Ph.D. Dissertation of Engineering

On-site Landscape Perception Analysis with Visitor Generated Contents in Bukhansan National Park

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ABSTRACT

Protected areas such as national parks need to be managed in consideration of positive or negative human impacts, including recreational and tourism activities, along with conservation of biodiversity. The landscape, which is a representative environmental resource of national parks, needs to be utilized more and more, but systematic survey and assessment system that meets it is still insufficient. In addition, the current research and evaluation methods are carried out by the expert-led approaches excluding the public such as visitors, local residents, and that it was done in such a way as to make one landscape better or worse rather than different from another. This problem is due to the lack of understanding of the pluralistic value of the landscape. The more fundamental reason is the lack of consideration of the relationship between humans and nature, which creates such pluralistic values. Landscape matters to humans and inseparable from each other. In particular, human experience of landscape is very important. On the other hand, there is a growing movement to reflect social values to manage sustainable environmental resources. Therefore, it is imperative to grasp public perception in order not only to reflect public opinions for democratic environmental management but also to lead active

participation. However, existing landscape perception research has been conducted solely of other landscape-related studies, or it has been mainly focused on visual-oriented preference analysis by quantitative response to a part of the perception. It is necessary to discuss a new method to explore landscape perception based on holistic view that recognizes ecological, socio-cultural, economic value of landscape as equivalent value while overcoming limit of existing method. The purpose of this study is to propose a method to understand on-site landscape perception of national park visitors. Furthermore, based on the results, some application for national park management will be discussed.

In this study, conceptual framework is presented to understand commonality and diversity of perception. First, the object of landscape are divided into spatial configurations and specific elements as well as ephemeral events. Then, the perception of landscape was divided into four levels of cognitive process (perceptual, expressive, interpretative, and symbolic). The perceptual and expressive level of the cognitive process emphasize the commonality of landscape perception based on evolutionary theory, and the interpretational and symbolic level can grasp the diversity of perception based on the cultural theory. These perceptions are finally divided into nine concepts (visual range, coherence, complexity, naturalness, disturbance, stewardship, historicity, imageability, ephemera) to assess landscape characters. The study area selected as a place where visitors can

experience various scenic resources of Mt. Bukhansan because it has a high usage density among designated trails in Bukhansan National Park and can be visited for one-day trips to a mountain-top destination. In order to select the optimal trail for this condition, we first select some trails as a candidate group based on statistical data of usage of the trails, and then analyze the density of coordinates of social media photographs (Flikr). High-density trail was finally selected. The total length of the trail is 3.4 km, along which four visually distinguishable units (Unit A-D) were identified.

The fieldwork and analysis method were divided into two stages in order to understand on-site visitors' landscape perception. VEP method have the advantage of directly recognizing visitors' perceptions of the landscape, but it is highly unlikely that it will be easy to recruit participants. Therefore, the research process is divided into two stages to utilize the VEP method more efficiently. In the first stage, commonality of landscape perception is focused on, and in the second stage, diversity of the perception is identified. Accordingly, detailed method related of fieldwork and analysis are set up to achieve objectives of each stage.

First of all, the survey process was divided into two steps. In order to focus on commonality of perception, random sampling was used in the first stage. This was done by recruiting participants in the field for actual visitors. Next, in order to concentrate on the stage's objective and increase the

participation rate of the survey, the types of the collected data were limited to the photographs containing the geographical information of the preferred landscape. In the second stage, the participants were recruited using purposive sampling in order to understand the diversity of perception according to the familiarity of the national park. The types of data collected include photographs containing geographical information on liked or disliked landscape and photo-logs describing the reasons why the photographs were taken. Additional short interviews were conducted with all participants. The purpose of conducting additional interviews is to prepare for the possibility of missing records. The interview method utilized the free-listing method. The method is similar to an open-ended question by allowing respondents to freely list what they are aware of on a topic.

Through the theoretical review, the conceptual framework proposed landscape perception analysis was utilized and the analysis was conducted according to the characteristics of the collected data through each step of the survey process. Geotagged photographs collected in the first step can be used as information on spatial coordinates and visual images of photographs. This can be used to analyze the types of the object of landscape and responses of the perceptual level of the cognitive process. Spatial configurations can be divided into two types 'Prospect' and 'Surrounding' according to depth of view corresponding to perceptual level. In addition, specific elements (natural and anthropic elements) can be called as a type

‘Single objects.’ The type of experiencing landscape can be classified into three types and further subdivided into each type by their primary objects of photographs. Finally, we select consensus photographs (CP) and perceptually exciting nodes (PEN) that show commonality of perception of the types of experiencing landscape. The analysis method in the second stage attempted to grasp the diversity of landscape perception by analyzing the visual image of the photographs of the first stage and the text of photo-logs obtained through the additional interview. It can be understood the responses of the whole cognitive process (perception, expressive, interpretative, and symbolic). We analyzed the diversity of perceptions among the inexperienced (novice) group and the experienced (veteran) group by grasping the responses of cognitive processes to the three objects of landscape - spatial configurations, specific elements (natural and anthropic elements) and ephemeral events. This diversity of perception can be used to deduce the reason for photography collected in the first stage.

As a result of the analysis of the first stage process, the experiencing landscape was classified into 18 types: 4 of Prospect, 4 of Surrounding and 10 of Single Objects. 11 CPs and PENs in which representing the commonality of landscape perception among them were selected. 8 of them belong to the category Prospect and 3 belong to the category Single Objects. The peaks such Mangyeongdae, Insubong, and Baegundae, showing the geological and topographical characteristics of the granite are the most

preferred. These results can be interpreted as the interest of visitors through the energy gradients. The commonality of landscape perception is mainly seen in perceptual responses during cognitive processes with no correlation familiarity of visitors. The expressive responses were similar in both groups. The differences in the perceptions of two groups were remarkable in the interpretative level during the cognitive process. The cognitive response of the interpretative level is about the positive or negative impacts of human beings on anthropic factors. In the case of disturbances caused by artifacts, the novice group perceives the visual aspect as negative, whereas the veteran group perceives the cues of care as a measure of stewardship, critically and specifically. They responded sensitively to the fact that it was left unattended and underutilized rather than achieving the original installation purpose, rather than the external features such as the size, shape, and color of the facilities. Perceptions related to naturalness is more favored by colorful vegetation such as wildflowers as wow factors than contents related to professional ecological knowledge such as the proportion of natural vegetation, level of succession, and fragmentation. In the case of naturalness, it can be said that there is a difference in perception due to professional knowledge or information rather than familiarity of visitors.

The commonality and diversity of landscape perception can be used for sustainable management of landscapes on the application aspect. First, major nodes of experiencing landscape were selected to provide various

landscape experiences. A expressively relieved node (ERN) that can feel tranquility in a landscape room bordered by trees or terrains as well as PENs similar to existing viewpoints. This is to provide more opportunities for landscape experiences through various sensory organs including vision. Applying this method to other trails also allows to identify the characteristics of experiencing landscape for each trail. It is necessary to actively utilize the concept of stewardship for the management of the trail-related facilities. There is a limit to the standardized management methods such as minimizing the artificial facilities in national parks and replacing them with facilities using natural elements. Rather, there should be a trail of management with a halo effect that allows you to have some kind of responsibility that requires careful management, so that visitors can voluntarily participate in ecosystem conservation. This research method proposed to grasp the landscape perception can be applied to the analysis process of big data such as landscape photographs of social media or to verify the analysis results. Regular panel surveys can also track the changes in visitors' perception of landscape. It is necessary to carry out the survey from the people who are familiar with the national park, such as local residents, regular visitors, and civic groups.

This study suggests an effective method to identify the commonality and diversity of on-site landscape perception. Especially, the familiarity of visitors is a major factor influencing the diversity of landscape perception.

Furthermore, some examples of sustainable landscape management using the results derived from the method are also presented. Reflecting public perception in landscape characters assessment is a sufficient condition, not a necessary condition. Based on the results of this study, indicators related to landscape perception should be considered in landscape character assessment. Assessment techniques that can be used in actual practice, including the development of indicators for landscape character assessment, should be devised.

Keywords: Environmental psychology; Environmental cognitive process; Visitor employed photography (VEP); Semantic network analysis; Consensus photograph (CP); Perceptually exciting node (PEN); Expressively relieved node (ERN); Landscape character concepts; Naturalness; Disturbance; Stewardship; Social media photographs

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CONTENTS

LIST OF TABLES

LIST OF ILLUSTRAIONS

PUBLICATIONS

Please note that Chapter 2-4 of this dissertation proposal were written as stand-alone papers (see below), and therefore there are some repetition in the methods and results.

Chapter 2-4.

Lee, K.-C., & Son, Y.-H. (2017). Exploring Landscape Perceptions of Bukhansan National Park According to the Degree of Visitors' Experience. Sustainability, 9(8), 1306.

Lee, K.-C., Son, Y.-H., & Lee, S.-H. (2016). Exploring the Characteristics of scenic landscapes of between the Dulle-gil and the uphill trail in Bukhansan National Park. Journal of the Korean Society of Rural Planning, 22(3), 21–31.

Chapter 1. Introduction

1.1. Background and purpose of the study

In order to effectively manage the excellent landscape of national parks representing natural parks, one must start by acknowledging the existence of various values of landscape. In particular, there is a need for a method that can grasp the inherent characters of each value, rather than pursuing or rejecting specific values by the dichotomy of conservation and utilization of environmental resources. Protected areas like the National Park in the first place have been set up to preserve biodiversity (Dudley, 2008), but as a result, they provide innumerable benefits to

humans. The most direct benefit is the provision of recreational and tourism opportunities (Reinius and Fredman, 2007). Among them, the scenic beauty in the visual aspect is one of the factors that have the greatest influence on the satisfaction of visitors to the national parks (Clay and Daniel, 2000). In addition, the experience gained through the five senses in the actual natural environment further enhances the satisfaction (Tahvanainen et al., 2001). In the management of national parks, there is a high degree of mutual relevance in setting management direction by emphasizing only one aspect of whether conservation or utilization. National parks need management that simultaneously considers the sustainable use of landscape as well as preventing the loss of biodiversity that is the original purpose of establishing protected areas. For this purpose, a method to understand various values of national parks from a comprehensive perspective is required.

Since the enactment of the Landscape Act (2007) and the fully amendment of the Act (2013), interest in the landscape has increased, and local governments have been making efforts to systematically manage related plans (Joo and Shin, 2015). Surveys and assessments of the landscape, which is the basis of landscape management, are also steadily taking place. ‘The National Survey of Natural Landscape (2006-08),’ ‘the Best 100 of National Park Landscape (2011),’ and ‘Korea's Best Mountains 100 (2002)’ were conducted (Joo and Shin, 2015). This is

meaningful as an attempt to explore its value in terms of utilization of natural landscape, but its limitations are clear. In the case of 'the Best 100 of National Park Landscape (2011),' which was conducted to select representative scenic beauty of national parks, it was decided that the evaluation was carried out by the expert-led approaches excluding the public such as visitors, local residents, and that it was done in such a way as to make one landscape better or worse rather than different from another. This problem is due to the lack of understanding of the pluralistic value of the landscape. The more fundamental cause is the lack of consideration of the relationship between humans and nature, which creates such pluralistic values.

Landscape matters to humans and inseparable from each other. The European Landscape Convention (ELC) definition of 'landscape' is: "… an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors (Prieur et al., 2006)." This definition focuses specifically on the human experience of landscape (Butler and Berglund, 2014; Ode et al., 2008; Sarlöv Herlin, 2016; Warnock and Griffiths, 2015). Based on the ELC, efforts are being made to reflect public perception within landscape management and policy in practice. As a representative example, within the UK, the Welsh Government includes public perception indicators in its framework for Landscape Character Assessment (LCA). The LCA considers not only the

perceptual and aesthetic aspects of the public perception, but also the characters of the natural and socio-cultural aspects (Scott, 2003). It is also emphasized that the identification of landscape characters is to explain the unique features of the landscape to distinguish them from others, not to judge the superiority of the better or worse (Jung and Han, 2015; Ode et al., 2008; Tudor, 2014). In recent years, ecosystem conservation and management have also considered the role of social values such as underlying values and assigned values (Ives and Kendal, 2014). In the decision-making process for ecosystem conservation activities, the impact of social and political values is greater than biological value (Knight et al., 2011). In an era when the anthropogenic impacts on natural ecosystems are increasing, understanding how and why human-being gives value to other aspects of the ecosystem allows management to minimize stakeholder conflicts. This leads to an increase in the social acceptability of management activities (Ives and Kendal, 2014). Understanding their perceptions for participation as well as reflecting public opinion can be a starting point for democratic environmental management.

The total number of national parks is 22 in Korea, including Taebaeksan National Park, which was recently established. Efforts to preserve biodiversity have continued through expanded protected areas. On the other hand, the number of visitors increased about 1.7 times from

about 24.9 million (as of 2006) to 46.4 million (as of 2014). As a result of the questionnaire survey, it was found that the main purpose of visiting the national park is to enjoy scenic beauty and experience the nature (Sim, 2014). It is time for landscape management to minimize negative impacts on national park landscape and provide high quality recreational and tourism opportunities for visitors. It is essential to understand the various public perceptions of landscape in the process. However, existing landscape perception research has been conducted solely of other landscape-related studies (Jorgensen, 2014), or it has been mainly focused on visual-oriented preference analysis by quantitative response to a part of the perception (Jorgensen, 2011; Yun, 2011). It is necessary to discuss a new method to explore landscape perception based on holistic view that recognizes ecological, socio-cultural, economic value of landscape as equivalent value while overcoming limit of existing method.

The purpose of this study is to propose a method to understand on-site landscape perception of national park visitors. Furthermore, based on the results, some application for national park management will be discussed.

The detailed objectives are as follows. First, we present a conceptual framework for analyzing the commonality and diversity of landscape perception according to cognitive processes through reviewing existing theories and previous studies. In order to apply the conceptual framework

to the present study which has disadvantages of commonly time-consuming and economic constraints, the research process is divided into two stages. The first stage focuses on the commonality of landscape perception, and the second one focuses on the diversity of the perception. And the results are analyzed according to the appropriate procedures of fieldwork and analysis. In particular, the second step is to identify the differences between the two groups by dividing according to the degree of experience of the national park. Based on the results of the analysis of the landscape, this study suggests ways to utilize it in national park management. First, it is the management of nodes where visitors experience landscape. Based on the positive contents of landscape perception, this study suggests ways to enhance the satisfaction of experience in national parks. It will also be considered providing landscape-related information and knowledge to visitors for sustainable use. The other one is the part of the trail management. It will be identified that the commonality and diversity of negative perceptions of landscape and suggested direction that human impact can act positively. Finally, it can be discussed how to use the method of on-site landscape perception analysis proposed in this study in practice. Some ways will be explored to be practical for the application of conceptual frameworks and the process of fieldwork and data analysis.

The ultimate goal of this study is to identify the commonality and

diversity of landscape perceptions and to suggest some application for management in terms of recreational aspects of national park landscapes directly and furthermore is the basis for landscape perception to be used as the basis for developing indicators of landscape character assessment (Figure 1).

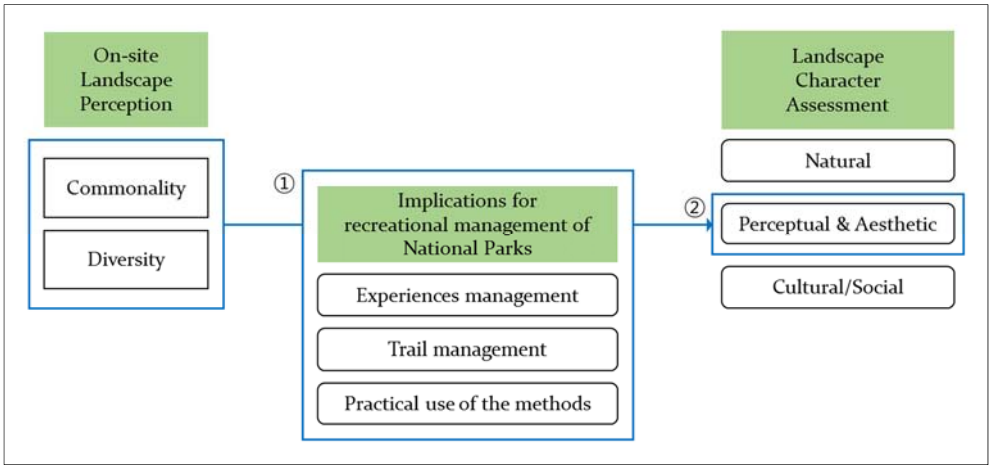


Figure 1. The stepwise purpose of the study.

1.2. Structure and process of the study

This study was divided into three phases: 1. design of the study method using conceptual framework, 2. data analysis and result derivation, and 3. application of results and research methods. In particular, the research method that is divided into two stages is intended to increase the possibility of practical use.

The first phase (research design) refers to the necessity of the landscape perception research (chapter 1), establishes a conceptual framework through consideration of related theory and prior research (chapter 2), and applies detailed fieldwork and analysis methods (chapter 3). The second phase (analysis) are divided into two stages, and the result which is based on commonality of perception and diversity (chapter 4) is discussed for each stage. The utilization part discusses the national park management plan in terms of recreation using the results of visitors' landscape perception (chapter 5) (Figure 2).

