

"The Most Deafening Silence You Can Hear": The International Comparison of Landscape Value Mapping on Linguistic Expressions of Islands

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Abstract. This paper presents a research framework aimed at enhancing our understanding of how people value natural places, focusing on islands. In particular, the paper presents a conceptual basis for a protocol to systematically analyze the information richness of the open answer valuation questions qualitative data in the Greenmapper dataset in people's native language, with an application on islands with specific case study examples. This protocol can be used for spatial planning purposes since it provides valuable insights into how people value landscapes. The paper presents a theoretical framework underpinned by the concepts of landscape perception, Public Participation Geographical Information Systems (PPGIS). It also considers the role of language in order to frame the scientific context of mapping landscape values research. The paper also explores the empirical application of the framework conducting an international comparative case study of a small set of landscape appreciation statements in three countries, focusing on islands.

Keywords: Land Value Mapping · Landscape Perception · PPGIS · Greenmapper

1 Introduction

Many studies have been conducted on the interactions between humans and landscape [1–5]. Scientific work on landscape value mapping becomes an increasing body of empirical work within landscape research field, for their significance in well-formed decision-making in both landscape management and spatial planning [6, 7]. Both quantitative and qualitative methods in can support an increased understanding of how people value nature, but the qualitative use of language can serve to better capture landscape representations for its advantages in identifying value that people attribute to landscapes [8].

Furthermore, in an international context, qualitative methods are hampered by language barriers, preventing in-depth comparisons. In order to fill the gap of international comparisons, data from islands of three countries will be collected using an online survey

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based on Public Participatory Geographical Information System (called Greenmapper), and analyzed by a modified landscape perception model.

The PPGIS method refers to "a set of methods for integrating public knowledge of places to inform land use planning and decision-making" [9]. "Public" and "participation" are its crucial features: Public may involve decision-makers, implementer, and affected individuals; participation, on the other hand, refers to the gradual involvement of the public in decision-making processes [10]. Therefore, the combination of value mapping and PPGIS is fruitful in various studies enhancing knowledge about the valuation of natural places in a participatory manner.

In line with Wartmann et al.'s argument [5, 8], this paper empirically explore qualitative, semantic descriptions of landscapes. We attempt to develop and analyze a protocol capable of grasping the information richness in landscape value mapping both in a qualitative and quantitative manner. Various indicators are developed based on data of a cluster of markers retrieved from three different islands: Sylt (Germany), Sicily (Italy) and Jeju (South-Korea). Several clusters of markers have been selected from islands by means of comparability.

The scientific contribution of this paper lies in providing a conceptual basis for a protocol to systematically analyze the information richness of the open answer valuation questions qualitative data in the Greenmapper dataset in people's native language. This protocol can be used for spatial planning purposes since it provides valuable insights into how people value landscapes.

In the next section, a theoretical framework introducing the concepts of landscape perception, Public Participation Geographical Information Systems (PPGIS), and the role of language will be developed and discussed in order to frame the scientific context of mapping landscape values research. Subsequently, we will explore the empirical application of the framework conducting an international comparative case study of a small set of landscape appreciation statements in three countries. Furthermore, we will describe details of the employed method, followed by a discussion of the results, describing the study. Afterwards, the outcomes will be considered with regard to existing scientific literature. This concluding section presents a research agenda to identify several steps that can be developed in order to progress along the preliminary lines of this paper. In turn, this ultimately enhances our understanding of how people value natural places.

2 Theoretical Framework

2.1 Landscape Perception

To capture the intangible landscape perception, Zube et al. [11] identifies three elements of the model [see Fig. 1], and concluded four paradigms relating to human-landscape interactions.

The human concept includes the nature of humanity that interacts with the landscape and reflects on the interaction itself. The landscape includes tangible and intangible properties, for instance, physical features as scales, perceived complexity, and gestalts, etc., or relations in the landscape that are important to the interaction. The interaction then leads to outcomes, which must be viewed in its interactional context, and in turn feedback to both human and landscape inputs.

In this research, the human element refers to tourists or fans who experience and express their attachment to the landscape. The landscape is ambiguous as it varies in our three research sites. To include both tangible and intangible features of landscapes, analyses of physical characteristics and discourses from interviewers must be combined. The interaction outcomes are illustrated by analyzing data collected by Greenmapper survey.

