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Key Aesthetic Appeal Concepts of Coastal Dunes and Forests on the Example of the Curonian Spit (Lithuania)

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Abstract: The main objective of the study was to elicit key concepts determining the aesthetic appeal of coastal dunes and forests using the example of the Curonian Spit (Lithuania). The mixed approach included three methods: (1) paired comparison survey of 45 coastal landscapes, (2) semi-structured interviews with local inhabitants, and (3) eliciting the key aesthetic appeal concepts by a panel of experts using the Delphi technique. The results of the paired comparison survey show that the most aesthetically appealing landscapes of the Curonian Spit are: (1) white mobile dunes, (2) white dunes with grey (grassland) dunes in the background, and (3) grey dunes with white dunes in the background. The local inhabitants considered the concept of visual coherence as the best, explaining the aesthetic appeal of the dune and the forest landscapes on the spit. The experts of the Delphi survey considered that the concepts of stewardship, naturalness, imageability, and visual scale best define the scenic appeal. The appeal of the least attractive landscapes, in their opinion, was shaped by the concepts of naturalness, disturbance, and complexity. We conclude that the notions of visitors, local inhabitants and experts differ on the aesthetic appeal concepts of coastal dunes and forests, suggesting potential management conflicts.

Keywords: aesthetic appeal; Baltic Sea; coastal dunes; Curonian Spit; Delphi technique; paired comparison survey; psychophysical approach

1. Introduction

Aesthetic appeal of landscapes for tourism is among essential intangible ecosystem services [1]. In particular, scenery plays an ever-increasing role in the provision of ecosystem services in coastal areas with high conservation value and recreational appeal [2]. The results of numerous recent surveys of beach attractiveness to visitors around the world show that nearly all beaches with the highest scenic value are located in protected natural coastal areas in Europe [3–8] and worldwide [9–16]. However, regarding the attractiveness of coastal areas for tourism, the challenge of accommodating nature conservation requirements with tourist interests, including their quest for scenic beauty, arises. This challenge is difficult yet necessary to meet [17]. It is difficult because, very often, matching the ecosystem services, the conservation regulations, and the landscape perceptions by the visitors can be problematic [18]. It is necessary because recreation demands must be balanced with conservation needs for natural resources and ecosystem services [19].

This study aimed to explore the psychophysical relationship between the visitors' perceptions and the key aesthetic appeal concepts of coastal dunes and forests on the Curonian Spit, a UNESCO world heritage coastal cultural landscape (Figures 1 and 2).

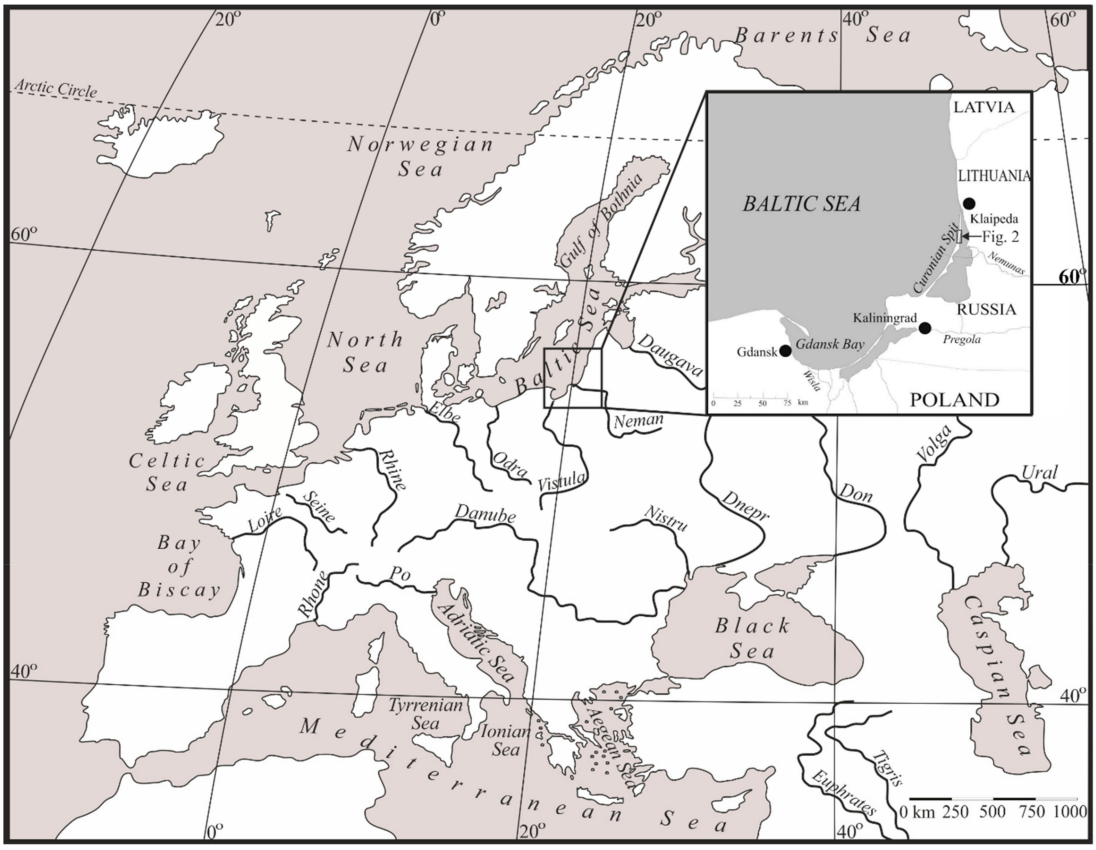

Figure 1. Location of the Curonian Spit on the southeast Baltic Sea coast.

In the study, we assessed a full range of scenes representing coastal dune and forest landscapes of the Curonian Spit—from white (open) mobile dunes and grey (grassland) dunes to Scots pine wood plantations and natural Black alder forests. Our study lies within this broad and rapidly advancing field of eliciting a comprehensive assessment of coastal non-use (intangible) ecosystem values for tourism. It is essential for integrated management of the complex coastal territories which are, as in our case, a transboundary world heritage cultural landscape, a national park, and a popular seaside resort.