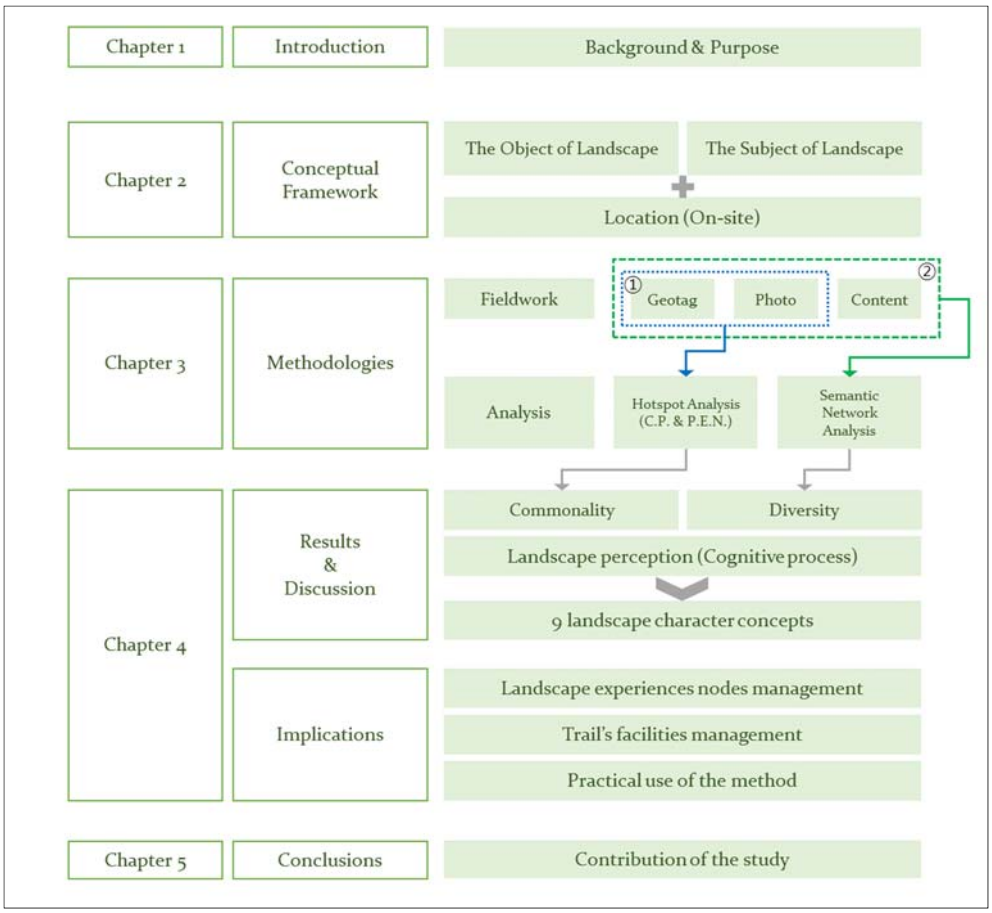


Figure 2. The process of the study.

In chapter 2, a conceptual framework is presented to understand the commonality and diversity of landscape perception through the responses in cognitive processes. Next, we review the related studies and revealed the limitation of existing indirect landscape perception research using photographs and emphasize the importance of on-site landscape perception research and emphasize the difference of this study from others. Chapter 3 explains the specific procedures of the research method divided

into two stages. In particular, the research process refers to the nature and reason for the contents that the visitor generated by each stage, and in the analysis process, the semantic network analysis (SNA) used in the second stage will be described. Chapters 4 identify the commonality and diversity of landscape perception according to the levels of cognitive process. And, we discuss the application of national park management in terms of recreation and tourism using the results. The management of specific areas that can provide a variety of landscape experiences, the management of trail facilities, and the practical use of this research method are suggested.

Chapter 2. Conceptual framework

2.1. Landscape and perception

2.1.1. Two paradigms related to the landscape quality

The multifaceted nature of landscape means that landscape can be grasped from various perspectives according to purpose. Since the 1960s, research has begun to analyze landscapes from various perspectives. The representative classification method suggested by some prominent scholars is as follows. Arthur et al. (1977) distinguished three types of

landscape analysis methods: descriptive inventories, public preference model, and economic aspects of esthetic measurement. Zube et al. (1982) categorized into four paradigm: the expert, the psychophysical, the cognitive, and the experiential. Daniel and Vining (1983) has divided into five approaches: ecological, formal aesthetic, psychophysical, psychological, and phenomenological. These categories can be grouped into ecological, aesthetics, psychophysics, psychological, semiotics, and phenomenological (Im, 1988) (Figure 3).

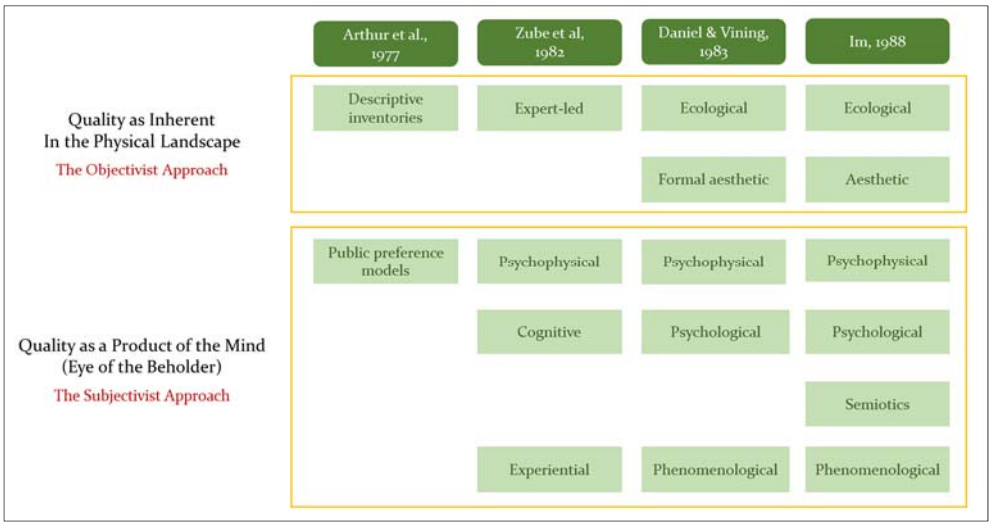


Figure 3. Comparison of paradigms with landscape typologies.

This classification system is divided into objectivist and subjectivist (Lothian, 1999) (Figure 3). The former one which regards quality as inherent in the physical attributes of the landscape and the other one which regards quality derived from the eyes of the beholder.

The objectivist approach considers that the absolute value of landscape can be measured objectively or quantitatively by an expert. Representative examples include the visual resource management (VRM) of the Bureau of Land Management and the British Landscape Assessment of the UK Countryside Commission (Lothian, 1999). Considering the landscape as an objective, however, biophysical object and evaluating only by the experts has problems in terms of reliability and validity (Daniel, 2001). Paradoxically, the fact that it is evaluated by a small number of expert means that the results of the analysis due to the individual differences of the expertise are subjective, resulting in lower replicability (Lothian, 1999). The subjectivist approach, on the other hand, is the analysis of landscape by emphasizing various aspects of human perception such as psychophysics, psychology, semiotics, and phenomenology (Lothian, 1999; Tveit et al., 2006). Typically, a scenic beauty estimation (SBE) method is used to quantitatively determine the influence of the characteristics of a particular group on landscape preference. Landscape analysis using perception basically analyzes a large number of samples, so statistically high reliability can be secured (Daniel, 2001). For this reason, the importance of landscape perception assessment according to the subjectivist approach is increasing.

In general, ecological experts want to treat landscape as the environment itself, but such a claim is unreasonable because landscape is

the result of human-environmental interaction (Daniel, 2001). One of the two prospective on the landscape quality cannot be said to be entirely correct, since the objects to be analyzed differ depending on the key factors of the interaction. In recent years, attempts have been made to analyze landscape from a comprehensive point of view based on the multifaceted characters of landscape (Fry et al., 2009; Gobster et al., 2007; Ives and Kendal, 2014; Jorgensen, 2011; Juutinen et al., 2011; Ode Sang et al., 2008; Tveit et al., 2006; Warnock and Griffiths, 2015). The study of landscape perception based on subjectivist approach does not exclude the objectivist's. Rather, it is necessary to actively pursue research based on each point of view while keeping in mind that the two perspectives are complementary.

2.1.2. The commonality and diversity of landscape perception

Studies of landscape perception based on the subjectivist approach has evolved through the debate between commonality and diversity of its perception. Both of them are divided into evolutionary theory and cultural theory according to the theoretical background (Hartmann and Apaolaza-Ibáñez, 2010; Ode Sang et al., 2008; Tveit et al., 2006). If evolutionary theory emphasizes the commonality of perceptions by human nature, the

cultural theory regards its diversity as a result of individual experience. According to evolutionary theory, humans perceive landscape according to the biological need for survival and prosperity. In other words, there is a common preference for all humans (Tveit et al., 2006). Typical examples are the habitat theory, the prospect-refuge theory, and the information processing theory. (Ode Sang et al., 2008). The habitat theory argues that most people prefer the savannah environment as their home (Orians, 1980). The prospect-refuge theory argues that humans prefer the state of being able to "see but being invisible" to survive biologically while simultaneously acting as predator and prey (Appleton, 1996). The information processing theory emphasizes the instinctive desire for information that humans have and the ability to handle it for survival (Kaplan and Kaplan, 1989). For instance, if coherence and legibility of landscape is high, people prefer it because the landscape is familiar and easy to recognize, while complexity and mystery make people feel interesting or afraid (Dorwart et al., 2010; Kaplan and Kaplan, 1989). Human beings tend to instinctively prefer environment (landscape) that can easily identify their threats to their survival. Cultural theory, on the other hand, argue that perceptions and preferences of landscapes can vary depending on the individual's cultural background, individual or group characteristics. Personal attributes such as age, gender, occupation, hobbies, education, and familiarity are closely related to landscape preference (Tuan, 1990; Tveit et al., 2006). It can be said that it focuses

on perception and preference by cultural context of individual or society beyond immediate and emotional response according to biological characteristics.

The commonality and diversity of landscape perception can be also divided into psychology and phenomenology (Ueda et al., 2012). Psychological perspective is divided into psychophysical approach and cognitive approach. The former can quantify human responses to the physical environment (Im, 1988), but has limitations that cannot explain the reasons for preference (Ueda et al., 2012). The latter is an analysis of human responses, such as feelings, emotions, etc. about the physical landscape. Typically, the reasons for landscape preference can be grasped partially through methods such as semantic differential scale (S.D. scale), questionnaires, and cognitive maps. The phenomenological perspective is to focus on the relationship human with the landscape as well as the passive response of the human to the landscape, and to grasp the overall phenomenon. It is divided into experiential approach and socio-cultural approach in detail. The former emphasizes the subjective experience of the place regardless of the social context and the latter regards that the meaning of the place and the value of the landscape are created only in the socio-cultural context (Ueda et al., 2012). The context can be formed mainly by objective information and the degree of providing education, so it can be a key parameter to examine the difference of landscape

perception.

The distinction between theories of evolutionary and cultural, or theories of psychology and phenomenology mentioned above, can be useful when considering only one aspect of perception. Since perception is the result of cognitive process, there is a complex response to various external stimuli. The cognitive process of landscape perception is divided into four major levels of knowledge or sense (perceptual, expressive, interpretative, and symbolic) (Buijs, 2009; Hull IV and Stewart, 1995; Parsons and Daniel, 2002; Russell et al., 2013; Ulrich, 1983) (Table 1).

Table 1. Cognitive process of landscape perception.

Cognitive Porcess	Description
Perceptual	The beholder captures some information through the sense, such as by viewing, hearing, touching or smelling.
Expressive	All perceived elements and compositions are associated by the beholder with feelilngs and emotions.
Interpretative	The beholder already has to know something about the landscape if they want to be get on this level of cognition. For example, a sandbank may talk of the rivers low water power.
Symbolic	Landscape realities become ideas, imaginations, utopian images, which are generated in t he head of the beholder.

At the perceptual level, the beholder immediately acquires relevant information through the sensory organs. The expressive level is related to the beholder's feeling regarding perceived elements or structures. The interpretative and symbolic levels refer to what is behind the physical objects: The interpretative level understands and interprets the objects as

signs or symptoms, whereas the symbolic level goes beyond the reality of the interpretative level, thus ultimately reaching the level of imagination. Some researchers argue that the perceptual and interpretative levels contribute to the narrative function; and the expressive and symbolic levels to its poetic function (Nohl, 2001; Ueda et al., 2012). The four levels of the cognitive process can be divided into evolutionary and cultural theories (Daniel, 2001; Lothian, 1999). The evolutionary perspective, which emphasizes human instincts such as natural survival, corresponds to the levels of perception and expression, whereas the cultural perspective, which emphasizes individual characteristics formed by acquired factors, corresponds to the interpretative and symbolic levels (Figure 4).

Interpretative and symbolic levels that emphasize the importance of cultural influences can be greatly influenced by factors such as familiarity and affinity with particular environments (Arnberger et al., 2012; Beza, 2010; Daerden, 1984; Dobbie, 2013; Van der Wal et al., 2014). For rural landscape, visitors (low familiarity) prefer a traditional rural landscape dominated by natural elements, while local farmers (high familiarity) prefer productive, well-organized landscapes (Prestholdt and Nordbø, 2015). Long-term residents are more likely to engage in more detailed and less attractive elements, including more constructive critiques and advice (Prestholdt and Nordbø, 2015). In the case of rural landscapes, it can be

seen that the greater the attachment, the more interpretative and symbolic is the perceived value of the landscape. For the natural landscape such as Mt. Everest, foreign tourists prefer scenic beauty, while local residents (Sherpa) have a difference in landscape perception that the mountain is considered beautiful by utilitarian reasons (Beza, 2010). In particular, the affinity of national parks showed positive or negative impacts on visitors' attitudes toward protected area management (Arnberger et al., 2012). Therefore, it is necessary to understand the difference of perception according to the characteristics such as the familiarity, affinity of visitors.

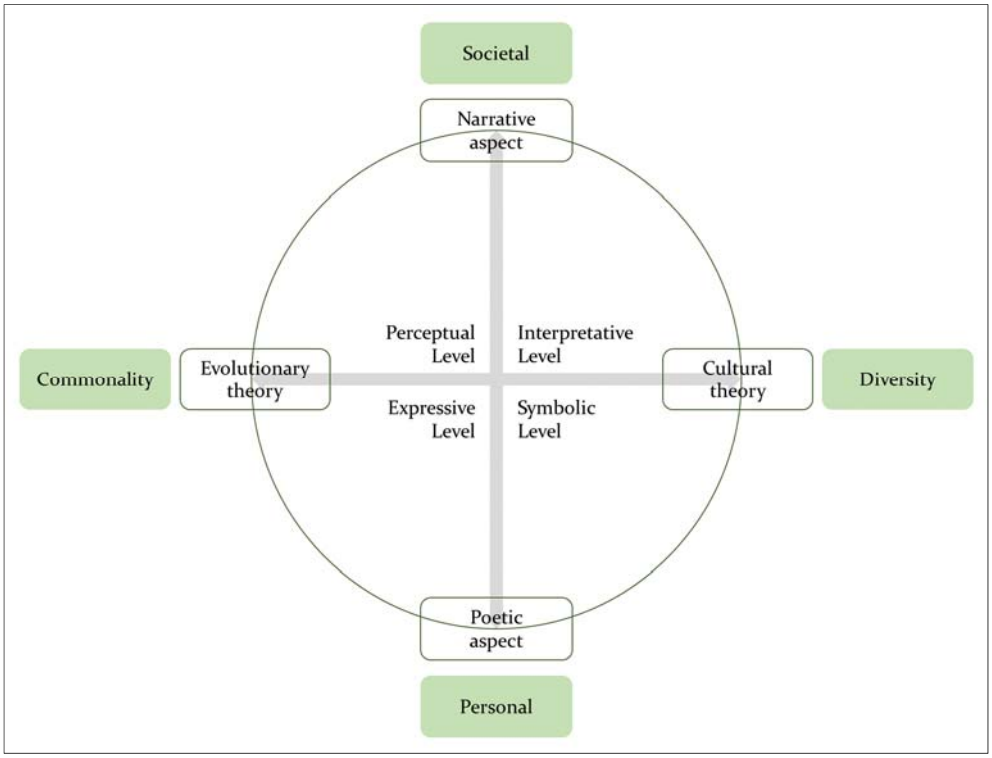


Figure 4. Relationship between cognitive process and theories related landscape perception.

Sustainable landscape management should take place with assessing the characters of the landscape, not merely the scenic beauty of the landscape. Tveit et al. (2006) proposed nine landscape character concepts (visual scale, coherence, complexity, naturalness, disturbance, stewardship, historicity, imageability, and ephemera) through extensive review of previous studies (Table 2).

Table 2. Concepts of landscape character and related theories.

Concept	Description	Theory
Visual Scale	Landscape rooms/perceptual units in relation to their size, shape and diversity, and the degree of openness in the landscape	Prospect-refuge theory Habitat theory
Coherence	The unity of a scene, the degree of repeating patterns of colour and texture as well as a correspondence between land use and natural conditions	Information processing theory
Complexity	The diversity and richness of landscape elements and features and the interspersion of patterns in the landscape	Information processing theory Biophilia hypothesis
Naturalness	The perceived closeness to a preconceived natural state	Biophilia hypothesis
Disturbance	The lack of contextual fit and coherence in a landscape	Information processing theory Biophilia hypothesis
Stewardship	The sense of order and care present in the landscape reflecting active and carefulmanagement	Aesthetics of care
Historicity	The degree of historical continuity and richness present in the landscape	Topophilia
Imageability	The ability of a landscape to create a strong visual image in the observer and thereby making it distinguishable and memorable	Spirit of place Topophilia Vividness
Ephemera	Landscape changes related to season or weather	Restorative environments

It is possible to assess landscape characters by deriving measurable indicators for each concept of abstract level (Ode Sang et al., 2008; Tveit et al., 2006). Furthermore, these concepts have the potential to integrate not only the cognitive aspects of landscape but also ecological aspects (Fry et al., 2009). According to the perspectives, it is necessary to clearly distinguish between the indicators that can be integrated according to the concepts of landscape characters and the indices to be considered independently.

2.1.3. On-site landscape perception

In order to explore landscape perception in the real context, there are additional considerations as well as the relationship between the cognitive process and the concept of landscape characters presented so far. It is a spatial area where the object of landscape is actually experienced and a cognitive response to the object is expressed. The object of landscape perceived by humans can be classified into spatial configurations and specific elements of landscape (Kaplan and Kaplan, 1989). Spatial configurations are related to the organization or composition of the landscape elements, and influenced by the depth and breadth of view (Nielsen et al., 2012). On the other hand, specific elements emphasize

experience and interaction, with attention to distinctive elements and subtle details (Carlson, 1977). Certain landscapes can be seen as part of the world seen by observers at a specific position (Steen Jacobsen, 2007). What should be noted here is the 'specific position.' Landscape perception is another term landscape image, and the spatial location at which the person who accepts the images is very important (Nakamura, 1982; Ueda et al., 2012). This is very similar to mentioning the importance of the vantage point in the SBE method (Daniel and Boster, 1976).

The combination of the object of landscape and viewpoints mentioned above can be used to distinguish landscape as a single object, an objective scene, a surrounding place, or a scenic place (Ueda et al., 2012). The objective scene and the scenic place correspond to the spatial configurations, and the single object corresponds to the specific elements. The surrounding place is a sort of space with a limited depth of view, and has characteristics that the perception of both the spatial configurations and the specific elements are displayed. Therefore, the place should be considered as the most important one when grasping the perception through landscape experience in the future.

