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Rethinking the economic valuation of natural land

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**How deep is your love – of nature? A
psychological and spatial analysis of the depth
of feelings towards dutch nature areas**

3. How deep is your love – of nature? A psychological and spatial analysis of the depth of feelings towards Dutch nature areas¹⁹

Abstract – The most legally binding nature protection policy in the Netherlands and the EU (Natura 2000) designates sites based on ecological value, ensuring their sustained protection. Of less concern to this policy are the current and future nature-based needs of the public, who is experiencing increases in education, income and health. This paper assesses the overlap between favorite natural places and Natura 2000 sites, and delves deeper into the nature-based emotions of individuals and whether they differ for different nature areas. Two samples answered the Hotspotsmonitor survey - one representative of the Dutch population (N=8,908), and one comprised of members of a Dutch nature conservation organization (N=1,715). While both selected their favorite natural place in the Netherlands, the latter also answered the open question, “Why is this your favorite place?”. Spatial analysis revealed nearly identical clusters for the two samples, indicating their proximal representativeness. Results revealed a large overlap between Natura 2000 and favorite natural places. Content analysis determined that the three emotional experiences identified – ‘Peace & Quiet’, ‘Let’s Explore’ and ‘Peak’ - manifest in mostly different, but some similar nature areas. The important societal benefits of augmenting ecologically based nature protection policies with emotional valuation are discussed.

¹⁹ This chapter is based on: 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 feelings towards Dutch nature areas. *Submitted to an ISI rated journal.*

3.1 Introduction

Which natural environments are protected now, and in the future is a critical questions in land-use policy and management (Flyvbjerg et al. 2002; Lenzholzer and Koh 2010). Yet the question as to ‘why’, or, the purpose behind the policy, is of equal importance (Coeterier 1996). In land-use planning, the ‘why’ of biodiversity protection is far more developed in terms of measurement of ecological quality and biodiversity loss than the ‘why’ of psychological appreciation (European Environment Agency (EEA) 2009; EEA 2012; Milcu et al. 2013). This paper aims to contribute a deeper understanding of the relationship between these two ‘why’s by combining the micro level study of psychological nature experiences with macro level mapping of attractive nature areas (Sijtsma et al. 2012). The paper evaluates whether and to what extent, highly attractive natural areas overlap with areas protected for biodiversity value. We also explore empirically to what extent different nature areas differ in the extent to which they reflect, or, ‘supply’ distinct categories of emotion. Focusing on the Netherlands as a case study, our objective is to contribute methodologically and empirically to what Alessa et al. (2008, p. 27) call socio-ecological hotspots mapping - that is investigating, “spatial representations of social and ecological system” convergence.

3.1.1 Nature protection and appreciation

Biodiversity is declining both on the global and the European level (Chapin et al. 1998; Dobson 2005; Millennium Ecosystem Assessment 2005; Smith et al. 2000; Swift et al. 1998). To prevent these declines, the European Union created a Europe-wide ecological network of nature conservation areas - Natura 2000 - established under the Habitats Directive (92/43/EEG) and Birds Directive (2009/147/EG). The aim of this policy action is to assure the long-term survival of Europe’s most valuable and threatened species and habitats that are of community interest (European Union Council Directive 1992). The current Natura 2000 network contains both natural and ‘anthropic’ landscapes, such as traditional rural landscapes (Evans 2006; Martinez et al. 2010). Although 17% of Europe has been designated a Natura 2000 area, a high proportion of protected species and habitats have an unfavorable conservation status (60%, 77%, respectively) (EEA 2015). In the Netherlands, only 23% of species and 4% of habitats have a favorable status. Bottlenecks for achieving the targeted favorable conservation states include key environmental pressures like habitat fragmentation, nutrient loading and pollution, invasive species, climate change and unsuitable management or land use (Balmford et al. 2005; Chapin et al. 2000; Cook et al. 2006; Galloway et al. 1984; Hanski 1994; Lameire et al. 2000; Mack et al. 2000; Thomas et al. 2004).

Restoring favorable conservation status requires action in various sectors by different parties, both inside and outside the protected areas. To gain societal acceptance

and involvement, information on why the public appreciates nature areas will be important (Smith et al. 2011). The current Netherlands Natura 2000 policy has been criticized for being too technocratic – focusing only on ecological protection (BIO Intelligence Service 2011). Research has found that the most successful Natura 2000 sites have nationally mandated local management and engagement (Petrosillo et al. 2009). However, words like ‘biodiversity’ and ‘Natura 2000’ are still not commonly known to the wider public (European Commission 2013). In order to increase knowledge on the value of biodiversity for human well-being, policy efforts have been taken to promote identification, mapping and valuation of the ecosystem services that species, ecosystems and landscapes provide (Maes et al. 2012). Such information might help in increasing the participation and mainstreaming of nature conservation. However, the cultural ecosystem services such as aesthetic, spiritual or recreational services are often missing in nature policy assessments, although these are the services most directly related to the current needs of the wider public. While Natura 2000 does not turn a blind eye to human use (e.g. recreation permitted at some sites), it does not consider emotions held by the wider public in site designation. As such, the extent to which public appreciation of nature areas overlaps with Natura 2000 areas remains an open question.