We hypothesize that open white and grey dunes are an overlooked asset for sustainable tourism development on the Curonian Spit. The scenic appeal of the dunes is one of the main reasons why tourists visit this unique peninsula. However, despite their immense aesthetic value, the dunes are mostly inaccessible for lay visitors and are overgrown with a natural mixed forest of Scots pine and Silver birch because of excessively strict conservation policies. Hence, the main conclusion of our study was that imageability and visual scale of open and semi-open dune landscapes support the notion of the importance of the "tourist gaze" [20] for the aesthetic appeal of coastal areas as tourist destinations.

Considering the assessment of aesthetic appeal of landscapes, we faced a dilemma of choosing between visitor-based, i.e., "subjective", and expert-based, i.e., "objective" approaches. It is noted in [21] that when investigating visual landscape aesthetics and preferences, a subjective approach is more meaningful and can be adopted, especially concerning the issues involving public interests. On the contrary, as argued in [8], perception varies from person to person, and while there is nothing wrong with a subjective view of the scenery, from a management viewpoint, objectivity should be a must.

This methodological divide predetermines the answer to the critical question of whether the scenic value is a real property inherent in a landscape or a subjective impression based on individual cognitive processes [22]. In other words, the former approach presupposes that scenic beauty is inherent in an original setting [15,23], whereas the latter assumes that scenic beauty is "in the eyes of the beholder" [24,25].

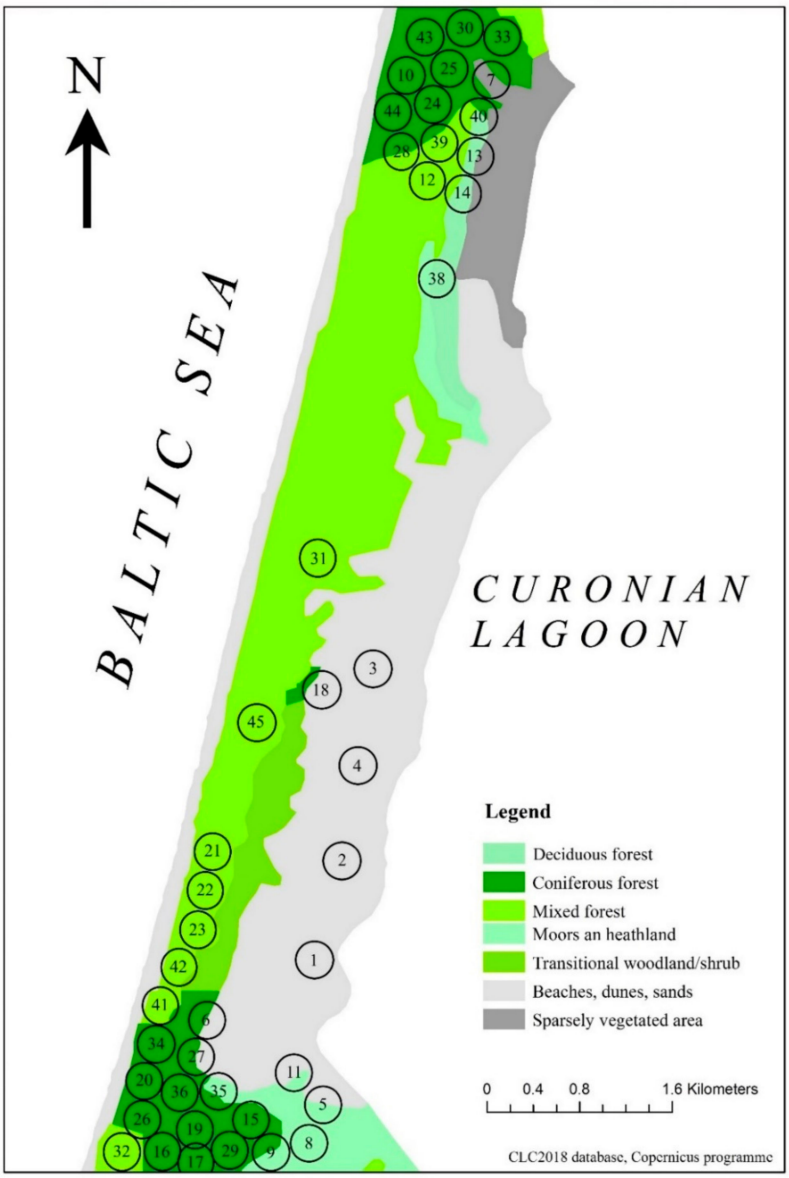

Figure 2. Locations of the sites for taking photos (the numbers refer to the habitats from Table 3).

Daniel et al. [26] were the first to separate aesthetic appraisal into the detailed inventory and the public preference approaches. Zube et al. [25] provided the most comprehensive classification of the approaches in landscape aesthetics, identifying four paradigms of landscape perception research (Table 1). Daniel and Vining [27] refined the classification, and Uzzell [28] extended it to include socio-cultural dimensions. The psychophysical paradigm, an approach grounded in environmental psychology, is a quantitative holistic methodology integrating both "objectivist" and "subjectivist" aesthetic appraisal approaches [29,30]. Psychophysics is defined as a segment of measurement theory and procedure, which attempts to relate environmental stimuli to human sensations, perceptions, and judgments [31,32].

The psychophysical paradigm relies on the assumption that specific, measurable parameters contribute to the perception of scenic beauty and therefore can be predicted [33]. It emphasizes the relationship between the occurrence of environmental events (the physical world) and the perceptual response (the psychological world) of the observer [34].

In other words, from the psychophysical perspective, the aesthetic appeal of a landscape results from an interaction between the physical features of the environment and the perceptual and the judgmental processes of a human observer. It means that aesthetic appeal is neither "inherent in

the landscape" nor purely "in the eye of the beholder". The psychophysical paradigm is, therefore, particularly suited for modeling landscape preferences based on geographical data of the physical landscape [35].

Table 1. Paradigms of landscape perception research.