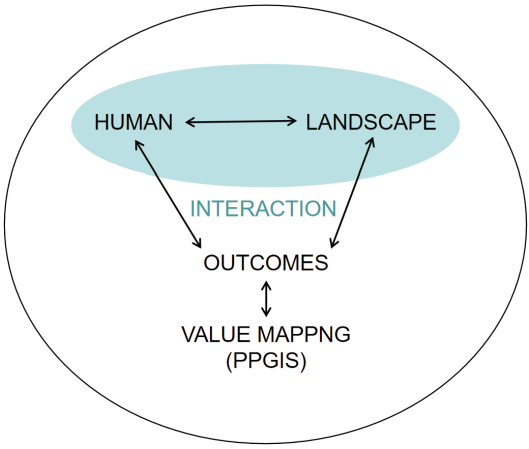

Fig. 1. Modified landscape perception model by the author from the model of Zube et al., 1982.

The four emergent landscape paradigms concluded by Zube are: (1) *the expert paradigm*, featured by evaluation of landscape quality by skilled and trained observers from interdisciplinary perspective; (2) *the psychophysical paradigm*, in which the objectives of assessments are general public or selected populations, and a correlational or stimulus-response relation is expected between observer evaluations and behavior; (3) *the cognitive paradigm*, emphasizing the sociocultural meaning associated with landscapes or landscape properties; (4) *the experiential paradigm*, which considers the experience of the human-landscape interaction as the basis of landscape values.

The four paradigms provide perspectives to deeper understand the mechanism, but however, do not conflict with each other. This research does not fall into the scope of a single paradigm but a fusion of the latter two. The objectives are not categorized by their profession or based on other selection criteria, and the cognitive and experiential paradigm provide insights on how people value the landscape.

2.2 Value Mapping, PPGIS, and Greenmapper

The concept of PPGIS has increasingly been applied in various contexts. For instance, Brown and Brabyn extrapolate social landscape values to a national level in New Zealand using a landscape character classification and PPGIS [3]. Their results indicate that extrapolating land use values can assist impact assessment for land use change but that it should be kept simple for decision support. Additionally, Brown and Brabyn analyze the

relationships between multiple values and physical landscapes at a regional scale using PPGIS and landscape character [4]. In this case, landscape values appear to be largely associated with urban areas, water features, indigenous land cover, and mountains. In his later work, Brown and Kyttä identify over forty empirical studies practicing with PPGIS and its implications for land use planning and management [13].

The field of PPGIS has progressed over the last decade aiming to enhance the knowledge of social and cultural landscapes. The mainstream of value mapping using PPGIS is to quantify landscapes values in terms of classification [3, 12, 13]. However, despite the strong advantage in identification of classifying landscape values, when translating and grouping massive linguistic materials, the research might confront with information losses. Therefore, discourse analysis to supplement the rough PPGIS analysis is of importance.

The Greenmapper platform is an online tool based on PPGIS, which allows participants to map their appreciated natural areas. Basic information of the land, participants, and human-landscape interactions will be collected by answers to close-ended questions regarding activities they enjoyed at research sites. Expressions of their landscape perception will be gathered by open answers to "what makes this specific place attractive to you" [14]. Participants are free to express appreciations in their own language or choose between their native language and others. The Greenmapper survey, therefore, is able to obtain abundant linguistic materials. Combining with discourse analysis, the Greenmapper survey answers to the information losses that quantitative PPGIS might face when roughly categorizing linguistic data.

Drawing on Wartman et al., we argue that language should be considered a starting point to analyze people's notions and reflections of landscapes [8]. Wartmann and Purves, use free listing tasks on landscape terms and interviews with visitors [5]. They compare and analyse descriptions of five different landscape types both quantitatively and qualitatively using an index which combines frequency and mean rank of terms. They "*elicit landscape terms that distinguish different landscapes and identify features to which cultural ecosystem services can be attached*" [8]. In doing so, they made a first step towards obtaining semantically rich descriptions of landscape.

Qualitative and extensive texts provide a wide variety of information contributing to information rich data. But the openness of this question challenges comparability due to the diverse nature of the data.

