Identifying and mapping cultural services in Berg en Dal by applying a participatory mapping tool

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Preface and Acknowledgements

This thesis could not have been carried out without the support of a number of people. Therefore, I wish to express my gratitude for their contribution to my final report.

I like to thank all people who are contributing to the CP3-project. Without this project, I would not have been given the opportunity to carry out my research in Berg en Dal. Also, I really enjoyed my time spent to get to know some of the research partners from Austria and Germany last July. I wish them all the best in continuing to carry out their research.

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Finally, I wish to express my gratitude to all my family and friends for their continuous support in various ways throughout the time spent working on my thesis.

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List of Acronyms

CES = Cultural Ecosystem Services

EU = European Union

LDP = Landscape Development Plan

PPGIS = Public Participatory Geographic Information System

SPSS = Statistical Package for Social Sciences

TEEB = The Economics of Ecosystems & Biodiversity

Summary

The concept of ecosystem services is increasingly used to support the management of natural resources. This concept entails four categories namely: provisioning services, regulating services, supporting and habitat services and cultural services. This thesis is focussed on the category cultural services, which are the non-material benefits people obtain from ecosystems and include aesthetic, spiritual and psychological benefits.

Present-day frameworks to assess ecosystem services consider (mostly) the biophysical and economic values of ecosystem services. Only one other study states that many cultural services cannot be appropriately represented through economic valuation. Furthermore, the cultural benefits that landscapes are providing are usually ignored and, consequently, the cultural services remain underrepresented in ecosystem-services research. Since characterizing, identifying and mapping cultural services lags behind mapping other ecosystem services, better mapping approaches must be developed.

This thesis applies a participatory mapping approach to identify a broad set of social perspectives related to landscape elements. The approach aims to characterize, identify and map cultural services of the municipality Berg en Dal in the Netherlands. This thesis aims to gain insight in how Berg en Dal's landscapes are experienced and used by different people.

The research area Berg en Dal, which is situated east of Nijmegen in the province of Gelderland, consists of an important nature restoration area with floodplains, forested 'hills' and mixed agricultural lands. The area offers a diverse and unique agricultural landscape.

To better understand the various cultural services, a Public Participatory Geographic Information Systems mapping approach was used. This method uses spatial methods and technologies to capture and use spatial information, and engage the general public in identifying and mapping place-based cultural services. I carried out the thesis' fieldwork in June and July 2016 and the data was collected with support of the online mapping tool Mapscape and a questionnaire to which fifty people responded.

The results show that two-thirds of all respondents are engaged in recreational activities. A quart of the respondents were engaged in several other nature related activities and one tenth engaged in sports activities.

The cultural services as expressed in carried out activities are from this point onwards referred to as Cultural Ecoystem Services related activities (CES-related activities). For most CES-related activities that were carried out, the preferred areas are situated in the floodplains of Ooij and Kekerdom, and in the forested areas in the central and western parts of Berg en Dal. In the mixed agricultural lands that are located south of the floodplains, several CES-related activities were carried out, whilst a few of these CES-related activities were carried out in the mixed agricultural lands that surround Groesbeek.

The respondents to this thesis' questionnaire carried out most CES-related activities on agricultural grasslands, forests and natural grasslands whilst hardly any of these CES-related activities were carried out in agricultural lands, urban green spaces and built up areas.

This thesis also shows that visitors appraise higher values to landscape features than local people. Furthermore, the respondents experience Berg en Dal's landscapes significantly better compared to the respondents of another study that was carried out in Berg en Dal in 1997. For the future development of Berg en Dal, the respondents do not want to increase the

area for intensive agriculture but favour an increased focus on multifunctional agriculture (e.g. local food production, recreation and biodiversity).

Few respondents indicate to perform sports activities but various new sports activities were carried out (e.g. fitness, yoga) that were not covered in the questionnaire. The results show that sports activities that are 'traditionally' carried out indoors are increasingly taking place outdoors. Furthermore, these new outdoor activities are currently ignored in ecosystem services assessments. Another study shows that Dutch citizens prefer carrying out CES-related activities on agricultural grasslands, forests and natural grasslands and that open agricultural areas and residential areas are the least preferred. This thesis affirms these findings.

This thesis shows that a participatory mapping approach can contribute to and support characterizing, identifying and mapping cultural services. Also, (non)-favourable areas can be distinguished and this gives insight into how areas are (spatially) utilized and thus, which opportunities are provided to develop Berg en Dal in the future. Overall, Berg en Dal's landscapes are positively experienced and also offer many cultural services for various age groups.

1. Introduction

1.1 Background

The concept of ecosystem services gained increased interest to support management of natural resources and it is seen as a fruitful approach to integrate ecosystem-related values (e.g. cultural values) into (environmental) decision-making (Chan et al., 2012b). Ecosystem services are defined as "the direct and indirect contributions of ecosystems to human well-being" (TEEB, 2010). The concept of ecosystem services entails four categories; 1) provisioning services (e.g. food or fresh water), 2) regulating services (e.g. local climate and air quality regulation), 3) supporting services (e.g. maintenance of genetic diversity) or habitat services (e.g. habitats for species). The fourth, and the last category are the cultural services (e.g. recreation and mental and physical health) (TEEB, 2010).

The Economics of Ecosystems & Biodiversity (TEEB) is a global initiative that provides a structured approach to valuate and recognize the wide range of benefits provided by ecosystems and biodiversity. TEEB (2010) describes cultural ecosystem services as "the non-material benefits people obtain from contact with ecosystems. They include aesthetic, spiritual and psychological benefits". These cultural services support human well-being by providing an array of physical, emotional and mental benefits that are closely linked to specific features of the (material) environment (Raymond et al., 2014).

The (traditional) frameworks of evaluating ecosystem services aim among others to bridge the gap between ecology and economics. Conventional valuation methods consider (mostly) the biophysical and economic values of ecosystem services (Sherrouse et al., 2011). However, these valuation methods ignore the different values as perceived by stakeholders nor can many cultural services be appropriately represented by means of economic valuation (Chan et al., 2012a). Despite the growing importance (and acknowledgement) of cultural services (Raymond, 2014, Chan et al., 2012, de Groot et al., 2010), current frameworks for the assessment of ecosystem services usually do not consider the (often obscure) cultural benefits the environment is providing (Raymond et al., 2014) and consequently, cultural services related to landscapes remain underrepresented within the domain of ecosystem services research (Chan et al., 2012b).

Cultural services are nonetheless valuable to people and the identification of cultural services by landscape users can be a very powerful tool since (local) landscape management can be focussed on what people care about (Chan et al., 2012a). If cultural services are ignored in the decision-making and planning for (nature) management, decision-makers and/or management could risk to get disconnected from what really matters to people (Chan et al., 2012a). Also, by engaging respondents in the identification and evaluation of cultural services (Brown et al., 2012) landscape management can comply better with the perceptions and expectations of the users of the landscape and prevent possible conflicts on land-use and land management (De Vreese et al., 2016).

To better integrate the diverse array of cultural services that can be derived from landscapes into ecosystem service assessments, a Public Participatory Geographic Information Systems (PPGIS) mapping approach can complement the conventional

ecosystem services mapping approach. PPGIS is very useful for mapping cultural services since it can assist in the "mapping of subjective perceptions, the personal use of nature and landscape and intangible ecosystem services" (De Vreese et al., 2016). PPGIS refers especially to the spatial methods and technologies that can capture and use spatial information whilst engaging the general public (stakeholders) to identify place-based cultural services based on local knowledge (Brown and Fagerholm, 2014). The inclusion of local stakeholders to gain knowledge on cultural services also broadens the scope and the range of prevalent cultural services. By including local stakeholders, PPGIS gives the opportunity to widen the knowledge base (e.g. expert and local knowledge) (De Vreese et al., 2016) and to enhance the relevance of the research to the stakeholders (Bracken et al., 2014).

For this thesis the areas Ooij, Groesbeek and Kekerdom, that are all part of the Dutch municipality of Berg en Dal is used as research area. The area that is indicated in **Figure 1** consists of a diverse and unique agricultural landscape. The municipality manages its diverse landscapes by considering its ecological diversity and recreational values, and at the same time respecting agricultural enterprises (ZALF, 2015). The municipality emphasises a governance strategy, whose focus is on increasing both public involvement and public participation (Turnhout and Zouwen, 2010) by incorporating businesses and individuals to the management of the area. Also, there is a focus on financial contributions and/or incentives for the maintenance and development of the area (ZALF, 2015).

The area of Berg en Dal was also used in another research project in 1997, in which the landscape elements were evaluated considering how inhabitants of Nijmegen use the landscape (Coeterier, 2002). As a result from this research project, the Berg en Dal municipality initiated a landscape development plan (LDP) for the area for the period 2004 – 2014, in which the initial steps were taken for the set-up of a fund for the future maintenance and development of the landscape (Van Blerck and Van Ziel, 2004). After the finalisation of the '04-'14 development plan, the fund continued. However, the fund is not merely focussing on financial contributions from the European Union (EU), the Dutch government, the Province of Gelderland or the different local municipalities. The fund accentuates on encouraging (local) companies and other, third parties and individuals to financially contribute to the maintenance and development of Berg en Dal, eventually creating a greater sense of responsibility for the area. For the landscape development plan many different objectives were initially set (e.g. strengthening the identity of the area, strengthening the natural features, increasing opportunities for recreation, improved communication to and involvement of inhabitants in local projects) (Van Blerck and Van Ziel, 2004). Also, the landscape has changed since 1997 due to the active management and development of Berg en Dal. Therefore, it is interesting to see if changes in the management of Berg en Dal resulted in changes in landscape experiences between the respondents of this thesis and Coeterier's research results from 1997. Furthermore, it is important to analyse if the future objectives of the landscape development plan (LDP) of 2015-2025 (Blerck, 2015) are in coherence with what the landscape users prefer for the future development of Berg en Dal.

1.2 Problem definition

Cultural services (e.g. recreation, tourism, scenic beauty and (in) formal education) are critical for human welfare. However, current frameworks to assess ecosystem services usually do not consider cultural services (Raymond et al., 2014) nor can cultural services appropriately be represented by means of economic valuation (Chan et al., 2012a). Consequently, cultural services remain underrepresented in ecosystem services research (Chan et al., 2012b). Since the inventory and mapping of cultural services lags behind the mapping of other ecosystem services' categories, developing approaches to map cultural services are needed (Brown and Fagerholm, 2014).

1.3 Aim of the study and research questions

This thesis proposes to apply a participatory mapping approach to identify a broad set of social perspectives that are related to landscape elements and that aim to characterize, identify and map cultural services in Berg en Dal. This approach enables me to identify high value areas ('hot' spots) and low value areas ('cold' spots) to understand how and where the landscape users utilize Berg and Dal's landscapes. The participatory mapping approach also allows for identifying how the respondents experience landscape features, to discover significant differences between local people and visitors. Furthermore, determining whether active management of Berg en Dal significantly affected the landscape user's experience compared to twenty years ago, is interesting (Coeterier, 2002). Finally, preferences (as indicated by the respondents) for the future development of Berg en Dal are compared to the objectives of the LDP 2015 – 2025 to discover different / similar viewpoints.

This thesis' main objective is to analyse: How users experience and use the landscapes of Berg en Dal and how can participatory mapping of cultural services contribute to understanding their perceptions?

To achieve this objective the following research questions (RQs) have been formulated:

RQ1 Which cultural services are provided by Berg en Dal's landscapes?

RQ2 Where can so-called 'hot' and 'cold' spots of cultural services be located with support of the participatory mapping tool?

RQ3 Which land-use types are preferred by the landscapes' users to carry out their activities?

RQ4 Are land-use types associated with the occurrence of cultural services?

RQ5 What is the difference in landscape experiences between local people and visitors?

RQ6 How have the experiences of the landscape users changed compared to the experiences from 1997?

RQ7 What are the preferences of the respondents for the future development of Berg en Dal's landscapes?

1.4 Research area Berg en Dal

The collecting of data for this thesis took place in the Dutch municipality of Berg en Dal. The research area encompasses the former municipalities of Ubbergen, Millingen aan den Rijn and Groesbeek. Berg en Dal is situated in the province of Gelderland, east of the city of Nijmegen and situated close to the river Waal (ZALF, 2015). The municipality is also part of the national landscape Gelderse Poort (**Figure 1**). The case study area consists of a diverse and unique agricultural landscape that can roughly be split into three zones; the first zone entails floodplains with an important nature restoration area on the southern banks of the Waal river. The second zone entails the forested 'hills' on the edge of the city of Nijmegen located in the central western area and the third zone entails mixed agricultural lands, located south of the floodplains and surrounding Groesbeek (ZALF, 2015).

The Dutch government downsized both its involvement and (financial) contributions to the management of nature areas (Turnhout and Zouwen, 2010). Consequently, the municipality of Berg en Dal is emphasizing on incorporating businesses and individuals for the (financial) management of the area. As such, a governance strategy, whereby the emphasis is on increased public involvement, is applied for managing the landscape whilst considering its ecological diversity and recreational values together with respecting the agricultural enterprises.

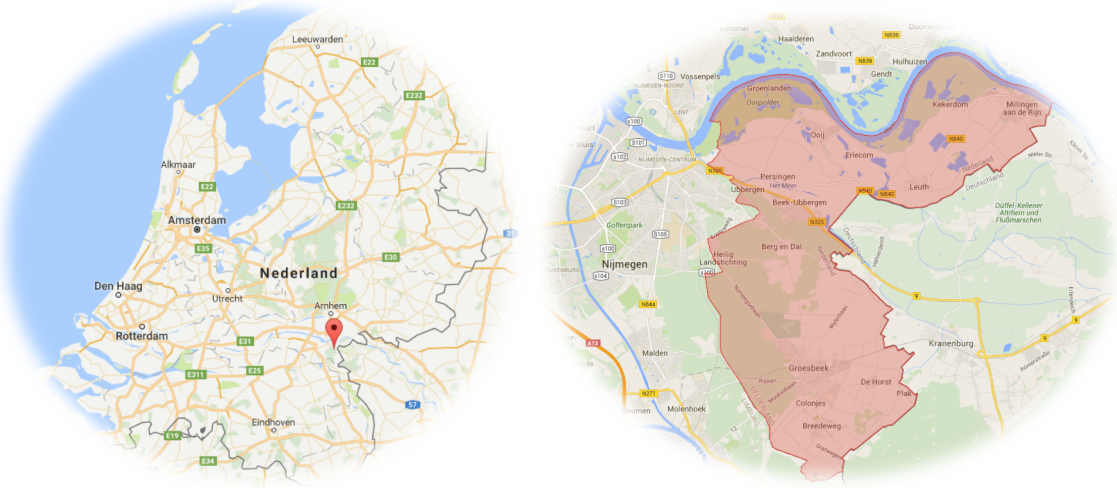

Figure 1. Research area Berg en Dal. Derived from Google Maps and adapted to the cp3 project.

This thesis contributes to the research project on Civil-public-private-partnerships (cp^3) (ZALF, 2015), which investigates different governance approaches for policy innovation to enhance biodiversity and ecosystem services delivery in agricultural landscapes. Wageningen University and Research contributes to the development of a comprehensive overview of ecosystem services of Berg en Dal (ZALF, 2015). This thesis contributes to the inventory of cultural services in Berg en Dal.

1.5 Brief overview on the following content

The current chapter presents a short overview of the chapters to come. After Chapter 1.5 I present the methodological framework (Chapter 2.1) in relation to the research questions and the tools that were used in executing the various analyses needed to answer the research questions (Chapter 2). Next the concepts ecosystem services and the participatory mapping approach are elaborated upon together with the tool, called Mapscape (Chapter 2.2). Chapter 2.3 presents the data collection methods (fieldwork method and questionnaire) and an elaboration is provided on the various questions that were included in the questionnaire. To conclude the methodology description and motivation, Chapter 2.4 presents a breakdown of the various analyses that were executed to support this thesis.

The CES-related activities that were carried out by the respondents of this thesis are presented in Chapter 3.1. These carried out CES-related activities were also mapped with support of Arc Map and per spatial analysis high and low value areas, or 'hot' spots and 'cold' spots were identified to gain insight in the spatial utilization of Berg en Dal's landscapes (Chapter 3.2).