Authors	Paradigms			
	Objectivist (Physical)	Subjectivist (Psychological)		
Lothian [22], Zube et al. [25]	Expert	Psychophysical	Cognitive	Experiential
Daniel and Vining [27] Uzzell [28]	Ecological/Formal aesthetic	Psychophysical	Psychological	Phenomenological

In psychophysical landscape preference surveys, the respondents are asked to evaluate the attractiveness of a scene, typically with a single response concerning aesthetic preference or appeal [36]. The relationships of interest are those between the physical features of landscapes, such as topography, vegetation, and water, and the psychological responses of the viewers expressing judgments of preference or attributing scores for attractiveness. Multiple linear regression is the most commonly used technique to determine relationships [37]. Many studies do not specify any quantitative functions but describe the characteristics of preferred and less-preferred landscapes in relative terms [27,36,38]. Extensive psychophysical aesthetic valuation studies require a full range of scenes to be selected to represent all of the physical characteristics used as predictors of aesthetic values [39]. They are sensitive to subtle landscape variations and consistently provide robust aesthetic quality assessments regarding changes in both landscapes and observers [27,32].

Another advantage of the psychophysical approach towards aesthetic valuation is that it can accommodate evolutionary and cultural interpretations of landscape aesthetics. The evolutionary interpretation advocates for a persistent cross-cultural preference for certain landscape types or the environmental context in which the transactions between individuals and landscapes occur. It stems from an intrinsic standard of beauty developed by humans in the hunter-gatherer phase of their evolutionary development [21,40–43]. It can be especially pertinent for studying the aesthetic appeal of coastal landscapes, since sheltered coasts, along with savannah-type landscapes, have been the habitats satisfying biological needs of early humans to survive and to spread worldwide [44].

Adepts of the cultural interpretation of landscape aesthetics argue that the appreciation of natural landscapes relies on a dynamic, poly-sensual, and active interaction with the environment and an understanding of its ecosystem functions and services [29]. In other words, the perception or the experience of the landscape is dependent on cultural background and personal attitudes, beliefs, and ideas of each observer focusing either on perceived functions of the observer [45] or on cultural conventions regarding landscapes [46]. Human factors affecting aesthetic preference include socio-cultural groupings, education, personality, profession, and involvement [47]. There are many pieces of evidence that individual preferences change in response to the context in which they are sought depending on an individual's qualifications, their understanding of the cultural background of a landscape, and their experiential connection with it [48,49].

An integrated approach to accommodate both interpretations was developed summarizing the aesthetic quality research outputs of the last half-century, covering both theories and identifying four hierarchical levels of aesthetic abstraction ranging from nine abstract concepts to concrete descriptors of the physical landscape: concepts → dimensions → landscape attributes → indicators [50]. The "concept" and the "dimension" level are both abstract conceptual levels, whereas landscape attributes and indicators are the aspects of a physical landscape.

A concept is an umbrella term that includes several visual dimensions [50]. These dimensions define different aspects of the concepts at a general level. Dimensions are predetermined by physical attributes of the landscape, while the landscape attributes are expressed using visual indicators. The indicators represent the basic level at which the physical landscape attributes are measured to allow different landscapes to be compared or to identify any change in the same landscape over time. Such

a systematic rendering is consistent with the psychophysical approach towards aesthetic valuation, reflecting the interdependence and the multi-dimensionality among human attitudes and landscape perceptions [51–54].

2. Materials and Methods

The 32.6-km long Great Curonian Dune Ridge of 40 m to 60 m high mobile dunes is the second longest coastal mobile dune ridge in Europe [55]. It is protected as a strict nature reserve within Kurshskaya Kosa national park on the Russian part of the spit (est. 1987) and Kuršių Nerija national park on the Lithuanian part (est. 1991). Due to its unique blend of nature and culture values, in 2000, the whole Curonian Spit was included in the UNESCO World Heritage List as a transboundary cultural landscape of outstanding international importance [56].

The unique landscape features of the Curonian Spit as we see them today have resulted from an intensive advance of mobile dunes from the 17th to the 18th century and their stabilization in the 19th century. In that period, ancient forested parabolic dunes, which have prevailed since Holocene, were destroyed by the sand intensively washed ashore from the Baltic Sea and were replaced by mobile barchans [57]. Much of the necessary primary work on dune stabilization of the Curonian Spit ended by the beginning of the 20th century [58]. These efforts stopped the rapid evolution of dune landscapes on the spit, thereby creating a rather specific landscape mosaic where the natural landscapes of the mobile dunes and the relics of the parabolic dunes—overgrown with natural mixed forest—are found along with various forest landscapes [59].

The Curonian Spit is a special place among the Lithuanian coastal areas, since it bears salient societal connotations such as "unique landscape", "place of outstanding natural beauty", "the greatest natural treasure of Lithuania", and "national pride". The objective of the Kuršių nerija national park is to preserve the Grand Curonian Dune Ridge, mobile bare dunes with marram grass ("white dunes"), fixed dunes with herbaceous vegetation ("grey dunes"), fossil dune and soil relics. Although forests are not even mentioned among the nature conservation targets of the National Park, they form an indispensable part of the local landscape. A forest plantation symbolizes the victory of the human order over the dune wilderness. Care for the forest plantations is ideologically motivated as the responsibility for the future generations [56], and foresters are cherished as wardens of the care for the coastal environment [60].

On an international scale, mobile dunes are valued as very diverse and variable environments and as multifunctional systems with great importance for our society [61]. Human activities such as forestation, recreation, or urbanization are perceived as disorder and left outside the reversed and the ecologically delimited boundaries of the concept of dunes. Forests and other human interventions into dunes are aliens to the intrinsic natural order of the very dynamic mobile dune area. As dynamic systems, mobile dunes are considered to be highly fragile, and their natural order is very vulnerable. The appeal is apparent; it is a challenge to ecologists, planners, engineers, and politicians to stop further deterioration and destruction of these fragile environments [61].

Along with Silver birch and Black alder forests, other forest landscapes under consideration comprise Norway spruce, Scots pine, and Mugo pine plantations that were planted to stabilize mobile dunes in the 19th and the 20th centuries. As a side effect of the maintenance of these plantations (which play an essential recreational role), forest vegetation proliferates into the white and the grey dune areas, thus accelerating the succession of vegetation and the natural forestation [62]. This process results in a loss of open dune landscapes. Hence, some visitors perceive the forested dune landscape of the Curonian Spit as a natural habitat, while others view it as a monument to the arduous toil of foresters who stopped the menacing sand drift.