A quantitative approach appears to deliver the opposite; less information rich data but increased comparability. In order to cope with this dilemma, this study will develop a protocol consisting of both quantitative and qualitative indicators grasping the information richness present in the open question of the Greenmapper survey, an online PPGIS tool requesting people about their most attractive natural areas.

3 Methods

3.1 The Greenmapper Survey

The Greenmapper survey has been used for various research purposes with a central theme of landscape values [14–18]. Other than mapping function, which allows users to mark their favorite natural spaces, the survey include several multi-choice questions, one

scaling question, and one open question where participants freely type their expressions. An overview of the survey portal is shown in Fig. 2.

The data has been standardized and stored. The standardized characteristics of the Greenmapper survey allow an international comparison between natural places [16]. In this international comparative study, the standardization process is guaranteed by native translators. Such characteristics of the Greenmapper survey can be highly beneficial in this study.

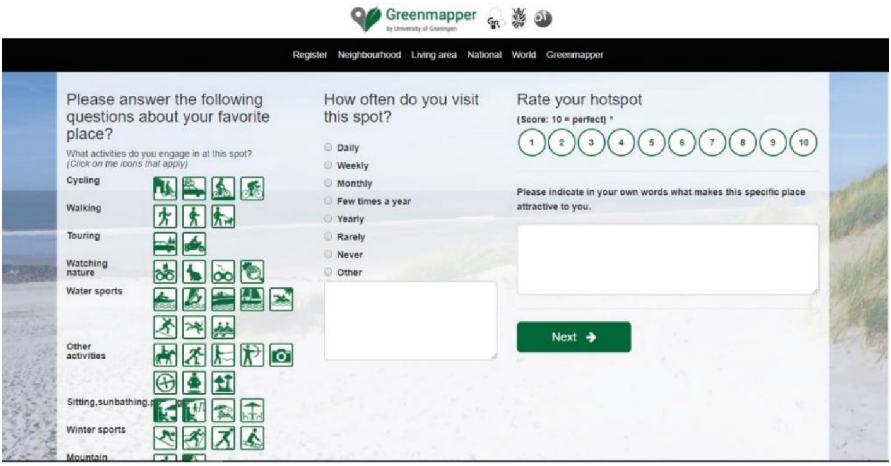

Fig. 2. An overview of the Greenmapper survey.

3.2 Data Selection: Clusters and Qualitative Data

Cluster of Markers. From the Greenmapper database (data.greenmapper.org), clusters of markers can be retrieved from places worldwide. This can be accomplished through a box that can be drawn around a certain cluster of markers. The markers can be categorized in four spatial levels: local, regional, national, and worldwide [16].

In this paper, the following procedures have been followed. Using ArcGIS, the national markers were selected from clusters from three islands: Sylt, Germany (N = 32), Sicily, Italy (N = 255) and Jeju, South-Korea (N = 303).

Example of selected national markers at the island of Sicily is shows in Fig. 3. The islands have been chosen because the collection of markers is relatively simple due to well-defined boundaries.

Furthermore, the relative similarity between the islands allows for an excellent comparison. The national level of markers was selected because on the one hand it includes as many participants as possible, from inhabitants of the islands, to internal tourists/visitors, and on the other hand because it ensures that participants are from the country the islands belong to. This means that it is likely that they answered the survey questions in the same language which allows for a comparison and analysis of three different languages.