To discover which land-use types are associated with the most attractive and roughest areas in Berg en Dal a statistical analysis was executed in Arc Map (Chapter 4.1). Furthermore, a similar statistical analysis was executed to discover which land-use types are preferred to carry out (particular) CES-related activities (Chapter 4.2).

For Chapter 5 a statistical analysis was executed with support of another software program called Statistical Package for Social Sciences (SPSS). The statistical analysis includes particular landscape features (of Berg en Dal) that were included in the questionnaire to distinguish significant differences between local people and visitors in experiencing Berg en Dal's landscapes.

The same landscape features were used for Chapter 6 to discover that the respondents of this thesis experience Berg en Dal's landscapes significantly better compared to the respondents of Coeterier's study (2002), twenty years ago.

Chapter 7 sets out the viewpoints from the respondents of this thesis on the future development of Berg en Dal's landscapes. These viewpoints were compared to the objectives set in the landscape development plan (LDP) 2015-2025 to discover what future development(s) of Berg en Dal's landscapes would be preferred most by the respondents of this thesis.

2. Methodology

2.1 Methodological framework explained

Figure 2 shows the methodological framework of this thesis. The focus of this thesis is to understand how people experience the landscape of Berg en Dal, by analysing how people use the landscape for carrying out activities and where these activities are carried out together with how people experience particular landscape features.

To discover which cultural services occur in Berg en Dal, an online PPGIS mapping tool (website) (detailed explanation given in Chapter 2.2.2) is applied to determine which CES-related activities are carried out in Berg en Dal's landscapes (RQ1).

To identify 'hot' spots / 'cold' spots of cultural services (RQ2), the software program Arc Map 10.2.1 is applied to analyse the (spatial) results of the questionnaire, among others with the tool Point Density. The software program supported by the particular tool, allows for the creation of high and/or low value maps, or 'hot' spot maps / 'cold' spot maps. Identifying 'hot' spots / 'cold' spots allows for the identification of areas that are more or less preferred to carry out CES-related activities.

The created Point Density maps were used as a basis to identify preferred land-use types to carry out CES-related activities (RQ3) by applying the tool Extract Values to Points. The tool allows for the conversion of points relative to particular land-use types, based on the Dutch land-use data LGN7 (Figure 3 in Chapter 2.4.2). After, the tool Zonal Statistics as Table was used. This tool allowed assessing on which land-use types the CES-related activities were carried out (see 2.3.3.2). Also, this tool allowed assessing which land-use types are most preferred to carry out (particular) CES-related activities (RQ4).

The software program SPSS was used to analyse RQ5. An independent *t*-test was executed to assess significant differences between local people and visitors in experiencing landscape features in Berg en Dal.

The last research question (RQ6) was analysed by reviewing Coeterier's study (2002). The respondents of this thesis are compared to the respondents of Coeterier's study on the grounds of the valuation of landscape features that are addressed in this thesis and in Coeterier's study. With support of the software program SPSS I intend to identify a significant difference in the valuation of the landscape features over a timeframe of approximately twenty years.

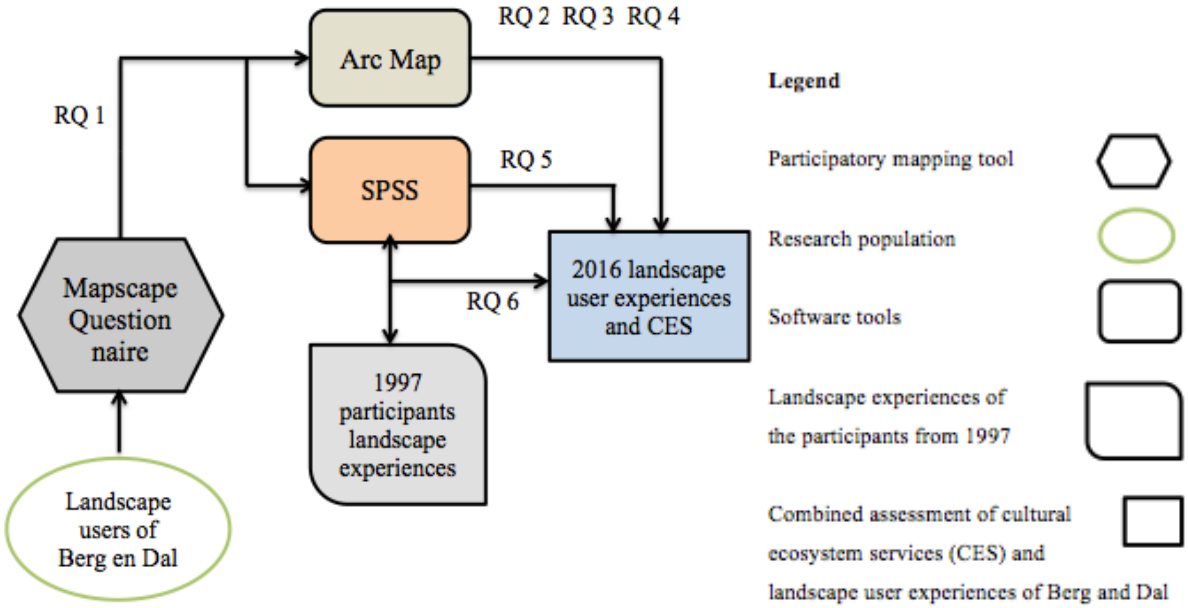

Figure 2. Methodological framework.

2.2 Concepts and Tool

2.2.1 Ecosystem services

The concept of ecosystem services entails four categories:

1) Provisioning services are ecosystem services that describe the material outputs from ecosystems, including food, water and other resources (e.g. ecosystems provide clean surface and groundwater);
2) Regulating services are the services that ecosystems provide by acting as regulators (e.g. local climate and air quality regulation by trees that provide shade and remove pollutants from the atmosphere);
3) Habitat or Supporting services underpin almost all other services. Ecosystems provide living spaces for plants or animals; they also maintain a diversity of different breeds of plants and animals (e.g. habitats provide everything that an individual plant or animal needs to survive.); and
4) Cultural services include the non-material benefits people obtain from contact with ecosystems, including aesthetic, spiritual and psychological benefits but also recreation and physical health (e.g. emphasizing the role of natural landscapes and urban green space for maintaining mental and physical health).

The focus of this thesis is on the fourth category, cultural services. Table 1 presents an overview of the cultural services as listed by The Economics of Ecosystems & Biodiversity (TEEB).

Table 1. Overview of cultural services, derived from The Economics of Ecosystems & Biodiversity (TEEB) (TEEB, 2010).

List of cultural services	Examples
Recreation and mental and physical health	The role of natural landscapes and urban green space for maintaining mental and physical health.
Tourism	Nature tourism provides considerable economic benefits and is a vital source of income for many countries
Aesthetic appreciation and inspiration for culture, art and design	Language, knowledge and appreciation of the natural environment have been intimately related throughout human history.
Spiritual experience and sense of place	Nature is a common element of all major religions; natural landscapes also form local identity and sense of belonging

2.2.2 Public participatory mapping approach

Public participatory GIS (PPGIS) is a new field (of research) that can supplement conventional ecosystem services approaches by using spatial methods and technologies that capture and use spatial information (Brown and Fagerholm, 2014). This research method engages the general public (stakeholders) to identify cultural services, based on local knowledge and the personal use of nature and personal experiences (De Vreese et al., 2016). PPGIS is also a useful research method to map values as perceived by stakeholders, so-called social value mapping. Creating social value maps is a means to represent survey results, which can assist to identify 'hot' spots / 'cold' spots, important areas that might need special attention from land and resource managers (Sherrouse et al., 2011).

2.2.3 Mapscape

The participatory mapping approach uses technologies to support in capturing and using spatial information. For this thesis, the technology used is expressed via the website www.mapscape.org. This website, used as a tool, was the designated platform for the (online) questionnaire (elaborated upon in Chapter 2.3.2) that was developed for this thesis. During the fieldwork, the researcher used an electronic device (tablet), with an active Internet connection, to use the tool to capture the (spatial) information, as indicated in the questionnaire by the respondents of this thesis. The (spatial) information, collected during fieldwork was stored in an (online) Excel file. I developed the questionnaire in both a Dutch version (Appendix 3) and an English version (Appendix 4).

On a final note, in paragraph 8.1 the participatory mapping approach as a research method and the tool Mapscape are reflected upon and discussed in relation to the usability for this thesis.

2.3 Data collection

2.3.1 Field work

The fieldwork area is shown in Figure 1. The fieldwork was carried out during five weeks, starting in the beginning of June until the second week of July. All areas were visited by bike, and the visits took part during the day, on weekdays. Respondents were selected based on the conditions that whoever were around and willing to participate was considered a respondent. After finalising the fieldwork, a total number of fifty respondents contributed to this thesis.

2.3.2 Questionnaire

For the fieldwork of this thesis, both a Dutch and English questionnaire was constructed (see Appendices 3 and 4). The questionnaire consists of twenty-seven questions and the options to respond to each question are represented via either checkboxes or (digital) geospatial maps where respondents could spatially indicate their answers. The following breakdown elaborates upon the questions:

- The first multiple-choice question inquires to the frequency of visits (Question1 (Q1));
- Three multiple-choice questions are used to identify the CES-related activities that are undertaken in Berg and Dal (Q2, Q4 & Q6);
- Three follow up questions are used to mapping the identified CES-related activities (Q3, Q5 & Q7);
- Two questions include statements regarding the accessibility and maintenance of the landscape of Berg and Dal (Q8 & Q9);
- Two questions include statements indicating the level of noise and smell nuisance (Q10 & Q11). For smell nuisance, the presence of the smell of manure is ignored in this thesis;
- One mapping question is about (possible) negative experiences regarding the previous statements addressed in Q8 – Q11 (Q12);
- Two questions include statements regarding the naturalness of the landscape (Q13) and if human influences have had an impact on the landscape (Q14);
- Two questions include statements related to if the respondents experience the presence of nature conservation and agricultural practices in Berg and Dal (Q15 & Q16);
- One mapping question is used to indicate where respondents experience the presence of nature conservation and agricultural practices (Q17);
- One mapping question includes four different statements (where is the landscape the most attractive, the least attractive, the most rough and the least rough) (Q18);
- One question includes a statement regarding the landscape being an important factor for visiting Berg and Dal (Q19);
- One multiple choice question concerns the future development of Berg and Dal (Q20);
- As a follow up, a mapping question is used to identify the location of the indicated future development(s) of Berg and Dal (Q21); and
- Last, six questions are related to socio-economic back ground information (Q22 – Q27).

The questionnaire was created to identify the CES-related activities that are carried out by the respondents in Berg en Dal. By reviewing three different literary sources (Coeterier, 2002; De

Valck et al., 2016; TEEB, 2010) an initial overview of CES-related activities were identified and drafted for the questionnaire. All CES-related activities were categorised into recreational activities, sports activities and other nature related activities. Also, the option 'other' was taken into account (per category) since the respondents might consider other CES-related activities that were not covered by the reviewed literature. To conclude the questionnaire, the respondents that are interested in the final results of this thesis were taken into account by leaving room to leave behind an e-mail address. Table 2 shows the (categorised) overview of all CES-related activities that were included in the questionnaire.

Table 2. Overview of all activities, split into three main categories.

Recreational activities	Sports activities	Nature related activities
Recreational hiking	Ball sports	Nature photography
Recreational swimming	Angling	Artistic
Recreational cycling	Cycling (e.g. bicycle racing / mountain biking)	Flora spotting
Relaxing	Running	Fauna spotting
Walking with pets	Horse riding	(In) formal education
Consuming of food	Other	Research
Visiting historical–significant places		Working
Other		Spiritual
		Other

Few questions did not reach their full potential because the respondents were hesitant or passive in answering specific questions. Most respondents did not indicate negative marks (1 = totally disagree / 2 = disagree). Consequently, Q12 had a low response rate (34%) and was not used for analysis. Also, respondents mentioned that they did not know Berg en Dal well enough to share their opinion on the least attractive areas (26%) or the least rough areas (42%). Because of the low response rates, these results were ignored for further analyses. Furthermore, Q15, Q16, Q17 and Q21 were also ignored for the analysis because the questions were not suitable to support in answering the research questions.

Identification of cultural services

In the questionnaire, three questions, separated per category, were about the occurrence of CES-related activities as presented in **Table 2**. Respondents were asked to indicate if they carry out any CES-related activities. Also, there was room for indicating that no CES-related activities were carried out.

Spatial questions

The questionnaire contains seven mapping questions. The respondents could indicate their answers on a (digital) map resembling the research area (**Figure 1**). The respondents could indicate a maximum of five answers (locations) per mapping question. Of all seven mapping questions, three are related to mapping the (categorised) CES-related activities, another three questions include statements and the last mapping question includes the future development of Berg en Dal. All mapped answers are collected in an Excel file and this output resembles X and Y coordinates.

Statements

Of the twenty-seven questions from the questionnaire, ten include statements. For answering, respondents could indicate one of the four options, based on a Likert scale of four indicators: 1) Totally disagree 2) Disagree 3) Agree and 4) Totally agree. The reasoning for not providing a "neutral" answer (middle) was to prevent respondents from giving socially desired answers. By having four distinctive answers, respondents are forced to make a clear choice, thus making the (final) data easier to interpret.

The information used for comprising the statements (Chapter 2.3.2) was derived from a questionnaire that is part of Coeterier's research (2002) since some of the questions were applicable to this thesis.

Socio-economic background questions

The last six questions of the questionnaire include socio-economic background to identify the distribution of the socio-economic background of the respondents. This was used to analyse differences between local people and visitors. The questionnaire includes questions regarding: age, gender, level of education, level of income, the area code and the number of years living in the area code.

The socio-economic background of the respondents can be found in full in Appendix 1. For every question, the response rate is taken into account (amount of times answered / total number of respondents). The socio-economic background questions are derived from both Coeterier (2002) and De Valck et al. (2016) because (some of) the questions were applicable to this thesis.

2.4 Data Analysis

2.4.1 Spatial analysis

The Excel file (.xlsx format) named 2017_05_14_Excel_file_elaborated_analysis_A_Jongens.xlsx contains the answers of the mapping questions, presented in coordinates. Per analysis, the data that is used (derived from the Excel file) is (re) structured accordingly to a different format (.CSV) to enable the analysis to be executed in Arc Map. Also, the file Gemeente_Groesbeek_2015.kmz is added to Arc Map, showing the boundaries of the research area. Lastly, an ArcGIS topographic package information layer of the Netherlands is applied for geographical referencing purposes. The layers Groesbeek and the Netherlands are used repeatedly per spatial analysis.

To analyse RQ2, the output (.CSV file) of the mapping question(s) is applied to Arc Map. First, supported by the tool "X Y Event Layer" the mapped answers are shown as points on a map. With support of the tool "Project" (data management) a temporary layer is saved as a

.gdb file to fit accordingly. The (saved) layer is then applied to the tool "Point Density" (spatial analyst), that enables creating maps with high density and low density value spots, or so-called 'hot' spots and 'cold' spots. Lastly, after creating the 'hot' spot / 'cold' spot map, the tool "Extract by Mask" is applied, using the layer file of Gemeente_Groesbeek_2015.kmz to take into account only the results that fall within the (geographical) boundaries of the research area. The steps taken until the tool "Project" are also applied for analysing the data, necessary to answer RQ3, RQ4 and RQ5.

2.4.2 Quantitative analysis

For RQ3 and RQ4 a statistical analysis is executed with support from (tools from) Arc Map. For RQ3 and RQ4, the saved .gdb layer from the tool "Project" is used together with the tool "Points to Values", thus allocating land-use types (Figure 3) to points (the mapped results). After the allocation of points to land-use types, the tool "Zonal Statistics as a Table" is applied, allowing for a statistical analysis of the CES-related activities relative to land-use types, enabling the analysis on land-use type preferences of the respondents of this thesis.

For RQ5 a statistical analysis is executed with support of SPSS and includes Q8, Q9, Q10, Q11, Q13, Q14 and Q19 of the questionnaire. The analysis intends to identify significant differences in experiencing landscape features between local people and visitors. The two groups are separated in accordance to their area code, resulting in a group whereby respondents live in Berg en Dal (N = 29) and the other group consists of people that visit Berg en Dal (N = 20). For the statistical analysis, an independent variables *t*-test is performed and the level of significance (α) is set on 0.05.