The third group of visitors appreciate the beauty of open dunes and regard forest plantations as a redundant alien intrusion to be erased [56].

The variety of approaches taken to apply visual methods for examining people's perceptions of destinations range from the highly interventionist, wherein researchers choose the visual images to

be studied, to the highly participatory, where the research subjects themselves collect photographic representations of those images, which are subsequently analyzed by the researchers [63]. Hitherto, practical application of the psychophysical approach for eliciting the preferences for and the attractiveness of coastal landscapes founded in the landscape's physical attributes was limited. Due to the complexity of the psychophysical approach using photographs as visual stimuli, coastal research case studies focusing on aesthetic appeal still mostly rely on the objectivist paradigm [64].

However, a mixed approach to the psychophysical interpretation of aesthetic appeal combining both quantitative (paired comparison survey) and qualitative methods (semi-structured interviews and the Delphi technique) can deliver results that contribute substantially to the development of a comprehensive methodology for the aesthetic appraisal of coastal landscapes as tourist destinations. The rationale for employing the mixed approach for interdisciplinary coastal management studies is explained in-depth in our previous study [18]. This innovative approach advances research in scenic aesthetics perception and appraisal and is the first study of this kind worldwide (Figure 3). The study employed a combination of quantitative and qualitative methods requiring a quantitative paired comparison survey, whose results were interpreted using the Delphi technique and face-to-face semi-structured interviews.

We applied the method of paired comparisons for the relative ranking of dune and forest landscapes of the Curonian Spit using an approach drawn from the literature [22,65,66]. This response method consists of the systematic pairing of objects or stimuli. As each pair is presented, the observer makes a judgment indicating which member of the pair has a higher value of some attribute. In this way, aesthetic values of several landscapes can be elicited by presenting pairs of landscape scenes to the observer. On each presentation, the observer would indicate which scene is perceived to be more attractive regarding scenery. The advantage of this method is that it presents a relatively simple task for the respondent [19].

The photographer used a digital camera Nikon N5005 wide zoom with a 28–200 mm focal length Tamron lens with an approximately 75° degree field of view. It was fixed on a high-angle Gitzo tripod. It is commonly considered that photographs taken with a 50 mm lens are closer to the experience of the landscape; yet, work undertaken by Wherrett [32] found the differences between 35 mm and 50 mm focal lengths negligible. Images were obtained at a high resolution (1536 × 1024 pixels). All photographs were taken on several beautiful days in summer by the same photographer.

To avoid a potential problem of photographic representations recording a limited field of view [67], we used panoramic images presenting a viewshed within an angle of approximately 150° (double width wide zoom photos). The foreground (20 m × 20 m) was the spatial dimension used for the photographs of the forested dunes, and the near view (next 20 m × 20 m) was the spatial dimension for the photographs of the open dune landscapes. It was of an appropriate size for habitat definition and heterogeneity to be evident on a photograph measuring 30 cm × 15 cm while allowing for vegetation detail to be seen [65,68].

Finally, in the screening phase, a team of professional judges made a unanimous group decision on the ultimate selection of the photographs, ensuring that all possible combinations of the surveyed landscape attributes (stages of succession, heterogeneity, and naturalness of scenery) were indeed represented by the images selected [32,68]. The final set comprised monochromatic double photos representing all dune landscape types and land features on the Curonian Spit from different viewing positions. As the visual conditions are quite diverse, and the level of patchiness of the landscapes is quite high in the dunes, we used three photographs for every analyzed landscape type [19].

Although some references on photograph-based landscape simulations indicate that lack of color makes a difference in simulation validity [69], applying larger samples of landscape photographs in the questionnaires in field conditions requires substantial funds for printing. This limitation rendered it possible to use only monochrome photographs in our survey.

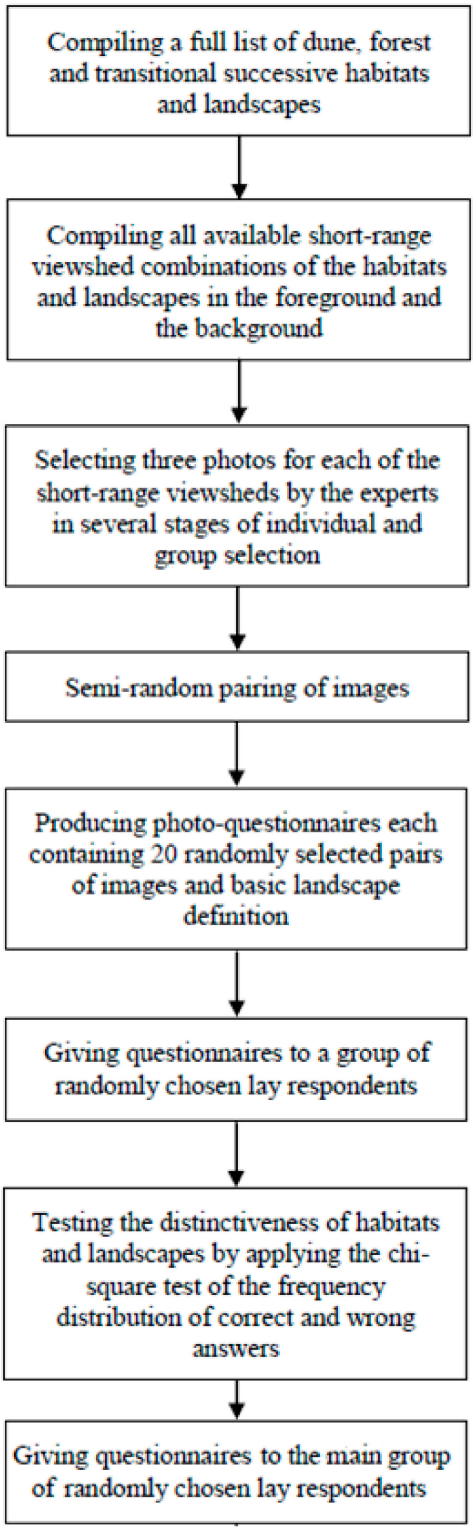

Figure 3. Research flow chart.