This question is further amplified when considering that, despite regional differences, on average, European citizens are experiencing greater life expectancy, education attainment and health outcomes (European Commission 2010; Malik 2013). In particular, the Netherlands Human Development Index score ranks amongst the top in the EU, maintaining a healthy, high-income and well-educated population (Malik 2013). In this paper, we conceptually build on human development ideas which suggest that when basic physical and social needs are met to a greater degree, growth needs, such as self-actualization and transcendence, may become more important (Inglehart 1995; Maslow 1970a). The ecosystem services of nature and landscape may then have "shifting roles" in human development. In the early stages of development, when basic needs are of primary importance, provisioning services (i.e. agricultural production) may dominate development and appreciation, whereas later in development, services such as emotional growth also become prominent (Wu 2013). For growth needs, appreciation of the natural environment may play an important role (Kaplan and Kaplan 1989). This implies that human development may lead to a shifting appreciation of land-use over time.

3.1.2 Understanding aesthetics and feelings for nature

There is a great debate between protecting natural landscapes for ecological versus aesthetic value (Gobster et al. 2007; Nelson and Callicott 2008). Some research suggests that the ecologically healthiest nature, or the ‘naturalness’ of a landscape, are key to its being perceived as beautiful (Gobster 1999; Tveit et al. 2006; Jankovska et al. 2014). A key theory on the benefits of nature - Attention Restoration Theory (ART) - argues that

aesthetic responses to nature are an expression of underlying human needs (Kaplan and Kaplan 1989). Nature areas allow for restoration from depleted emotional and cognitive resources (Kaplan and Kaplan 1989; Kaplan 1995; 2001; Van den Berg et al. 2014; Thompson 2011), for fulfillment of personality needs or values (Caspi et al. 2005; Korpela et al. 2009), and for temporary emotion regulation (Korpela et al. 2001).

A lot of research on nature experience focuses on restorative components of nature such as ‘being away’ from one’s daily routine (i.e. within ART, Kaplan and Kaplan 1995), however, some work looks into growth experiences (e.g. transcendence, Williams and Harvey 2001), or immediate affective appraisals of nature. Emotions, which are comprised of “various cognitive, motivational, and somatic components simultaneously” (Moors et al. 2013, p. 123), can be identified across and within each approach. Specifically, within the affective appraisal framework, a grid of pleasant to unpleasant, and low to high arousal responses is identified (e.g. pleasant-low = relaxation, and pleasant-high = exciting) (Russell 1989). In a similar vein, Korpela et al. (2009) suggest that nature experiences exist on a continuum where experiences such as the clearing away thoughts, allows for more contemplative experiences. Specifically, the feeling of ‘being away’ - escaping physically or psychologically from one’s daily routine – has been proposed as a prerequisite to other nature experiences (Hartig et al. 1991; Kaplan 1995). This experience could be accompanied by low arousal pleasant feelings such as relaxation, peace and quietude (Korpela et al. 2001; Korpela and Hartig 1996; Tyrväinen et al. 2007), and reflection (Pearce 2005).

On the opposite end of the conceptual continuum are peak or transcendent nature experiences (Maslow 1970b, Williams and Harvey 2001), or what planning and tourism research calls ‘intangible’, ‘spiritual’ or ‘higher’ nature values (Kler 2009; Sijtsma et al. 2013b). These tend to be infrequent (James 1920; Maslow 1970b; Natural England 2009; Townsend and Weerasuriya 2009), and can include feelings such as a sense of spirituality, unity, timelessness, absorption, and harmony (Csikszentmihalyi 1992; Williams and Harvey 2001). Such experiences also tend to occur in more wild or remote natural environments (Davis and Gatersleben 2013), and, can inspire environmental concern (Fredrickson and Anderson 1999; Kaplan and Kaplan 1989).

So from the literature we can see at least two psychologically distinct categories of emotions related to nature and landscape, which we may call: ‘peace and quiet’ and ‘peak’. There seems to be a final category which lies conceptually between these two captures experiences such as freely exploring (Hartig et al. 1991) or recreating in nature (Townsend and Weerasuriya 2010). Being more dependent upon physical exertion, these experiences involve higher arousal levels, and, at times involve confronting challenges in nature (Natural England 2009), which can lead to a sense of mastery and competence (Kaplan and Kaplan 1989). These experiences require an environment strong in “extent”

(within ART), defined as the realization that one's immediate environment allows for exploration by being coherently connected to a larger varied area (Hartig et al. 1991; Herzog et al. 1997; Kaplan and Kaplan 1989, p. 184). One might call this third in between category of emotions 'let's explore'.

As stated above our objective is to contribute methodologically and empirically to spatial representations of social and ecological system convergence (Alessa et al. 2008). Building upon Sijtsma et al.'s (2012) suggestion that there appear to be large nature areas in the Netherlands that inspire 'deeper feelings,' this paper aims to specify and map distinct emotional nature experiences, and compare them against areas protected for biodiversity (i.e. Natura 2000 sites).

And we may now ask, will different emotion categories be distinguishable and will they appear in similar or different natural areas? Existing methodologies are somewhat limited in their ability to answer such a question. The majority of nature experience research relies upon well-established quantitative scales and remains at the micro-level of the individual (e.g. Mayer and Frantz 2004; Schult and Tabanico 2007; Hartig et al. 2007). On the other hand, research that maps nature values asks participants to map where particular values, identified by professional experts (e.g. resource managers), occur (e.g. Alessa et al. 2008; Brown et al. 2007; Rolston and Coufal 1991).

