics (Fry et al., 2008; Ode et al., 2008; Gobster et al., 2007). These interconnections between aesthetic features and ecological ones have been long ignored, but have since been included in several landscape analysis frameworks. One example is the English-Scottish *Landscape Character Assessment* methodology, which will be described below.

2.2 Differences between landscape evaluation and characterisation

The major difference to be identified within the current landscape analysis frameworks may be divided into two types of frameworks. That is: (1) landscape characterisation and (2) landscape evaluation (Figure 1). While both these types of frameworks share some common characteristics, they present different outputs.

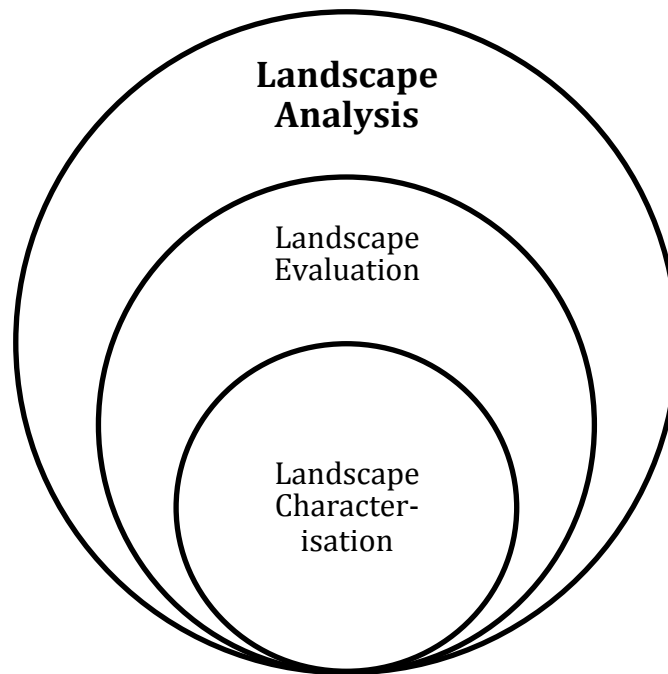


Figure 1. The relationship between landscape analysis, landscape characterisation and landscape evaluation. Both landscape characterisation and landscape evaluation share common features, but landscape evaluation includes a further step.

Landscape characterisation can be seen as a systematic description of landscape units within a set of defined attributes (Van Eetvelde & Antrop, 2008). This enables the researcher to underline the landscape unique characteristics, such as land use, scenic qualities or historical and cultural properties. At present, the main framework based on this concept is the Landscape Character Assessment developed in England and Scotland, where landscape character is described as a “distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse” (Swanwick, 2002, p.8). Landscape character is thus a systematic description of the landscape units in terms of unique features, but does not imply assigning value (Brabyn, 2009).

The lack of quality assessment connected to landscape characterisation has both positive and negative sides. First of all, by not assigning a value to the landscape considered within a study, landscape characterisation recognizes the role of public participation and discussion when it comes to landscape planning; an issue which was especially underlined within the European Landscape Convention (see Jones & Stenseke, 2011). This avoids an elitist approach, where scientists are the only ones having a say on the matter. Moreover, by including the general public and the local communities in the final decision-making and evaluation process, this type of

framework enables a more complete assessment of cultural and societal characteristics within the decision-making process.

On the other hand, landscape characterisation has some serious shortcomings. First of all, previous literature has underlined how a clear definition of ‘the general public’ is still lacking (Conrad et al., 2011). This underpins a serious problem to be found in the democratic decision-making process, which is necessary in order for landscape characterisation to be used (Parkinson, 2003; Horowitz, 1993). On top of that, while the lack of quality assessment makes public participation more direct, the risks of a divergence between the expert’s opinion and that of the public is greater. The risk is that the study will lead the path towards an unclear decision-making process. On this matter, previous literature has underlined that the problem might lay in the language utilised, rather than within the content expressed to the public (Conrad et al., 2011). Indeed, by not producing a final evaluation of the landscape, such studies do not provide policymakers with a clear framework for use as a reference, increasing the possibility of subjectivity when it comes to the decision-making process (e.g. a policymaker could give more importance to his/her personal preferences, rather than fully taking into account the preferences of the general public).

Landscape evaluation is the identification and analysis of landscape qualities. Modern landscape evaluation includes landscape characterisation, but involves a further step that analyses and structures the qualities to be found in the study area. For this reason, landscape evaluation can be seen as a way to convey further public discussion, while providing a reference framework at the same time. This method normally involves two phases: a) the identification and delimitation of appropriate and relevant classes of attributes and parameters, and b) the implementation of these classes and parameters in order to understand landscape qualities (Brabyn, 2009).

The former contains many elements of subjectivity, especially when it comes to the inclusion and/or exclusion of certain parameters. Ideally, landscape evaluation will include a broad range of parameters (such as expert-based ones and visual and sensory ones) that will help during phase two to make decisions and judgements about the landscape considered. Consequently, the latter tries to produce a quality assessment based on fixed parameters and value scales. This approach recognizes landscape quality as being intrinsic and not only dependent on human perception, making it measurable and quantifiable (Lothian, 1999).

Landscape evaluation is at present utilised in several existing frameworks (e.g. Norwegian Landscape Analysis, Danish Landscape Character Assessment) and is the only method that provides a clear ranking scale of the landscape assessed within a study.

Although landscape evaluation is by far the most direct way to provide policy makers with an easily understandable reference tool, it still presents several risks. In specific, the chance is that it rules out the public perception of a landscape, giving importance merely to the technical and scientific point of view. In order to avoid such problems, there may be a need to enhance the collaboration with local communities within the framework. This will not only avoid an elitist approach, but will also enhance the quality of the study itself. Landscape evaluation should aim to include both physical reality and human perception, producing a comprehensive assessment and trying to convey as much information as possible to the final user (Brabyn, 2009). Indeed, the inclusion of cultural knowledge and perception are of importance in order to produce a comprehensive analysis of an area. This is done only in a few existing frameworks (such as the Norwegian Landscape Analysis), underlining the need to further develop landscape evaluation methodologies.

2.3 The subjectivity vs. objectivity debate

Throughout the history of landscape assessment, two contrasting paradigms can be identified: an objective approach, which recognises the quality of landscape as an intrinsic value that can be assessed by looking at physical attributes; and a subjective one, which, in contrast, states that landscape quality is a human construct, product of a subjective perception aiming at the understanding of human preferences to landscape (Lothian, 1999).

This dichotomy is, however, contrasted by the philosopher Finn Arler. In an essay published in 2000, the author argues that landscape qualities “are sharable and discussable, even though they may not actually be shared by all, and even though the common discussion cannot make up for personal experience” (Arler, 2000, p. 294). This moves the focus away from the subjective vs. objective debate, by underlining that the qualities identified by experts are an important instrument to broaden and enhance the public discussion about a complex concept such as landscape. Indeed, he

argues, it is exactly through the identification of contrasting opinions about the identified landscape qualities, and through questioning our own preferences, that a constructive discussion between different fields of studies can be created. On the matter, the philosopher Guðbjörg Jóhannesdóttir (2010) stresses the need to overcome the difference between subjectivity and objectivity when it comes to landscape assessment. In her essay, it is highlighted that this dichotomy is one of the main reasons why landscape conservation is weak at present. She speculates that the ELC might be the means through which landscape studies can finally move onto a new approach (Jóhannesdóttir, 2010).

2.4 Landscape perception

As pointed out by Jóhannesdóttir (2010), the root of the subjectivity vs. objectivity debate has to be identified in philosophy. Indeed, while from Plato to the seventeenth century aesthetic qualities were recognised as being intrinsically contained within the object; during the eighteenth century saw a shift towards a more subjective assessment of aesthetic qualities, now seen as being in the eye of the observer.

This duality can be overcome utilising the ideas of the French philosopher Merleau-Ponty, which in his phenomenology emphasises the notion that aesthetic qualities are not to be categorised within the dualistic (subject-object) approach to reality (Merleau-Ponty, 1993). Overcoming this duality means also rethinking the approach to landscape perception, thus stating that the value of a specific landscape does not lie merely in its objective features nor in its social construct or subjective appreciation (Jóhannesdóttir, 2010). Thus, what can be seen in Merleau-Ponty ideas is a new approach to the human-nature paradigm and, in turn, a new environmental philosophy which places humans within the concept of nature itself. The consequences of this new approach are twofolds: first of all, perception is seen as an active exchange between the subject and the object itself. Secondly, the body is seen as a 'chiasm', or as a combination of subjective experience and objective existence (Baldwin, 2004). Our bodies, mind and senses (or simply our 'flesh', as defined in Merleau-Ponty's phenomenology) all actively participate in an exchange with the land, determining the values perceived. This new understanding has been particularly

emphasised by the philosopher Tim Ingold (2000), which put an emphasis on the active role of the senses when it comes to landscape perception.

This thesis actively engages with the idea of a perceptual act as being the combination of the effort of both subject and object. Perception becomes therefore the meeting of both the external world and the eyes of the subject, a combination between objective qualities, social constructs and several other elements affecting the overall act.

2.5 The many values of landscape

Due to its holistic and multi-faceted character, the concept of landscape can be valued in several different ways, which include both natural and cultural aspects (Antrop, 2005; Gray, 2004). The identified values are as follows:

- (1) Intrinsic or Existence Value
- (2) Cultural Value
- (3) Aesthetic Value
- (4) Economic Value
- (5) Functional Value
- (6) Research and Educational Value

(1) Intrinsic or existence value

The concept of intrinsic value, meaning that something is valuable for its own sake, has deep historical and philosophical roots (Zimmerman, 2008). Aldo Leopold was the first one to highlight the link between the philosophical concept and the discipline of ecology in his book *A Sand County Almanac*, defining the land as a moral community to which the individual belongs, rather than a simple property (Leopold, 1949). This ecocentric view of nature was later expanded with the deep-ecology movement founded by Arne Næss (Nordstrom, 1993). The tie established between intrinsic values and the environment is subsequently to be found during the 19th century with the raise of a romantic view of nature, which led to the institution of the first national parks (e.g. Yellowstone), and of a broader nature conservation movement (Gray, 2004).

On this matter, Nordstrom (1993, p. 474) underlined how “the concept of intrinsic value has great potential in landscape evaluation because it grounds theoretical discourse and decision-making processes in the essence of the object being evaluated”. In this sense, if the intrinsic value of a landscape is recognized, the discussion will not only revolve around the human perception of it, but, rather, include also an ecological and non-anthropocentric discourse (Gray, 2004).

(2) Cultural Value

Landscape is everyone’s fundamental heritage. It is all embracing and unavoidable (Lowenthal, 2007, p. 635).

Landscape has always shaped cultures and affected humans in significant ways, reflecting the characteristics of the social and cultural environment (Schwartz, 2006; Krause, 2001). For this reason it is of extreme importance to understand “the way the environment is perceived and comprehended as landscape by individuals and societies, and the consequences this has for behaviour towards the environment” (Olwig, 2003, p. 873). Cultural landscapes have not only shaped individuals, but have also created national identities and have been utilised as a way to represent oneself to the world (especially in Europe, see Cosgrove, 1984). This interconnection between folklore, language and national identity can be traced all the way back to the end of the 18th century, when the concept of landscape underlined the concept of rural liberation and emancipation (Lowenthal, 2007).

At present, there is a growing concern about the vanishing traditional landscapes (Antrop, 2005). This concern is growing in the Icelandic context as well, even though, as pointed out by Edda Waage (2013), the term ‘cultural landscape’ has not been part of the Icelandic culture until very recently. In fact, while landscapes always evolve, as they are “the expression of the dynamic interaction between natural and cultural forces in the environment” (Antrop, 2005, p. 2), current changes are perceived as a threat, mainly because they are connected to a loss of diversity and historical coherence. In order to protect the cultural heritage of a landscape, a careful planning process has to be undertaken (e.g. Schmid, 2001). For this reason, an integrated landscape analysis framework is of extreme importance because it allows for the understanding, planning and monitoring of possible landscape changes.

(3) Aesthetic Value

Throughout history, natural landscapes have not always been connected with aesthetic value (Gray, 2004; Brady, 2003). Lowenthal (2007) underlined how, up to the early 19th century, nature was perceived as fearsome, wild, something unknown and horrid. Even landscape paintings, which first appeared during the 17th century, were initially considered to be the lowest of the arts (Lowenthal, 2007). This genre of painting rapidly gained respect and importance with the work of Claude Lorrain. It is only with the rise of the Romantic Movement during the 19th century that underlined the connection between man and nature, and consequently in the 20th century with Aldo Leopold's work, that the intrinsic value of the nature was recognized. the focus shifted on landscape's recreational qualities making nature worth protecting (Gray, 2004).. On the matter, several studies underlined how the preferences for landscapes are to be found in multiple factors (Gobster, 1999). Previous literature has established the western's world connections of aesthetic preferences with age (Zube et al., 1983), gender (Lyons, 1983) and ethnicity (Kaplan and Talbot, 1988).

Nowadays, due to the recognised importance of landscape perception, both in terms of conservation and tourism, our aesthetic preferences of landscapes are taken into consideration when it comes to decision-making processes (see Selman & Swanwick, 2010).

(4) Economic Value

Often, the benefits and costs of land-use are assessed in economic terms. In recent years several studies tried to perform an economic evaluation of ecosystem services (e.g. Costanza et al., 1997). The reason behind this was that the services have been undervalued and used without taking into account the damage made for many years and that, by putting a price on them, both policy makers and people will start appreciating them more (Abramovitz, 1998). The problem with this evaluation is that, as previously mentioned, landscape is a holistic and multi-faceted concept, which cannot be completely assessed within the economic framework. The most obvious example is the cost-benefit analysis method that requires a division of the services into separate units and consequently accounts for their individual value. Within a cost-benefit analysis, the interconnections and relationships between the different elements analysed are completely disregarded and not taken into account, making its reductionist approach quite obvious.

While certain economic values of landscape can be priced, such as the presence of construction minerals at a particular site, most of the values connected to the concept of landscape are non-priced elements or otherwise complex to fully comprehend, such as recreational opportunities (Gray, 2004; Tyrväinen and Väänänen, 1998). Therefore, it can be stated that the economic value of a landscape does not reside merely in its specific resources and materials but, rather, is an interconnection of cultural values, aesthetic values, functional values and intrinsic ones. This interconnection is especially evident in the case of a nature reserve. The economic value of a specific landscape will not only consist of the ability to attract tourists, but rather, it will be a mesh of biological, ecological, cultural and aesthetical characteristics. This link between several different values underlines the need for a holistic approach towards landscape management and utilization.

(5) Functional Value

Landscapes have an important functional value in the ecosystem (Fisher et al., 2006). Land-use in specific region can have effects on several ecological functions, such as species interaction (Fahrig, 2003), animal movement, and population persistence (Fraterrigo, 2009; Fahrig et al., 2011). Moreover, the role of biodiversity in a specific area is of extreme importance because it increases the resilience of the ecosystem to human-made changes (Fisher et al., 2006).

It has to be underlined that these elements do not only provide a functional value to the species to be found in a landscape, but they also contribute to indirect human-centred values such as health, pollution control, water flow regulation, avalanches control in mountain environments and nutrient supply, to name a few (Gray, 2004).

(6) Research and Educational Value

Landscapes are an important element for educational purposes. In example, the geological formations in an area can be the means for understanding Earth history (Gray, 2004). Also the study of evolution and biology depends on the presence of resilient and coherent landscapes. On this matter, as previously mentioned, often landscapes present clear connections with the development of a nation. For this reason, they are of extreme importance when it comes to history and knowledge and can provide further information on a nation's folklore.

2.6 Key landscape concepts

Landscape being a holistic and complex concept, a plethora of elements contribute to the final perception of its qualities (Figure 2). This section, largely based on Tveit et al. (2006), offers an overview of the main parameters identified within this thesis, the elements that can influence them and the reasons why they were taken into account within this study. The theoretical background and key concepts related to landscape quality assessment are thus emphasised.