We relied on the argument that monochrome photography supposedly captures both the historical ambience and the closeness of tourists to the "other" nature, landscape, heritage, or local culture [19,70]. This argument is coherent with the psychophysical approach on which our study relied.

Before the survey, we compiled a full list of dune, forest, and successive transitional habitats of the Curonian Spit using a pre-existing national database of NATURA 2000 habitats. Then, we compiled all short-range viewshed combinations of the habitats in the foreground and the near view. As a result, the

complete list of the short-range viewsheds of the Curonian Spit landscapes under scrutiny comprised 45 combinations of dunes, brushwood, and forest habitats in the foreground and the near view. Other potential short-range viewsheds of dunes, brushwood, and forests are either absent on the spit or are so rare that visitors rarely encounter them in practice.

A pre-test of the survey instrument was conducted using a Chi squared-test to identify whether the difference among different landscape type images and the equivalence of the three different images representing the same landscape type was statistically significant. As the main result of the pre-testing, we proved ($p < 0.00001$) that lay visitors of the Curonian Spit indeed distinguish different landscapes and their combinations portrayed in monochrome photographs [19]. Therefore, the 135 images representing 45 forest and dune landscapes of the Curonian Spit as well as their intermediate succession and management stages served as visual stimuli for the main paired comparison study.

The respondents had a chance to see any ten of all possible pairs of the objects (N * (N − 1)/2 = 990 if N = 45 sorted in random order. The objects were repeated 15 times with each of three photos representing each landscape with equal chances to be paired with any of the photos representing other landscapes. It yielded a final sample of 14,850 pairs presented to 1485 randomly selected visitors of the Curonian Spit. Every respondent had equal chances to receive any of the 14,850 pairs of large monochrome images for the assessment provided in ten randomly sorted pairs of photographs in a flipper album. The limit for a single evaluator was kept as low as ten pairs of photographs to be examined, considering this number to be the highest possible for an attentive and dedicated judgment by an individual [19,21,65], thus preventing visual and mental fatigue of the evaluators.

The paired comparison survey took place in July and August 2017 at the ferry pier upon leaving the Curonian Spit for the continent. While the ferry pier was convenient for the interviewer, it also was the best location because the visitors had completed their stay on the spit and had enough time while waiting for the ferry. An additional advantage was that upon departure, information was accumulated from the whole vacation experience [71], since a vacation provides an episodic memory containing personal experiences related to a particular time and place [72]. The surveys took place throughout the day, both on weekdays and weekends. The average time used by a visitor in responding to the questionnaire, including socio-demographic questions, was approximately 15 min. Respondents were assured verbally that the information they provided would be used only for research purposes and that their responses were anonymous and confidential.

The population in the study comprised all domestic summer visitors to the Lithuanian part of Curonian Spit, currently amounting to 387,000 according to the data from the toll-point (Table 2). The sample (n = 1485) included randomly selected adult domestic visitors to the Curonian Spit (0.38% of the total visitors population). We assessed two principal socio-demographic factors (age and gender) for their effects on landscape preference. The results show that the sample of respondents was not significantly different from all domestic visitors to the Lithuanian part of the Curonian Spit during the two-month study period of the peak tourism season (July and August) in terms of average age and gender ($p < 0.05$). We also found that age and gender did not have any significant effects on landscape preferences, which was in line with other similar studies [32].

Interpretation of the survey results started from the ranking of the surveyed landscapes relative to each other regarding their aesthetic appeal. The ranking was done using a simple ranking technique. It involved the calculation of the proportion of times each photo was judged as "more attractive" than any other photo. These proportions were then transformed to normalized values that represented the judgments on aesthetic values of various landscapes. For the interpretation of the ranking results, we conducted twelve interviews with local inhabitants of the Curonian Spit in April 2018 and February 2019. The interviews were in-depth, open-ended, and semi-structured around the concepts defining the aesthetic appeal of the Curonian Spit [50,73,74].

The interviewees included officials, park rangers, resort staff, and inhabitants of the Curonian Spit (Table 2). The sample was evenly distributed between women (50%) and men (50%).

Table 2. The sample characteristics and the survey methods of quantitative and qualitative surveys.

Sample Characteristics and Survey Methods	Quantitative Survey	Qualitative Survey
Number of respondents	1485	12
Representativity	Representative sample of domestic summer visitors	Representative sample of local stakeholders
Survey method applied	Paired comparison survey	Semi-structured face-to-face interviews
Survey months	July, August	April, February
Average duration	~15 min.	25–30 min.
Number of landscape types	45	45
Number of photographs	135	135
Additional questions asked	Socio-demographic questions (age, gender, residence, visit frequency)	Socio-demographic questions and opinion about the presented landscape appeal concepts

The mean age of the respondents was 43 years. The kick-off question for the interviews was "What are, in your opinion, the key elements of scenic beauty and conservation values of the spit?"; next, the stakeholders were introduced to the different concepts of landscape appeal and shown different landscape types used in the quantitative survey. They were not asked to compare but rather to tell which concepts best described the most appealing landscape types.

The concepts defining the aesthetic appeal of the five most attractive and the five least attractive landscapes of the Curonian Spit were elicited using the Delphi technique. The technique uses a series of iterative rounds interspersed by controlled feedback for the formulation of consensus judgment within a group of experts in a relevant field who do not interact directly with each other. For our study, three rounds of expert judgment were performed using an approach drawn from previous Delphi studies in landscape management and heritage tourism found in the literature [75–81]. This Delphi study was completed in April–September 2018 using the e-mail communication to relate a panel of ten experts in coastal tourism, landscape architecture, and dune geomorphology.