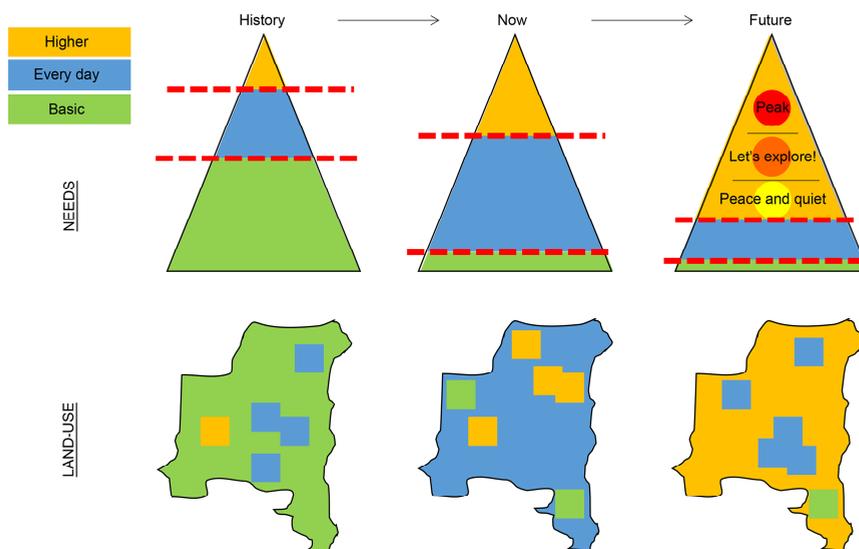


Figure 3.1 – A conceptual model: the growing importance of higher needs through time and the associated shifting needs for different land-use types

One approach lacks macro level methods and policy, and the other, the actual self-reported experiences of real visitors. While researchers have mapped attractive natural places (Bijker et al. 2014; De Vries et al. 2013; Sijtsma et al. 2012), well-being (Brereton et al. 2006; Pellenbarg and Van Steen 2011), and nature values and preferences (Ribiero et al. 2013; Tyrväinen et al. 2007), this paper adds the analysis and mapping of micro level study of psychological nature experiences from a land-use policy perspective. By using an open-ended question, we not only map the nature areas the Dutch nature visitor finds attractive compared to ecologically rich Natura 2000 sites, but also their distinct emotions and whether they differ for different nature areas.

3.1.3 Aims and hypotheses

The central argument of this paper is that because nature conservation requires long-term policy actions and public support, it is essential that policymakers consider people's aesthetic and emotional appreciation of natural areas. Cultural ecosystems may grow in importance as human development progresses. But the psychological classification of emotions, specifying the type of cultural ecosystem service is essential. Obviously we cannot directly see the future values of nature and landscape in current feelings and preferences. But we do know that as human development progresses in terms of health, material wealth and knowledge, that growth needs will become more important. If currently natural areas can provide these higher growth needs to some extent, this could serve as an indication of long term value. Figure 3.1 presents this idea conceptually, where 'higher' nature-related needs (appreciation, self-actualization) emerge as basic needs (provisioning services) are increasingly met over time, and how this may have implications on appreciation for different natural areas. When interpreting Figure 3.1 two points are noteworthy. First, although basic needs could be seen as becoming less prominent over time, they have to be met continuously and simultaneous to other needs. Second, the land-use surfaces shown are meant to convey the idea (not realistic projections) of increasing importance in appreciation.

Building on this conceptual framework, and focusing on the Netherlands this paper sets out the following threefold goals and associated hypotheses: (1) To determine whether and how attractive nature areas, as perceived by the average Dutch citizen, overlap with Natura 2000, including what nature types this overlap represents. We hypothesize that there may be substantial differences between Natura 2000 areas and appreciated areas. (2) To categorize the emotional responses of a sample of citizens identified analyzing their statements about appreciation of specific natural areas. We hypothesize that it is possible to indicate the importance of areas for different emotional needs, i.e. with different depth of emotions, using text content analysis. (3) To assess if 1 and 2 are connected by exploring whether there are differences between different nature areas as to what needs they serve to which extent and what implications this has on nature

protection policy. We hypothesize that different nature areas will show different emotional profiles.

3.2 Methods

3.2.1 Sample data

The central data used in this paper's analyses are derived from the Hotspotmonitor survey database as per December 2014 (see www.hotspotsmonitor.nl). On the Hotspotmonitor survey respondents are asked to mark which place with nature area they find "attractive, valuable or important" on a national map of the Netherlands in a Google Maps-based environment and then to answer several questions regarding that place. While the selection of a nature area as attractive supports the systematic assessment of non-monetary values in landscape impact evaluations (Sijtsma et al. 2013a), the open-ended responses about why a particular area attractive identify people's latent emotional needs related to these places.

In this paper, we split the available Hotspotmonitor datasets as of December 2014 into two. The first set then contains all data using the GfK internet panel (see De Vries et al. 2013; Sijtsma et al. 2012). In terms of socio-economic profile, these are representative for the Dutch population, because the data is acquired with the prerequisite that the respondents are representative. The average age of the respondents in this set is 48 years, and 46% have a university or higher vocational degree. This combined set contains $N = 8,908$ national markers. We use this set because it gives the largest spatial precision for the cluster analysis, showing which areas are appreciated by the general Dutch public.

The second dataset contains data from members of Natuurmonumenten, the largest private nature conservation organization of the Netherlands (~750,000 total members). The data come from a survey among the internet member panel of Natuurmonumenten who were asked to fill in the Hotspotmonitor (Sijtsma et al. 2012). This set differs from the GfK set in three respects: they are member of a nature organization, indicating their support for nature protection; they are older with average age of 56 years; and they have higher education levels (67% have a university or higher vocational degree). The Natuurmonumenten set contains 1,728 markers, fourteen of which were excluded from spatial analysis because they plotted outside of Dutch municipal borders (Statistics Netherlands and Netherlands Cadastre, Land Registry and Mapping Agency 2013). This dataset was chosen because it contains open-ended responses about why the nature area they chose is attractive to them; these open answers facilitate the textual analysis on the basis of which we classify their psychological appreciation.