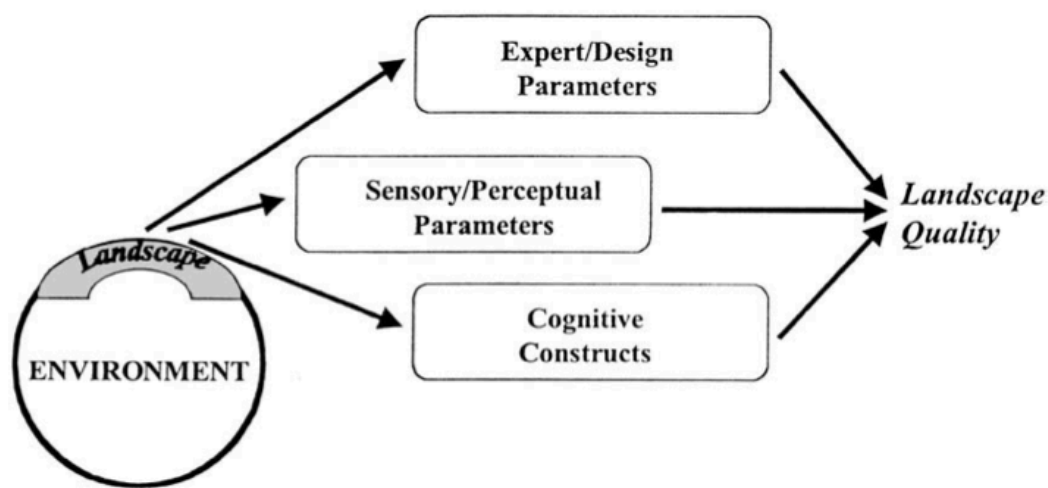


Figure 2. The consideration of different parameters is necessary to understand landscape quality and produce a comprehensive landscape evaluation. In particular, the interconnection between expert based parameters (such as ecological ones), sensory ones and cognitive constructs (linked to the human perception of landscape and identity) are highlighted in the scheme (Daniel, 2000).

The key parameters identified are twelve:

- (1) Coherence
- (2) Naturalness
- (3) Diversity and variety
- (4) Time depth
- (5) Narrative
- (6) Visual scale
- (7) Seasonality
- (8) Disturbance
- (9) Stewardship
- (10) Imageability

(11) Sound

(12) Smell

(1) Coherence

- Concept: defined as “the reflection of the unity of a scene” (Tveit et al., 2006, p. 239).
- Attributes in the landscape: geology and landform, vegetation, land use, historical features, presence of water.

This concept refers to the perceived natural harmony of a particular landscape. It is directly connected to the ability of the viewer to fully comprehend the landscape visual patterns, both in terms of harmony, colour and readability (Bell, 1999). Van Mansvelt & Kuiper (1999) divide landscape coherence into three separate elements: (i) vertical coherence, which is reflected in the geology, morphology, vegetation cover and landform; (ii) horizontal coherence, which is reflected by the overall connection of the separate elements; (iii) temporal coherence, which is the product of landscape development patterns through time and seasons, presence of historical elements, presence of seasonal references. A landscape with high coherence will enhance the ability of a viewer to process the unity of elements visible in it (Kuiper, 1999). A particular component connected to landscape coherence is the presence of water. Previous literature has emphasised how waterscapes enhance the overall perception of coherence, as they are usually seen as harmonious (Litton et al., 1974; Kaplan, 1977).

(2) Naturalness

- Concept: the closeness of a landscape to its perceived natural state.
- Attributes in the landscape: geology and landform, vegetation, land use, historical features, presence of water.

The concept of naturalness, as stressed by Tveit et al. (2006), is seen as a key aspect of a landscape's visual quality. According to Gobster (1999), a landscape that is perceived to be ecologically intact will be assigned a higher value, compared to a landscape disrupted by human activities. This theory has been emphasised by several studies, which found a general preference towards landscapes that are composed of a dominant natural element (Ode et al., 2009; Hägerhäll et al., 2004; Real et al., 2000).

Water plays an important role also within this concept, mainly due to its perceived natural state (Real et al., 2000).

(3) Diversity and variety

- Concept: the richness of landscape elements, the variety in its patterns
- Attributes in the landscape: geology and landforms, vegetation, land use, historical features.

This concept directly refers to the complexity of landscape elements and their visual variety (Kaplan & Kaplan, 1989; Hanyu, 2000). The complexity of a landscape is reflected in several different attributes, among which its landform, vegetation cover and presence of fauna. Unfortunately, as underlined by Tveit et al. (2006), a lack of assessment when it comes to the relationship between complexity and landscape preference is to be identified within the existing literature.

(4) Time depth

- Concept: refers to both the visibility of different historical elements in the landscape and to the richness and coherence of those elements.
- Attributes in the landscape: historical features, geology, vegetation, landform.

Previous literature has highlighted how the richness of the time depth within a landscape is an important element when it comes to landscape perception (Hägerhäll, 1999; Strumse, 1994). Moreover, the presence of historical elements within a landscape has been connected to heritage and a general sense of belonging (Lowenthal, 2007). This is because landscapes have “holistic and complex character, which bridges natural and cultural aspects” (Antrop, 2004, p. 7).

The landscape time depth can be seen not only through historical man made features (such as historical buildings, cairns, land use patterns) but can be also traced within physical features, such as geology and vegetation.

(5) Narrative

- Concept: the presence of landscape narrative.
- Attributes in the landscape: landform, geology, vegetation, historical features.

This concept is related to the notion that landscape shapes our cultures and identities, creating a narrative with the observer (Lowenthal, 2007; Hansen-Møller, 2006;

Bunkše, 2007). According to Arler (2000), the introduction of a specific landscape narrative shapes all the other qualities in a positive or negative way. This is particularly evident with the presence of historical attributes within a landscape which will enhance the time depth, while at the same time creating a narrative clearly identifiable by the observer.

(6) Visual Scale

- Concept: the openness and visibility of a landscape
- Attributes in the landscape: landform, geology, complexity, presence of water.

Previous literature has highlighted the link between the degree of openness and landscape preference (Hanyu, 2000; Clay & Smidt, 2004). The scale of landscape is of special importance in an Icelandic context, especially considering the lack of high vegetation, which contributes to a general larger scale of the landscape. Furthermore, the concept of visual scale can be positively influenced by water bodies (such as the sea), which increase its impact on the observer.

(7) Seasonality

- Concept: elements in the landscape that are influenced by seasonal change.
- Attributes in the landscape: vegetation, complexity, presence of water.

This concept directly relates to the amount of landscape changes throughout the year and the different seasons (Litton, 1972). Seasonal variability is especially relevant when connected to the amount of colours and variety visible in a specific landscape (e.g. snow cover will affect the landscape perception, affecting also its perceived complexity). A particular mention is the possible waterscape found in an area, which greatly impacts the perceived season changes within a landscape (Litton et al., 1974).

(8) Disturbance

- Concept: “lack of contextual fit and coherence, where elements deviate from the context” (Tveit et al., 2006).
- Attribute in the landscape: man-made buildings, construction or intervention in the landscape.

The concept of disturbance generally refers to the amount of interventions that modify the landscape (Pachaki, 2003). These interventions are considered to be negative

when they do are not harmonious with the landscape, affecting mainly its coherence and its appreciation (Ulrich, 1983).

(9) Stewardship

- Concept: the perceived sense of order within a landscape.
- Attributes in the landscape: vegetation cover, man-made structures, waste.

This indicator directly refers to the management of a landscape and its perceived effect (Van Mansvelt & Kuiper, 1999). Generally speaking, the appreciation of the observed environment will be greater when there is a visible ‘aesthetic of care’, meaning that the observer is able to understand that the area is taken care of without disrupting its natural qualities (Nassauer, 1997). Previous literature has emphasised how the optimal degree of maintenance within a landscape depends on the context, highlighting the fact that a high maintenance level and a low one can both be valued negatively (Coeterier, 1996).

(10) Imageability

- Concept: the presence of landmarks, special features or spectacular elements in a landscape.
- Attributes in the landscape: viewpoints, landmarks, landform, geology, presence of water.

The concept of imageability refers to the physical qualities in a landscape that make it unique and remarkable. These qualities enhance the area identity, making it distinguishable from others. As underlined by Tveit et al. (2006), this indicator is connected to several concepts such as spirit of place (Norberg-Shulz, 1980), vividness (Litton et al., 1974) and imageability (Lynch, 1960). The spirit of place concept is defined as the ability of a landscape to transmit a sense of beauty and appreciation to the viewer (Bell, 1999). Furthermore, the concept of vividness, defined as the quality inherent to a landscape that makes it striking, has been connected to the presence of water bodies (Litton et al., 1974).

(11) Sound

- Concept: the occurrence of sound within a landscape.
- Attributes in the landscape: fauna, natural noise, human noise.

Sound is an inherent quality of every landscape and is closely related to visual qualities and perception (Pijanowski et al., 2011; Carles et al., 1999; Smith, 1994). The presence of man-made or natural sounds within a specific area has the effect of enhancing or diminishing its perceptual qualities (Southwork, 1969). In specific, Carles et al. (1999) demonstrated how natural sounds are generally rated positively and contribute to an increase in the appreciation of the natural (or artificial) area considered. Moreover, the study created a positive link between water related sounds and an overall higher environmental appreciation.

(12) Smell

- Concept: the occurrence of odour in a landscape.
- Attributes in the landscape: fauna, vegetation, human influence.

Considering that the perception of landscape involves the utilisation of all the senses, this concept refers to the occurrence of particular smell or odour within a landscape (Coeterier, 1994). A lack of literature was found, especially when it comes to the link of landscape appreciation and the influence of smell. Nonetheless, a correlation between landscape and the perception of a specific place is to be identified in previous studies (Haque, 2004; Hoover, 2010; Paraguai, 2013).

Even though the twelve concepts were presented in a separate and independent way, it is important to understand that they are closely correlated. Indeed, they are to be understood as integrated parameters, which contribute in different ways to the final perception of a specific landscape. Furthermore, it is important to note that these concepts are to be understood as context-dependent and observer-dependent (Tveit et al., 2006).

3 Existing Frameworks

3.1 European frameworks

In order to assess landscapes characterisation on a national as well as regional level, several frameworks based on different methodologies are currently being used. This section, largely based on the report edited by Wascher (2005), presents an overview of the existing frameworks in European countries that are taken into account for this study.

Austria

SINUS (Spatial Indices for Land Use Sustainability)

The SINUS project, funded by the Austrian Federal Ministry for Education, Science and Culture (BMBWK), tries to develop “spatially explicit indicators of practical use in long-term monitoring and assessment of ecological sustainability of Austrian cultural landscapes” (Peterseil et al., 2004, p. 308). Furthermore, the framework assesses the degree of human influence on the natural ecosystem by analysing the transformation of species composition and structure in plant communities (Peterseil et al., 2004). An inter-disciplinary top-down multi-scale approach is utilised by combining ecological field surveys and remote sensing. The whole framework presents statistical and automated processing of the images, as well as interactive refinement (Wascher, 2005).

The SINUS method is of relevance because of its integrated approach towards the production of thematic maps and because it enables the production of the impacts of humans on the ecosystem. While this approach accounts only for ecological and biological data, it is considered in this thesis mainly for its use and intersection of thematic maps.

ÖR7 (Landscape development model for the EUREGIO Bavarian Forest – Sumava – Mühlviertel)

The method developed for the Bavarian Forest assesses both natural (geology, climate, altitude-model, Corine-landcover, and field pattern) and cultural aspects and stratifies the information on 5x5km grids using GIS compiled maps (Vierlinger et al.,

1998). The method combines statistical analysis with subjective expert knowledge in order to demarcate and categorise the different landscape areas and produce maps of cultural landscape types.

The Austrian ÖR7 framework is an influential work especially when it comes to the consideration of cultural data within a landscape analysis framework. This method, applied onto a protected area, represents a unique dataset of cultural information that is available online for the public. Within this framework, it is of particular interest how the intangible cultural objects were integrated and then analyzed on thematic maps

Belgium

Ecodistricts, Flanders

The mapping of geophysical and biotic aspects related to the environmental policy in the Flanders. The methodology utilises GIS and statistical analysis, mainly aiming at assessing the homogeneity of the landscape contained within the study area. The outputs of the framework are ecoregions or ‘ecodistricts’ that are areas presenting unique features. The framework is interesting because the data analysed was specifically integrated within the identified districts and regions’ environmental policy

Landscape Character Map

This framework assesses a wide variety of natural features as well as land use and historic features. The use of GIS analyses as well as existing literature results in the production of a single layered map that merges all the features considered in the study area.

Czech Republic

LCA (Methodology based on the work of Bukáček and Matejka, 1997)

A framework based on the analysis of biological, cultural and aesthetic indicators, especially designed to be used on protected areas and National Parks. The methodology tries to determine specific territorial units, the expression of each characteristic in the landscape and their functions and changes over time. The fundamental characteristics are then simplified and classified. Subsequently, a quality assessment on spatial relations of the characteristics and components of the landscape

is produced (Bukáček and Matejka, 1997). The output is a map highlighting different landscape units, where a higher rating corresponds to a higher need for landscape protection. Furthermore, the produced map highlights the protected area limits.

The framework developed in 1997, based on the analysis of potential protected areas, represents one of the earliest examples of a top-down approach to data analysis and was thus mentioned in the thesis. This framework is relevant because of the integration between the ecological characteristics and the cultural ones, which is sought within this thesis.

Denmark

Danish Landscape Character Assessment

This framework, completed in 2007, aims at producing a planning framework for the Danish countryside (Hansen et al., 2010; Nellemann, 2007). The methodology focuses on landscape values and entities, particularly on landscape perception. GIS maps are extensively used throughout the framework, in order to produce a final evaluation (Nellemann, 2007). The framework is divided in four different phases (see table 1).

Table 1. The four phases used in the Danish Landscape Character Assessment framework (Hansen et al., 2010).

Phase 1: Characterisation	Phase 2: Making Judgements	Phase 3: Strategy	Phase 4: Implementation
<ul style="list-style-type: none"> - Define scope - Natural environment - Cultural environment - Spatial/perception features - Mapping of landscape character areas 	<ul style="list-style-type: none"> -Landscape character: strength -Visual Qualities - Condition -Sensitivity -Mapping of landscape character areas 	<ul style="list-style-type: none"> -Strategy and zoning -Proposed actions and initiatives 	<ul style="list-style-type: none"> -The municipal plan -Main structure -Guidelines and frames -Premises

Phase 1: Characterisation

After the definition of the scope of the study, the analysis to be conducted is threefold:

I) Natural environment (geomorphology, soil types, landform).

II) Cultural environment (historic maps, natural regions and dominant land cover).

III) Perceptual feature (Field survey – visual analysis of the dominant features present in the area, spatial structures and visual aspects, analysis of digital photos, survey sheet, underlining of disturbing elements).

The data collected in the previous analysis will then have to be combined, through the use of GIS, into digital maps that will allow the description of the different landscape characters.

Phase 2: Making judgements

During this phase of the Danish framework, the study focuses on four different characteristics: (1) Character strength, (2) Perceptual qualities, (3) Condition and (4) Sensitivity. These elements will have to be taken into account considering the special characteristics of the sub-region (e.g. when considering a coastline particular emphasis has to be given to the perceptual qualities).

Phase 3: Strategy

This phase aims at producing and describing the policy objectives and guidelines for the implementation of the framework into decision-making processes. In particular, the zoning of the study area has to be completed and decisions on each zone's strength and weaknesses have to be taken.

Phase 4: Implementation

During this phase the Danish method aims to provide the municipality with a landscape plan, that presents development projects and guidelines for stakeholder involvement and designation of special areas (e.g. National Parks).

This method is of particular interest for this study, mainly because it takes into account ecological, geological and visual characteristics in order to produce thematic maps with a close policy-oriented focus. The methodology is of similar entity when compared to the Norwegian Landscape Analysis framework, but presents a zoning effort and is thus more usable when it comes to urban areas planning, rather than a protected area.

Norway

Norwegian Landscape Analysis (Landskapanalyse)

The Norwegian Landscape Analysis was developed jointly by the Directorate for Nature Management and the Directorate for Cultural Heritage in Norway. The official documentation and framework description was finally published in February 2010 (Directorate for Nature Management and the Directorate for Cultural Heritage, 2010). In this framework, ‘landscape character’ is defined as “a concentrated expression of the interaction between an area’s natural environment, land use, historical and cultural content, as well as spatial and other sensory conditions that characterise the area and separates it from the surrounding landscape”¹ (Directorate for Nature Management and the Directorate for Cultural Heritage, 2010, p.10, own translation). This holistic approach is reflected in the methodology of the entire framework. To reflect this, the analysis is composed of five different steps that include desk studies as well as fieldwork that together produces a complete assessment of the landscape included in the study (See Table 2, Directorate for Nature Management and the Directorate for Cultural Heritage, 2010).