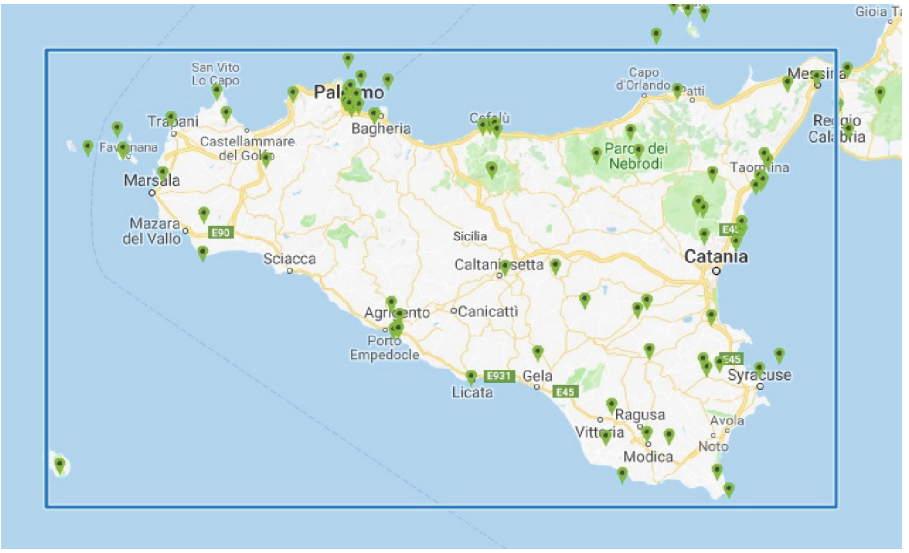

Fig. 3. Selection of national markers at the island of Sicily, Italy.

Qualitative Data. After the markers were obtained, the next step focuses on retrieving the qualitative data from the markers. More precisely, the words and sentences are obtained from the Greenmapper data and stored in Excel. Subsequently, the nouns, verbs, and adjectives are filtered for the analysis since those are the words most likely possessing information about the appreciation of natural lands. The linguistic data are categorized using Excel, and then processed into quantitative and qualitative indicators of landscape perception.

3.3 Indicators of Landscape Perception

Quantitative Indicators. In order to illustrate the information richness of the data per island, three quantitative measures have been developed. First of all, the average characters used per person per island. The average number of characters being used might potentially be a proxy of how extensively people value landscapes at islands.

A second indicator is the number of different words (words here refer to adjectives, nouns and verbs) that is being used to describe the islands thereby providing an overview of the diversity. Overcoming the challenge of difference in language, required all words and sentences used in the analysis to be translated to English with Google translate. The South-Korean data has been double checked with a native speaker. The translated data has been used to compare both the number of characters used averagely and the number of different words. To account for the differences in sample size per island, this indicator has been based on the first 33 cases in each sample thereby incorporating the fact that Sylt has the lowest number of cases, namely 33.

The third indicator is the Sutrop's index. This indicator calculates a word rank based on the frequency and the mean position of a term using the formula $S = F/(NR)$ where

F is term frequency, N the number of participants, and R the mean rank [19]. The idea is that incorporating the number of participants multiplied by the mean rank allows for a relative comparison between different countries.

Qualitative Indicators. Besides the three quantitative indicators of information richness, four qualitative indicators have been developed. Firstly, the most often used words have been identified. This provided an overview of what people often say about a particular place. This might be useful in order to understand the qualities of a particular place.

A second qualitative indicator considers the rarely mentioned but content rich words. The rareness lies in word frequency, which is the opposite to the first indicator; and the richness lies in its psychological sphere. For instance, "affections", "freeing" and "world" are mentioned only once but relate to extraordinary feelings people might have at a certain natural place. This indicator has been included because it presents the remarkable and rich words. These statements often start with more commonplace notions and end with words with more character, richness, and personal meaning. For instance, "The island is very beautiful, the sea, the dunes and the island atmosphere." Or, "The island and the sea are fantastic. We used to come here with my grandfather". Thus, it appears to be the combination of both common and rare linguistic expressions that can provide useful insights into how and why people value natural places. The first and second qualitative indicators of Sicily are presented in Fig. 4 as an example.

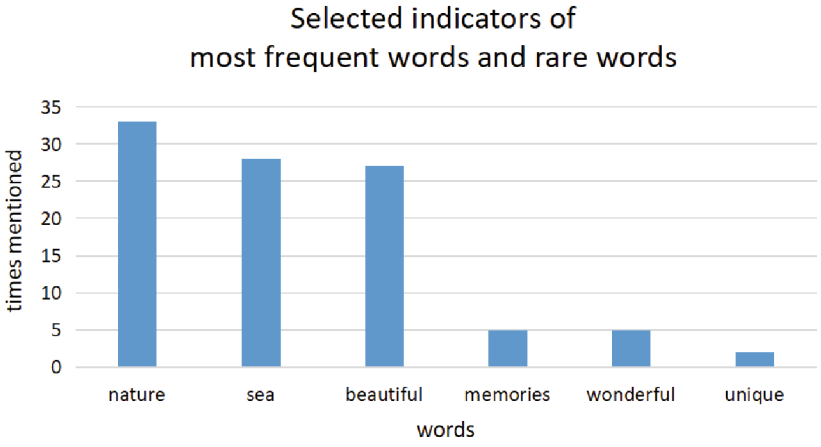

Fig. 4. Word frequency analysis of the island of Sicily, Italy.