In this study, conceptual framework is presented to understand commonality and diversity of perception. First, the object of landscape

are divided into spatial configurations and specific elements as well as ephemeral events. Ephemeral events are the effects of time constraints such as weather, sunlight, color, and seasons (Martín et al., 2016; Tveit et al., 2006). Ephemeral events include a factor of 'visitors' from national parks. The influence of the recreational experience on the presence of others cannot be ignored (Dorwart et al., 2010). These events also improves extraordinary experience of landscape (Kaplan and Kaplan, 1989). Then, the perception of landscape was divided into four levels of cognitive process. The perceptual and expressive level of the cognitive process emphasize the commonality of landscape perception based on evolutionary theory, and the interpretational and symbolic level can grasp the diversity of perception based on the cultural theory (Figure 5).

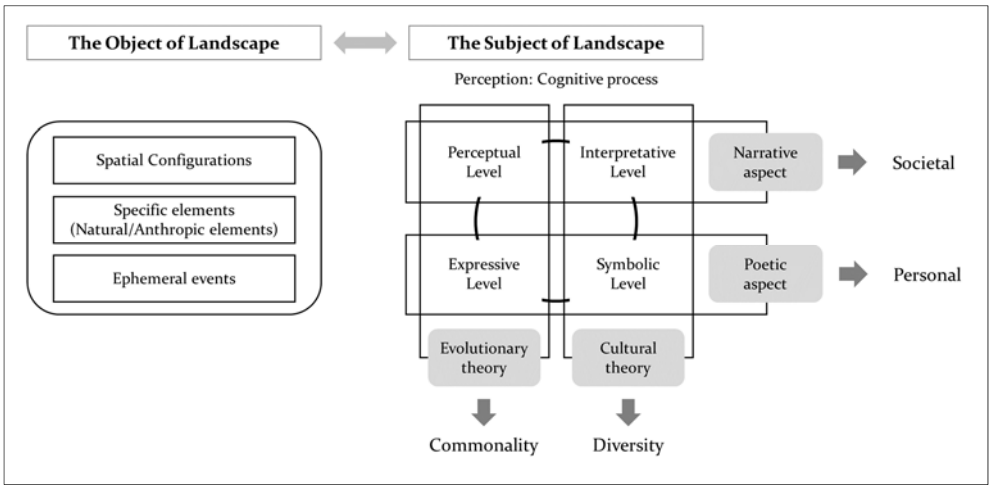


Figure 5. Typology of the object of landscape and cognitive process of landscape perception.

2.2. Photo-based landscape perception research

2.2.1. Visitor employed photography (VEP)

One of the most representative landscape perception studies using photographs is the scenic beauty estimation (SBE) method. The SBE method was developed in the mid-1970s, and grades were assigned to the landscape photographs. In order to compensate for differences in the grade scores depending on the individual characteristics, standardization was attempted to obtain more objective evaluation results can be obtained (Daniel and Boster, 1976). Another method is the semantic differential scale (S.D. scale). This method is used to measure the impression and image of people on a certain object and to grasp and measure the intrinsic meaning of the object (Osgood, 1952). In Korea, researches using these two methods is dominant. As a result of analyzing the visual landscape preference of the students in the landscape architecture school in 14

national parks using the SBE method, the degree of invasion of the mountain peaks, skyline, rocks, water, and artificial structures which is found that it was decisive for the preference (Suh, 1987). After that, most researches on natural landscape preference are based on S.D. Scale. In the study conducted for the national park trail, landscape attractiveness, the spatial scale, naturalness, and geographical features were extracted as the factors influencing the landscape preference around the trail, and among them, the landscape attractiveness has the greatest influence on the preference (Kim, 1996). Subsequent studies have shown that degree of naturalness and geographical features have a negative effect on preference if they become too high or complicated. (Kim and Hur, 2007). In the study on preference for landscape in Bukhansan National Park, the expert group (graduate students, professional workers) evaluated landscape photographs, among them, some photographs which have abundant natural elements are perceived as refreshing, and landscape preferences are related to refreshing and comfortable images. (Cho and Im, 2013).

Early research on landscape perception analyzed the psychophysical or psychological responses of the public to photographs taken by the researchers as representations of the environment (Arthur et al., 1977; Daniel and Boster, 1976). Dependence on photographs as a research material was justified because of the economic efficiency according to the cost reduction (Daniel and Meitner, 2001). However, because of the

limited range of view and the composition of the photographs can affect visual preferences, the validity of such approaches was questioned on the basis of whether photographs can replace reality (Daniel and Meitner, 2001; Dupont et al., 2014; Hull IV and Stewart, 1992; Meitner, 2004; Svobodova et al., 2014). One way to solve this problem is to study landscape perception directly on-site (Svobodova et al., 2014). This attempts to minimize distortion in representing the interaction that occurs in human experience in the natural environment (Hoyle et al., 2017; Scott et al., 2009; Stewart and Hull IV, 1992).

Visitor employed photography (VEP) is a useful way of directly grasping landscape perception that emphasizes on-site experience (Steen Jacobsen, 2007). It was first developed and used in the United States in the 1970s (Cherem and Driver, 1983). Depending on the nature of the survey participants, they use different names, such as volunteer employed photography (Cherem and Driver, 1983; Chenoweth, 1984) or resident employed photography (Stedman et al., 2004). The progress of the VEP method can be applied very flexibly depending on the situation. The method of recruiting of survey participants, the type of photographic equipment, the limitation of the number of photographed pictures, the type of content to be filled in the photo-log, and whether to conduct additional interviews may vary depending on the purpose of the study. The success of the VEP method depends on how effectively you can

capture moments of interaction with humans and nature.

The early VEP method was used to quantitatively analyze the perceptual response of physical objects, by transferring experimental esthetics in the laboratory to the actual field. This method revealed a consensus photograph (CP), in which the same objects appeared very frequently in photographs taken by participants; and a perceptually exciting node (PEN), the representative node where these photographs were taken (Cherem and Driver, 1983). Early VEP studies showed the methodological possibility of directly grasping perceptions of the landscape in the real context, and of identifying their commonality. Since the late 1990s, the trend in VEP research has shifted from the commonality of landscape perception to the diversity of human cognitive responses based on environmental psychology. The results of this study are as follows. First, it is necessary to analyze the perception of water resources that have positive effects on the visitor's experience (Taylor et al., 1995), or to identify the preferred or non-preferred factors by walking the visitors' that is reflected in management (Dorwart et al., 2010). For the natural environment other than national parks, it is analyzed the effects of different management methods on the scenic beauty and recreational value in the forest (Tahvanainen et al., 2001), set up the monitoring management index according to the preference of visitors (Kim et al., 2003), a study of emotional or cognitive responses that appear by walk

(Nielsen et al., 2012). In summary, when visitors walk through the trails and also experience the natural environment, research is focused on identifying preferences for specific elements such as water resources or their surroundings and then applying them to management. On the other hand, researches on the difference of perceptions among different groups are progressing actively through the VEP method. According to the age group, it is analyzed the difference of perceptions of water resources between adults and children (Yamashita, 2002) or explored the difference of perceptions according to nationality in historical sites (Lin et al., 2013). There is also a study that analyzed the differences in perceptions of objects, activities, and places for visitors to other recreational activities (Oku and Fukamachi, 2006). In terms of tourism, the analysis of the difference of perceptions among various stakeholders such as local residents and tourists reveals that there are a lot of researches on the place and place attachment of delayed residents (Stedman et al., 2004), a study that analyzed residents, domestic tourists (Garrod, 2008), and foreign tourist perceptions of rural landscape (Prestholdt and Nordbø, 2015). Thus, attempts have been made to grasp the characteristics of landscape perceptions among various groups such as age, nationality, residents and tourists.

Many types of research have focused on identifying the characteristics of landscape perception according to various groups such as age, or

residents versus tourists (Garrod, 2008; Lin et al., 2013; Oku and Fukamachi, 2006; Prestholdt and Nordbø, 2015; Stedman et al., 2004; Yamashita, 2002). In addition, a number of researches suggest ways to manage landscape and trails through various landscape perceptions (Dorwart et al., 2010; Nielsen et al., 2012; Tahvanainen et al., 2001). Based on recent research findings, we examine whether the degree of visitors' familiarity with the national park could be an important variable for the diverse perceptions of the site. Furthermore, we discuss the ways in which the two groups' various perceptions could be in line sustainable landscape management practice.

2.2.2. Semantic network analysis (SNA)

Semantic network analysis (SNA) was used to analyze text of the photo-logs. SNA is one of the various methods of analyzing text, which is a qualitative data made up of language. It aims at grasping its meaning through coding and categorization process such as content analysis, grounded theory (Atteveldt, 2008; Lee and Lee, 2012). The difference between SNA and existing qualitative research methods is that the relationship between coded analytical units can be visually recognized. Landscape perception is the result of the cognitive process of the

environment. Therefore, the relationship between the object of landscape, which is a part of the environment, and the landscape perception subject, in which cognitive process occurred in their mind, is very important. In addition, the cognitive process consisting of four levels is not a sequential process but a complex one. In order to analyze landscape perception, it is necessary not only to grasp the main meaning through categorization but also to grasp the relationship between the object and subject of landscape.

As in content analysis, the core of SNA is to establish an 'analysis unit', called a 'node.' In general, not all words in the text are used as nodes. Nodes should be selectively extracted to match the research topic and purpose (Paranyushkin, 2011). The methods of establishing nodes consist of a confirmatory approach based on existing theory, and an exploratory approach by empirical method (Park and Chung, 2013). The core concept for understanding the relationship between nodes is 'proximity,' which indicates how close the relationships are between the nodes. In SNA, this concept is expressed as a 'co-occurrence' of the nodes (Callon et al., 1983; Park and Chung, 2013). It is assumed that nodes within a certain range of text are semantically correlated between all nodes within that range when they occur at the same time (Callon et al., 1983). In general, co-occurrence is expressed by the frequency of co-appearance of the nodes in a single nuclear sentence. However, a researcher may limit the scope of the co-occurrence to the nature of the text and the research purpose

(Paranyushkin, 2011) (Figure 6).

To fully understand the meanings and concepts given through SNA, one should analyze the variables that have structural characteristics, including ‘betweenness centrality’, ‘degree centrality’, and 'community structure (Freeman, 1978).’ Betweenness centrality refers to the degree of influence of a certain node that interconnects two different nodes to the formation of the meaning network. Community structure refers to the subgroups created by the interrelationships with the relevant nodes (Newman, 2006). Degree centrality refers to the importance of meaning in the subgroup. If degree centrality is high in a certain node, then the node is the representative concept of the group (Paranyushkin, 2011).

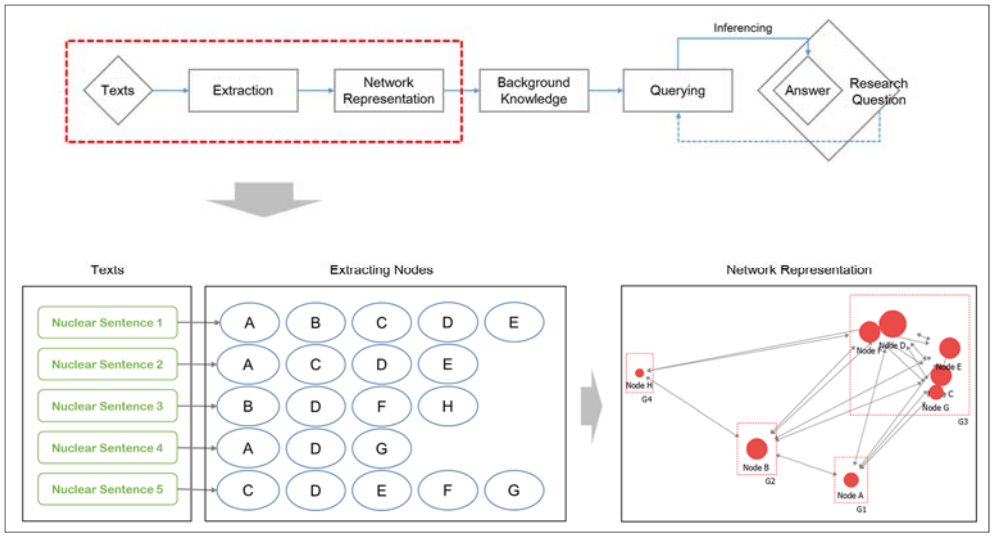


Figure 6. Semantic network analysis and the example of network visualization.

Chapter 3. Materials and methods

3.1. The study site

3.1.1. Bukhansan national park

Bukhansan National Park belongs to a Category V (Protected Landscape/Seascape) according to the classification system of the International Union for the Conservation of Nature (IUCN). It is the 15th national park designated in South Korea (5 April 1983), and covers an area of 78.5㎢, including Mt. Bukhansan and Dobongsan, and the highest

peak Baegundae (837m elevation) (Juffe-Bignoli et al., 2014). The park is adjacent to Seoul Metropolitan City, and is the most visited national park in South Korea, currently attracting approximately 10 million tourists annually (one-fifth of the total South Korean population) (Figure 7).

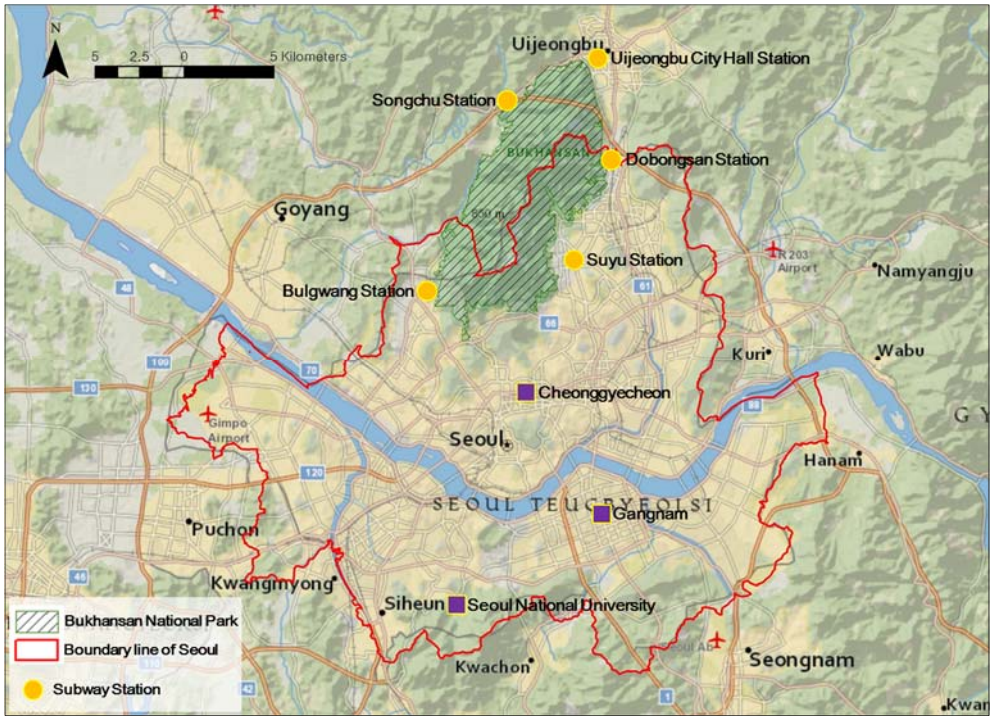


Figure 7. Location of Seoul and Bukhansan National Park.

3.1.2. Study site selection

It was selected as a place where visitors can experience various scenic resources of Mt. Bukhansan because it has a high usage density among designated trails in Bukhansan National Park and can go there on the same day as a destination. In order to select the appropriate trails for this condition, we first select some trails as a candidate group based on statistical data of usage of the trails, and then analyze the density of social media photographs coordinates (Flikr). High-density trail was finally selected.

Visitors to Bukhansan National Park were found to be more likely to use the Bukhansanseong trail, Obong trail, Hwalyong trail, Sinseondae trail, Samobawi trail and Bogugmun trail. Recreation Analysis of InVEST 3.3.0, an ecosystem service analysis program, was used to understand the general aspects of photographing landscapes when a public visited Bukhansan National Park. The analysis makes it possible to analyze the density of the photographing location using the photographs from Flickr, which is one of the social media platforms. If you set the grid type and cell size after inputting the SHP file of Bukhansan National Park boundary, you will get the right results. Taking into account the error range of the smartphone coordinates values, when a cell size of 100m and a grid type of hexagon were selected, a total of 11,254 cells were formed throughout

Bukhansan National Park, and photographs taken from 2005 to 2014 A total of 1,009 pieces were collected. The density distribution within the hexagonal cell is divided into 5 levels from 0% to 6.73%. If you look at the high density of the location, you can roughly divide into three regions. It is located in Baekundae area of Mt. Bukhansan, Samobawi and Gugigyegog area, and Jaunbong area of Mt. Dobongsan (Figure 8).