¹ “Landskapskarakter er et konsentrert uttrykk for samspillet mellom et områdes naturgrunnlag, arealbruk, historiske og kulturelle innhold, samt romlige og andre sansbare forhold som særpreger området og adskiller det fra omkringliggende landskap” (Directorate for Nature Management and the Directorate for Cultural Heritage, 2010).

Table 2. Norwegian Landscape Analysis framework, divided into five different phases. (Directorate for Nature Management and the Directorate for Cultural Heritage, 2010).

PHASE I: PREPARE	PHASE II: DESCRIBE	PHASE III: INTERPRET	PHASE IV: EVALUATE	PHASE V: PLAN
- Set Goals and limits	- Conduct initial source studies of landscape content and features - Conduct inspection - Organisation of knowledge	- Fix landscape character for subareas - Interpreting landscape as a whole and the relationships in the study area	- Assess the landscape value in the study area	- Planning process and impact assessment

Phase I - Prepare

This phase requires the definition of the goals and scope of the project, as well as the identification of a clear framework to be utilised. During this phase, deskwork will be conducted, analysing the available knowledge and presence of previous studies on the study area, the possible municipal plans and knowledge about specific issues (e.g. utilization of resources, cultural heritage). Finally, the map scale will have to be defined in order to conduct a preliminary assessment of the area.

Phase II – Describe

During the second phase of the framework, an assessment of the fundamental characteristics that the area presents is to be conducted. A sketch map of the defined sub-areas of the region to be considered is required. It is important that those carrying out the assessment to familiarise themselves with the study area in order to consequently conduct useful and effective fieldwork. The fieldwork is an important aspect of this framework, because through it more information about visual and ecological qualities will be collected.

Finally, all the data collected, both on the field and while conducting deskwork, has to be implemented into a GIS-based map of the study area.

Phase III – Interpret

The determination and analysis of the general landscape character is the main purpose of Phase III. Both the sub-areas as well as the whole study area have to be interpreted utilising the data collected in the previous phases.

Phase IV- Evaluate

During this phase the landscape value should be assessed and reviewed. Through the use of fixed criteria and pre-determined concepts, the general idea of landscape that was found in the study area should be reviewed. The valuation is based on a sliding five-level scale, where five represents the higher value (Table 3).

Table 3. The Norwegian Landscape Analysis valuation table, based on a scale from one to five represented by stars (Directorate for Nature Management and the Directorate for Cultural Heritage, 2010, own translation).

Value Criteria	*	**	***	****	*****	Reason
Diversity and Variety						
Depth & Continuity						
Wholeness & Coherence						
Contrast						
Condition & Time						
Public Perception & Local Knowledge						
Readability						
Belonging & Identity						

Since the evaluation is subjective, a clear and detailed explanation of the decisions to be taken during this phase has to be written. A description of the overall conclusions should be completed, with the inclusion of maps as well as photographs for each sub-area.

Phase V- Plan

This phase implements the landscape analysis as a useful tool for town and country planning and policy developments.

The Norwegian Landscape Analysis is especially helpful considering the aim of this project, due to its integration of multiple methodologies and technologies. First

of all, it utilises a set of variables that is not only extensive, but also can be easily applied to the Icelandic case (albeit, with many exception and adaptations, especially when it comes to the different geological characteristics). The integration of visual, geological, biological and anthropological variables, both in the desk study aspect of the framework, as well as in the fieldwork, makes it a complete tool for landscape analysis. This is reflected in the “Register for Landscape Data” provided with the framework, which constitutes a good all-round approach to the elements that this study was seeking to underline in the protected area.

Furthermore, the Norwegian Landscape Analysis is one of the few frameworks, along with the Danish Landscape Analysis, that includes the creation of a final ranking scale, which helps towards the building of a clear classification of the landscape characteristics analysed in the study. The production of a final ranking scale comes with a series of disadvantages, especially in regards to the inevitable reduction and over-simplification of the multiple landscape values. As underlined previously in the chapter, the risk is to exclude the general public from the final assessment of the landscape qualities. This risk, however, comes with advantages, the main one being that the creation of a ranking scale represents a further tool that enhances the comprehension of the overall study by the final user. The Norwegian Landscape Analysis includes both the overall description of the landscape character as well as the final scale, without omitting the subjectivity that lies within the latter. This will be useful for the protected area considered, as it will allow building a final evaluation of the different sub-regions, which will hopefully be then useful to the management of the area.

United Kingdom

LANDMAP information system (Wales)

The Countryside Council for Wales (CCW) established this framework in 1994. LANDMAP consists of a dataset containing information about landscape that is compiled at a county level and then validated on a national level by CCW.

The dataset contains information about contextual layers (landscape form and landscape function), evaluated layers (geological landscapes, landscape habitats, visual and sensory, historical landscape, cultural landscape), socio-economic layers (people, economy, wealth, health) and public perception (‘top down’ information and

‘bottom up’ information). The classification for each aspect are standardised and integrated within the dataset (CCW, 2003). It has to be underlined that LANDMAP does not produce an integrated landscape characterisation, but rather places the attention on individual characteristics (Washer, 2005).

The strength of this framework lies in the diffusion of the data – that is constantly updated on the LANDMAP website and is thus a shared resource that can be used by policy-makers and local authorities (CCW, 2003). This framework is particularly noteworthy because of the aim to produce an integrated and national database that is accessible to policy-makers. It is important however to underline that the human perception of landscape is not included within the framework.

Landscape Character Assessment (Scotland & England)

The Countryside Agency in England and the Scottish Natural Heritage developed the Landscape Character Assessment framework over many years in Scotland and England. The final report was published in 2002, providing a guidance tool for its use and application in a wide range of fields (Swanwick, 2002). Over the years LCA has been widely used for planning and policy making (see in example the criteria based development in West Sussex, CCN, 2006 or Derbyshire, CCN, 2005). The methodology utilised in the LCA is a combination of deskwork and fieldwork. The focus is on landscape character types defined as “a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from one another, rather than better or worse” (Swanwick, 2002, p. 19). LCA combines field data and GIS-produced maps, in order to provide the policy makers with usable and readable detailed maps.

The LCA framework is divided into two stages with six different steps (Table 4):

Table 4. The LCA framework, divided into two different stages (Swanwick, 2002).

Stage I: Characterisation	Stage II: Making Judgements
Step 1: Define the Scope	Step 5: Deciding the Approach to Judgements
Step 2: Desk Study	Step 6: Making Judgements
Step 3: Field Survey	
Step 4: Classification and description	

Stage I: Characterisation

Deskwork and field survey are strictly interrelated in the LCA framework. It is necessary to gather all the available information about the different map layers and elements that will be considered in the landscape characterisation and on the field work, which will take into account a variety of visual characteristics (e.g. scale, enclosure, diversity, texture, form, colour) positioned on a premade scale that will help the following classification and description to be assessed in Step 4, Stage I. During this step the study should be able to group different landscape types in order to produce a general assessment of the study area.

Stage II: Making Judgements

During this step judgements have to be made in order to inform the policy-makers and the decision-makers. The framework could also be implemented into an Environmental Impacts Assessment or a landscape capacity study.

The LCA was chosen because it provides a very detailed framework for landscape characterisation. The most important element within the framework is the division between characterisation and the process of making judgements, that marks the difference between objective and subjective choices to be made during the landscape character assessment (Swanwick, 2002). This allows the development of two distinct steps of analysis that will then be merged into the final report. Because of the integration between conservation and human interests within a protected area, it is necessary for this study to underline the connections between objective and subjective values in the area. The LCA framework provides a useful tool that allows making

evident the need to consider both in every management decisions to be made within the park's boundaries.

Moreover, the LCA was considered to be of importance for this study, because of the emphasis put on the field survey. As explained in the guidance, the “field survey provides important ground level view that shows how the landscape is seen by people” (Swanwick, 2002, p.41). The purpose of a detailed field survey is to collect information on the character, aesthetic qualities as well as to expand and update the data available through desk study. The English and Scottish framework integrates within the fieldwork variables considering aesthetic, land use, anthropological and cultural as well as perception values. This general approach was utilised in this study, in order to gain as much data as possible while conducting the fieldwork. However, it has to be underlined that most of the variables utilised were taken from the Norwegian Landscape Analysis, because of the similarities between the two countries' landscapes and land variables. The LCA provided the basis for the inclusion of sound perception within the variables to be considered during fieldwork.

3.2 Comparison between the LCA and the Norwegian Landscape Analysis

Among the many existing European frameworks, two were deemed to be useful for this specific research: (1) Norwegian Landscape Analysis and (2) UK Landscape Character Assessment. The main reason is these frameworks are the only ones that require the inclusion of visual, cultural, ecological and geological characteristics within the analysis. By doing so, the output is an integrated overview of landscape characteristics, emphasising the role of human perception.

The commonalities between the two chosen frameworks are many, as shown in Table 5. First of all, both frameworks try to cover every aspect of landscapes within the analysis, in order to produce an integrated and comprehensive assessment. In order to do so, both the frameworks make it clear that the first step to be made is the definition of the study scope and aims, as well as the selection of a precise study area utilising a combination of desk-based work as well as field-based work to produce a holistic analysis. The field-based work is conducted in similar ways, even though the characteristics covered are more complete in the LCA, due to the inclusion of sound

qualities for example. It has, however, to be noted that the variables considered in the Norwegian Landscape Analysis are more adaptable on this study's case. This is because the landscape in the United Kingdom is deeply connected with human influence and cultural heritage, a characteristic that is in many cases not present in the Icelandic context. On the other hand, the landscapes of Norway are somewhat similar to Icelandic ones in that the presence of human influence is often minimal and the landscape is thus often perceived as largely 'natural' and 'pristine'. Thus, the field-based survey used within this study is a combined version of the two different frameworks.

Table 5. Comparison of the main structure: Landscape Character Assessment and Norwegian Landscape Analysis.

	LCA	Norwegian Landscape Analysis
<i>Definition of Scope</i>	Well defined	Well defined
<i>Desk-Work</i>	Yes	Yes
<i>Visual Analysis</i>	Yes (with exceptions)	Yes
<i>Field Based Survey</i>	Yes	Yes (lack of sound qualities)
<i>Aesthetic Aspect</i>	Yes	Yes
<i>Final Evaluation</i>	No	Yes (based on a ranking scale)
<i>Output</i>	Information for making judgements	Evaluation scale for policy-makers

The main difference between the two methodologies lies in the visual analysis of the landscape. The LCA, while putting an emphasis on the visual characteristics of landscape, has certain limits when it comes to the visual analysis approach. Indeed, the framework underlines that "each point should be publicly accessible" (Swanwick, 2002, p. 41). This element can undermine the overall analysis of the landscape considered in a study and can result in the production of a partial assessment of the visual characteristics, especially when the fact that many areas in Iceland are not publicly accessible. On the other hand, the Norwegian Landscape Analysis includes detailed instructions about methodologies to use and does not specify where the fieldwork should be conducted.

Moreover, the LCA framework does not include the evaluation of landscape qualities. This is specifically avoided, as the LCA overall aim is to provide a tool to

facilitate the discussion within the general public. The creation of a final evaluation table is thus seen as an element that can diminish the inclusion of different stakeholders. On the other hand, the Norwegian Landscape Analysis framework includes the creation of a specific ranking scale. This final evaluation is utilised to produce a clearer visual analysis of each sub-region considered as well as to produce a final quality assessment of the study area. This is not seen as a disadvantage, but rather as an advantage for several reasons. First of all, it will be possible for policy makers and for the final user to understand the results of the study in an easier way (avoiding, perhaps, interpretation errors). Secondly, it is important to see the evaluation table as a further element, along with the characterisation of each area, to be found within the landscape study. This will possibly enhance the discussion on the many values of landscape.

4 Landscape Assessment in Iceland

4.1 Historical Overview

The first example of landscape classification in Iceland is found in V.H. Malmström's *A Regional Geography of Iceland*, published in 1958. The author defines landscape as the correlation between structure, time and geological processes (Malmström, 1958). He presents a division of Icelandic landscape into six regions, based on geological and geomorphological characteristics.

Another attempt at classification of the Icelandic landscape was undertaken by Hubertus Preusser, which published his study *The Landscape of Iceland: Types and Regions* in the Netherlands in 1976. Preusser is the first one to recognise the interconnection between natural and cultural feature of the landscape (Waage, 2013; Preusser, 1976). The study conducted by Preusser can be divided into two phases. During the first assessment, the author identifies eight different types of landscapes (excluding the islands), mainly taking into consideration landforms, geology and surface features. Consequently, he recognises the existence of 26 landscape regions and four additional for the islands. In the specific, when it comes to the Snæfellsness peninsula, he marks the distinction between 'Western Snæfellsnes lowland' and 'Snæfellsnes Mountains' (Preusser, 1976).

More recently, several scholars have emphasized the need for further research when it comes to landscape studies in an Icelandic context. Due to the increasing interest in resource utilization in the country, emphasized by the production of the Geothermal and Hydropower Master Plan in 2009, it is of extreme importance to understand the value of landscape in an Icelandic context and the reasons why it should be protected. On this matter, some studies stressing the interconnection between land use and tourism in the country have been produced (e.g. Sæþórsdóttir, 2012; Sæþórsdóttir et al., 2011; Greipsson, 2012). Furthermore, in recent years, a framework for landscape analysis has been developed by the biologist Þóra Ellen Þórhallsdóttir and environmental scholar Þorvarður Árnason (Þórhallsdóttir et al., 2010).

4.2 The Icelandic Landscape Project (Icel. *Íslenska landslagsverkefnið*)

The Icelandic Landscape Project (ÍLV) has been developed as a part of a working group set up for the production of the Geothermal and Hydropower Master Plan in 2009 (Þórhallsdóttir et al., 2010). The study aims were to produce a classification of the different types of landscape found in Iceland.

The study's background and methodology is an adaptation of the English/Scottish LCA to the special Icelandic conditions. The approach utilised within the ÍLV combines a multitude of different characteristics in order to classify the different types of Icelandic landscapes. The framework, as stated in the original document, tries to classify the characteristics of landscape assessed in the study in a quantitative way, ruling out subjective decisions and inconsistencies (Þórhallsdóttir et al., 2010).

The ÍLV divided the country into 10*10 km quadrats, based on a grid produced by the Institute of Natural History (icel. Náttúrufræðistofnun), utilising GPS spots at the centre of each quadrat where field data were collected. The framework's field approach included 23 variables that were then quantified with a score ranging from one (not present or very unobtrusive) to five (high prominence) (Figure 3).

variable		scoring				
basic landscape shape		concave (U)		straight		convex (N)
visible landscape depth (score for ¼ parts of horizon)		≤ 3 km	3-10 km	11-20 km	21-40 km	>40 km
elevational range		small		to		great
landscape forms	straight	not present		to		very prominent
	rolling	not present		to		very prominent
	sharp	not present		to		very prominent
	sinuous	not present		to		very prominent
	diversity	homogenous		to		diverse forms
repeated forms		none		to		very prominent
vegetation	cover	low		to		continuous
	diversity	low		to		high
colour range		low		to		high
patterns	patch size	large		to		small
	diversity	low		to		high
texture	diversity	low		to		high
	surface roughness	smooth		to		very rough
water	cover	low		to		high
	current	calm		to		torrent
	expression	1 form only		to		many different
sea	cover	none		to		prominent
snow, glacier, ice		none		to		prominent
contrasts		low		to		high
magnificence		low		to		high
diversity		low		to		high

Figure 3. Field checklist presenting the 23 different variables included in the study. Each variable is quantifiable on a scale from 1 to 5 (Bárðarson, 2009).