A third indicator deals with the context of the often mentioned words. Since the meaning is often not exact, the context might provide more information around one word. The following table [see Table 1] provides an overview of the context of the word "sea".

The fourth and final indicator considers three of the longest quotes. This indicator was developed in order to gain a "sense of place" of the place under investigation and

Table 1. The word 'Sea' and its context on the island of Sicily.

Marker No	Example
4	"Nature includes North African landscapes such as sandy dunes. The **sea** is transparent. If you are lucky you could also find a rare human specimen to which everyone hunts and help make the world better by freeing it from the mafia."
6	"The **sea** of Sicily."
7	"**sea** and beautiful landscapes."
8	"There is a beautiful **sea**."
12	"Near the **sea**."
14	"**Sea**, places and people."

to make maximum use of the context of words in their natural linguistic setting. In the case of Sicily, Italy, the following three quotes belong among the longest:

"A visit to the Nebrodi Park is recommended for several reasons. I was there once and it hit me. Meanwhile, because there are still few tourists. Then because the nature here is still very intact, both in the cultivated areas and in the forest."

"Sicily, the place where I was born and grew up. I lived near the Etna and then immersed in nature. What to say we had everything: sea, sun, mountain, snow, everything!"

"The true Sicilian uncontaminated nature, the most deafening silence you can hear in Sicily."

4 Results

Together with the sample indicators mentioned above, Table 2 provides an overview of the results of indicators in three islands. Detailed results of each indicator are presented in the following sections. Comprehensive elaborations will follow in the conclusion part.

4.1 Results of Quantitative Indicators

The Average Used Words Per Person. The first quantitative indicator describes the average used characters per person. As can be seen in Table 2, Italians included in this dataset tend to describe most extensively why they appreciate certain parts of Sicily with an average of 33,4 English characters per person. Koreans involved in this study used 33,4 characters as well whereas Germans only use 17,3 characters on average.

Most Used Words Per Island. A second quantitative indicator copes with the number of different words that is being used to describe the different islands. Here, we only considered the first 33 markers due to reasons of comparability. Italians describing Sicily

Table 2. Main results from the pilot study.

	Jeju (South Korea)	Sylt (Germany)	Sicily (Italy)
Averagely used characters per person	33,41	17,25	33,39
Number of different words used in first 33 cases	71	43	84
Sutrop's Index of five most used words	1. Scenery (0,13) 2. Beautiful (0,06) 3. Good (0,04) 4. Natural (0,03) 5. Island (0,02)	1. Sea (0,24) 2. Beach (0,08) 3. Vacation (0,05) 4. Beautiful (0,04) 5. North (0,02)	1. Nature (0,13) 2. Sea (0,05) 3. Beautiful (0,04) 4. Place (0,02) 5. Relaxing (0,01)
Three of the most frequent words	Nature, scenery, good	Sea, beach, vacation	Nature, sea, beautiful
Three of the most rare words	Heaven, charms, memories	Homeland, peace, loneliness	Memories, wonderful, unique
Three of the longest sentences	1. "Jeju Island, the largest island in the Republic of Korea, is a beautiful scenic spot and a place for foreigners to visit. Especially, Halla Mountain is very scenic and is a very good place for walking and hiking." 2. "The scenery is very beautiful and the charm of each season is different. Where there is a tiring charm enough to try to visit every year." 3. "Jeju is a rejuvenating heaven. It's a place to visit once or twice a year. It's a very attractive place that does not need explanation."	1. "Beach, vacation, Sylt - that must be enough:)." 2. "Sylt is the most beautiful island in Germany." 3. "Wad and sandy beach is available."	1. "A visit to the Nebrodi park is recommended for several reasons. I was there once and it hit me. Meanwhile, because there are still few tourists. Then because the nature here is still very intact, both in the cultivated areas and in the forest." 2. "Sicily, the place where I was born and grew up. I lived near the Etna and then immersed in nature. What to say we had everything: sea, sun, mountain, snow, everything!" 3. "The true Sicilian uncontaminated nature, the most deafening silence you can hear in Sicily."

used the most different words with a total number of 84 words. Koreans use 71 different words to describe the attractiveness of the island of Jeju. Germans used 43 words.