The visual concepts of landscape aesthetics defined by Tveit et al. [50] include:

1. *Stewardship* (the presence of a sense of order and care contributing to perceived accordance with an "ideal" situation and reflecting care for the landscape through management).
2. *Coherence* (a reflection of the unity of a scene enhanced through repeating patterns of color and texture, and a reflection of the correspondence between land use and natural conditions).
3. *Disturbance* (lack of contextual fit and coherence where elements deviate from the context due to temporary and permanent interventions occurring in the landscape).
4. *Historicity* (historical continuity reflecting the visual presence of different time layers and historical richness related to the amount, the condition, and the diversity of cultural elements).
5. *Visual scale* (perceptual units reflecting the experience of landscape visibility and openness).
6. *Imageability* (qualities of a landscape present in totality or through elements; landmarks and unique features, both natural and cultural, making the landscape create a strong visual image in the observer and making landscapes distinguishable and memorable).
7. *Complexity* (diversity and richness of landscape elements and features and their interspersion).
8. *Naturalness* (closeness to a preconceived natural state).
9. *Ephemera* (elements and land-cover types changing with season and weather).

In the scoping round, the selected experts were introduced to the conceptual framework of the hierarchical levels of aesthetic abstraction ranging from the abstract concepts to the concrete descriptors of the landscape [50]. They were asked to attribute the most suitable primary and secondary concepts

from the offered nine options to the landscape types of the Curonian Spit using the photos from the paired comparison survey and to explain their choice. The first judgments were collected, summarized, and sent back to the panelists for further evaluation.

They included the responses of other panelists so that participants could read the other opinions and adjust their own opinions.

In the next two iterative convergence rounds, the revised judgments with the feedback from other panelists were sent back again to the participants. The Delphi technique aims to achieve a higher quality of response on expert issues than a single round questionnaire could achieve [75]. As we fed back the results from the previous rounds, there was a tendency among the panelists to converge their opinions around the emerging key concepts and look for a consensus.

The objective to narrow the judgments of the respondents was successfully achieved, and a partial consensus of 80% (162 of 200) of the judgments by the experts regarding the primary and the secondary concepts defining the aesthetic appeal of the ten landscape types was reached after the third round.

3. Results

The main results of the study are summarized in Table 3 and explained in Figure 4. They show that the five most aesthetically appealing landscapes of the Curonian Spit are: (1) white mobile dunes (Figure 5), (2) white dunes with grey dunes in the background (Figure 6), (3) grey dunes with white dunes in the background (Figure 7), (4) mature Scots pine wood with dry grassland in the background (Figure 8), and (5) mature Scots pine wood (Figure 9). Meanwhile, the five least attractive landscapes of the Curonian Spit are: (41) middle-aged Scots pine woods with Juniper, (42) mature Black alder forest with middle-aged Black alder in the background, (43) young Silver birch stands (Figure 10), (44) young Black alder stands, and (45) deciduous forest clearings (Figure 11).

The results of our research also show that summer visitors of the Curonian Spit prefer open landscapes with a clear visual scale (white and grey dunes and edges of mature Scots pine woods with dunes and grassland). They also prefer artificially nurtured landscapes (Scots pine plantations) to ecologically richer landscapes of mixed young stands and brushwood. Also, all local inhabitants of the Curonian Spit value the landscapes that are denoted by the concept of coherence (Figure 4).

Coherence is a reflection of the correspondence between land use and natural conditions [50]. The key dimensions defining coherence are harmony, unity/holistic, land-use suitability, and readability of a landscape, while the main physical landscape attributes are pattern and structure [73]. In the case of the spit, coherence designates familiarity, comprehensiveness, and readability of landscapes both as a recreational space and a fragile heritage. It is enhanced by anything that helps to organize the patterns of light, size, texture, or other elements into a few significant units [82].

The most coherent landscape of the spit, i.e., which best "hangs together", according to the interviewed local inhabitants comprises mobile dunes with some patches and edges of forest vegetation (up to 50%) and occasional clumps of trees. As a whole, it presents a complex yet comprehensible scene [83].

The coherence of the plantations with an open background is notable for its similarity to the savanna environments of our speciation [42]. It offers the visual relationship between the landscape components that simultaneously afford prospect (open views from which hazards can be spotted) with refuge (protected settings that prevent one from being seen) [40]. Coherence enhances people's ability to orient themselves, which is dependent on the legibility of the landscape [84]. A coherent landscape presents itself as a structured wholeness—as a unity—which is experienced aesthetically as a pleasing harmonic entirety, a capability "to tell its story" or to deliver orientation patterns [85].

On the contrary, in the opinion of the Delphi expert panel, another two primary concepts define the aesthetic appeal of the most and the least attractive of the 45 dune and forest landscapes on the Curonian Spit, namely, naturalness (both in favorable and unfavorable terms) and stewardship (only in favorable terms) (Table 3). The secondary concepts defining the aesthetic appeal are the concepts of

imageability and visual scale defining the aesthetic appeal in favorable terms, while the concepts of disturbance and complexity define the aesthetic appeal in unfavorable terms.

Table 3. Results of the paired comparison and the Delphi survey of the Curonian Spit landscapes.