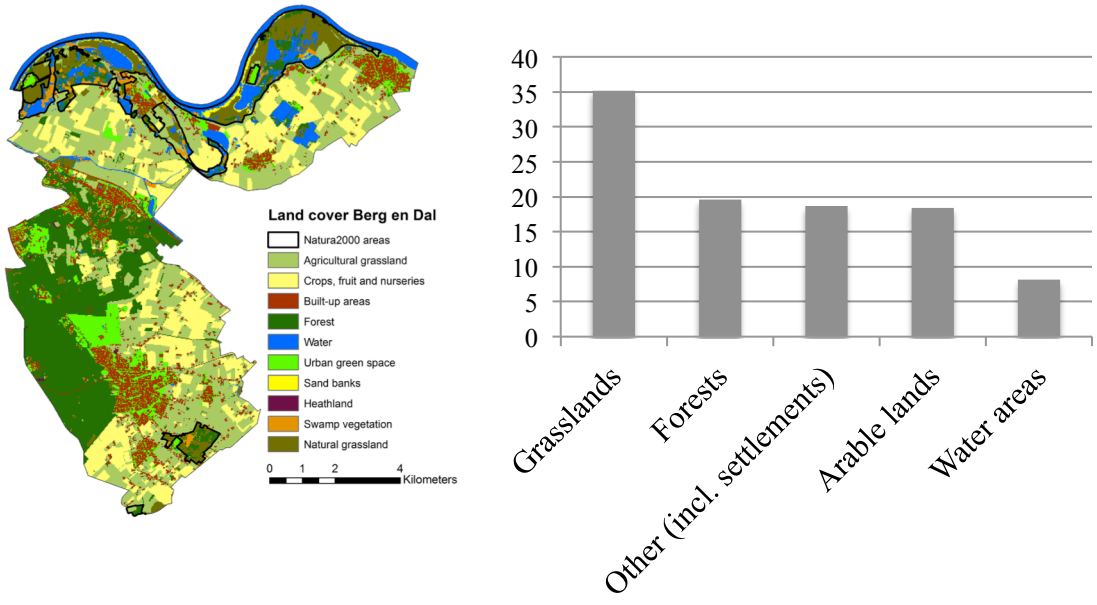

Figure 3. Overview of the land-use types of Berg en Dal based on the Dutch land-use data LGN7. Additionally, the distribution of land-use types in percentage for Berg en Dal.

Figure 3 presents the overview of the different land-use types of Berg en Dal, based on the Dutch land-use data LGN7 (ZALF, 2015). Figure 3 shows the land-use type 'crops, fruit and nurseries' but for making it more suitable to this thesis, this land-use type is renamed and

referred to as agricultural land(s) throughout the rest of this thesis. The size of Berg en Dal is approximately 93 km², whereby grasslands account for approximately 33 km², forests account for approximately 19 km², other and arable lands account both for approximately 18 km² and the water bodies are about 8 km² in total.

2.4.3 Comparative analysis of landscape experiences for a timeframe of twenty years

To answer RQ6, the answers to questions used in both Coeterier's study and this thesis are compared. Coeterier (2002) showed two answers corresponding with the areas Ooij and Groesbeek. The two means are combined and divided, allowing the (mean) answer to be suitable to compare Berg en Dal as one. Additionally, a paired *t*-test is executed in SPSS to identify a significant change in experiencing landscape features of Berg en Dal over the past twenty years. The questions that are included in the (statistical) analysis of RQ6 concern the maintenance and accessibility of the landscape, the occurrence of noise and smell nuisance in the landscape and the naturalness of the landscape.

To be able to compare the results, the answers of this thesis are made suitable for comparison to the answers of Coeterier's research. Therefore, the Likert scale for answering in this thesis (1 to 4) was reordered to compare to Coeterier's scale (1 to 10). This thesis shows a Likert scale of 1 (= totally disagree) 2 (= disagree) 3 (= agree) 4 (= strongly agree). For comparison, the answer categories 3 and 4 are most important and the values (e.g. >5.5 - 10) occur in the answer categories 3 to 4. Also, in between the numbers 2 and 3 the standard fail/pass mark of <5.4 or >5.5 is situated and means between 8.5 to 10.0 are usually not very common as a result from a questionnaire. Here, values comparable to 8.5-10.0 are closely associated to 4.0 and most answers are on average lower than values similar to 8.5-10.0.

The rhetoric behind the conversion of the values goes as follows: 4.0 is equal to 9.0 > 10.0 and 3.5 is equal to 7.5. In between are values of 0.5 (4.0 – 3.5) and 2.5 (10.0 – 7.5). The values are then divided to see how the values change. As a result, for every increase or decrease of 0.1, with 3.5 as a baseline the value of 7.5 increases or decreases by 0.25.

Table 3 shows the conversion in more detail.

Table 3. Conversion of Likert scale (1-4) to Coeterier's Likert scale (1 – 10)

1.0 – 1.4	1.5 – 2.4	2.5 – 3.4	3.5 – 4.0
1.0 – 2.4	2.5 – 4.9	5.0 – 7.4	7.5 – 10.0
No (useful) comparable values within the range of 1.0 – 2.4		3.5 – 0.1 = **3.4** = 7.5 – 0.25 = **7.25**	(**0.5/2.5**) = 0.2 0.5+7.5 = 3.5 + 0.2 (**0.5/2**) = 0.25 & (**0.2/2**) = 0.1
		3.4 – 0.1 = **3.3** = 7.25 – 0.25 = **7.0**	**+/- 0.25** = **+/- 0.1**
		3.3 – 0.1 = **3.2** = 7.0 – 0.25 = **6.75**	3.5 + 0.1 = **3.6** = 7.5 + 0.25 = **7.75**
		3.2 – 0.1 = **3.1** = 6.75 – 0.25 = **6.50**	3.6 + 0.1 = **3.7** = 7.75 + 0.25 = **8.0**
		3.1 – 0.1 = **3.0** = 6.50 – 0.25 = **6.25**	3.7 + 0.1 = **3.8** = 8.0 + 0.25 = **8.25**
		3.0 – 0.1 = **2.9** = 6.25 – 0.25 = **6.0**	3.8 + 0.1 – **3.9** = 8.25 + 0.25 = **8.5**
			3.9 + 0.1 = **4.0** = 8.5 + 0.25 = **8.75**
			4.0 + = **9.0+**

2.4.4 Comparison of the landscape development plan (LDP) (2015 – 2025) objectives and landscape user preferences for the future development of Berg en Dal

Chapter 7 presents the results of the question: what do you think that should gain more attention for the future development of the landscape of Berg en Dal. The results are used to gain insight in what the landscape users prefer for the future development of Berg en Dal. Also, the objectives concerning the development of the landscape, as stated in LDP (Blerck, 2015) are presented. Finally, similarities and differences were analysed.

3. (Spatial) analysis of Cultural Services

3.1 Identified cultural services as expressed in carried out CES-related activities

The collected data in the Excel file is analysed and the results are presented in chapter 3.1.1 and 3.1.2 by bar charts.

3.1.1 Total number of carried out CES-related activities per category

Figure 4 shows a categorised overview of the total number of CES-related activities (in percentage) as indicated by the respondents in the questionnaire. Figure 4 clearly shows that respondents carry out more CES-related activities from the category recreational activities compared to the other categories (sports activities and other nature related activities). Also, the response rate is considerably higher: 98% for recreational activities, 66% for other nature related activities and 46% for sports activities.

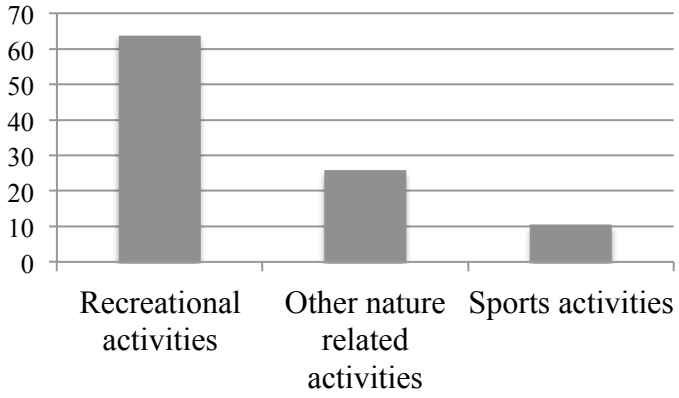

Figure 4. Overview of cultural services in percentage, divided in three categories.

The identified CES-related activities (**Table 2**) are all appointed by the respondents of this thesis. The results of the multiple choice questions including the undertaken CES-related activities in Berg en Dal are shown in percentage in bar charts (Figures 5, 6 and 7).

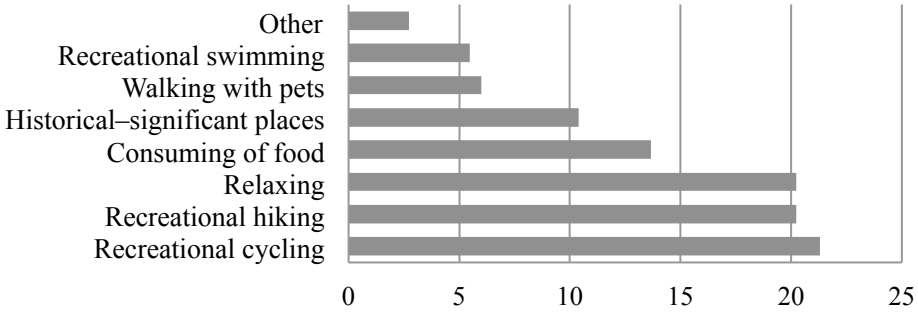

Figure 5. Overview of the carried out CES-related activities in percentage of the category recreational activities.

The results of the questionnaire show that forty-nine respondents filled in the question related to recreational activities, resulting in a response rate of 98%. For the category recreational activities cycling, hiking, relaxing and the consumption of food are carried out the most.

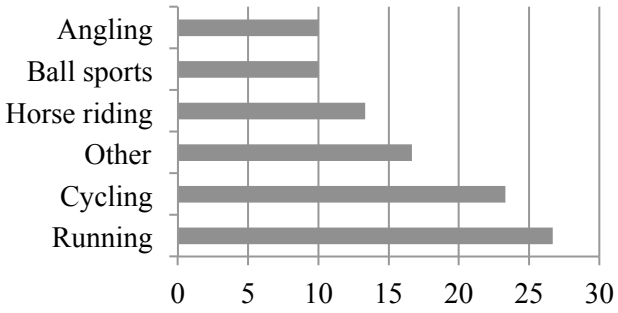

Figure 6. Overview of the carried out CES-related activities in percentage of the category sports activities.

The results of the questionnaire show that twenty-three respondents filled in the question about sports activities, resulting in a response rate of 46%. Although Berg en Dal is very accessible to carry out sports activities, it is the least mentioned category (10%) (Figure 4). Nonetheless, Figure 6 shows that running and cycling (race cycling and mountain biking are combined) are carried out the most.

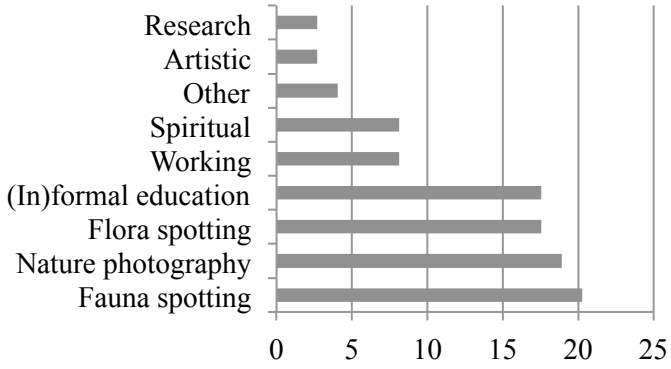

Figure 7. Overview of the carried out CES-related activities in percentage of the category other nature related activities.

The results of the questionnaire shows that thirty-three respondents mentioned carrying out other nature related activities, resulting in a response rate of 66%. Flora spotting, nature photography, fauna spotting and (in) formal education are carried out the most (Figure 7).

3.1.2 Category ‘other’

In addition to the (scientifically) acknowledged CES-related activities, discussed in Section 3.1.1, the questionnaire also left room for respondents to mention other recreational, sports or nature related activities that were not considered by the scientific literature used for constructing the questionnaire. Figures 5, 6 and 7 show the activity other and Section 3.1.2 elaborates on the other CES-related activities mentioned by the respondents.

The other CES-related activities are mentioned in total thirteen times. For the category recreational activities, ‘other’ is indicated five times, another five times in the category sports activities and three times in the category other nature related activities. These CES-related activities were mentioned from a personal perspective and are not (yet) mentioned in the scientifically acknowledged list of cultural services (**Table 2**).

Other recreational activities include:

- Multifunctional agriculture (farmer’s campsite): a farmer’s campsite near Persingen and Groesbeek;
- Keeping chickens;
- Vista: Panorama view of the area around Groesbeek; and
- Gardening.

Other sports activities include:

- Fitness centre;
- Outdoor boot camp;
- Yoga; and
- Hockey referee.

Other nature related activities include:

- Wine festival: Groesbeek’s wine festival in September;
- Neighbourhood garden: The garden is a local initiative for the community of Kekerdom to promote and enhance community interaction together with nature related activities; and
- Nature photography exhibition: Exhibition of (local) nature photography in a local church in Leuth.

3.2 Hot spot areas for CES-related activities identified with a participatory mapping tool

After the indicated CES-related activities were established in Chapter 3.1, it is interesting to see if so-called 'hot' spots / 'cold' spots can be identified. Following up the identified CES-related activities (Chapter 3.1), the results of the spatial questions were applied to the geospatial data software program Arc Map. First, a point analysis was done, with support of the tool XY event layer, allowing to map all CES-related activities as indicated by the respondents.

3.2.1 Carried out CES-related activities as expressed in points via Arc Map

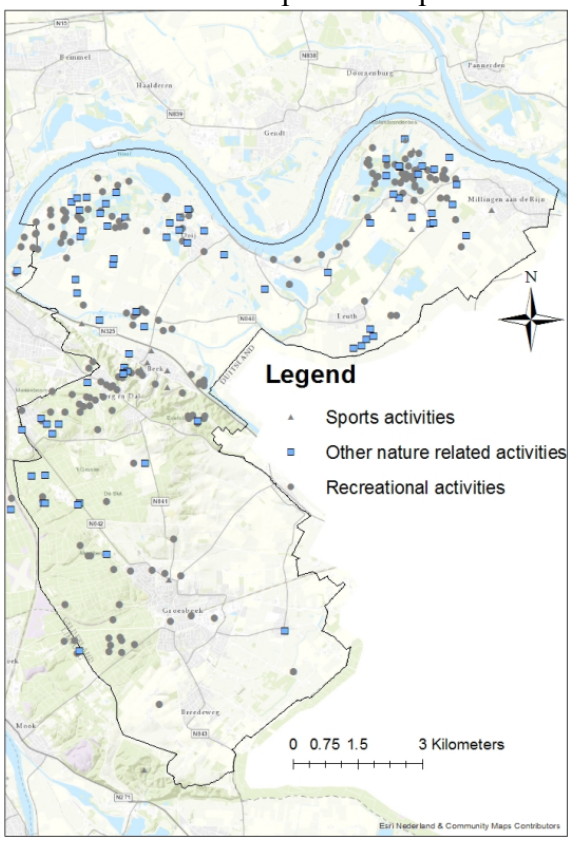

Figure 8. Overview of all spatially mapped cultural services.

Figure 8 shows the mapped answers to the questions on the spatial allocation of the cultural services Berg en Dal provides. Figure 8 shows that the CES-related activities occur in various places, but it also becomes clear that particular areas are indicated more than others. Although clear differences are distinguished for the presence of CES-related activities, Figure 8 shows that recreational activities are carried out throughout Berg en Dal.

The category sports activities is mentioned least and in Figure 8 it is hard to distinguish the sports activities because they are shaded by CES-related activities from the other two categories. Other nature related activities are carried out frequently, but hardly any CES-related activities are carried out in the area(s) surrounding Groesbeek.

3.2.2 Identified ‘hot’ spot areas for carried out CES-related activities

For the identification of so-called ‘hot’ spots and ‘cold’ spots of cultural services, a point density analysis using Arc Map, was applied. Dark(er) blue spots (hot spots) indicate many (clustered) answers, resulting in high values. Light(er) spots indicate low values (cold spots) resulting from a low (to zero) number of answers given.