3.2.2 Analysis

In order to designate hotspots areas based on the 8,908 national Hotspotmonitor markers (Figure 3.2), we used the measurement approach as well as the specific parameters that De Vries et al. (2013) applied to designate hotspot areas. This approach identifies the degree to which Hotspotmonitor markers are clustered in particular areas across the Netherlands. Areas where markers are more clustered than a particular cut-off level are then designated as hotspot areas. Specifically, hotspot areas were defined as contiguous 250x250 meter grid cells with at least an average of 0.4 markers/km² surrounding their centroids within a 5 kilometer radius.

To investigate not only what nature areas respondents find attractive generally, but also why, we performed a content analysis of each respondent's emotional experiences in nature. Content analysis is a method whereby in-text patterns and themes are identified for the purpose of creating and coding categories with specified criteria (Krippendorff 1980; Stemler 2001). Spatially explicit data was derived from the following question: "Please indicate, in your own words, what makes this exact spot attractive to you?" Responses ranging in length from 1 to 250 characters were inductively analyzed through the following process. Next, codes were recommended, discussed and finalized. Finally, all three coders gathered in the same location, where, after each privately read and coded a response, codes were shared aloud. Discrepancies were resolved through discussion.

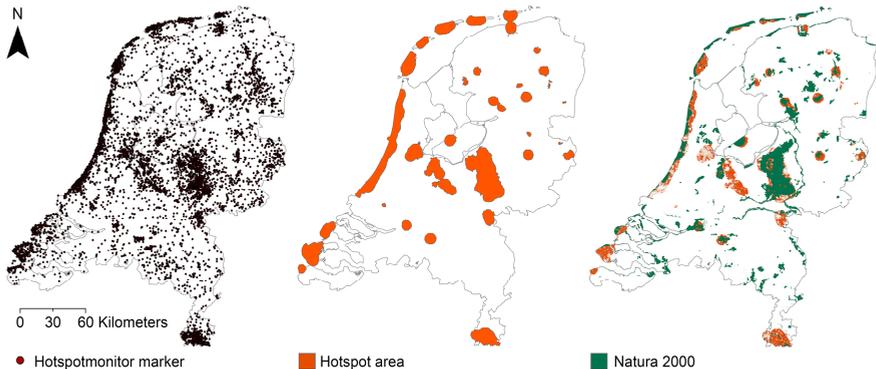


Figure 3.2 – left) Markers from stratified Hotspotmonitor (HSM) surveys representing the perceptions of favorite nature areas by individuals; center) hotspot areas identified from clustering of HSM markers, thus representing the larger public; right) overlap between Hotspot areas and Natura 2000 areas, on natural land.

Spatial analysis for this Natuurmonumenten dataset again used method of De Vries et al. (2013). Hotspot areas were delineated using markers included in the Natuurmonumenten dataset. Because this dataset has significantly fewer markers (1/4th) than De Vries et al. (2013), we used a cut-off point four times lower than their 0.4 cut-off point to delineate hotspots clusters from marker densities, merging all cells for which at minimum 0.1 marker/km² within a 5km radius.

3.3 Results

3.3.1 Attractive hotspots and protected areas

To answer the first question as to the extent of overlap between attractive hotspots and Natura 2000 areas, analysis indicated an overlap of 63% (see Figure 3.2). Figure 3.2 shows the overlap of nature included in Hotspot areas with Natura 2000 areas. There is great overlap in some areas, and limited overlap in others. The larger Natura 2000 areas are all mostly identified as attractive hotspots. The areas of greatest overlap are for almost all Natura 2000 areas near the northern and western coast (e.g. Kennermerland, Coepleduynen, Meyendel, the North-Holland dune reserve, the dunes of Vlieland, the dunes and lower lands of Texel), and holds as well for inland Natura 2000 sites (e.g. the forest area of the Veluwe, the heathlands of Dwingelderveld, Sallandse Heuvelrug and Loonse and Drunense Duinen, and the swamps of Oostvaardersplassen, Biesbosch, Wieden and Weerribben, and Lauwersmeer).

There are three large areas where the attractive nature area markers do not overlap with Natura 2000 areas. The largest misfit is in the large area in the middle of the Netherlands, the Utrechtse Heuvelrug, a hilly forested area, not designated as a Natura 2000 site. The second largest area with limited overlap is located in the south-east. This area (Zuid-Limburg) can be characterized as a hilly, mosaic landscape with small patchy nature areas (some of them Natura 2000 sites) and extensive agriculture. In this mosaic landscape, the cluster of the markers – of average Dutch citizens – differs from the patchiness of the nature areas. The third largest difference between Natura 2000 and attractive areas occurs in the western part of the Netherlands at the coastline of the North Sea. A large part of these clusters are the dunes designated as Natura 2000 sites and/or protected nature within the National Ecological Network. However, in the clusters also the agricultural grasslands behind the dunes seem to be part of the clusters. This is most notable in the north-western and south-western islands - these grasslands are often rich in agricultural birdlife and some are within the National Ecological Network. Some coverage outside of the narrow coastline may, however, also be a result of the width inherent to the clusters given how these are constructed.