Sutrop's Index. The third quantitative indicator considers the Sutrop's index. With regard to the outcomes in Table 2, it can be seen that the word "Sea" at Sylt scores particularly strong (Sutrop's index = 0,24), especially compared to the word "Sea" at Sicily. Remarkably, the first two quantitative indicators appear to follow a consistent pattern. Italian and Korean people in this sample seem to explain and describe most extensively why they value a particular natural place, followed by German people.

4.2 Results of Qualitative Indicators

The first qualitative indicator considers the three most often used words. In the case of Jeju (South-Korea), these are "natural", "scenery" and "good". Furthermore, the words "sea", "beach" and "vacation" were most often used when Germans described "Sylt". Lastly, the words "nature", "sea" and "beautiful" were most often used in the case of Sicily. From the results, it appears that the physical characteristics of the natural place are often mentioned.

The second qualitative indicator relates to the words that are remarkable and rarely mentioned but still might be of interest. Remarkable words that are not that often mentioned with regard to Jeju are "heaven", "fly" and "resort". In the case of Sylt, "relaxation", "peace" and "loneliness" were found. Finally, when looking at Sicily, the words "wonderful", "memories" and "unique", among others, appear. These words appear to be less directly related to the natural place but rather describe a certain "sphere" that is present at a particular natural place.

The third qualitative indicator copes with the context of certain often mentioned words. Considering the example, this indicator seems useful in describing linguistic connections of words. For instance, "sea" is mentioned twice in one sentence with "beautiful". Embedding frequently mentioned words in a certain context provides more information about what is exactly meant when a particular word is mentioned.

Therefore, when working with more cases, a more standardized account of word combinations could be developed. In doing so, the context of words can be further explored ultimately leading to a further understanding of how people value natural places.

A fourth qualitative indicator copes with some of the three longest sentences per island. The Italian sentences are the longest. This is mainly because the sentences consist of many adjectives. The Korean sentences seem to align with the Italian regarding the amount of adjectives being used. The German sentences seem to be more direct and to the point, using less adjectives. True language richness can be found in the following longest sentences:

Jeju: "Jeju Island …a rejuvenating heaven".

Sylt: "Pure relaxation, the peace, the environment".

Sicily: "The true Sicilian uncontaminated nature, the most deafening silence you can hear".

5 Discussion

This study aims to enhance the understanding of how people value natural places, focusing on islands. In particular, the paper presents a conceptual basis for protocol to systematically analyze the information richness of the open answer to valuation questions.

The paper presents a theoretical framework underpinned by the concepts of landscape perception, Public Participation Geographical Information Systems (PPGIS). It also considers the role of language in order to frame the scientific context of mapping landscape values research. Linguistic data in the Greenmapper dataset is stored in participants' chosen language, mainly their native language, and translated for further standardized studies.

The paper also explores the empirical application of the framework conducting an international comparative case study of a small set of landscape appreciation statements in three countries, focusing on islands. With specific samples of Jeju, Sylt, and Sicily islands, this protocol has proved to be suitable for spatial planning purposes since it provides valuable insights into how people value landscapes. The supplementary linguistic expressions add to its characteristic of "participatory", and the open access regarding registration and downloading dataset add to the characteristic of "pubic".

From a methodological point of view, four quantitative indicators and three qualitative ones are proposed. The selection of indicators are based on word frequency and information richness, as well as its context. The results provide insight both quantitatively and qualitatively into language being used to value landscapes at three islands.

With specific samples in three countries, this method allows for an international comparison, but also leads to information missing. This inevitable cost in translation process might cause inaccuracy in indicator calculation. All responses to the open question were translated from German, Italian and South-Korean to English in order to assure comparability. Translation often fail to capture the full and exact meaning of the original language. Therefore, a further discussion about how to deal with such translation issues is therefore desirable. Key sentence analysis is essential but is dependent on the researcher's judgement.

Therefore, a priority in our research agenda is to develop relevant algorithms and apply the Greenmapper methodologies more extensively in other contexts.