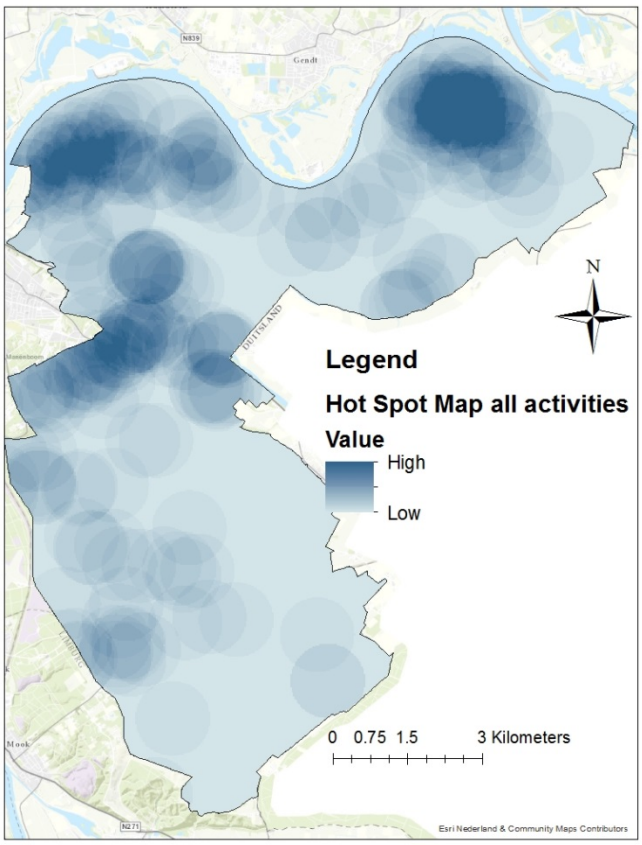

Figure 9. Hot spot map of all spatially indicated CES-related activities.

Figure 9 shows a hot spot map of all the indicated CES-related activities of the three categories. Figure 9 shows that particular areas of Berg en Dal are more preferred for carrying out CES-related activities. Comparing Figure 9 to **Figure 1** (research area Berg en Dal) shows that the floodplains of both Ooij and Kekerdom are intensely utilized for carrying out CES-related activities. Also, the northernmost point of Groesbeek, and the former municipality of Berg en Dal are showing dark(er) blue spots, indicating that a large amount of CES-related activities are carried out. However, Figure 9 is a representation of all the CES-related activities that were carried out. Since the CES-related activities were categorised into recreational, sports and other nature related activities I also created ‘hot’ spot maps per category to identify differences between categories (regarding preferred areas).

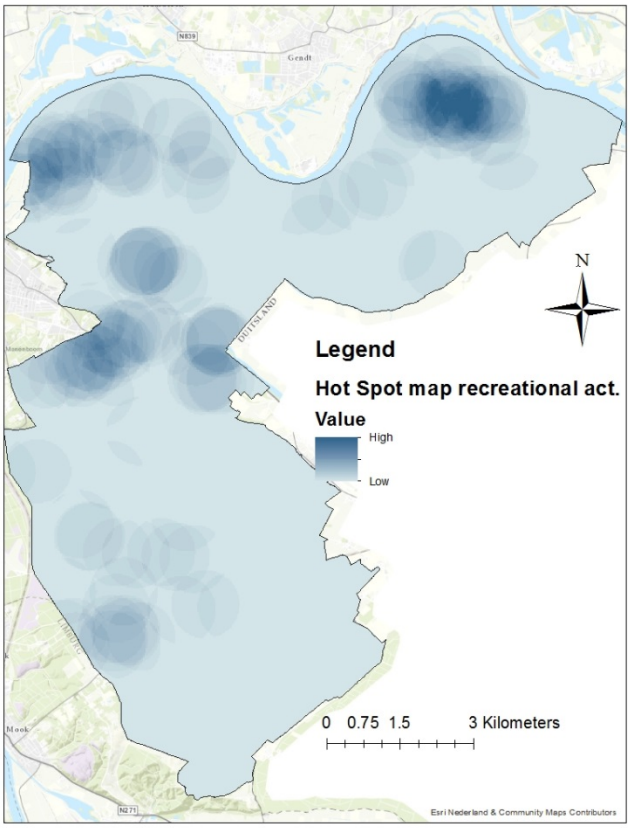

Figure 10. Hot spot map of the category recreational activities.

Figure 10 shows a hot spot map of the category recreational activities. Figure 10 shows that the floodplains of Ooij and Kekerdom are intensely utilized because of the large number of recreational activities, hence the dark blue spots. In addition, the former municipality of Berg en Dal and the northernmost part of Groesbeek are also intensely utilized areas for carrying out recreational activities. Figure 10 shows that some recreational activities are carried out west of Groesbeek, indicating that the forested part of Groesbeek is more preferred for carrying out recreational activities in comparison to the area(s) east of Groesbeek where predominantly (mixed) agricultural lands are situated.

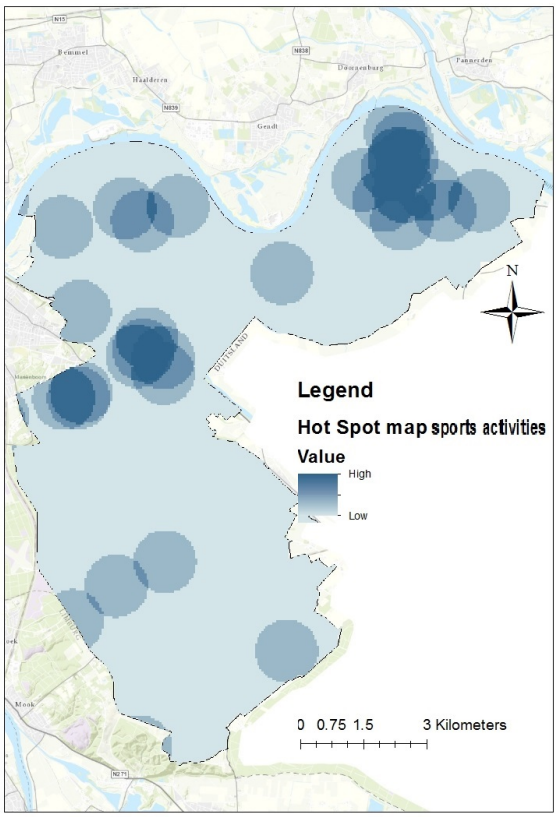

Figure 11. Hot spot map of the category sports activities.

Figure 11 shows a 'hot' spot map of the category sports activities. As indicated in Section 3.1.1, the sports activities mentioned by the respondents make up for 10% of the total number of CES-related activities. Although the total number of sports activities that were carried out is low, the clustered answers, resembled by the high value spots indicate that the floodplain area of Kekerdom is most preferred for carrying out sports activities. Also, the second zone, situated in the central western part of Berg en Dal is moderately used for carrying out sports activities. Nonetheless, Figure 11 shows that in most of Berg and Dal hardly any sports activities are carried out.

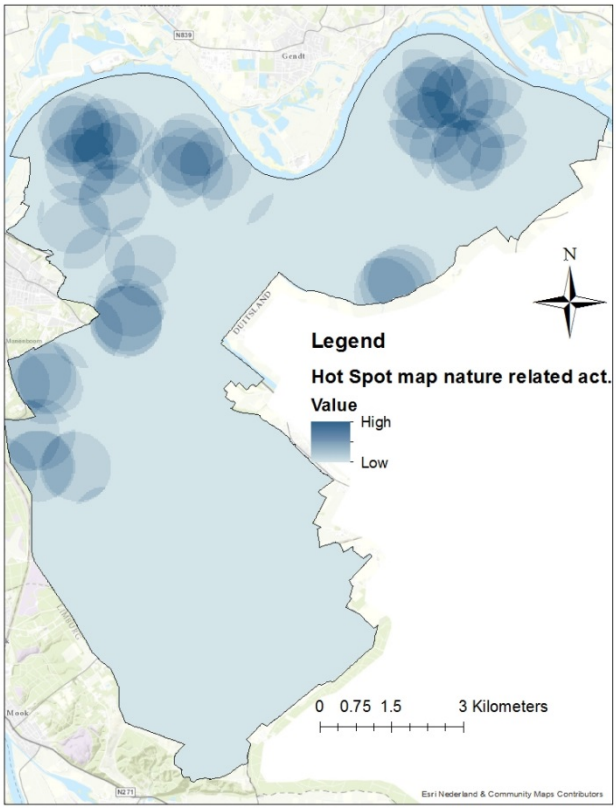

Figure 12. Hot spot map of the category other nature related activities.

Figure 12 shows a hot spot map of the other nature related activities. Figure 12 shows that, predominantly the floodplains of both Ooij and Kekerdom are most preferred for carrying out other nature related activities. A moderate number of other nature related activities are carried out near the most north-western part of Berg en Dal. Figure 12 also shows that a few other nature related activities are carried out near Groesbeek.

4. Land-use type preferences in relation to cultural services

4.1 Land use type preferences in relation to landscape experiences

For Chapter 4 the geospatial data software program Arc Map was used. With support of the tool "Points to Values" and the tool "Zonal Statistics as a Table" various analyses on land-use type preferences were executed. To identify land-use type preferences, all CES-related activities, as indicated by the respondents, are expressed in percentage, relative to land-use types. Also, the mapping questions related to the statements in the questionnaire (Q18) ("here I find the landscape the most attractive" and "here I find the landscape the most rough/roughest") are used to identify land-use type preferences.

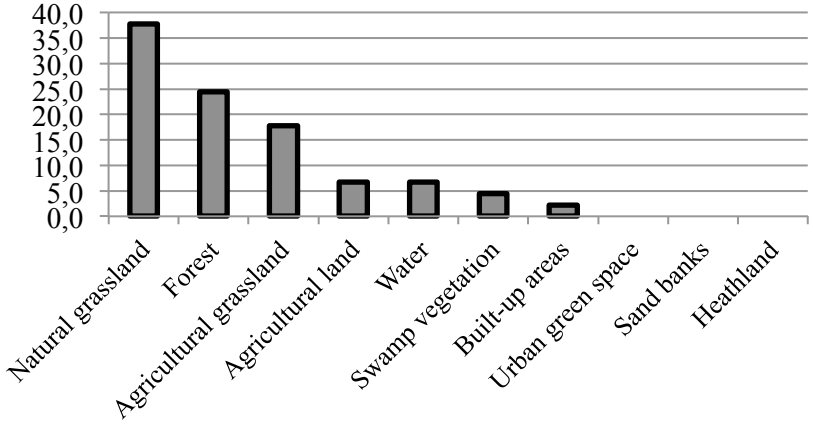

Figure 13. Results of the spatial question related to the statement 'most attractive area' per land-use type (in %).

Figure 13 shows which land-use types the landscape users find the most attractive in Berg en Dal. The response rate for the question is 94%. Figure 13 shows that the most attractive areas are associated with the land-use types natural grassland and forest (37% + 24% = 62%) whilst agricultural grasslands are moderately attractive. The land-use types agricultural land, water, swamp vegetation and built-up areas are slightly attractive. Urban green spaces, sand banks and heathlands are not indicated.

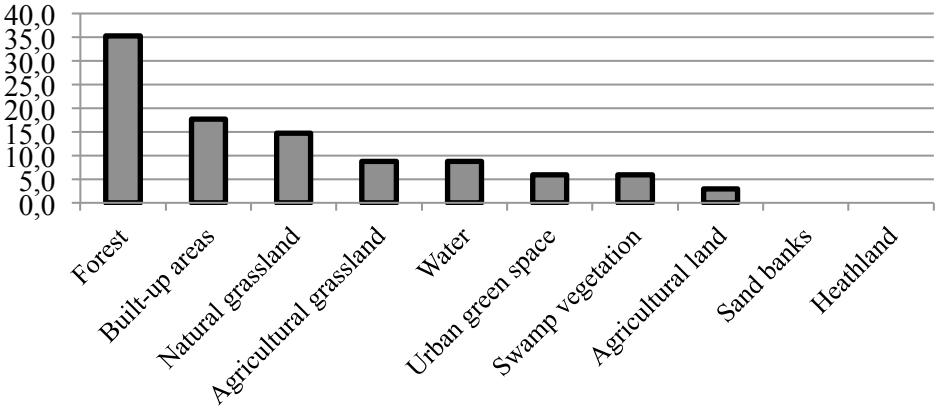

Figure 14. Results of the spatial question related to the statement 'most rough area' per land-use type (in %).

Figure 14 shows which land-use types the landscape users find the roughest in Berg en Dal. The response rate for the question is 76%. Figure 14 shows that the roughest areas in Berg en Dal are associated with forests, whilst built-up areas and natural grasslands are considered to be moderately rough. Agricultural grasslands, water, urban green spaces, swamp vegetation and agricultural lands are the least rough. Sand banks and heathland are not indicated.

4.2 Land use type preferences for carried out CES-related activities

This chapter intends to identify if certain land-use types are related to the occurrence of cultural services in Berg en Dal by analysing the categorised CES-related activities.

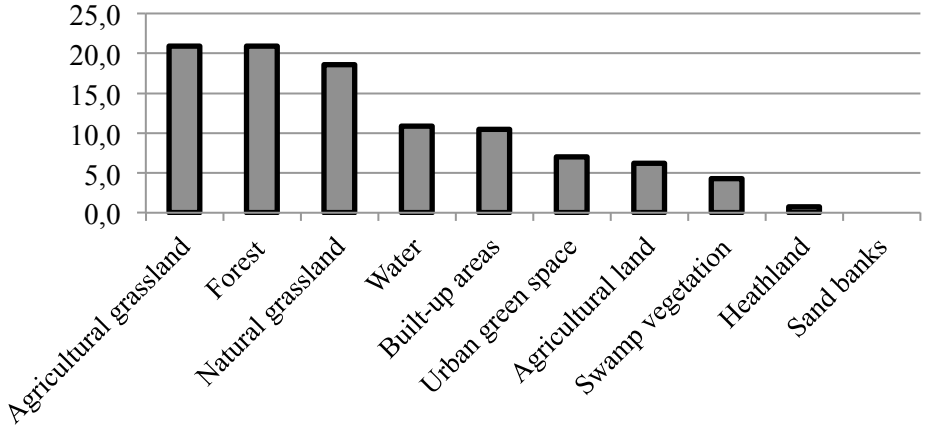

Figure 15. Results of the spatial questions related to all CES-related activities per land-use type (in %).

Figure 15 shows all indicated CES-related activities per land-use type in percentage. Figure 15 shows that most CES-related activities are carried out on agricultural grasslands, forests and natural grasslands since these three land-use types cover about two-thirds of the indicated CES-related activities (21% + 21% + 19% = 61%). A moderate number of CES-related activities are carried out in water and built-up areas; whereas only a few CES-related activities are carried out in urban green spaces, agricultural lands, swamp vegetation and heathland. No CES-related activities are carried out on sand banks.

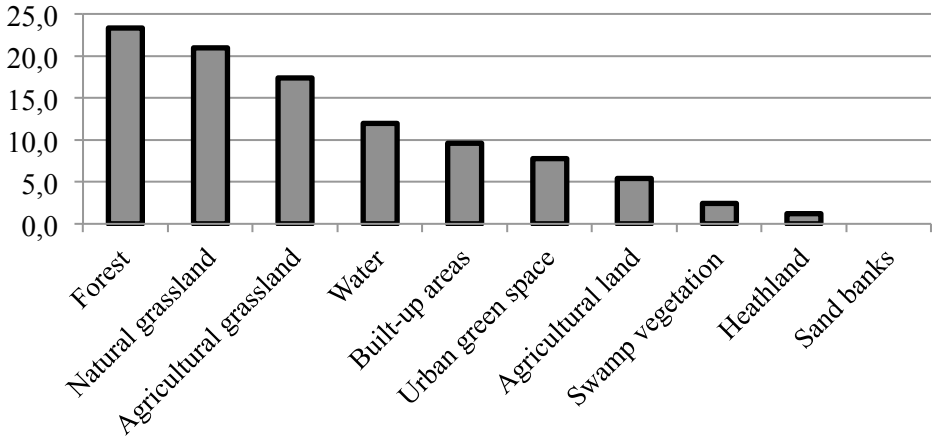

Figure 16. Results of the mapping question regarding recreational activities per land-use type (in %).