Furthermore, a quantitative analysis of colour was carried out. Consequently, utilizing multivariate statistical analysis (e.g. cluster analysis and principal component analysis), the data collected were classified according to landscape characteristics. Finally, the study identified 11 different typologies of landscape in Iceland:

1. Glaciers
2. Sands and glaciers with glaciers and high mountains
3. Sandy desert/wasteland
4. Undulating and stony desert/wasteland
5. Dry, semi-vegetated wilderness, uneven vegetation cover
6. Lava with sea
7. Fjords, subclass in which there are three flat beaches next to high mountains
8. Flat beaches and islands
9. Well covered but uniform lowland and heaths
10. Deep, well-vegetated valleys

11. Various areas, most of which have good cover

According to these identified classes, a geographical pattern of the 114 points or regions was identified and described (Pórhallsdóttir et al., 2010).

It is moreover important to mention the Master's thesis by Bárðarson (2009), which was part of the final ÍLV report published in 2010. Within this study, the connection between the visual landscape classification and geological factors (e.g. geological age, bedrock types) in Iceland were explored. Using digital geological maps (in the specific distribution of bedrock by age and type), correlation analysis showed a high interconnection between the geological age and bedrock types and the types of landscape.

While the ÍLV is at present the most complete and precise framework for landscape analysis produced in Iceland, several shortcomings can be identified. First of all, it seems quite obvious that the framework described stems directly from the tradition of biological sciences and landscape ecology. The emphasis is put on the impact of humans on the different components of a landscape, but not on the perception of landscape qualities (cf. Fry et al., 2008; Wu, 2013). This is moreover evident because, throughout the study, the connection between each one of the 23 variables analysed and the ecological theoretical background is underlined. As a result, characteristics such as the human perception of the landscape are only partially assessed in the framework.

The second problem to be identified within the ÍLV lies within the identification of parameters. Throughout the study, it is quite obvious that only visual characteristics that are referable to precise geological and ecological matrices are considered, resulting in an inevitable reduction of the landscape characteristics. Thus, only quantifiable and defined ecological or ecological characteristics are taken into account. This means that emphasis is put on the natural dimension of the landscape analysed and on an objectivist approach, making the role of human perception secondary. The final classification of landscape is then fundamentally based on the ecological and geological variables. This can be considered to be quite appropriate to a degree, especially when considering that the Icelandic landscape doesn't present, in many cases, a clearly identifiable cultural dimension and that the human influence on it can be minimal. However, by not including and fully assessing historical references and other characteristics that are included into frameworks such as the UK LCA and

the Norwegian Landscape Analysis, the final outcome will not present a integrated picture of the landscape character.

Moreover, while the framework is quite useful and clear when applied on a national scale, it seems not appropriate on a regional level. The main problem lies in the attempt to classify landscape by dividing and distinguishing discrete features one from another, an issue that has been underlined in previous literature and that seems to be quite evident in the ÍLV (e.g. Burkhard et al., 2013). Indeed, evident throughout the study is an attempt to identify discrete landscape characteristics and distinct, identifiable metrics to assess them. The reduction of landscape components is then made necessary by the framework itself, disregarding the interconnection between the identified units and the landscape character as a whole.

In conclusion, while the ÍLV can be considered a good framework to be used for the classification of landscape types, it was not deemed to be useful for this thesis. This is mainly because, contrary to the ÍLV, this thesis tries to produce an integrated overview of the landscape perceived qualities and does not aim at the production of a classification into different types of landscape.

5 Methodology

5.1 Framework development

The framework developed for this study is composed of three different phases that help the development of a clear and precise landscape characterisation (Table 6). The methodology consists of an adaptation of the previously mentioned landscape analysis frameworks (Chapter III). In the specific, the basic structure utilised is the Norwegian Landscape Analysis' one. Elements from the LCA were included as well, especially in the field-based work. Within this study, an emphasis was also put on the fact that the study area is a national park. This entails the fact that a conservation plan has already been prepared and that the landscape is already protected because of its special qualities (Environment Agency of Iceland, 2010).

Table 6. Major phases utilised in this study.

Phase I Definition of the Scope	Phase II Description & Fieldwork	Phase III Interpretation & Assessment
Ia. Identification of project goals. Ib. Study area. Ic. Map scale. Id. Background information (geological, cultural and biological) of the considered region.	IIa. Inspection of the study area. IIb. Identification of the sub-regions. IIc. Analysis of the study area. IId. Fieldwork and field-based survey. IIe. Implementation of the collected data into maps.	IIIa. Comprehensive assessment of the landscape character. IIIb. Production of a descriptive analysis (including maps and photographs) IIIc. Final evaluation

The different phases of the study's methodology will be briefly described within this chapter.

5.1.1 Phase 1 - Definition of the study's scope

Ia. Study Goals

As mentioned in chapter I, the general goal of the thesis is to produce an integrated overview of the perceived landscape qualities.

Ib. Study area

The study assesses the landscape character within the Snæfellsjökull National Park.

Ic. Map scale and coordinate system

Considering the study area, the selected scale for the project is 1:20,000. The vegetation maps utilised for the preliminary assessment and desk study were on a 1:20,000 scale, even though a lack of data on this scale was encountered when it comes to the geology and Digital Elevation Models (DEM).

The geographic coordinate system utilised in this study is ISN93 Lambert 1993, in accordance with the national grid of Iceland.

Id. Background information and data

Studies have been conducted assessing the geological features found on the peninsula (see chapter 6). However, there is a lack of complete assessment when it comes to the vegetation and the fauna. Indeed, data is available on a regional scale, but a specific assessment of the western Snæfellsnes peninsula has yet to be produced.

Digital data used within this study has been obtained from the IS50v3.4 geodatabase, provided by the National Land Survey of Iceland (NLSI). In particular, data regarding heights and the digital elevation model (DEM), roads, man-made structures and protected areas were used (Table 7). Other data were kindly made available by the Icelandic Institute of Natural History (icel. Náttúrufræðistofnun Íslands).

Table 7. Parameters analysed within this study.

Type	Database Year	Scale	Database
Vegetation (manuscript)	2013	1:20,000	Icelandic Institute of Natural History
Geology	1994	1:250,000	Icelandic Institute of Natural History
Vegetation	1998	1:500,000	Icelandic Institute of Natural History
Roads	2001	1:500,000	NLSI IS 50V 3.1
Protected Areas	2012	1:500,000	Environment Agency of Iceland
Iceland Contour	2004	1:500,000	NLSI IS 50V 3.1
Landsat (Bands 4, 3 and 2)	2013	Geometric resolution, 15 m	Landsat 8
DEM	2011	1:500,000	NLSI IS 50V 3.4
Hillshade	2011	1:500,000	NLSI IS 50V 3.4
Place Names	2011	1:25,000	NLSI IS50V 3.4

All the data were analysed on a visual level, in order to understand the dominant character of each region within the study area. This identified dominant character was the basis for the division of the National Park into sub-regions with a coherent visual character. This division was then verified during the fieldwork process. A particular attention was given to the geological and vegetation thematic maps, due to their high influence on the visual character of the landscape. The map featuring an overview of the geology in the Snæfellsnes peninsula was obtained through the Icelandic Institute of Natural History. The map was published in 1994 by Jóhannesson on a scale 1:250,000 and was digitised in ArcMap 10.2. This map was furthermore combined with two more recent maps published in 2009 and focusing on bedrock and tectonic movements on a 1:600,000 scale (Jóhannesson & Sæmundsson, 2009). When it comes to vegetation, the Icelandic Institute of Natural History

published the most comprehensive map assessing vegetation in Iceland in 1998, on a scale 1:500,000 (Guðjónsson & Gíslason, 1998). However, the institute is currently working on a map at the scale 1: 20,000 that was made available and that was utilised within the study. Also the available road data, hillshade and digital elevation model were analysed on a visual basis. In the specific, through the overlaying of maps, the interconnection between the different data and the influence of different factors on the landscape dominant aesthetic character were assessed.

The Landsat aerial image was of particular influence within the study because it gave the possibility to identify the interconnection and interplay between the previously analysed factors, allowing the selection of more specific borders between the sub-regions, which were subsequently verified during the fieldwork.

5.1.2 Phase 2 – Description

Following the background knowledge assessment, a preliminary assessment of the study area is conducted. This includes an initial division into sub-regions, identified in regard to the available information on vegetation cover, species present in the area as well as geological formations and historical characteristics.

After this preliminary assessment, a sub-region-specific desk study was completed, taking into account these characteristics: land cover, geology, buildings, vegetation cover and habitat diversity, cultural sites, access routes and roads disturbance. This specific study helps establishing the base for fieldwork. The fieldwork represents an important step when it comes to the collection of visual qualities data (Appendix I).

The data collected both through desk study and fieldwork will then have to be included into a comprehensive map of the study area, through the help of GIS.

IIa. Inspection of the study area

A preliminary inspection of the study area was conducted in July 2013. During this phase, the background information obtained on the land and the national park has been tested and verified on the field.

IIb. Identification of the sub-regions

The study area was divided into different sub-regions by recognising the dominant visual character of each area, through the aid of a visual analysis of aerial photographs and thematic maps, such as vegetation ones. Following the initial division, fieldwork was conducted in order to understand if the identified borders were appropriate. Finally, the last division was made keeping in mind the major transitions found through the landscape (e.g. coastal to lava fields) and by trying to identify the visual character of the landscape in aesthetic terms.

IIC. Analysis of the study area

During this phase all the information obtained through desk based work (presented in chapter 6) as well as the preliminary inspection were analysed in order to understand if the division into sub-areas was appropriate and reflected the major visual transitions within the study area.

IId. Fieldwork

The ‘Register for Landscape Data’ developed for this study, adapted to the specific Icelandic condition from the register included in the Norwegian Landscape Analysis framework, includes the collection of visual characteristics on the geology, natural vegetation cover, land use, historical development, scale, complexity and soundscape (Appendix; Directorate for Nature Management and the Directorate for Cultural Heritage, 2010). Data and background information were also taken from the LCA fieldwork sheet, which was then integrated into the Norwegian framework and adapted to the special characteristics of the study area. Particular emphasis has been put on the geological characteristics of the land, as well as on the content and composition of each sub-area, by trying to assess all the different indicators identified in chapter 2.4. The register has been divided into seven different sections, mainly based on the identified components discussed in chapter 2.4 (Appendix):

1) Landforms, geology & structure

As discussed in chapter 2.4, the landform and geology of a specific area can have an overall effect on the perception of landscape. For this reason, within this section, the land structure and texture is considered and analysed, based on visual characteristics.

2) Natural vegetation cover

The second section takes into account the type of vegetation cover and its overall coverage. The vegetation has major effects on the perception of a landscape, especially in a country like Iceland, where the lack of a high vegetation cover makes it possible to see a larger portion of the area considered.

3) Land use

This section covers the possible presence of man-made structures within the sub-region. It is of particular importance when related to the touristic experience within a natural park. Moreover, the presence of tourist facilities and built-up areas could change the perception of the landscape wilderness and shape the attitude of the viewer.

4) Historical development traits and cultural references

Local knowledge and history are important factors that shape the landscape in multiple ways. Historical landmarks can be a part of a landscape and can underline its history and enhancing its narrative.

5) Scale

The scale of the landscape considered is an important factor that shapes the perception of the viewer, as discussed in chapter 2.4. For this reason it is important to make the distinction between a vast landscape and a medium or intimate one.

6) Complexity and content

This section is closely related to the previous one. The visual appraisal and colour scheme of the landscape are here considered and classified. Moreover, the section includes the movement found within the specific landscape. The presence of a waterfall or a coastline can influence greatly the perception of a landscape and enhance certain qualities.

7) Soundscape

This indicator of the register includes the soundscape elements. In particular, this section can be found also in the LCA and plays an important role when it comes to landscape classification. As previously discussed, the presence of natural and/or human-induced noises plays, indeed, a big role on the perception of wilderness and of a landscape. This has to be taken into account

when it comes to a protected area that is a touristic destination. The section was thereby included in the register for fieldwork.

8) Smellscape

This section assesses the presence of odour or smell within the area considered. Indeed, recent studies underlined how the presence of a specific smell in an area can enhance the landscape narrative and create specific landscape geographies (Haque, 2004; Hoover, 2010; Paraguai, 2013). Considering the presence of coastal areas within the study area, it was deemed to be appropriate to include the presence, or lack, of smell in the fieldwork register. This indicator is not included in any of the previously developed frameworks.

The identified eight landscape components were assessed individually during fieldwork. Specifically, the register for landscape data looked at the effects that each element had on the aesthetic and overall perception of the specific area. Fieldwork included also the collection of photographic evidence of the landscape visual characteristics, which were consequently implemented in the descriptive part of the study. All the pictures were taken with a Nikon D90 mounting a Nikkor 105mm FD 2.8f on a tripod at approximately 170cm height.

Ile. Implementation of the collected data into maps

All the data collected according to appendix I were imported within the attribute tables of the sub-regions layer created with ArcMap 10.2. This allowed the production of maps focusing on each different parameter considered during the fieldwork. This made it able to visualise and understand the interconnection between key characteristics.

5.1.3 Phase 3 – Interpretation & Assessment

During Phase 3 a descriptive overview of each sub-region was formulated. This included detailed comments on the study's findings in regards to each identified indicator and the overall perceived quality of the landscape.

During this phase, the final evaluation of each sub-area was also undertaken. When applied to this thesis, the inclusion of a ranking table enhanced the understanding of landscape qualities, mainly by highlighting (1) the overall perceived

value of each sub-area; (2) the specific indicators that lower or enhance the overall appreciation of landscape and the reason why.

The identified parameters for evaluation were based on the theoretical framework found in chapter 2.4, with the exception of the sound and smell characteristics that were excluded from the table. This is for several reasons: first of all, the assessment and evaluation of the sound and smell component on each area is intrinsically non-linear, and no grade of simplification would be possible, making an evaluation rather difficult. Even though the presence of a clear soundscape can enhance the quality of a specific area in some cases, it can also be perceived as being negative (e.g. man-made sounds). Secondly, the absence of sound and smell was not perceived as being a negative attribute, rather the opposite. Indeed, in specific cases, the absence of the sound element enhanced the landscape narrative. This made evident the inevitable contradictions that a ranking system applied both to smell and sound qualities would have entailed. A higher sound or smell value could have corresponded either to the lack or to the presence of these characteristics, making the evaluation table hardly readable and understandable. These attributes were nonetheless analysed during fieldwork and discussed in the results section, but were not included in the final ranking table.

The criteria identified are ten (Table 8):

Table 8. Landscape evaluation table, based on a ranking system from one to five.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>		
<i>Condition and Naturalness</i>		
<i>Diversity and variety</i>		
<i>Time depth</i>		
<i>Narrative</i>		
<i>Visual Scale</i>		
<i>Seasonality</i>		
<i>Disturbance</i>		
<i>Stewardship</i>		
<i>Imageability</i>		

1) Wholeness and Coherence:

This concept denotes to the overall unity of a landscape (especially when it comes to repeating patterns or elements). The references can be related to the vegetation, to geological characteristics and/or to historical buildings present in the area.

A low rank will correspond to the presence of disrupting elements or contrasting features in the landscape. A medium rank will be given to the sparse presence of diverse and not coherent features scattered throughout the region considered. A high rank will represent a highly coherent landscape, with repeating patterns and consistent features.

Questions to answer:

- Is the landscape perceived as coherent/as a whole unit?
- Does the presence of certain features affect the landscape wholeness?

2) Condition and Naturalness:

Refers to the amount of artificial influence and disruption present in the landscape (such as roads, or human made structures). Naturalness is the ‘perceived’ natural state when looking at a landscape.

A ranking of one will coincide with a large influence of man on the surrounding landscape, making it ‘less natural’. A medium ranking will be assigned in the presence of a balance between human influence and the natural element within the landscape; with the presence of human made structures and feature that however do not greatly impact the visual qualities of the whole area and that are integrated within the landforms. A high rank will correspond to a mostly untouched landscape with no visible presence of human influence.

Questions to answer:

- Is the landscape visibly influenced by human influence?
- Is the natural element dominant in the landscape?
- Is the perception of the landscape condition close to the perceived natural state?

3) Diversity and Variety:

This indicator refers to the richness to be found in landscape elements and diversity in terms of patterns, textures and visual character (Ode et al., 2008).

A low score will reflect a landscape that is quite homogeneous and repetitive, with low variety and variation. A high score represents a highly varied landscape, with the presence of different patterns, textures and elements (such as diverse fauna, diverse historical features or diverse formations).