The Bukhansanseong trail course was selected as the study area, based on the following criteria:

- A site with high usage density
- A site that can be visited for one-day trips to a mountain-top destination
- A place where one can experience various scenic resources of Mt. Bukhansan

As mentioned above, one type of the object of landscape, spatial configurations, is primarily influenced by the depth or breadth of view. The location of the beholders in experiencing of landscape is very important. Therefore, we divided into four units according to the similarity of vegetation and geographical features around the trail that can affect the depth and breadth of view. The total length of the trail is 3.4㎞, along which four visually distinguishable units were identified (Figure 9, 10):

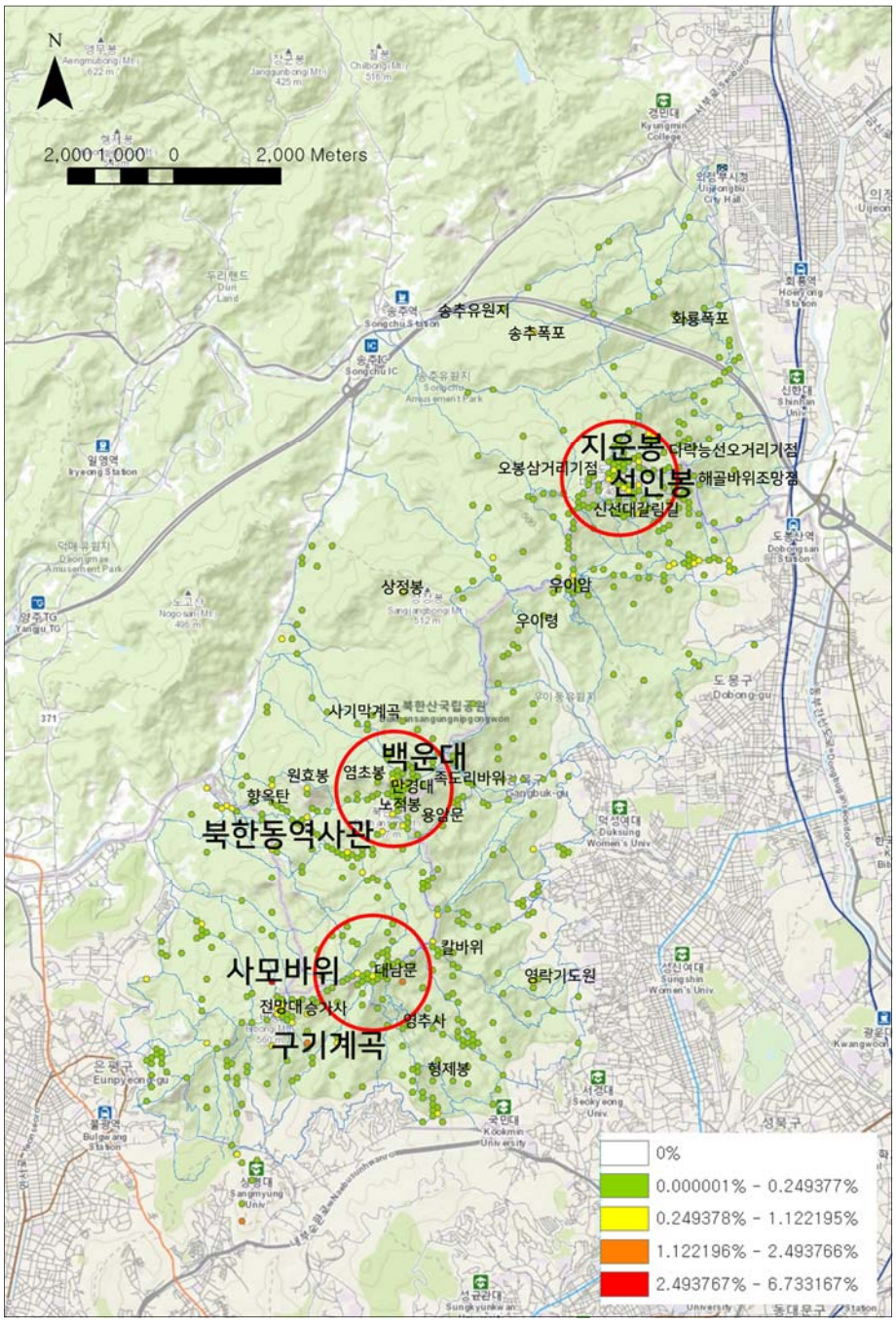


Figure 8. Density analysis of Flicker photographs.

Figure 9. The route of the Bukhansanseong trail.

- Unit A (0–800 m from the trail start): The area in which most traces of past villages remain. The facilities of old villages have been demolished, and the vegetation has been restored ecologically. Some of the existing buildings have been retained and used for other purposes.
- Unit B (800–1600 m): A stream runs adjacent to the trail, which is surrounded by pine, mixed deciduous, and coniferous forest, with oriental oak forest distributed around the trail.
- Unit C (1600–3200 m): Dominated by oriental oak forest. This section of the trail has the shortest depth of view, due to the high stand density.
- Unit D (3200–3400 m): This section is a dry and rocky ridge. The length is very short compared to the other units, but it is included as a unit in consideration of being a final destination; and due to its characteristics, with the furthest and broadest vistas.

Figure 10. The concept map of elevation, gradient, vegetation, and representative landscape photos of each unit of the trail.

3.2. The study method

3.2.1. The study method design

The fieldwork and analysis method were divided into two stages in order to understand on-site visitors' landscape perception. VEP method have the advantage of directly recognizing visitors' perceptions of the landscape, but it is highly unlikely that it will be easy to recruit participants. Therefore, the research process is divided into two stages to utilize the VEP method more efficiently. In the first stage, commonality of landscape perception is focused on, and in the second stage, diversity of the perception is identified. Accordingly, detailed method related of fieldwork and analysis are set up to achieve objectives of each stage.

First of all, the survey process was divided into two steps. In order to focus on commonality of perception, random sampling was used in the

first stage. This was done by recruiting participants in the field for actual visitors. Next, in order to concentrate on the stage objective and increase the participation of the survey, the types of the collected data were limited to the photographs containing the geographical information of the preferred landscape. In the second stage, the participants were recruited using purposive sampling in order to understand the diversity of perception according to the familiarity of the national park. The types of data collected include photographs containing geographical information on liked or disliked landscape and photo-logs describing the reasons why the photographs were taken. The aim of the additional interview is to prepare for the possibility of missing contents because it is harder than expected to written down the reason at the same time while photographing the trail.

Through the theoretical review, the conceptual framework proposed landscape perception analysis was utilized and the analysis was conducted according to the characteristics of the collected data through each step of the survey process. Geotagged photos collected in the first step can be used as information on spatial coordinates and visual images of photographs. This can be used to analyze the types of the object of landscape and responses of the perceptual level of the cognitive process. Spatial configurations can be divided into two types ‘Prospect’ and ‘Surrounding’ according to depth of view corresponding to perceptual

level. In addition, specific elements (natural and anthropic elements) can be called as a type ‘Single objects.’ The type of experience landscape can be classified into three types and further subdivided into each type. Finally, we select consensus photographs (CP) and perceptually exciting nodes (PEN) that show commonality of perception of the experience landscape types. The analysis method in the second stage attempted to grasp the diversity of landscape perception by analyzing the visual image of the photographs of the first stage and the text of photo-logs obtained through the additional interview. It can be understood the responses of the whole cognitive process (perception, expressive, interpretative, and symbolic). We analyzed the diversity of perceptions among the inexperienced group and the experienced group by grasping the responses of cognitive processes to the three objects of landscape - spatial configurations, specific elements (natural and anthropic elements) and ephemeral events. This diversity of perception can be used to deduce the reason for photography collected in the first stage.

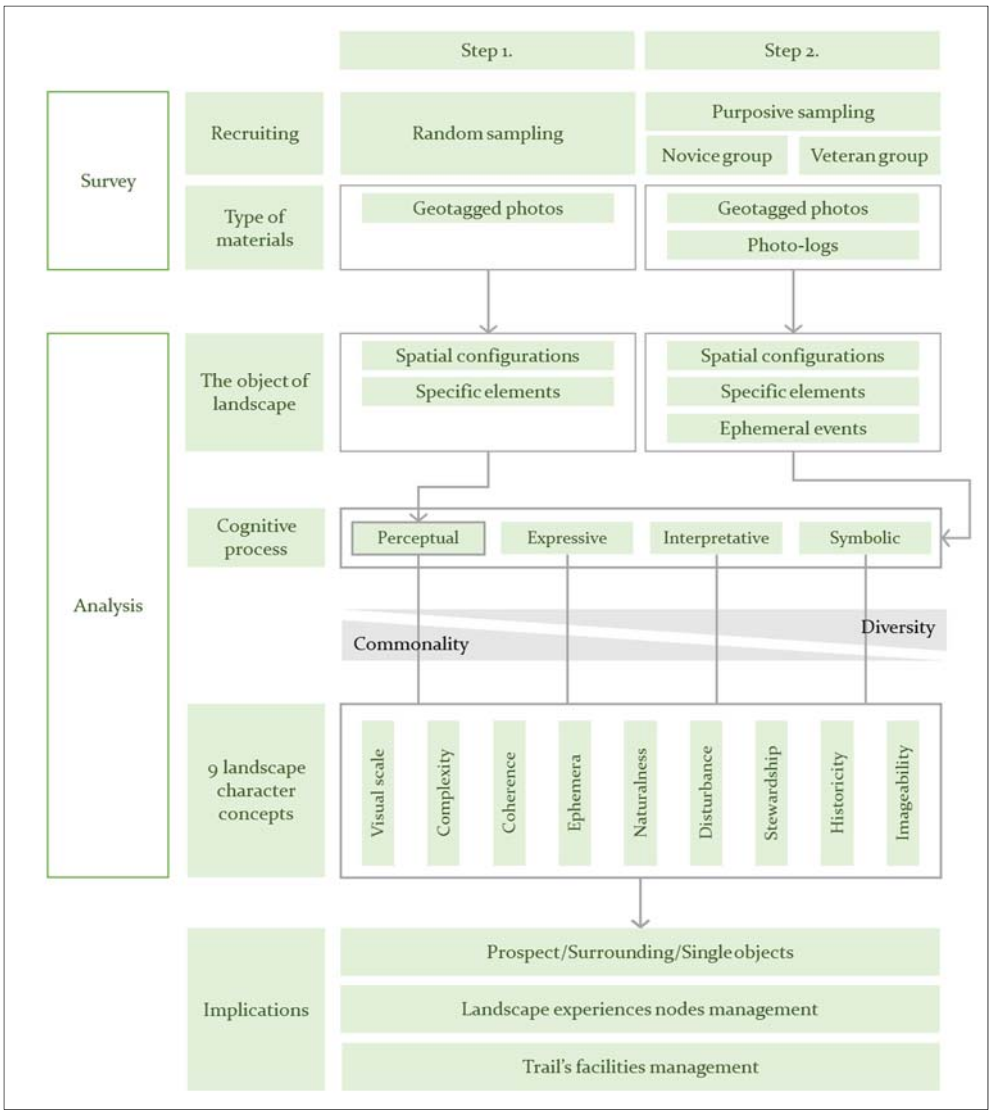


Figure 11. Two-step process of study survey and analysis.

3.2.2. The commonality of landscape perception analysis

The first stage's survey was conducted during the summer (May) and autumn (November). During the four seasons, the period of spring was short and winter was excluded due to the risk of accident. The survey was fourth on November 8 and 15, 2014, May 16 and 17, 2015, from 10:00 am to 4:00 pm. The subjects of the survey were selected only for the visitors who are willing to participate in the survey among people who visited Bukhansan National Park using the random sampling method. The method of collecting the geotagged photos was that the participant of the survey photographed the preferred landscape in the designated trail, and then researchers collected the photographs at the opposite end point. The photography device utilized their own smartphones. In order to focus on collecting photographs of participants' preferred landscape, this stage did not collect any photo-logs that was recorded the reason why they take the photographs.

Through the visual images of the photographs, the types of experience landscape are classified into 'Prospect,' 'Surrounding,' and 'Single objects.' The type classification method applied a kind of information processing process. It has been repeatedly performed the process of distinguishing the primary objects of the photographs that clearly appear without any controversy. In order to increase the reliability of the classification

method, the pictures with ambiguous type classification were held for the last time. Finally, the type was classified according to the opinions of a plurality of researchers. Generally, the error range of the coordinates of the smartphone is around 30m. Therefore, we divided the survey interval into 50m grid and selected the coordinates of the photographs in the same grid. The photographs included in the same grid were analyzed to identify the photographs that matched the types of experience landscape and the primary objects. Through the process, it has revealed consensus photographs (CP) and perceptually exciting nodes (PEN) which more than 15% of the survey participants perceived.

Figure 12. Kernel density analysis of geotagged photographs.

3.2.3. The diversity of landscape perception analysis

The second stage's survey was conducted twice, on June 19 and 26, 2016, from 10:00 am to 4:00 pm. The survey volunteers consisted of a novice group with little experience of visiting national parks, and a veteran group who had visited national parks at least once a month for 10 years. Participants recruited to the novice group (n=8) were limited to those who had made less than one or two visits to the national park. Purposive sampling (through Internet-organized groups and blog searches, individual contacts, and professional links) was used to recruit participants for the veteran group (n=8). Inclusion criteria were: members of the general public who do not have relevant expertise such as landscape or ecology, who made more than one visit per month to the national park for more than 10 years.

The on-site survey and landscape photographing were conducted from 10:00 am to 2:00 pm, followed by individual interviews from 2:00 pm to 4:00 pm. The participants were asked to photograph landscapes that they 'liked' and 'disliked' while walking along the trail, documenting some information about their photos and experiences in a photo-logs from the entrance to the top of the mountain. All the photographs and photo-logs were collected after the participants returned to the departure point. The photo-logs asked such questions as: (a) "What attributes of landscape did

you photograph?" (b) "From where did you photograph?" (c) Describe why you choose these attributes of landscape to photograph?" Additional short interviews were conducted with all participants. The purpose of conducting additional interviews is to prepare for the possibility of missing records. The interviews took place inside the building (coffee shop) near the entrance of the national park. The interview time was limited to about 20-30 minutes per person. We conducted face-to-face interviews so that the respondents could express his or her thoughts as much as possible without being interrupted by other people's comments. The interview method utilized the free-listing method. The method is similar to an open-ended question by allowing respondents to freely list what they are aware of on a topic (Bieling et al., 2014; Shim, 2011). Viewing the pictures one by one in order of the photographing time with the participants, we asked "Why did you take a photo? Please answer anything that comes to your mind." Next, the participants answered several open-ended questions about the reason for the photos, and the answer was voice recorded and later transcribed for analysis. All the participants used their own smartphones for digital photography, so that differing proficiency in dealing with the camera would not affect the survey results. Details of the photography process were entered through the photo-logs, such as the subject of a photograph, the reason for taking the image, and the preference (like/dislike). To prevent participants impeding or interfering with each other's photography, they started

walking from the departure point at 15-minute intervals.

The photographs taken by the two groups were classified spatial configurations and specific elements (content-based attributes) according to landscape physical attributes, and then by preference (liked/disliked). Finally, we conducted SNA on positive perception of spatial configurations, natural elements of specific elements, and positive and negative perception of artificial elements. A small number of nodes extracted negative perception of spatial configurations and natural elements did not carry out SNA. We set up the analysis unit (node) to perform the SNA. The size of the nodes was limited to words and phrases. The content of each picture was considered as a range of co-occurrence frequency. We used an "exploratory approach" to extract nodes: nodes that include the object of landscape, spot (the location where the photograph was taken), ephemeral events, and the level of cognitive processes (perceptual, expressive, interpretative, and symbolic) were selectively extracted (Figure 12). The SNA was analyzed using NetMiner 4.3 social network analysis software. The software which is developed by CYRAM in Korea is a tool for exploratory analysis and visualization of network data. We analyzed betweenness centrality, degree centrality, and community structure based on the co-occurrences between the nodes, the basic concept of the network.

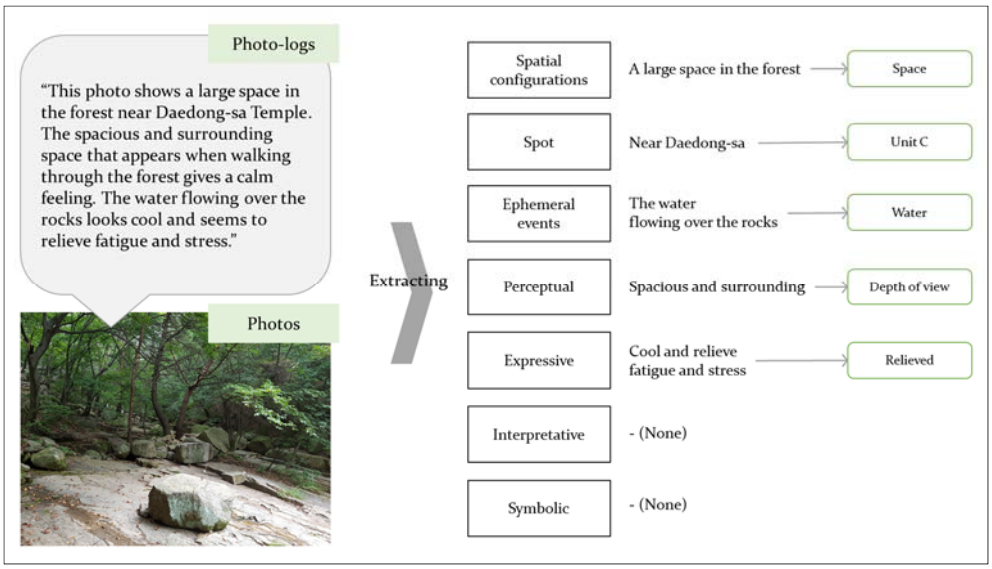


Figure 13. The example of node extraction process on semantic network analysis.

Chapter 4. Results and discussion

4.1. The commonality of landscape perception

4.1.1. Overview of demographic characteristics

According to the gender of the respondents, male (62.1%, n=36) accounted for more than half of the total. By age, the group showed the highest rate with 31.0% (n=18) in their fifties, followed by 29.3% (n=17) in their 20s. Most respondents (89.6%, n=52) resided in the metropolitan area (Table 3). The number of visits was similar to the percentage of first-

time visitors (37.9%, n=22) and regular visitors (34.5%, n=20) who visited more than 10 times. More than half of the participants (62.5%, n=25) found that the level of knowledge about flora and fauna was common. The general reasons for visit was walking and exercise (67.2%, n=39). The types of visiting companion are mostly friends (55.2%, n=32) and lovers (31.0%, n=18).

Table 3. Number of participants allocated to each of age and gender.

Gender	SUM	10s	20s	30s	40s	50s	60s	70s
Men	36	3	10	1	6	11	4	1
Women	22	0	7	4	4	7	0	0
Total	58	3	17	5	10	18	4	1

Prior to analyzing the collected landscape photographs, some photographs which cannot be analyzed were excluded first. The types of photographs excluded are self-portrait photographs (so called selfie), close-up photographs, photographs of the sky, and photographs in which the focus is unclear and cannot be read. In addition, if there were multiple photographs of the same primary objects from the same spot by one participant, only one of them was selected and the others were excluded. I have notified the participants about the method of photographing before the start of the survey, but this is the result that the participant did not follow the guidelines properly. Finally, 792 (45.5%) out of 1,742 photographs were selected for analysis. The average number of photographs per person was 30.0, and the average number of pictures per

person was 13.7 (Table 4). It can be seen that the collecting rate of photographs is higher than the existing researches by allowing the participants to photographs with their own smartphones without photo-logs describing the reason for the photography.

Table 4. Number of participants and photos.

Data characteristics	SUM	May	Nov.
Number of participants	58	24	34
Number of collected photos	1,742	697	1,045
Number of analysed photos	792	351	441
Average number of photos per person	30.0	29.0	30.7
Average number of analysed photos per person	13.7	14.6	13.0

4.1.2. The types of experiencing landscape

The visitors' preferred landscape were classified into three categories according to the types of experience landscape, and then subdivided according to the characteristics of its primary objects. As a result, 18 types were identified: each 4 types in the Prospect and Surrounding, and 10 types in the Single Objects (Table 5).

Table 5. Number of photos allocated to each of type of experience landscape.