In general, overlap between nature protection areas and areas of high collective experience value is relatively high, particularly considering that the non-Natura 2000 areas were often protected by the National Ecological Network. Although the collective Hotspot areas show considerable overlap with Natura 2000, of the 8,908 individually placed markers considered here, 39% still did not fall within Natura 2000. Next, we will take a closer look at the balance between protection and appreciation through an analysis of the ecological value and experience value of distinct types of nature. Figure 3.3 shows for different types of nature (including agricultural areas) to what extent they are protected by Natura 2000 or not. These are the upper horizontal bars for each nature type. The lower horizontal bars show how much of both types of area is found attractive by the average Dutch citizen (using the areas from the cluster analysis above).

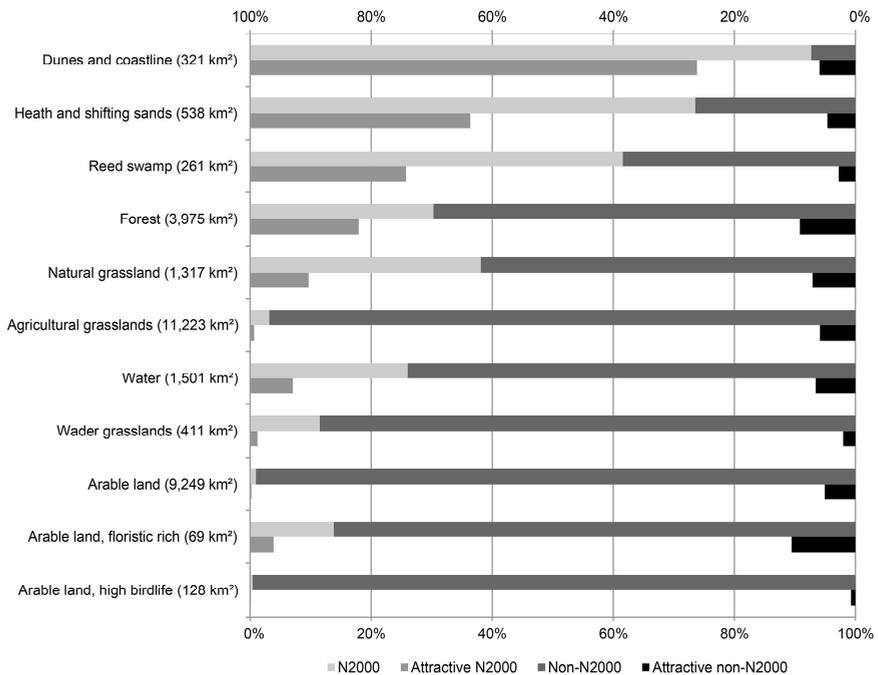


Figure 3.3 – The amount of area designated as Natura 2000 and within a Hotspot areas per nature type. In parenthesis, the total area of each nature type within the Netherland is provided.

The overlap between Natura 2000 and attractive hotspot areas vary across nature types (Figure 3.3). The most overlap appears for beaches, dunes, and sandbars, followed by heath, reed swamp and forest. Regression analyses indicates a similar variation among

the different nature types inside and outside Natura 2000 areas ($r^2 = 0.83$; $y = 0.80x + 19.16$; $p < 0.05$ with x and y as the proportion of a nature type within hotspot clusters in- and outside Natura 2000 areas). Because this regression line lies above the $y=x$ line, it is clear that the level of appreciation per nature type is in general higher in than outside Natura 2000 areas. In addition, the proportion of the various nature types in hotspots areas is positively correlated with the proportion of these nature types in Natura 2000 sites ($r^2 = 0.66$ $y = 0.78x + 1.84$, $p < 0.05$), which suggests that designation of Natura 2000 areas is, in general, substantially in line with the appreciation of the nature types by the general public. Exceptions are agricultural pastures and common fields which are sometimes highly appreciated (for example area in the hilly south), but not designated as Natura 2000 areas.

3.3.2 Classifying distinct nature related emotions

In the analysis of the open-text answers of the Natuurmonumenten dataset, thirteen emotional experience codes were identified (Table 3.1). These were reduced to three categories based on their alignment with one another and the research outlined in the introduction: ‘1-Peace and Quiet,’ ‘2-Lets Explore!’ and ‘3-Peak.’ Because only a third of markers contained emotions, categorizing them into groups was necessary, in order to have a critical mass for spatial analysis. If a participant reported at least one of the sub-emotions in a given category, they were recorded as having experienced that category. Two codes, beautiful and nostalgia, were evident in the data but excluded from analysis. Beautiful was excluded for two reasons – first, it could refer to an emotion or objective description (Natural England 2009; Zube et al. 1982), and second, it theoretically exists across responses since respondents are asked to mark an area they find ‘attractive.’ The code ‘nostalgia’ was excluded from spatial analysis because it was not spatially compelling.

Table 3.1 – Emotion categories

	% of all responses N = 1,728	% of all emotion responses N = 795
Peace & Quiet- 1 (461)	26.7%	58.0%
Let's Explore- 2 (157)	9.1%	19.7%
Peak- 3 (177)	10.2%	22.3%
Total: 795	46.6%	100%

Note: The total for each emotion category were determined by giving that category a ‘1’ if any of the sub-emotions within that category were present in a response.