Questions to answer:

- Is the landscape eventful and varied in terms of form and content, features and stories?
- Are there many different individual elements that characterize the landscape?

4) Time depth:

Refers to the quantity and quality (especially in terms of time depth) of historical references contained within a landscape. The references can be related to the vegetation, to geological characteristics and/or to historical buildings present in the area.

A low rank will correspond to a lack of historical features or time depth within the landscape considered. A medium rank will be assigned to the sparse presence of historical buildings and/or features scattered throughout the region considered. A high rank will signify a dense presence of historical depth within the landscape.

Questions to answer:

- Are there any historically relevant references?
- Does a clear time depth mark the landscape?

5) Narrative:

The concept is directly connected to the idea that the human perception of landscape is influenced by one's personal experience, culture and narrative (e.g. Bunkše, 2007). Thus, this indicator is highly subjective and personal.

A low score on the evaluation table will reflect low identity and belonging to the landscape. A high score will be given in the presence of a strong affinity between the landscape and the identity of the viewer, with the presence of a clear narrative within the area.

Questions to answer:

- Is there a sense of belonging when looking at the landscape?
- Is there a link between the landscape narrative and the physical features, such as landmarks?

6) Visual Scale:

As previously discussed, this indicator refers to the perceptual openness and visibility of a landscape. This concept is directly affected by the presence of building or natural obstacles.

A low rank will correspond to a landscape that does not allow the observer to get an extensive overview of its aesthetic qualities. On the other hand, a high rank will

be given to a vast and open landscape, which offers to the observer an overview on the surrounding with no visible obstacles.

Questions to answer:

- Is the visual scale of the landscape vast?
- Does the landscape offer an extensive view on its qualities?

7) Seasonality:

This indicator refers to the amount of season variation in the landscape. The variation through different seasons can greatly affect the perception of the landscape (e.g. the presence of snow in an area will greatly impact the visibility of any vegetation).

A low rank within this indicator will correspond to a landscape that is not highly influenced by seasonal variation in its fundamental aesthetic characteristics and accessibility. On the other hand, a high rank will reflect a wide range of variation due to seasonal variability. This can be, for example, a well-vegetated and colourful landscape that is heavily affected by the presence of snow on the ground, especially in terms of aesthetic perception.

Questions to answer:

- Is the accessibility of the landscape affected by seasonal conditions (e.g. presence of snow on the road)?
- Does the fundamental aesthetic structure of the landscape change through the seasons?

8) Disturbance

The disturbance indicator is connected to the visible occurrence of non-fitting elements within the landscape. As discussed in chapter 2.4, these elements are most often man-made building and structures that lower the coherence of an area.

A low rank within this indicator will be assigned to the occurrence of disturbing elements and/or structures within the landscape. A medium rank will indicate a well-balanced landscape, with human intervention that however does not affect the overall harmony. A high rank will correspond to a landscape with no disturbance.

Questions to answer:

- Are there elements of disturbance within the landscape?
- Is the perceived harmony of the landscape affected by these elements?

9) Stewardship

The concept refers to the perceived sense of order when observing at a landscape. In the specific, this indicator refers to the management of an area and his perceived sense of care.

A low rank will correspond to an area that is not taken care of, with low 'aesthetic of care'. A high rank will be assigned to an area that is well managed and harmonious overall.

Questions to answer:

- Is the landscape well managed?
- Are there any element of visible carelessness or bad management of the area?

10) Imageability

This indicator refers to the perceived landscape identity, directly referring to the presence of landmarks and/or elements that make the landscape unique and distinguishable from other areas.

A low rank will be given to a landscape with low identity or no particular features. A high rank will correspond to a unique landscape with a clear identity that is perceived by the observer.

Questions to answer:

- Are there any landmarks in the area?
- Does the landscape have a unique identity that makes it distinguishable from the other areas?

It is important to note the fact that the scale utilised within this thesis is non normative. This means that the relation between a higher ranking and the landscape value is not always linear (Figure 4).

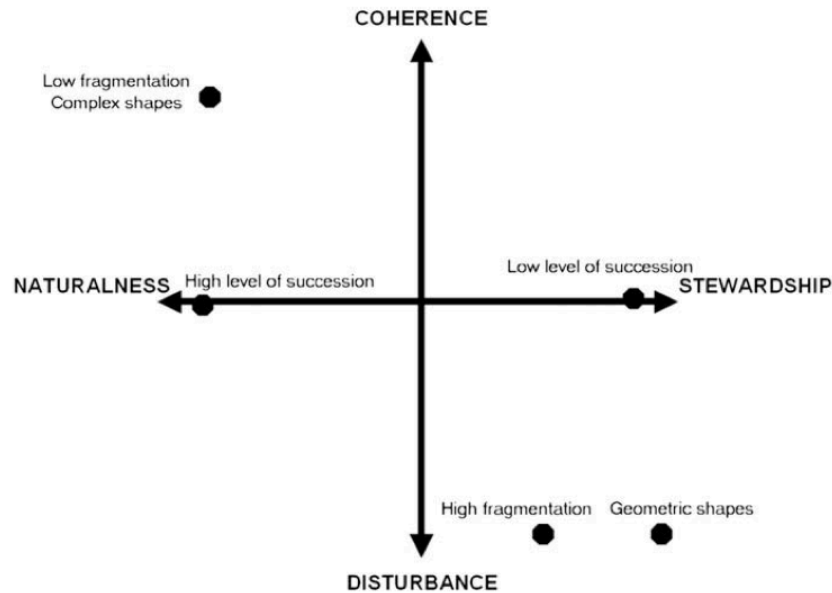


Figure 4. Relationship between four indicators: coherence and disturbance, naturalness and stewardship. As visible in the figure, a higher level of coherence might be connected to lower disturbance in the area. A lower naturalness can correspond to a higher stewardship (Ode et al., 2009).

This is particularly evident in the relationship between the disturbance and the coherence indicator, where higher value means higher disturbance and decreased perceived coherence (as visible in figure 4). Also the stewardship indicator and naturalness are closely correlated, a higher value of stewardship might correspond to excessive landscape management and, in turn, a lower perceived naturalness, as underlined by Tveit et al. (2006). This indicator-oriented evaluation is followed by an overall rank of each sub-area identified within the study area. This final assessment will be based on a one-to-five ranking system. A low score will indicate a landscape with no particular features, whereas a high rank will indicate a prominent or particularly interesting landscape on which, perhaps, the conservation effort has to be enhanced.

6 Overview of the Study Area

6.1 Study Area

Snæfellsjökull National Park was established on June 28th, 2001 and is located in the western part of Iceland, some 200 km by road from Reykjavík (Figure 5). The park is under direct supervision of the Environment Agency of Iceland, and is at present the only national park whose borders extend to the seashore. The Snæfellsjökull's NP Conservation Plan 2010–2020 mentions that protected areas “are created to preserve the unique landscape, biodiversity and cultural heritage while providing the public with information about the area and access to it following certain rules” (Environment Agency of Iceland, 2010, p.4, own translation). In specific, the park authorities are acting towards the prevention of the degradation of tourist hotspots (e.g. the cliffs at Malarrif), which face large numbers of visitors over short periods of intense activity (Environment Agency of Iceland, 2010).



Figure 5. Overview of the study area. It is noteworthy to mention, in the south-western part of the National Park, the cut-off coastal area between Djúpalónssandur and Malarrið, which is currently still private property and excluded from the protected area.

The tourist attractions in the area are multiple, ranging from geological ones to fauna and cultural aspects. According to a survey carried out by the Icelandic Tourist Board, 30% of the total international visitors to Iceland in 2012 decided to go to the Snæfellsnes peninsula (Óladóttir, 2013). For this reason the area has seen an increase in tourist influx throughout the years, furthering the need for an integrated landscape-oriented policy (e.g. higher demand for facilities at Malarrið).

6.2 Literary References

The study area has rich historical references. Firstly, the peninsula is mentioned in the Eyrbyggja saga, with its political and heroic themes (Lethbridge, 2011). The peninsula is also the location where the late 13th (or early 14th century) *Bárðar saga Snæfellsáss* takes place. The saga, which includes a wide range of folklore motifs, narrates the history of a half-human, half-ogre, Bárðr and his life on a farm in Djúpalón called Laugarbrekka (Pulsiano & Wolf, 1993). The saga tells that Bárðr disappeared on Snæfellsjökull and that his treasure is hidden on the mountain Bárðarkista. The references to this saga have given the whole peninsula a mystic aura.

Much later, or in 1864, the Snæfellsjökull glacier and the western end of the peninsula was mentioned in the novel *Journey to the Centre of the Earth*, by Jules Verne. In fact, the glacier represents that entry point where the German Professor Otto Lidenbrock and his companions (Axel, his nephew, and Hans, the guide) start their journey to the center of the earth. Furthermore, the novel *Under the Glacier* by Iceland's Nobel Laureate writer, Halldór Laxness and published in 1968, takes place on the peninsula. The novel narrates the journey of an emissary of the Bishop of Iceland to the mysterious district, where he experiences a series of extraordinary events (Laxness, 2007).

6.3 Geology

The Snæfellsnes peninsula has high geological diversity, including formations from all the geological phases of Iceland (Environment Agency of Iceland, 2010b). The bedrock in the lowland area in the peninsula is formed of tertiary rocks, shaped by glacial erosions. Above those there are strata of lava streams formed during interglacial periods. In the western part of the peninsula (where the National Park is located) sits the volcanic cone of Snæfellsjökull. The glacier's highest peak is Þúfur, which was reported to be ice-free for the first time in 2012 (Sigurðsson, 2012). The volcano is still considered active, even though the last eruptions took place a while ago (approximately 200AD).

The lava presence in the area is extensive and dominates the majority of the

landscape within the National Park (see figure 6). Two different types of lava can be found in the Park: rough, stony lava (or 'A'ā) and smooth lava (or Pāhoehoe). These lava fields present various geological formations and caves. The best known cave (and the only one utilised by the National Park for tourist purposes) is Vatnshellir. Of particular mention is the coastal area of the Snæfellsnes, where a wide variety of lava fields, sea cliffs and coastal rocks as well as gravel and sand beaches can be found.

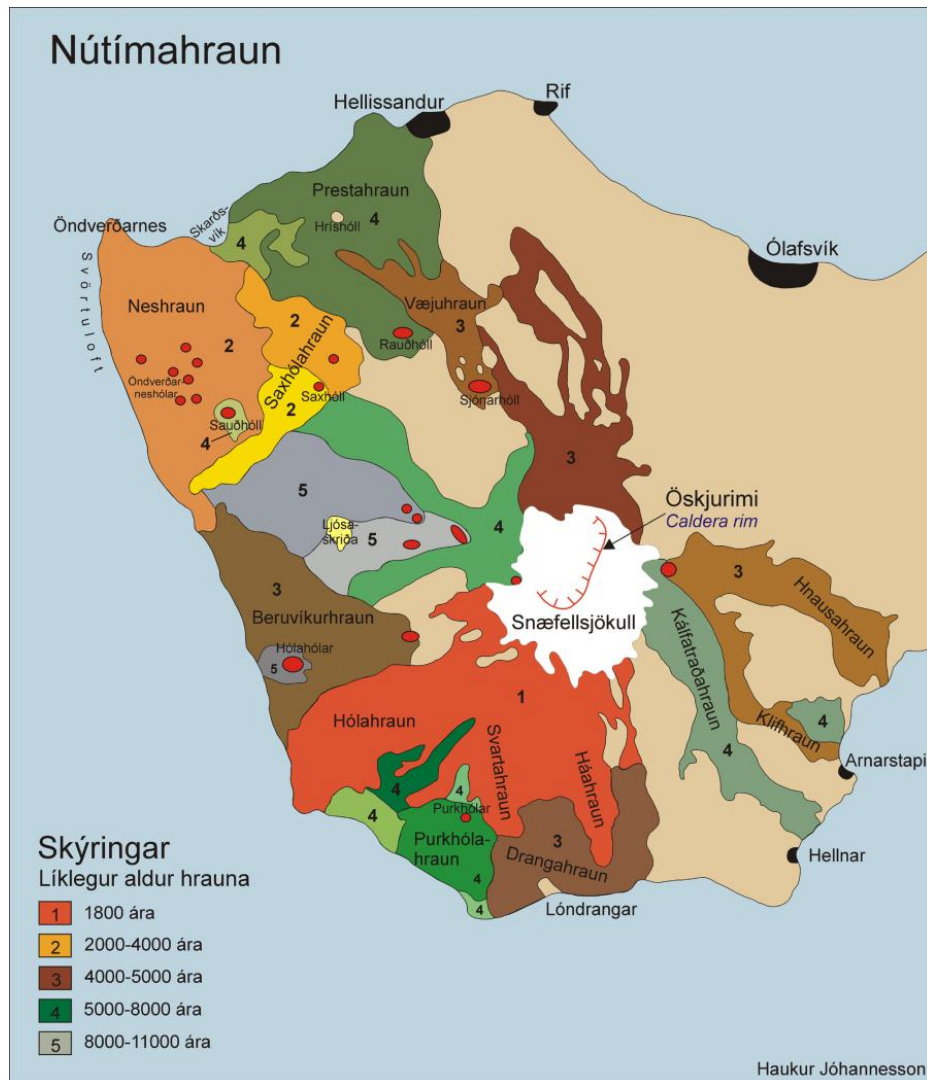


Figure 6. The major lava fields in the western tip of the Snæfellsnes peninsula, as well as their estimated age. Based on work done by Haukur Jóhannesson (Environment Agency of Iceland, 2010b).

The area presents also several smaller volcanoes, such as Purkhólar, Saxhóll, Öndverðarneshólar, Sjórnarhóll, Rauðhóll, and Hóláhólar (Environment Agency of Iceland, 2010b). It is important to highlight that most of the lava fields in the area are untouched by human activities, with the exception of Rauðhólar, which used to be an

old mine slag.

6.4 Vegetation

Judging by the literature, a study focusing specifically on the vegetation within the protected area has not been undertaken. The first noteworthy vegetation map of the region was completed in the years 1982–1984 by the Department of Agricultural Research, utilizing aerial photographs on a scale 1:25.000 (Icelandic Environmental Agency, 2010c). Later, the Icelandic Institute of Natural History (Náttúrufræðistofnun Íslands) reviewed and updated the information about the vegetation and digitized the maps (Figure 7).