Category	Sub-category	Primary objects	SUM	May	Nov.
	Prospect	Mountainous	41	12	29
		Peaks	133	70	63
		Ridges	45	20	25
		Cityscape	37	21	16
	Surrounding	Forest	73	35	38
		Forest/Rocks	70	0	70
		Valley	30	15	15
		Forest/Trails	33	16	17
	Single Objects (Natural)	Trees	46	18	28
		Bedrock	8	5	3
		Cliff	34	15	19
		Rocks	68	46	22
		Water	8	5	3
	Single Objects (Anthropic)	Remains	36	16	20
		Buildings	25	15	10
		Facilities	50	19	31
		Trails	30	15	15
		Visitors	26	8	18
	Total		792	350	442

The category Prospect account for 32.3% (n=256) of the whole photographs in which are subdivided into 4 types: Prospect & Mountainous (5.2%, n=41), Prospect & Peaks (16.8%, n=133), Prospect & Ridges (5.7%, n=45), and Prospect & Cityscape (4.7%, n=37) (Figure 13).

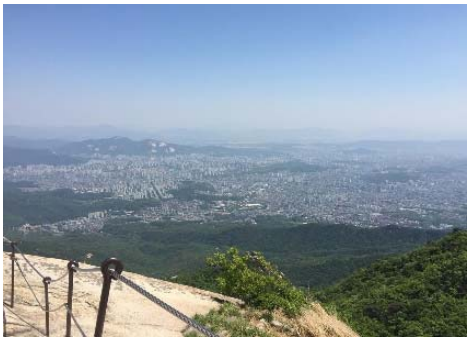
The category Surrounding account for 26.0% (n=206) of the whole

photographs in which are subdivided into 4 types: Surrounding & Forest (9.2%, n=73), Surrounding & Forest/Rocks (8.8%, n=70), Surrounding & Valley (3.8%, n=30), and Surrounding & Forest/Trails (4.7%, n=37) (Figure 14).

Prospect & Mountainous

Prospect & Peaks

Prospect & Ridges



Prospect & Cityscape

Figure 14. Each representative photographs of category Prospect.

The category Single Objects (Natural) account for 20.7% (n=164) of the whole photographs in which are subdivided into 5 types: Single Objects & Trees (5.8%, n=46), Single objects & Bedrock (1.0%, n=8), Single objects & Cliff (4.3%, n=34), Single objects & Rocks (8.6%, n=68),

Single objects & Water (1.0%, n=8) (Figure 15).

The category Single Objects (Anthropic) account for 20.9% (n=167) of the whole photographs in which are subdivided into 5 types: Single object & Remains (4.5%, n=36), Single Objects & Buildings (3.2%, n=25), Single Objects & Facilities (6.3%, n=50), Single Objects & Trails (3.8%, n=30), and Single Objects & Visitors (3.3%, n=26) (Figure 15).

Surrounding & Forest

Surrounding & Forest/Rocks

Surrounding & Valley

Surrounding & Forest/Trails

Figure 15. Each representative photographs of category Surrounding.

				
Trees	Bedrock	Cliff	Rocks	Water
Single Object (Natural)				
				
Remains	Buildings	Facilities	Trails	Visitors
Single Object (Anthropic)				

Figure 16. Each representative photographs of category Single Objects.

The type that account for the highest percentage is the Prospect & Peaks (16.8%, n=133). Because the most prominent characteristic of Bukhansan National Park is its unique peaks, joints and rocks created by thousands of years of weathering: Baegundae Peak (836m) that is an ivory-colored granite peak, Insubong Peak (804m) and Mangyeongdae Peak (800m). The types that accounted for the following highest percentage are Surrounding & Forest (9.2%, n=73) and Surrounding & Forest/Rocks (8.8%, n=70). The characteristics of the former type vary from season to season. In May, The green forest becomes lush, while in November, the forest is colored with the leaves and a unique shape of the tree appears. The latter type can be seen only in November, and red

colored leaves and gray rocks are mixed. The type Single Objects & Rocks (8.6%, n=68) belonging to the category Single Objects (Natural) accounts for the highest percentage in that category. It is a result that reflects the topography and geological characteristics of Mt. Bukhansan made of granite. Representative examples include Olibawi (duck-shaped rock), Eolgulbawi (a rock that resembles the profile of a person's face), Baegunbongammunbawi. It is also necessary to pay attention to the type Single Objects & Visitors (3.3%, n=26) in which various activities of the visitor appear. The images are that either people are walking in a row, or resting on wide rocks or in the forest. This type shows that presence of other visitors to the national park are perceived as one of landscape elements.

4.1.3. CPs and PENs

According to the criteria mentioned above, the consensus photographs (CP) and the perceptually exciting nodes (PEN) are revealed. The total number of analyzed images is 792, the average number of analyzed images per person is 13.7, and the number of CP is 11. The number of CP accounted for 32.0% (n=254).

11 CPs appeared in 7 out of 18 types of experience landscape: 4 CPs in the type Prospect & Peaks, 2 CPs in the type Prospect & Mountainous, and 1 CP in the each type Prospect & Cityscape, Single Objects (Natural) & Rocks, Prospect & Ridges, Single Objects & Visitors, and Single Objects & Remains. (Table 6).

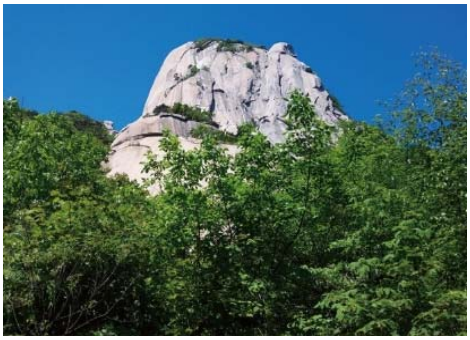
Table 6. Consensus photographs (CP) in the trail.

Code	Frequency	%	Type	Description
PN03A	34	58.6		Mangyeongdae Peak from the top of the mountain
PN03B	30	51.7		Insubong Peak from designated view point in the trail
PN03C	25	43.1		Insubong Peak from the top of the mountain
PM01A	24	41.4	Prospect & Cityscape	The panoramic view of cityscape from the top of the mountain
ON03A	24	41.4	Single Objects & Rocks	The rock from the Baegundae
PN01A	17	29.3	Prospect & Ridges	The ridges of Mt. Bukhansan from the Baegundae
PN03D	15	25.9	Prospect & Peaks	The Baegundae Peak from the near top of the mountain
KOM01A	15	25.9	Single Objects & Visitors	The visitors in a row to the peak from the near top of the mountain
OM04A	14	24.1	Single Objects & Remains	Baegundae's small gate from the near top of the mountain
PN02A	12	20.7		Wonhyobong Peak from the entrance of the trail
PN02B	12	20.7		Nojeokbong with 3 peaks from designated view point in the trail

The CP with the highest frequency was PN03A: Mangyeongdae Peak from the top of the mountain (Baegundae) which is photographed by 34

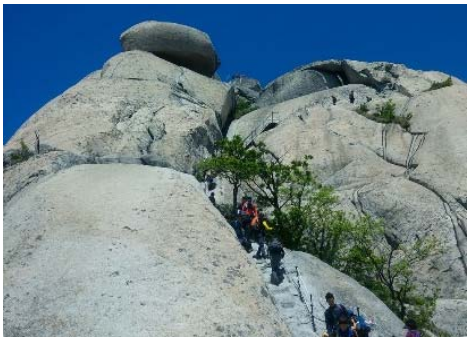
(58.6%) of 58. The next highest frequency of CP was PN03B: Insubong Peak from the near Bukhansan Mountain Rescue Police Building which is taken by 30 (51.7%). The Insubong Peak from the summit, where 25 (43.1%) took photographs, were selected as another CP (PN03C). The peaks such Mangyeongdae, Insubong, and Baegundae, showing the geological and topographical characteristics of the granite are the most preferred. Baegundae is the main PEN and the primary subject of CP (PN01A) (Figure 17).

PN03A



PN03B

PN03C



PN01A

Figure 17. The CPs in the type Prospect & Peaks.

The CPs, Cityscape from the summit to the North (PM01A) (41.4%, n=24) and Ridges from Baegundae (PN01A) (29.3%, n=17), are seen at the angle of depression like bird's-eye view. On the other hand, Wonhyobong Peak from the entrance of the trail (PN02A) (20.7%, n=12) and Nojeogbong Peak from the designated view point in the trail (PN02B) (20.7%, n=12) are seen at the angle of elevation (Figure 18).

PM01A

PN01A

PN02A

PN02B

Figure 18. The CPs in the type Prospect & Cityscape, Ridges, and Mountainous.

ON03A (41.4%, n=24) appeared in the type Single Objects & Rocks was Baegunbongammunbawi from the Baegundae. KOM01A appeared in

the type Single Objects & Visitors was people walking in a row in the trail from the near top of the mountain which is taken by 15 (25.9%). OM04A (24.1%, n=14) appeared in the type Single Objects & Remains was Baegunbongammun, small gate of fortress which is called Bukhansanseong, from the close range.

		
ON03A	KOM01A	OM04A

Figure 19. The CPs in the type Single Objects & Rocks, Visitors, and Remains.

8 out of 11 PENs are distributed at the top of the mountain (Baegundae). The other 3 PENs are also located at nodes where the range of view is wide-open and can be seen far away (Figure 20).

In the category Prospect, participants in the survey preferred landscape with distinctive forms such as mountain peaks and ridges. And texture was also the main factor of preference of landscape. Canopied landscape is preferred in the category Surrounding. In the category Single Objects, preference is given to landscape that is perceptually easy to react, such as unique rocks and remains.

Both CPs and PENs did not appear in the category Surrounding. This does not mean that there is no photograph in this category, or that this category should be excluded when considering the characteristics of the landscape that people prefers. The survey and analysis method of the first stage is effective to identify the most preferred landscape and some spots where the landscape is perceived, but it limits the detailed understanding of visitors' perception of the other types of landscape that can be experienced in the trail.

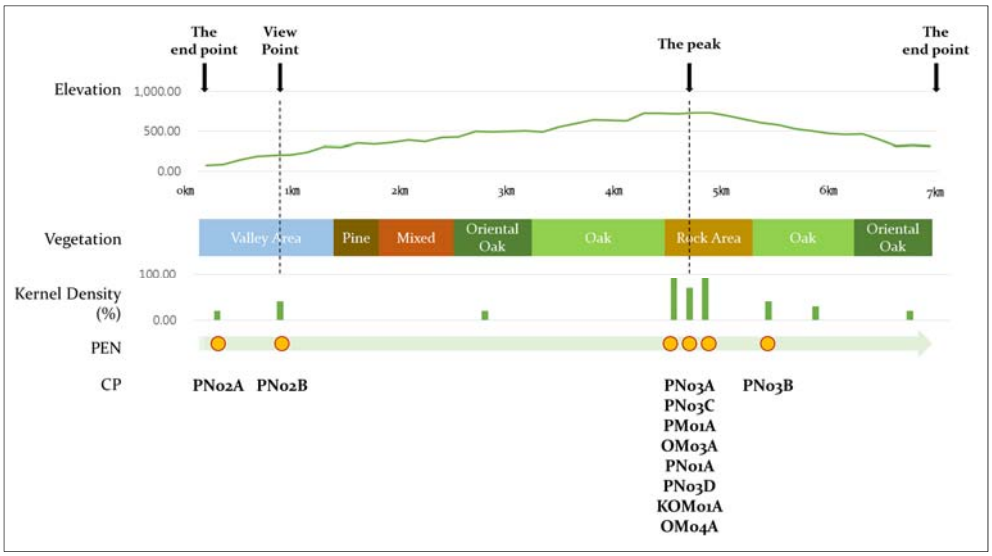


Figure 20. Distribution of CPs and PENs in the trail.

4.2. The diversity of landscape perception

4.2.1. Overview of individual landscape perception

The total number of photographs was higher in the veteran group (n = 111) than in the novice group (n=86). In terms of the frequency of the object of landscape photographed, spatial configurations were most common in the novice group (36.0%), versus anthropic elements in the veteran group (44.1%) (Table 7).

The veteran group included a professional mountaineer, a teacher, self-employed persons, and office workers, most of whom are aged in their fifties. Two participants (KV01 and KV04) first visited the mountain before the 1990s, three (KV03, KV05, KV06) in the 1990s, and another three (KV02, KV07, and KV08) in the 2000s. As mentioned previously, all members of the group veteran group were regular visitors to the

mountain for more than ten years: four participants (KV01, KV03, KV04, and KV05) at least two or three times a month, and the other four (KV02, KV06, KV07, and KV08) at least once a month. The former four were more familiar with the mountain (KV01 professional mountaineer; KV03 local resident; and KV04 and KV05 participating as Civilian Conservation Corps) (Table 8).

Table 7. Number of photos allocated to each of the two groups and to the individual categories distinguishing between spatial configurations and specific elements.

ID	Preference	Photos	Spatial Conf.	Specific elements		
				Natural elements	Anthropic elements	Subtle details
Novice	Liked	57	29	18	7	3
	Disliked	29	2	3	19	5
	SUM	86	31	21	26	8
Veteran	Liked	74	29	24	19	3
	Disliked	37	1	3	30	2
	SUM	111	30	27	49	5
Total		197	61	48	75	13

The number of nodes allocated to each of the level of cognitive process can be used to understand the tendency for perceptual differences. In the novice group, the number of nodes was high in the perceptual and expressive levels, whereas the veteran group showed a high number of nodes in the interpretative and symbolic levels (Table 9).

Among the veteran group, those who lived near the national park or

were active in the citizen protection group showed a high number of nodes in the interpretative level. However, the number of symptomatic nodes was not significantly different between the novice group and participants who was low frequency of visits (KV06, KV07, and KV08) in the veteran group (Table 9).

Table 8. Demographic features of participants between two groups.

ID	Gender	Age	Occupation	Experience	Frequency (per month)	Notes
KN01	Female	20	Student	First	None	
KN02	Female	20	Student	First	None	
KN03	Male	20	Student	First	None	
KN04	Female	20	Student	First	None	
KN05	Male	20	Student	First	None	
KN06	Male	30	Student	First	None	
KN07	Female	20	Student	First	None	
KN08	Female	20	Student	First	None	
KV01	Male	50	Mountaineer	From 80s	More than 2-3	Pro rock climber
KV02	Female	50	Inoccupation	From 2000s	More than 1	
KV03	Male	50	Teacher	From 90s	More than 2-3	A local resident
KV04	Male	60	Self-employed	From 70s	More than 2-3	
KV05	Male	50	Self-employed	From 90s	More than 2-3	
KV06	Male	50	Office worker	From 90s	More than 1	
KV07	Male	50	Office worker	From 2000s	More than 1	
KV08	Male	50	Office worker	From 2000s	More than 1	

Table 9. Number of nodes allocated to each of the participants and to the individual categories distinguishing the object of landscape (Spatial configurations, Specific elements and Ephemeral events) and cognitive process.

ID	Total	Spatial Conf./ Specific elements	Spot	Ephemeral events	Cognitive process			
					P [1]	E [2]	I [3]	S [4]
KN01	67	14	11	7	16	11	8	
KN02	70	16	10	6	19	11	4	4
KN03	53	12	10	4	13	9	4	1
KN04	62	14	10	7	11	10	10	
KN05	55	13	10	3	11	6	11	1
KN06	73	17	11	5	13	7	18	2
KN07	64	19	11	6	16	6	6	0
KN08	52	13	10	3	10	9	7	
SUM	496	118	83	41	109	69	68	8
KV01	62	19	13	1	8	4	12	5
KV02	71	20	14	5	7	2	22	1
KV03	82	17	14	2	4	4	38	3
KV04	67	14	12	1	4	4	27	5
KV05	68	17	13	2	10	3	22	1
KV06	68	19	15	0	8	3	12	11
KV07	59	11	11	5	12	4	14	2
KV08	84	22	18	2	12	13	16	1
SUM	561	139	110	18	65	37	163	29
Total	1,057	257	193	59	174	106	231	37

[1] Perceptual; [2] Expressive; [3] Interpretative; [4] Symbolic.

4.2.2. Differences in perception of spatial configurations

Regarding the spatial configurations of the object of landscape, the novice group took 31 photos and the veteran group took 30 photos, with 29 pictures liked in each group. The number of nodes extracted from the photo-logs was relatively high in the novice group (n = 174). In detail, the number of nodes corresponding to the perceptual level (n = 46) of the cognitive process was high, whereas the veteran group showed a high number of nodes in the symbolic stage (n = 17).

Analysis of the community structure showed that the two groups included four clusters. The perceptions considered most important for the spatial configurations of landscape can be identified through the following clusters: Terrain (n = 92) and Forest (n = 46) in the novice group (Table 10); Terrain (n = 55) and Peaks (n = 50) in the veteran group (Table 11). Cluster Terrain of the novice group refers to mountain, mountain peaks, valleys, etc. at a relatively long distance. At the perceptual level, 34 nodes were extracted that related to the depth and breadth of view (far-sighted, wide-spread, wide-open). Cluster Forest represents the atmosphere of three-dimensional space surrounded by trees. At the expressive level, 11 nodes were extracted that related to stress relief (Table 12).

Table 10. Number of nodes of liked spatial configurations allocated to each of the landscape attributes and to the individual clusters of the novice group.

	SUM	Terrain	Insubong Peak	Forest	Mangyeongdae Peak
Spatial Conf.	43	25	4	12	2
Spot	29	11	8	2	2
Ephemeral	17	10	3	4	
P [1]	46	34	5	5	2
E [2]	28	9	8	11	
I [3]	8	3		5	
S [4]	3		2	1	
Total	174	92	30	46	6

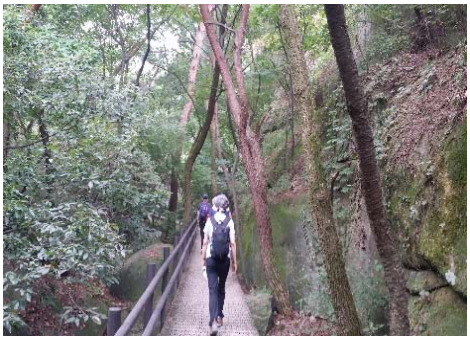
Table 11. Number of nodes of liked spatial configurations allocated to each of the landscape attributes and to the individual clusters of the veteran group.

	SUM	Terrain	Peaks	Forest	Bedrock space
Spatial Conf.	35	15	14	4	2
Spot	29	14	9	4	2
Ephemeral	6		1	2	3
P [1]	18	8	8	2	
E [2]	21	11	3	5	2
I [3]	10	4	2	2	2
S [4]	17	3	13	1	
Total	136	55	50	20	11

Table 12. Contents of nodes and its frequency of liked spatial configurations allocated to each of the main clusters in the novice group.