Emotion categories were formed by the presence of any sub-emotion in a response. Because more than one sub-emotion was sometimes present in a single response, the number of sub-emotions (982) is higher than the total N of emotion categories (795) (46.6% of the sample). Table 3.1 presents the percent of each emotion category. The first column presents the emotion category itself (e.g. Peace & Quiet)

followed by the frequency of this category in parenthesis. Table 3.2 presents the frequency and percent of sub-emotions in each emotion category. Between 1% and 3% of respondents reported emotions in more than one category (e.g. Peace & Quiet and Let's Explore). 'Peace and Quiet-1' experiences includes a sense of being away (e.g. from the everyday or city life), cognitive relaxation, rest, and peace. 'Lets explore!-2' experiences include feeling alive, invigorated, and free to explore. 'Peak-3' experiences include feeling fascination, timelessness, overwhelmed, connected to nature, and the connectedness of nature in general. Much of the non-emotional textual content (roughly 2/3rds) contained a description of the nature area itself. Indeed, not only do forests, dunes and beaches represent the majority of emotion markers, these were the most commonly mentioned nature types (13.4%, 11%, respectively).

Table 3.2 – Sub-emotions in each category

	Frequency	%	Sample quote
<i>Peace & Quiet- 1</i>			
1. Rest	97	9.9%	"The sea, rest; you will come to rest."
2. Being away	230	23.4%	"It's a whole different world than the world of everyday life."
3. Peace; calm	239	24.3%	"tranquility in nature"
<i>Let's Explore- 2</i>			
4. Alive; invigorated	24	2.4%	"Inviting nature!"
5. Freedom; wandering	140	14.3%	"carefree wandering" "I must go as far as possible"
<i>Peak- 3</i>			
6. Connectedness all	62	6.3%	"Dear and intense moments...so dynamic, autonomous, strong presence, but also vulnerable"
7. Overwhelmed	55	5.6%	"the immensity of nature in which man seems a tiny crumb"
8. Connected self & nature	50	5.1%	"was here as a child for the first time and was overwhelmed by the shifting sands"
9. Timelessness	48	4.9%	"The endless vastness and emptiness of these beaches" "The sea is the end for me"
10. Sense of divine	10	1.0%	"Lovely sanctuary" "exactly, salvation"
11. Fascination, awe	27	2.7%	"awesome!"
Total sub-emotion codes	982	100.0%	

Note: more than one sub-emotion category was coded for several responses, thus the N of sub-emotions (982) is higher than the N of emotion categories (795).

3.3.3 Spatial differentiation in emotions

To address the third goal of this paper, a comparative analysis of the two cluster analyses revealed that the two samples markers have a nearly identical percent of markers within the Hotspot areas, indicating proximal representativeness of these cluster areas: for the GfK hotspot markers, which represent the general Dutch public, 63.1% of the markers fall within the cluster areas and for the Natuurmonumenten sample, the areas enclose 60.9% of the markers.

To explore whether different nature areas are linked to experiences in different emotional categories, we looked at the dominance (percentage share) of the different classes within the overall responses for an area. This combined spatial cluster and psychological experience analysis revealed differences between the spatial distributions of distinct emotion categories across hotspot areas (see Figure 3.4). Peace & Quiet showed the highest percentages in the Wadden and Borger areas, which contains predominantly coastal and rural landscapes, respectively. Let's Explore showed the highest percentages in Oosterwijkse bossen, a forest in the southern part of the Netherlands, in Oostvaardersplassen, a swamp in the central part, and in the Wieden and Weerribben (see #14 on map 2), a national park known for its wet semi-natural grassland and swamps, amongst other nature reserves. Peak emotions showed the highest percentages in nature areas in the eastern part of the Netherlands, such as the countryside river valley of Vechtdal (the Valley of the River Vecht), and the forest, Groesbeekse bos.

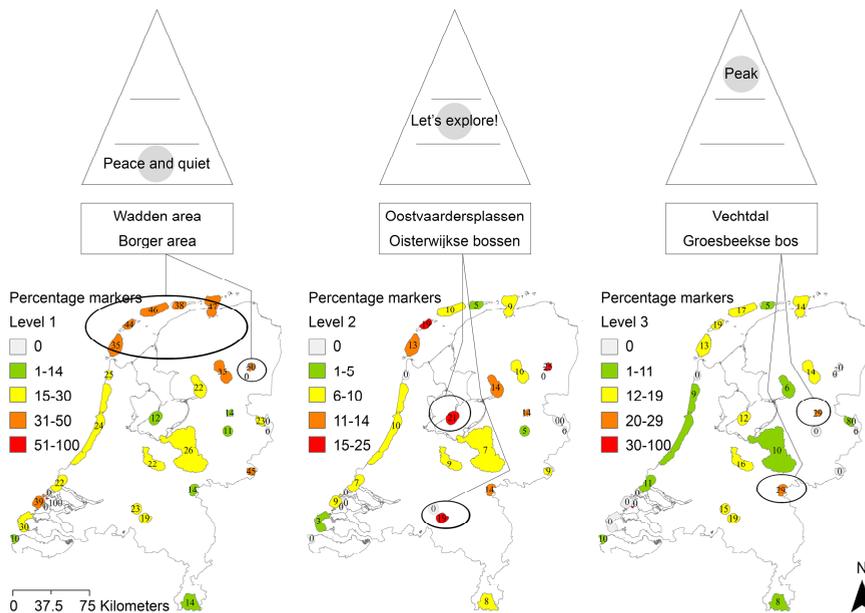


Figure 3.4 – Map of emotion category density

The data also suggest that different emotion categories overlap differently with Natura 2000 areas. Let's Explore- 2 markers overlapped the most (67.0%), followed by Peak- 3 (65.0%), and Peace & Quiet- 1 (58.4%). Finally, Figure 3.5 shows the results of all three emotion categories together on a continuum of psychological intensity (the

darker the area, the more emotions reported). The clusters that contain the highest percent of emotions, representing the highest ecosystem service need, are seen in the Wadden Islands, specifically, Terschelling, Vlieland, Schiermonnikoog, as well as in the rural, forested, landscape of Borger, the Vechtdal river valley near Ommen, and the Winterwijk area which offers a rural landscape with streams. This underlines that while all Hotspot areas in Figure 3.5 are highly appreciated by members of Natuurmonumenten, some areas may evoke more emotion than others.