References

1. Kaplan, R., Kaplan, S.: The Experience of Nature: A Psychological Perspective. Cambridge University Press, New York, NY, US (1989)
2. Howard, P.: An Introduction to Landscape. Routledge, Farnham, Surrey, England (2011)
3. Brown, G., Brabyn, L.: The extrapolation of social landscape values to a national level in New Zealand using landscape character classifications. Appl. Geogr. **35**, 84–94 (2012)
4. Brown, G., Brabyn, L.: An analysis of the relationships between multiple values and physical landscapes at a regional scale using public participation GIS and landscape character classification. Landsc. Urban Plan. **107**, 317–331 (2012)
5. Wartmann, M.F., Purves, R.S.: Investigating sense of place as a cultural ecosystem service in different landscapes through the lens of language. Landsc. Urban Plan. **175**, 169–183 (2018)

6. Garcia-Martin, M., et al.: Participatory mapping of landscape values in a Pan-European perspective. Landscape Ecol. **32**(11), 2133–2150 (2017). https://doi.org/10.1007/s10980-017-0531-x
7. Kühne, O.: Landscape Theories: A Brief Introduction. Springer (2019). https://doi.org/10.1007/978-3-658-25491-9
8. Wartman, M.F., Acheson, E., Purves, R.S.: Describing and comparing landscapes using tags, texts, and free lists: an interdisciplinary approach. Int. J. Inf. Sci. **32**(8), 1572–1592 (2018)
9. Brown, G.: An empirical evaluation of the spatial accuracy of public participation GIS (PPGIS) data. Appl. Geogr. **34**, 289–294 (2012)
10. Schlossberg, M., Shuford, E.: Delineating 'public' and 'participation' in PPGIS. J. Urban Reg. Inf. Syst. Assoc. **16**, 15–26 (2005)
11. Zube, E.H., Sell, J.L., Taylor, J.G.: Landscape perception: research, application and theory. Landscape Planning **9**, 1–33 (1982)
12. Brown, G., Strickland-Munro, J., Kobryn, H., Moore, S.: Mixed methods participatory GIS: an evaluation of the validity of qualitative and quantitative mapping methods. Appl. Geogr. **79**, 153–166 (2017)
13. Brown, G., Kyttä, M.: Key issues and research priorities for public participation GIS (PPGIS): a synthesis based on empirical research. Appl. Geogr. **46**, 122–136 (2014)
14. Sijtsma, F.J., Daams, M.N., Farjon, H., Buijs, A.E.: Deep feelings around a shallow coast. A spatial analysis of tourism jobs and the attractivity of nature in the Dutch Wadden area. Ocean Coast. Manag. **68**, 138–148 (2012)
15. de Vries, S., Buijs, A.E., Langers, F., Farjon, H., van Hinsberg, A., Sijtsma, F.J.: Measuring the attractiveness of Dutch landscapes: identifying national hotspots of highly valued places using Google Maps. Appl. Geogr. **45**, 220–229 (2013). https://doi.org/10.1016/j.apgeog.2013.09.017
16. Bijker, R.A., Sijtsma, F.J.: A portfolio of natural places: using a participatory GIS tool to compare the appreciation and use of green spaces inside and outside urban areas by urban residents. Landsc. Urban Plan. **158**, 155–165 (2017). https://doi.org/10.1016/j.landurbplan.2016.10.004
17. Daams, M.N., Sijtsma, F.J., van der Vlist, A.J.: The effect of natural space on nearby property prices: accounting for perceived attractiveness. Land Econ. **92**(3), 389–410 (2016)
18. Daams, M.N., Veneri, P.: Living near to attractive nature? a well-being indicator for ranking Dutch, Danish, and German functional urban areas. Soc. Indic. Res. **133**(2), 501–526 (2016). https://doi.org/10.1007/s11205-016-1375-5
19. Sutrop, U.: List task and a cognitive salience index. Field Methods **13**(3), 263–276 (2001)
20. Davis, N., Daams, M.N., Van Hinsberg, A., Sijtsma, F.J.: How deep is your love – of nature? A psychological and spatial analysis of the depth of feeling towards Dutch nature areas. Appl. Geogr. **77**, 36–48 (2016)