Figure 16 presents the recreational activities relative to the-land use types in percentage. The response rate for the question is 98%. Figure 16 shows that most recreational activities are carried out in forests, natural grasslands and agricultural grasslands. These land-use types

cover about two-thirds of all recreational activities (23% + 21% + 17% = 61%). A moderate number of recreational activities are carried out in water, built-up areas and urban green spaces. Few recreational activities are carried out on agricultural lands, swamp vegetation and heathlands. No recreational activities are carried out on sand banks.

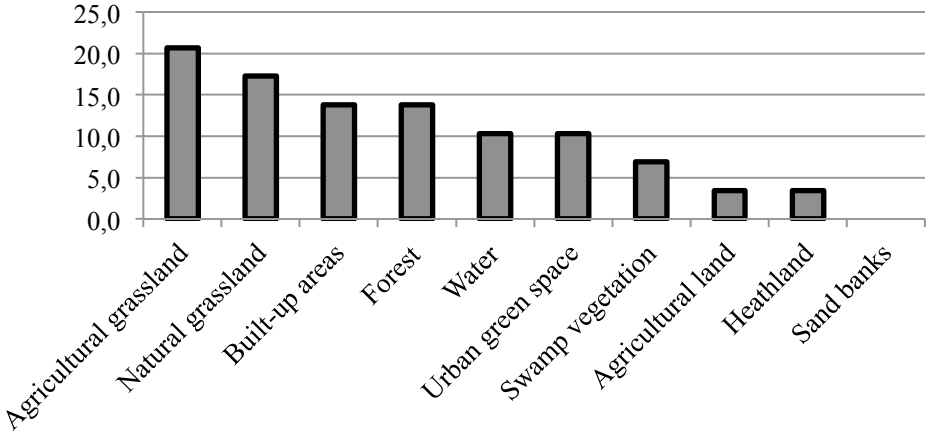

Figure 17. Results of the mapping question regarding sports activities per land-use type (in %).

Figure 17 presents all sports activities relative to the land-use types in percentage. The response rate for the question is 46%. Figure 17 shows that most sports activities are carried out on agricultural grasslands and natural grasslands (21% + 17% = 38%), whilst a moderate number of sports activities are carried out in built-up areas, forests, water and urban green spaces. Few sports activities are carried out on swamp vegetation, agricultural lands and heathlands, whilst none are carried out on sand banks.

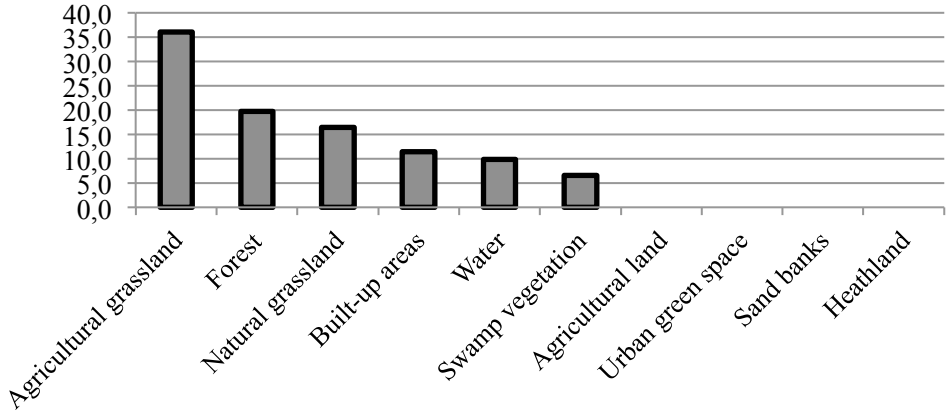

Figure 18. Results of the mapping question regarding other nature related activities per land-use type (in %).

Figure 18 presents all other nature related activities relative to the land-use types in percentage. The response rate for the question is 66%. Figure 18 shows that the majority of the other nature related activities are carried out on agricultural grasslands and forests (36% + 20% = 56%). On natural grasslands and built-up areas a moderate number of other nature related activities are carried out, whilst a few other nature related activities are carried out on water and swamp vegetation. No other nature related activities are carried out on agricultural lands, urban green spaces, sand banks and heathland.

5. Differences in landscape experiences between local people and visitors

For Chapter 5 the software program to execute statistical analyses, SPSS was used. The analysis intends to identify significant differences between the mean answers of two groups. The groups are separated accordingly to their area code, resulting in a group whereby respondents live in the area (N = 29) and the other group consists of people that visit Berg en Dal (N = 20). For all questions the response rate is 98% (49/50) since one respondent did not fill in the area code, therefore the results of this respondent are ignored in this analysis. For the statistical analysis, an independent variables *t*-test was executed and the level of significance (α) is set to 0.05.

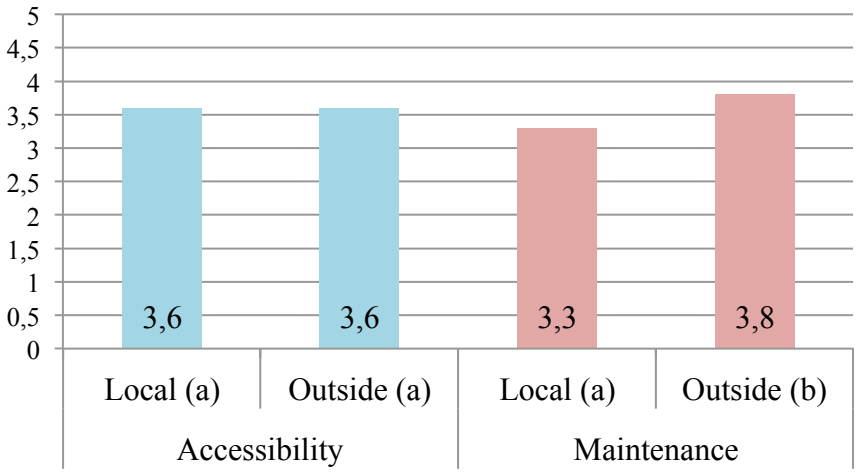

Figure 19. Mean results of the questions including the accessibility and maintenance of the landscape.

Respondents were asked to indicate how content they are regarding the accessibility and the maintenance of the landscape of Berg en Dal. The results of these two questions are presented in Figure 19. Figure 19 shows that both local people and visitors are content with the accessibility of Berg en Dal (3.6). Also, the result from the *t*-test in Table 4 (Appendix 2) shows a significance level of .809. Since .809 is larger than α 0.05, the two groups do not experience the accessibility of Berg en Dal differently.

For the maintenance of the landscape of Berg en Dal, Figure 19 shows that visitors experience the level of maintenance better (3.8) than local people do (3.3). Furthermore, the *t*-test in Table 5 shows a significance level of .030, which is smaller than α 0.05. This shows that visitors experience the maintenance of Berg en Dal's landscapes significantly better (b) than local people.

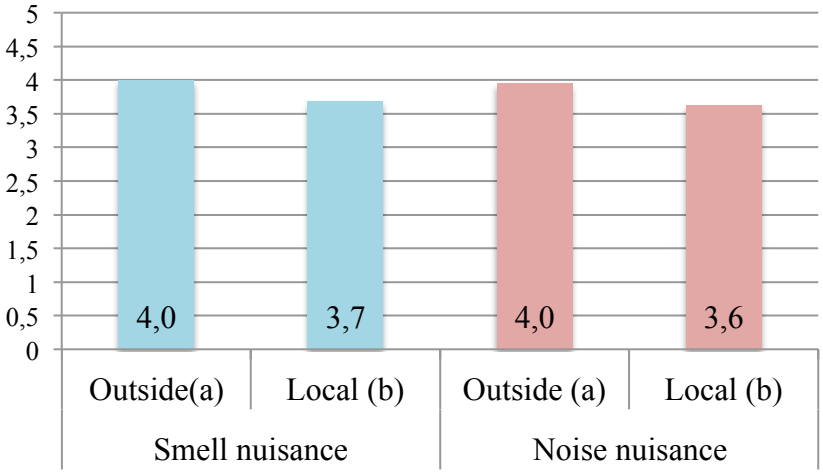

Figure 20. Mean results of the questions including noise and smell nuisance in Berg en Dal.

Respondents were asked to indicate if they did not experience noise or smell nuisance in Berg en Dal. The results of the two questions are presented in Figure 20. Figure 20 shows that local people (3.6) and the visitors (4.0) do not experience noise nuisance in Berg en Dal. The *t*-test in Table 6 (Appendix 2) shows a significance level of .048, which is smaller than α 0.05, indicating that local people do experience noise nuisance significantly worse (b) compared to the visitors. This implies that local people do experience more noise nuisance than visitors.

Figure 20 shows that both the local people (3.7) and the visitors (4.0) do not experience smell nuisance in Berg en Dal. However, Table 7 (Appendix 2) shows from the *t*-test a significance level of .026, which is smaller than α 0.05, indicating that local people do experience smell nuisance in Berg en Dal significantly worse than the visitors (b).

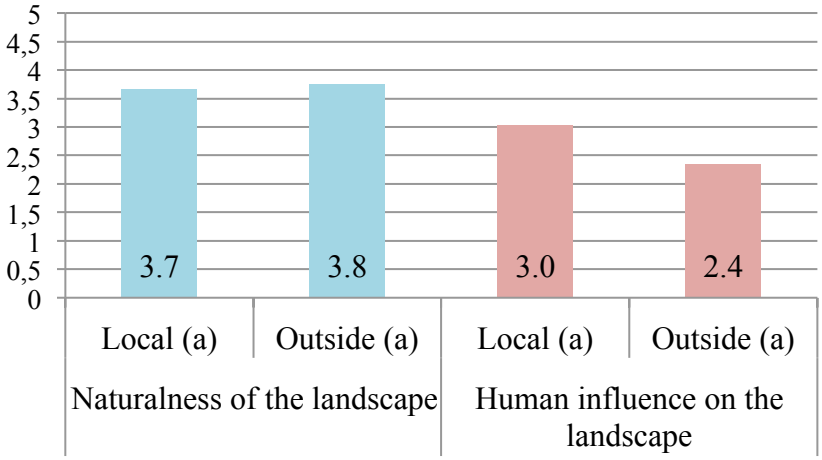

Figure 21. Mean results of the questions including naturalness of and human influence on the landscape.

Respondents were asked to indicate if the landscape of Berg en Dal looks natural (not shaped by human activity) and whether the landscape looks like it is (strongly) influenced by human activity. The results are presented in Figure 21. Figure 21 shows that local people (3.7) and people from outside Berg en Dal (3.8) experience that Berg en Dal's landscapes look natural. Also, the *t*-test in Table 8 (Appendix 2) shows a significance level of .638, which is larger than α 0.05, indicating that the two groups do not experience the naturalness of Berg en Dal significantly different.

Figure 21 shows that local people (3.0) do experience influences of human activity on the landscape but people from outside Berg en Dal do not (2.4). However, the *t*-test in Table 9 (Annex 2) presents a significance level of .070, which is larger than α 0.05. This observation shows that the two groups of people do not experience the influence of human activity on the landscape of Berg en Dal significantly different.

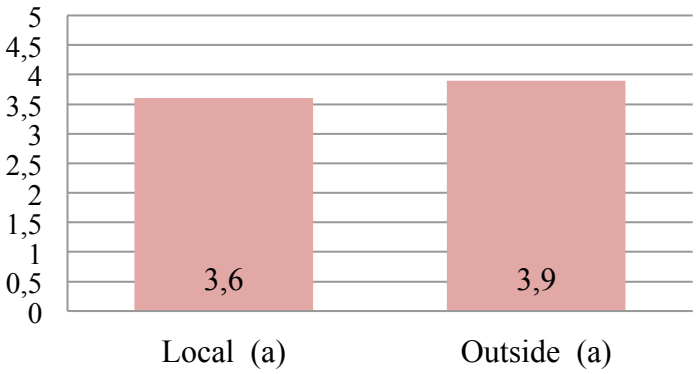

Figure 22. Mean results of the question about the importance of the landscape for visiting Berg en Dal.

Respondents were asked to indicate if Berg en Dal's landscapes are an important reason for visiting (Berg en Dal). The results in Figure 22 show that both local people (3.6) and the visitors (3.9) strongly agree that the landscape of Berg en Dal is an important reason for visiting. Table 10 (Appendix 2) presents a significance level of .058, which is larger than α 0.05. This observation shows that the two groups do not experience the importance of the landscape as a reason for visiting Berg en Dal, significantly different.

6. Landscape experiences from 1997 and 2016

Chapter 6 shows the results of analysing RQ6, whereby the results of this thesis are compared to Coeterier for the following questions: the maintenance and accessibility of the landscape, noise and smell nuisance in the landscape and the naturalness of the landscape. Chapter 2.4.3 presents the detailed conversion of values from this thesis to compare to the results of Coeterier's study. The blue bar represents the results from this thesis (N = 50). The red bar represents the results of the combined areas of Ooij and Groesbeek (derived from Coeterier (2002)). Figure 23 presents the results of this analysis.

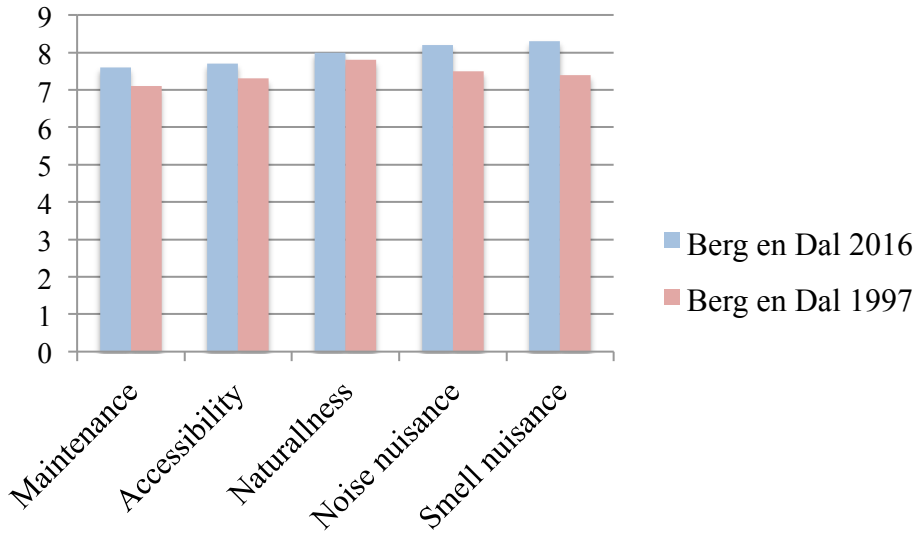

Figure 23. The answers of two research projects on landscape experiences over twenty years time for Berg en Dal.

Figure 23 shows that the respondents of this thesis ascribe higher values to landscape experiences compared to Coeterier's respondents. Also, Table 11 presents the results from the Paired Samples T-Test, executed in SPSS. The significance level is 0.011, which is smaller than α 0.05. This level of significance (0.011) indicates that the respondents of this thesis do experience the landscape significantly better compared to the respondents of 1997.

Table 11. Paired Samples T Test result on landscape experiences from 1997 and 2016 in Berg en Dal.

Paired Samples Statistics & T Test results			
	Mean	N	Sig. (2-tailed)
1997	7,42	5	0,011
2016	7,96	5	0,011

7. Future development of Berg en Dal

As part of this thesis, RQ 7 aims to compare what landscape users prefer for the future development of (the landscapes of) Berg en Dal and what the objectives of the LDP are for 2015 – 2025 (Blerck, 2015). For comparison, the results of the question: What do you think that should gain more attention for the future development of the landscape of Berg en Dal? are analysed and compared to the objectives provided by the LDP 2015 – 2025.