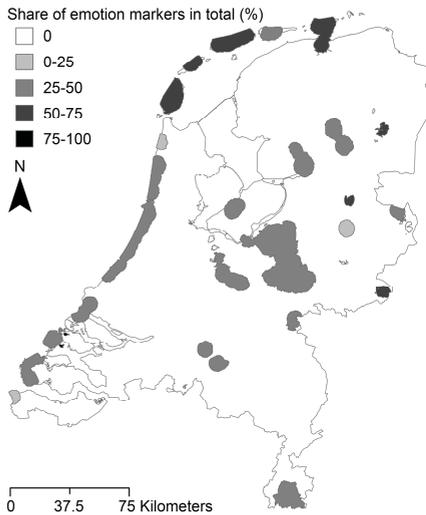


Figure 3.5 – Map of overall emotion density. This map gives the percent of markers associated with any of the three classified emotions within each cluster, relative to the number of all markers from the Natuurmonumenten sample used in the content analysis.

3.4 Discussion

The goals of this study are threefold: (1) to determine the overlap between attractive nature areas, as perceived by the general public in the Netherlands, with Natura 2000, including what nature types this overlap represents; (2) to categorize the emotional responses of a sample of citizens using a classification of nature experience needs approach; and (3) to assess if 1 and 2 are connected by exploring whether there are differences between different nature areas as to which needs they serve to which extent and what implications this has on nature protection policy. Each are discussed in turn below.

As to the first goal, contrary to our hypothesis that there would be substantial differences between Natura 2000 areas and attractive nature areas, a large overlap was observed. This positive correlation was also visible in our analysis of nature types – that is, the more attractive nature types have more protected area in Natura 2000 sites. This could be due to respondent’s explicit knowledge of the areas ecological value, or underlying factors related to ecological quality or appreciation, such as limited pollution or noise. Despite this positive relationship, there were several smaller areas where Natura 2000 areas and attractive hotspots did not overlap, many of which were national nature reserves, or landscapes with heterogeneous areas located at the boundary of Natura 2000 sites. Although these areas are not Natura 2000 sites, there is still a high correlation between ecological values with attractiveness since most are nationally protected nature areas. For instance, the misfit in the heterogeneous landscape in the southern part of the country suggests that the attractiveness of this area depends not only on the varied nature and the species and habitats within it, but the wider landscape including the (extensive) surrounding agricultural areas. These areas might also be considered worthy of national or international protection. The misfit in areas around Natura 2000 sites might be due to fact that individuals do not perceive the formal legal boundaries of nature areas. It may also be that our method of clustering markers only by their locations, without spatial landscape information (e.g. vegetation structure, land use), led to clusters that were wider than the designated nature areas and as a result include developed land in between, or next to, natural lands.

As to the second goal of this paper, consistent with our hypothesis, we found a method of assessing the importance of nature areas for different hierarchical needs, with different depths of emotion. Content analysis revealed three types of emotional experiences – 1-Peace & Quiet, 2-Let’s Explore, and 3-Peak.

Across emotion categories, the highest densities were evident in the large nature areas along the coastline and scattered in the central part of the country. However, specific categories showed up more so in some locations than others. 1-Peace & Quiet were reported the most frequently and represented basic emotion nature needs such as ‘being away’ and ‘rest.’ These represented the majority emotion in almost every high marker density region, echoing previous research that defines this nature experience by its accessibility (Natural England 2009). The Wadden and Borger areas, with coastal and rural landscapes had relatively high levels of 1-Peace & Quiet markers. 2-Let’s Explore emotions showed unique regional representations in several national parks and nature reserves, such as the famous, new wilderness area of the Oostvaarders plassen. Finally, 3-Peak emotions mostly occurred in remote central and eastern countryside and forested areas, echoing previous research that ‘intangible’ nature experiences are infrequent, and tend to occur in distant, spectacular and varied nature (Alessa et al. 2008; Davis and

Gatersleben 2013). The density of ‘emotion markers’ was relatively high in Natura 2000 areas. Those areas overlapped the most with Lets Explore, followed by Peak and the least with Peace & Quiet emotional experiences, which was surprising since respondents most frequently reported these. However, this may be due to the fact that these more accessible nature experiences can occur in several nature areas (Martens et al. 2011; Van den Berg and Ter Heijne 2005), including those of less conservation value.

Future research should investigate how the emotional categories identified in this study are comparatively predicted by demographic, spatial and related psychological variables (e.g. connectedness to nature). Such a model would be particularly interesting if a time-series were employed, where nature experiences unfold in phases - the clearing away of random thoughts allows for recovery from directed attention, which allows for deeper contemplation and reflection on personal matters (Kaplan and Kaplan 1989; Korpela et al. 2009). The additional inclusion and mapping of climate change impacts (Meyer et al. 2010) could also assess whether emotional attachments to nature are changing, as the climate changes.