Cluster	Spatial conf./ Ephemral	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Terrain	Ridges (6), Mountainous (5), Valley (4)	Unit A (9), Unit C (2)	Far-sighted (5), Coherent (4), Wide-spread (5)	Mystery (4), Expectation (3), Refreshing (1),	Being in the wild nature (1)	
Forest	In the forest (6), Deck road (2), Bedrock area (2)	Unit B (6), Unit C (2)	Be overgrown (3), Wide (1) Can be seen from close (1)	Cozy (4), Feel better (3), Relieved (2)	Convenient (2) Topographic feature (3)	Going in to unknown space (1)

(a)



(b)

Figure 21. (a) A representative photo of cluster Terrain, (b) A representative photo of cluster Forest.

Cluster Terrain of the veteran group concerns the mountain peak and the mountain range viewed from the top of the mountain. The respondents saw the layered mountain range as natural regardless of its close proximity to the city. Cluster Peaks concerns the recollection of past

memories of ascending the mountain trail while looking at the mountain peak. The respondents regarded the mountain peak as a symbolic element that represented the sense of the place (Table 13).

Table 13. Contents of nodes and its frequency of liked spatial configurations allocated to each of the main clusters in the veteran group.

Cluster	Spatial conf./ Ephemral	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Terrain	Mountainous (5), Baegun-dae Peak (5) Valley (4)	Unit D (9), Unit A (3), Unit B (2)	Unique (5), Coherent (1), Being adjacent to the city (1),	Curious (2), Grandness (4), Expectation (1),	Being in the wild nature (3), Typical Images of national park (1)	Praying at the top (1), Snowy scene (1), Drawing a painting (1)
Peaks	Insu-bong Peak (4), Ridges (2), Sangjang Ridge (1)	Unit D (7), Unit A (1), Unit C (1)	Visible at a glance (1), Wide-spread (2), Smooth (2)	Refreshing (2), Thrilled (1)	Representative resources (2)	Memory of the past (6), Rock climbing (4), Wanting to climb again (3)

(a)

(b)

Figure 22. (a) A representative photo of cluster Terrain, (b) A representative photo of cluster Peaks.

Both groups were strongly influenced by the depth and breadth of view, and showed a commonality that positively responded to major mountain peaks. On the other hand, there was a difference in the perceptive process of the mountain peaks. The veteran group showed that their perception extended beyond the perceptual level of the morphological characteristics of the mountain peaks, to the symbolic level through its memory of the past.

4.2.3. Differences in perception of specific elements

The specific elements of landscape are largely divided into natural elements, anthropic elements, and subtle details. The number of associated photographs is 136 (48 natural elements, 75 anthropic elements, 13 subtle details). The number of 'liked' photos of natural elements was 18 in the novice group and 24 in the veteran group. The number of nodes in the photo-logs for each group was similar for the novice (n = 105) and veteran (n = 115) groups. In the novice group, the number of nodes was higher in the expression level (n = 20), and in the interpretative level (n = 20) among the veteran group. Six clusters were identified in the novice group, and four in the veteran group. The most important perceptions of 'liked' natural landscape elements were Water (n = 47) and Bedrock (n =

31) in the novice group, and Water (n = 52) and Wildflower (n = 28) in the veteran group (Table 14, 15).

Table 14. Number of nodes of liked natural elements allocated to each of the landscape attributes and to the individual clusters of the novice group.

	SUM	Water	Rock/ Tree	Bed -rock	Wild -flower	Pine tree	Vegetation
Specific elements	23	10	8	1	2	1	1
Spot	18	7	7	1	1	1	1
Ephemeral	12	6	3		2	1	
P [1]	20	11	3	3		2	1
E [2]	20	12	2	2	3	1	
I [3]	12	1	8				3
S [4]							
Total	105	47	31	7	8	6	6

Table 15. Number of nodes of liked natural elements allocated to each of the landscape attributes and to the individual clusters of the veteran group.

	SUM	Water	Wildflower	Rocks	Vegetation
Spatial Conf.	34	15	12	4	3
Spot	24	11	5	5	3
Ephemeral	4	2	2		
P [1]	16	11	1	4	
E [2]	10	8		1	1
I [3]	20	5	7		8
S [4]	7		1	5	1
Total	115	52	28	19	16

Cluster Water in the novice group and cluster Water in the veteran group are related to the water resource in the valley. Participants prefer flowing water and clean water quality. Therefore, dynamics and clarity, corresponding to the perceptual level, are seen to affect participants' preferences (Table 16, 17). Cluster Rock/Tree in the novice group concerns specific elements such as rocks and trees. It is interpreted as a high valuation for naturalness that is preserved without being damaged as much as possible. Cluster Wildflower in the veteran group contains information on the management of wildflowers and of vegetation around the trail (Table 16, 17).

Both groups' perceptions of natural elements indicate strong preferences for naturalness in relation to water. As suggested by Taylor et al. (1995), the study result also indicates that water resources are one of the most strongly preferred natural elements. The difference is that the veteran group perceives that naturalness is high in the areas of restored vegetation as well as the wild flowers. Specifically, participants who remembered the area before and after its development mentioned the necessity of restoring them to the state of wild nature before development.

Table 16. Contents of nodes and its frequency of liked natural elements allocated to each of the main clusters in the novice group.

Cluster	Specific elements/ Ephemral	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Water	The water in the valley (7), Fish (2), Waterfall (1)	Unit B (4), Unit A (3)	Flowing through the rocks (4), Huge (3), Clean (2)	Refreshing (7), Active (2), Letting me be rest (1)	Seem to be designed (1)	
Rock/ Tree	Rock in the valley (3), Moss (1), Rock on the trail (1)	Unit B (5), Unit D (1), Unit C (1)	Transparent (1), Coherent (1), Blocked the way (1)	Mystery (2)	Natural (4), Taking discomfort (2), not artificial (1)	

(a)

(b)

Figure 23. (a) A representative photo of cluster Water, (b) A representative photo of cluster Rock/Tree.

Table 17. Contents of nodes and its frequency of liked natural elements allocated to each of the main clusters in the veteran group.

Cluster	Specific elements/ Ephemral	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Water	The water in the valley (8), Deck roads (3), Fish (1)	Unit B (7), Unit A (2), Unit C (2)	Clean (3), Flowing through the rocks (4), Can be seen from close (3)	Refreshing (4), Active (2), Not boring (1)	Being well preserved (2), Convienient (3)	
Wild-flower	Wildflower (5), Hemerocallis fulva (2), Lilium lancifolium (1)	Unit C (3), Unit A (1), Unit B (1)	Standing out (1)		Similar (1), Being confusing (1), The vitality of nature (2)	A barren hill (1)

	
(a)	(b)

Figure 24. (a) A representative photo of cluster Water, (b) A representative photo of cluster Wildflower.

The number of photographed anthropic elements was almost twice as high in the veteran group (n = 49) as in the novice group (n = 26). The novice group preferred seven photographs compared with 19 in the veteran group. As with the number of pictures, the number of nodes and the veteran group (n = 96) were higher. In the total number of nodes in the veteran group, 36 nodes related to stewardship in the interpretative level.

The cluster was divided into five in the novice groups and eight in the veteran group. The most important perceptions of 'liked' anthropic landscape elements are Deck roads (n = 10), Rock climbers (n = 9), and Temple (n = 8) in the novice group (Table 18), and Guide signs (n = 32) and Visitors (n = 22) in the veteran group (Table 19).

Table 18. Number of nodes of liked anthropic elements allocated to each of the landscape attributes and to the individual clusters of the novice group.

	SUM	Temple	Deck roads	Rock climber	Guide signs	Stone stairs
Specific elements	9	2	3	1	1	2
Spot	7	1	2	2	1	1
Ephemeral	3	1		2		
P [1]	6	2	3	1		
E [2]	6	1		2		
I [3]	7	1	2		2	2
S [4]	1			1		
Total	36	8	10	9	4	5

Table 19. Number of nodes of liked anthropic elements allocated to each of the landscape attributes and to the individual clusters of the veteran group.

	SUM	Guide signs	Re-mains	Facil-ities	Visi-tors	Plant name tag	Trails	Tem-ple	Foreig-ner
Specific elements	16	6	3	2	2	1	1	1	
Spot	19	4	3	2	4	3	1	1	1
Ephemeral	7		1		5				1
P [1]	10		1	5	4				
E [2]	4		1		2				1
I [3]	36	21	1	1	5	3	2	3	
S [4]	4	1	2						1
Total	96	32	12	10	22	7	4	5	4

Cluster Rock climbers and Visitors concern other people that participants might meet or see in the national park. The content of Rock climbers represents positive responses at the expressive level concerning resting or climbing, such as serenity or novelty (Table 20). Cluster Visitors refers to visitors who are resting naturally, criticizing the presence of a large-scale shelter, and mentioning ways to remain longer in the forest through a small-scale shelter that does not (in the participants' perception) damage the environment around the trail (Table 21).

Cluster Guide signs contains a positive note on the guide signage that provides a variety of information in the national park. Respondents perceive that the quality of the signboards and the types of information

provided, such as history, animals, and plants, are being managed well (Table 21).

Table 20. Contents of nodes and its frequency of liked anthropic elements allocated to each of the main clusters in the novice group.

Cluster	Specific elements/ Ephemral	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Deck roads	Steep slope (1), Deck roads (1), A small hidden gate (1)	Unit C (1)	Can be seen from close (1), Spiral shape (1), Unique (1)		A part of the Wall (1), Historical remains (1)	
Rock climbers	Insu-bong Peak (1), Rock climber (1), Visitors (1)	Unit D (2)	Taking a rest (1)	Curious (1), Thrilled (1)		As a picture (1)
Temple	Temple (1), Lotus lantern (1)	Unit B (1)	Coherent (1)	Safe (1)	Representative resources (1)	



(a)	(b)	(c)

Figure 25. (a) A representative photo of cluster Deck roads, (b) A representative photo of cluster Rock climbers, (C) A representative photo of cluster Temple.

Table 21. Contents of nodes and its frequency of liked anthropic elements allocated to each of the main clusters in the veteran group.

Cluster	Specific elements/ Ephemral	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Guide signs	Guide signs (6)	Unit A (4)			Providing information (5), Useful (4), Explanation of the gate (3)	Preparing (1)
Visitors	Visitors (5) In the forest (1), A spacious rock (1)	Unit D (2), Unit B (1), Unit C (1)	Taking a rest (4)	Serene (2)	Being used as a shelthers (2), No need shelter (1), Small shelters (1)	

(a)

(b)

Figure 26. (a) A representative photo of cluster Guide signs, (b) A representative photo of cluster Visitors.

The number of disliked photos that contain anthropic elements was also higher in the veteran group (n = 30) than in the novice group (n = 19). Node extraction shows that disliked photos were associated with many more nodes than the 'liked' photos among the veteran (n = 174) and novice (n = 111) groups. Six clusters were identified in the novice group, and five in the veteran group. Facilities (n = 29) and Bridges (n = 27) in the novice group, and Remains (n = 58), Facilities (n = 44), and Shelters (n=41) in the veteran group are the most important clusters for negative perceptions of anthropic elements (Table 22, 23).

Table 22. Number of nodes of disliked anthropic elements allocated to each of the landscape attributes and to the individual clusters of the novice group.

	SUM	Buildings	Bridges	Facilities	Deck roads	Fences	Remains
Specific elements	29	5	3	12	7	1	1
Spot	19	5	3	4	5	1	1
Ephemeral	7	4	2	1			
P [1]	17	6	7	3	1		
E [2]	13	1	2	4	4	1	1
I [3]	26		10	5	3	4	4
S [4]							
Total	111	21	27	29	20	7	7

Table 23. Number of nodes of disliked anthropic elements allocated to each of the landscape attributes and to the individual clusters of the veteran group.

	SUM	Remains	Shelters	Facilities	Vending machines	Stone stairs
Specific elements	39	3	10	12	2	6
Spot	30	10	6	8	2	4
Ephemeral	1		1			
P [1]	12		9	2	1	
E [2]	6		1	4		1
I [3]	84	39	14	16	3	12
S [4]	2			2		
Total	174	58	41	44	8	23

Cluster Facilities of the novice group concerns the wires and electric poles that can be seen in the forest, and anthropic structures whose functions are unknown. The structures with unknown uses are evidence of poor management, and suggest that they should be dismantled. Cluster Bridges concerns materials such as concrete or marble, which are inappropriate for the natural environment (Table 24).

Cluster Remains concerns the history of the national park. In addition to walls built during the Joseon Dynasty 500 years ago, it includes opinions on various historical layers, including traces of villages constructed up to the 20th century. Cluster Facilities of the veteran group concerns negative perceptions of facilities installed to improve walkability and accessibility. Cluster Shelters refers to improvements in

the scale, facilities to be installed, and surrounding conditions in relation to the shelter constructed on the trail (Table 25).

Table 24. Contents of nodes and its frequency of disliked anthropic elements allocated to each of the main clusters in the novice group.

Cluster	Specific elements/ Ephemral	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Facilities	In the forest (6) Wires and electric poles (3), Structures (2)	Unit B (3), Unit A (1)	Be overgrown (1), Get tangled (1), Blocked the view (1)	Ugly (2), Expectation (1), Scared (1),	Not knowing the purpose (2), Seem to be neglected (1), Need to be removed (1)	
Bridges	Bridge (2), Temple (1)	Unit C (2), Unit B (1)	Incoherent (7)	Repulsed (2)	Artificial (3), Made of concrete (2), Made of marble (2)	

(a)

(b)

Figure 27. (a) A representative photo of cluster Facilities, (b) A representative photo of cluster Bridges.

Table 25. Contents of nodes and its frequency of disliked anthropic elements allocated to each of the main clusters in the veteran group.

Cluster	Specific elements	Spot	Cognitive process			
			P [1]	E [2]	I [3]	S [4]
Remains	Information center (2), Guide signs (2), Fortress (3)	Unit A (6), Unit C (4)			Seem to be neglected (6), Restore (4), Need to be removed (3)	
Facilities	Guardrail (3), In the forest (2), Wires and electric poles (2)	Unit C (5), Unit D (2), Unit A (1)	Collapsed (1), Get tangled (1)	Dangerous (3), Unpleasant (1)	Damaging (5), Made of steel (3), Convenience (2)	Putting a distance (2)
Shelters	Shelters (4), Bridge (3), Boundary stones (1)	Unit C (4), Unit A (1), Unit B (1)	Incoherent (5), Standing out (3), Enclosed (1)	Stuffy (1)	Under-utilization (3), The material of facilities (3), Artificial (2)	



(a)	(b)	(c)

Figure 28. (a) A representative photo of cluster Remains, (b) A representative photo of cluster Facilities, (C) A representative photo of cluster Shelters.

The novice group positively perceived the artificial elements that enhance convenience. On the other hand, the veteran group prefers the

appearance of visitors who are resting naturally, as well as providing more information about national parks, such as guide signs that provide diverse information. The number of nodes related disliked anthropic elements occupies the largest number of nodes in the level of interpretative. In particular, the number of nodes is much higher in the veteran group. The novice group focuses on the complexity one of the visual landscape characters in the natural environment, while the veteran group mentions opinions or thoughts about conflicting values such as historicity, naturalness, and affordance.

4.2.4. Utilization of perception in landscape management

The differences in the perceptions of two groups were remarkable in the interpretative level during the cognitive process. The contents of major nodes appearing in the interpretative level are related to the human impacts such as naturalness, stewardship, disturbance of landscape character concepts. This level emphasizes narrative functions of landscape, and the contents of accepting and interpreting landscape phenomena may vary depending on an individual's interest and background. It is therefore necessary to acknowledge that the underlying values and assigned values are different and to understand the role of the

two values (Ives and Kendal, 2014). In practice, the decision-making process for management of protected areas such as national parks should include not only ecological data but also human, social and economic data (Knight et al., 2011).

The photo-logs showed more nodes related to the interpretative level among the veteran group than the novice group, especially for anthropic elements. The veteran group showed a strong tendency to interpret landscape from a relatively critical perspective. This result is similar to the findings of local residents perceiving rural landscapes (Prestholdt and Nordbø, 2015), which contain critical but constructive opinions. The greater the participants' experience of the national park, the closer were their perceptions to those of the local residents who have the higher affinity to the rural landscapes.

According to 'cues to care' or 'the theory of visible stewardship,' humans generally have a higher preference when there are signs that the given environment is visibly and carefully managed (Nassauer, 2011; Sheppard, 2001). On the one hand, it is argued that when considering the installation of artificial elements, efforts should be made to minimize the visual impact and maximize the use of natural materials (Nielsen et al., 2012). However, the cue of care cannot be stereotyped because it can vary in cultural context (Nassauer, 2011). This approach to formal

management can easily achieve consensus if the quality of the landscape is extremely good or bad (Wang et al., 2016). As shown in this study, both groups expressed negative perceptions of the bridges constructed of marble. However, in the case of anthropic elements, there were few cases in which visible problems were clearly noticed. Rather, they were difficult to find without paying close attention. Also, preference for anthropic elements may vary depending on the importance of values. The cue of care has a halo effect that allows people to take responsibility for providing care (Nassauer, 2011). And if such a halo effect becomes a cultural norm, its power can become even bigger (Nassauer et al., 2009).

In the case of the novice group, they had positive perceptions of anthropic facilities that enhanced walkability and accessibility (Ode et al., 2008). In contrast, the veteran group considered nature foremost, and had negative opinions of artificial facilities that damaged their perception of naturalness. For example, they did not prefer large shelters, and were opposed to what they regarded as excessive measures to promote accessibility, which they considered as undermining the natural environment.

There was no significant difference between the two groups regarding the interpretative level of the natural elements. The participants mostly focused on the structures and diversity of vegetation, and on individual

plants or animals (Qiu et al., 2013). Consequently, the novice group did not mention the vegetation and its structure, and positively recognized individual natural elements such as water, trees, and rocks. The veteran groups made greater references to wildflowers, but also provided information on the need for management of vegetation diversity and information for ecological education. Providing information on biodiversity and management in ecological terms is closely related to landscape preferences (Van der Wal et al., 2014). Because both groups were ordinary people, perception of naturalness appeared through expressive response rather than interpretative one.

Despite the general limitations of qualitative studies that are not easy to generalize in this study, it is a very useful way to analyze the differences of perceptions of two visitors, both the novice group and the veteran group in order to grasp the positive or negative perceptions of people's impacts on the landscape. And understanding the value of relevant visitors through analysis results is one way to resolve potential conflicts (Ives and Kendal, 2014).

4.3. Application of landscape perception for park management

4.3.1. The nodes of experiencing landscape

Management of landscape experience nodes should be directed toward minimizing negative perceptions while maximizing the positive aspects of landscape perceptions. On the other hand, it is also necessary to consider the false public perception of landscape that may arise from unconfirmed information and knowledge.