7.1 Landscape user preferences for the future development of the landscape of Berg en Dal

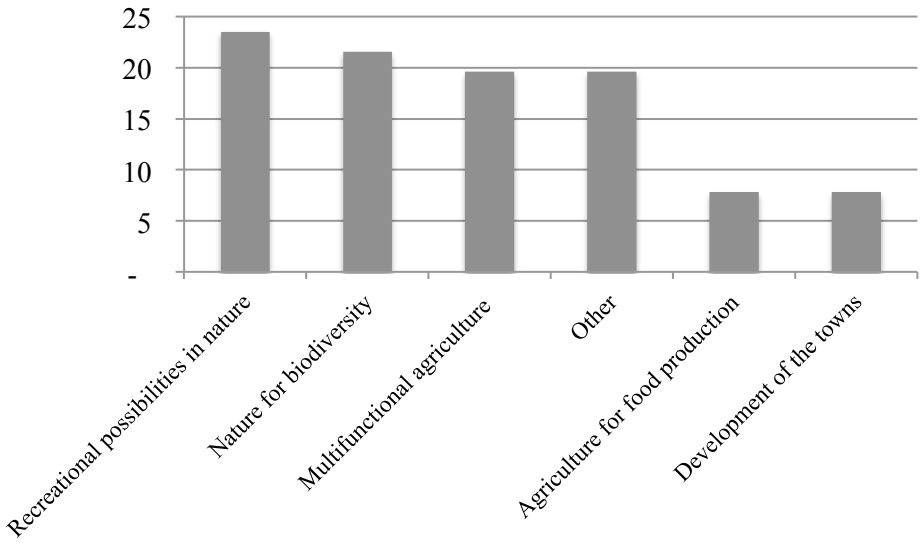

Figure 24. Landscape user preferences for the future development of Berg en Dal (in %).

Figure 24 presents six answers (in percentage). The response rate of the question is 76%. Figure 24 shows that the respondents of this thesis least prefer focussing on more agriculture for food production or the development of the towns. The respondents of this thesis do prefer focussing on multifunctional agriculture for the future development of Berg en Dal.

As for the answer "other", there was space left for respondents to mention other issues of attention in the questionnaire. In total, "other" was mentioned ten times:

- Traffic safety in Berg en Dal and Groesbeek;
- Campsite in the forested area near Berg en Dal / Beek;
- Food forest: exotic food forest/agriculture in the areas surrounding Groesbeek;
- Music festival south of Groesbeek, close to the German border;
- More appropriate facilities for elderly people / physically impaired people;
- Lifting the ban on hunting specific animal species (issues with deer / boar);
- Increased balance of space for nature and recreation;
- Increased naturalizing of the landscape; and
- Increased number of resting possibilities.

7.2 Landscape Development Plan 2015 – 2025 objectives

In the landscape development plan for the new municipality Groesbeek/Berg en Dal 2015-2025 called 'Landschap voor iedereen' ('Landscape for everyone') the objectives towards the overall development of Berg en Dal are stated. Below, the objectives of the landscape development plan as to what the landscape should offer to its landscape users, is presented:

- Producing agricultural products for the world market (regular farmers);
- Producing local agricultural products for local markets (e.g. juice, honey, marmalade);
- Offering recreational products/services for regional/national markets (e.g. farmers campsites, Bed & Breakfast (B & B));
- Producing and offering other services (health care);
- Accommodating for working and living; and
- Enjoying the beauty and tranquillity of nature, both actively and passively.

7.3 Similarities and differences between LDP objectives and landscape user preferences

Figure 24 shows that the landscape users least prefer for agricultural activities to focus solemnly on intensified food production, which is in strong contrast to what the LDP presents. Chapter 7.1 and Chapter 7.2 both show strong support for increased focus on multifunctional agriculture, with a special focus on the production of local products.

As regards to offering other services (e.g. health care) the landscape users of Berg en Dal indicate that the landscape needs to offer more appropriate facilities to elderly people / physically impaired people. Currently, (much of) Berg en Dal's landscapes are not suitable to people who cope with mobility problems.

To work and live in Berg en Dal, the landscape users indicate that minimum focus should be directed towards the development of the towns. On the contrary, the LDP indicates that the landscape of Berg en Dal should actively accommodate space for living (and working). However, for actively accommodating space to life (and work) in Berg en Dal, the respondents of this thesis indicate that traffic safety cannot be ignored. This is because the respondents mention that currently, many unsafe traffic conditions occur in the towns of Berg en Dal and Groesbeek.

Both the LDP and the landscape users mention that the beauty of nature should be enjoyed, actively and passively. Furthermore, the landscape users indicate that for the future development of Berg en Dal, management needs to take into consideration that space for nature and recreation need to be more balanced. Currently, landscape users are dissatisfied that making room for nature reduces the accessibility to certain areas that used to be freely accessible. Consequently, the amount of land for leisurely activities is decreasing (personal note from respondents 50, 58, 68 and 80). On a final note, the landscape users mention that the number of resting possibilities is not sufficient.

8. Discussion

8.1 Limitations of the research method

The research method used was a participatory mapping approach. A website called Mapscape was developed and an online questionnaire was used to collect data. A key feature to carry out my research was an Internet connection that enables to use the tool and store the (collected) data. Therefore, to use this research method, the fieldwork conditions must allow the researcher to receive an Internet connection. For this thesis, I used my cell phone to receive a connection and transmitted this connection to another device, a tablet. This tablet was easy and compact to work with during fieldwork, but the operational system of the tool, particularly the geospatial data component, was static. This geospatial data component allowed me to spatially represent the answers (or points) given by the respondents. However, many respondents preferred to indicate a dynamic line, exemplary to a route that would allow for more elaborate mapping to better discover all movements. Consequently, the lack of a more dynamical representation of the carried out CES-related activities limited my data collection and thus, the results of this thesis offer a snapshot. From my experience with this research method, I believe that the option to indicate a (dynamic) route can prove useful to future research because a route can provide more comprehensive insights. Nonetheless, more research is needed to see if a (dynamic) route proves suitable whilst delivering more resourceful insights. Nevertheless, the geospatial data component proved resourceful and provided me with exactitude on where the respondents carried out CES-related activities and where the respondents experienced particular landscape features.

8.2 Limitations of the fieldwork method and the consequences for the data (collection)

The fieldwork was carried out on weekdays in about five weeks' time. I approached (possible) respondents based on whether anyone was present and available to participate in this thesis. Consequently, in the floodplains of Ooij and Kekerdom a large number of elderly people enjoying the outdoors were encountered. Encountering this large number of elderly people most likely explains why the age category of 65> years is the largest single category in the overall age distribution of the respondents (Appendix 1). To continue on the age distribution, the results of the socioeconomic information (Appendix 1) show that there are no respondents in the age class of 35 – 44 years. This bias of respondents is most likely explained by my visiting hours in Berg en Dal because all visits took place between 10:00 am and 17:00 pm. Clearly, during these times most people within the age category of 35 - 44 years have responsibilities somewhere else. Consequently, there is no information available on their landscape experiences, or which (and where) people between the ages of 35 to 44 years carry out any CES-related activities in Berg en Dal.

For future use of this thesis' research data, the research population bias cannot be ignored because this thesis might not be suitable in representing the (visiting) population of Berg en Dal altogether. Nonetheless, taking all information into account, I strongly believe that, in light of redoing this thesis in Berg en Dal, under similar conditions, it is likely to encounter no respondents during fieldwork in the age category of 35 – 44 years.

Consequently, the findings of this thesis remain valid. Nonetheless, to decrease the chances of not encountering any respondents between 35 and 44 years old, I suggest visiting Berg en Dal on the weekend to minimize the chances on a population bias.

8.3 Explaining the low occurrence of sports activities and prospective cultural services

Chapter 3.1 shows that few CES-related activities from the category sports activities are carried out (10% of all CES-related activities) and the overall response rate for the category sports activities is low (46%). During the fieldwork, I did encounter people who were exercising / carrying out sports activities but since there was no opportunity to interrupt their exercises, I was unable to ask to participate in this thesis. Consequently, the results of the category sports activities give a distorted picture of the real situation in Berg en Dal.

Among the sports activities that were carried out, this thesis identified new sports activities that were not included in the overview of CES-related activities (**Table 2**). The new sports activities those respondents indicated carrying out, include fitness, boot camp and yoga. The 'other' sports activities are currently ignored in the present-day overview of CES-related activities. Nonetheless, the identification, mapping and acknowledgment of new sports activities (e.g. yoga) that are carried out outdoors can (ultimately) increase the current number of CES-related activities. The other sports activities are nevertheless less represented (<20%) (Chapter 3.1) compared to the 'traditional' sports activities (e.g. cycling & running).

This finding is in contrast to findings in Harshaw's study (2006) on recreational activities in a popular recreation destination in British Colombia, Canada. Their study shows that the level of 'traditional' CES-related activities that were carried out in this area (e.g. trail hiking & mountaineering) are lower compared to 'newer' forms of outdoor recreational activities (e.g. mountain biking & snowboarding). Their argumentation behind this finding is related to increased involvement of management to create favourable conditions that facilitate new and emerging outdoor CES-related activities. The article argues that for newer forms of recreation more assistance from management is required. Creating favourable conditions to facilitate these 'other' CES-related activities can furthermore increase the utilization of Berg en Dal's landscapes.

8.4 Identified hot spot and cold spot areas for CES-related activities

The finding of this thesis concerning the low number of CES-related activities that were carried out in the mixed agricultural land(s) in Berg en Dal is similar to findings stated in Van Berkel and Verburg's study (2014) on the spatial quantification and valuation of cultural services in Winterswijk, which is an area in the middle-eastern part of the Netherlands. The article states that 'hot' spots are areas that are preferred because of the composition of different landscape features such as tree lines, forests, cultural buildings and animal habitats. On the contrary, the 'cold' spots are areas where the landscape is dominated by agricultural land(s) and modern large scale farm business (Van Berkel and Verburg, 2014). This pattern is also visible in the utilization of Berg en Dal's landscapes.

8.5 Landscape users most and least preferred land-use types

The finding of this thesis about the three most preferred land-use types is in line with a report that describes the results of an analysis regarding landscape preferences of Dutch citizens

from 2006 to 2011. This particular report (Alterra, 2011) shows similar results to this thesis. The report includes a table with research results on the average landscape type preferences; 1) forest 2) ditches, creeks, rivers, lakes 3) heathland sand and dune areas 4) natural grassland, swamp and reef 5) semi open agricultural areas 6) sea and great lakes 7) small agricultural areas 8) residential areas 9) open agricultural areas and 10) business and industrial areas. The land-use type 3 (heathland, sand and dune areas) is not suitable for comparison to this thesis; therefore it is ignored in this discussion. Of the four most preferred landscape types (Alterra, 2001) three land-use types are similar, indicating that (1) forest, (4) natural grassland and (5) agricultural grassland are the most preferred landscape types for both research projects, affirming the results of the study undertaken by Alterra.

As indicated in the previous section, the Alterra report also presents the least preferred land-use types from a cultural services perspective: 1) business and industrial areas, 2) open agricultural areas and 3) residential areas. Since business and industrial areas are not occurring as a landscape type in this thesis, the focus is on the remaining land-use types, (2) open agricultural areas and (3) residential areas. Chapter 4.2 affirms that hardly any CES-related activities are carried out on either agricultural lands or in urban green spaces / built up areas, here interpreted as residential areas. Additionally, Chapter 4.1 affirms that the land-use types agricultural land(s) and built-up areas are considered to be the least attractive areas. The observations made in Chapters 4.1 and 4.2 affirm that the land-use types agricultural land and residential, or built-up areas are the least preferred land-use types in both research projects.

8.6 Land-use types and the occurrence of cultural services

As for the occurrence of cultural services, there is a distinctive relationship between specific land-use types and CES-related activities. Three land-use types agricultural grasslands, natural grasslands and forests account for the occurrence of about two-thirds of all CES-related activities that were carried out.

In Berg en Dal, the land-use type ‘water’ covers about eight per cent of the total land cover of Berg en Dal. Therefore, I presumed that respondents would frequently carry out water-related activities (e.g. swimming). This presumption was also strengthened by the report that was used for the discussion in Section 8.5 (Alterra, 2011). The report shows an overview of average land-use type preferences and the land-use type ditches, creeks, rivers and lakes comes second to the most preferred land-use type (forests). As such, the report indicates that landscapes containing (large) water bodies are much preferred by Dutch citizens.

However, after finalising the results of this thesis, Chapter 4.2 evidently shows that hardly any water related activities are carried out in Berg en Dal even though the land-use type water accounts for about ten per cent of the CES-related activities that were carried out (Figures 16, 17 and 18 (Chapter 4.2)). This result is surprising considering that Berg en Dal accommodates water related activities like swimming and angling. Apparently, Dutch citizens prefer the presence of (large) water bodies (Alterra, 2001) but in Berg en Dal, water bodies are hardly utilised.

The cause of the lack of water related activities might possibly be related to the (increased) prohibition on both fishing and swimming in Berg en Dal. Respondents mentioned that swimming along (most) parts of the south bank of the Waal river, is by law

not allowed. During fieldwork, respondents also acknowledged that the number of fishing areas was greatly reduced over the past years, indicating that strict(er) fishing restrictions limit the ability to utilise the water bodies in Berg en Dal. These various regulations clearly affect the utilization of water bodies in Berg en Dal.
Although Dutch citizens do prefer the presence of water bodies in landscapes, this thesis is exemplary to the notion that context specific conditions allows for water bodies to be utilised. As such, this thesis shows that assumptions on land-use type preferences and the real-life utilisation of landscapes can differ.

8.7 Differences in landscape experiences between local people and visitors

From all results presented in Chapter 5, the researcher can safely conclude for this thesis that visitors assign higher values to landscape features compared to local people. This finding, however is not supported by van den Berg's (1998) study on group differences as regards to the evaluation of nature development plans. Van den Berg's study (1998) shows that, in general local people assign higher values to landscape features compared to visitors. In the same study, van den Berg discusses the possible development of general models that predict and explain for landscape preferences, also known as the 'consensus assumption'. The 'consensus assumption' is "the assumption that similarities in responses to natural scenes outweigh the differences across individuals, groups and cultures" (Van den Berg et al., 1998). However, I do not share this view nor support the 'consensus assumption' because to explain for landscape preferences, every research area is different, therefore unique and every study population utilizes landscapes differently. The results of this thesis support my viewpoint, since I affirm the discovery of significant differences between groups of people in their responses to natural scenes (Chapter 5). Therefore, predicting and explaining landscape preferences cannot be generalized.

8.8 Differences in time between Berg en Dal and the former municipalities of Ooij and Groesbeek and the Likert scale.

Chapter 6 presents the results of this thesis and show that the landscape features of Berg en Dal are appreciated significantly better by the respondents of this thesis, compared to the respondents of 1997 (Figure 23) (Alterra, 2001). Although the *t*-test acknowledges the observation, perhaps the (excessively) high-appreciated landscape features might be linked to a form of bias related to the options for answering in the questionnaire. The following paragraph will elaborate upon this 'bias'.

As for the Likert scale, in Coeterier's research a Likert scale of 1 – 10 was applied and for this thesis a Likert scale of 1 – 4 was used. For the Likert scale of 1 – 4, no mid-point, or neutral answer was used because for this thesis a definite choice was preferred from the respondents. However, because a 1 – 4 Likert scale was chosen, the values had to be converted. The choices made for the conversion are subjective because no literature was found to support the researcher with a method for the particular conversion. Consequently, the converted values could have been lower or higher, would the researcher have chosen a different method. Nonetheless, the choice of using a four point Likert scale could also have played an important role in the decisiveness of the respondents regarding answering the question, as indicated in the study of Garland Worchester and Burns (1991). Their study looked into the desirableness of a midpoint, or neutral answer on a rating scale and the article

states that a four point Likert scale without a neutral answer, or mid-point appears to push (the answers of) respondents more towards the end of the Likert scale (answer 3 / 4). This push towards the end of the Likert scale would imply that a four point Likert scale would generate high mean results. The use of a four point Likert scale for this thesis could have (unintentionally) generated higher results because of the implications described in this paragraph. Therefore, as a recommendation to future research, when comparing to other results, a likewise Likert scale would be preferable since it would be easier to analyse and simultaneously decrease uncertainties.

8.9 Recommendations

On a final note, a few recommendations are included that are related to the future development of Berg en Dal's landscapes (Chapter 7). First, both the LDP and the respondents of this thesis show a strong preference for multifunctional agriculture to produce local products but also to provide secondary activities/services such as farmer's campsites-/-Bed and Breakfast. Second, currently the landscapes do not offer many possibilities for people with mobility problems. A focus on supporting facilities to make landscapes more accessible to everyone is needed. Third, from the discussion in Chapter 8.3 I suggest to create favourable conditions to increase facilities for new outdoor CES-related activities (e.g. yoga). In turn, this could also favour increased utilization of the landscape of Berg en Dal. Fourth, to accommodate space for living and working in Berg en Dal, I recommended that traffic safety should be taken into account since many respondents of this thesis indicate unsafe traffic conditions in various towns. Fifth and last, with regard to create space for nature and recreation, the respondents of this thesis indicate that the management of the landscapes need to ensure more balanced conditions to allow for both nature and recreation to flourish because, respondents currently indicate that making room for nature results in diminishing opportunities to undertake CES-related activities in certain areas of Berg en Dal.