Rank	Normalized Rating	Landscape Type	Key Concepts [50]	
			Primary Concept	Secondary Concept
1.	1.00	White (open) mobile dunes (Figure 5)	Naturalness	Imageability
2.	0.92	White dunes with grey dunes (Figure 6)	Naturalness	Visual scale
3.	0.91	Grey dunes with white dunes (Figure 7)	Naturalness	Visual scale
4.	0.82	Mature Scots pine with grey dunes (Figure 8)	Stewardship	Visual scale
5.	0.79	Mature Scots pine (Figure 9)	Stewardship	Visual scale
6.	0.76	Young Scots pine with Grey dunes	n.a.	n.a.
7.	0.76	Grey dunes	n.a.	n.a.
8.	0.74	Middle-aged Silver birch	n.a.	n.a.
9.	0.73	Mature Norway spruce	n.a.	n.a.
10.	0.69	Middle-aged Scots pine with Mugo pine	n.a.	n.a.
11.	0.69	Mature and middle-aged Scots pine	n.a.	n.a.
12.	0.68	Forest glade in mature Scots pine stands	n.a.	n.a.
13.	0.68	Mature Silver birch	n.a.	n.a.
14.	0.68	Mature Silver birch with dry grasslands	n.a.	n.a.
15.	0.67	Mature Silver birch with Scots pine	n.a.	n.a.
16.	0.66	Dry grasslands	n.a.	n.a.
17.	0.62	Middle-aged and young Scots pine	n.a.	n.a.
18.	0.59	Grey dunes with middle-aged Scots pine	n.a.	n.a.
19.	0.59	Young Scots pine stands with Mugo pine	n.a.	n.a.
20.	0.59	Young and mature Norway spruce	n.a.	n.a.
21.	0.59	Middle-aged Scots pine	n.a.	n.a.
22.	0.59	Middle-aged Black alder	n.a.	n.a.
23.	0.59	Middle-aged Norway spruce	n.a.	n.a.
24.	0.59	Mature and middle-aged Norway spruce	n.a.	n.a.
25.	0.58	Juniper brushwood	n.a.	n.a.
26.	0.58	Young and middle-aged Scots pine	n.a.	n.a.
27.	0.58	Mature Silver birch with Norway spruce	n.a.	n.a.
28.	0.57	Grey dunes with young Scots pine	n.a.	n.a.
29.	0.57	Young Scots pine	n.a.	n.a.
30.	0.56	Mugo pine with middle-aged Scots pine	n.a.	n.a.
31.	0.52	Young Norway spruce	n.a.	n.a.
32.	0.52	Mature Black alder forest	n.a.	n.a.
33.	0.49	Dry grasslands with Mugo pine	n.a.	n.a.
34.	0.48	Middle-aged Scots pine with Grey dunes	n.a.	n.a.
35.	0.47	Juniper with middle-aged Scots pine	n.a.	n.a.
36.	0.46	Willow stands with young Scots pine	n.a.	n.a.
37.	0.45	Grey dunes with Willow stands	n.a.	n.a.
38.	0.45	Mugo pine plantation	n.a.	n.a.
39.	0.42	Young and mature Silver birch	n.a.	n.a.
40.	0.42	Willow stands with Grey dunes	n.a.	n.a.
41.	0.39	Middle-aged Scots pine with Juniper	Naturalness	Disturbance
42.	0.39	Mature and middle-aged Black alder	Naturalness	Disturbance
43.	0.35	Young Silver birch (Figure 10)	Naturalness	Disturbance
44.	0.35	Young Black alder	Naturalness	Complexity
45.	0.34	Deciduous forest clearing (Figure 11)	Naturalness	Complexity

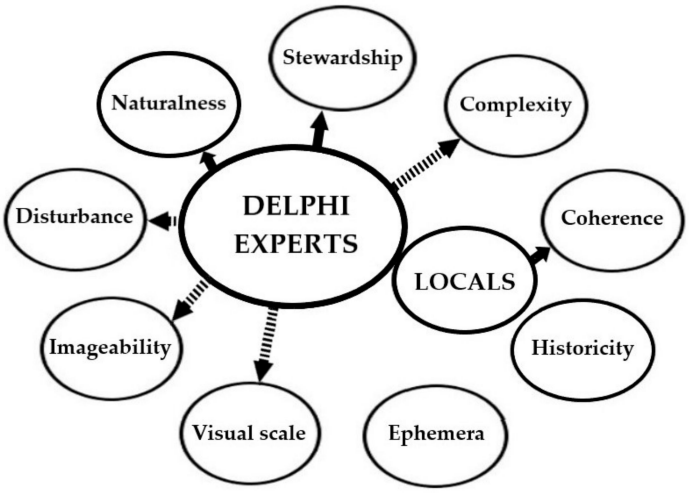

Figure 4. Key aesthetic appeal concepts of coastal dunes and forests of the Curonian Spit.

Figure 5. White (open) mobile dunes of the Curonian Spit (photo by Arvydas Urbis).

Figure 6. White dunes with grey (grassland) dunes in the background (photo by Arvydas Urbis).

Figure 7. Grey dunes with white dunes in the background (photo by Arvydas Urbis).

Figure 8. Mature Scots pine wood with dry grasslands in the background (photo by Arvydas Urbis).

Figure 9. Mature Scots pine wood (photo by Arvydas Urbis).

Figure 10. Young Silver birch stands (photo by Arvydas Urbis).

Figure 11. Deciduous forest clearing with undergrowth (photo by Arvydas Urbis).

The concept of *naturalness* indicates how close a landscape is to a perceived natural state, where perceived naturalness can be different from ecological naturalness [50]. The main dimensions of naturalness are intactness, wilderness, naturalness, and ecological robustness. As the results of the aesthetic valuation studies in the Netherlands show, opinions of different social groups differ most concerning the appreciation of natural, unmanaged coastal landscapes, such as marshes and dunes [35].

Indeed, concerning the "naturalness" concept, mobile dunes are widely acknowledged as a "natural" coastal landscape in terms of aesthetics [14] but also ecological terms [86].

Additionally, forests of the Curonian Spit might look entirely natural for lay visitors, particularly the old stands of Scots pine and Norway spruce with dense understorey vegetation. However, different from a standard assertion that the level of the succession is an expression of naturalness [84], the succession on the Curonian Spit does not indicate the degree of naturalness. The proliferation of forest to mobile dunes is a natural phenomenon. However, the national park rangers heavily regulate it by forest management activities. Instead, a more significant indicator is a varied edge between the forest and the dune habitats, which may be perceived as more natural compared to a straight edge [45].

The concept of *stewardship* reflects human care for the landscape through active and careful management as the presence of a sense of order and care contributing to perceived accordance with an "ideal" situation [50]. Sevenant and Antrop [87] found that stewardship or maintenance as a concept describing scenic beauty is correlated by viewers with the term "well maintained" as a cognitive item. In order to analyze the presence of care in the landscape, "cues of care" are used [46]. These cues are familiar to visitors and tell them whether the landscape is well-nurtured or not.

In the case of the Curonian Spit, tidy and well-kept Scots pine plantations are the most obvious example of dedicated human care for the landscape [88]. The visitors of the national park regularly mention the sense of order, the sense of care, and the upkeep as essential items determining landscape preference [18]. On the spit, large monocultural forest plantations indicate a lower level of naturalness than small forest patches in the mobile dunes. This observation is different from the notion that a landscape in which woodland consists of small, fragmented patches rather than one sizeable woodland patch may be interpreted as less natural [73].