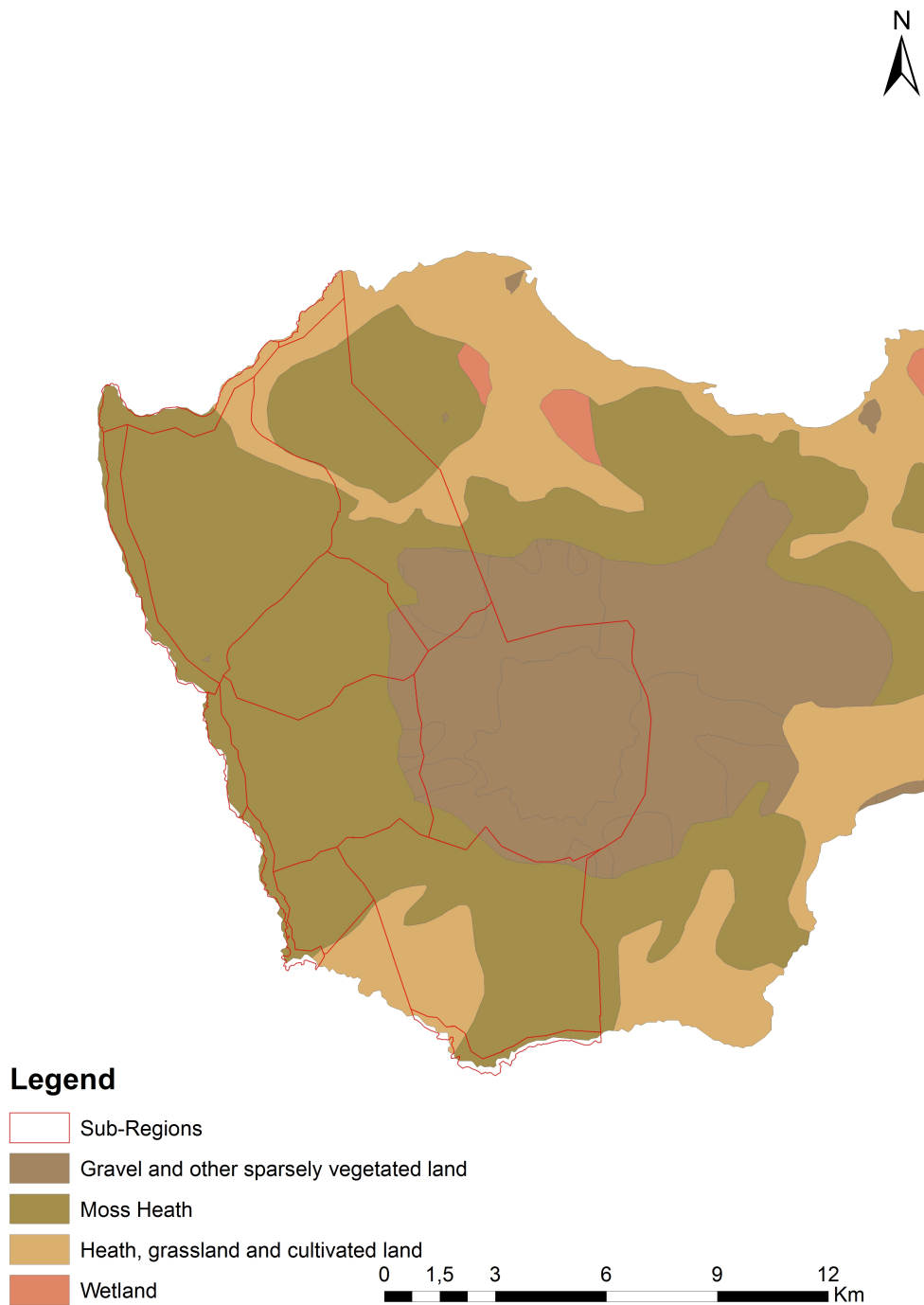


Figure 7. Simplified vegetation map highlighting the dominant vegetation (Guðjónsson & Gíslason, 1998).

Given the widespread lava fields in the region, moss, shrub and grasses are largely visible (Petersen et al., 1994). Additionally, there are several areas that present various species such as northern bilberry (*Vaccinium uliginosum*), alpine azalea (*Loiseleuria procumbens*), dwarf birch (*Betula nana*), black crowberry (*Empetrum nigrum*) (Icelandic Environmental Agency, 2010c; Petersen et al., 1994; Icelandic

Flora, 2007). The density of the vegetation cover has been assessed both by the Department of Agricultural Research and the Icelandic Institute of Natural History and averages 50% or greater. There are areas where the cover reaches 75%.

It is also important to mention the varied coastal vegetation in the Snæfellsnes peninsula, consisting of heather-covered lava fields and grass amongst others (Icelandic Environmental Agency, 2010c). In the coastal areas, marshes can be found as well, even though they are not widespread.

6.5 Fauna

Seabirds are prominent in the study area. No region-specific bird count has been done so far. The number of sea birds is particularly high along those parts of the coast where cliffs are present (e.g. Öndverðarnes, Arnarstapi, Malarrif). According to Arnþór Garðarsson (1995), the following bird species can be found in the area: Puffin (*Fratercula arctica*), Razor Bill (*Alca Torda*), Thick-billed Murre (*Uria lomvia*), Common Murre (*Uria aalge*), and several gull species (*Laridae*). Additionally, a few wetland birds and the White-tailed Eagle (*Haliaeetus albicilla*) are found (Petersen et al., 1994). Three different species of mammals are present in the study area as well: Arctic Fox (*Vulpes lagopus*), Mink (*Mustela vison*) and Wood Mouse (*Apodemus sylvaticus*) (Environment Agency of Iceland, 2010c).

In regards to the sea fauna, whales and seals are often visible from the coastline of the peninsula, in particular around Hellissandur (Icelandic Environmental Agency, 2010c). The most common species are the Killer Whale (*Orcinus orca*), and Minke Whale (*Balaenoptera acutorostrata*) (Petersen et al., 1994). Grey Seals (*Halichoerus grypus*) and Common Seals (*Phoca vitulina*) can be seen along the coast, especially in the western part of the peninsula (Petersen et al., 1994). It is important to note that the distribution and presence of these species in the area has not been systematically analysed yet.

6.6 Division into sub-areas

The NP was divided into 13 different sub-regions (Figure 8).

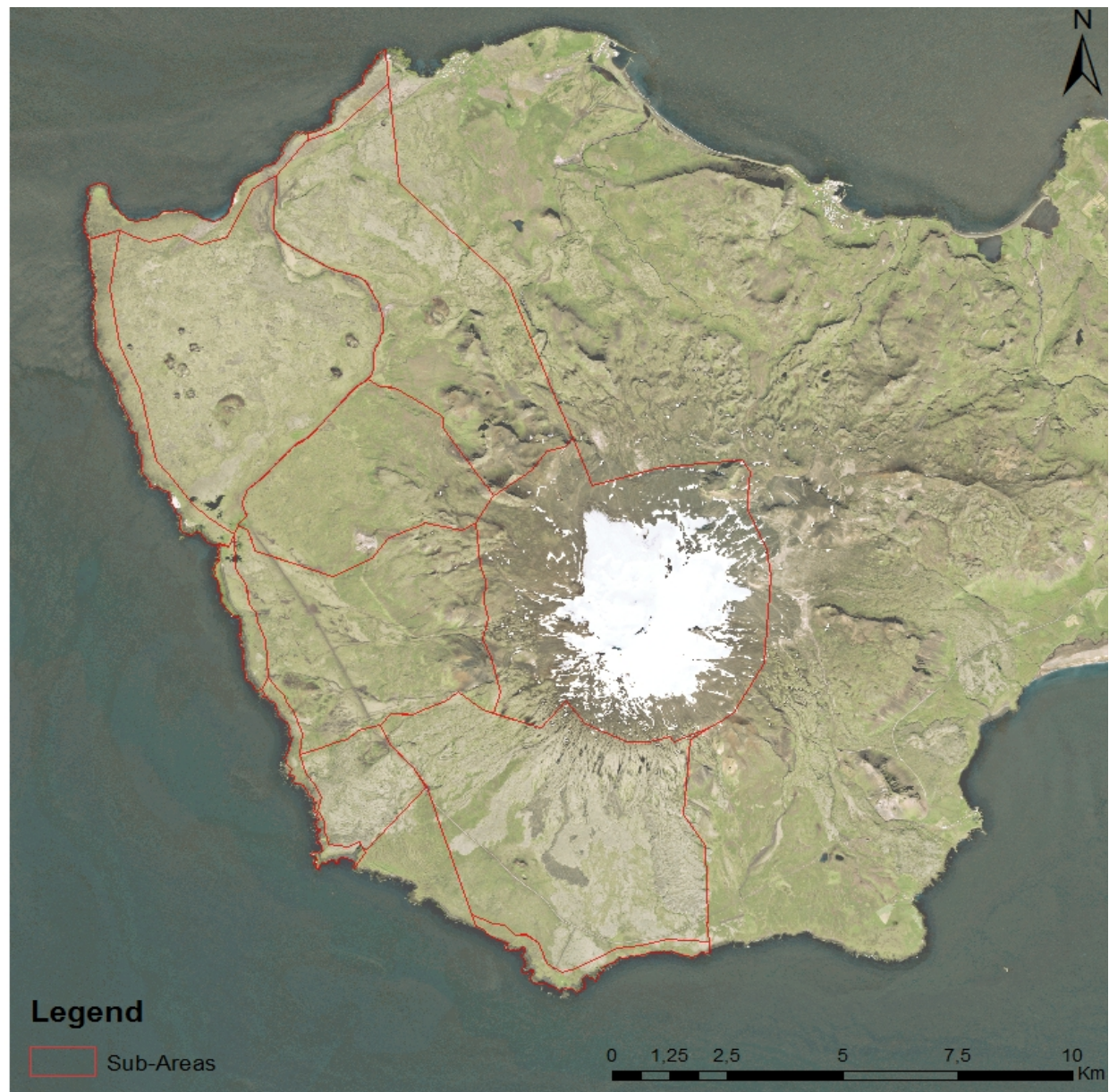


Figure 8. Division of the area into thirteen sub-regions.

The different regions were identified by recognising the dominant visual character of each area and the major transitions found within the landscape (for example, the transition from a lava field to a grass-vegetated area). As visible in Figure 8, a particular focus was given to coastal areas and their specific features, because, due to the presence of water, their dominant character is quite different to the rest of the NP. This is quite evident in the transition from the lava fields and crater area in the northwest part of the peninsula, which includes Saxhóll and Sauðhóll (Figure 8). This area was divided from the surrounding coastal areas, which present a

more patchy vegetation cover and different geological and visual characteristics, and from the flat lava fields that are present to its east and south.

7 Results

This chapter presents the results obtained for each identified sub-region within the study area (Figure 9). A brief description of the main landscape character, followed by an evaluation table based on the ten identified parameters is presented. Consequently, the final evaluation of each region is highlighted.

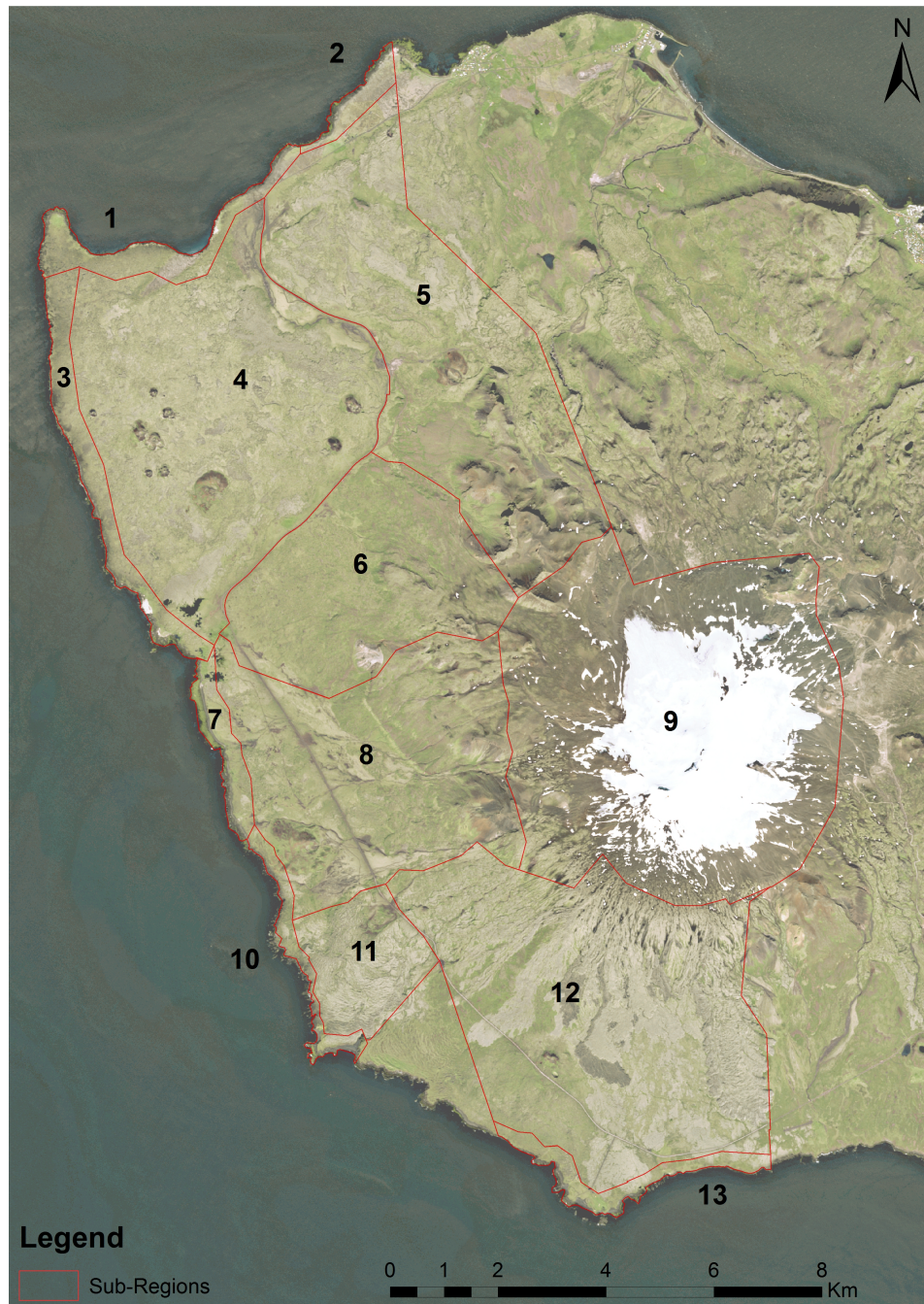


Figure 9. Division into sub-regions.

Sub-region 1

The coastline dominates the landscape within this region, with the presence of numerous high cliffs (Figure 10). Otherwise, the landscape is rather monochrome and flat, even though Snæfellsjökull is clearly visible in the distance when looking eastwards.

The land surface has a rough texture due to the numerous rock and lava formations. This is reflected in the vegetation cover, which consists mostly of mosses and dwarf shrubs, and is unevenly distributed throughout the region. The vegetation cover is rather patchy, especially at the seaside (Figure 10). The fauna is quite diverse, with seabirds nesting in the coastal cliffs.



Figure 10. From the coastline, where the lava meets the ocean, resulting in rough rock formations.

The soundscape within this region is rather busy, mainly due to the rich fauna that can be found along the seaside. On top of that, the closeness to a gravel road has, from time to time, an effect on the soundscape. Also the smellscape in the region is rather strong, with odour coming both from the sea element and from the fauna present in the area.

As for human-made structures, there is a lighthouse within the area, which is always visible along the coastline but is not always visible when approaching them on the gravel road. Furthermore, old cairns, archaeological remains and ruins of old farms and houses are to be found. The radio antenna at Gufuskálar is also visible in the distance.

Evaluation

Table 9. Evaluation table for sub-region 1.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	***	Overall coherence in the coastline.
<i>Condition and naturalness</i>	****	Presence of man-made structure that do not however affect the condition of the landscape, especially considering the numerous cliffs.
<i>Diversity and variety</i>	****	Quite high variety in terms of landscape characteristics and habitats.
<i>Time depth</i>	*****	Cairns, abandoned farms and a lighthouse contribute to the high historical value of the region.
<i>Narrative</i>	*****	Presence of historical features that make the narrative evident.
<i>Visual scale</i>	*****	Vast landscape, especially due to the presence of water.
<i>Seasonality</i>	****	Quite high seasonality, both in terms of accessibility and visual characteristics.
<i>Disturbance</i>	*****	No disturbance in the region.
<i>Stewardship</i>	****	Well-maintained area.
<i>Imageability</i>	*****	Unique features, presence of the ocean and clear landscape identity.
Final Evaluation	*****	High value of the landscape due to high historical features, diversity and variety.

Sub-region 2

The landscape contained within this region is dominated by man-made structures and the presence of the seaside (Figure 11). The landform is quite flat and presents rock formations along the coastline, with the presence of low cliffs and few or no seabirds, unlike the cliffs found in sub-region 1.



Figure 11. Radio antenna in Gufuskálar.

The land has a rough texture, mainly due to lava formations. The vegetation cover is quite extensive, with grass, moss and birch visible in the area. The vegetation cover decreases towards the coast, which is constituted mainly of bare rocks.

The presence of man-made structures in the area is extensive. As a result, the soundscape is busy, with noise coming from the nearby town and the buildings present close by. The radio antenna, which is currently also the tallest building in Iceland, dominates the whole landscape, being positioned in between the coastline and the rest of the National Park. Connected to the antenna are multiple cables visible along the coastline and a fence that runs across the whole region.