9. Conclusions

To conclude this thesis the answers to the research questions (RQs) are presented.

RQ1 Which cultural services are provided by Berg en Dal's landscapes?

As shown in chapter 3.1 all identified cultural services in scientific literature that were used for the questionnaire are recognized and mentioned by the respondents of this thesis. For the three categories recreational, sports and other nature related activities, recreational activities are carried out the most (64%). As such, in Berg en Dal the CES-related activities that were carried out the most are recreational hiking, recreational cycling and relaxing. Furthermore, a quart of the respondents were engaged in several other nature related activities (26%) and one tenth engaged in sports activities (10%).

RQ2 Where can so-called 'hot' and 'cold' spots of cultural services be located with support of the participatory mapping tool??

Chapter 3.2 shows the areas where a large number of CES-related activities are carried out ('hot' spot areas). The 'hot' spot areas are situated in the floodplains of the Ooij and Kekerdom together with the forested areas, north of Groesbeek. This thesis shows that these areas are most preferred to carry out a diverse array of CES-related activities. Also, several CES-related activities are carried out in the mixed agricultural land(s), south of the floodplains. In contrast, the 'cold' spot areas, or areas where a low (to zero) number of CES-related activities are carried out, are the mixed agricultural land(s) surrounding Groesbeek.

RQ3 Which land-use types are preferred by the landscapes' users to carry out their activities?

Chapter 4.1 shows that the most attractive areas for carrying out CES-related activities are on the land-use types natural grasslands, forests and agricultural grasslands. Additionally, the roughest areas are inherently associated with forested areas. Furthermore, Chapter 4.2 shows that most CES-related activities are carried out on the land-use types agricultural grasslands, forests and natural grasslands.

RQ4 Are land-use types associated with the occurrence of cultural services?

Chapter 4.2 shows that most recreational activities are carried out on the land-use types forests, natural grasslands and agricultural grasslands. In contrast, agricultural grasslands, natural grasslands and forests/built-up areas are the most preferred land-use types for carrying out sports activities. Most of the other nature related activities are carried out on the land-use types agricultural grasslands, forests and natural grasslands. Additionally, although the landscape of Berg en Dal is characterised by vast water bodies, the respondents of this thesis hardly carry out any water related activities (<10%). This finding is most certainly related to the (increased) prohibition on fishing and swimming in many parts of the water bodies in Berg en Dal, inevitably resulting in reduced accessibility to certain areas.

RQ5 What is the difference in landscape experiences between local people and visitors?

Although respondents mentioned a decreased accessibility to certain areas, this thesis affirms that both groups (the local people and the visitors) are content about the accessibility of Berg en Dal. For local people, the maintenance of the landscape is experienced significantly poorer compared to the visitors. As both groups of people acknowledge that the landscape looks

(very) natural, local people do agree that the landscape is strongly influenced by human activity. However, the two groups of people do not experience this influence on the landscape significantly different. Overall, for this thesis the researcher concludes from the results of Chapter 5, that visitors assign higher values to landscape features compared to local people.

RQ6 How have the experiences of the landscape users changed compared to the experiences from 1997?

Chapter 6 affirms that the landscape experiences of the respondents of this thesis are valued significantly better compared to the respondents of the research project of 1997. This finding indicates that, for the landscape features that are taken into account, much is significantly improved over the past twenty years in Berg en Dal.

The participatory mapping approach, used as a research method to support the execution of this thesis proved suitable in capturing geospatial data during fieldwork. During fieldwork I engaged with the general public that was present in Berg en Dal's landscapes. Supported by the Mapscape tool that was developed for this thesis, I was able to (geospatially) capture how and where the respondents use the natural environment, and how respondents experience particular landscape features of Berg en Dal. Consequently, I was able to characterize and identify the various cultural services Berg en Dal provides (Chapter 3.1). The geospatial data was used in Arc Map to support the creation of maps to represent my survey results. Creating maps allowed me to identify 'hot' spots and 'cold' spots, to discover the geospatial utilisation of Berg en Dal's landscapes (Chapter 3.2). The geospatial data together with Arc Map also allowed me to discover which land-use types the respondents find the most attractive and the roughest (Chapter 4.1) and on which land-use types the respondents prefer to carry out CES-related activities (Chapter 4.2). Amongst the respondents, significant differences in experiencing landscape features are discovered (with support of SPSS) between local people and visitors (Chapter 5). Visitors also value the landscape features better than local people. Furthermore, the landscape features are experienced significantly better by the respondents of this thesis compared to the respondents of Coeterier (2002) (Chapter 6). The results of this thesis show that a participatory mapping approach can contribute to identifying, characterizing and (geospatial) mapping cultural services. Also, (non)-favourable areas can be distinguished and this gives insight into how Berg en Dal's landscapes are spatially utilized. Overall, Berg en Dal's landscapes are positively experienced and offer many cultural services for different age groups.

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Appendices

Appendix 1. Social economic background information

At the end of the questionnaire all respondents were asked to answer questions related to their social economic background. The results of these questions are shown via pie charts (Figure 25a, 25b, 25c, 25d, 25e and 25f.). The total number of respondents is 50.

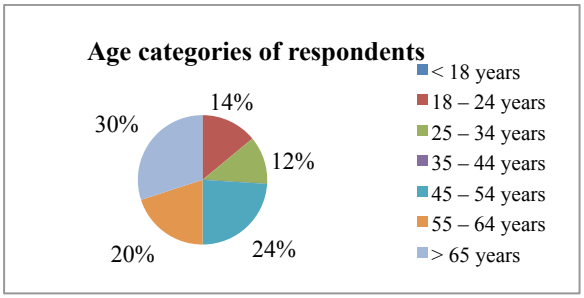


Figure 25a. Distribution of age categories

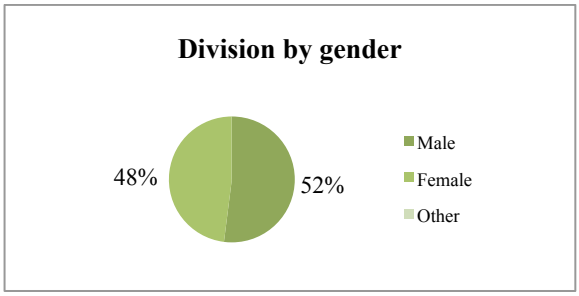


Figure 25b. Division of respondents by gender

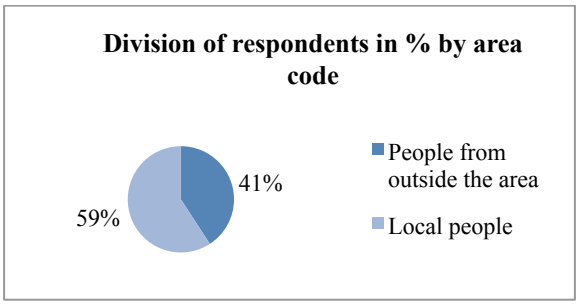


Figure 25c. Division of respondents by area code

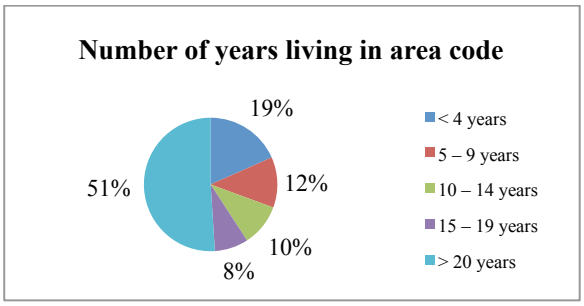


Figure 25d. Distribution of number of years living in area code

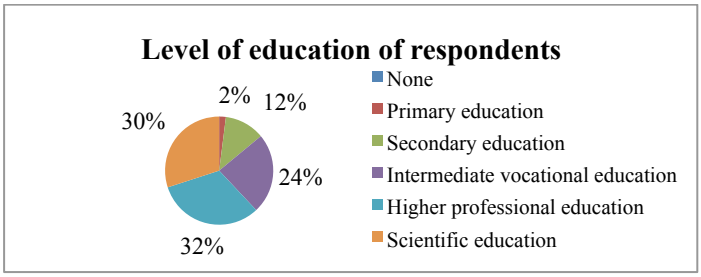


Figure 25e. Distribution of level of education

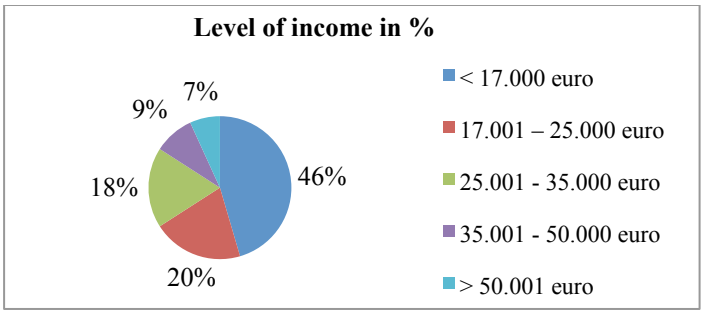


Figure 25f. Distribution of income categories.

The response rate of all categories is considered. For the age category it is a 100%, for gender division it is a 100%, for the division regarding the area code it is 98%, for the number of years living in the area code it is 98%, for the level of education it is a 100% and for the income categories it is 88%.
Figure 25a shows no respondents in the age category of 35-44 and slightly less than one third of the research population consists of people over the age of 65.
Figure 25b indicates that the number of men participating in this research is 26 and 24 for women.
Figure 25c indicates that 29 respondents live within the area code of the research area, and 20 respondents are from outside the research area.
Figure 25d shows that over half of the respondents live in their area code for over 20 years.
Figure 25e shows the distribution of the level of education of all respondents.
Figure 25f shows that approximately half of all the respondents are in the lowest income category.
The last pie chart is not part of the socio-economic questions at the end of the questionnaire. The question "How many times per month do you visit the municipality of Berg and Dal?" is asked at the beginning of the questionnaire. The result is shown in figure 26.

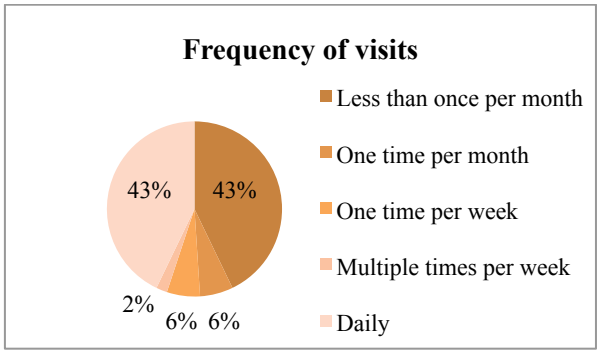


Figure 26. Frequency of visits to the research area

The response rate for the frequency of visits is 98%.
Figure 25 shows that the respondents of the research are predominantly either (short-time) visitors for once or twice per year or people who live in Berg en Dal.

Appendix 2. Results of SPSS analysis for Chapter 5

Table 4. Results of an independent samples *t*-test for comparing the mean of the answers of two groups.

Accessibility		
Levene's Test for Equality of Variances		t-test for Equality of Means
F	Sig.	Sig. (2-tailed)
.073	.788	.809
		.809

The results of Levene's Test for Equality of Variances is shown in table 4. In the first column (reading from left to right) of table 4, a significance level of .788 is presented, which is larger than α 0.05. As such, one can assume that the variances are approximately equal. Thus, the null hypothesis is not rejected and there is no difference between the means of the two groups. The significance level is higher than α 0.05, which means that for the next step in the analysis the focus is on the upper line. Table 4 shows a significance level of .809, which is larger than α 0.05. The null hypothesis is accepted which means that the two groups of people do not experience the accessibility of Berg and Dal differently.

Table 5. Results of an independent samples *t*-test for comparing the mean of the answers of two groups

Maintenance of the landscape		
Levene's Test for Equality of Variances		t-test for Equality of Means
F	Sig.	Sig. (2-tailed)
7.934	.007	.047
		.030

The results of Levene's Test for Equality of Variances is shown in table 5. The first column of table 5, shows a significance level of .007, which is smaller than α 0.05. As such, one can assume that the variances are not equal and therefore, the null hypothesis is rejected, which indicates that there is a significant difference between the means of the two groups. The significance level is smaller than α 0.05, which means that for the next step in the analysis the focus is on the bottom line. Table 5 shows a significance level of .030, which is smaller than α 0.05. As such, the null hypothesis is rejected and that means that the two groups of people do experience the maintenance of Berg en Dal significantly different.

Table 6. Results of an independent samples *t*-test for comparing the mean of the answers of the two groups

Noise nuisance		
Levene's Test for Equality of Variances		t-test for Equality of Means
F	Sig.	Sig. (2-tailed)
15.695	.000	.087
		.048

The results of Levene's Test for Equality of Variances is shown in table 6. The first column of table 6, shows a significance level of .000, which is smaller than α 0.05. Thus, the variances are not assumed to be equal and therefore, the null hypothesis is rejected, which indicates that

there is a significant difference between the means of the two groups. Since the significance level is smaller than α 0.05, that means that for the next step in the analysis the focus is on the bottom line. Table 6 shows a significance level of in the second column, which is also smaller than α 0.05. As such, the null hypothesis is rejected and that means that the two groups of people do experience noise nuisance in Berg en Dal significantly different.

Table 7. Results of an independent samples *t*-test for comparing the mean of the answers of the two groups

Smell nuisance		
Levene's Test for Equality of Variances		t-test for Equality of Means
F	Sig.	Sig. (2-tailed)
18.778	.000	.058
		.026

The results of Levene's Test for Equality of Variances is shown in table 7. Table 7 presents in the first column a significance level of .000, which is evidently smaller than α 0.05. We can assume that the variances are not equal and therefore, the null hypothesis is rejected. That indicates that there is a significant difference between the means of the two groups. Because the significance level is smaller than α 0.05, for the next step in the analysis the focus is on the bottom line. In the second column Table 7 shows a significance level of .026, which is also smaller than α 0.05. So, the null hypothesis is rejected and that means that the two groups of people do experience smell nuisance in Berg en Dal significantly different.

Table 8. Results of an independent samples *t*-test for comparing the mean of the answers of the two groups

Naturalness of the landscape		
Levene's Test for Equality of Variances		t-test for Equality of Means
F	Sig.	Sig. (2-tailed)
.269	.607	.638
		.643

The results of Levene's Test for Equality of Variances is shown in table 8. The first column of table 8 presents a significance level of .607, which is larger than α 0.05. As such, one can assume that the variances are approximately equal thus, the null hypothesis is not rejected. This indicates that there is no difference between the means of the two groups. Since the significance level is larger than α 0.05, for the next step in the analysis the focus is on the upper line. The second column of table 8 shows a significance level of .638, which is larger than α 0.05. Therefore, the null hypothesis is accepted which means that the two groups of people do not experience the naturalness of Berg en Dal differently.