The most common landscape experience points are similar to viewpoints. The viewpoints are mainly the spot where the cognitive responses of the perceptual level occurs, and it can be explained by the CPs and PENs of the first step analysis (Chapter 4.1.). The category Prospect includes 8 CPs out of a total of 11. The 8 PENs that are paired

with the CPs are distributed 1 at the trail entrance (Unit A), 1 at the valley section (Unit B), and 6 at the summit section (Unit D). In the second step analysis (Chapter 4.2.), In the second step analysis, the response of the perceptual level to the spatial configurations of landscape is seen as the main perception in both groups (the novice and the veteran). The difference is that the perception of the novice group appear mainly in the trail entrance and the valley section (Unit A, B), while those of the veteran group appear mainly at the summit section (Unit D).

The spots to be added in the management of landscape experience nodes including the existing viewpoints is the 3-dimensional space of the forest. The characteristics of the inner forest are very limited both in the depth of view and in the breadth of view. Most of the trails of national parks have steep sections. The results of the second step analysis show that this area is boring, uninteresting, and sometimes dangerous. However, in the first step analysis, the category Surrounding (26.1%, n=207) is the second largest number of the 792 photographs. The category Surrounding is a sort of 'landscape room' that is bordered by tall trees or terrains (Fry et al., 2009; Ode Sang et al., 2010; Ode Sang et al., 2008; Tveit et al., 2006). This category can be classified according to the characters of the visual range in the first step analysis, but it cannot be interpreted as the preferred reason, and the contents of the perception can be grasped through the interpretation of the cognitive process in the second step. In

this category, the responses of the expressive level such as tranquility and stability were conspicuous in the perception of the two groups in common. Especially, the veteran group showed responses of interpretative level together with expressive one. In summary of the main content of the interpretative level, the veteran group perceives that it is better to create a lot of small shelters that can naturally experience category Surrounding rather than artificial large-scale shelters.

In this study, we propose management of expressively relieved nodes (ERN) focusing on expressive response with perceptually exciting nodes (PEN) emphasizing perceptual response similar to the existing viewpoints. The selection method (ERN) of expressive response is as follows. First, the preliminary candidate spots are selected through the density analysis of photographs' coordinates of category Surrounding of experience landscape of the first step. Next, compare with the positive perception about the spatial configurations in the second step, and finally select the spots that matches the preliminary candidate ones. When the density analysis of the coordinates corresponding to the category Surrounding is performed, a total of 7 preliminary candidate spots (A-G), such as PEN, having a density of 15% or more can be derived. There are 1 at each of unit A and unit B, and 5 at Unit C (Figure 29).

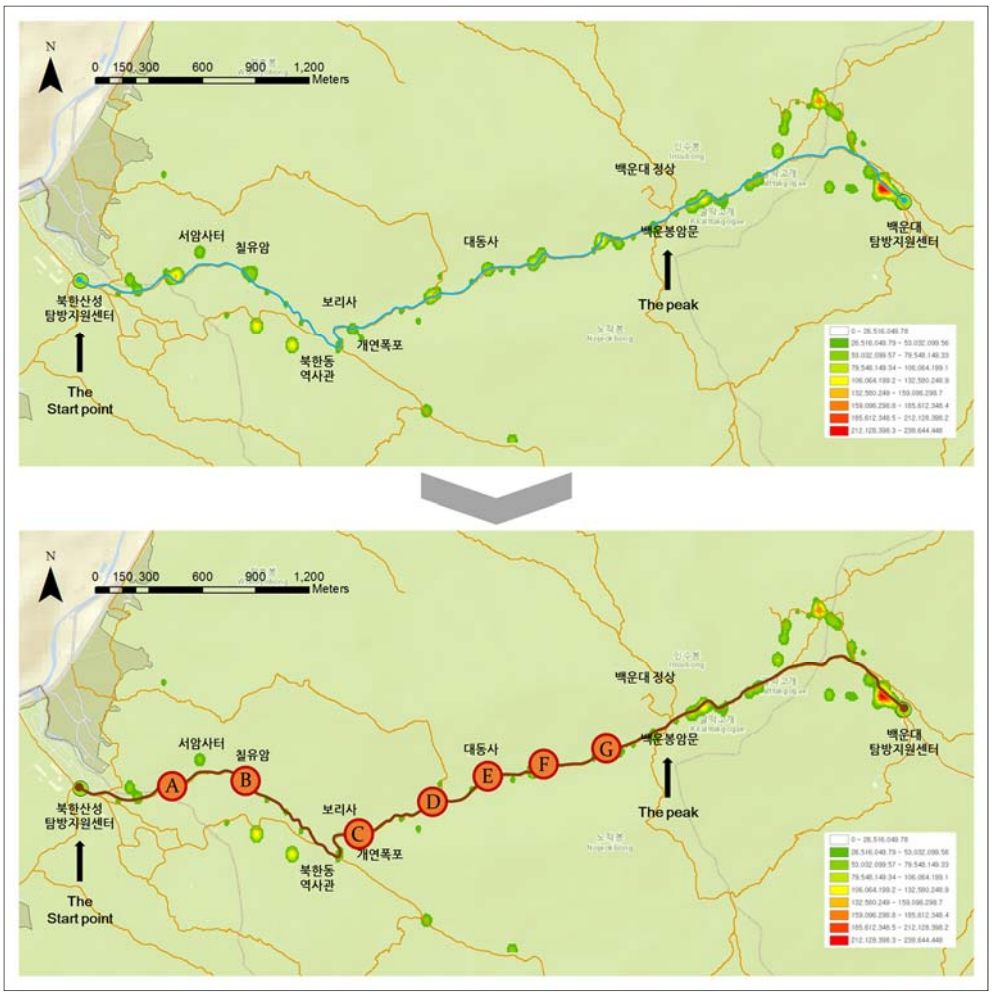


Figure 29. Primary selection spots of expressively relieved nodes.

Through the content of the cluster Forest and Bedrock space, which contains the positive perception of the two groups on the spatial configurations belonging to the result of the second step, it is possible to explain the category Surrounding of the first step's result. The cluster Forest of the novice group is mainly about content of calming in lush

forests and water in the valley section (Unit B). Cluster Forest and Bedrock space of the veteran group indicate that they want to go to the forest area (Unit C) to feel comfortable with the sound of birds. ERNs were selected considering the spots where expressive responses were perceived and also the first candidate nodes designated (Figure 30).

Figure 30. Expressively relieved nodes and its example images.

Finally, PENs and ERNs of the Bukhansanseong trail are as follows: the trail entrance (PEN 1), Seoamsateo (PEN 2), Chilyuam (ERN B), designated viewpoints (PEN 3), Gaeyeonpogpo (ERN: C), Daedongsa (ERN E), Baegundae (PEN 4, 5).

Figure 31. The distribution of PENs and ERNs in the trail.

4.3.2. Trail's facilities management

Negative or critical perception of landscape must be considered for the management of trails in the national park. As a result of the second step, there was a strong negative perception on the anthropic elements and the main content are visual disturbance, safety and convenience of facilities and naturalness and historicity.

In the case of disturbance, the novice group responded more sensitively to the visual aspect than to the veteran group. For example, for a newly constructed bridge made of marble, there was a very negative responses to the color and size of the material that did not match the surrounding environment. It has been shown that the retaining walls that are left in the collapsed state and the structures which are not known to use are not well managed. The more extreme the degree of visual disturbance is, the easier it is to set the direction of management because the negative perception of it is easy to reach consensus.

In the case of naturalness, most cases were mentioned with disturbance of anthropic elements to the natural environment. Because

both groups are non-experts, they prefer individual natural elements rather than professional ecological characteristics such as the proportion of natural vegetation, level of succession, and fragmentation.

In particular, the preference for wildflowers in the veteran group should be discussed again in terms of diversity of vegetation management. Most people prefer wow factor if the distribution of colored flowers exceeds about 27%, but the general green vegetation has no effect on the euphoric response, but has a recovery environment effect (Hoyle et al., 2017). In national parks, the factor is ephemera events due to seasonal factors such as flowers of spring and foliage of autumn. Another aspect of management of landscape experience nodes is the provision of education and information. The experience group positively perceived the role of the guide sign as an artificial element. The provision of correct ecological knowledge and information is closely related to the preference of landscape, regardless of the timing and depth of information it provides (Juutinen et al., 2011; Qiu et al., 2013; Van der Wal et al., 2014). Also, the location and readability of the guide signs have an effect on the preference of landscape (Fung and Jim, 2015).

On the other hand, there are various perceptions about affordance. In general, preference for landscape is favorable when affordance such as accessibility and walkability is high (Bell, 2001; Kwon and Im, 2010).

However, there may be a conflict between assigned values in the case of the veteran group's negative responses to deck loads made of wood or steel that excessively improve accessibility and walkability. In the case of deck road, about 3.8% (n=30) of the first stage study were taken. Most of them are taken on the linear characteristics that appear depending on the type of deck road installed. Although there is the advantage of deck roads that not only improve accessibility and walkability but also causes visual interesting, it also has a disadvantage that it can serve as a channel to expand the extent of the damage to the forest, so it is necessary to carefully consider installation.

In the case of historicity, the historical spectrum of Bukhansan National Park is diverse from the remains of the Joseon Dynasty to the modern buildings and facilities and the projects of ecological restoration. The veteran group remembers the process of landscape change of the national park through actual experience for a long time periodically. However, while the opinions of the prosperity of the remains of the Joseon Dynasty are presented positively, the buildings and facilities of the modern era are regarded as a scab and they response negatively. Instead, swimming pools and restaurants that existed in the 1970-80 were destroyed. There was a positive perception about the restored space to the natural states. There is a need for a way to preserve the diversity of cultural landscape in protected areas such as national parks, as well as

educational efforts to turn biased thinking that only a long history is worth preserving.

The management of each of the landscape characteristics mentioned above results in stewardship. First, it is necessary to understand the underlying values of the landscape and the assigned values. Disciplines related to the landscape are making efforts to identify and preserve each assigned values. Efforts for a series of formalized results that minimize artifacts are limited. Instead, it is important to provide a cue of care so that visitors have the idea that they need to preserve the national park well by themselves. The cues of care have a halo effect that makes people have the responsibility to provide care (Nassauer, 2011). And if such a halo effect becomes a cultural norm, its impact can be even greater (Nassauer et al., 2009).

4.3.3. Practical use of the method

The practical use of the study method is to utilize when analyzing social network photographs. So far, using photographs in landscape perception research is one of the most common methods. Photographs describe the historical, cultural, and social ways of looking at the world

and can be used as a single source of data (Stedman et al., 2004). The photographs that are being shared on social media platforms in recent years are user generated contents (Oteros-Rozas et al., 2017) with a very large sample size. This feature has the potential to complement the limitations of the generalization of landscape perception research using existing photographs. The biggest obstacle, however, is the lack of discussion of specific methods for analyzing vast amounts of data (Oteros-Rozas et al., 2017). Also, according to the privacy policy, it is difficult to collect social and demographic information, and thus the representativeness of the sample cannot be verified (Guerrero et al., 2016) In order to overcome these shortcomings, it is necessary to confirm the results of field survey and analysis on actual sites (Guerrero et al., 2016). This study suggests that landscape perception can be generalized, and if the results are derived, the perception can be deduced from the social network photos of national parks. The results of social media analysis to understand the commonality of landscape perception can be used for professional assessment.

The Korea National Park Service conducts an expert-based natural resource survey on national parks every year. Nowadays, like other ecological resources survey, expert-oriented research on landscape resources is being conducted. It proposes to change the method of survey conducted in a single year to a multi-year survey: 1. pre survey, 2. survey

3. planning. First, the preliminary survey reflects the perception of the landscape by conducting a panel survey of various stakeholders such as field managers, public visitors, and local residents in each national park. In the following year, the survey will be conducted based on the results of previous surveys conducted by experts involved landscape. In the next year after this survey, landscape management plans are established through coordination of opinions with experts in other fields such as topography, geology, and vegetation including cultural and historical fields.

Chapter 5. Conclusions

In order to manage the sustainable landscape of national parks, it is very important to study on site perception of landscape. The two-step method proposed in this study proceeded from surveys to analysis in order to understand the commonality and diversity of landscape perception.

The landscape perception is a process in which the cognitive responses appear. The commonality of perception appears mainly in the perceptual and expressive level of the cognitive process. In the first step, commonality of perception was perceived based on the cognitive responses of the perceptual level, and CPs and PENs were derived. At this step, since it is impossible to grasp other than the perceptual characteristics, ERNs are derived by grasping the emotional response to

the spatial configurations of the object of landscape in the second step. The ERNs are the representative spots of emotional-centered, which represents recovery environment related to relieving stress such as cozy and relief. PENs and ERNs can be used to manage experience landscape nodes in the future. National park trails do not exist solely for the purpose of climbing mountain tops. The two type of nodes can be used as a solution to problems to be used as a trail only for passage to go to the top of the mountain in the meantime. PENs should be managed to enjoy the scenic beauty of national parks in a similar way to the existing viewpoints management. On the other hand, ERNs are kinds of recovery environment in the forest, and it should be a place where it can communicate with nature slowly. At the same time, it can be enhanced visitors' preference by experiencing a variety of natural elements such as water, trees, rocks, and wildflowers with positive perceptions. Therefore, careful management of a relatively small space that can satisfy the five senses is necessary.

Among the diversity of landscape perception that was emphasized in the second step, the characters that should be considered important from the management standpoint are naturalness, disturbance, and stewardship. The differences in perceptions of these three characters are evident in the description of anthropic elements. Perception of naturalness is closely related to ecological knowledge and information, which is mainly

expressed in the interpretative level of the cognitive process. In other words, without that knowledge and information, it means that characters of naturalness cannot be interpreted. The two groups of participants in this study are all ordinary people, not experts who they prefer certain natural factors such as water, in particular, the veteran group seem to more prefer wildflowers. There is a need to be more careful when applying this perception of nature to management. When vegetation such as wildflowers are planted over a certain range in the bordered area, the preference of the general public may appear immediately and intensely. However, since the general green vegetation is not irritating, it has the effect of helping to maintain emotional calmness. It should be careful to unconditionally accept public perception of the character of naturalness.

A ‘cue of care’ is needed that can be thought of as a systematically well-managed national parks. This concept is very important in the character of stewardship. Presently, in the site of Bukhandong migration project of Bukhansan National Park, some of the remains of the villages that existed in the modern era were preserved. The unused and abandoned appearance of the buildings is perceived as more negative for the veteran group than the appearance of the building, such as not coherent with the surrounding environment. It is a problem of the formal management method that leaves the building of the time without removing it in order to leave trace of the history of the modern times. People cannot have some

stewardship to care about facilities where there is no cues of care. In other words, stewardship needs a halo effect that makes people have responsibility. And the halo effect should become a cultural norm. The start is from sharing the diverse perceptions of national park professionals, practitioners, local residents and visitors with high levels of involvement.

We examined the visual scale, naturalness, disturbance, and stewardship of commonality and diversity of perception identified in this study among the nine landscape characters. In order to place the assessment of perception as the main indicator of the landscape character assessment in the future, the generalization of the results should be made based on a large number of samples together with other characters not revealed here.

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APPENDIX

Table 26. Number of nodes related liked spatial configurations allocated to each of the seven attributes and to the individual categories distinguishing among four and four clusters.

		The novice group					The veteran group				
Label	Category	SUM	Terrain	Insubong Peak	Forest	Mangyoungdae Peak	SUM	Terrain	Peaks	Forest	Bedrock space
	Topology	29	23	4		2	28	14	14		
	Space	10			10		6			4	2
	Elements	2			2						
	Other	2	2				1	1			
SUM		43	25	4	12	2	35	15	14	4	2
Spot	Unit A	9	9				5	3	1	1	
	Unit B	6			6		3	2		1	
	Unit C	4	2		2		5		1	2	2
	Unit D	10		8		2	16	9	7		
SUM		29	11	8	8	2	29	14	9	4	2
Ephemeral	Light/Weather	4	3		1		1				1
	People	2		2			1		1		

	Sensory	8	7	1			2			2	
	Water	3			3		2				2
SUM		17	10	3	4		6		1	2	3
Perceptual	Depth of view	12	9		3		2			2	
	Breadth of view	13	12		1		3		3		
	Vivid-ness	15	8	5		2	10	6	4		
	Complexity	5	5				1	1			
	Other	1			1		2	1	1		
SUM		46	34	5	5	2	18	8	8	2	
Expressive	Tranquil	5			5		4			4	
	Relieved	8	2		6		5		2	1	2
	Wonderness	5		5			7	7			
	Mystery	5	4	1			3	2	1		
	Other	5	3	2			2	2			
SUM		28	9	8	11		21	11	3	5	2
Interpretative	Naturalness	6	3		3		3	3			
	Stewardship	2			2		7	1	2	2	2
SUM		8	3		5		10	4	2	2	2
Symbolic	Imagination	3		2	1		1			1	
	Memory						16	3	13		
SUM		3		2	1		1	3	13	1	

								7					
Total		174	92	30	46		6	136	55	50	20	11	

Table 27. Number of nodes related liked natural elements allocated to each of the seven attributes and to the individual categories distinguishing among five and four clusters.

		The novice group							The veteran group				
Label	Cate-gory	SUM	Water	Rock/Tree	Bedrock	Wildflower	Pine tree	Vegetation	SUM	Water	Wildflower	Rocks	Vegetation
	Water	8	8						10	10			
	Rocks/ Trees	10		7	1	1	1		7		2	4	1
	Vege-tation	2				1		1	12		10		2
	Other	3	2	1					5	5			
SUM		23	10	8	1	2	1	1	34	15	12	4	3
Spot	Unit A	4	3		1				5	2	1		2
	Unit B	11	4	5		1		1	8	7	1		
	Unit C	2		1			1		6	2	3		1
	Unit D	1		1					5			5	
SUM		18	7	7	1	1	1	1	24	11	5	5	3
Ephemeral	Light/ Weather	3		2		1							
	Sensory	9	6	1		1	1		4	2	2		

SUM		12	6	3		2	1		4	2	2		
Perceptual	Vividness	9	5	1	2		1		7	3	1	3	
	Static	6	2	1	1		1	1	4	4			
	Dynamic	4	4						4	4			
	Complexity	1		1					1			1	
SUM		20	11	3	3		2	1	16	11	1	4	
Expressive	Tranquil	3				3							
	Relieved	9	9						4	4			
	Wonderness	1	1										
	Mystery	4		2	2				1			1	
	Active	3	2				1		4	4			
	Other								1				1
SUM		20	12	2	2	3	1		10	8		1	1
Interpretative	Naturalness	10	1	6				3	7	2	2		3
	Stewardship	2		2					11	3	4		4
	Historicity								2		1		1
SUM		12	1	8				3	20	5	7		8
Symbolic	Imagination								4			4	
	Memory								3		1	1	1

SUM									7		1	5	1
Total	105	47	31	7	8	6	6	115	52	28	19	16	

Table 28. Number of nodes related liked anthropic elements allocated to each of the seven attributes and to the individual categories distinguishing among five and eight clusters.