The secondary concept of *imageability* designates qualities of a landscape present in totality or through elements, landmarks, and unique features—both natural and cultural—making the landscape create a sharp visual image in the observer and making landscapes distinguishable and memorable [50]. Imageability applies to qualities that are special for a landscape and hence make the place distinguishable from other places [89]. The landscape of the mobile dunes of the Curonian Spit is one of the most iconic landscapes in Lithuania due to its exotic features, which are unique for this country, and due to its liminality and sublimity [90].

Visual scale as a concept comprises perceptual units that reflect the experience of landscape visibility and openness. Weinstoerffer and Girardin [91] use it as an indicator defined by the ease with which an observer can obtain an extensive view over the landscape. Sevenant and Antrop [87] also found that visual scale as a concept describing scenic beauty is correlated by viewers with the term "vast" as a cognitive item. The vast landscapes of white and grey dunes of the Curonian Spit together with the dry grassland in the background of mature pine woods are appreciated for their beauty and salient societal connotations [56,90].

The concept of *disturbance* is defined as a lack of contextual fit and coherence where elements deviate from the context [50]. Other dimensions related to disturbance are intrusion, alteration, and impact understood both in terms of scenery and of landscape ecology [92]. It is a broadly interpreted concept, as the context of introduced elements determines the pattern and the scale of the impact [50].

For instance, in the worldwide survey of coastal scenery, the disturbance is defined as an audial factor rather than a visual intrusion, causing discomfort for beach visitors [3,13]. For the natural and the semi-natural landscapes of the Curonian Spit, the perceived disturbance is of natural origin epitomized by a mixture of dense forest stands with brushwood with low appeal for tourists in terms of both aesthetic delight and visitation comfort.

The concept of *complexity* is similar to the heterogeneity or the patchiness of the landscape structure correlated with landscape diversity [65]. The main dimensions are diversity, variation, the complexity of patterns, and shapes. Also, it can be divided into two properties (or dimensions), diversity and edge [93]. Diversity refers to the abundance and the evenness of land-cover classes in the view, and edge refers to the number of ecotones dividing up habitat types. However, in the case of the Curonian

Spit, complexity is interpreted as a proxy concept for landscape fuzziness in terms of attractiveness for tourists according to comments provided by the Delphi study panelists.

4. Discussion

The results of this study are coherent with the findings of other similar studies from various parts of the world. Experiences developed through tourist–landscape interactions are independent of any historical knowledge or cultural awareness of the landscape itself. They are dependent upon the cultural and the knowledge background of the viewer [94]. While comparing the landscape perception of an expert and lay people, Vouligny et al. [95] found that those two groups use different visual criteria, since an expert does not experience the landscape continuously.

Therefore, to capture the value of ordinary landscapes (i.e., landscapes that do not stand out in any particular way), a combination of expert and lay people approaches is necessary [95]. Our case study proves that this is also true for outstanding landscapes as well. As results of a similar case study from Australia show, people tend to give high importance to those attractions which are known as tourist icons for the region [96]. Likewise, a survey of forested landscapes in east Texas has shown that spatial configuration, especially openness, has an essential impact on scenic beauty [97].

Another important feature that matches the dune landscapes of the Curonian Spit with other coastal landscapes, such as the coastal landscapes of the North Sea or the Baltic Sea or the riparian landscapes of vast river valleys, is their widely appreciated aesthetic appeal [98,99]. Hence, a broad agreement is that the attention recently paid to ecosystem services, which includes cultural services such as spiritual and aesthetic experiences, encourages the consideration of scenic landscape values in land management policies [100]. However, the specific perceptions of landscape values may widely differ from one society to another. These cultural characteristics play a crucial role in how people act on the landscape; different cultures see the physical environment in different ways [101].

5. Conclusions

Three conclusions regarding the key aspects defining the aesthetic appeal of coastal landscapes for tourism could be drawn from the results of the study. First, the findings of our study support the notion that the psychophysical approach towards aesthetic appraisal using proxy visual stimuli is appropriate for the assessment of the aesthetic appeal of coastal landscapes eliciting realistic and reasonable rankings. The psychophysical approach towards valuation of the aesthetic appeal of coastal dunes and forests of the Curonian Spit embraces both the evolutionary and the cultural interpretations of landscape aesthetics in terms of "ordering of nature" [56]. It takes into account the interdependence and the multi-dimensionality among human attitudes and landscape perceptions.

The second conclusion is that it is essential to collect a representative sample of both lay and professional evaluators in order to elicit realistic ranking values of aesthetic appeal and to set a proper framework for their interpretation. As we have seen from the results of the survey and their interpretation, ecological robustness and aesthetical appeal may mean different things to different stakeholders. For instance, the locals of the Curonian Spit are well aware of the World Heritage status awarded to the Curonian Spit by UNESCO. However, there is no clear understanding or consensus of what this means. Many locals relate the UNESCO status to the beauty of the local nature and to keeping the Curonian Spit, as a seaside resort, tidy and clean [18].

Finally, it is necessary to realize that the aesthetic appeal of a landscape or a scene for tourism is transient and contingent on various landscape history and legacy effects resulting in variations of how different landscapes are valued [1,102]. The values, particularly those of coastal landscapes, change with changes in perceptions of the users towards ecosystems and their functions [103,104]. Environmental attitudes, knowledge, and experiences might influence the aesthetic appreciation of iconic and symbolic landscapes [105].

However, it is evident that imageability and visual scale of open and semi-open dune landscapes in contrast to the "messiness" of disturbance and complexity of ecologically more diverse wet forests

and clearings support the notion of the importance of the "tourist gaze" [20] for the aesthetic appeal of coastal areas as tourist destinations. With both key concepts of naturalness and stewardship related to the highest aesthetic value scores of the dune and the pine wood landscapes, we cannot confirm an essential cognitive opposition between these two concepts [50,73]. The main practical implication of the study is that the proposed method can help the National Park authorities in regulating uses and activities in landscapes that are under protection without conducting new surveys each time when they have to decide about the landscape management priorities.

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