Table 9. Results of an independent samples *t*-test for comparing the mean of the answers of the two groups

Influence of human activity on the landscape		
Levene's Test for Equality of Variances		t-test for Equality of Means
F	Sig.	Sig. (2-tailed)
4.301	.044	.059
		.070

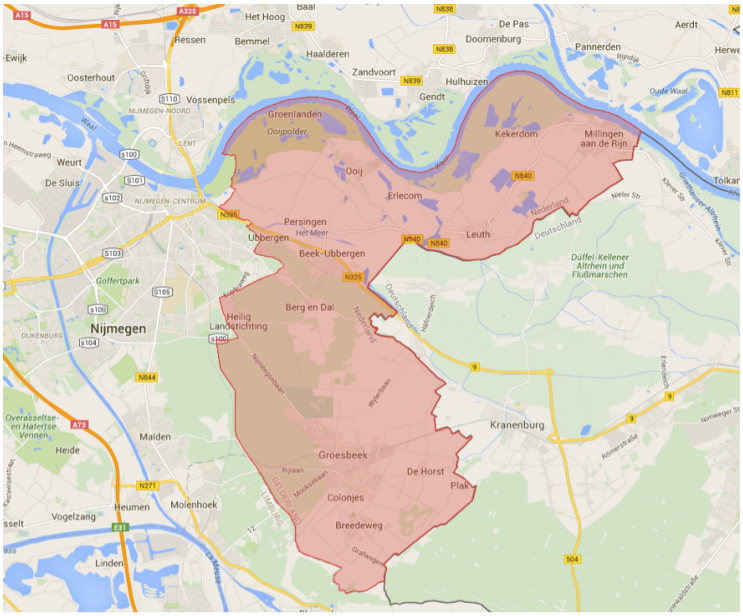
The results of Levene's Test for Equality of Variances is shown in table 9. The first column of table 9 presents a significance level of .44, which is smaller than α 0.05. The significance level of .44 indicates that we can assume that the variances are not equal and therefore, the null hypothesis is rejected. Also, it indicates that there is a significant difference between the means of the two groups. Because the significance level is smaller than α 0.05, for the next step in the analysis the focus is on the bottom line. The second column of table 9 presents a significance level of .070, which is larger than α 0.05. Therefore, the null hypothesis is accepted which means that the two groups of people do not experience the influence of human activity on the landscape of Berg en Dal differently.

Table 10. Result of an independent samples *t*-test for comparing the mean of the answers of the two groups

Levene's Test for Equality of Variances		t-test for Equality of Means
F	Sig.	Sig. (2-tailed)
14.517	.000	.092
		.058

The result of Levene's Test for Equality of Variances is shown in table 10. The first column of table 10 presents a significance level of .000, which is evidently smaller than α 0.05. The significance level of .000 indicates that we can assume that the variances are not equal and therefore, the null hypothesis is rejected. This also indicates that there is a significant difference between the means of the two groups. Because the significance level is smaller than α 0.05, for the next step in the analysis the focus is on the bottom line. The second column of table 10 presents a significance level of .058, which is larger than α 0.05. Therefore, the null hypothesis is accepted which means that the two groups of people do not experience the importance of the landscape as a reason for visiting Berg en Dal significantly different.

Appendix 3. Final Questionnaire (Dutch)



Beste respondent,

Alvast hartelijk bedankt voor uw deelname aan dit onderzoek. Al uw antwoorden zullen anoniem behandeld worden en worden uitsluitend gebruikt voor dit onderzoek.

Deze enquête wordt gebruikt voor een onderzoek naar de (persoonlijke) gebruiks- en belevingswaarde van het landschap in de gemeente Berg en Dal (voorheen de gemeenten Groesbeek, Millingen aan de Rijn en Ubbergen (zie bovenstaande afbeelding)). Dit project tracht te achterhalen hoe, waarom en waar mensen het landschap gebruiken, ervaren en waarderen om zodoende deze waarden vast te stellen.

Dit onderzoek is onderdeel van een master scriptie aan de Wageningen Universiteit. Tevens draagt dit onderzoek bij aan het civil-public-private partnerships (cp3) project, een samenwerking tussen onderzoeksinstituten uit Nederland, Duitsland en Oostenrijk en gefinancierd door de Europese Unie, ten behoeve van het versterken van ecosysteem diensten in agrarische landschappen.

Hieronder volgt een vragenlijst, inclusief een aantal kaartvragen die zo nauwkeurig mogelijk ingevuld dienen te worden. Deze questionnaire zal ongeveer 15 minuten duren.

Alvast hartelijk bedankt,

Alexander Jongens

MSc Environmental Sciences

Environmental Systems Analysis group

1) Hoe vaak per maand bezoekt u de gemeente Berg en Dal?

- o Minder dan 1 keer per maand
- o 1 keer per maand
- o 1 keer per week
- o Meerdere keren per week
- o Dagelijks

2) Welke ontspanning gerelateerde activiteiten onderneemt u in de gemeente Berg en Dal?

- o Recreatief wandelen
- o Recreatief zwemmen
- o Recreatief fietsen
- o Ontspannen
- o Uitlaten van dieren
- o Consumeren van voedsel (bv. picknicken)
- o Bezoeken van historisch-significante plaatsen
- o Andere, licht toe:……
- o Niet van toepassing

3) Kunt u de vijf meest voorkomende activiteiten aangeven op de kaart?

(1) (2) (3) (4) (5)

4) Welke sport gerelateerde activiteiten onderneemt u in de gemeente Berg en Dal?

- o Bal sport (bv. voetbal)
- o Hengel / Vis sport
- o Fietsen (bv. wielrennen / mountainbiken)
- o Hardlopen
- o Ruitersport
- o Andere, licht toe:……
- o Niet van toepassing

5) Kunt u de vijf meest voorkomende sportactiviteiten aangeven op de kaart?
(1) (2) (3) (4) (5)

6) Welke natuur gerelateerde activiteiten onderneemt u in de gemeente Berg en Dal?

- o Natuur fotografie
- o Artistiek (bv. schilderen)

- Flora spotten (bv. unieke planten)
- Fauna spotten (bv. unieke vogels)
- (In)formele voorlichting (bv. ouder naar kind)
- Onderzoek (bv. biodiversiteit)
- Werken (bv. onderhoud)
- Spiritueel (bv. heilige / religieuze plaatsen bezoeken)
- Andere, licht toe:…….
- Niet van toepassing

7) Kunt u de vijf meest voorkomende activiteiten aangeven op de kaart?

(1) (2) (3) (4) (5)

8) Ik ben tevreden over de toegankelijkheid van de diverse landschappen in de gemeente Berg en Dal

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

Toegankelijkheid = Bv. parkeerplaatsen, wegen, fietspaden of wandelpaden

9) Ik ben tevreden over het onderhoud van de diverse landschappen in de gemeente Berg en Dal

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

Onderhoud = Bv. de wegen, huizen, sloten, bermen

10) Ik ondervind geen geluidsoverlast in de gebieden in de gemeente Berg en Dal

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

Geluidsoverlast = Bv. gemotoriseerd verkeer, werkzaamheden in de omgeving

11) Ik ondervind geen stankoverlast in de gebieden in de gemeente Berg en Dal

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

Stankoverlast = Bv. zware industrie, bemesting, organisch restafval

12) Indien u bij de vragen 8 t/m 11, 1 of 2 heeft aangegeven, geef dan op de kaart aan waar u dit heeft ondervonden

1 = Lastig bereikbaar 2 = Nalatigheid betreffende onderhoud 3 = Geluidsoverlast 4 = Stankoverlast

13) Ik ben van mening dat het landschap in de gemeente Berg en Dal, over het algemeen een natuurlijk karakter heeft

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

Natuurlijk karakter = minimale invloed van de mens op de indeling van het landschap. (Bv. hoeveelheid en afwisseling)

14) Ik ben van mening dat het landschap van de gemeente Berg en Dal sterk beïnvloed is door mensen

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

15) Ik ben van mening dat er veel nadruk ligt op natuurbehoud in de gemeente Berg en Dal

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

16) Ik ben van mening dat er veel nadruk ligt op de landbouw in de gemeente Berg en Dal

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

17) Indien u bij de vragen 15 & 16, 3 of 4 heeft aangegeven, indiceer dan op de kaart waar dit is
1 = natuurbehoud 2 = landbouw

18) Indiceer op de kaart waar u onderstaande uitspraken het best vindt passen

Hier vind ik het landschap het 1 = meest aantrekkelijk 2 = minst aantrekkelijk 3 = meest ruig 4 = minst ruig

19) Het landschap is voor mij een belangrijke reden om Berg en Dal te bezoeken en/of om er te wonen

Helemaal mee oneens (1) Oneens (2) Eens (3) Helemaal mee eens (4)

20) Wat zou volgens u meer aandacht verdienen bij de verdere ontwikkeling van het landschap in Berg en Dal?

Meerdere antwoorden mogelijk:
- o Meer natuur voor biodiversiteit
- o Meer recreatiemogelijkheden in de natuur
- o Landbouw voor voedselproductie

- o Multifunctionele landbouw (voor voedselproductie, recreatie en biodiversiteit)
- o Ontwikkeling van de dorpen
- o Andere, licht toe
- o Niet van toepassing

21) Waar zou deze verdere ontwikkeling volgens u moeten plaatsvinden?

1 = Meer natuur voor biodiversiteit
2 = Meer recreatiemogelijkheden in de natuur
3 = Landbouw voor voedselproductie
4 = Multifunctionele landbouw (voor voedselproductie, recreatie en biodiversiteit)
5 = Ontwikkeling van de dorpen
6 = Andere, licht toe……

Dit was het einde van de enquête. Er volgen nog enkele achtergrondvragen betreffende uw leeftijd, geslacht en uw woonplaats, evenals uw sociaal-economische achtergrond.

22) Wat is uw leeftijd?

- o < 18 jaar
- o 18 – 24 jaar
- o 25 – 34 jaar
- o 35 – 44 jaar
- o 45 – 54 jaar
- o 55 – 64 jaar
- o > 65 jaar

23) Wat is uw geslacht?

- o Man
- o Vrouw
- o Andere

24) Wat is uw vier cijferige postcode?
……..

25) Hoelang woont u al in deze omgeving?
- o < 4 jaar
- o 5 – 9 jaar
- o 10 – 14 jaar
- o 15 – 19 jaar
- o > 20 jaar
- o Ik woon niet in deze omgeving

26) Wat is u hoogst genoten opleiding?

- Geen
- Basisschool
- Middelbare school
- MBO
- HBO
- WO

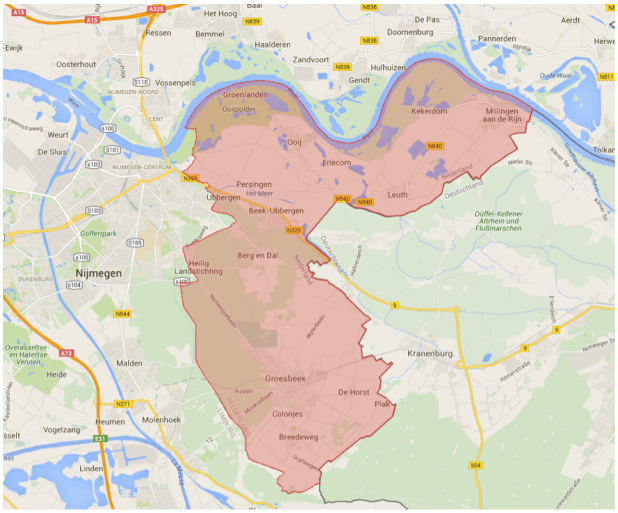
27) In welke inkomensklasse valt u?

- < 17.000 euro
- 17.001 – 25.000 euro
- 25.001 - 35.000 euro
- 35.001 - 50.000 euro
- > 50.001 euro

In het geval u geïnteresseerd bent in de resultaten van dit onderzoek, vul dan uw email hieronder in:

……..

Appendix 4. Final Questionnaire (English)



Dear respondent,

Thank you for participating in this research. Your answers will be used in confidentiality and solely for this research.

This questionnaire is used for a study regarding the (personal) user value and perception on the landscape of the municipality of Berg en Dal (formerly known as the municipalities Groesbeek, Millingen aan de Rijn and Ubbergen (see the picture above)). This research project will attempt to determine how, why and where people are experiencing and using the landscape to determine the user values of the landscape.

This research is part of a master thesis from the University of Wageningen and Research Centre. Also, this research is contributing to the civil-public-private partnerships (cp3) project, which is a collaboration between research institutes from The Netherlands, Germany and Austria and financed by the European Union, for the enhancement of ecosystem services in agricultural landscapes.

Below you will find a questionnaire, including questions related to spatial mapping and all the questions need to be answered as completely as possible. This questionnaire will take 15 minutes.

Thank you in advance,

Alexander Jongens.
MSc Environmental Sciences
Environmental Systems Analysis group

1) How many times per month do you visit the municipality of Berg and Dal?

- Less than 1 time per month
- 1 time per month
- 1 time per week
- Multiple times in the week
- Daily

2) Which recreational activities do you carry out in the municipality of Berg and Dal?

- Recreational hiking
- Recreational swimming
- Recreational cycling
- Relaxing
- Walking with pets
- Consuming of food (e.g. pick nick)
- Visiting historical–significant places
- Other, explain:……..
- Not applicable

3) Can you indicate the five most frequently done activities on the map?

(1) (2) (3) (4) (5)

4) Which sports do you carry out in the municipality of Berg and Dal?

- Ball sports (e.g. soccer)
- Angling
- Cycling (e.g. bicycle racing / mountain biking)
- Running
- Horse riding
- Other, explain:…….
- Not applicable

5) Can you indicate the five most frequently done activities on the map?

(1) (2) (3) (4) (5)

6) Which nature based activities do you carry out in the municipality of Berg and Dal?

- Nature photography
- Artistic (e.g. painting)
- Flora spotting (e.g. unique plants)
- Fauna spotting (e.g. unique birds)

- (In)formal education (e.g. parent to children)
- Research (e.g. biodiversity)
- Working (e.g. maintenance)
- Spiritual (e.g. visiting of religious places)
- Other, explain:…….
- Not applicable

7) Can you indicate the five most frequently done activities on the map?

(1) (2) (3) (4) (5)

8) I am content with the accessibility of the landscape of the municipality of Berg and Dal

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

Accessibility = e.g. parking lots, roads, bicycle roads or hiking roads

9) I am content with the maintenance of the landscape of the municipality of Berg and Dal

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

Maintenance = e.g. roads, houses, ditches, roadsides

10) I experience no noise hindrance in the areas in the municipality of Berg and Dal

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

Noise hindrance = e.g. motor vehicles, construction in the area

11) I experience no odour hindrance in the areas in the municipality of Berg and Dal

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

Odour hindrance = e.g. (heavy) industry, manuring, organic waste

12) In case you answered, 1 or 2 for the questions 8 to 11, please indicate on the map where you have experienced this

1 = Difficult to reach 2 = Negligence regarding maintenance 3 = Noise hindrance 4 = Odour hindrance

13) I believe that the landscape of the municipality of Berg and Dal looks natural

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

Natural = minimal interference of humans in the design of the landscape (e.g. quantity and diversity)

14) I believe that the landscape of the municipality of Berg and Dal is influenced by humans

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

15) I believe that there is an emphasis on the conservation of nature in the municipality of Berg and Dal

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

16) I believe that there is an emphasis on agricultural production in the municipality of Berg and Dal

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

17) In case you answered 3 or 4, for questions 15 & 16, please indicate on the map where this is occurring

1 = nature conservation 2 = agriculture

18) Indicate on the map where you think the following statements are most suitable

Here the landscape is the 1 = most attractive 2 = least attractive 3 = most wild 4 = least wild

19) The landscape is an important reason for me to visit and / or to live in the municipality of Berg and Dal

Totally disagree (1) Disagree (2) Agree (3) Totally agree (4)

20) What do you think that should gain more attention for the future development of the landscape of Berg and Dal?

- More nature for the enhancement of biodiversity
- More recreational possibilities in nature
- More agriculture for food production
- Multi-functional agriculture (for food production, recreation and biodiversity)
- Future development of the towns / cities
- Other, please explain……

21) Where should this development take place?

1 = More nature for the enhancement of biodiversity
2 = More recreational possibilities in nature
3 = More agriculture for food production
4 = Multi-functional agriculture (for food production, recreation and biodiversity)
5 = Future development of the towns / cities
6 = Other, please explain……

This is the end of the questionnaire. In the following part there will be some social economic background questions related to, for example, your age, gender and area code of your residence.

22) What is your age?

- < 18 years
- 18 – 24 years
- 25 – 34 years
- 35 – 44 years
- 45 – 54 years
- 55 – 64 years
- > 65 years

23) What is your gender?

- Male
- Female
- Other

24) What is your area code?

…….

25) How long have you been living in this district?

- < 4 years
- 5 – 9 years
- 15 – 19 years
- > 20 years

26) What is your highest level of education?

- None
- Primary school
- Secondary school
- Intermediate Vocational Education
- University of Applied Sciences
- University

27) To which income category do you belong?

- < 17.000 euro
- 17.001 – 25.000 euro
- 25.001 – 35.000 euro
- 35.001 – 50.000 euro
- > 50.001 euro

In case you are interested in the results of this thesis, please fill in your e-mail below:
…….

Appendix 5. List of Figures

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Appendix 6. List of Tables

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