		The novice group							The veteran group							
Label	Category	SUM	Temple	Deckroads	Rockclimber	Guidesigns	Stonestairs	SUM	Guidesigns	Remains	Facilities	Visitors	Plantnametag	Trails	Temple	Foreigner
	Facilites	3		1		1	1	11	6	2	2		1			
	Temple	1	1					1							1	
	Remains	1		1				1		1						
	Natural	3		1	1		1	3				2		1		
	Other	1	1													
SUM		9	2	3	1	1	2	16	6	3	2	2	1	1	1	
Spot	Unit A							8	4				3	1		
	Unit B	1	1					3			2	1				
	Unit C	4		2		1	1	6		3		1			1	1

	Unit D	2			2			2				2				
SUM		7	1	2	2	1	1	19	4	3	2	4	3	1	1	1
Ephemeral	Light /Weather							1	1							
	People	2			2			6				5				1
	Sensory	1	1													
	Water															
SUM		3	1		2			7	1			5				1
Perceptual	Vividness	1		1				1		1						
	Static	2		2								4				
	Dynamic	1			1			4			4					
	Complexity	2	2					4			1					
	Other							1								
SUM		6	2	3	1			10		1	5	4				
Expressive	Tranquil							2				2				
	Relieved	1	1													
	Wonderness															
	Myst	1			1											

	ery															
	Active	1			1											
	Other							2		1						1
SUM		3	1		2			4								
Interpretative	Naturalness	1					1									
	Stewardship	4	1			2	1	34	20		1	5	3	2	3	
	Historicity	2		2				2	1	1						
SUM		7	1	2		2	2	36	21	1	1	5	3	2	3	
Symbolic	Imagination	1			1											
	Memory															
	Idea							3	1	2						
	Phenomena							1								
SUM		1						4								1
Total		36	8	10	9	4	5	96	32	12	10	22	7	4	5	4

Table 29. Number of nodes related disliked anthropic elements allocated to each of the seven attributes and to the individual categories distinguishing among six and five clusters.

		The novice group							The veteran group					
Label	Category	SU	Building	Bridg	Facilitie	Dec	Fenc	Remai	SU	Remai	Shelte	Facilitie	Vending	Ston

		M	gs	es	s	k ro ad s	es	ns	M	ns	rs	s	mac hine s	e st air s
	Facili tes	11	2	2	3	3	1		24	2	9	8	2	3
	Tem ple	4	3	1					1		1			
	Rem ains	3			2			1	7	7				
	Natur al	11			7	4			6			3		3
	Other								1			1		
SUM		29	5	3	12	7	1	1	39	9	10	12	2	6
Spot	Unit A	7	5		1			1	10	6	1	1	2	
	Unit B	4		1	3				2		1			1
	Unit C	7		2		4	1		16	4	4	5		3
	Unit D	1				1			2			2		
SUM		19	5	3	4	5	1	1	30	10	6	8	2	4
Ephe meral	Sens ory	7	4	2	1				1		1			
SUM		7	4	2	1				1		1			
Perce ptual	Vivid ness	1	1						3		3			
	Static	4	1		3				3		1	2		
	Dyna mic								1				1	
	Com plexit y	12	4	7		1			5		5			

SUM		17	6	7	3	1			12		9	2	1	
Expressive	Safety	6	1		1	4			3			3		
	Unpleasant	5		2	2		1		1			1		
	Bored								2		1			1
	Other	2			1			1						
SUM		13	1	2	4	4	1	1	6		1	4		1
Interpretative	Naturalness	4		3		1			5	1				4
	Stewardship	6			2	2		2	39	15	8	6	3	7
	Historicity	1						1	17	17				
	Disturbance	15		7	3		4	1	23	6	6	10		1
SUM		26		10	5	3	4	4	84	39	14	16	3	12
Symbolic	Imagination								2			2		
SUM									2			2		
Total		111	21	27	29	20	7	7	174	58	41	44	8	23

ABSTRACT in KOREAN

국립공원 탐방객을 대상으로 한 현장 기반의 경관 인식 분석

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국립공원과 같은 보호지역은 생물다양성의 보존과 함께 여가 및 관광 활동을 비롯한 다양한 인간의 영향을 고려한 관리가 필요하다. 국립공원의 대표적인 환경 자원인 경관은 그 활용에 대한 필요성이 점차 부각되고 있지만 그에 부합하는 체계적인 조사 및 평가 체계의 확립이 아직 미흡하다. 현재의 조사 및 평가 방식은 기존의 생태학적 접근과 같이 전문가에 의해 주도되며, 경관이 가지고 있는 고유의 특성의 차이를 구분하는 것이 아니라 단순히 선호도에 의한 우열을 가려 순위를 매기는 방식으로 진행되고 있다. 이는 경관의 다원적 가치에 대한 이해가 부족하기 때문이며, 특히 경관을 다각적인 측면으로 인식하는 인간의 존재를 무시한 결과이다. 경관은 인간에

게 매우 중요하며 서로는 불가분의 관계이다. 특히 그 관계에서 인간의 체험은 매우 중요한 부분을 차지하고 있다. 한편 지속가능한 환경 자원의 관리를 위해 사회적 가치(social values)를 반영하려는 움직임이 뚜렷이 증가하고 있다. 그 사회적 가치는 공공의 인식과 매우 밀접한 관련이 있다. 민주적 환경 관리를 위해 공공의 의견을 반영하는 것뿐만 아니라 그들의 능동적인 참여를 이끌어내기 것이 중요하며, 그 중 공공의 인식을 이해하는 것은 그 무엇보다도 선행되어야 한다. 이와 같은 흐름에 맞춰 경관 연구도 공공의 인식을 해석하는데 주력해야 한다. 하지만 지금까지의 경관 인식 연구는 다른 경관 관련 연구, 특히 생태학 기반의 연구와는 별개인 것처럼 독립적으로 진행되었거나, 시각 중심의 반응을 통해 정량적인 선호도 분석이 주를 이루었다. 기존 방법의 한계를 극복하면서 경관의 생태적, 사회문화적, 경제적 가치 등을 동등한 가치로 인정하는 전체론적 관점 속에서 경관 인식을 파악할 수 있는 새로운 방법에 대한 논의가 필요하다. 본 연구의 목적은 국립공원 탐방객을 대상으로 현장 기반의 경관 인식을 파악하기 위한 방법을 제안하는 것이다. 그리고 제안한 방법을 통해 도출된 경관 인식의 결과를 활용하여 국립공원 관리에 활용할 수 있는 몇몇 방안을 제시하였다.

경관 인식에 대한 공통성과 다양성을 파악하기 위해 개념적 틀을 제시하였다. 경관의 물리적인 대상은 경관 객체(the object of

landscape), 그 객체를 인식하는 인간은 경관 주체(the subject of landscape)로 구분하였다. 경관 객체는 공간적 구성(spatial configurations), 특정 요소(specific elements) 그리고 일시적 현상(ephemeral events)으로 세분화하였다. 경관 주체의 인식은 지각(perceptual), 감정(expressive), 해석(interpretative), 상징(symbolic)의 4단계 인지 과정으로 구분하였다. 인지 과정의 지각 및 감정 단계는 진화론에 기반을 둔 경관 인식의 공통성이 강조되며 해석 및 상징 단계는 문화론에 기반을 둔 인식의 다양성을 파악할 수 있다. 이러한 인식은 최종적으로 경관 특성을 평가하기 위한 9가지 개념(시각적 범위, 응집성, 복잡성, 자연성, 훼손, 책무적 관리, 역사성, 이미지성, 일시성)으로 구분된다. 연구 대상지는 북한산국립공원 내 지정된 법정 탐방로 중 이용 밀도가 높고, 산 정상을 목적지로 하여 당일 일정으로 다녀올 수 있으며 북한산의 다양하고 중요한 경관을 체험할 수 있는 곳으로 선정하였다. 이 조건에 맞는 탐방로를 선정하기 위해 우선 탐방로 이용 현황 통계 자료를 바탕으로 이용 밀도가 높은 탐방로를 후보군으로 선정한 후, 인터넷 사진 공유 서비스인 플리커(Flikr)에 저장된 사진의 촬영 지점에 대한 밀도 분석을 통해 밀도가 높은 탐방로를 최종적으로 선정하였다. 그 결과 북한산성코스가 선정되었다. 그리고 물리적 성격에 따라 탐방로 입구 구간(Unit A), 계곡 구간(Unit B), 숲 구간(Unit C), 정상 구간(Unit D)으로 구분

하였다.

현장 기반의 경관 인식을 파악하기 위해 이용자 활용 사진 촬영(visitor employed photography, VEP) 방법을 응용하였다. 보다 효율적으로 VEP 방법을 활용하기 위해 연구 과정을 두 단계로 구분하였다. 1단계에서는 경관 인식의 공통성을, 2단계에서는 그 다양성을 중점적으로 파악하였다. 그에 따라 각 단계별 목표를 달성하기 위한 세부적인 조사 및 분석 방법을 설정하였다. 우선 조사 과정을 단계별로 살펴보면 크게 조사 참여자 모집 방법과 수집 자료의 종류의 차이를 두고 진행하였다. 인식의 공통성을 중점적으로 파악하기 위한 1단계에서는 조사 참여자 모집을 무작위추출법(random sampling)을 활용하였다. 실제 탐방객을 대상으로 현장에서 무작위로 58명의 조사 참여자를 모집하였다. 그리고 연구 목표에 집중하고 참여도를 높이기 위해 수집 자료의 종류는 선호하는 경관을 촬영한 지리정보가 담긴 사진만으로 한정하였다. 2단계는 국립공원의 친숙도(familiarity)에 따른 인식의 다양성을 파악하기 위해 조사 참여자를 유의추출법(purposive sampling)을 활용하여 모집하였다. 국립공원을 방문한 횟수가 1~2회 미만인 무경험 집단(the novice group) 8명과 10년 이상 정기적으로 방문한 다경험 집단(the veteran group) 8명이 조사에 참여하였다. 수집 자료의 종류는 선호 또는 비선호 경관에 대한 지리정보가 담긴 사진과 그 사진을 촬영한 이유가 적힌 기록지가 포함된다. 실제 조사 참

여자가 탐방로를 걸으며 사진을 촬영하고 그 이유에 대해 기록을 하는 행위가 익숙하지 않기 때문에 표현하고자 하는 내용이 누락될 수 있다. 이러한 경우에 대비하기 위해 조사 완료 후 추가적인 인터뷰를 실시하였다. 인터뷰는 응답자가 어떤 주제에 대해 그들이 인지하고 있는 것을 자유롭게 나열할 수 있도록 하는 것으로 일종의 개방형 질문(open-ended question)과 유사한 프리리스팅(freelisting) 방법을 활용하였다.

경관 인식 분석의 개념적 틀을 활용하여 각 단계별 조사 과정을 통해 수집된 자료의 성격에 맞게 분석을 실시하였다. 1단계에서 수집한 지리 정보 사진(geotagged photos)은 공간 좌표에 대한 정보와 사진의 시각적 이미지를 자료로 활용할 수 있다. 이를 통해 경관 객체의 유형과 인지 과정 중 지각 단계의 반응을 분석할 수 있다. 공간적 구성은 지각 단계의 반응에서 나타나는 시야의 깊이와 너비(the depth and breadth of view)에 따라 조망(prospect)과 위요(surrounding)로 구분할 수 있다. 여기에 구체적 요소(자연 및 인공 요소)는 단일 대상(single objects)으로 변환하여 총 3가지의 체험 경관(experiencing landscape) 유형으로 범주화하였고, 각 범주별로 경관 사진에 나타나는 주요 대상(primary objects)에 따라 다시 세분화하였다. 최종적으로 체험 경관 유형 중 인식의 공통성을 잘 나타내는 대표경관(consensus photograph, CP) 및 대표시점(perceptually exciting node, PEN)을 선정하

였다. 2단계의 분석 방법은 1단계의 사진의 시각적 이미지와 함께 사진 기록지 및 추가 인터뷰를 통해 얻은 촬영 이유에 대한 내용이 담긴 텍스트를 분석하기 위해 의미 네트워크 분석(semantic network analysis) 방법을 활용하였다. SNA 방법은 언어로 구성된 질적 자료인 텍스트를 분석하는 다양한 방법 중 하나로, 내용 분석, 근거 이론 등과 같이 코딩 및 범주화 과정을 통해 그 의미를 파악하는 것을 목적으로 한다. 공간적 구성(조망 및 위요), 구체적 요소(단일의 자연 및 인공 요소), 일시적 현상의 3가지 형태의 경관 객체에 대해 인지 과정을 통해 나타나는 반응을 파악하여 무경험 집단과 다경험 집단 간의 경관 인식의 다양성을 분석하였다.

1단계 과정의 분석 결과 체험 경관은 조망 4가지, 위요 4가지, 단일 대상 10가지의 총 18가지의 유형으로 구분되었다. 그 유형 중 경관 인식의 공통성이 강하게 나타나는 11개의 대표경관 및 대표시점을 선정하였다. 그 중 8개는 조망 범주에 속하고 3개는 단일 대상 범주에 해당한다. 조망 범주에 해당하는 대표경관은 화강암이 지반의 상승 및 침식 작용으로 지표에 노출되고 절리와 풍화 작용으로 형성된 만경대, 인수봉, 그리고 백운대 등의 독특한 산봉우리가 대부분을 차지하였다. 이러한 결과는 급격한 물리적 에너지의 변화(energy gradients)가 탐방객의 흥미를 유발시킨 것으로 해석할 수 있다. 경관 인식의 공통성은 인지 과정 중 지각적인 반응에서 주로 나

타난다. 이 결과는 무경험 집단과 다경험 집단의 인식을 비교한 결과, 친숙도와는 상관이 없는 것으로 나타났다. 감정적인 반응도 두 집단이 유사한 것으로 나타났다. 두 집단의 경관 인식의 차이는 특히 해석 단계의 내용에서 두드러지게 나타났다. 해석 단계의 인지 반응은 인공 요소에 의한 인간의 긍정적 또는 부정적 영향에 관한 것이다. 인공 요소에 의한 훼손(disturbance)의 경우 무경험 집단은 시각적 측면에 대해서 부정적으로 인식하는 반면 다경험 집단은 책무적 관리(stewardship)의 척도인 관리의 흔적(cues of care)에 대해 비판적이고 구체적으로 인식하였다. 시설물의 크기, 형태, 색채 등의 외형적 특성보다는 본래 설치 목적을 달성하지 못하고 방치되어 저활용되는 것에 대해 민감하게 반응하였다. 자연성(naturalness)과 관련된 인식은 식생의 분포, 천이 과정, 파편화 등의 전문적인 생태적 지식과 관련된 내용보다는 감탄 요소(wow factors)로써 야생화와 같은 색채가 다채로운 식생 군락을 선호하는 것으로 나타났다. 자연성의 경우 친숙도보다는 전문적 지식 또는 정보에 의해 인식의 차이가 발생한다고 할 수 있다.

경관 인식의 공통성 및 다양성은 활용적 측면에 대한 경관의 지속가능한 관리에 활용될 수 있다. 우선 다양한 경관 체험을 위해 체험 경관의 주요 지점을 선정하였다. 기존의 조성 및 관리된 조망점(viewpoints)과 유사한 지각 기반의 대표시점(PEN) 뿐만 아니라 수목

또는 지형에 의해 경계를 이루는 경관 공간(landscape room)에서 평온함(tranquility)을 느낄 수 있는 감정 기반의 대표시점(expressively relieved node, ERN)을 제안하였다. 인간이 가지고 있는 시각을 비롯한 다양한 감각 기관을 통해 경관 체험의 기회를 보다 더 많이 제공하기 위함이다. 이 방식을 다른 탐방로에도 적용하면 각 탐방로별 체험 경관의 특성을 파악할 수 있다. 또한 그 결과를 바탕으로 탐방로 관리에서 특정 구간에 대해 휴식년제를 적용할 때 유사한 체험 경관 특성을 가진 다른 탐방로 구간으로 탐방객을 유도하여 이용에 불편이 없도록 하는 등의 구체적인 방안으로 활용할 수 있다. 탐방로 관련 시설물을 비롯한 주변의 식생 등의 관리를 위해 책무적 관리 개념을 적극적으로 활용해야 한다. 국립공원 내 인공시설을 최소화하고 자연 요소를 활용한 시설물로 대치하는 등의 정형화된 관리 방안은 한계를 드러내고 있다. 오히려 세심한 관리의 손길이 필요하다는 일종의 책임감을 가질 수 있게 만드는 후광 효과를 가진 관리의 흔적을 남김으로써 탐방객들이 자발적으로 생태계 보전에 동참할 수 있도록 해야 한다. 탐방객의 경관 인식을 파악하기 위해 제안한 본 연구 방법은 소셜 미디어의 경관 사진과 같은 빅데이터(big data)를 분석 과정에 적용하거나 분석 결과를 검증하는데 활용할 수 있다. 또한 패널 조사를 통한 정기적인 경관 인식의 변화를 추적할 수 있다. 이 조사는 지역주민, 정기적으로 방문하는 탐방객, 시민단체 등

국립공원의 친숙도가 높은 대상부터 진행하는 것이 필요하다.

본 연구를 통해 현장 기반 경관 인식의 공통성 및 다양성을 파악할 수 있는 효과적인 방법을 제안하였다. 특히 탐방객의 친숙도가 경관 인식의 다양성에 영향을 주는 주요한 요인인 것을 밝혀냈다. 더 나아가 그 방법을 통해 도출된 결과를 활용하여 지속가능한 경관 관리에 적용할 수 있는 몇 가지 사례도 함께 제시하였다. 경관 특성 평가에서 공공의 인식을 반영하는 것은 필요조건이 아닌 충분조건이다. 본 연구 결과를 토대로 향후 경관 특성 평가 시 경관 인식 관련 항목이 반드시 고려되어야 한다. 추후 경관 인식을 평가할 수 있는 지표 개발 연구를 비롯하여 실제 실무에서 활용될 수 있는 평가 기법이 고안되어야 한다.

주요어 : 환경 심리학, 환경 인지 과정; 이용자 활용 사진 촬영 (VEP); 의미 네트워크 분석; 대표경관 (CP); 지각 중심의 대표시점 (PEN); 감정 중심의 대표시점 (ERN); 경관 특성 개념; 자연성; 훼손; 책무적 관리; 소셜 미디어 사진

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