The second goal of this paper has societal implications in terms of which experiences and environments afford emotional growth given increases in wealth, health and education (EC 2010; Malik 2013). Research on emotional nature experiences is critical given their ability to inspire psychological expansion (Fredrickson 1999; Heylighen 1992; Kaplan and Kaplan 1989) and environmental concern (Dietz et al. 2009; Jongman et al. 2004; Kals et al. 1999). Indeed, some suggest that in failing to provide opportunities for psychological growth to an increasingly ‘satisfied’ citizen, the so-called ‘hedonic wheel’ can start to spin, where no matter the amount of money or resources consumed, happiness levels do not increase (Diener 2000).

As to the third goal of this paper, our hypothesis that different nature areas would show different profiles as to which needs they serve most was partially supported. While the content analysis revealed this to be true, a comparison of the general public with the Dutch nature organization samples revealed nearly identical clusters. In other words, the attractive nature areas chosen by the general public were nearly identical to the members of the nature organization, who are older, more educated, and nature conservation supporters. Challenging the European biodiversity monitor’s conclusion that the wider public is not familiar with Natura 2000, our results show that Natura 2000 areas are highly appreciated by the general public and nature conservation supporters. Future research could investigate whether the general public is as aware as Natuurmonumenten members that these areas are Natura 2000 sites, and whether or not they report the same distinct spatial emotional needs in the same areas.

Finally, consistent with some of the most frequently designated Natura 2000 nature types - forests (32.3%), coastal saline habitats (16%) and inland sand dunes (1.6%) (Mucher et al. 2009), our results revealed that dunes, coastline and forests represented much of the overlap between appreciated nature and Natura 2000 areas. Triangulating these results with the open ended data, forests, dunes and beaches nature types were the most commonly mentioned nature types. This suggests that nature policies set up to protect and conserve these types of nature for ecological value could be further legitimized by emphasizing the basic and deep experience value that the Dutch public attributes to these areas. We conclude that such information, quantified in policy indicators, may provide important information as to what land to protect and why for long-term land use, nature and environmental policy.

3.4.1 Policy implications

Current nature protection policy overwhelmingly refers to ecological motives and the directives of the EU, rather than aesthetic or emotional appreciation of nature, particularly in the Netherlands (Groote et al. 2006). This paper shows that cultural ecosystem services (emotional value) can be monitored and assessed in terms of policy-relevant indicators. It is clear that both the general public and the members of Natuurmonumenten appreciated the same areas and nature types within these, and that different nature areas satisfy distinct emotional needs. These results provide added support for protecting areas rich in biodiversity, such as Natura 2000. For instance, monitoring how the overlap between appreciated hotspots and Natura 2000 evolves over time might be useful in assessing trends in appreciation of current policy prioritizations as well as gauging public sentiment towards new site designations. On the other hand, future research might explore whether showing the high appreciation and emotional value of a site could help in protecting areas of declining ecological value, protected or not. This information could indeed be helpful in garnering resources to strengthen existing Natura 2000 sites with low conservation status in the Netherlands.

Current Dutch policy documents speak to improving the public's involvement in nature conservation (Dutch Ministry of Economic Affairs 2014). While our analysis revealed that the majority of the current policy prioritization is well-aligned with spatial-emotional needs, expanding this questionnaire to other groups, such as residents in the proximity of Natura 2000 sites or visiting tourists, could be useful for local planning. Specifically, knowing which areas overlap with which spatial-emotional needs would benefit site managers in deciding which areas need to be strengthened, particularly if tourists prefer to visit and pay for nature destinations that are known to have a protected status. As the results indicate that many of the hotspot markers were also outside of the Natura 2000 areas, it is clear that focusing on biodiversity hotspots alone does not fully grasp citizens' spatial-emotional needs. Areas with a high density of markers outside the

Natura 2000 might be prioritized for national funding, whereas targeted or regional funding could support areas with less-pronounced densities.

3.4.2 Limitations

Several limitations regarding sampling and data exist. One of the samples was representative for the general public (GfK sets), whereas the other was not (Natuurmonumenten) – this sample was biased in terms of income level, age and their support for nature protection. This was partially addressed by the discovery that the more representative GfK sample could serve as a proxy. What remains unknown is whether the emotional responses of the members of Natuurmonumenten are similar or different to spatial-emotions of the general public. In terms of open-ended data, the language provided by respondents varied greatly in terms of the quality, frequency and openness of emotional expression. Finally, as the field of participatory GIS and hotspots mapping is relatively new, the accuracy of the points selected by participants is at times imprecise (Alessa et al. 2008). Even with 100% accuracy in terms of marker location, without field research, the psychological and emotional value of text analysis remains limited.

3.5 Conclusions

This paper explored attractive nature areas and emotions in nature and how these are related to nature protection policy goals. We showed the use of a method and indicator measuring the emotional meaning that different nature areas hold to visitors. Although more research is needed to confirm these results, we found that attractive nature areas overlapped significantly with Natura 2000 sites, indicating a strong relationship between ecology and appreciation – this was strongest for areas that inspired a sense of freedom and exploration. We also found that measuring emotions in different categories reveals important differences between nature areas, indicating variation in how the public perceives cultural ecosystem services. Identifying and mapping spatial-emotional needs provides added justification for stringently protecting ecologically valuable nature areas. In addition, the method shows that binding European nature policy does not automatically protect all highest-valued nature areas. Explicitly adopting emotional value as a reason for protection may be a logical next step for spatial planning strategies aimed at the long-term well-being of citizens.

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