Evaluation

Table 10. Evaluation table for sub-region 2.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	**	Repeating patterns in the seaside but lack of coherence due to man-made structures.
<i>Condition and naturalness</i>	**	Extensive presence of man-made structures that dominate over the natural features of the landscape.
<i>Diversity and variety</i>	***	Medium variety in the landscape.
<i>Time depth</i>	***	Historical features to be found in the radio antennas.
<i>Narrative</i>	**	The landscape does not have a distinct narrative.
<i>Visual scale</i>	***	Vast scale when facing north; elements of disturb are to be found when facing south (e.g. radio antenna, numerous buildings).
<i>Seasonality</i>	***	The landscape is not affected in a major way by seasonal variation.
<i>Disturbance</i>	**	High disturbance in the area due to the man made buildings and radio antenna.
<i>Stewardship</i>	**	Not particularly well-maintained landscape.
<i>Imageability</i>	***	Unique man-made structures but otherwise lack of harmony within the landscape.
Final Evaluation	**	Quite low value considering the massive presence of man-made structures and disturbances in the area.

Sub-region 3

This coastal area has numerous high cliffs, a vibrant sea-bird fauna and a lighthouse (Figure 12). The landform in the region is quite flat with repeating patterns of rough lava fields. As a consequence, the vegetation is rather patchy and monochrome, with the presence of moss and grass that gradually diminishes closer to the coastline.



Figure 12. Coastline with vertical cliffs and rough rock formations.

The vibrant sea fauna, with of arctic terns and seagulls amongst other species, contributes to a rather busy soundscape. The smellscape in the region is strong, with odour coming both from the sea element and from the local fauna.

Evaluation

Table 11. Evaluation table for sub-region 3.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	***	Repeating patterns throughout the region, and coherent coastline with high cliffs.
<i>Condition and naturalness</i>	****	High naturalness, the natural condition is dominant in the landscape.
<i>Diversity and variety</i>	****	Presence of diverse fauna.
<i>Time depth</i>	***	Presence of a lighthouse in the region.
<i>Narrative</i>	****	The presence of high cliffs, the lighthouse and rich fauna enhances the landscape narrative.
<i>Visual scale</i>	*****	Vast visual scale due to the presence of the ocean and lack of elements disturbing the view.
<i>Seasonality</i>	****	High both in terms of access to the area and visual characteristics.
<i>Disturbance</i>	*****	No disturbance in the area.
<i>Stewardship</i>	****	Well-maintained landscape.
<i>Imageability</i>	****	Unique features and cliffs, presence of the ocean.
Final Evaluation	****	Natural cliffs and vibrant fauna, high sense of belonging within the landscape.

Sub-region 4

The landscape contained within this region is dominated by the extensive presence of lava fields (Figure 13). The land here is rather, exception made from the presence of hills and geologically peculiar craters scattered throughout the lava field (e.g. Saxhóll). On the eastern side, Snæfellsjökull and the radio antenna are clearly visible.



Figure 13. Rough lava field with hills and craters in the distance.

The region presents a rather rough texture with patchy vegetation cover and the sporadic presence of soil erosion. Most of the vegetation in the area is composed by moss and dwarf shrub, with the sporadic presence of dwarf birch, black crowberry and northern bilberry.

The soundscape within this area is rather calm, with the presence of a paved road nearby that however doesn't affect the landscape in a major way.

Evaluation

Table 12. Evaluation table for sub-region 4.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	***	Repeating patterns and lava fields, with the exception of craters.
<i>Condition and naturalness</i>	****	High naturalness, the natural condition is dominant in the landscape.
<i>Diversity and variety</i>	****	Diverse vegetation cover in the region.
<i>Time depth</i>	***	Geologically interesting craters, which make the time depth more readable.
<i>Narrative</i>	****	High sense of belonging within the landscape, especially in coincidence with the craters.
<i>Visual scale</i>	****	Quite vast landscape scale.
<i>Seasonality</i>	****	High both in terms of access to the area and visual characteristics.
<i>Disturbance</i>	*****	No disturbance in this sub-area.
<i>Stewardship</i>	****	Well looked after, sense of order.
<i>Imageability</i>	****	Unique land formations (craters).
Final Evaluation	****	The dominant natural element, along with unique land formations, contribute to a high rank.

Sub-region 5

Lava fields dominate sub-region 4, which has a rather repetitive colour scheme (Figure 14). The landform is flat in the northern part, but rather hilly on the southern part of the region.



Figure 14. Picture showing the extensive presence of lava in the region.

The site has a rough texture, with numerous lava formations. This is reflected in the vegetation cover which is quite patchy in specific areas, but that can be quite vibrant in certain areas due to the presence of mosses, dwarf birch and northern bilberry.

When it comes to man-made structures, the main visible elements are the paved road, the radio antenna in Gufuskálar and the town of Hellissandur. The soundscape is calm with the occurrence of man-made noises due to the presence of a paved road on the western side of the region.

Evaluation

Table 13. Evaluation table for sub-region 5.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	****	Repeating patterns and vegetation throughout the region.
<i>Condition and naturalness</i>	****	Mostly untouched landscape, with visible man-made structures in the distance.
<i>Diversity and variety</i>	**	Repeating patterns of vegetation, low variety.
<i>Time depth</i>	**	Lack of historical features.
<i>Narrative</i>	**	Low narrative within the landscape, no significant identity within the region.
<i>Visual scale</i>	****	Vast visual scale, overview on different sub-regions.
<i>Seasonality</i>	***	Medium influence on the landscape aesthetic.
<i>Disturbance</i>	*****	No disturbing elements.
<i>Stewardship</i>	***	Mostly untouched landscape.
<i>Imageability</i>	**	Repetitive lava fields, no unique landmarks.
Final Evaluation	***	Repetitive patterns and low variety in terms of vegetation contribute to a medium value.

Sub-region 6

Extensive lava fields, grass fields and the coastline in the western part are all visible within the area (Figure 15). The texture varies greatly, going from the rock-dominated seaside to the smooth fields. Also the vegetation cover and type is quite different, giving a perception of variety.



Figure 15. Rough lava formations with patchy vegetation cover.

Contained within the area are several hiking paths and a gravel road, but these are not always visible and thus do not dominate the whole region. The soundscape is rather calm, with the rare occurrence of human-induced noise on the eastern part makes and natural noise along the coast.

Evaluation

Table 14. Evaluation table for sub-region 6.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	***	Quite high diversity, but overall medium coherence in the landscape.
<i>Condition and naturalness</i>	***	Visible man-made structures, but the natural element is dominant.
<i>Diversity and variety</i>	****	Diversity in terms of vegetation and patterns.
<i>Time depth</i>	**	Lack of historical features, no visible time depth.
<i>Narrative</i>	**	No specific narrative within the landscape.
<i>Visual scale</i>	****	Open landscape, with a clear view on Snæfellsjökull.
<i>Seasonality</i>	***	Medium seasonality, especially in terms of access to the region.
<i>Disturbance</i>	*****	No disturbing element.
<i>Stewardship</i>	****	Well-managed area, with hiking paths.
<i>Imageability</i>	**	No peculiar landscape features.
Final Evaluation	***	Diversity in terms of patterns and vegetation, but lack of landscape narrative.

Sub-region 7

This region presents rather low cliffs (especially when compared to the ones found in region 1), bare rocks on the coastline and the presence of bird life (Figure 16).



Figure 16. Rough landform with coastline.

The land has a rather rough texture, with bare rock formations that extend all the way to the coast. For this reason the vegetation is patchy, with an alternating pattern of grass, dwarf shrub and bare terrain.

When facing northwards, the remarkable visible elements are the crater of Hólahólar and Snæfellsjökull in the far distance. The soundscape in the region is rather busy due to the sea fauna and the ocean. The smellscape is moderately strong, with odour coming both from the sea and from the local fauna.

Evaluation

Table 15. Evaluation table for sub-region 7.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	****	Coherence found in the landscape character, which presents repeating patterns and a coherent outlook.
<i>Condition and naturalness</i>	****	The natural condition is dominant in the landscape.
<i>Diversity and variety</i>	***	Repeating patterns, to be found also in the coastline, contribute to a medium variety.
<i>Time depth</i>	***	Lack of historical features in the region, no evident time depth.
<i>Narrative</i>	***	Clear narrative in the coastline.
<i>Visual scale</i>	****	Open landscape with an overview on the glacier (northwards) and the ocean (southwards).
<i>Seasonality</i>	****	High seasonal influence when it comes to accessibility of the area.
<i>Disturbance</i>	*****	No disturbance in the area.
<i>Stewardship</i>	****	Well-managed area, with maintained hiking paths.
<i>Imageability</i>	***	Medium imageability, the landscape identity is clear, but not unique when compared to other regions.
Final Evaluation	***	Dominant natural element in the region but no particular landscape narrative.

Sub-region 8

Hilly landforms, rough lava formations and the proximity to Snæfellsjökull (visible when facing north) are the dominant characteristics of this region (Figure 17).



Figure 17. Patchy vegetation cover and overview of the surrounding landscape.

It is important to note Vatnshellir, a cave said to be the place where Jules Verne's took inspiration from for his book, now utilised for touristic tours, and of the crater of Hólahólar.

Visible in the figure is the patchy vegetation cover, with the vast occurrence of moss and dwarf shrubs and the occasional bare lava rock formations. The scale of the landscape within this area is rather large, with a visible coastline in the distance and a good overview on other areas of the National Park. Due to the presence of the paved road within the region, the soundscape can at times be disturbed by human induced noise.

Evaluation

Table 16. Evaluation table for sub-region 8.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	***	Medium coherence found in the landscape character.
<i>Condition and naturalness</i>	****	The natural condition is dominant in the landscape.
<i>Diversity and variety</i>	***	Repeating patterns throughout the area.
<i>Time depth</i>	****	Crater of Hólahólar and Vatnshellir.
<i>Narrative</i>	***	Specific narrative in coincidence with Vatnshellir, otherwise lack of specific landscape identity.
<i>Visual scale</i>	****	Vast visual scale and overview on different regions, extending all the way to the coastline.
<i>Seasonality</i>	****	High seasonality both in terms of accessibility and landscape aesthetics.
<i>Disturbance</i>	****	No specific disturbance – exception made for the touristic facilities at Vatnshellir.
<i>Stewardship</i>	***	Mostly untouched landscape.
<i>Imageability</i>	***	No specific landscape identity. The only distinguishable feature is Vatnshellir.
Final Evaluation	***	Prevailing naturalness and closeness to Snæfellsjökull, but lack of particular landscape narrative and variety.

Sub-region 9

The landscape contained within region 9 is of a glacial type (Figure 18). The vegetation is non-existent and the area is accessible through a gravel road. The natural element is dominant within this region, which, on a clear day, provides a great

overview on the surrounding landscape. No fauna is present in the area, exception made for the sporadic presence of birds flying over the glacier.

The soundscape in the area is dominated only by natural noises, which contribute to a general sense of naturalness.



Figure 18. Oblique aerial photograph of Snæfellsjökull (Sigurðsson & Williams, 2001).

Evaluation

Table 17. Evaluation table for sub-region 9.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	*****	High coherence of the landscape.
<i>Condition and naturalness</i>	*****	The natural element is dominant.
<i>Diversity and variety</i>	**	Lack of vegetation and quite low diversity.
<i>Time depth</i>	*****	Historical depth to be recognised within the glacier components and visible layers.
<i>Narrative</i>	****	The predominant natural element of this area contributes to a high narrative found within the landscape.
<i>Visual scale</i>	*****	Vast and open visual scale, due to the lack of vegetation and disrupting elements.
<i>Seasonality</i>	**	The landscape is not affected in a major way by seasonal changes. The accessibility of the area is affected by seasonal change.
<i>Disturbance</i>	*****	No disturbance in the area.
<i>Stewardship</i>	****	Natural landscape – mostly untouched.
<i>Imageability</i>	*****	Unique landscape and features in the area. High landscape identity.
Final Evaluation	*****	Dominant natural element and landscape narrative contribute to a quite unique landscape.

Sub-region 10

The landscape contained within this region presents large lava fields that are interrupted in coincidence with the coastline and numerous rock beaches (e.g. Dritvík, Djúpalónssandur) (Figure 19). Tourist facilities in this area are found in proximity of the beach, which was made accessible to tourists through a series of paths. Djúpalónssandur has a series of historical features: the lifting stones utilised by

fishermen to test their strength, and the remains of the fishing trawler that was wrecked on the beach in 1948. Also Dritvík is rich with historical features, such as an abandoned fishing hut, ruins and old cairn that can be seen right on the cliff edges.



Figure 19. Rock beach and hills at Djúpalónssandur.

The landform found in the area is hilly, especially when it comes to the lava fields, with the presence of high cliffs. The vegetation varies from moss and dwarf shrubs to vast non-vegetated areas, such as the sandy beach of Djúpalónssandur.

The soundscape is rather busy, especially along the coastline, due to the rich sea-bird fauna. Also the smellscape is strong in the area, with odour coming both from the sea and the sea plant species and from the local fauna.

Evaluation

Table 18. Evaluation table for sub-region 10.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	***	Quite diverse landscape, especially transitioning from the lava fields to the sandy beach.
<i>Condition and naturalness</i>	***	Touristic facilities are visible throughout the area.
<i>Diversity and variety</i>	****	Lack of vegetation diversity, but diverse coastline.
<i>Time depth</i>	*****	Presence of historical features such as shipwrecks.
<i>Narrative</i>	****	High identity of the landscape due to historical features and smellscape.
<i>Visual scale</i>	****	Vast visual scale, mainly due to the presence of the ocean.
<i>Seasonality</i>	**	The landscape is not particularly affected by seasonality.
<i>Disturbance</i>	****	No specific disturbance – the man-made structures are well maintained and harmonious.
<i>Stewardship</i>	*****	Well-managed area, new tourist facilities.
<i>Imageability</i>	*****	Unique landmarks with historical features (e.g. Djúpalónssandur).
Final Evaluation	****	Unique historical features and high landscape narrative

Sub-region 11

The dominant character of this region is composed by the extensive lava fields, covered with moss and dwarf shrub (Figure 20). The landform is quite hilly with a repetitive textured pattern made of lava rock formations. Old cairns are to be found in the area, augmenting the landscape narrative.



Figure 20. Lava fields on the way to Dritvík.

The only human influence in the area is the hiking path (visible in figure 20), which brings all the way from the main paved road to the coastline. The hilly landform inhibits the visibility of the paved road or other touristic facilities (e.g. Djúpalónssandur).

The soundscape within this region is rather calm if not still, especially when hiking through the lava fields, contributing to a general sense of calmness.

Evaluation

Table 19. Evaluation table for sub-region 11.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	****	High coherence of the landscape.
<i>Condition and naturalness</i>	****	The natural element is dominant, with a few exceptions.
<i>Diversity and variety</i>	**	Lack of vegetation diversity and overall repeating patterns.
<i>Time depth</i>	***	Presence of Cairns in the region.
<i>Narrative</i>	****	The predominant natural element of this area contributes to a high identity found within the landscape.
<i>Visual scale</i>	***	Medium openness of the landscape, especially in certain spots of the lava fields.
<i>Seasonality</i>	****	High seasonality, in terms of accessibility and aesthetic features.
<i>Disturbance</i>	*****	No disturbance identified in the area.
<i>Stewardship</i>	***	Well-maintained hiking paths, but mostly untouched area.
<i>Imageability</i>	***	Medium imageability, clear landscape identity but no specific landmarks (exception made for a few lava formations).
Final Evaluation	****	The clear landscape narrative in the lava fields, along with historical features contributes to a high value.

Sub-region 12

This region is mainly composed of flat lava fields with a patchy vegetation cover (Figure 21). When facing northwards Snæfellsjökull is prominent and dominates the landscape. On the other hand, when facing southwards, the landscape is quite open and the coastline is visible in the distance.



Figure 21. Lava formations with a view towards Snæfellsjökull.

The soundscape in this region is mostly quiet, exception made for disturbances created by the nearby paved road.

Evaluation

Table 20. . Evaluation table for sub-region 12.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	****	Repetitive landscape patterns and coherence in the landscape overall.
<i>Condition and naturalness</i>	****	The lava fields are mostly untouched within this region.
<i>Diversity and variety</i>	**	Repetitive vegetation and repetitive patterns, medium to low variety.
<i>Time depth</i>	***	No defined historical features apart from the lava fields.
<i>Narrative</i>	****	The proximity to Snæfellsjökull enhances the landscape identity and creates a precise narrative throughout the lava fields.
<i>Visual scale</i>	***	Open and vast visual scale throughout the area.
<i>Seasonality</i>	***	The landscape is affected by seasonality but not in a major way, especially considering the already low variety.
<i>Disturbance</i>	*****	Untouched area.
<i>Stewardship</i>	***	Mostly untouched area.
<i>Imageability</i>	**	No specific imageability, exception made for the view on Snæfellsjökull.
Final Evaluation	***	Repetitive patterns and low variety, but the good overview on the glacier, which enhances the landscape identity.

Sub-region 13

High cliffs with numerous rock formations and sea birds are the main contradistinction of this sub-region (Figure 22). The hilly landform is composed by a grass dominated vegetation, with the occasional occurrence of soil erosion. Tourist facilities are present in the area, making the coastline easily accessible through a man-made path. Abandoned farms and a lighthouse, with rich historical references, are

present in the region as well. Furthermore, a power line and an antenna are visible near the farm.



Figure 22. High cliffs overlooking the coastline.

The soundscape in this region is quite busy, especially due to the presence of fauna in the high cliffs. Human-induced noises are also to account to the nearby paved road. The smellscape is moderately strong, with odour coming both from the sea and from the local fauna.

Evaluation

Table 21. Evaluation table for sub-region 13.

Value Criteria	Evaluation	Reason
<i>Wholeness and coherence</i>	****	Repetitive landscape patterns, but diverse coastline.
<i>Condition and naturalness</i>	***	Presence of touristic facilities and man-made buildings that however do not significantly affect the naturalness.
<i>Diversity and variety</i>	****	Diverse and varied coastline.
<i>Time depth</i>	*****	Rich historical features to be found throughout the region.
<i>Narrative</i>	*****	Strong landscape identity due to the smellscape and local fauna.
<i>Visual scale</i>	*****	Vast landscape, especially due to the presence of water.
<i>Seasonality</i>	****	No strong influence on the landscape.
<i>Disturbance</i>	***	The power line and antenna are elements of disturbance.
<i>Stewardship</i>	***	Abandoned buildings that lower the perceived 'aesthetic of care'.
<i>Imageability</i>	****	Unique rock formations along the coastline, presence of the ocean.
Final Evaluation	****	Unique coastline with rock formations and sea-bird fauna.

7.1 Final Evaluation

In total, two regions obtained a score of five (sub-regions 1 and 9), five regions obtained a score of four, five regions obtained a score of three and, finally, one region obtained a score of two (Figure 23). No region was ranked in the lowest category.

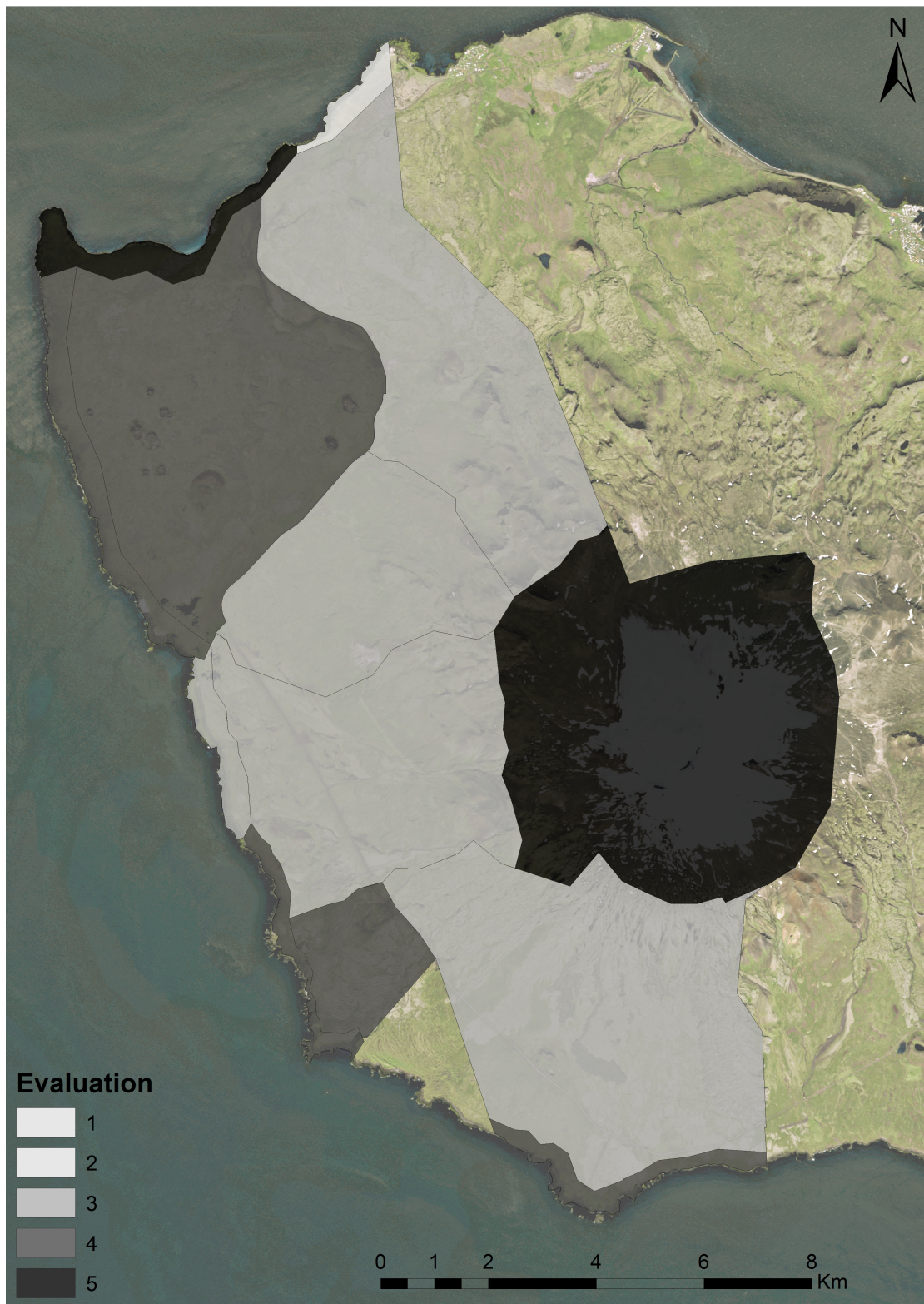


Figure 23. Map showing the final evaluation of each sub-region.

8. Discussion

The results identified a general high value of the landscape contained within the Snæfellsjökull National Park, with seven of the sub-areas having a final rank of 4 or 5. Only one region, namely Sub-region 2, was found to be of a rather low aesthetic value. This has to be linked with the extensive presence of man-made structures and man-made noises within the area, suggesting that when the balance between natural elements and human influence is not present the overall value of a landscape is lowered.

8.1 Relationship between the indicators

When looking at the final evaluation, the complex interplay within the different indicators becomes clear. Indeed, each aspect considered within the landscape evaluation framework has to be seen as an integrative part of the process that is landscape perception and not as a stand-alone concept. This is because, as previous literature highlighted, determining the precise relation between aesthetic preference and other aspects of landscape perception is difficult (Sevenant & Antrop, 2009). Therefore, it was evident how the elements that contribute to the appreciation and perception of a specific landscape are multiple and multi-faceted. This thesis stresses the fact that the discussion about landscape perception and landscape evaluation has to be included into decision-making processes, aiming at directly engaging the multitude of stakeholders that are to be identified when tackling such a multi-faceted and complex concept.

It is furthermore important to underline that the identified concepts have not only a non-linear relationship but are also context-dependent and observer-dependent (Tveit et al., 2006, Purcell et al., 2001). Indeed, because the study assessed a National Park, the perceived naturalness within each sub-area was found to have more weight than other indicators. When looking at the results, there seemed also to be an overall increased appreciation of the landscape in coincidence with a readable time depth, which, in turn, increased the landscape identity and coherence. Nonetheless, other indicators played an important role during the final evaluation process, demonstrating how these are to be read as a complex net of elements, all contributing towards the

perception process. This interplay between different indicators was particularly evident in sub-region 2. This coastal area presented low coherence and a low perceived naturalness indicator, resulting in an overall low value. This was mainly due to the occurrence of man-made structures and of a lack of harmony within the landscape.

8.2 The role of subjectivity and objectivity

Considering the context- and observer-dependent nature of the indicators, the question being asked is if there is a correspondence between the values recognised within this thesis and the wider community's landscape perception. This is exactly what Lothian (1999) identified as being the main weakness of the expert-based approach. At the same time, Arler (2000) identifies this interplay between objectivity and subjectivity as well as the possible disagreement between the expert and the public, as the major strength of the 'connoisseur's approach'. Indeed, by identifying a clear set of parameters and producing an evaluation of the landscape considered, the study could have the ability to spark and facilitate discussion, especially amongst the ones that disagree with the findings. Also the philosopher Jóhannesdóttir underlines that "at least some degree of objectivity can be found in subjective, aesthetic judgements of nature" (2010, p. 110). This is in accordance with Merleau-Ponty's phenomenological approach to reality, which attempts at rethinking the division between object and subject (1968, 1993). Perception, he argues, is engaged both by the perceiver (the subject) and the perceived (the object) (Merleau-Ponty, 1968, 1993). Thus, the distinction between the two should be overcome, moving forward towards a comprehensive phenomenology of the senses.

Indeed, throughout this thesis it was clear how both objectivity and subjectivity are important when tackling a holistic concept such as landscape. While some degree of objectivity is to be found in the selection and identification of relevant parameters, mainly because based on previous literature on landscape preferences, a higher degree of subjectivity is evident in the results and within the interactions between the identified parameters. This, however, is not to be understood as a weakness, but rather as the strength of this evaluation approach that aims to be a tool used to facilitate the discussion on landscape qualities and perception among different stakeholders. It is therefore argued that the inclusion of a final evaluation table is to be seen as a tool to

enhance and sparkle discussion about the many values that might be found within a specific landscape.

8.3 Landscape perception and coastal areas

It appears to be quite clear that the aesthetic perception of coastal areas enhances the overall evaluation of a landscape. Within the study area, coastal regions always scored high ranks (exception made for region 2). This is perhaps a link to different indicators, as previously mentioned.

First of all, the occurrence of water bodies in these regions, which, as discussed in chapter 2.4, could have enhanced the overall appreciation. Secondly, all the coastal regions show higher presence of fauna. Thirdly, the majority of historical features to be found within the National Park were identified within such regions. Fourthly, the transition from the mainland to coastline increases greatly the perception of variety within a region. Lastly, the soundscape was found to be the busiest with natural induced noises. A link is then identified between the presence of such features within the regions and the enhanced identity and narrative found within the landscape, making it obvious how a strong landscape identity contributes to the overall evaluation of an area. A further element to consider is the fact that imageability indicator was 4 or 5 in most of the coastal areas (exception made for sub-region 2 and 7, which were assigned a medium score of 3). This is possibly to attribute to the occurrence of high cliffs in the regions, which seem to increase the overall landscape impression on the viewer.

Perhaps a further element to identify within these areas is the strong presence of ‘smellscapes’ and specific soundscapes. First of all, as mentioned in chapter 2.4, the presence of smell in a landscape creates historical and cultural interactions, enabling humans to organize “spatial experiences” (Paraguai, 2013). Indeed, the occurrence of sea birds fauna and the proximity to the ocean did not only enhance the visual qualities of a specific area, but it also creates a strong and unique odour identity that was lacking in the mainland. In her essay *The geography of smell* (2010) Kara Hoover states: “odour is just as provocative as visual stimuli in creating and inducting memories” (p. 238). The correlation between smellscapes and geographic experience is thus evident, and the presence of odour is a vehicle for the “ability to recollect experiences of space” (Haque, 2004, p. 5). It has also to be underlined that all the coastal regions considered

within this thesis presented a clearer identity due to the specific and vibrant soundscape. Previous literature showed how the occurrence of man-made or natural sounds has effect on the overall perceived qualities of a landscape (Southwork, 1969; Carles et al., 1999). This statement was confirmed by the results, showing generally positive correlation between natural noise, to be attributed both to the fauna and to the ocean, and the overall appreciation of landscape.

Overall, it is important to highlight the strong correlation found between the presence of water and the overall perceived landscape value. It is therefore advised that a stronger effort in protecting the landscape contained within coastal areas has to be made from the National Park, perhaps with a specific conservation policy to prevent possible future damage.

8.4 Effects of tourism on landscape perception

The fieldwork conducted for this thesis took place during a low season for tourism. This could have greatly impacted the results of the thesis, especially when it comes to tourist hotspots such as Djúpalónssandur and Malarrið. Considering the fact that landscape perception is the result of a complex interaction between different factors, the presence of man-made noise and of other tourists in the area could have a negative effect on the overall perception of a landscape and its characteristics. This could, in turn, lower the appreciation of tourist hotspots within the National Park, perhaps shifting the appreciation towards less popular areas. It is thus clear how the considered parameters are highly context-dependent and could vary greatly depending on the season when the study is conducted. Taking this into account, it would be interesting to produce a comparison between this study and the landscape analysis conducted during the tourist season (June to August), in order to understand if the landscape value is affected, and if so, in which ways this changes the results of the framework utilised within this thesis.

9 Conclusion

This thesis has looked at the multifaceted and holistic concepts that is landscape. The multiple values of landscape were highlighted, as well as the difficulties that come with the inevitable selection of parameters that have to be considered within an analysis framework. An attempt to produce an overview of perceived landscape qualities within the Snæfellsjökull National Park has been presented. The framework developed here is to be viewed as an attempt to assess the perceptual qualities by identifying a broader spectrum of indicators, especially when compared to frameworks previously developed. The aim of this inter-disciplinary approach is to provide a tool for discussion and debate on landscape qualities both on a regional and national level.

The final evaluation results showed an overall high value of the landscape contained within the study area, highlighting the interconnections and complex interplay between the different indicators. An additional link was identified between landscape appreciation and coastal areas, underlining perhaps the need of further research and debate on the overall effect of water bodies in terms of landscape appreciation. Overall, this assessment of landscape qualities could be utilised as a tool for discussion on landscape perception in the study area and in a wider context.

Considering the holistic nature of the concept of landscape, the main weakness to be identified within this thesis is the necessary simplification that the project presents and the inevitable subjectivity of the results. For this reason, a more thorough assessment of the landscape qualities in the study area could follow. For example, future research could explore the relationship between the results obtained within this thesis and the opinions of the general public, identifying the commonalities and the differences due to the context and observer-based nature of the indicators utilised. Furthermore, given the numerous interconnections between different parameters identified within the thesis, further exploration on numerous topics is advisable. Some suggested topics include the examination of the differences between coastal landscape perception and inland landscape perception, the ways in which the presence of tourists in an area affect the quality of a specific landscape and how smellscape and soundscape influence the overall perception of the landscape qualities.

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Appendix: Register for landscape data

Date:

Coordinates:

Section 1 – Landforms, Geology & Structure

Mountainous ☐

Hilly ☐

Largely Hilly ☐

Repetitive ☐

Alternating ☐

Flat ☐

Texture:

Smooth ☐

Textured ☐

Rough ☐

Very Rough ☐

Other:

Section 2 – Natural Vegetation Cover

Dense ☐

Sparse ☐

Patchy ☐

Bare ☐

Vegetation Type:

Other:

Section 3 – Land Use

Built up Area ☐

Agriculture ☐

Leisure Buildings ☐

Touristic Facilities ☐

Village ☐

Energy Production Facilities ☐

Agriculture:

Field ☐

Meadow ☐

Pasture ☐

Uncultivated ☐

Other:

Section 4 – Historical Development Traits and Cultural References

Landscape time depth:

Historical continuity and landmarks:

Traditional Cultural landscapes:

Places of religious and belief importance:

Other:

Section 5 – Scale

Vast ☐

Large ☐

Medium ☐

Small ☐

Intimate ☐

Other:

Section 6 – Complexity and Content

Visual appraisal:

Open ☐

Closed ☐

Horizon and Contrast:

Coherent ☐

Fragmented ☐

Colour:

Monochrome ☐

Diverse ☐

Colourful ☐

Movement:

Still ☐

Calm ☐

Busy ☐

Other:

Section 7 – Soundscape

Silent ☐ Natural Noise ☐ Human-induced Noise ☐

Observations:

Others:

Section 8 – Smellscape

No smell ☐ Natural Smell ☐ Human-induced Smell ☐

Observations: