

Changing valuations of cultural ecosystem services
along an urban–periurban gradient in Berlin:
Qualitative and quantitative assessments

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CHAPTER ONE
CHANGING VALUATIONS OF CULTURAL ECOSYSTEM SERVICES



Abstract of the doctoral thesis

Urban green experiences high use-pressures through differing and conflicting demands. Ecosystem services provided by urban green are manifold, with cultural ecosystem services (*CES*) representing socio-cultural benefits. To be able to inform policy-makers about the values of their urban green, changing and conflicting perceptions of cultural ecosystem services should be acknowledged. In the doctoral thesis at hand I combined qualitative and quantitative social research methods to gain information on cultural ecosystem services provided by urban green in Berlin.

After theoretical analyses, qualitative values of CES were assessed through semi-structured interviews with Berlin inhabitants (problem-centered interviews, $n = 22$) and experts (expert interviews, $n = 19$). Categories of cultural ecosystem services were uniquely adjusted to fit to the urban context and detailed information on the benefits of urban green for local inhabitants gained. Further, I emphasized differences between experts and inhabitants understanding, which should be considered in planning processes. Additionally, quantitative values were assessed using a face-to-face survey, based on proportioned stratified sampling. Data ($n = 558$) were collected in two sampling rounds in four districts of Berlin. My results show that green space utilization and valuation of cultural ecosystem services differs by population density of the sampled district of Berlin. Moreover, different social groups – here younger urban dwellers in the city center and older residents in less densely populated areas – perceive cultural ecosystem services differently. I uncovered spatial, temporal and social factors which underlie cultural ecosystem service valuation. Cultural ecosystem services have a heterogeneous character and their understanding is of great importance for green space management, spatial planning and ecosystem service research.

Growing awareness of Cultural Ecosystem Services

The ecosystem service approach gained vast momentum in the last decade (Seppelt et al. 2011; Fisher et al. 2009; Costanza & Kubiszewski 2012). Designed as a heuristic analytical tool to stress connections between human well-being and ecosystem conservation (Norgaard 2010), it is now a frequently used tool in research to inform decision-makers and policy planners. Based on the works of the Millennium Ecosystem Assessment (MEA 2005) and The Economics of Ecosystems and Biodiversity (Teeb 2010) the concept aims to inform about complex and intricate ecological and socio-ecological connections to avoid further environmental damage on various spatial and temporal scales (MEA 2005; Teeb 2010). It particularly stresses quantifications of ecosystem services, leading to the call of the EU to value and assess ecosystem services by 2014 (European Commission 2011) and the emergence of national research groups as e.g. Naturkapital Deutschland.

Ecosystem services are mainly classified in four categories: regulating, provisioning, supporting and cultural (MEA 2005; Teeb 2010). While plenty of research has been done in the last decade, there are still unresolved conceptual and methodological problems, especially within the realm of cultural ecosystem services (CES) research (E.S.F. 2010; Daniel et al. 2012; Norton et al. 2012). Although studies on CES increase recently, various research gaps are yet to fill (Milcu et al. 2013; Hernández-Morcillo et al. 2013).

Within the MEA report, CES are defined as the "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (2005:40). Another valuable definition comes from Chan et al. (2012) in which CES are "ecosystems' contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships" (2012:9). In general, CES are differentiated in 10 different categories (MEA 2005:40):

- | | |
|-----------------------------------|---------------------------------------|
| 1. Values for cultural diversity | 6. Aesthetical values |
| 2. Spiritual and religious values | 7. Values for social relations |
| 3. Values for knowledge systems | 8. Values for sense of place |
| 4. Educational values | 9. Cultural heritage values |
| 5. Inspirational values | 10. Values for recreation and tourism |

CES only occurring if they "demonstrate a significant relationship between ecosystem structures and functions specified in the biophysical domain and the satisfaction of human needs and wants specified in the medical/psychological/social domain" (Daniel et al. 2012).

Urbanization and Cultural Ecosystem Services

Research shows that CES become more important and their necessity will increase over time (Guo et al. 2010), especially in urban areas (Radford & James 2013). In general, with the proceeding urbanization ecosystem services will become more valuable for urban sustainability. Urban ecosystems improve biodiversity, mitigate urban heat effects and contribute to public health (Bolund & Hunhammer 1999; Faehnle, Bäcklund, et al. 2014; Bowler et al. 2010). However, protection of urban ecosystems is difficult as competition for economical usage of this land is high. Commercial use, residential development and the increasing use for recreational purposes require a balanced, comprehensive planning to account for the need of the growing population (Bolund & Hunhammer 1999; Seeland et al. 2009; Chan et al. 2007). CES can be one way to assess these needs and demands. However, urban landscapes or green spaces have long been neglected (E.S.F. 2010) and are only slowly becoming of more interest in the CES research (Radford & James 2013). Further, especially in urban areas where the use pressure is high, inclusion of the public is a prerequisite for socially just and sustainable urban planning (Faehnle, Bäcklund, et al. 2014; Kabisch & Haase 2014). However, inclusion of stakeholders in ecosystem service research is still lacking (Menzel & Teng 2010; Seppelt et al. 2011).

Urbanization can range from urban sprawl to densification. In urban sprawl the periurban surrounding of a city is increasingly settled without substantially increasing inner-city density. When city limits have to be maintained, city growth is achieved by urban densification (e.g. Eigenbrod et al. 2011). These differing urbanization processes can result in complex population density structures which impact demands for urban ecosystem services. Resulting spatial patterns in the use, conservation and appreciation of ecosystem services are rarely considered (de Groot et al. 2010; Faehnle, Söderman, et al. 2014), especially for CES (Radford & James 2013). My study is the first to focus solely on urban CES while including an urban–periurban gradient defined through population density to reflect spatial factors influencing CES valuations. I further focused on social factors which can influence CES valuations, as only limited knowledge exists on the provision of CES from urban green and their value heterogeneity (e.g. Feld et al. 2009).

Problems of Valuation and Quantifications

Even though there has been much recent research on CES, it is still the least developed category in the ecosystem service framework (Polishchuk and Rauschmeyer 2012, Plieninger et al. 2013). CES are described as difficult to assess due to their heterogenic values (e.g.

Plieninger et al. 2013; Daniel et al. 2012; Gee & Burkhard 2010). Further, socio-cultural values assessments are especially challenging (Oteros-Rozas et al. 2014; Iniesta-Arandia et al. 2014; Scholte et al. 2015). Socio-cultural values are only lately come into focus of ecosystem service research (e.g. review by Scholte et al. 2015). While the valuation of non-material aspects of the human–environment interaction might be difficult, neglecting socio-cultural aspects in ecosystem service research might unduly reduce the impact of CES demands on environmental policy and urban planning (de Groot et al. 2010; Klain & Chan 2012; Norton et al. 2012).

Further, until now, most published studies focus on only specific CES (especially recreation and tourism or aesthetical values) and rarely use all ten CES categories (Milcu et al. 2013; Hernández-Morcillo et al. 2013). Through such a prior selection, under or over-valuation of CES and a hence biased information for decision-makers can be the result. Effects of interrelations between CES categories between variables are rarely recognized (e.g. Ruiz-Frau et al. 2012; Polishchuk & Rauschmayer 2012).

One way to tackle the problems of comprehensive CES valuations could be the use of bundles. Ecosystems are multifunctional and collectively deliver multiple bundles of ecosystem services (Haslett et al. 2010; Raudsepp-Hearne et al. 2010). Yet, in a recent review Milcu et al. (2013) stated that only a small amount of studies focused on ecosystem bundles, especially in the realm of CES. While the topic of bundling ecosystem services recently got more attention (e.g. Bieling & Plieninger 2012; Klain et al. 2014; Martín-López et al. 2012), there are conceptual gaps on bundle creation. It is often unclear how bundles were created and if local perceptions were included into the creation.

Furthermore, inclusion of social preferences without using monetary valuation is relatively scarce in ecosystem services research (e.g. Martín-López et al. 2012; Klain & Chan 2012; Chan, Satterfield, et al. 2012), and the eco-cultural domain largely overlooked within current studies (Plieninger et al. 2013). Social research methods can focus on perceptions, values and attitudes. They may generate more meaningful insights regarding the contributions of ecosystem services to human well-being than purely biophysical assessments (Martín-López et al. 2012; Plieninger et al. 2013). In particular, they give more precise understanding of the relevance of ecosystem services for local stakeholders (Chan, Guerry, et al. 2012).

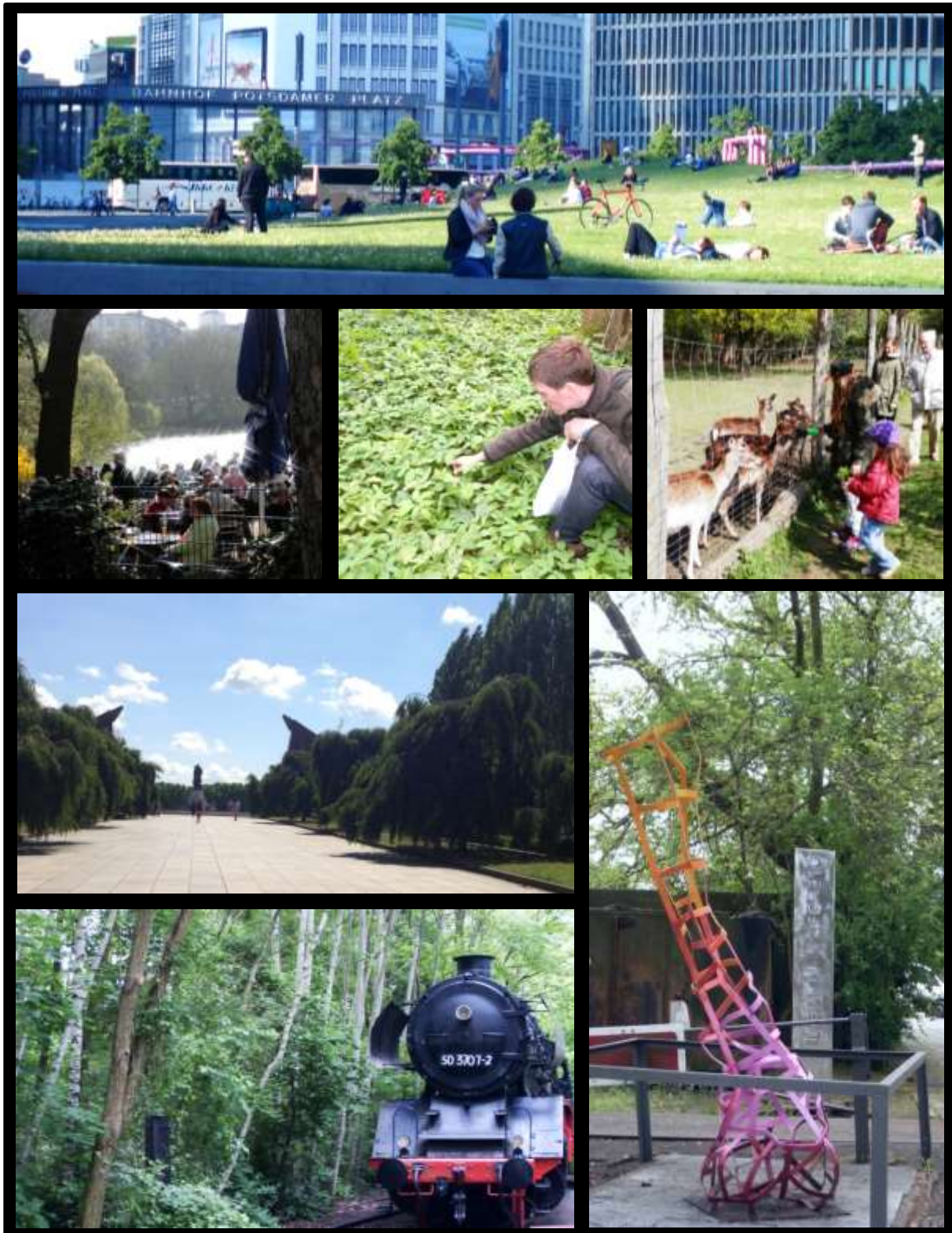


Figure 1 Different urban green spaces in Berlin providing cultural ecosystem services. From top left to bottom right: grass field in front of the Potsdamer Platz Station, Café at Lietzensee, *Allium ursinum* (ramson) picking and deers at Botanical garden Pankow, Soviet memorial at Treptower Park, Old train and *Il Giardino Secreto* of the group Odious at Natur-Park Südgelände.

Chapter Outline and Research Questions

Chapter II Perceptions of cultural ecosystem services from urban green

After theoretical and literature studies, I qualitatively assessed CES through semi-structured interviews. Interviewees were distinguished into: (1) Professionals from planning and decision-making positions sampled from the Berlin Senate Administration for City Development and Environment and the Berlin Forestry Commission Office (expert interviews, $n = 9$); (2) Representatives of users from organizations concerned with CES (expert interviews, $n = 10$); (3) Ordinary users (problem-centered interviews, $n = 22$) (Flick 2006; Witzel 2012; Witzel 2000). Interviews were evaluated by an inductive content analysis (Mayring 2000), which guaranteed assessment the urban context and of local specific perceptions. In this chapter I address the research questions of: How are CES understood in the urban context of Berlin and which are the focus areas of the interviewees. Second, I ask if the MEA categories for CES are backed by my research. My study results show that many CES categories, especially the one for cultural diversity values had to be adjusted to the urban context. Further, the category of knowledge systems was substituted by one for nature awareness. I found that the academically developed MEA categories are supported by my empirical research. Furthermore, I suggest connections between the concepts of CES and urban social sustainability. I hence see the concept of CES as one way to facilitate a simultaneous inclusion of social sustainability and CES in policy and decision-making through mutual enhancement of socio-ecological aspects.

Chapter III Experts' versus laypersons' perception of urban cultural ecosystem services

The research presented in this chapter uses the qualitative data of $n = 41$ interviews collected through expert and problem-centered interviews, as described above. Based on the qualitative content analysis of chapter II, I address differences and correspondences between laypersons' and experts' conceptualizations of urban CES in Berlin, as these may affect effective management negatively. This chapter focusses on quantification of results through quantitative content analysis to compare results. My study aims to contribute to the improvement of effective participation in urban environmental planning and increase the acceptance of respective programs by the persons concerned through incorporating their needs and wants therein. I used frequency analysis and multidimensional scaling (ALSCAL) to indicate differing priorities and perceptions of CES by the experts and laypersons. With this approach I additionally suggest a way of bundling CES through qualitative research. CES bundles could be used for further studies, especially facilitating quantifications. My results

suggest that laypersons and experts may not share a common understanding on demands for urban green. For example, experts prioritize CES which contribute to human interactions on urban green, while laypersons' stress the importance of emotional connections to nature. However, the underlying concepts of which CES were defined as being beneficial for emotional connections to nature differed also between the actor groups. Aware of these contrasts, communication between stakeholders could be facilitated (e.g. Martín-López et al. 2012; López-Santiago et al. 2014).

Chapter IV Cultural ecosystem services of urban green along an urban– periurban population density gradient

In this chapter I investigate spatial effects on CES importance in urban areas. Based on the qualitative research, I assessed CES quantitatively using a face-to-face survey. Data ($n = 558$) were collected through proportioned stratified cluster sampling in two sampling rounds in four districts of Berlin. Research question were about the influence of population density on urban green space utilization and CES perceptions. Further, I investigated connections of urban green utilization and stated importance for CES, as it is necessary for grasping CES values to understand utilization patterns (e.g. Scholte et al. 2015; Qureshi et al. 2010). Study results show that in more densely populated areas parks and open green spaces are visited in higher frequency, while residents of less densely populated areas visit e.g. forests more often. Duration of visits was decreasing with my urban–periurban gradient. My findings suggest that inhabitants of densely populated areas prefer social CES, such as values for social relations and cultural diversity, while CES related to direct natural experiences are valued higher by periurban dwellers. Through my results conclusions could be drawn for spatial factors influencing CES values and to give suggestions for cities with similar population densities as selected districts. Additionally, I present social research methods for ecosystem service quantifications, while incorporating a wide set of understanding of CES (e.g. Klain & Chan 2012). Further, I introduced an approach on how to identify bundles of CES that refer to similar socio-ecological preferences of urban green.

Chapter V Conflicting demands of different social groups on cultural ecosystem services provided by urban green

In this chapter I used data ($n = 558$) collected through face-to-face survey, based on proportioned stratified cluster sampling to scrutinize the heterogeneity and subjectivity of CES values. I researched the questions of existing synergies and trade-offs between categories of CES

provided by urban green. Further, I analyze spatial, temporal and, above all, social factors which influence CES valuation. With this research I aim to show possible conflicting user demands and preferences (e.g. Calvet-Mir et al. 2012). Overarching research question is hence, who likes which CES provided by urban green in Berlin and why. My findings suggest a dichotomy regarding socio-demographic factors, especially for age and the urban gradient. We can distinguish CES preferences between an older social group, living in more periurban areas which prefer CES related to direct natural experiences, such as values for education, religious and spiritual values. This social group values social CES significantly less. In contrast to this group stand younger and more urban dwelling user groups. These prefer CES which positively influence human interactions. We hence see a contrast between two groups, in which the one group does not share the values of the other.

Through findings like this I hope to shed light on the user demands on CES in urban green in Berlin (e.g. Kabisch & Haase 2014; Priego et al. 2008). I aim to give tools at hand to mitigate conflicts before they emerge, showing interactions often overlooked in research and policy making. Additionally, my quantitative findings again suggest connections of CES and urban social sustainability. As sustainable cities can only occur if ecological, social and economic sustainability is achieved, CES can act as a tool to link social and ecological dimensions.

Appendix Discussion Paper “Bewertung kultureller Ökosystemleistungen von Berliner Stadtgrün“

One aim of this doctoral thesis is the distribution of results to political decision-makers, who are actually affected by the problems and discussions stated in this research. I thus created a policy report in German language to be distributed to all experts involved in the qualitative interviews, as well as higher positions of the Senate Department for Urban Development and the Environment. This additional chapter mainly gives descriptive information on green space utilization, attitudes towards CES and nature conservation and a short discussion on temporal/seasonal influences when assessing environmental or nature related issues. It picks up results of the main four chapters of this dissertation in easy understandable language.

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CHAPTER TWO
PERCEPTIONS OF CULTURAL ECOSYSTEM SERVICES
FROM URBAN GREEN



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Abstract

Cultural ecosystem services are growing in importance and their substantial contribution to well-being is well recognized. Yet, significant conceptual and methodological gaps exist, especially for urban ecosystems. We analyzed perceptions of cultural ecosystem services in the urban context of Berlin, based on qualitative research methods. Using expert and problem-centered interviews, we show how cultural ecosystem services are understood and which focus areas were emphasized. We compared our inductive codes with the Millennium Ecosystem Assessment. While our findings show supporting evidence for the Millennium Ecosystem Assessment classification, some categories had to be substituted, others adjusted to local citizen understandings. The results reveal a variety of intricate cultural ecosystem services perceptions. Hence, selecting and emphasizing only a few services without prior studies could misinform decision-makers and lead to biased policy outcome. Regionally specific perceptions of cultural benefits from urban green are important information for planning processes. Cultural ecosystem services could be one way to achieve awareness of socio-ecological aspects, as our results show linkages between cultural ecosystem services and urban social sustainability. Using qualitative cultural ecosystem services research could foster public participation and increase the input of regionally specific perceptions.

Keywords

Cultural values; nature perceptions; qualitative research; urban social sustainability; valuation

Introduction

To achieve socio-ecological sustainability and sound management decisions, understanding cultural benefits of ecosystem services is important (e.g. Faehnle et al., 2014). Regional characteristics, actor groups and landscape settings can all influence the perceptions of immaterial aspects of natural environments (e.g. Cumming et al., 2014; Kabisch and Haase, 2014). Incorporating regionally specific preferences into policy and decision-making is a core challenge to understand social-cultural perceptions at local scales (Pereira et al., 2005).

In the report of the Millennium Ecosystem Assessment (MEA) cultural ecosystem services (CES) are defined as "nonmaterial benefits people obtain from ecosystems through spiritual

enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (MEA, 2005a:40). Another valuable definition comes from Chan et al. in which CES are defined as "ecosystems' contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships" (2012:9). Although often neglected (Hernández-Morcillo et al., 2013; Norton et al., 2012), a relative negligence of socio-cultural aspects in ecosystem service research might trivialize the importance of CES in environmental policy and planning (e.g. Plieninger et al., 2013). As ecosystem services as a resource are scarce in urban areas, they become even more relevant for decision-makers (e.g. Kabisch and Haase, 2014).

The CES categories appear to have been developed in discussions among the MEA experts, but are not based on a comprehensive empirical study of peoples' perceptions. There are still conceptual and methodological gaps in the realm of CES (Daniel et al., 2012; Milcu et al., 2013; Polishchuk and Rauschmayer, 2012). CES are often regional- and individual-specific as they refer to personal capabilities and interests of the people who benefit from them (Gee and Burkhard, 2010; Kumar and Kumar, 2008; Polishchuk and Rauschmayer, 2012). These complex contexts require social research to increase cultural and regional sensitivity of CES studies (Daniel et al., 2012; Gould et al., 2014; López-Santiago et al., 2014; Plieninger et al., 2014). Studies of perceptions can often generate more insight into an under-developed research area than purely quantitative or monetary studies (e.g. Chan et al., 2012). Through exploring the relative priorities, needs and wishes of the interviewees, our qualitative research is an initial approach to the CES complexity and can set parameters for future research (e.g. Hartel et al., 2014).

In our study we approach this task by focusing on CES from urban green in the city of Berlin. We address the following research questions: 1) How are CES understood in the urban context of Berlin? Which are the focus areas of the interviewees? 2) Are the MEA heuristics of CES categories backed by our qualitative research?

Methods

The capital city of Germany, Berlin, was selected as our study area. With an area of 892 km² Berlin is Germany's largest and with 3.5 million inhabitants (2013) its most populated city.

Over 40% of Berlin's area is covering green or water spaces (Statistik-Berlin-Brandenburg, 2014).

Data collection

Interviewees were distinguished into three actor groups: (1) Professionals from planning and decision-making positions sampled from the Berlin Senate Administration for City Development and Environment and the Berlin Forestry Commission office ($n = 9$). This group was able to give insights into the supply-side of CES. (2) Representatives of users from organizations concerned with CES gave an overview on collective demands ($n = 10$). For group (1) and (2) expert interviews were conducted (Flick, 2006). Experts were defined as persons with extensive knowledge, engagement or work in relation to CES aspects. Groups (3) consist of ordinary users ($n = 22$). For this group, problem-centered interviews were carried out with inhabitants of Berlin (Flick, 2006; Witzel, 2000). Through incorporating three actor groups, we captured a range of different insights and levels of knowledge. 41 interviews were conducted from May to December 2013 by the first author: 19 expert and 22 problem-centered interviews. Average length was 46 minutes.

The sample structure for expert interviews was decided *ex ante* through extensive studies on CES and Berlin's environmental infrastructure. Experts were chosen in regard to their CES related projects. Inhabitants of Berlin were approached on green and water spaces during an "urban nature"-event in different districts in Berlin and apart from that through snowball sampling. After a first analysis of the interview contents, we used contrast sampling for all interview groups to increase contrary and conflicting opinions and henceforth increase representativity (Flick, 2006). Especially for problem-centered we balanced gender, age, education level and included a distribution of urban and periurban residency. As we choose interviewees with opposing viewpoints, a broad range of opinions was selected.

For the interviews, a semi-structured guideline was used. Interview guidelines were constructed through intensive literature studies on CES and the supply situation of Berlin's green spaces. The guidelines were directed towards our research questions on how CES were understood and specified by our interviewees. Structure and wording of interview guidelines were improved through two focus groups and four pretest interviews. Guidelines contained questions on local preferences for green spaces, on which elements of Berlin's natural environment were used or demanded for which purposes and regarding different aspects of CES. The inter-

viewees were prompted with a talk-generating question and the structure of the interview was adjusted to their statements. The terms of ecosystem services has not been used, as even for experts these concepts were unfamiliar. Examples from translated expert and problem-centered interviews are found in the appendix. For presentation of our results, quotations were translated from German to English by the first author.

Data Analysis

Interviews were transcribed verbatim and analyzed with MAXQDA 11 (VERBI GmbH Berlin, Germany) using qualitative content analysis (Mayring, 2008). We chose an inductive coding strategy rather than one based on previous CES research in order to increase sensitivity to the local socio-cultural context. Thus, our results contain conceptualizations specific to the emotional attachment and perceptions of Berlin inhabitants. Interview transcripts were coded with respect to discrete meaning units (codes) (Mayring, 2008) resulting into 2.506 codes concerning CES. In three successive steps the codes were inductively grouped together to form categories of an increasing level of abstraction. During these steps, we aimed at preserving the qualitative character of interviewee statements. Because of its strictly inductive character, this procedure resulted in top categories of differing levels of abstraction. After the 3rd reduction step the resulting 16 inductive codes were compared and, if possible, assigned to the CES categories of the MEA report (2005a).

Results

Resulting from qualitative content analysis, the following sixteen topics regarding CES on urban green in Berlin were identified:

1. Group specific needs and uses of nature

Many interviewees stressed that the demands and needs with respect to public green spaces differ between social groups. As one inhabitant expressed it: there are groups that *“Use the green spaces like a living room. [...] And then the diversification with age. [...] Some come with whole families, some only with people their own age. They use it all very differently”*. This category includes different demands from groups varying, e.g., by age, migratory background or income groups.

2. Social planning of urban green is needed

Based on the presumption that needs and uses of nature are group specific, experts stated that a social development of urban green is needed. They stress that various social groups have differing capabilities and requirements of urban nature. One expert said: *“The city community is really diverse, also in their demands of open green spaces!”* This has to be taken into account during the urban planning process. This category was named by experts.

3. Spiritual and religious notions of nature

This category includes a sense of nature as part of ‘God’s creation’ or as a room for contemplation and meditation. In the words of one inhabitant, nature is valued *“Because it takes the breath away. Because there is just so much to see. [...] Because it’s just great, in the sense of size. Super-human. Incredibly beautiful [...] A totally different conscience of the ‘I’, a completely different conscience of the body”*.

4. Love for nature

Also, deep rooted feelings of love in the presence of ‘nature’s majesty’ were stated that were not specifically spiritual or religious: *“[...] Just like I love my wife, I also love nature and I then have a relationship with it. It gets more intensive [the relationship with nature] the longer you know each other [...]”* (Berlin inhabitant). Or as one expert notes: *“I find a lot in forests which I need for living. I don’t talk about fruits, wood, but it’s mostly non-tangible, more like emotional-bounded things. Also a basic positive feeling, shelter, security. Very positive. Which humans, or I, need as basis in my life, which I can’t go without”*.

5. Inspiration from and through time spent in nature

This topic includes artistic aspects such as inspiration for art or creating art with nature (*“Like artists which have built a little cottage [in a forest park] and create art there [often out of natural materials, such as wood] or perform plays [on a homemade outdoor stage]”* Berlin inhabitant). Furthermore, it includes the effects of mental ‘cleansing’ and ordering thoughts while in nature. In the words of one inhabitant: *“For inspiration I like to go somewhere [into nature] to think, to clear my mind. [...] But maybe inspiration can also be creating space for new thoughts, space for a new order”*.

6. Aesthetic impressions of nature

Addressing a feeling of beauty, interviewees stated that aesthetic values often emerge from diversity in landscapes, from rivers or lakes or from a broad panorama view: *“For me a beau-*

tiful walk is when there is diversity, when the landscape is maybe a bit hilly, there is not just a route where I have a straight path. [...] You go there not knowing what might come, or that there are on the right and left interesting things to see. Maybe natural phenomenon or water" (expert). Interviewees state that aesthetic feelings are mostly related to green spaces that seem "natural" and do not show signs of human-built construction or maintenance, as the following quotation illustrates: *"I don't have the feeling it is a real forest. I would like it to be a real forest though. For me it is too regulated and structured. [...] I don't think that this is beautiful"* (Berlin inhabitant).

7. Nature as a meeting place

This category includes views of nature as a place for social integration, to overcome the loneliness in a city and to strengthen personal social relations. Open space is used as a resting or meeting point, for festivities, as a living or dining space. For people who do not have home gardens or balconies, urban green spaces provide crucial opportunities to leave the apartment and have an outdoor place to meet. As one inhabitant states: *"You have a picnic and just sit together and watch something. You go out together and you are outside together. That is simply a whole different being together than in the standard pubs, coffee shops or restaurants. [...] We also celebrate birthdays outside. [...] But you are by yourself, even when there are many people"*.

8. Sense of place (*Heimatgefühl*) through nature

This category refers to the influences of natural environments on feelings of embeddedness in the local environment and of feeling at home. It includes statements on memories of natural environments, which led to today's sense of place or statements of choosing a certain place to live due to its natural surroundings. As one inhabitant expressed: *"Where I grew up [...], we lived next to a forest, therefore it is important for me, it just connects me [to a feeling of home]. I cannot imagine living somewhere where there is no nature."* (Berlin inhabitant).

9. Designing nature; appropriation of urban green

This topic includes statements on creative design and appropriation of urban green, especially with regard to the urban gardening trend. Interviewees stress that they identify more with their direct surrounding, creating a feeling of belonging and home if they can actively modify the environment or public green spaces. This effect is actively used to activate citizen participation and to foster integration and a sense of community. As one expert states: *"There is no one*

of us who goes there and destroys something, there is no one of us who goes there and doesn't like it [an integration/ community garden in a socially difficult region of Berlin]. When someone knows someone who works there, you maybe treat it a bit better. So maybe less garbage, less vandalism and more understanding and acceptance”.

10. Cultural landscape/ natural heritage

This category addresses the appreciation of cultural landscapes, such as agricultural landscapes in the outskirts of Berlin or historical parks and gardens (“*I think the people love that very much, a constructed garden, they see that as a cultural achievement, when an old baroque garden is re-established and the old pathways are remade*” expert). This category includes statements about historical sites and their preservation when directly linked to nature. In the words of one inhabitant: “*The Berlin Wall Path is beautiful, an experience of nature. [...] There are places which had been empty in east-times, where there is now great nature*”.

11. Nature as recreational space

This category addresses recreation, e.g. the possibility of relaxing activities or sports in nature (“*I visit nature to do sports*”, “[Urban green spaces] *are places of activity*” Berlin inhabitants). Additionally, recreational aspects are often named with regard to nature as being the opposite of a city. Nature is seen as contrasting to the limitedness of space and view, the density of buildings and noisiness in the city - giving visitors in nature a relaxing feeling of space and freedom. City planners acknowledge their responsibility for supplying respective green spaces: “[It is important] *that the requirement for recreation is secured for the population*” (expert). This category also includes recreation through practical work in nature, especially gardening.

12. Visiting nearby recreational nature areas

Codes naming statements upon visits to nearby recreational areas (*Naherholung*) were grouped together under this heading (“*One can go to the nature protection area of Barnim or so. We accept long distances to beautiful nature areas if you can enjoy hiking there*” Berlin inhabitant). This category is plainly related to statements on touristic visits that are not accompanied by CES relevant explanations or reasons.

13. Education based on nature perceptions

This topic address benefits through environmental education for the public, especially children, as revealed through statements such as: “*We noticed in the last years that early education about nature [N.B. identification of tree species] is important*” (expert). The category includes codes on formal and informal education and aspects of learning from each other about nature. One expert recalled: “*We have some forest education routes. These are education routes which explain things at certain points and they do that with a display or with charts. [...] about the ecological communities that live here, how we sustain them*”.

14. Social and motoric development

This topic addresses the social and motoric development of children, achieved through ‘working’ or playing together in nature. These aspects have most often been stated in connection with freedom from limitation in nature, as a counterpart to the regulated city and artificial playgrounds that is necessary for children’s development. This is shown in expert statements such as: “*[...] that they [the children in cities] show more motoric deficiencies, which we think, and representatives of nature experience areas say the same, that when children have enough space, they can autonomously discover the world, without falling onto a street, or similar then they will do this playfully. They have to take care of themselves. A small child will never climb on a tree, if it does not know it can do that. [The child] does this step by step, but it acquires it for itself.*” Occasionally this topic has been named without direct reference to children.

15. Alienation from nature

This category includes statements of personal or general alienation from nature in the city and its counterpart on how to re-engage people – often children – with nature. As one expert expressed it: “*We have school classes coming over, the students are 15 to 16 years old [...] and they are visiting the forest for the first time at age 16. [...] They come into the forest and are afraid of lions, tigers [...] and they start walking and are totally tense, [...] it’s really that way. They only know the forest from television and from India or somewhere else. Also they know how dangerous animals can be from television action scenes, and they think these animals exist here as well*”. This alienation was said to negatively influence awareness of nature and sustainability and should be countered through more interactions with nature.

16. Awareness of nature

For a conscious experience of natural environments using all five senses played a crucial role for the interviewees. This sense-based approach to nature stands in contrast to a purely educa-

tional aspect as it focusses solely on experiences and awareness (*“It’s about sensual experiences, about bodily experiences. It’s about experience, not knowledge. Knowledge becomes important when there is already interest and curiosity [...]. Then they want to know. Before this, information won’t be memorized”* Berlin inhabitant). Interviewees stated that without being in contact with nature, awareness for the environment, sustainability or nature protection cannot be raised.

For descriptive purposes, table 1 shows which categories were addressed to which extent. Recreation was the most frequently named topic (30%). Least often named was the category of inspiration with 1.4% of all codes named.

Table 1: Frequencies of inductive codes and aggregated CES as they resulted from this study in percentage to the respective overall code amount ($n = 2.506$). The table shows the aggregation into CES. CES were slightly rephrased to have comparable terms. The inductive codes directly adapt perceptions from the interviews, illustrate the regional specifications and sharpen the MEA categories.

| Inductive codes | % of codes | CES categories | % of codes |
|---|------------|---|------------|
| Nature as recreational space | 26.7% | Values for recreation and tourism | 30.0% |
| Visiting nearby recreational nature areas | 3.4% | | |
| Awareness of nature | 9.0% | Values for nature awareness | 12.2% |
| Alienation from nature | 3.2% | | |
| Aesthetic impressions of nature | 12.1% | Aesthetic values | 12.1% |
| Designing nature; appropriation of urban green | 5.7% | Values for sense of place and regional identity | 9.9% |
| Sense of place (<i>Heimatgefühl</i>) through nature | 4.2% | | |
| Nature as meeting place | 8.5% | Values for social relations | 8.5% |
| Education based on nature perceptions | 6.6% | Educational values | 6.6% |
| Spiritual / religious notions of nature | 3.7% | Spiritual and religious values | 6.4% |
| Love of nature | 2.8% | | |
| Needs and uses of nature are group specific | 4.2% | Values for cultural diversity | 5.3% |
| Socially just planning of urban green needed | 1.1% | | |
| Cultural landscape / natural heritage | 5.2% | Cultural heritage values | 5.2% |
| Social and motoric development | 2.5% | Values for social and motoric development | 2.5% |
| Inspiration from and through stays in nature | 1.4% | Values for inspiration | 1.4% |

Discussion

Our results show how our interviewees perceive and understand CES in the context of Berlin's urban green. In sum, most top code categories could be assigned to one of the MEA categories for CES (MEA, 2005a:40, see table 1). While there are many similarities, some differences can be seen.

For example, the MEA categories had to be re-interpreted for a dominantly urban environment. A prominent case is *values for cultural diversity*. In the MEA explanation, "the diversity of ecosystems is one factor influencing the diversity of cultures" (MEA, 2005a:40) is broadly understood as nature enhancing the creation of different societies (MEA, 2005b). In an urban environment, however, cultural diversity is rarely shaped through the interaction of inhabitants with urban green. Instead, culturally differing communities 'pre-exist' in large urban agglomerations, which have differing demands with respect to urban ecosystems. Our respective results are in line with other studies in this field (e.g. Priego et al., 2008). Specific social groups prefer places for barbequing, picnicking or festivities while others are reliant on shaded pathways, seating possibilities or a feeling of solitude (for similar findings in Berlin see Kabisch and Haase, 2014). Our experts have stated that with specific restrictions on usage or green space compositions, different social groups are attracted or repelled. Consequently, the need for a socially just development strategy arises that is sensitive to the needs of different age groups as well as different cultural or social backgrounds (Faehnle et al., 2014; Kabisch and Haase, 2014). Thus, the causality between cultural diversity and ecosystem diversity differs from the general MEA conceptualization: Pre-existing culturally differing groups have differing demands on urban green which are, in turn, incorporated into design and access of urban green.

The inductive codes of 'sense of place (*Heimatgefühl*) through nature' and 'designing nature; appropriation of urban green' were grouped together into the CES category of 'values for sense of place and regional identity'. Hence, our category includes a sense of regional identity related to natural surroundings (see e.g. Bieling, 2014; Gould et al., 2014; Plieninger et al., 2013) and a more practical notion of place attachment from experiences and interactions with the natural surroundings (see description in Eisenhauer et al., 2000; Brehm et al., 2006; Spartz and Shaw 2011). Our findings suggest that active appropriation of urban green stimulates a feeling of home and belonging among participants as these activities fills the urban environment with meaning (Bendt et al., 2013; Calvet-Mir et al., 2012; Eisenhauer et al., 2000; Kal-

tenborn, 1998). This effect of attachment through interactions and appropriation of one's 'own' natural space is actively used by city planners, especially with regard to social difficult areas and youth work (e.g. neighborhood management projects of Berlin).

The CES category 'knowledge systems' was not prevalent in our study in the urban area of Berlin. Knowledge systems are explained by the MEA as "(e)cosystems influence [of] the types of knowledge systems developed by different cultures" (2005a:40) and refer to traditional or formal indigenous/ local knowledge (see Barthel et al., 2010 for local ecological knowledge in urban gardens). However, we identified another, broadly related, topic: 'values for nature awareness' (see table 1). Nature awareness was aggregated from topics of alienation from nature in the city and experiencing awareness of nature. Direct experiences with nature are often lost, especially for the youth, so the statement of our interviewees (Bendt et al., 2013; Bickford et al., 2012; see similar discussion in Miller, 2005). Yet, a general awareness of and close contact to nature was deemed as highly important by the inhabitants, reaching in the realm of spiritual notions. Additionally, inhabitant awareness of and connection with their natural surroundings might lead to greater acceptance of environmental planning outcomes, so the statements of our experts (see also Schenk et al., 2007). Nature awareness enhances understanding of the need for sustainability and nature conservation and stands in opposition to an urban life alienated from nature. In contrast to mere educational values, this category focuses on a senses-based, emotional awareness of nature (e.g. Bickford et al., 2012; Miller, 2005).

A further high order category emerged from the interviews that could not be matched easily to any of the MEA categories: 'values for social and motoric development'. This category addresses positive psycho-motoric developments of children in natural environments. We regard this category as distinctly different from values for education or nature awareness. However, for further aggregation it could be discussed to include the categories of values for nature awareness, education and development into a broader category of e.g. 'values for nature experiences' (cf. Bögeholz, 2006).

Recreation played a crucial role for all interviewees. In fact, recreation appears as an underlying goal of many of the categories of interviewee interactions with urban green. This understanding might challenge some quantitative valuations of CES since the use of recreational indicators might overlap with indicators for other CES categories. For example, benches are interpreted as indicators for an aesthetic view; however, benches with an aesthetic view are

likely to contribute to recreation (cf. Bieling and Plieninger, 2013). In quantitative CES studies, this results in double-counting if not properly accounted for in the operationalization process.

In sum, our qualitative study supports the notion of several, sometimes overlapping, groups of CES. In this respect it is important to keep in mind that the MEA report itself stresses the heuristic nature of its CES categories: “(w)hile there are specific cultural “services” that ecosystem provide [...], it is quite artificial to separate these services or their combined influence on human well-being” (2005b:457). Most clearly this is documented by the intersecting meaning of the recreation, or the close relation of the values for cultural diversity and social relations or even inspiration and aesthetical values. In detail, our results support most MEA categories of CES (MEA, 2005a:40; see table 1), yet, some categories had to be modified and one substituted. However, overall the perceptions and experiences of our interviewees are concordant with the MEA.

Connections to social sustainability and political implications

Additionally, we found several connections between CES and urban social sustainability. Social sustainability is the most vaguely defined dimension of sustainable development and is often neglected in practical terms (Vifell and Soneryd, 2012). Definitions for social sustainability are either very specific (e.g. Bramley and Power, 2009) or very broad (Partridge, 2005). No matter which definition is preferred, social sustainability is mainly concerned with “relationships between individual actions and the created environment, or the interconnections between individual life-chances and institutional structures” (Jarvis et al., 2001:127). A policy and planning relevant conclusion for urban social sustainability is provided by Dempsey and colleagues (2009). Based on a literature review, the authors explore the contradictory and complex relationship between urban form and social equity, and as a result identify two main dimensions of urban social sustainability: (1) equitable access and (2) community sustainability (Dempsey et al., 2009).

The concept of CES could be one way of facilitating the simultaneous inclusion of social sustainability and CES in policy and decision-making through mutual enhancement of socio-ecological aspects. For example, in our study, interviewees stated a high demand for nature and urban green. These demands were expressed in an urge to be out in the green and in terms of proximity and accessibility of nature (equitable access, Dempsey et al., 2009). Experts stated that the proximity of urban green and their quality, often measured through its aesthetical

values, are seen as an indicator of a districts quality. As restrictions on usage or green space compositions attract or repel different social groups, cultural diversity should be acknowledged. Hence, equitable access is prerequisite for a socially just city design, as effects on and demands from age groups, as well as cultural or social backgrounds have to be incorporated into the planning process (Faehnle et al., 2014; Kabisch and Haase, 2014). Another example is the case of values of sense of place and regional identity, contributing to community stability. By actively creating the positive effect of attachment, as in the case of several urban gardening or youth work projects in Berlin, a certain sustainability of community could be reached.

Aspects of equitable access had an influence on the perception and importance of CES for our interviewees, since exclusion affects the benefits provision from CES. Managing CES is therefore not simply about access or resources, but about transactions of power, wealth and privileges and is in essence political. Incorporating the concept of CES as an ecological dimension of social sustainability could help for social and environmentally sound urban planning while fostering inhabitant's participation.

There have been some differences between the preferences and understanding of CES between the experts and inhabitants. Inhabitants, for example, gave high priority to activities in nature and nature aesthetics, while experts favored creative designs of nature, such as urban gardening or meeting places in nature. In general experts' perceptions of nature appeared to be more practical, management-centered, whereas inhabitants prioritized enjoyment of nature. A more detailed discussion of these differences is giving elsewhere (Riechers, Barkmann and Tschardtke *in progress*).

Conclusion

Concluding, we showed perceptions and understandings of CES and their benefits in the urban context of Berlin. Our findings generally support the academically developed MEA heuristics for CES. However, several differences can be seen and some categories had to be adjusted to portray the correct understanding of our interviewees. We have shown that there is a wide variety of perceptions on CES, and that categories may often overlap. Focusing on only a few services without prior studies might therefore give a wrong picture and may lead to biased policy decisions. Showing that a wide range of CES categories are important in the study region, we pledge for a wider research with a more detailed focus on different CES.

Considering the growing importance (Guo et al., 2010) and their direct experience by people (e.g. Daniel et al., 2012), CES have a substantial impact on planning and management issues. Qualitative research on CES can help to understand the specific perceptions and needs in a regional context and foster decision-making. Assessing CES qualitatively will give deeper understanding on meanings and intricate interactions of inhabitants and their natural surroundings, helping policy and decision-makers to understand or prevent political conflicts and acknowledge trade-offs in policy appraisals (e.g. Chan et al., 2012; Daniel et al., 2012; Gould et al., 2014; Martín-López et al., 2012; Spartz and Shaw, 2011). It can also be one way to foster public participation and raise awareness. Additionally, it can be used to gain valuable insight for the EU 2020 Biodiversity Strategy and nature conservation (European Commission 2011), as it is necessary if CES are valued quantitatively or monetarily. Our qualitative research is a basis for further quantitative and monetary studies as it is part of a broader research project on CES in Berlin.

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CHAPTER THREE

**EXPERTS' VERSUS LAYPERSONS' PERCEPTION OF URBAN CULTURAL
ECOSYSTEM SERVICES**



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ception of urban cultural ecosystem services.**

Abstract

Unaccounted differences between laypersons' and experts' perceptions can lead to management problems for urban green spaces, as experts may recommend practices that do not meet the laypersons' wishes. Qualitative research on the perception on cultural ecosystem services (CES) can be one tool to analyze these differences. The aim of this study is to assess and compare differences in CES perceptions for experts and laypersons. Using an inductive qualitative content analysis, we conduct a frequency analysis and multidimensional scaling (ALS-CAL). The study shows significant differences between laypersons and experts in the ranking of CES. In contrast to experts, laypersons gave high priority to activities in nature and nature aesthetics, whereas experts favored creative designs of nature (such as urban gardening), meeting places in nature and education from nature. The experts' perceptions of nature appeared to be more practical, management-centered, whereas laypersons prioritized enjoyment of nature. Recreational space provided by nature was equally highly valued by experts and laypersons. Overall, multidimensional scaling shows different perceptions and conceptualizations of CES bundles, emphasizing the diverging understandings. The strikingly different perceptions might be based on experts' concern for broad and balanced mixtures of interests, thereby deviating from the particular interests of individuals. This could lead to social and political conflicts if unaccounted for and should henceforth influence decision-making and goal formulation.

Keywords

bundles of services; management of urban green; Millennium Ecosystem Assessment; political conflict; public participation; qualitative research

Introduction

In planning processes the necessity of public participation in decision-making is commonly accepted (see list in Petts, & Brooks, 2006). Accounting for local preferences should also be common practice in environmental matters (e.g. UNECE, 1998; Webler, Tuler, & Krueger, 2001), yet experts, such as planners, are mostly those who decide on management of ecosystems (Bendt, Barthel, & Colding, 2013; Plieninger, Dijks, Oteros-Rozas, & Bieling, 2013). Community planners are experts and may try to consider inhabitants' preferences, but are often unaware of their perceptions and priorities and the outcome might be inconsistent with inhabitant's wishes (e.g. Faehnle, Bäcklund, Tyrväinen, Niemelä, & Yli-Pelkonen, 2014). Being potential beneficiaries or 'victims' of planning, inhabitants are often best at assessing and possibly altering options proposed by experts (Renn, Webler, Rakel, Dienel, & Johnson, 1993; Bonnes, Uzzell, Carrus, & Kelay, 2007). In addition, the engagement of inhabitants in decision-making promotes civic empowerment and trust in authorities (OECD, 2001).

As decisions that are not socially shared may negatively impact inhabitants' compliance with environmental policies and long-term planning processes (e.g. Alberts, 2007; Churchman, & Sadan, 2004), it is essential to consider local inhabitants' perceptions and their (desired) use of natural resources in urban areas (Kabisch, & Haase, 2014). Inhabitants are increasingly unwilling to uncritically accept an experts' trained judgement (e.g. Fischer, 2000; Petts, & Brooks, 2006). Inhabitants bring their expertise as 'users', however with respect to technical planning issues, they are frequently referred to as laypersons. We therefore designate inhabitants as laypersons in opposition to experts in order to emphasize contrasts.

Despite the increasing importance of public participation in environmental decision-making (e.g. Beierle & Cayford, 2002), there has been little research on the extent that expert – layperson perspectives of ecosystem service benefits differ. We argue that the valuation of cultural ecosystem services (*CES*) could be one way to investigate these different perspectives and increase public involvement (see also Faehnle et al., 2014). Up to now, most studies on experts' versus laypersons' perceptions on environmental concerns focus on risk (see list in Lazo, Kinell, & Fisher, 2000; e.g. Bonnes et al., 2007), landscape values (e.g. Hunziker, Felber, Gehring, Buchecker, Bauer, & Kienast, 2008; Vouligny, Domon, & Ruiz, 2009) or historic sites (e.g. Coeterier, 2002). There is little knowledge in which aspects experts' and laypersons' perceptions differ towards CES.

In the Millennium Ecosystem Assessment (*MEA*) CES are defined as the "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (MEA, 2005:40). Guo, Zhang, & Li (2010)

show that CES are becoming increasingly important, especially in urban areas. The scarcity and pressure on ecosystems and their services in urban areas makes green spaces even more relevant for decision-makers (Melichar & Kaprová, 2013; Kabisch & Haase, 2014).

Valuation of CES in urban areas requires a consolidated understanding of ecological, socio-economic and cultural impacts of ‘natural’ urban environments: The way social groups of people perceive nature depends on culturally defined value and belief systems (Hunziker et al., 2008; Faehnle et al., 2014; Kabisch & Haase, 2014) and CES are described as difficult to assess and value (Plieninger et al., 2013, Daniel, Muhar, Arnberger, Aznar, Boyd, Chan, Costanza, et al., 2012). This is said to possibly pose problems in representing CES in decision-making processes (e.g. Gee, & Burkhard, 2010; Norton, Inwood, Crowe, & Baker, 2012; Tengberg, Fredholma, Eliassona, Knezb, Saltzmana, & Wetterberga, 2012). Yet, a relative negligence of socio-cultural aspects in ecosystem service research could lead to a tendency to trivialize the importance of CES in environmental policy and urban planning, posing difficulties regarding comprehensive information (e.g. Plieninger et al., 2013). Understanding which CES affect social-ecological systems most may help city planners and policy makers to anticipate and explain reaction to planning actions (Faehnle et al., 2014). Values of CES can be critical driving forces in nature conservation and ecosystem management and crucial in their communication to the public (Plieninger et al., 2013).

There are multiple examples of problems in planning due to insufficient consideration of local preferences. In 2014, Berlin inhabitants outvoted the master plan of the Senate Department for Urban Development and the Environment which comprised the construction of 4,700 new apartments on the Tempelhofer Feld, a large centrally located green area; a law followed forbidding future construction (e.g. Senatsverwaltung für Stadtentwicklung und Umwelt, 2014a; Senatsverwaltung, 2015b; Demokratische Initiative 100% Tempelhofer Feld e.V., 2014). Already at this early stage, the costs of the Tempelhofer Feld project, were about 3.95 million € in total (Senatsverwaltung für Stadtentwicklung und Umwelt, 2014b). This sum includes more than the planning process, yet it shows the significant amount of money invested in the cancelled project. While the project has a complex political context and even though the Berlin Senate Administration included the public, it is likely that contrasts in perceptions of demands had a big share in the planning difficulties. There are sometimes differing, contrary perceptions and evaluations of the same environmental policy depending on actor groups. Knowledge of these differences could circumvent future planning failures (Kabisch, & Haase, 2014).

In this paper, we aim to address the differences and correspondences between laypersons' and experts' understanding of urban CES in Berlin. Our study indicates where differing perceptions and priorities of CES by experts and laypersons may affect effective management and in which respect communication between stakeholders could be facilitated (e.g. Martín-López, Iniesta-Arandia, García-Llorente, Palomo, Casado-Arzuaga, Del Amo et al., 2012; López-Santiago, Oteros-Rozas, Martín-López, Plieninger, González Martín, & González, 2014). Hence, this paper breaks new ground to explore different cultural perceptions of CES and highlight their importance for the development and strengthening of more effective and comprehensive strategies on management of urban green. The paper contributes to the improvement of effective participation in decision-making. With the used methods needs and wants of inhabitants can be included and therewith increase their acceptance of respective programs by laypersons.

This article is based on empirical research analyzing laypersons' and experts' perceptions and assessments on CES in the city of Berlin. We conducted semi-structured interviews, compared the quantified results and applied simple statistics to highlight differences.

The paper will first describe the methods used for data collection and analysis; it will then shortly discuss the results of the qualitative content analysis as basis for quantitative analyses. A frequency analysis and multidimensional scaling are the main focus of this paper.

Methods

The area of study is the capital city of Germany, Berlin. Berlin is a federal state as well as Germany's largest city with an area of 892 km², out of which over 45% are covered by green and recreational areas, forests, public green and water spaces. With 3.5 million inhabitants (2013) Berlin is Germany's most populated city with wide ranging population density between several districts (Amt für Statistik Berlin-Brandenburg, 2014; Senatsverwaltung, 2015a)

Study design and data collection

A qualitative research design was chosen for data collection. Qualitative data provide a deep understanding of the meaning of concepts and categories and it offers comprehensive insight on regional and personal differences (Bieling, 2014; Gould, Ardoin, Woodside, Satterfield, Hannahs, & Daily, 2014). Due to their openness for the unknown, qualitative methods are in

particular suitable for exploratory studies (Mayring, 2002). Therefore, they represent a fitting initial approach to such a complex and under-documented aspect as CES and can set the parameters for future research, including quantitative approaches (Chan, Satterfield, & Goldstein, 2012; Hartel, Fischer, Câmpeanu, Milcu, Hanspach, & Fazey, 2014).

For this study, we carried out semi-structured interviews with three actor groups: 1) Professionals from planning and decision-making positions from the Berlin Senate Administration for City Development and Environment ($n = 7$) and the Berlin Forestry Commission office ($n = 2$). These experts represent various projects regarding urban green space management. 2) User-representatives and heads from organizations concerned with CES. This group includes decision-makers and active members of organizations concerned with e.g. local and regional traditions, forms of urban gardening, park management and social or educational work ($n = 10$). Group 1 and 2 were interviewed using expert interviews (Flick, 2006) to focus on their specific field of work. Experts were defined as people with extensive knowledge, engagement or work within certain CES categories. They were asked based on their expertise regarding CES related issues in respect to their specific affiliated institution.

Group 3) consists of laypersons ($n = 22$). With these participants, problem-centered interviews were carried out (Witzel, 2000; Flick, 2006), focusing on the topic of personal benefits through green space utilization.

We included different levels of knowledge and a range of experiences and resulting perspectives by interviewing three actor groups. Table A.1 and A.2 give more information on interview participants. In total 19 expert and 22 problem-centered interviews were conducted from May to December 2013 by the first author. Average length of the interviews was 46 minutes. Some interviews were held in small groups of maximum three people if particularly wished by the interviewees. After reaching saturation of the topic a group interview was chosen to examine for possible uncovered aspects through group dynamics.

Experts were selected due to their professional relation to one or several CES, after thorough examination on their work fields and projects. We balanced the number of experts by actor group. Laypersons were first approached on urban green such as parks and lake banks in different districts in Berlin to include urban and periurban inhabitants. We then used snowball sampling and purposively selected those laypersons with possibly contrasting opinions (Flick, 2006; Hunziker et al., 2008) – as indicated by e.g. educational background or current job positions. We also balanced for gender and age. This contrast sampling was conducted for all

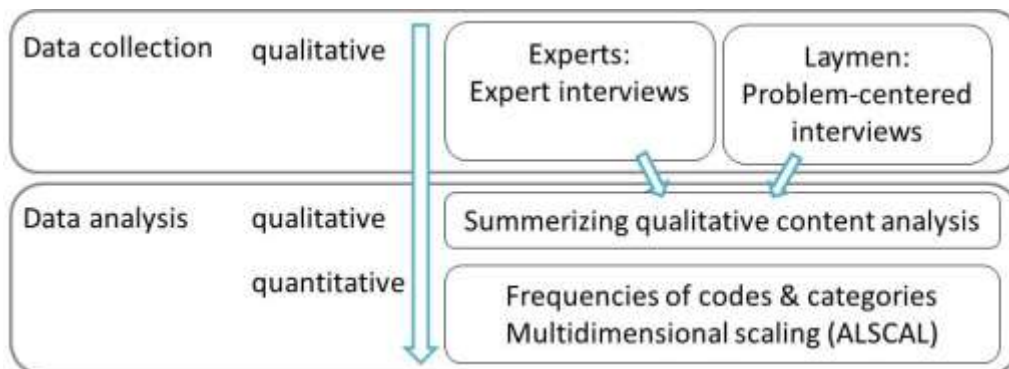
three actor groups after a first analysis of the interview contents to cover a broad range of opinions and henceforth increase representativity (Flick, 2006).

The interview guidelines were created based on intensive literature studies on CES. Two focus groups with laypersons and experts in the area of qualitative research and four pretest interviews were used to refine the wording, structure and content of the questions. Both interview guidelines contained open-ended key questions to macro-structure the conversations. Due to this open interview situation interviewees' main foci and perspectives could be assessed. An opening question prompted the interviewees to talk freely. For experts these initial questions were related to their field of work, for inhabitants they were about their use of green spaces. The order and the wording of the questions were not adhered to but could be adjusted to fit the flow of the interview. In using expert and problem-centered interviews, we were able to set the focus on CES while acknowledging the different approaches to the topic between actor groups. The expression 'ecosystem services' or related academic terms were not used, as even the experts were not familiar with the concept. A.3 provides examples for a problem-centered and expert interview guideline.

Data Analysis

Using the program F4 (Version 2013, Dr. Dresing & Pehl GmbH, Marburg, Germany) the interviews were fully transcribed. Codes were inductively created with qualitative content analysis based on Mayring (2008).

Graph 1 Study design



Using the summarizing qualitative content analysis (Mayring, 2008), codes ($n = 2506$) were aggregated in different steps with increasing abstraction level. After the 3rd aggregation level

this inductive approach resulted in 17 overarching codes. These 17 codes were then compared to the official CES categories of the MEA (2005). Tables A.1 and A.2 show the codes per interviewee. Based on this qualitative content analysis, we carried out a quantitative data analysis (see graph 1).

The relative frequency of all 17 inductive codes was compared and ranked between experts and laypersons. With the complex retrieval tool of MAXQDA 11 (VERBI GmbH Berlin, Germany) in-text proximity of the aggregated eleven CES categories was calculated. The number of occasions of one coded CES in the vicinity of another within the distance of one paragraph was counted. This resulted in a matrix showing the absolute number of close proximity for each CES in relation to all other CES. This ranking was interpreted as showing content proximity, as we assumed that interviewees talk about related things before or afterwards (on critique of this method see Coffey & Atkinson, 1996:180).

On this data, we applied multidimensional scaling (ALSCAL) with Euclidian metric through SPSS 21 (IBM Deutschland GmbH, Ehningen, Germany) with the calculated dissimilarities matrix. Multidimensional scaling can be used to picture subjective perceptions spatially (Backhaus, Erichson, & Weiber, 2006). This perceptual space is mostly multidimensional, which means that objects are positioned in different dimensions of the graphic, showing the relative distances to each other (Backhaus et al., 2006). Kruskal's STRESS was criteria for selecting two dimensions (see graph 2 and 3). Qualitative interviews do not aim at representativity but to give exploratory insights. Our quantitative results have to be understood in this respect.

Results

To facilitate the understanding of the quantitative results we first present the results of the qualitative content analysis. Quotations from the interviews illustrating the findings were translated from German by the first author.

Synopsis of the qualitative content analysis: CES category description

Table 1 shows the 17 inductive codes and the aggregated eleven CES (e.g. the inductive codes 1 and 2 where grouped together under the CES category of 'cultural diversity').

The content analysis revealed regional specifications of CES: For one, the CES 'social and motoric development' was included. This service addresses children's social and motoric de-

velopment achieved through ‘working’ or playing together in nature. For another, the CES of ‘sense of place’ includes the category of ‘creative design and occupation of nature’, which relates to statements with regard to the urban gardening trend. This self-design and occupation of urban greenspaces led to identification with the laypersons’ direct surrounding creating a feeling of belonging and home, as the respondents stated. One layperson stated regarding sense of place that “*Where I grew up [...], we lived next to a forest, therefore it is important for me, it just connects me [to a feeling of home]. I cannot imagine living somewhere where there is no nature.*” Nature is thus connected to home and belonging; this could be and is actively used by experts to activate laypersons’ participation and to foster social integration (e.g. in neighborhood management projects).

Table 1: CES categories and the inductive codes as they resulted from this study. CES categories were slightly rephrased to have comparable terms. The inductive codes directly adapt perceptions from the interviews, illustrate the regional specifications and sharpen the MEA categories.

| Modified CES categories | Inductive codes |
|--|--|
| 1. Values for cultural diversity | 1. Needs and uses of nature are group specific 2. Socially just planning of green spaces needed |
| 2. Spiritual and religious values | 3. Spiritual / religious notions of nature 4. Love for nature |
| 3. Values for nature awareness as knowledge system | 5. Alienation from nature 6. Awareness of nature |
| 4. Educational values | 7. Education based on nature perceptions |
| 5. Values for Inspiration | 8. Inspiration from and through stays in nature |
| 6. Aesthetical values | 9. Aesthetic impressions of nature |
| 7. Values for social relations | 10. Nature as meeting place |
| 8. Values for sense of place and regional identity | 11. Sense of place (<i>Heimatgefühl</i>) through nature 12. Designing nature creatively; occupation of nature |
| 9. Cultural heritage values | 13. Cultural landscape / natural heritage 14. Nature as recreational space |
| 10. Values for recreation and tourism | 15. Recreational activities in nature 16. Visiting nearby recreational nature areas |
| 11. Social and motoric development | 17. Social and motoric development |

Another CES with specific perceptions differing slightly from the MEA definition is ‘cultural diversity’. This CES is described by the MEA as ecosystems that influence the diversity of cultures (MEA, 2005:40) and usually in reference to e.g. fisherman or nomads. In the case of Berlin we transferred this category to the different needs and uses of urban green by various

social groups – and their acknowledgement in planning. Cultural diversity was perceived as inherent in a culturally diverse city such as Berlin and influenced by urban green. Statements on specific needs and uses of nature, differing e.g. by age, migratory background, income groups were frequent. One expert exclaimed in relation to cultural diversity that “(t)he city community is really diverse, also in their demands of open green spaces!”. Additionally, it was addressed that it is necessary to consider these heterogeneous demands to guarantee a socially fair development of urban green in regard to these demands.

The CES category ‘knowledge systems’ is explained by the MEA in the realm of traditional ecological knowledge and as “Ecosystems’ influence [of] the types of knowledge systems developed by different cultures” (MEA, 2005:40) and relates to local or indigenous knowledge. As this category was not frequent in the city of Berlin, we substituted it with the category of ‘values for nature awareness’ as this topic was prevalent for our interviewees. In Berlin, alienation from nature in general and especially for the children was a topic that frequently arose in interviews. Interviewees stated that without being in contact with nature awareness for sustainability or nature protection cannot be raised. Interviewees spoke about engaging and introducing people, especially the younger generation in activities outside in nature. Similarly, the issue of using all senses played a crucial role for interviewees for experiencing nature. The consensus of interviewees is that this experience and contact with nature will facilitate consciousness of nature and sustainability.

Quantitative content analysis: Differences between laypersons and experts

Table 2 shows the relative frequency of inductive codes in percentage of the overall mentioning frequency for laypersons and experts, which is used as proxy of their prioritization. The table shows partially great differences in prioritizations between laypersons’ and experts’. While both give ‘nature as recreational space’ the highest importance (with 17.3% and 13.7%, respectively), laypersons prioritize ‘aesthetic impressions of nature’ (16.4%). Second most frequently named was ‘recreational activities in nature’ (13.5%), followed by the issue of raising and being aware of nature (9.9%). Experts rank issues of designing nature creatively and the occupation of nature (12.4%) higher than nature as meeting place (11.2%) or education through and with nature (10.8%). Laypersons named least often the categories of ‘social and motoric development’ (1.3%) and ‘socially just planning of green spaces needed’ (0%). While experts named ‘visiting nearby recreational nature areas’ (1.1%) second last and ‘inspiration from and through stays in nature’ (1%) last. A Spearman’s rank correlation showed no signifi-

cant correlation between expert and layperson ordering ($r_s = .382, p = .131$), suggesting a difference in ranking order.

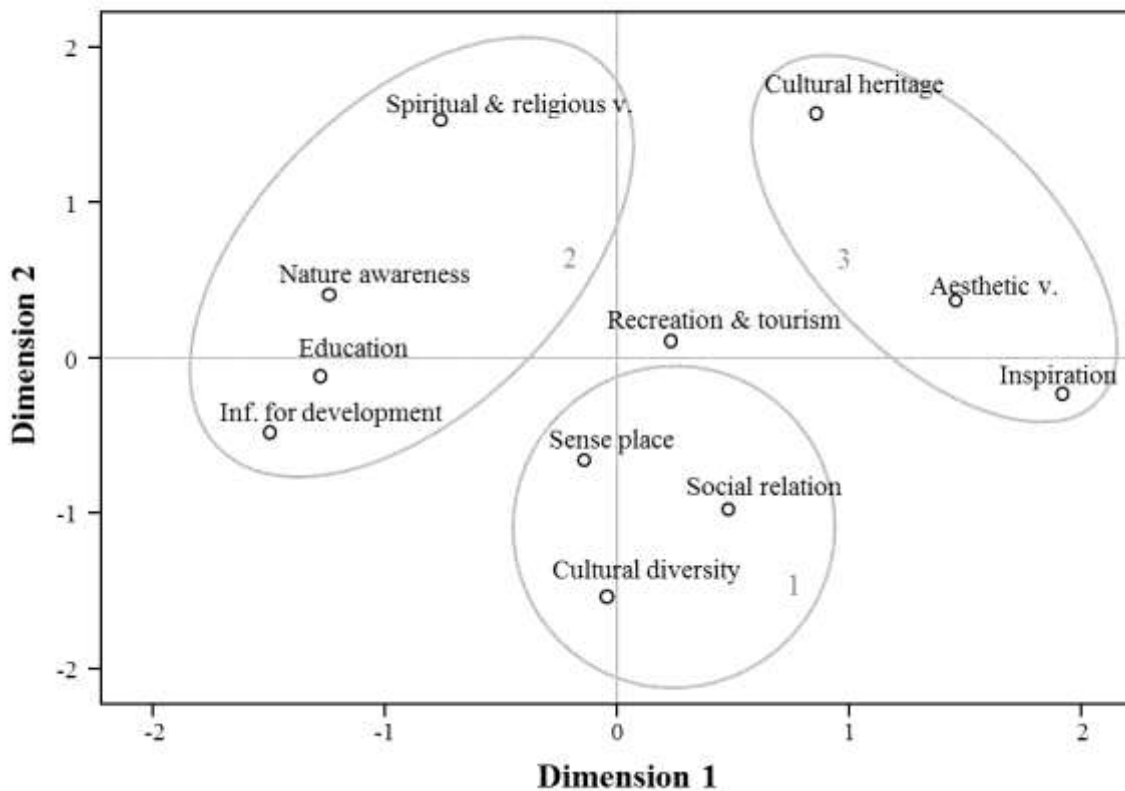
Table 2: Frequency of inductive codes in percentages of the overall mentioning frequency for problem-centered interviews and expert interviews and their ranking order

| Inductive CES codes | Experts (<i>n</i> = 946 codes) | | Laypersons (<i>n</i> = 1560 codes) | |
|---|------------------------------------|-------|--|-------|
| | % of codes | Order | % of codes | Order |
| Nature as recreational space | 13.74 % | 1 | 17.31 % | 1 |
| Designing nature creatively; occupation of nature | 12.37 % | 2 | 1.67 % | 14 |
| Nature as meeting place | 11.21 % | 3 | 6.79 % | 5 |
| Education based on nature perceptions | 10.78 % | 4 | 4.04 % | 10 |
| Awareness of nature | 7.61 % | 5 | 9.87 % | 4 |
| Needs and uses of nature are group specific | 6.55 % | 6 | 2.69 % | 12 |
| Recreational activities in nature | 6.13 % | 7 | 13.46 % | 3 |
| Cultural landscape / natural heritage | 5.39 % | 8 | 5.06 % | 6 |
| Alienation from nature | 5.29 % | 9 | 1.86 % | 13 |
| Aesthetic impressions of nature | 4.97 % | 10 | 16.41 % | 2 |
| Social and motoric development | 4.33 % | 11 | 1.35 % | 16 |
| Sense of place through nature | 3.17 % | 12 | 4.87 % | 8 |
| Socially just planning of green spaces needed | 2.96 % | 13 | 0.00 % | 17 |
| Love for nature | 2.01 % | 14 | 3.21 % | 11 |
| Spiritual / religious notions in nature | 1.48 % | 15 | 5.00 % | 7 |
| Visiting nearby recreational nature areas | 1.06 % | 16 | 4.81 % | 9 |
| Inspiration from and through stays in nature | 0.95 % | 17 | 1.60 % | 15 |

The 17 inductive codes were aggregated to eleven CES which we used for further statistical analysis (see table 1). To gain a deeper insight into the understandings of CES we used the distances between codes for a multidimensional scaling. In the graphical depiction of multidimensional scaling the closer the objects, the more similar they are. Objects lying on two opposite sides of one axis might be interpreted as polar endpoints of this axis. Average profiles lie in the origin of the coordinate system; hence the distance to zero shows how far a profile is to the average. The multidimensional scaling shows how a CES is perceived in relation to other CES and helps to emphasize which were perceived similarly by the interviewees

(e.g. Backhaus et al., 2006). To facilitate interpretation, we encircled the chosen clusters manually. Naming these clusters and interpreting them is a very subjective entertainment and we present one way of organizing them. Yet, the graphs show groupings between certain categories which show that their content might be similarly understood. To exemplify and emphasize differences, the expert cluster 2 and the layperson cluster 1 are supported by quotes concerning the respective differing perceptions.

Graph 2: Multidimensional scaling (ALSCAL) for CES categories from expert interviews. Kruskal Stress Formula 1: 0.26, R^2 0.54. Dimension 1: Cultural heritage / Spiritual and religious values; Dimension 2: Inspiration.

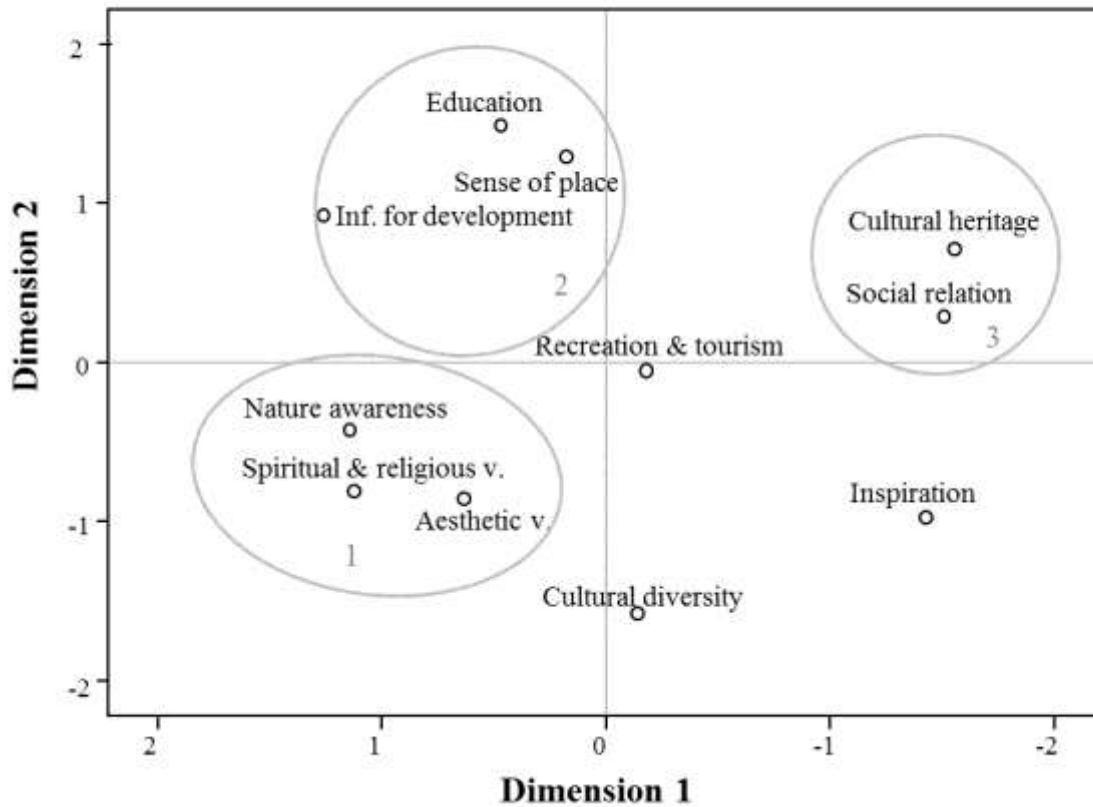


Graph 2 shows the multidimensional scaling (ALSCAL) of the eleven CES from experts, graph 3 those from Berlin laypersons. The multidimensional scaling for expert statements showed two clusters of CES. (1) One cluster consists of the CES: ‘values for sense of place’, ‘values for cultural diversity’ and ‘values for social relation’. These categories focus mainly on human relations and interactions in and dependent on nature. Putting the human relationships as CES in the focal point, we call this bundle ‘*human interactions*’. (2) Another cluster includes statements on ‘religious and spiritual values’, ‘values for nature awareness’, as well as ‘values for education’ and ‘values for social and motoric development’. We call this bundle

'direct natural experiences'. This cluster can be illustrated by the statement of one expert, who emphasizes the connection between senses and learning. The expert stated that children are taken to forest sceneries *"(t)o engage children to sharpen their own power of observations and awareness. And also to wait and smell. Or we stand still [...] and I ask: Do you hear anything? [...] And then they notice that there is a completely different forest scenery"*. This connection between education and nature awareness is also expressed in another expert's statement: *"We noticed in the last years that early education on nature like [N.B. identification of tree species] is important. And also the intensive research of and exploration in nature in early age"*, stressing the use of self-organized exploring of nature as important for factual learning in school.

Other CES such as 'values for cultural heritage', 'aesthetical values' and 'values for inspiration' are not tightly connected. Inspirational and aesthetic values could be included in a third cluster. 'Values for recreation' located in the middle of the graphic can be seen as nearly similarly connected to all categories.

Graph 3: Multidimensional scaling (ALSCAL) for CES categories from laypersons interviews. Kruskal Stress Formula 1: 0.33, R^2 0.26. Dimension 1: Education; Dimension 2: Social and motoric development.



Clusters of laypersons' statements differ (graph 3). Here we see three clusters: (1) One cluster concerns 'values for nature awareness', 'spiritual and religious values' and 'aesthetic values'. As this category mainly includes codes with a strong emotional attachment it could be interpreted as concerning '*emotional connections to nature*'. Statements from laypersons highlight the differences between this cluster and the expert cluster of '*direct natural experiences*'. Regarding the category of 'nature awareness' one layperson expressed: "*It is more a feeling. [...] And this can't be done through education in school.*" Schools can teach biological facts and ecological connections, but they do not succeed "*to connect these hard facts with feelings. I think that just works when you are outside [...]. I believe you have to grow into this*". In contrast to the experts, laypersons highlight the connection of aesthetics and spiritual and religious values, as nature is valued "*(b)ecause it's just great and great in the sense of big. Super-human. Incredibly beautiful [...]. A totally different awareness of the 'I', a completely different awareness of the body*". Thus, for laypersons spiritual notions seem to have a higher priority. One layperson said "*(t)hat you can somehow experience yourself as finite and as a bodily*

entity. And not just cognitive, but that you can feel it and experience it with your senses, experience it aesthetically.”

(2) A second cluster includes the CES of ‘values for education’, ‘values for sense of place’ and ‘values for social and motoric development’, which could be termed ‘*education and attachment*’.

(3) Lastly, the CES ‘values for cultural heritage’ and ‘values for social relation’ and ‘values for inspiration’ are one cluster, which is difficult to grasp by a single term.

The category of ‘values for cultural diversity’ cannot clearly be assigned to one particular cluster. The same applies to ‘values for recreation and tourism’ which again lies close to the center. In general, our study shows differences between laypersons and experts in the ranking of CES. For example, laypersons gave high priority to activities in nature and nature aesthetics, whereas experts favored creative designs of nature, meeting places in nature and education from nature. In total, experts’ perceptions of nature appeared to be more practical, management-centered, whereas laypersons prioritized enjoyment of nature.

Discussion

With about 45% of the total area being green and water spaces, Berlin has a wide range of semi-natural areas, with differing management intensities. Management and planning are hence a big concern in Berlin, especially, as after reunification of Germany many places were re-structured. Public participation is used in management of urban green but final decisions are mainly made based on expert opinions (e.g. Faehnle et al., 2014). Often experts understand themselves as acting on behalf of the public instead of with them (Petts, & Brook, 2006). Yet, our study showed differences between laypersons and experts in understanding and preferences of CES. Some environmental problems are socially defined and laypersons’ simplified understanding has to be taken into account (Petts, & Brooks, 2006). Understanding the differing, in some cases opposing, perceptions on CES and their given importance can greatly enhance the decision processes and increase laypersons’ satisfaction (cp. e.g. Bonnes et al., 2007). Changes and transformation of urban green is a difficult field for decision-makers due to the growing pressure and conflicting interests. Urban green is often value-laden and local inhabitants are emotionally attached to them (e.g. Ernstson, 2013; Turner, Odgaard, Bøcher, Dalgaard, & Svenning, 2014). In-depth understanding of opinions and values on CES will help the process of negotiation and hopefully help towards a sustainable outcome (e.g.

Churchman, & Sadan, 2004, Faehnle et al., 2014). Especially as criteria and indicators of success of experts and laypersons are not necessarily the same (Petts, & Brooks, 2006).

While experts and laypersons both attached highest importance to the recreational value of nature, there were notable differences regarding other aspects. Distinct was the discrepancy for ‘designing nature creatively; occupation of nature’, which was only highly important for experts. Interestingly, Berlin laypersons named aesthetical values of nature second most often (16.4%) but these only made up 5% of all experts’ statements. Experts prioritized ‘needs and uses of nature are group specific’ more than the interviewed laypersons did, probably because a large part of their work consists in balancing different demands on space. Experts with public responsibility (similarly to representatives of major political parties) tend to care for very broad and balanced mixtures of interests, thereby deviating from the particular interests of individuals (Faehnle et al., 2014). It is interesting, however, that the topic of a socially just city planning, which aims to enable a diverse usage of nature by all (included into the CES of cultural diversity), was only named by experts.

Expert and laypersons of our study region saw recreational values from nature clearly as the most important benefit. This goes hand in hand with the results of our multidimensional scaling, where ‘values for recreation and tourism’ was located in the middle of the coordinate system. This leads us to the hypothesis that the recreational value of nature is the overarching goal of all other CES. This understanding challenges the CES MEA heuristic, as the category of ‘recreation and tourism’ would lie on a higher categorical level, overarching the other categories of CES. This is important to note as it might impact valuation through e.g. double-counting.

The two multidimensional scaling plots showed qualitative differences between the conceptual understandings of CES between experts and laypersons (for other approaches see e.g. Lazo, Kinell, & Fisher, 2000; Turner et al., 2014). For the experts the cluster of ‘*human interactions*’ had the highest weight in importance in the ranking, while laypersons’ importance lay on the cluster of ‘*emotional connections to nature*’.

To highlight differences in the understanding of CES clusters we gave an example regarding the experts’ cluster ‘*direct natural experiences*’ versus the laypersons’ cluster ‘*emotional connections to nature*’ focusing on the category ‘values for nature awareness’. For experts the cluster of ‘*direct natural experiences*’ was identified as including the services ‘values for nature awareness’, ‘values for social and motoric development’, ‘values for education’ and ‘spiritual and religious values’. It hence included a wide spectrum of CES, yet the ranking showed

that the main focus of this cluster was the connection of educational values (overall ranked fourth) and natural awareness (ranked fifth). The benefits of creative playing and learning in natural environments to children might have gained in importance as the digitalization of society in recent years leads to the suggestion that “nature is something to watch, to consume, to wear – to ignore” (Louv, 2008:2), showing historic and socio-ecological influences in ecosystem service distribution (Turner et al., 2014).

In contrast to experts, laypersons had a different understanding: The cluster which we termed *‘emotional connections to nature’* embraced ‘values for nature awareness’, ‘spiritual and religious values’ and ‘aesthetic values’. In the laypersons’ perception, nature awareness was henceforth not connected to education but to a strong sense of aesthetical values (ranked second). Compared with the prioritization, for laypersons spiritual and religious values had a greater weight in this cluster than for experts. The experience to be part of nature instead of being outside of it was an important fact and stood only in loose connections with the hard facts that are acquired through educational values. Hence due to the prioritization order of CES by experts and laypersons we interpreted the clusters as inherently different. While the experts focused more on the educational matters, achieved through nature awareness or vice versa, laypersons focused on aesthetical experiences which lead to nature awareness and spiritual attachment. This might show the more practical and management-oriented understanding of nature awareness against a more emotional-based interpretation partly based on personal concern and commitment (comparable to the distinction of environmental consciousness [Umweltbewusstsein] and environmental attitudes [Umwelteinstellung], e.g. Urban, 1986; Chrebah, 2009). Therefore, as a practical conclusion, for example pure educational nature paths without high aesthetical values and possibilities for spiritual contemplation (e.g. through solitude, ways to use senses to feel nature, etc.) would not, in the understanding of laypersons, provide much benefit for nature awareness.

Valuation of CES is deemed to be difficult (e.g. Plieninger et al., 2013) with little understanding on valuation problems for urban ecosystem services (Gómez-Baggethun & Barton, 2013). Many studies of CES focus on a few services, but their selection is most often not explained. Yet, studying only a few CES without justification can lead to an understatement of the value of CES benefits. Whereas one approach could be to focus on the most often stated CES, another could be the bundling of CES. Bundles have often been suggested (e.g. Chanet et al., 2012; Milcu, Hanspach, Abson, & Fischer, 2013), yet a clear method and justification of bundling is missing. In a recent review Milcu et al. (2013) states that only a small number of stud-

ies focus on the issue of ecosystem service bundles especially in the realm of CES. Ecosystems are multifunctional and collectively deliver multiple bundles of ecosystem services (Hasslett, Berry, Bela, Jongman, Pataki, Samways, & Zobel, 2010; Turner et al., 2014). Additionally, study regions might differ in the perceptions and connections of CES (e.g. Gómez-Baggethun, & Barton, 2013; Turner et al., 2014). Where a full assessment of all CES available benefits is not possible due to monetary and time constraints, assessment of statistically created CES bundles could be a solution (e.g. Martín-López et al., 2012). Our innovative approach can be seen as example of creating CES bundles through multidimensional scaling.

The chosen methods of qualitative interviews and quantitative content analysis have given us the advantage of getting an in-depth understanding of the perception of CES, while still being able to compare the results (e.g. Bieling, 2014; Gould et al., 2014). Due to the amount of interviewees and codes (Flick, 2006) statistical tests for comparison and emphasis on differences could be made. However, the qualitative nature of our data has to be acknowledged and results do not aim for representativity. Some further limitations have to be acknowledged: Even though we tried to include a wide range of opinions through contrast sampling, an increased sample size could make the results more robust. Experts were sampled due to an affiliation to a certain CES category. Even though they included various CES in their opinion and showed no significant bias towards one category, a broader sampling could show more differentiated results. Comparing results from expert and problem-centered interviews did not hinder sound results, as both guidelines were centered around the topic of CES experiences, be it professionally or personally. Yet, although guidelines were semi-structured and the order of questions altered, questions were not posed randomly. A bias related to the question order can hence not be completely excluded. To infer proximity of content between CES we used the proximity of codes in the interviews. We based this on the assumption that interviewees are likely to talk about related things before or afterwards. We acknowledge that this assumption can be faulty (e.g. Coffey & Atkinson, 1996:180) but stress the explorative and heuristic character of our results. The presented results are a basis for a broader quantitative study in the project: “Changing valuations of cultural ecosystem services along an urban–periurban gradient in Berlin: Qualitative and quantitative assessments”.

Conclusion

Political decision-makers have the responsibility to maintain the provision of cultural ecosystem services provided by urban green. They are also responsible for a socially just provision and an equal access for all social groups. As our study showed differing perceptions and prioritizations of CES for laypersons and experts, stakeholder inclusion should become more frequent to become aware of these contrasts. Our results suggest that laypersons and experts may not share a common understanding how to use urban green, which might be based on (i) discordant perceptions of nature and (ii) the experts concern for broad and balanced mixtures of interests, thereby deviating from the particular interests of individuals. One ecosystem service may contain contrasting perceptions depending on actor groups.

While many participation methods are already used, a more frequent use of social research methods or the concept of ecosystem service would help to identify priority CES. Incorporating layperson in the decision-making process on urban green management might ease communication between stakeholders. This way, a more sustainable urban planning process may secure a long-term environmental sustainability of urban systems. The amount of time and resources spent in a participatory process may hence be balanced by the higher probability of stable, long-term solutions for the management of urban green. We therefore pledge for a wider inter- and transdisciplinary communication between various actors involved.

To meet publicly defined management objectives, it becomes important to assess ecosystem services on a local or regional scale. If an assessment scale lies beyond management decisions, a place-based and context-specific recommendation cannot be guaranteed.

Due to the identified different perceptions, valuation of CES is a complex task. Comparing stakeholder groups in the same geographical area has shown vast differences. If inhabitants of other regions, such as rural or coastal people, or different stakeholder groups would be included, differences in understanding and valuating CES are likely to increase greatly. A local specific and multi-methodological study including qualitative and quantitative research should hence be a guideline for CES valuation.

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Supporting information

Table A.1: Information on participants of expert interviews

| No. | No. of codes | Length of interview |
|-----|--------------|---------------------|
| 1 | 89 | 52:33 min. |
| 2 | 62 | 28:25 min. |
| 3 | 82 | 52:28 min. |
| 4 | 63 | 45:34 min. |
| 5 | 50 | 33:08 min. |
| 6 | 6 | 15:03 min. |
| 7 | 38 | 38:52 min. |
| 8 | 67 | 52:12 min. |
| 9 | 98 | 1:12:55 min. |
| 10 | 77 | 58:28 min. |
| 11 | 84 | 44:41 min. |
| 12 | 23 | 12:28 min. |
| 13 | 33 | 45:03 min. |
| 14 | 56 | 1:12:58 min. |
| 15 | 35 | 58:16 min. |
| 16 | 79 | 55:44 min. |
| 17 | 10 | n.a. |
| 18 | 6 | n.a. |

Table A.2: Information on participants of problem-centered interviews

| No. | No. of codes | Length of interview | Gender | Age Group |
|-----|--------------|---------------------|--------|-----------|
| 20 | | | Female | 18 – 25 |
| 21 | 174 | 47:44 min. | Male | 18 – 25 |
| 22 | | | Male | 26 – 35 |
| 23 | 115 | 45:12 min. | Female | 26 – 35 |
| 24 | 88 | 45:30 min. | Female | 18 – 25 |
| 25 | | | Female | 26 – 35 |
| 26 | 144 | 44:55 min. | Female | 18 – 25 |
| 27 | 35 | 31:10 min. | Male | 26 – 35 |
| 28 | | | Male | 36 – 45 |
| 29 | 127 | 42:10 min. | Male | 36 – 45 |
| 30 | 122 | 45:19 min. | Female | 26 – 35 |
| 31 | | | Male | 36 - 45 |
| 32 | 167 | 1:08:45 min. | Female | 36 - 45 |
| 33 | 117 | 52:20 min. | Male | 26 - 35 |
| 34 | 121 | 43:23 min. | Male | 46 – 55 |
| 35 | 39 | 23:15 min. | Male | 55+ |
| 36 | 44 | 24:36 min. | Female | 55+ |
| 37 | 29 | 11:04 min. | Female | 26 – 35 |
| 38 | 50 | 43:25 min. | Female | 36 – 45 |
| 39 | | | Female | 55+ |
| 40 | 121 | 1:01:04 min. | Male | 55+ |
| 41 | 85 | 39:13 min | Female | 25 - 35 |

CHAPTER FOUR

CULTURAL ECOSYSTEM SERVICES OF URBAN GREEN ALONG AN URBAN-PERIURBAN POPULATION DENSITY GRADIENT



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Abstract

Urban areas are increasing in size and population density and pose ever new demands on their ecosystem services. While cultural ecosystem services play a crucial role in human well-being, insufficient emphasis has been put on their role in urban areas so far. Regionally specific and non-monetary quantification approaches have been increasingly used to advocate cultural ecosystem service research. We present results from an analysis of inhabitant perceptions on cultural ecosystem services and utilization of urban green along an urban–periurban population density gradient in Berlin. Based on an extensive qualitative study, we designed a standardized questionnaire and conducted 558 face-to-face interviews. Using multiple regressions and principal component analysis we show differing valuations of cultural ecosystem services and uses of urban green and depending on the urban–periurban gradient. For most cultural ecosystem services importance decrease with population density, indicating a greater value of nature in more periurban areas. However, the services for social relations and cultural diversity have the highest importance in the urban core. Our findings shed light on the specific demands for urban green which can be used to adapt urban green space management.

Keywords

Ecological functions; green infrastructure; nature perceptions; urban ecology; urban sustainability; spatial planning

Introduction

Urbanization is projected to be the main driver of land-use change in Europe (Eigenbrod et al. 2011; Seto, Parnell, and Elmqvist 2013) affecting ecological functions of landscapes and ecosystems (Qureshi, Breuste, and Lindley 2010). Urban ecosystems provided by urban green increases biodiversity, improves air quality, reduces noise levels and contributes to public health (Bolund and Hunhammer 1999; Faehnle, Bäcklund, et al. 2014; Bowler et al. 2010). However, urban green is frequently under pressure as competition for land is high. Requirements for commercial or residential development and cultural benefits or nature conservation have to be balanced. Land-use planning for urban areas needs a comprehensive socio-ecological understanding to balance the competing functions of land use. To account for multiple interests in urban green, planning should be spatially specific and should take public opinions into account.

Hence, the importance of cultural ecosystem services (*CES* in the following) is expected to increase (Guo, Zhang, and Li 2010), especially in urban areas (Radford and James 2013).

However, urban landscapes and green spaces have been neglected in CES research so far and are only slowly attracting more interest (e.g. Ernstson and Sörlin 2013; Radford and James 2013).

CES can be defined as “ecosystems' contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships“ (Chan, Satterfield, and Goldstein 2012:9). They require that “a significant relationship between ecosystem structures and functions specified in the biophysical domain and the satisfaction of human needs and wants specified in the medical/psychological/social domain” exists (Daniel et al. 2012). In contrast to several previous studies we also include everyday recreation in nearby green spaces, which is often neglected in ecosystem service research (Daniel et al. 2012). We quantify the perceived importance of 10 groups of CES supplied by urban green in a non-monetary form.

Urbanization can occur in different ways, ranging from urban sprawl to densification. In urban sprawl the periurban environment of a city is increasingly settled without substantially increasing inner-city density. When city limits have to be maintained for political or geographic reasons, city growth is achieved by urban densification (e.g. Eigenbrod et al. 2011). Urbanization can result in complex population density patterns. However, spatial patterns regarding use, conservation and appreciation of ecosystem services are rarely considered in research (de Groot et al. 2010; Faehnle, Söderman, et al. 2014), especially for CES (Radford and James 2013). To account for the complexity of socio-ecological systems in cities due to the heterogeneous utilization of urban green and the changing perceptions of its CES, our study is the first to use an urban–periurban gradient, defined by population density.

In this paper we investigate spatial effects on CES importance in urban areas. We ask how green space utilization and CES perceptions vary along a population density gradient. Green space utilization means the socio-ecological interactions of use of urban green and perception by residents (Qureshi, Breuste, and Lindley 2010). We focus on how the link between CES perceptions and green space utilization can be used to inform greenspace management, which has not been done so far. Additionally we present an approach on how to identify bundles of CES that refer to similar socio-ecological functions of urban green.

Methods

Study site

The area of study is Berlin, the capital city of Germany. Berlin is a federal state, located in the eastern part of Germany. The city area has a size of 892 km² from which over 40% covers green or water space. With 3.5 million inhabitants in 2013 Berlin is the most populated city of Germany. Berlin has 12 boroughs with population densities ranging from 13 818 inhabitants/km² (Friedrichshain-Kreuzberg) to 1 466 inhabitants/km² (Treptow-Köpenick) in 2013. At the higher spatial resolution of city districts, population density differences are even higher (Amt für Statistik Berlin-Brandenburg 2015a, 2014a, Sentatsverwaltung 2015).

Research design and data analysis

Given the broad range of socio-ecological interactions that can give rise to CES and given the strong relation of urban green to human perceptions, we sought to quantify CES values of green spaces based on public perceptions (e.g. Calvet-Mir, Gómez-Baggethun, and Reyes-García 2012). The methodological approach for this work included (1) extensive literature research and theoretical conceptualization of CES, (2) semi-structured interviews with Berlin inhabitants and experts ($n = 41$), (3) two focus groups with laypersons and experts to improve structure and wording of the questionnaire and (4) a pilot study ($n = 65$). Our prior qualitative study resulted in an adjustment of the 10 Millennium Ecosystem Assessment (MEA, 2005) CES to account for locally specific understandings of CES in Berlin and to increase the cultural sensitivity of the analysis. Most prominently the category of ‘traditional knowledge systems’ was substituted by the category of ‘values for nature awareness’.

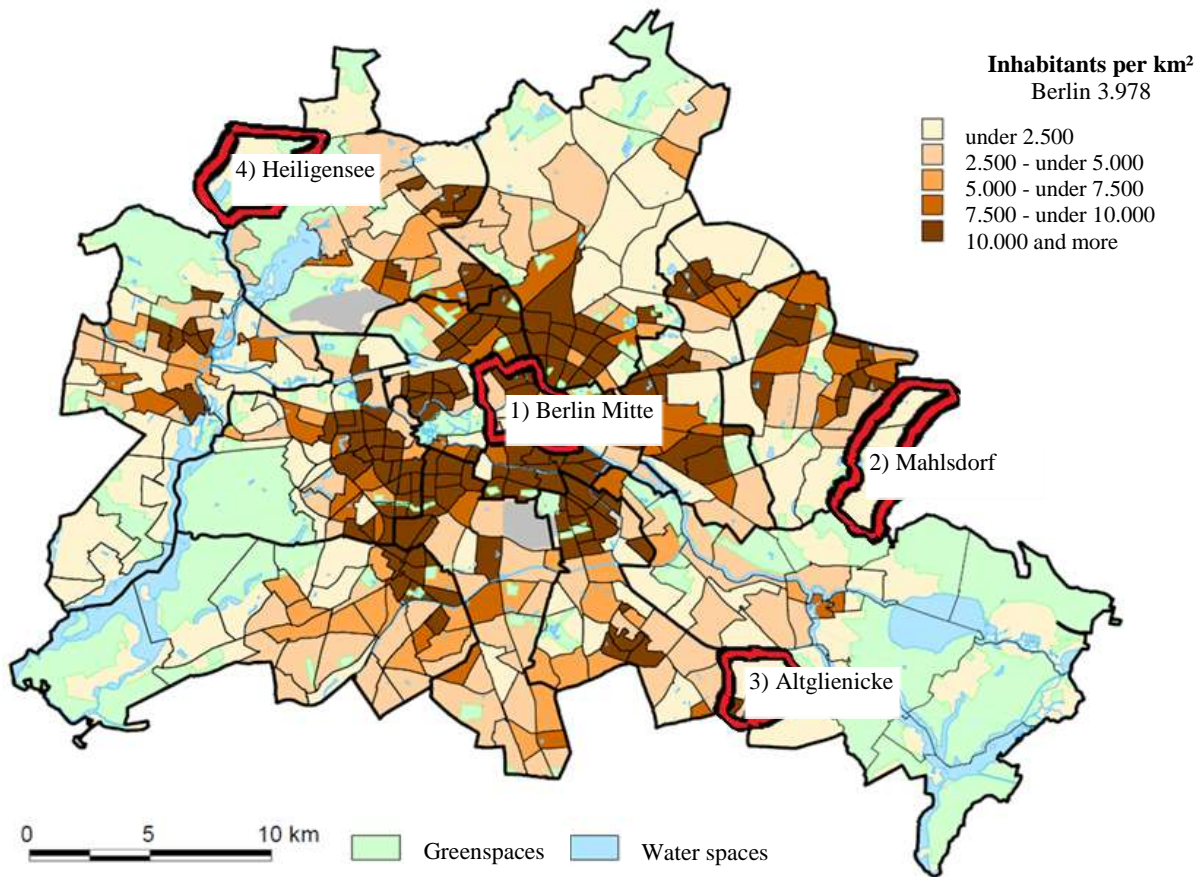
Table 1 Scale and coding of the variables used in the analyses

| Topic | Scale & Coding |
|--|---|
| Green space utilization | Index generated through aggregated from 10 items consisting of average days per year and hours spend per visit on five different green spaces |
| Average distance traveled to urban green | In categories from up to 1km to over 10km. Answers were coded by the category mean |
| Importance of 22 different CES items | 7 point rating scale (clearly not important to very important). The 22 items were centered with the individual mean and two or three of them were aggregated to a CES construct resulting in 10 CES importance. |
| Age, income | Income was coded by the category mean |

The resulting questionnaire focuses on three topics: actual green space utilization, CES perceptions, and socio-demographics (see table 1).

An ecosystem can be defined as “a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit” (MEA 2005:V), however borders of ecosystems are diffuse, especially in urban areas (Bolund and Hunhammer 1999). For simplicity the instruction of the questionnaire used the term urban ecosystems and urban green interchangeable to describe formal and informal urban green spaces which provide CES (see also Bowler et al. 2010; Bolund and Hunhammer 1999). As urban green is highly patchy and diverse, in our study we include all natural blue and green areas regardless of their management: (1) parks and open green spaces, including abandoned industrial sites, overgrown gardens or other brownfield sites, (2) forests and other areas dominated by trees, (3) water spaces such as lakes, ponds and river sites, (4) the four designated recreational areas of Berlin (the areas around Müggelsee, Wannsee, Tegeler See and the Berliner Barnim, a total area of around 26.000 ha) and (5) the surrounding green spaces of Berlin belonging to the federal state of Brandenburg, such as e.g. agricultural landscapes (for similar approaches see Bolund and Hunhammer 1999; Qureshi, Breuste, and Lindley 2010).

Data were collected via a direct (face-to-face) survey in four districts of Berlin (Figure 1) using roughly proportionate stratified random sampling of Berlin inhabitants >15 years of age. To obtain data on a population density gradient from the city core to its periurban surroundings, districts in Berlin were assigned to four strata of decreasing population density. From each stratum a district was randomly selected (Berlin Mitte, Altglienicke, Mahlsdorf, Heiligensee; see Table 2). Note that since the population density is polycentric throughout Berlin, the selected urban–periurban gradient is not linear from core to periphery. It therefore accounts for the structural composition of the districts and reflects the living environment regarding population density of the participants. We adjusted the sample proportion of the three smaller districts in order to obtain sufficient sample sizes. As we were interested in systematic differences between districts, sampling weights were not used to adjust for the deviations from strictly proportional sampling (see table 2).

Figure 1 Sampled districts

Source: Amt für Statistik Berlin-Brandenburg 2014b

Within the districts, streets and households were chosen randomly. Data were collected on various days of the week between 09:00 and 21:00 o'clock to decrease selection bias. Selected household were contacted twice; after a second unsuccessful try, households were counted as dropouts. To balance the risk of a high dropout rate with the demand for strict random sampling, no attempt was made to randomly select individual respondents at the household level. We hypothesized that answers to questions related to natural environment depend on the season (e.g. Oteros-Rozas et al. 2014). Thus to improve representativity, we sampled in two rounds to decrease a bias depending on seasonal weather conditions. Data were collected in late autumn 2013 (November – December) and in late spring, early summer 2014 (April – June). The aggregation from both rounds should help avoiding biased answers and allows results that are representative for the whole year. An overall response rate of about 48% resulted in a sample size of $n = 558$ (round 1 $n = 249$, round 2 $n = 309$).

Table 2 Study sites description and sample size.

| Research areas | No. of interviews |
|--|---------------------------|
| District: Berlin Mitte Population density: 7.850 inhabitants per km ² ; Characterized by blocks of flats. Borough: Berlin Mitte; located in former eastern Berlin | <i>n</i> = 219 (39.2%) |
| District: Altglienicke Population density: 3.422 inhabitants per km ² ; Blocks of flats and single houses; Borough: Treptow- Köpenick; located in former eastern Berlin | <i>n</i> = 128 (22.9%) |
| District: Mahlsdorf Population density: 2.095 inhabitants per km ² ; Blocks of flats and single houses; Borough: Marzahn- Hellersdorf; located in former eastern Berlin | <i>n</i> = 124 (22.2%) |
| District: Heiligensee Population density: 1.665 inhabitants per km ² ; Dominated by village structure and single or dispersed single houses; Borough: Reinickendorf; located in former western Berlin | <i>n</i> = 87 (15.6%) |

Data were analyzed using SPSS 21 (IBM Deutschland GmbH, Ehningen, Germany). As item non-response was low, missing data was excluded pairwise. Depending on the scale of measurement, correlations were computed by Pearson's chi-squared statistic (Cramer's V) for nominal variables, Spearman's rank correlation (Spearman's Rho) for ordinal and Pearson product-moment correlation (Pearson's *r*) for interval variables. CES importance was centered to eliminate individual overall importance, i.e., acquiescence. To explore the density gradient in our sample, we checked for correlations of socio-demographic data with population density. A stepwise linear regression of the centered importance of each CES on the population density gradient includes it in the second step, the first step includes the density correlated variables age and income.

Finally, we conducted a principal component analysis on the centered CES importance. This analysis reduced the 10 CES to two bipolar dimensions depicting individuals' differences. The vectors of the CES dimensions structure the perceptual space of the interviewees (Figure 6). Predictors (i.e., the population gradient) and covariates (e.g., the visiting frequencies, which also were centered) were projected in that space by correlational loadings. The closer the variables projection, the more similar they are. Variables lying opposite to each other can be interpreted as polar endpoints of an axis. This mapping shows how a CES is perceived in relation to other CES.

Results

The descriptive results on participation indicate the representativity of our sample for Berlin. Sex and age distribution of the sample are similar to the distribution known for Berlin (compared to data from Amt für Statistik Berlin-Brandenburg 2015a). There is a slightly higher amount of individuals with higher education in the sample, possibly a result of a biased drop-out rate (compared to data from Amt für Statistik Berlin-Brandenburg 2015a). An inspection of correlations of the main predictor population density showed negative relations with age and income (Age $r = -.234$, Income $r = -.197$, $p < .001$, age and income uncorrelated): The lower the population density, the older and the wealthier participants. Hence, we control for age and income, when the gradient predicts CES importance.

Cultural Ecosystem Services

The assessment of CES in the city of Berlin showed that the values of aesthetics were perceived as most important, with a mean rating of 5.8 on the seven – point scale. The second rank was reached by the value of nature awareness (5.3), followed by religious and spiritual values (4.7). Least importance received the cultural diversity service (4.0). Mean importance across the 10 CES was 4.6.

Table 3 The importance of cultural ecosystem services as depending on population density; stepwise linear regression with age and income as predictors in step 1 and population density added in step 2; regression coefficients from step 2 model; $n = 513$

| CES importances | Age | Income | Population density | |
|-----------------------|----------|----------|--------------------|-----------------------|
| | Beta | Beta | Beta | R ² change |
| Social relation | -.324*** | .027 | .269*** | .065*** |
| Recreation | -.233*** | -.054 | -.255*** | .058*** |
| Education | .163*** | .030 | -.243*** | .053*** |
| Cultural diversity | -.234*** | -.090* | .218*** | .042*** |
| Cultural heritage | .337*** | -.113** | -.126** | .014** |
| Natural awareness | .168*** | .050 | -.122** | .013** |
| A esthetic | .040 | .115* | -.110* | .011* |
| Sense of place | .098* | -.242*** | -.082 | .006 |
| Religious & spiritual | .248*** | .016 | -.072 | .005 |
| Inspiration | .251*** | .116** | .028 | .001 |

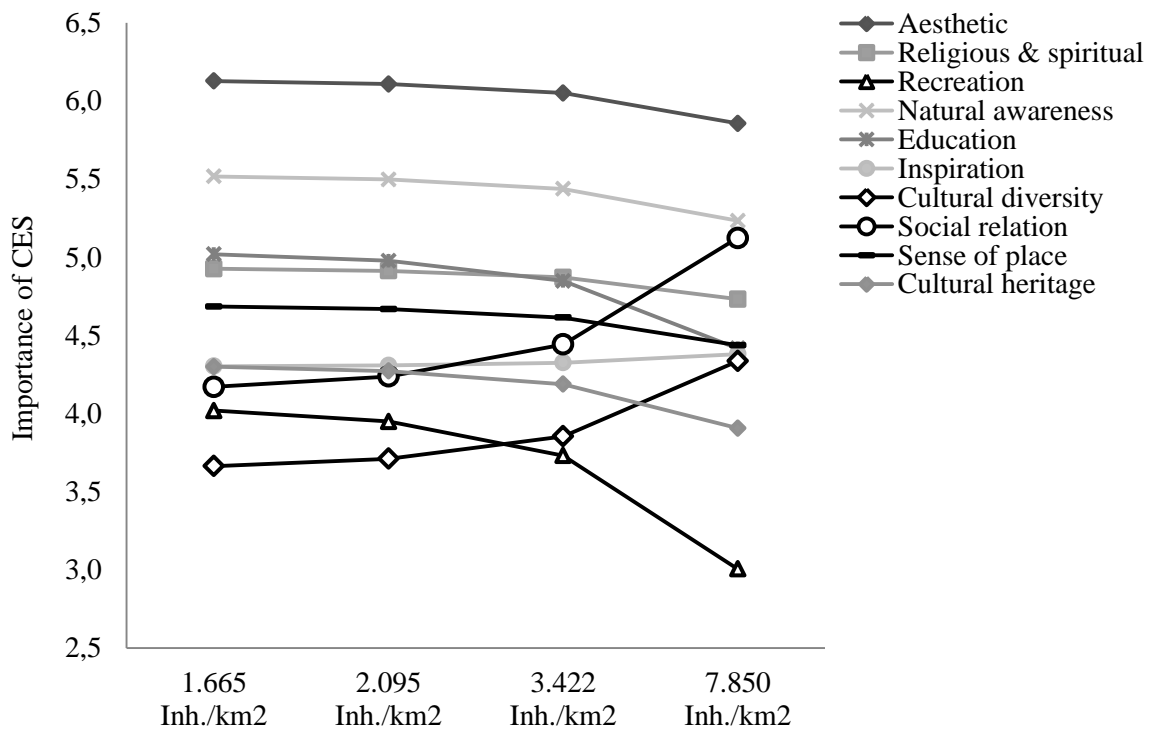
* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

A stepwise linear regression of centered importance of CES on age and income in the first and population density in the second step confirmed the dependence of CES importance on the urban–periurban gradient for 7 out of 10 CES. Table 3 gives beta coefficients and significances.

Figure 3 Cultural ecosystem services importance as a function of population density while correct for age (m 46 yrs.) and income (m 2,500 €/m). For simplification a categorical gradient variable is used for graphical presentation.



Only inspiration, religious/spirituality and sense of place CES values were of equal importance in more or less rural areas, all three inclining with age. Five of the ten CES decreased in importance the more densely populated the residential area of the participants is: Cultural heritage, Education, Natural awareness, and Recreation are more important functions of nature in the less dense areas. In contrast, for the services of social relations and cultural diversity importance increased with higher population density.

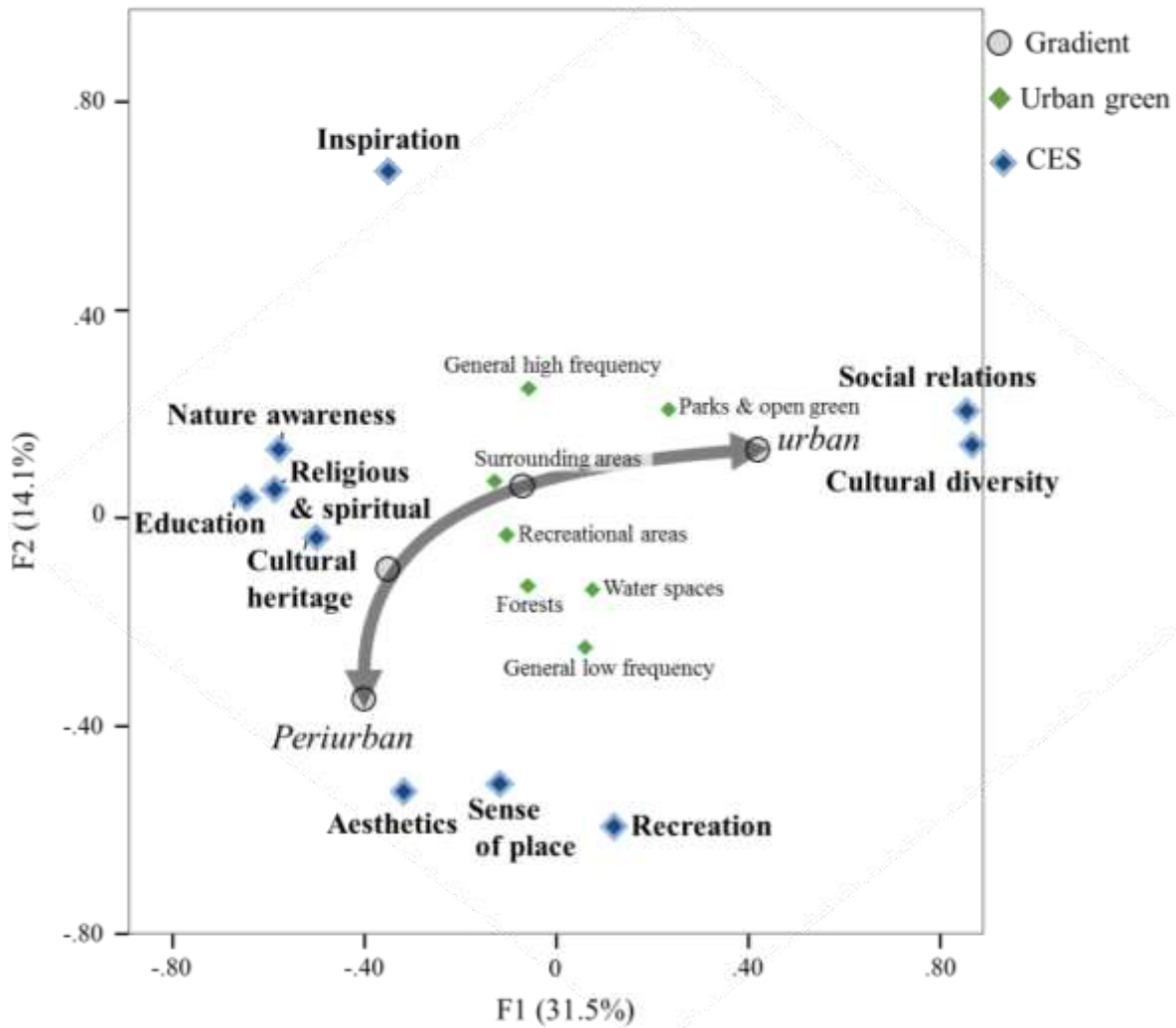
The relationships among the 10 CES importance can be depicted by the PCA reduction. CES tend to be grouped in four clusters that share similar perceptions (figure 4).

- Cluster 1 (*social aspects*) consists of CES related to social relations and cultural diversity.

- Cluster 2 (*educational and transcendental aspects*) includes educational, religious and spiritual services as well as for natural awareness and cultural heritage.
- Cluster 3 (*aesthetics and recreation*) is made up of aesthetical and recreational services and for sense of place.
- Cluster 4 (*inspiration*) includes a single CES.

Figure 4 additionally shows the estimated location of participants as grouped by the density gradient and correlations of visiting frequencies for the five urban green spaces. High population density is associated with a higher valuation of social CE services, as was found in the univariate analyses (table 3). Visiting of parks and open green spaces are associated with importance of social CES and respondents from the urban core. At the opposite side of the graph, the educational and transcendental aspects are related with inhabitants of the peri-urban area. The second dimension contrasts the basic aesthetic and recreational services appealing also to individual's seldom visiting urban green with inspiration especially important for individuals often stay in green spaces.

Figure 4 Factor loadings of cultural ecosystem services with means of the population density gradient and correlated visiting frequencies of five urban green spaces

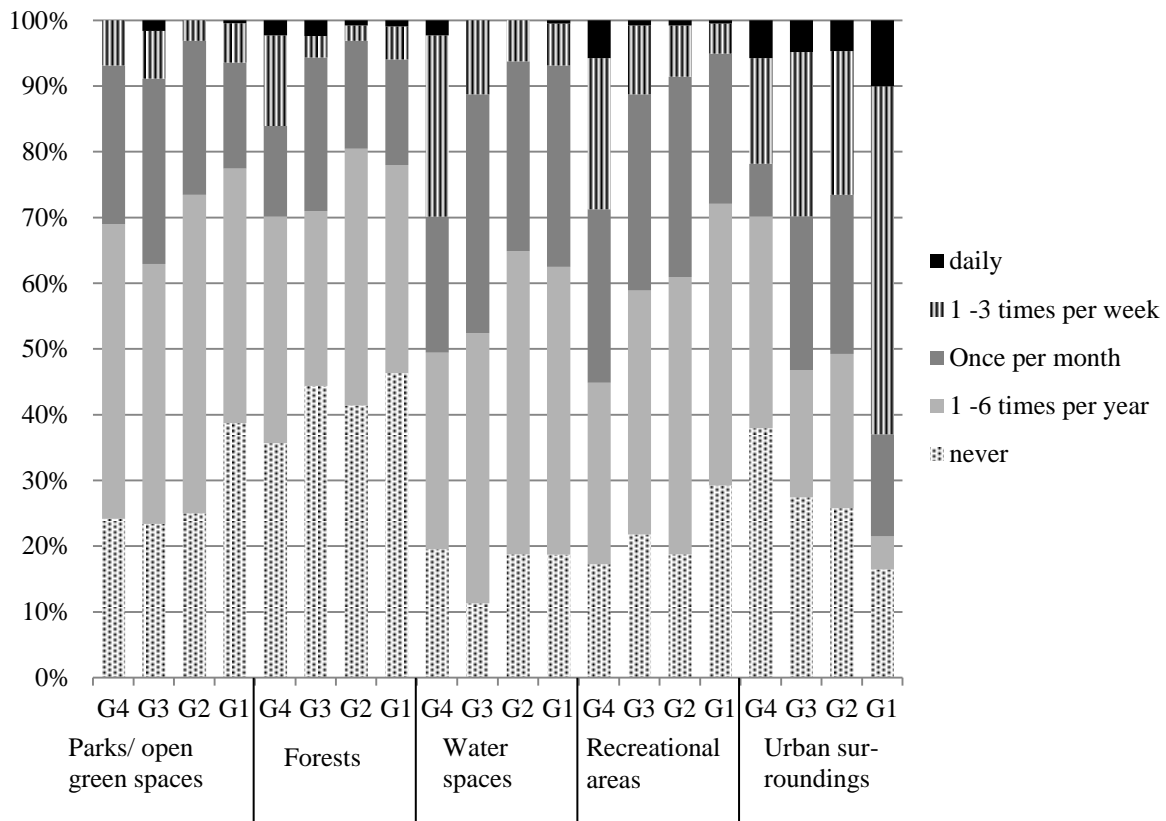


Urban green space utilization

37% of the inhabitants visit green spaces within a radius of one kilometer, 77% of the interviewees did not travel more than five kilometers. Traveled distance to green spaces was positively related to the density gradient ($Rho .143, p = .001$), showing that inhabitants of the urban core had to travel further to urban green than people inhabiting less densely populated areas. Also the mode of travel was correlated with population density (Cramer's $V .204, p < .001$): While people in the urban core used public transport more frequently, individuals in the periurban areas more often go by foot or ride a bike when visiting green spaces. However, 70.5% of the respondents stated that accessibility to green spaces was good or very good, which was not correlated to population density.

In total, parks and open spaces have the highest visiting frequency. Population density was positively related with the visiting frequencies of parks and open green spaces ($Rho .322, p < .001$), i.e., inhabitants of the urban core visit these places more often.

Figure 5 Utilization frequencies (%) of five urban green spaces by population density gradient in percent. G1 = urban core to G4 = least densely populated area, $n = 556 - 558$



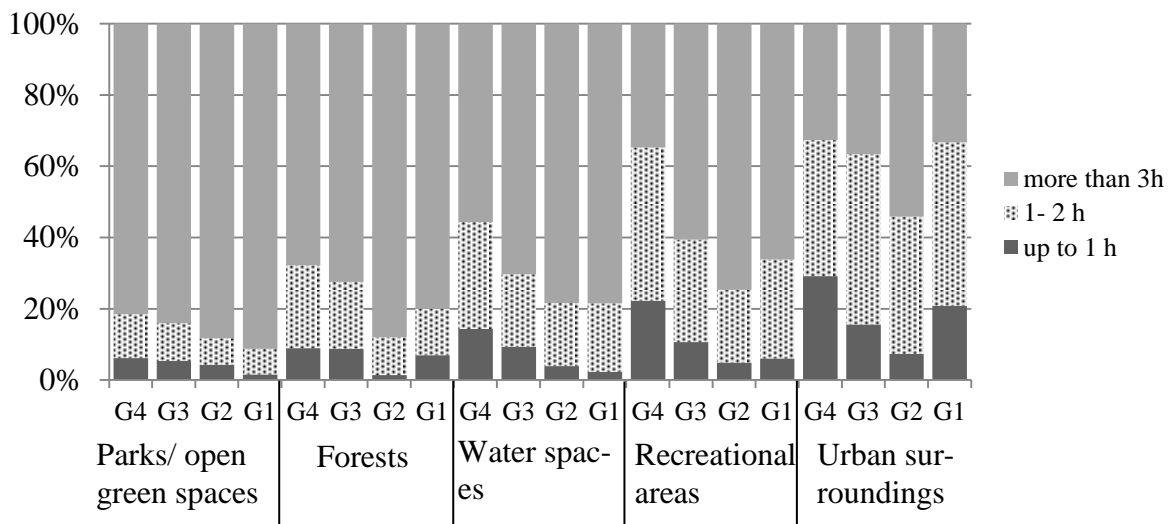
Visiting forest ($Rho -.205, p < .001$) and water spaces ($Rho -.127, p = .003$) negatively correlate to the population density gradient, indicating a more frequent use of these spaces by people inhabiting periurban populated areas. Respondents from the more periurban areas closer to the edge of Berlin city also visited surrounding green spaces more frequently than respondents from the urban core ($Rho -.144, p < .001$). Figure 5 gives a detailed account of utilization frequencies broken down by type of green spaces and the population gradient position of respondents.

The overall mean visiting frequency of urban green did not showed a significant correlation with population density, indicating that inhabitants differ within each study sites as is depicted by the second dimension of figure 4. While 60% of the inhabitants in the urban core (G1) visit parks and open green spaces at least once per week, only 20% from the least densely populated areas (G4) do so. Contrastingly, 72% of the inhabitants of the urban core (G1) stated that

they never or at most six times a year visit Berlin’s forest areas, whereas 55% of those from the most periurban sector (G4) visit forests at least once per month.

Figure 6 depicts the average time the five urban green spaces were visited. On average, Parks and open green spaces are visited only for up to one hour. Population density is negatively correlated to time spent at water bodies ($Rho .206, p < .001$) and forests ($Rho .171, p < .001$). While respondents from the urban core visit lakes and forests less often than their periurban counterparts, they tend to stay significantly longer *if* they do. Inhabitants of the less densely populated areas visit the Berlin-Brandenburg surrounding longer, as the negative correlation with population density indicates ($Rho -.112, p = .029$). Figure 6 documents the duration the inhabitants’ visit at the five urban green spaces structured by the population density gradient. For example, 60% of the interviewees in the urban core (G1) and even 70% of the ones in area G2 stayed more than three hours if they visited Berlin’s forest areas. Yet, only 35% of those in the periurban area (G4) stayed as long.

Figure 6 Average Length of time spent (%) at five urban green spaces in relation to the population density gradient. G1 = urban core to G4 = least densely populated area, $n = 457 - 203$



Discussion

We identified how CES values and urban green space utilization are affected by a population density gradient in Berlin. For most CES, importance decreases with population density.

However, the values for social relations and cultural diversity values have higher importance in the urban core.

Urban green is important for urban dwellers, especially, for those who do not have home gardens or balconies because they help to entertain social relations. Urban green provides opportunities to leave the built environment and have an outdoor place to meet family and friends. In Berlin, inner city parks and open spaces are, in fact, used intensively as a resting or meeting point, for festivities, as a living and dining space. In 2012 about 54% of private households in Berlin were single households (Amt für Statistik Berlin-Brandenburg 2015b). Thus, these areas have a high value for social integration, to overcome the loneliness in a city and to strengthen personal social relations.

The MEA explanation for the CES of cultural diversity reads: “The diversity of ecosystems is one factor influencing the diversity of cultures” (MEA 2005a:40). In an urban environment, however, cultural diversity is rarely shaped through the interaction of inhabitants with urban green. Instead, culturally differing communities in large urban agglomerations have differing demands with respect to urban ecosystems. Specific social groups prefer places for barbecue, picnic or other social functions while others prefer shaded pathways, quiet resting places, or seek a feeling of solitude (for similar findings in Berlin see Kabisch and Haase 2014). Cultural diversity hence stresses use differences in social groups.

CES associated with cultural diversity and social relations correlate with a visiting frequency of urban parks and open places, oftentimes the only green spaces easily accessible to the – younger and lower income – inhabitants from the urban core. The high demand of these green space qualities have to be incorporated into the urban planning process to guarantee an adequate supply in the face of high real estate values in part reflecting the high population density.

A recent study showed that CES are perceived as the most important ecosystem services by home garden owners (Calvet-Mir, Gómez-Baggethun, and Reyes-García 2012). Our data shows that people living in the urban core had less access to private green spaces. Hence, CES which are delivered more frequently by private green in periurban areas are supplied by public urban green in areas where private green is scarce. This might explain the importance urban green used for social relations under the conditions of cultural diversity in the urban core.

Combined with the information that inhabitants of the urban core travel farther to reach green spaces, an increase of supply of urban green in the city center should be considered. Yet, as the Berlin city administration focuses on urban densification, green spaces in the urban core will be subjected to increasing conversion pressure. An example of this is the Tempelhofer

Feld, a large green area in the middle of Berlin. In May 2014 a referendum against the construction of apartments and public city infrastructure forestalled a partial conversion of Tempelhofer Feld (e.g. Senatsverwaltung für Stadtentwicklung und Umwelt 2014a; Demokratische Initiative 100% Tempelhofer Feld e.V. 2014). More than 3.95 million € in planning costs had been spent since 2008 (Senatsverwaltung für Stadtentwicklung und Umwelt 2014b). The majority of voters preferred an unaltered open space as, e.g., a green meeting point, an area for various physical and sports activities, and to enjoy a wide view. Judged from the results of this study, the contrasting perceptions were likely related to two of the main clusters of CES by urban green: those related to aesthetics and recreation contrasting with those related to social aspects. Our results provide insights into the structure and socio-ecological interactions of green space utilization and appreciation that may help to better balance – environmentally as well as economically motivated – densification approaches (cf. Qureshi, Breuste, and Lindley 2010).

Urban green and water areas can increase urban biodiversity and will, as cities grow in size and number, become increasingly important for nature conservation (de Groot et al. 2010; Seto, Parnell, and Elmqvist 2013). CES can be used as an additional argument for urban nature conservation (Chan et al. 2007; Chan, Satterfield, and Goldstein 2012).

As urbanization, be it through urban sprawl or urban densification, poses very different demands on ecosystem services (Eigenbrod et al. 2011), spatially explicit and conceptually comprehensive studies of social and environmental factors influencing CES are necessary. There are contrasting definitions for ‘urban’ depending on the size and structure of the urban area (e.g. Faehnle, Söderman, et al. 2014). We base our urban–periurban typology on population density as an indicator, since we expected relations to geophysical and socio-economic aspects. Under careful consideration of local specificities, our gradient analysis could be extrapolated to regions with similar densities for comparison. Urban gradient analyses highlight the dependency of CES perceptions on urban structures and, indicating what may be needed and by missing, suggests potential management adaptations. Thus, urban gradient analyses suggest itself as a tool not only for CES research but also for the wider field of urban planning.

There are many possible ways in which social variables such as age, education or income might affect the valuation of CES. For simplicity, we have focused here on the population density gradient, which is correlated with age and income. Further studies could include such social aspects at more detail and focus on the heterogeneity of CES valuation by social groups

(e.g. Burger 2011; Martín-López et al. 2012). Also, more detailed indicators of local and regional CES demand and supply could be included.

While studies on CES are increasing recently (Milcu et al. 2013), there are still several methodological and conceptual gaps (Daniel et al. 2012; Norton et al. 2012). CES are described as difficult to value and assess (e.g. Plieninger et al. 2013; Daniel et al. 2012; Gee and Burkhard 2010). While the valuation of non-material aspects of the human–environment interaction might be difficult, a relative negligence of socio-cultural aspects in ecosystem service research might unduly reduce the impact of CES demands on environmental policy and urban planning (de Groot et al. 2010; Klain and Chan 2012; Norton et al. 2012). A possible way to tackle the problems of CES valuation could be the use of clusters or bundles of related CES. Yet, in a recent review Milcu et al. (2013) stated that only a small amount of studies focused on ecosystem bundles, especially in the realm of CES. In this study, we showed that CES are not only perceived in three related clusters - as assumed e.g., by Eigenbrod et al. (2011), de Groot et al. (2010), and Martín-López et al. (2012) – we also show that the relative importance of the clusters changes systematically along a population density gradient from a city core to periurban districts. Specifically, we find that CES related to social relations and cultural diversity could be aggregated into a cluster of CES related social aspects. Educational, religious, spiritual and cultural heritage values as well as values for nature awareness constitute a second cluster of educational and transcendental values of nature. Likewise, an aesthetics and recreation cluster can be formed. Meaningfully bundling CES could substantially decrease biases introduced by CES selection. Further social research into the empirical reality of deductively defined CES is likely to yield tools for quantifying CES without necessarily relying on often criticized monetary valuations (cf. Norton et al. 2012). Furthermore, it could simplify monetary as well as non-monetary assessment tasks in urban planning for which ten distinct CES yield an overly complex vector of indicators.

Our contribution to the better understanding on the locally specific perception and provision of CES along an urban–periurban gradient adds to the growing knowledge on enhancing and conserving ecosystem services. Urban sustainability refers to the ability to maintain ecosystem services and biodiversity (ecological dimension), the well-being of its inhabitants (social dimension) and economic prosperity (economic dimension) (Dempsey et al. 2011; Söderman et al. 2012). We understand CES as connecting particularly the social and ecological dimensions of sustainability.

Conclusion

Our approach shows how cultural ecosystem service assessment and green space utilization change along an urban population density gradient, detailing differences in perception and use. We present ways to comprehensively quantify CES in a non-monetary way, and to form bundles or clusters of CES that empirically address related socio-ecological interactions. On this basis, we pledge for a more detailed, yet more structured inclusion of CES variables in ecosystem service research.

Studies of CES and urban green utilization along a population density gradient provide policy-makers with spatially explicit information on demands and supply of urban green. Social research of the type conducted in this study tends to foster public participation, not only increasing information on public opinion into the decision-processes, but also increasing inhabitant's awareness on urban nature. Our study gives one example on how to assess values of CES in a more comprehensive way using qualitative and quantitative research methods.

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CHAPTER FIVE

CONFLICTING DEMANDS OF DIFFERENT SOCIAL GROUPS ON CULTURAL
ECOSYSTEM SERVICES PROVIDED BY URBAN GREEN



Abstract

Urban green provides many different cultural ecosystem services (*CES*) and provisions ought to reflect and meet requirements of the inhabitants to achieve a sustainable management. Many studies on ecosystem services do not adequately capture the full spectrum of social values that influence *CES*. Culturally sensitive and non-monetary quantification approaches have been increasingly advocated but are only slowly attracting interest. We present results from an analysis of inhabitants' perceptions of *CES* providing urban green in Berlin using social research methods. Based on information from semi-structured interviews we designed a questionnaire and conducted 558 face-to-face interviews using proportionate cluster sampling. Our results show that urban green in Berlin provides a variety of *CES* with competitive, additive or even synergistic interactions between each other. Valuations of *CES* were influenced by temporal aspects, as found that *CES* appreciation increased in summer. What is more, our results indicate a dichotomy of stated *CES* importance regarding spatial and social factors: Older inhabitants of Berlin, living in more periurban areas prefer *CES* related to natural experiences and value *CES* concerned with human interactions much less. Younger urban dwellers in the urban core have a more homogenous valuation with preference for *CES* related to social interactions. This indicates different demands on the restricted resource of urban green in Berlin, which is likely to influence urban green management and spatial planning.

Keywords

Green infrastructure; green space management; nature perceptions; user preferences; urban ecology; urban sustainability; spatial and temporal scales; spatial planning

Introduction

More than 50% of the world population lives in cities (World Bank 2015) and with this number expected to grow challenges and problems regarding sustainable urbanization are likely to increase (Seto et al. 2012). Urban ecosystems, that is urban green spaces, within cities contribute to the cities sustainability (Bolund & Hunhammer 1999), as they positively affect biodiversity, mitigate of urban heat, pollution and noise and have many other beneficial health and recreational contributions to the people (Bolund & Hunhammer 1999; Faehnle et al. 2014; Bowler et al. 2010). Yet, use pressure on urban ecosystems, that is urban green, in-

creases steadily. From plans for apartment houses or industrial areas and the increase of visitors for different kinds of recreational activities – urban green management faces great challenges through the increasing and changing demands of growing populations (Bolund & Hunhammer 1999; Seeland et al. 2009; Chan et al. 2007). The different demands and requirements of the inhabitants regarding the restricted resource of urban green may generate possible user-conflicts. It is hence important that urban green offers, with equal access, the same quality of recreational experiences to all social groups. To reflect and meet the needs and requirements of the inhabitants, a comprehensive analysis of residents' values should be achieved (Burgess et al. 1988). We address this challenge by focusing on conflicting demands of different social groups on cultural ecosystem services (*CES*) provided by urban green spaces.

CES are defined as “ecosystems' contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships“ (K. M. a Chan et al. 2012). They are based on “significant relationship[s] between ecosystem structures and functions specified in the biophysical domain and the satisfaction of human needs and wants specified in the medical/psychological/social domain” (Daniel et al. 2012). The MEA presented a heuristic set of *CES* categories which include a range from aesthetical values to educational or religious values (MEA 2005:40), linking ecosystem conservation and human well-being (Chan et al. 2007; Guo et al. 2010; Norgaard 2010). *CES* will become increasingly important in the coming years (Guo et al. 2010), especially in urban areas (Radford & James 2013). Yet, only limited knowledge exists on the provision of *CES* from urban green and their valuations, changing with social groups (e.g. Feld et al. 2009). Socio-cultural values have only lately come into focus of ecosystem service research (e.g. review by Scholte et al. 2015).

Especially in urban areas, inclusion of the public is a prerequisite for socially just and sustainable urban planning (Faehnle et al. 2014; Kabisch & Haase 2014). However, inclusion of stakeholders in ecosystem service research is still largely lacking (Menzel & Teng 2010; Seppelt et al. 2011). As personal, contextual, temporal and spatial factors can influence socio-cultural values, their quantifications is especially challenging (Oteros-Rozas et al. 2014; Iniesta-Arandia et al. 2014; Scholte et al. 2015). This accounts even more so for *CES* quantifications. Social research methods can be one tool to incorporate stakeholders and account for various factors influencing valuations (Daniel et al. 2012; Gould et al. 2014; López-Santiago et al. 2014). While many previous studies in ecosystem service research mainly focused on

monetary valuation (e.g. Martín-López et al. 2012), we perform a non-monetary quantification of detailed CES perceptions of urban green.

In this research we focus on (1) providing insights into social research methods for assessing CES, (2) identifying the most important CES categories named by Berlin inhabitants and (3) examine relationships between these CES categories, analyzing possible competition, synergies or trade-offs involved in CES provision by urban green. (4) Above all, we aim to empirically advance on the assessment of social aspects which influence CES valuation, such as age and education as well as of spatial factors such as the population density of the district. Our survey reveals spatial, social and temporal differences in CES valuations, which shed light on contrasting user demands on CES provided by urban green (see also e.g. Calvet-Mir et al. 2012). With our information we give tools at hand to mitigate potentially emerging conflicts between social groups with different CES preferences. Sustainable cities need ecological, social and economic sustainability. We perceive CES as an interesting link between the social and ecological dimensions, showing interactions often overlooked in research and policy making.

Methods

Study side

Our study area was Berlin, the capital city of Germany. With 892 km² and 3.5 million inhabitants in 2013, Berlin is Germany's largest and most populated city. Over 40% of Berlin is covered by green or water spaces. With its current new plan "strategy City-Landscape Berlin" by the Senate Department of Urban Development and the Environment (Senatsverwaltung für Stadtentwicklung und Umwelt Kommunikation 2012) Berlin is now placing more emphasis on a comprehensive planning strategy for urban green, while strengthening its "green" image. Boroughs have a population density range from 13.818 inhabitants/km² (Friedrichshain-Kreuzberg) to 1.466 inhabitants/km² (Treptow- Köpenick) with even more difference on district level (in 2013, Amt Statistik Berlin-Brandenburg 2014).

Research design and data analysis

Preparation for our quantitative survey included extensive theoretical and literature studies on cultural ecosystem service and the environmental infrastructure of Berlin. As the present study is part of a wider research project on socio-cultural valuations of CES, a qualitative study was first conducted to adjust CES variables to locally specific perceptions of Berlin

citizens, This qualitative study used semi-structured interviews with Berlin inhabitants and experts ($n = 41$) to increase cultural sensitivity of our quantifications. Our qualitative study resulted in an adjustment of CES description in respect to the specific local perceptions of Berlin inhabitants and experts. Some categories such as cultural diversity values had to be related to the urban context. Further, the category of traditional knowledge systems was substituted by a category of nature awareness. Additionally, we performed two focus groups with laypersons to improve structure and wording of the questionnaire and conducted a pilot study ($n = 65$). The questionnaire contained parts on (1) utilization of urban green spaces, assessed in ordinal scale (Average visiting frequency and duration of urban green spaces; perceived accessibility to green spaces; compositional preferences of green spaces; average distance traveled and mode of transport; accessibility to balcony or private green spaces), (2) importance of different aspects related to CES variables, assessed in interval scales from 1 (unimportant) to 7 (important) and (3) socio-demographic information, such as: age; sex; occupation; education; no. of children; income; membership of an organizations concerned with nature; political attitude; residence time and prior residence in Berlin. The questionnaire can be found in the appendix B in a translated version, to see assessment scales and formulations.

Data were collected through two rounds of face-to-face surveys in the city of Berlin in four districts of Berlin. Sample population were the inhabitants of Berlin, restricted to people over 16 years of age. Sample method was proportionate stratified cluster sampling. To include an urban–periurban gradient, districts in Berlin were clustered in four groups by population density. Within these four clusters, districts were selected randomly. Sampled districts were:

- (1) Berlin Mitte: located in Berlin Mitte, 7.850 inhabitants/km², $n = 219$ (39.2%);
- (2) Altglienicke: located in Treptow- Köpenick, 3.422 inhabitants/km², $n = 128$ (22.9%);
- (3) Mahlsdorf: located in Marzahn- Hellersdorf, 2.095 inhabitants/km², $n = 124$ (22.2%) and
- (4) Heiligensee: located in Reinickendorf, 1.665 inhabitants/km², $n = 87$ (15.6%) (Amt für Statistik Berlin-Brandenburg 2014). Since the population density is different throughout Berlin, our population density gradient is not linear from core to periphery, accounting for Berlin's structural composition.

Within the districts the streets households were sampled randomly. Surveys were conducted on various days of the week between 09:00 and 21:00 o'clock. After a second unsuccessful try, chosen households were marked as dropouts. To decrease the dropout rate we did not use a random selection of the interview partners on household scale. Yet, as our sample shows representativity with Berlin's social-demographic structure, the compromise of random selec-

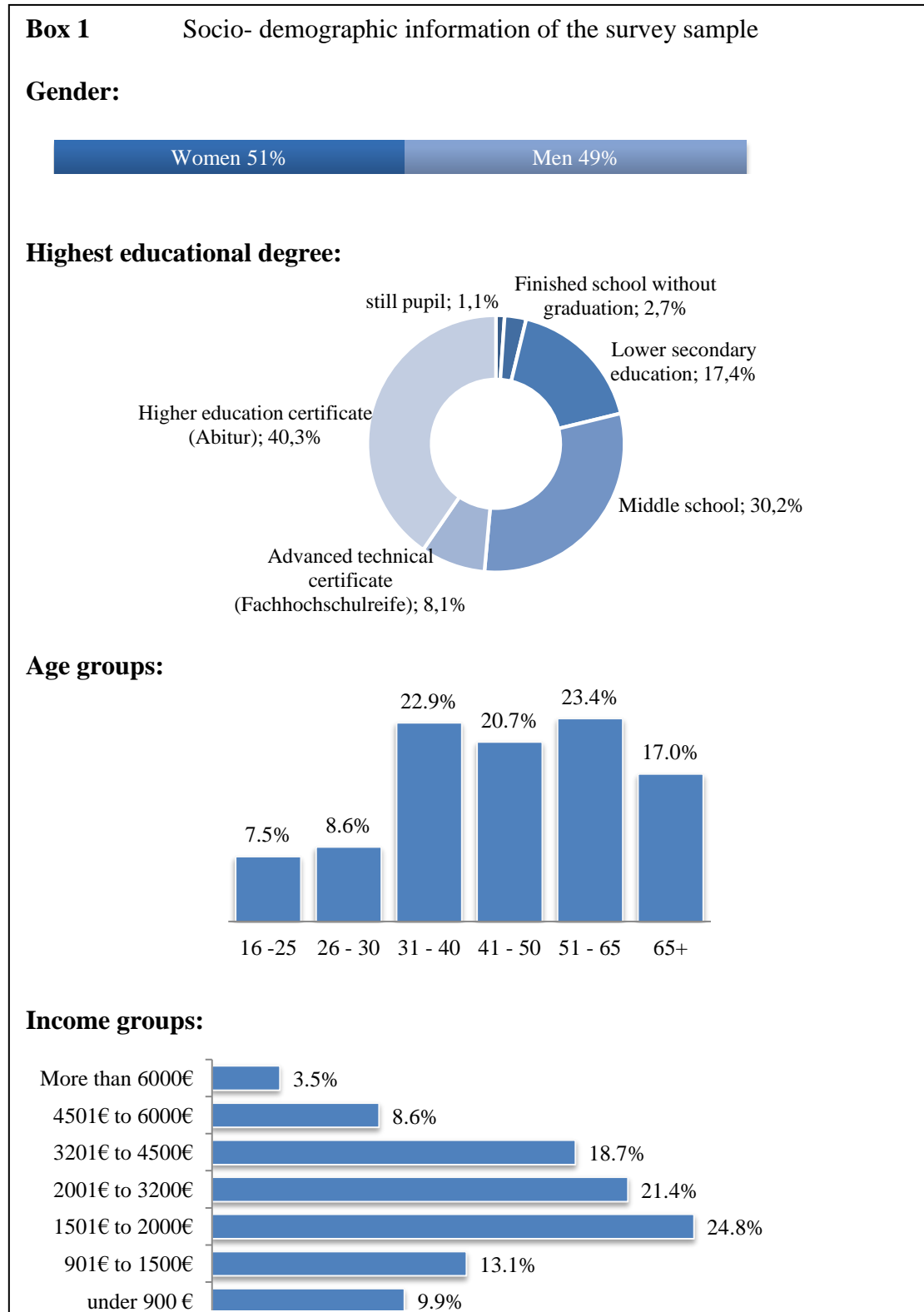
tion on household scale versus dropout rate seems justified. A response rate of about 48% resulted in a sample sized of $n = 558$ (round 1 $n = 249$, round 2 $n = 309$).

We hypothesized that answers related to natural environments would depend on seasonal and weather conditions (e.g. Oteros-Rozas et al. 2014; Scholte et al. 2015). To improve representativity and consider temporal aspects of valuation, we collected data in late autumn 2013 (November – December) and in late spring/ early summer 2014 (April – June).

Missing data was excluded pairwise for each method separately, as their percentage and item non-response rates were low. Data was analyzed using SPSS 21 (IBM Deutschland GmbH, Ehningen, Germany). In a first step, we examined relations between our CES variables. For that we conducted bivariate correlations between our 10 CES categories using their ipsatized importance. We ipsatized data on CES as ipsatized importance eliminate individual overall importance, i.e., acquiescence. We then analyzed different social and spatial aspects influencing CES valuation. To assess our research questions of who prefers which CES, we conducted a regression on CES importance. We performed stepwise multiple regression analyses of the ipsatized importance of each CES variable on school years, age and population density, as these variables resulted to be the most important influences. Additionally, if the variables had significant influence, we included income (in €), length of residence (in years) and average distance travelled to green spaces (in km).

Finally we conducted a hierarchical (agglomerative) cluster analysis (HCA) using the Ward's method and squared Euclidian distance on the ipsatized importance's of CES categories. The resulting clusters where then correlated to socio- demographic variables, to gain information on the social groups behind these clusters. For reasons of simplification we decided on showing two clusters, as these showed the most distinct differences in their profiles.

Results

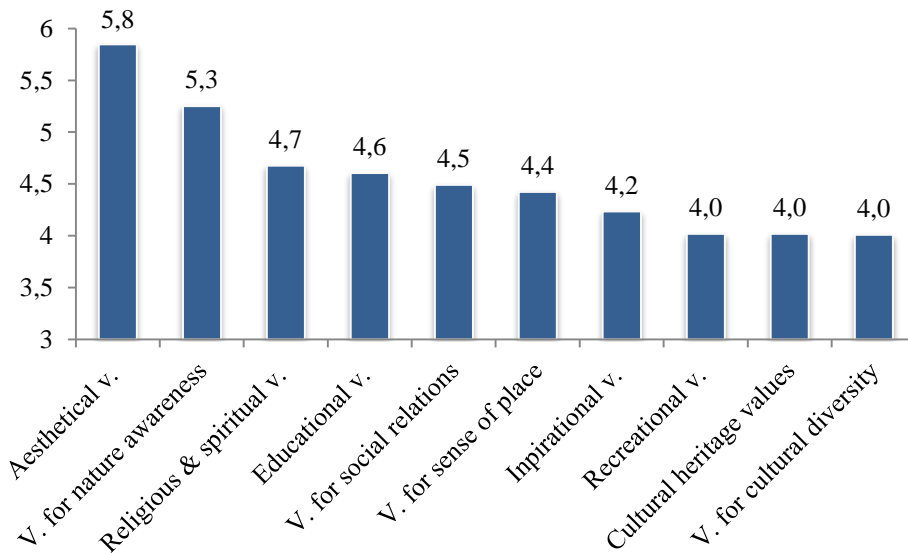


Box 1 shows socio-demographical information of our sample. Gender and age can be said to be representative for Berlin (women 51%, men 49%; average age women 44 years, men 42

years, for 2013, Amt für Statistik Berlin-Brandenburg 2015). The sample includes slightly higher educated people, possibly due to a biased dropout rate.

Aesthetical values were perceived as the most important ones, with a mean of 5.8, followed by values of nature awareness (5.3) and religious and spiritual values (4.7). Least important were cultural diversity values (4.0). As figure 1 shows, stated overall importance is rather high.

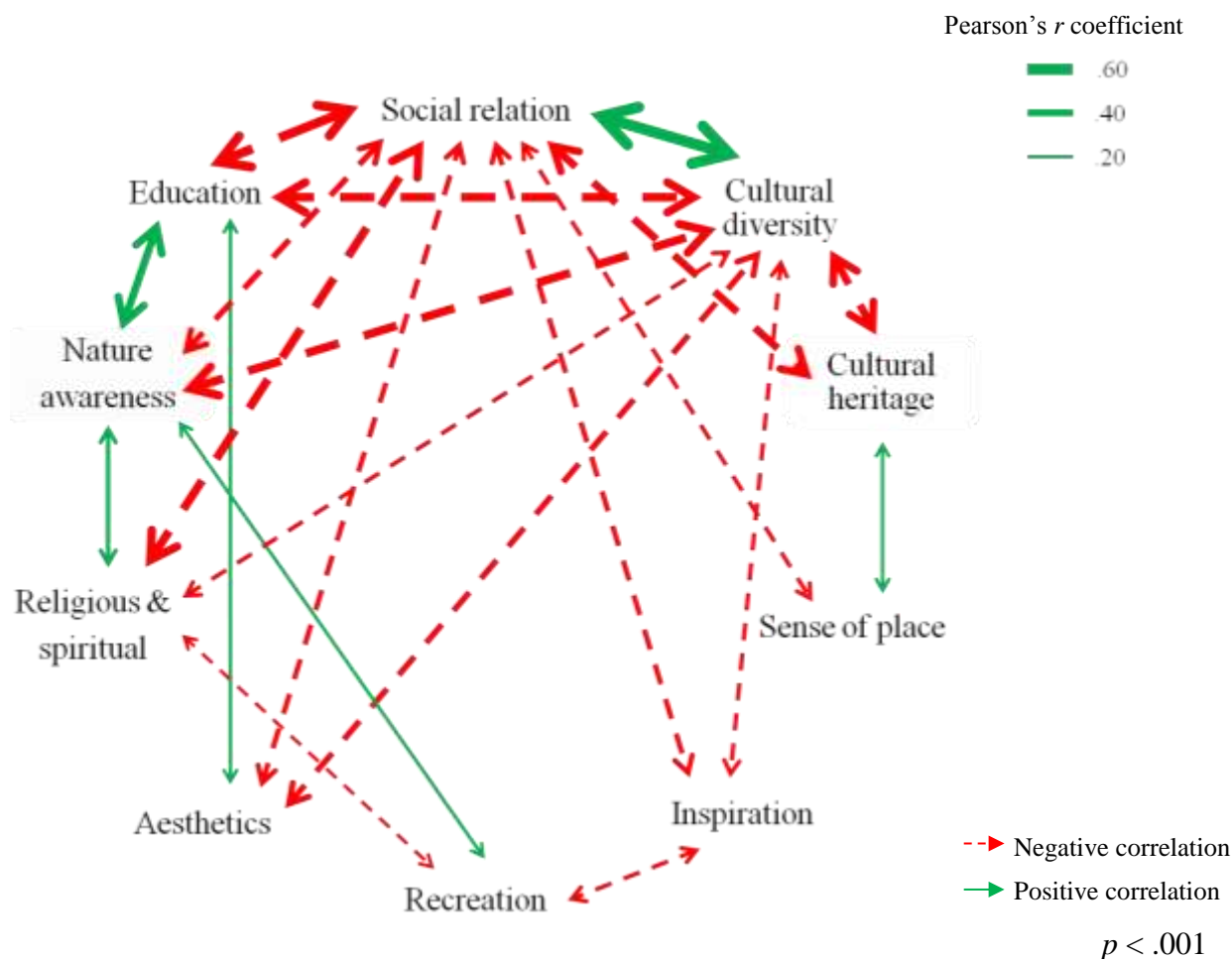
Figure 1 Importance of cultural ecosystem services in the study region; adjusted MEA categories; Scaling from 1 (lowest) to 7 (highest importance). Abbreviation: V. = Value



We used bivariate correlations to analyze relations between stated CES importance. Figure 2 visualizes correlations of $p > .001$, with a Pearson product-moment correlation (Pearson's r) of $\leq .20$. The strength of the arrows indicates the strength of the correlation. Table A.1 shows the precise Pearson's r coefficients and significance levels of all CES variables.

Results indicate many negative relationships between CES variables. The graph shows grouping between values from social relations and cultural diversity on the one hand and variables such as values for education and nature awareness on the other. Furthermore, values for cultural heritage and sense of place are also positively related. Interestingly, values for recreation, sense of place and inspiration seem to have only a few relations to other CES categories.

Figure 2 Bivariate correlations between stated importance of cultural ecosystem services across participants, $p > .001$ (2-sided); Strength of the arrows indicate the strength of Pearson's r coefficients



The three most important socio-demographic variables that explain stated importance of CES were education, age, and population density of the sampled region. For some CES categories the regression gained further significance through the addition of variables such as income, years of residence within Berlin and the average distance that the interviewees traveled to green spaces. Table 1 shows standardized Beta coefficients and significant levels of the regressions. Strongest influence can be seen for age and education, showing that stated CES importance mostly increases with increasing age and educational level. For the variables of values for nature awareness, cultural heritage, sense of place and cultural diversity increasing income shows negative influence on the importance, indicating that these CES are enjoyed more by people with less income.

A similar grouping as seen through the bivariate correlations gets emphasized in the regression analysis. While an increase of age and a decrease of population density was positively related to most of the CES categories: Values for recreation, cultural diversity and social relations were more important for younger persons living in densely populated areas (table 1) than for older persons in periurban areas. Hence, to analyze the hypothesis of conflicting demands, we grouped categories for cultural diversity, social relations and recreation under the heading of ‘social CES’, and the other variables under ‘nature experience CES’ for further regression analysis.








Table 2 shows Beta coefficients and their significance, based on the regression of our two aggregated CES groups on population density, education, age and income. We added arrows for visualization. The values for the nature experience CES were positively related to an increase in age and education and a decrease in population density. The values for the ‘social CES’, however, decreased with age and increased with population density, whereas education still had a positive effects, while income had no influence.

Table 1 Spatial and social aspects of valuation: Multiple regression of stated importance of cultural ecosystem service categories on socio- demographic variables, showing standardized Beta coefficients with significance levels

| | Population density | School years | Age | Income | Years of residence | Distance to green |
|----------------------|---------------------------|---------------------|------------|----------|--------------------|-------------------|
| Education | -.167*** | .097* | .280*** | | | |
| Nature Awareness | -.111* | .227*** | .258*** | -.102* | | .136** |
| Aesthetic | -.081+ | .169*** | .227*** | | | -.112** |
| Cultural heritage | -.079+ | .137** | .398*** | -.160** | | |
| Sense of place | -.045 | .023 | .184*** | -.224*** | | |
| Religious/ Spiritual | -.027 | .124** | .341*** | | | |
| Recreation | .013 | .162** | -.386*** | | .324*** | |
| Inspiration | .013 | .169*** | .316*** | | | .123** |
| Cultural diversity | .218*** | .045 | -.097* | -.113* | | |
| Social relation | .267*** | .146** | -.353*** | | -.262** | |

+ $p < 0.1$
 * $p < 0.05$
 ** $p < 0.01$
 *** $p < 0.001$

Table 2 Multiple regression of cultural ecosystem service importance on socio-demographic variables, showing standardized Beta coefficients with significance levels

| | Population density | School years | Age | Income |
|-----------------------|--|--|--|--|
| Nature experience CES | -.099*  | .198***  | .418***  | -.127**  |
| Social CES | .223***  | .137*  | -.166**  | -.073 |

* $p < 0.05$
 ** $p < 0.01$
 *** $p < 0.001$

To gain more information on how these different social groups are constituted we performed a hierarchical (agglomerative) cluster analysis (HCA) on the stated importance of the CES categories. When comparing the arithmetic means of our two groups, the ‘nature experience CES’ and ‘social CES’, persons in cluster 1 show a homogeneous answer behavior, while the persons in group two have higher variability between the two CES groups. Additionally, cluster 2 has a strong emphasis on CES concerning nature experience as shown in table 2. Information on the exact means of all 10 CES variables can be seen in table A.2.

The two clusters are described in a relation to each other and not in absolute values as table 3 shows. Figure 3 depicts an abstract graphical representation of the two contrasting user groups on urban green in Berlin. The profiling of the two clusters back the results of our multiple regression analysis.

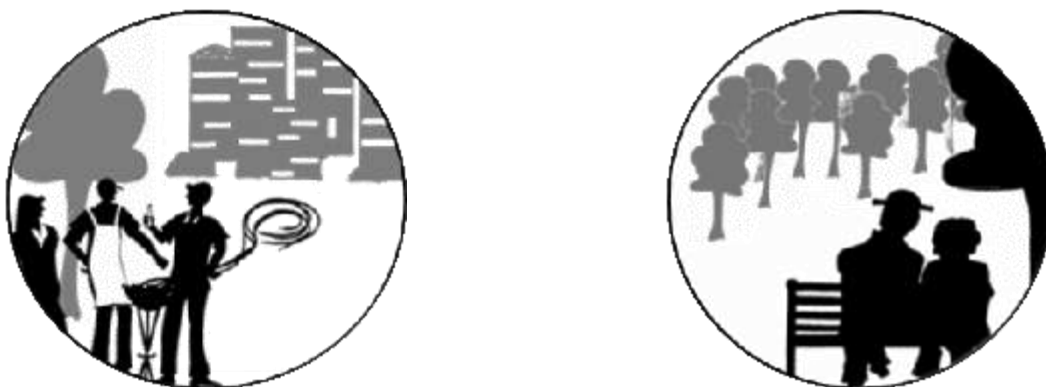
Cluster 1 is constituted of in average younger persons in more densely populated areas, which value CES more homogeneously but emphasize services related to human interactions. This social group has not been living as long in Berlin, visit green spaces less often and perceives these as not as well accessible as people under cluster 2. Cluster 2 on the other hand is constituted of older persons, living in periurban areas (less densely populated). They have lived longer in Berlin, visit green spaces more often and perceive them as being well accessible. Education and income do not differ between the clusters, as indicated in the regression. The

general positive effect of educational levels could also be due to the higher amount of higher educated people within our sample.

Table 3 Correlation of socio-demographic variables with two clusters for profiling; Eta coefficient, F-Value and significance

| Cluster 1 <i>n</i> = 419 (75.6%) | Cluster 2 <i>n</i> = 135 (24.4%) | Eta | F-Value | <i>p</i> - value |
|---|--|------|---------|------------------|
| Nature experience CES: 4.38 | Nature experience CES: 5.54 | .491 | 175.027 | < .001 |
| Social CES: 4.56 | Social CES: 3.35 | .479 | 165.308 | < .001 |
| Younger (42.56, SD 15.0) | Older (54.91, SD 17.2) | .344 | 73.098 | < .001 |
| Shorter length of living in Berlin | Longer length of living in Berlin | .312 | 32.961 | < .001 |
| Lower visiting frequency to urban green | Higher visiting frequency to urban green | .150 | 12.767 | < .001 |
| Higher population density | Lower population density | .135 | 10.261 | = .001 |
| Urban green perceived as not so well accessible | Urban green perceived as well accessible | .112 | 7.028 | = .008 |

Figure 3 Graphical abstractions of two contrasting user groups (cluster 1 and cluster 2) of urban green spaces in Berlin



Lastly we assessed temporal differences in valuations. Table 4 shows differences in answers regarding stated frequency urban green visits and CES perceptions in respect to our two collection rounds. CES are mainly perceived to be of general higher importance and green spaces

stated to be visited more frequently in spring/ summer, than in the autumn collection round. Additional, stated average distance traveled to green spaces increased in warmer seasons (Cramer’s V .341, $p > .001$), and urban green was perceived as better accessible (Cramer’s V .373, $p > .001$).

Table 4 Temporal aspects of valuation: Correlation of cultural ecosystem services and visiting frequency with round of data collection (Late autumn/ early summer); Cramer’s V, significant level marked with *

| CES | Cramer’s V | Visiting frequency | Cramer’s V |
|----------------------|------------|---------------------------|------------|
| Aesthetics | .182 | Parks/ open green spaces | .322*** |
| Religious/ spiritual | .281*** | Playgrounds | .148* |
| Recreation | .314*** | Cemeteries | .129 |
| Nature awareness | .411*** | Forests | .253*** |
| Education | .342*** | Water spaces | .251*** |
| Inspiration | .382*** | Nearby recreational areas | .354*** |
| Cultural diversity | .274** | Urban surroundings | .455*** |
| Social relations | .244** | | |
| Sense of place | .166 | | |
| Cultural heritage | .305*** | | |

* $p < 0.05$
 ** $p < 0.01$
 *** $p < 0.001$

Discussion

As cities grow and citizens live in more confined space with limited access to natural areas, cultural ecosystem services increase in importance (Guo et al. 2010). Urban green management faces demands for industrial or residential development, for nature protection or for various kinds of recreational activities (Bolund & Hunhammer 1999; Seeland et al. 2009; Chan et al. 2007).

Urban green should be equally accessible for all social groups and the same quality for their recreational experiences should be provided. Differing preferences on the use and benefits from urban green may lead to differing demands on the restricted resource of urban green. When a restricted resource, here urban green spaces, is object to various and possible secluding demands, user-conflicts may emerge. In this paper we analyzed conflicting and changing demands on Berlin’s urban green spaces providing CES.

Most important socio-demographic influences on CES valuations were the education and age of the interviewees and population density of the district they were living in. Our findings show a dichotomy of CES preferences between: (1) an older social group, living in more peri-urban areas. This social group prefers CES related to direct natural experiences, such as values for education, religious and spiritual values. In contrast, this group values social CES, such as values for social relations, cultural diversity and recreation, much less, potentially indicating less sympathy for the use of green spaces as living or dining spaces. (2) In contrast to this group are younger, in densely populated areas living user who prefer CES which positively influence human interactions. If urban green precludes some or many of these demands and opportunities, inhabitants express discontent (see also Burgess et al. 1988). Our results lend support to possibly user-conflicts between the two groups, as their demands can be secluding if presented on a restricted urban green space.

Urban green provides crucial opportunities to leave the apartment and have an outdoor place to meet, especially in densely populated areas. In Berlin, parks and open spaces are used as a resting or meeting point and as extended living space. Hence these areas have a high value for social integration as they help to overcome the loneliness in a city and to strengthen personal social relations (Kabisch & Haase 2014; Seeland et al. 2009). Yet, urban green in Berlin is restricted. Use of urban green for social interactions, such as barbequing or festivities or for sports may hinder and negatively influence CES provision regarding contemplation and a more quiet recreation. These differing demands may lead to specific user-conflict due to restricted amount of green spaces areas (see also Priego et al. 2008; Kabisch & Haase 2014; Burger 2011). The different preferences may in part be explained by the lack of contact to places where social CES are the primary provision or the lack of understanding of such a use, as gardens are more frequent and substitute social CES from common green (own results and e.g. Calvet-Mir et al. 2012). Faulty information for decision-makers which do not account for contrasting demands between social groups might thus lead to conflicts, as compromises could not be acknowledged properly.

The older population, living more frequently in less densely populated areas tends to use green spaces differently than the population in the core. In less densely populated areas, nature is especially valued as room for contemplation, quietness or education. Berlin possesses many green areas, such as forests, within the urban fringe. The connected surrounding areas of Brandenburg consist in part of (semi-)natural areas and agricultural land. Access to different kinds of green spaces is hence more easily provided. Our qualitative results indicate that areas which are colloquially termed “real nature”, such as bigger forests and water spaces

with fewer visitors, are rather far away from the urban core. Visiting frequency of inhabitants of higher populated areas is less than for those living in periurban areas. Longer distances and travel time discourage frequent and especially weekday visits for residents of the urban core. These differences regarding supply and accessibility cause contrasting scarcity patterns and, subsequently, differing demands on urban green within Berlin. What is more, green space utilization and access seems to influence perception of CES and possibly towards nature in general (see similar approaches by Martín-López et al. 2012; Yu 1995; Priego et al. 2008).

The topics of equitable access and equal quality of recreational activities for all social groups connect CES and urban social sustainability research (Dempsey et al. 2011; Bramley et al. 2006). Restrictions on green space usage or their compositions can attract or repel different social groups, which should be acknowledged in planning processes. Equitable access is a prerequisite for a socially just city design and effects on and demands from different user groups of urban green play a crucial role for urban sustainability (Faehnle et al. 2014; Kabisch & Haase 2014). The connection of the concepts of CES and social sustainability could facilitate the simultaneous inclusion of socio-cultural values in policy and decision-making through mutual enhancement of socio-ecological aspects.

With our study, we have tried to fill several methodological and conceptual gaps for quantifying CES (E.S.F. 2010; Daniel et al. 2012; Norton et al. 2012; Milcu et al. 2013). Decision-makers are often interested in quantitative trade-offs between the impacts of the differing planning options (e.g. de Groot et al. 2010; Klain & Chan 2012; Tengberg et al. 2012), yet quantification is deemed to be difficult (e.g. Plieninger et al. 2013; Daniel et al. 2012; Gee & Burkhard 2010).

Our results showed that stated CES importance have various interrelations, with a high amount of negative interactions. The results make clear that relations between CES variables play a significant role for a comprehensive assessment. Possible synergies and trade-offs between benefits of each service should be incorporated into CES valuation and in policy planning, as they might indicate possible conflicting relationships. Our results emphasize that assessing CES variables without acknowledging their interactions might produce biased results and over or under valuations of certain variables. A pre-requisite for meaningful quantification in these cases is a sufficiently comprehensive and differentiated assessment of CES.

Further, our data showed a positive influence of warmer seasons on variables such as the stated frequency of visits and the perception towards CES benefits for almost all green spaces

prompted: Stated visiting frequency increased in the second collection round in summer, traveled distance, and urban green perceived as better accessible. CES (except values for aesthetics and sense of place) were valued higher in summer times. These differences in valuation are likely due to two effects: On the one hand, even if asked for a yearly average estimation, interviewees give only an assessment of a current temporal snapshot. On the other hand, urban green does not provide CES in the same amount in all seasons. In colder seasons, CES provision is much lower as utilization frequencies decrease. It is hence questionable if annual average statements can be given if data is collected in one season. The seasonal character had hence a great impact and is likely to be so for many surveys regarding nature or outdoor recreation (e.g. Oteros-Rozas et al. 2014; Scholte et al. 2015).

Our study uncovered underlying spatial, temporal and social factors of CES valuation, which are required for a comprehensive understanding in research and for reliable information for political planning processes (e.g. Iniesta-Arandia et al. 2014; Conrad et al. 2011). Future studies should be directed to disentangling further possible social and spatial factors which contribute to a differentiation of CES valuations. Research in this realm could show important management implications, as preferences and utilizations are likely to vary even further across different subgroups in different city areas and or on higher spatial scales (e.g. Bonnes et al. 2011). Our findings lend support to an interdisciplinary approach using qualitative and quantitative valuation and combining ecological and social sciences, as done in this study, for an comprehensive assessment of CES (see also Norton et al. 2012; Klain & Chan 2012; K. M. A. Chan et al. 2012).

Conclusion

In our study, we comprehensively analyzed changing and contrasting values for cultural ecosystem services from urban green in Berlin. Most important socio-demographic influences were education, age and population density. Our findings suggest a dichotomy regarding socio-demographic factors: We can distinguish CES preferences between an older social group, living in more periurban areas which prefer CES related to direct natural experiences. This social group values social CES significantly less. In contrast to this group stand younger and more urban dwelling user groups. These prefer CES which positively influence human interactions. We thus see a contrast between the two groups, in which the one group – the older, periurban dwellers – does not share the values of the other. This indicates a possible user-specific conflict, emphasizing contrasting demands and willingness to find a consensus on green space use. Further research could address these issues more specifically, through distin-

guishing into more subgroups or by comparing different spatial areas, such e.g. along an urban – rural gradient.

We suggest that management of urban green spaces should take spatial and social aspects, such as the division of at least two groups of citizens into account. Problems of conflicting demands and expectations – and the underlying importance assignments of green spaces showed by different preferences on CES – could be mitigated through this detailed knowledge. As the concept of CES gives one possibility of comprehensively acknowledging shared socio-cultural values of nature, we consider them as being a great tool to assess conflicting demands on urban green. Carefully assessed importance ascriptions of CES could be one tool to gain information of public and locally specific demands.

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Supporting Information

Table A.1 Bivariate correlations between cultural ecosystem service variables across participants, Pearson's r coefficient.

| | Aesthetics | Religious/ spiritual | Recreation | Nature awareness | Education | Inspiration | Cultural diversity | Social relations | Sense of place |
|-------------------------|------------|-------------------------|------------|---------------------|-----------|-------------|-----------------------|---------------------|-------------------|
| Religious/ spiritual | .186*** | 1 | | | | | | | |
| Recreation | .055 | -.214*** | 1 | | | | | | |
| Nature awareness | .215*** | .240*** | .200*** | 1 | | | | | |
| Education | .065 | .185*** | .003 | .408*** | 1 | | | | |
| Inspiration | -.181*** | .150*** | -.217*** | .070 | .145** | 1 | | | |
| Cultural diversity | -.359*** | -.217*** | -.066 | -.457*** | -.480*** | -.257*** | 1 | | |
| Social relations | -.284*** | -.467*** | -.137** | -.347*** | -.520*** | -.264*** | .634*** | 1 | |
| Sense of place | .048 | .073 | -.045 | -.116** | -.024 | -.199*** | .124*** | .240*** | 1 |
| Cultural heritage | -.048 | .155*** | .072 | .046 | .198*** | .158*** | .441*** | .437*** | .200*** |

* $p < 0.05$ (2-sided)
 ** $p < 0.01$ (2-sided)
 *** $p < 0.001$ (2-sided)

Table A.2 Cluster differences regarding cultural ecosystem service valuation; Eta coefficient, F-Value and significance

| CES | Group 1 | Difference | Group 2 | Eta | F-Value | <i>p</i> -value |
|----------------------|---------------------------|------------|---------------------------|------|---------|-----------------|
| Religious/ spiritual | 4.2 | + 1.4 | 5.6 | .421 | 119.465 | < .001 |
| Cultural heritage | 3.6 | + 1.3 | 4.9 | .360 | 82.933 | < .001 |
| Education | 4.2 | + 1.2 | 5.4 | .423 | 121.209 | < .001 |
| Nature awareness | 4.9 | + 1.1 | 6.0 | .355 | 79.790 | < .000 |
| Sense of place | 4.1 | + 0.9 | 5.0 | .273 | 44.611 | < .001 |
| Inspiration | 4.0 | + 0.8 | 4.8 | .260 | 39.970 | < .001 |
| Recreation | 4.2 | - 0.5 | 3.7 | .210 | 25.744 | < .001 |
| Aesthetics | 5.6 | - 0.9 | 6.3 | .275 | 45.419 | < .001 |
| Cultural diversity | 4.4 | - 1.3 | 3.1 | .372 | 89.163 | < .001 |
| Social relations | 5.1 | - 1.9 | 3.2 | .502 | 187.092 | < .001 |
| Distribution | <i>n</i> = 419 (75.6%) | | <i>n</i> = 135 (24.4%) | | | |

SUMMARY

Global urbanization leads to increasing value of inner city ecosystems - which is urban green - making them become more valuable for urban sustainability. Urban ecosystems increase biodiversity, mitigate urban heat and contribute to public health. However, maintenance or restoration of urban green is difficult, as competition for land in cities is high. Commercial use, residential development and the increasing need for recreational areas require comprehensive planning to balance the needs of a growing population. One way to gain information on these conflicting needs and demands in urban land-use and to increase understanding is the application of cultural ecosystem services (*CES*).

In my interdisciplinary project on urban green in Berlin I comprehensively analyzed changing values for *CES* in qualitative and quantitative ways.

In my study, qualitative value dimensions of *CES* related perceptions were assessed through semi-structured interviews with Berlin inhabitants ($n = 22$, problem-centered interviews) and by interviewing experts in planning and decision-making positions of green space management ($n = 19$, expert interviews) (**chapter II** and **III**).

Interviews were analyzed by inductive content analysis, yielding locally specified perceptions of *CES* benefits (**chapter II**). I found that the importance of the Millennium Ecosystem Assessment (*MEA*) categories is supported by my empirical research. The heuristic nature of this classification allowed for adjustments of the categories to the perception and understanding of the interviewees. The application of qualitative social research methods enabled us to identify and characterize *CES* benefit dimensions beyond the *MEA* categories; a task that cannot be achieved with quantitative methods. The specifications support the idea that *CES* are rooted in subjective aspects of the human-nature relation of heterogeneous individuals. In my thesis I further argue for a close connection of the normative base of *CES* with social sustainability. I hypothesize that a high provision of *CES* tends to have positive effects not only on social but also on ecological aspects of sustainability because improving human well-being by an increased provisioning of *CES* will often require that ecologically valuable ecosystems are spared from development.

To deepen the understanding of *CES* I compared the perceptions of experts *versus* laypersons (**chapter III**). According to my results, experts and laypersons approach to and valuation of *CES* differ strongly in preferences and perception. Expert decision-makers try to acknowledge the heterogeneity of green space user groups and their demands in my interviews. Still,

sufficient and timely public participation is often absent in actual decision-making in Berlin as evidenced by the recent collapse of the Tempelhofer Feld project that would have developed part of a major inner city area to green space for apartment buildings. Hence, I postulate, that raising awareness for the colliding demands and perceptions between experts and inhabitants could facilitate the success of planning processes.

Regardless of their heterogeneity or subjectivity, quantifications of CES are often needed. Quantifications are used, e.g. for comparisons between ecosystem service provisions and trade-offs in political planning processes. In my thesis, I therefore focused on a comprehensive, differentiated quantification of CES (**chapter IV and V**).

I used a representative face-to-face survey, based on proportionate stratified sampling. Data from $n = 558$ respondents were collected in two sampling rounds in four districts of Berlin. The districts were chosen to represent a gradient from densely populated to sparsely populated districts of Berlin. Focusing on this gradient enabled us to systematically identify and quantify spatial influences on green space utilization and CES perception. Although results were generated from Berlin respondents, similar results are likely to be obtained from cities with similar population densities to my four districts (**chapter IV**).

My results show that in more densely populated areas, parks and open green spaces are visited more frequently. Inhabitants of the urban city core prefer social CES: such as values for social relations and cultural diversity whereas periurban dwellers (low population density) value CES that are related to direct natural experiences. Residents of the urban core (high population density) visit forest or water areas less frequently but for a longer period of time than periurban residents. As their access to urban green tends to be spatially as well as economically more restricted, the demands that residents from densely populated city areas articulate should be considered particularly carefully.

To scrutinize the heterogeneity of CES valuations, I analyzed spatial, temporal and social factors influencing CES valuations (**chapter V**). Most important socio-demographic influences were education, age and population density. My findings suggest a dichotomy regarding socio-demographic factors. We can distinguish CES preferences between an older social group, living in more periurban areas which prefer CES related to direct natural experiences, such as values for education, religious and spiritual values. This social group values social CES significantly less. In contrast to this group are younger and more urban dwelling user groups. These prefer CES which positively influence human interactions. We

thus see a contrast between the two groups, in which the one group does not share the values of the other. This indicates a possible user-specific conflict, emphasizing contrasting demands and willingness to find a consensus on green space use. These findings are concordant with my spatial analysis and are robust, as the findings from various statistical methods supported the same results.

While many studies focus only on a (often arbitrary) selection of CES or mix socio-cultural values into an overarching category, I stressed the differences in the valuation of various CES. My results clearly show that a more detailed analysis is necessary, as CES can have positive and negative relations with each other (**chapter V**). Further, lack of differentiation between different social groups could lead to biased or simply wrong assessments, with potentially grave consequences for planning processes. However, it is not always possible to implement comprehensive research projects, especially for political planning institutions. My qualitative and quantitative findings indicate the possibility to aggregate CES into bundles, accounting for their interrelations. In my thesis I thus introduce methods of statistical bundling CES through multi-dimensional scaling and factor analyses (**Chapter III and IV**).

In conclusion, CES valuations are influenced by spatial, temporal and social factors which have to be considered by assessments. To acknowledge this heterogeneous character, social research methods are a valuable tool for assessment, particularly for quantifications. Especially the combination of quantitative and qualitative analyses can be an efficient way to include opinions and demands of inhabitants, which can serve to attain more sustainable results. The higher monetary and time-wise research efforts have been highly rewarded by the detailed and reliable results.

We expanded this research area on CES theoretically as well as methodically and provided interesting results regarding the diversified consideration of their values. This study was the first to focus on urban CES using an urban gradient. Further, there is up to date no study quantifying 10 CES categories while surveying their interaction and social influences on valuation. What is more, a study using our way of combining qualitative and quantitative methods in a socio-ecological research alliance has not been done before. We give important information on urban green space management and sustainable project implementation. Thereby, we present methods which facilitate valuations of CES and which can increase public awareness and participation.

I want to encourage interdisciplinary projects, as only alliances between social and ecological

SUMMARY

sciences, as accomplished in this project, allows such a comprehensive understanding of the many benefits of urban green.

ZUSAMMENFASSUNG

Durch fortschreitende Verstädterung werden urbane Ökosysteme immer wichtiger, um eine nachhaltige Stadtentwicklung zu gewährleisten. Die urbanen Ökosysteme erhöhen die Biodiversität, schwächen den Urban Heat Effekt und haben einen generell positiven Einfluss auf die Gesundheit der StadtbewohnerInnen. Jedoch stehen die urbanen Ökosysteme unter starkem Nutzungsdruck: Städtebauliche Projekte, aber auch der Anstieg von Nutzung erfordert eine ausbalancierte und umfassende Grünflächenplanung. Eine Möglichkeit Informationen über diese kollidierenden Interessen in urbaner Landnutzung zu erlangen, ist ein besseres Verständnis und Anwendung von kulturellen Ökosystemleistungen (kulturelle ÖSL).

In meinem interdisziplinärem Projekt von Stadtgrün in Berlin untersuche ich umfassend anhand qualitativer und quantitativer Methoden sich verändernde Bewertungen von kulturellen ÖSL.

In unserer Studie wurden qualitative Werte der kulturellen ÖSL durch qualitative semi-strukturierte Interviews mit BürgerInnen Berlins ($n = 22$, Problemzentrierte Interviews) und Experten in Planung und Entscheidungspositionen im Grünflächenmanagement ($n = 19$, Experteninterviews) erfasst (**Kapitel II und III**).

Die Interviews wurden durch induktiver Inhaltsanalyse ausgewertet. Mit einem solchen Verfahren wird gewährleistet, dass die lokal spezifischen Auffassungen der Vorteile kultureller ÖSL erhoben werden (**Kapitel II**). Wir haben herausgefunden, dass die theoretische Grundlage des Millennium Ecosystem Assessment (MEA) durch unserer Studie gestützt wird. Die heuristische Natur dieser Einteilung ermöglichte es uns, die Kategorien den Vorstellungen unserer Befragten anzupassen. Unsere Methoden der empirischen Sozialforschung ermöglichten uns ein einbeziehen qualitativer Werte, die durch quantitative Erhebungen nicht hätten erfasst werden können. Dadurch wird der heterogene und subjektive Charakter kultureller ÖSL anerkannt. Wir haben in dieser Forschung ebenfalls herausgefunden, dass kulturelle ÖSL einen engen Bezug zur urbanen sozialen Nachhaltigkeit haben. Wir postulieren, dass eine hohe Bereitstellung kultureller ÖSL einen positiven Effekt auf soziale sowie ökologische Nachhaltigkeit hat, da menschliches Wohlbefinden gefördert wird und Ökosysteme vor Bebauung geschützt werden können.

Um unser Verständnis von kulturellen ÖSL zu vertiefen, haben wir die Vorstellungen

zwischen Experten *versus* Laien verglichen (**Kapitel III**). Heraus kam, dass sich ihre Betrachtungsweisen und Bewertungen stark unterscheiden. Trotzdem sind Experten meist alleinige Entscheidungsträger. Zwar beziehen sie auch die Meinung der BürgerInnen mit ein und versuchen die kontrastierenden Anforderungen von Benutzergruppen auszubalancieren. Jedoch ist die Öffentlichkeitsbeteiligung oft nicht ausreichend und manchen Projekten fehlt an Rückhalt (wie im Beispiel des Tempelhofer Felds, **Kapitel III**). Wenn ein Bewusstsein geschaffen wird für die oft kollidierenden Anforderungen und Vorstellungen zwischen Experten und Laien, könnten Planungsprozesse vereinfacht werden.

Trotz ihrer Heterogenität und Subjektivität sind Quantifikationen von kulturellen ÖSL gefordert. Quantifizierungen werden u.a. für die Vergleichbarkeit zwischen Bereitstellungen von Ökosystemleistungen und für planungspolitischen Kompromissen genutzt. In unserer Studie haben wir uns daher auch auf die umfangreiche und ausdifferenzierte Quantifizierung kultureller ÖSD konzentriert. Mit einer repräsentativen face-to-face Fragebogenerhebung in zwei Runden, wurden mit einem proportionierten geschichteten Klumpenauswahlverfahren 558 Personen in vier Ortsteilen Berlins befragt (**Kapitel IV** und **V**). Ein Fokus der Analyse war der Einfluss eines Stadtgradienten definiert durch Populationsdichte. So können Schlüsse auf die lokal spezifischen Einflüsse auf kulturelle ÖSL gezogen und Hinweise für ihre Bewertung in Städten mit ähnlichen Populationsdichten gegeben werden (**Kapitel IV**).

Wir fanden, unter anderem heraus, dass in dichter besiedelten Gebieten besonders Parks und offene Grünflächen besucht werden. Dieses ist nicht nur zurückzuführen auf die Angebotsstruktur von Flächen, sondern auch auf Präferenzen der BewohnerInnen des Stadtkerns (hohe Populationsdichte). Dort werden soziale kulturelle ÖSL, wie Werte für soziale Beziehungen und kulturelle Diversität, besonders bevorzugt. Kulturelle ÖSL, die direkte Naturerfahrung ermöglichen, werden von den BewohnerInnen der periurbanen Gegenden (geringe Populationsdichte) höher wertgeschätzt. Bewohner dichter besiedelter Gegenden halten sich jedoch länger in Wäldern oder an Wasserfläche auf, als das für die periurbanen der Fall ist. Diese Ergebnisse sollten in Erhebungen bezüglich kultureller ÖSD sowie in Planungsprozesse für Stadtgrün mit einbezogen werden.

Um die Heterogenität der Bewertungen kultureller ÖSL noch genauer zu betrachten, haben wir die Ergebnisse der quantitativen Studie anhand sozialer Einflussaspekte untersucht (**Kapitel V**). Während Bildung einen durchweg positiven Einfluss auf die Bewertung hat, gibt es eine grundsätzliche Zweiteilung bei Faktoren wie Alter und urbanen– periurbanen

Gradienten. Die älteren Bevölkerungsgruppen in periurbanen Gebieten schätzten besonders die kulturellen ÖSL, welche direkte Naturerfahrung beinhalten, wie zum Beispiel Werte für Bildung oder religiöse Werte. Diese soziale Gruppe besucht Grünflächen recht häufig und findet deren Zugänglichkeit sehr gut. Kulturelle ÖSL im sozialen Bereich werden von ihnen nur gering geschätzt. Ganz im Gegenteil dazu die jüngeren, urbaneren Nutzungsgruppen. Diese wertschätzen besonders die kulturelle ÖSL, welche menschlichen Interaktionen positiv bedingen, haben aber generell eine eher homogene Wertschätzung von kulturellen ÖSL. Es entsteht hier ein Kontrast zwischen zwei Gruppen, von denen die eine Gruppe die Wertschätzungen der anderen nicht teilt. Hier wird ein möglicher Nutzer-spezifischer Konflikt sichtbar, der Einfluss auf die Anforderungen und Kompromissbereitschaft für Grünflächenstruktur hervorhebt. Diese Resultate sind kohärent mit denen des Kapitel IV, was auf eine hohe Reliabilität der Ergebnisse hinweist.

Während viele Studien sich noch immer auf einige wenige Kategorien beziehen, oder kulturelle oder soziale Werte in einem Überbegriff zusammen mischen, betonen wir die Unterschiede der Bewertung verschiedener Variablen kulturellen ÖSL. Unsere Resultate zeigen deutlich, dass eine genauere Betrachtung wichtig ist. Kategorien kultureller ÖSL beeinflussen sich zum Teil positiv, wie auch negativ (**Kapitel V**). Eine undifferenzierte Erhebung kann zu verzerrten und falschen Ergebnissen kommen und die Resultate für die Planung negativ beeinflussen. Natürlich ist es grade in Planungsprozessen oft nicht möglich, sehr weitreichende Forschungsprojekte durchzuführen. Unsere qualitativen und quantitativen zeigen aber, dass eine Bündelung von kulturellen ÖSL möglich sein kann. Voraussetzung dafür ist jedoch zwingend, dass diese Bündelung auf vorangegangenen Studien basiert und die Ansichtsweisen der Bevölkerung adäquat widerspiegelt. Die Methoden der statistischen Bündelung durch multidimensionale Skalierungen und Faktorenanalysen (**Kapitel III und IV**), kann eine gute Methode sein.

Zusammenfassend steigert die Arbeit mit sozialwissenschaftlichen Methoden das Bewusstsein der Befragten zu dem Thema, was in Planungsprozessen oft gewünscht wird. Es ermöglicht ebenfalls eine effiziente Methode, die Meinung und Ansprüche der AnwohnerInnen mit in die Planungsprojekte mit einzubeziehen, um nachhaltigere Resultate zu erlangen. Wir plädieren dafür, Projekte zu kulturellen ÖSL interdisziplinär aufzubauen. Eine Verbindung von qualitativen und quantitativen Methoden wurde von uns durchweg positiv betrachtet und zeitlicher oder monetärer Aufwand durch die konkretere und verlässlichere Forschung aufgewogen.

Wir konnten den Forschungsbereich zu diesem Themen theoretisch und methodisch voranbringen, und Ergebnisse zur diversifizierten Betrachtung der Variablen kultureller ÖSL bereitstellen. Meine Studie ist die erste, welche sich auf urbane kulturelle ÖSL anhand eines urbanen Gradienten fokussiert. Des Weiteren existiert bis heute kein Projekt, das 10 Kategorien kultureller ÖSL, deren Interaktionen und soziale Einflussfaktoren untersucht. Überdies, benutze noch keine Studie zuvor unsere Kombination qualitativer und quantitativer Methoden in einer sozio-ökologischen Forschungsallianz. Wir liefern Informationen zum urbanen Grünflächenmanagement sowie zur Verbesserung der nachhaltigen Planung. Dadurch stellen wir Methoden vor, die eine Erhebung von kulturellen ÖSL erleichtern, in der Bevölkerung Bewusstsein zum Thema wecken und die AnwohnerInnen mit einbeziehen. Nur interdisziplinäre Verbindungen zwischen sozialer und ökologischer Forschung ermöglichen ein solch umfassendes Verständnis der vielen Vorteile von Stadtgrün.

APPENDIX A

BEWERTUNG KULTURELLER ÖKOSYSTEMLEISTUNGEN VON BERLINER STADTGRÜN ANHAND EINES URBANEN–PERIURBANEN GRADIENTEN



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Abstract

Urban green experiences high use-pressures. Especially aspects of recreation are perceived differently by inhabitants. One possibility to assess values for green spaces are cultural ecosystem services. In the paper at hand we combine qualitative and quantitative valuation to gain information on cultural ecosystem services and visiting behavior towards urban green spaces in Berlin. Our results show that use and valuation of urban green differs by population density of the sampled district of Berlin. Additionally, different social groups – here younger urban dwellers and older residents in less densely populated areas – perceive cultural ecosystem services differently. We herewith give information on these differences for a possibly facilitation of green space management.

Keywords

Urban cultural ecosystem services; green infrastructure; spatial planning; qualitative and quantitative valuation; green space management

Zusammenfassung

Stadtgrün steht unter hohem Nutzungsdruck. Gerade Erholungsfunktionen werden von AnwohnerInnen unterschiedlich wahrgenommen. Eine Möglichkeit, Bewertungen für Grünflächen zu erheben, sind kulturelle Ökosystemleistungen. In dieser Studie vereinen wir qualitative und quantitative Methoden, um Informationen zu kulturellen Ökosystemleistungen und Besuchsverhalten zu Grünflächen in Berlin zu erhalten. Unsere Ergebnisse zeigen, dass sich Nutzung und Bewertung von Stadtgrün je nach Populationsdichte des Berliner Ortsteils unterscheidet. Außerdem werden kulturelle Ökosystemleistungen zwischen sozialen Gruppen – jüngere im urbanen Ballungsraum lebende Befragte und ältere in weniger eng besiedelten Gegenden – unterschiedlich bewertet. Mit der vorliegenden Studie informieren wir über diese Unterschiede, um das Management von Stadtgrün zu erleichtern.

Schlüsselwörter

Urbane kulturelle Ökosystemdienstleistungen; Grüne Infrastruktur; Raumordnungsplanung; quantitative und qualitative Bewertungen; Management von Stadtgrün

Einleitung

Ein gutes Management der urbanen Grünflächen ist wichtig für die ökologische und soziale Nachhaltigkeit in Städten¹⁻³. Während die Urbanisierung fortschreitet, ist die nachhaltige Verwaltung von Grünflächen innerhalb Städten wichtig. Urbane Grünflächen sind wichtige Faktoren zur Steigerung von städtischer Biodiversität, zur Schwächung vom „Urban Heat“ Effekt und als Erholungsfunktion für die BürgerInnen⁴. Um nachhaltige Veränderungen zu bewirken, sollten die BürgerInnen in die Entscheidungsprozesse mit einbezogen werden⁵⁻⁷. Um Entscheidungen überzeugend der Bevölkerung zu präsentieren und deren Rückhalt zu haben, ist es wichtig die Heterogenität der Wünsche verschiedener sozialer Gruppen oder lokale Besonderheiten mit einzubeziehen. Eine Arbeit mit kulturellen Ökosystemleistungen (*kulturelle ÖSL* im Folgenden) ist eine Möglichkeit die Präferenzen der Bevölkerung mit einzubeziehen, und gleichzeitig soziale und ökologische Nachhaltigkeit zu verbinden. Dieses Diskussionspapier gibt einen Überblick über die qualitativen und quantitativen Ergebnisse einer Dissertation zum Thema: „Changing values of cultural ecosystem services: Qualitative and quantitative assessments on urban green in Berlin“ (Riechers 2015).

Das Konzept der Ökosystemdienstleistungen (gleichbedeutend aber kürzer: Ökosystemleistungen) wurde maßgeblich durch die Berichte des Millennium Ecosystem Assessment (*MEA* im Folgendem, 2005) popularisiert. Nach dem MEA sind Ökosystemleistungen (*ecosystem services*) jene Vorteile (im Englischen *benefits*, übersetzt als Beiträge, Leistungen, Nutzenstiftungen) die Ökosysteme zu Gunsten der Menschen bereitstellen⁸. Darunter finden sich auch kulturelle ÖSL. Im Report des MEA werden kulturelle Ökosystemleistungen als nicht-materielle Vorteile definiert, die Menschen seitens der Ökosysteme durch spirituelle Bereicherung, kognitive Entwicklung, Reflektion, Erholung und ästhetischen Erlebnissen zuwachsen⁸. Leicht abweichend definieren Chan et al.⁹, kulturelle ÖSL als “ecosystems' contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships“. Jenseits begrifflicher Differenzierungen erscheint die fundamentale Gemeinsamkeit beider Definitionen bedeutsam: In beiden Fällen bieten die ökologischen Systeme Kausalursachen oder förderliche Voraussetzungen für die Verwirklichung spezifisch sozio-kulturell getönter menschlicher Interessen und Entfaltungsmöglichkeiten. In Übereinstimmung mit der aktuellen internationalen Literatur¹⁰ gehen wir daher davon aus, dass von kulturellen ÖSL nur gesprochen

werden sollte, wenn ökologische Systeme, beziehungsweise deren Zustände, Elemente, Strukturen oder Prozesse, einen identifizierbaren Beitrag zur Befriedigung sozio-kultureller Bedürfnisse leisten.

Es gibt verschiedene Kategorien, in die Ökosystemleistungen eingeteilt werden^{8,11}. Der Einteilung kommt dabei vor allem ein heuristischer Wert zu und sollte nicht überbewertet werden. Gemeinsam ist den derzeit einflussreichsten Einteilungen, dass eine Reihe recht heterogener Phänomene einer gemeinsamen „kulturellen“ Kategorie zugeordnet werden. Wir nennen hier die Unterkategorien, die das MEA⁸ (eigene Übersetzung) aufführt:

- Werte für kulturelle Vielfalt
- Spirituelle und religiöse Werte
- Werte für (traditionelle und formelle) Wissenssysteme
- Werte für Bildung
- Werte für Inspiration
- Werte der Ästhetik
- Werte für soziale Beziehungen
- Werte für Heimatgefühl
- Werte für kulturelles Erbe
- Werte für Erholung und Tourismus

In der vorliegenden Studie untersuchen wir kulturelle ÖSL, die vom Berliner Stadtgrün bereitgestellt werden.

Stadtgrün ist sehr unterschiedlich konstituiert und auch Definitionen können sich unterscheiden^{1,4}. Wir haben daher alle Grün- und Wasserflächen Berlins in die Studie mit einbezogen, unabhängig vom Level der Pflege oder des Managements.

Unsere Studie schließt folgende öffentliche Grünflächen ein: (1) Parks und offenen Grünflächen, aber auch z.B. überwuchertes, vormals industrielles Land, (2) Berlins Wälder und waldähnliche Gebiete, (3) Berliner Wasserflächen, wie Seen oder Flussufer, (4) die vier offiziellen Naherholungsgebieten Berlins (die Bereiche um Müggelsee, Wannsee, Tegeler See und den Berliner Barnim) sowie (5) dem Brandenburger Umland Berlins. Zusätzlich wurden (6) Friedhöfe und (7) Spielplätze als Grünflächen einbezogen, sofern diese relativ naturnahe Struktur haben^{1,4}.

Methoden

Qualitative Studie

Datenerhebung

Zur qualitativen Erhebung haben wir unsere Befragten vor der Auswahl nach drei Befragungsgruppen klassifiziert: (1) Fachkräfte in Planungs- und Entscheidungspositionen der Berliner Senatsverwaltung für Stadtentwicklung und Umwelt sowie dem Landesforstamts Berlin ($n = 9$). Diese Gruppe konnte uns Einblicke in die Angebotsseite der kulturellen ÖSL geben. (2) Repräsentative Vertreter von Gruppen/Organisationen, die sich mit kulturellen ÖSL beschäftigen. Diese konnten uns einen Überblick über Nachfragen geben ($n = 10$). Für Gruppen (1) und (2) wurden Experteninterviews durchgeführt¹². Als Experten haben wir Personen mit weitreichendem Wissen, Engagement oder Beruf innerhalb bestimmten kulturellen ÖSL Kategorien definiert. Gruppe (3) besteht aus „normalen“ Nutzerinnen und Nutzern ($n = 22$). Für diese Gruppen wurden problemzentrierte Interviews durchgeführt^{12,13}. Insgesamt wurden 41 Interviews von Mai bis Dezember 2013 von der Erstautorin durchgeführt: 19 Experten Interviews und 22 problemzentrierte Interviews. Die Durchschnittslänge der Interviews betrug 46 Minuten.

Experten wurden *ex ante* durch extensive Recherche zu kulturellen ÖSL und Berlins grüner Infrastruktur ausgewählt. EinwohnerInnen Berlins wurden erst am „Langen Tag der StadtNatur 2013“ an verschiedenen Flächen angesprochen. Nach einer ersten Analyse der Gespräche wurde anhand von Snowball Sampling nach Personen mit kontrastierenden Meinungen gesucht, z.B. durch verschiedene Nutzergruppen oder sozio-demografische Faktoren. So konnten der Zugang zu weiteren Gesprächspartnern geöffnet werden, während Personen gleichzeitig bezüglich möglicher Meinungsunterschiede ausgesucht werden konnten. Solche kontrastierende Stichproben wurden bei allen Befragungsgruppen durchgeführt. Vor allem bei den problemzentrierten Interviews wurde auf eine Balance bezüglich Geschlecht, Alter und Bildungsstatus geachtet sowie für einen gewissen Unterschied im Wohnbezirk gesorgt.

Für die qualitativen Interviews wurden semi-strukturierte Interviewleitfäden benutzt. Diese Leitfäden wurden durch intensive Literaturstudien bezüglich der kulturellen ÖSL und der Angebotssituation von Grünflächen in Berlin konstruiert. Struktur und Wörtlichkeiten der Interviewleitfäden wurden außerdem durch zwei Fokusgruppen mit Laien und Experten im Bereich der qualitativen sozialwissenschaftlichen Forschung verbessert. Zusätzlich wurden 4

Prätestinterviews durchgeführt. Die Leitfäden beinhalteten unter anderem Fragen zu lokalen Präferenzen für Grün- und Wasserflächen in Berlin und welche Elemente der Berliner Umwelt für welche Zwecke genutzt werden.

Die qualitativen Interviews wurden mit dem Programm F4 (Version 2013, Dr. Dresing 6 Pehl GmbH, Marburg, Deutschland) wörtlich transkribiert. Wir benutzten eine zusammenfassende, induktive Inhaltsanalyse, basierend auf Mayring¹⁴. Satzteile oder Wörter wurden als Codes markiert und nach und nach zu hierarchisch höheren Ordnungen zusammengefasst. Benutztes Programm war MAXQDA 11 (VERBI GmbH Berlin, Deutschland). Diese Inhaltsanalyse resultierte in 2506 Codes. Nach der dritten Zusammenfassungsstufe erhielten wir 17 Kategorien, die dann mit den originalen Kategorien kultureller ÖSL des Millennium Ecosystem Assessment⁸ verglichen wurden. Anhand diesem Vergleich mit diesem Konzept, konnten wir unsere 17 Kategorien nochmals zu 11 Kategorien zusammenfassen.

Quantitative Studie

Datenerhebung

Die quantitativen Daten wurden via face-to-face Interviews in vier Ortsteilen Berlins erhoben. Erhebungsmethode war eine proportionale geschichtete Zufallsstichprobe. Um einen urbanen–periurbanen Gradienten zu beproben, wurden die Ortsteile Berlins nach Populationsdichte stratifiziert. Aus diesen Straten wurden dann per Zufallsauswahl vier Ortsteile ausgewählt (siehe Abb. 1):

- (1) Berlin Mitte: Bezirk Mitte, 7.850 Einwohner/km², $n = 219$ (39.2% der gesamten Befragten);
- (2) Altglienicke: Bezirk Treptow- Köpenick, 3.422 Einwohner/km², $n = 128$ (22.9%);
- (3) Mahlsdorf: Bezirk Marzahn-Hellersdorf, 2.095 Einwohner/km², $n = 124$ (22.2%) und
- (4) Heiligensee: Bezirk Reinickendorf, 1.665 Einwohner/km², $n = 87$ (15.6%)¹⁵.

Da Berlin bezüglich der Populationsdichte sehr unterschiedlich konstituiert ist, ist unser urbaner–periurbaner Gradient nicht linear von Stadtmitte zu Stadtrand. Wir gehen somit auf die konstitutionellen Besonderheiten der Struktur der Populationsdichte Berlins ein.

Innerhalb dieser Ortsteile wurden zufällig Straßen ausgewählt und innerhalb der Straßen nach einem zufälligen Muster Häuser, beziehungsweise Wohnungen, ausgesucht. Erhoben wurde

zu verschiedenen Zeiten des Tages sowie an unterschiedlichen Wochentagen und am Wochenende. Wenn Bewohner ausgewählter Wohnungen/ Gebäude nicht angetroffen wurden, sind wir die Adressen maximal zweimal angelaufen und haben sie danach als Abbrecher notiert. Um die Abbrecherquote gering zu halten, wurde keine Zufallsstichprobe zur Auswahl der Befragten innerhalb der Wohnungen durchgeführt (z.B. Schwedenschlüssel etc.). Dieser Kompromiss bezüglich der Repräsentativität versus Abbrecherquote wurde eingegangen.

Erhoben wurde in zwei Runden im Spätherbst 2013 (November bis Dezember) und im Spätfrühling/ Anfang Sommer 2014 (April bis Juni). Wir haben hypothesiert, dass je nach Jahreszeit die Wahrnehmungen und Angaben zum generellen Verhalten bezüglich Grünflächenbenutzung unterscheiden. Mit zwei Erhebungsrunden erhofften wir uns die unterschiedlichen Wahrnehmungen der Berliner Bevölkerung mit nur geringer Verzerrung durch saisonale Unterschiede wiederzugeben.

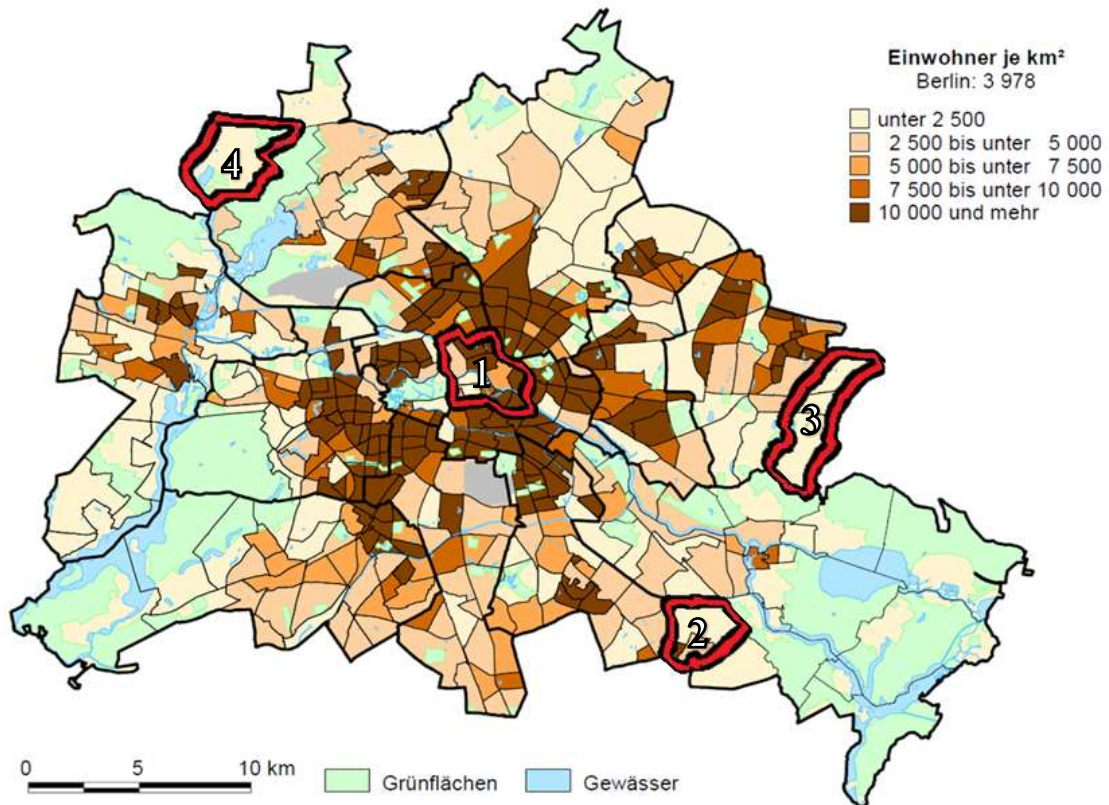
Der Fragebogen wurde auf Grundlage der qualitativen Studie sowie extensiver Literaturstudien entwickelt. So konnte auf die lokalen Besonderheiten und Verständnisse von kulturellen ÖSL eingegangen werden. Zusätzlich wurden zwei Fokusgruppen mit Laien durchgeführt, um die Struktur und Formulierung des Fragebogens zu verbessern sowie eine Pilotstudie mit $n = 65$ durchgeführt. Der Fragebogen beinhaltet Teile zum Besuchsverhalten bezüglich verschiedenen Grünflächen, zur Einstellung und Wichtigkeit von kulturellen ÖSL und Naturschutz sowie sozio-demografische Angaben.

Erhoben wurden die Daten von drei Personen mit Kenntnis sozialwissenschaftlicher Erhebungsmethoden und unter Beaufsichtigung von Experten der Universität Göttingen.

Population der Stichprobe war die gesamte Bevölkerung Berlins über 16 Jahren, der Stichprobenumfang betrug 558 Befragte (Runde 1: $n = 249$, Runde 2: $n = 309$), mit einer Antwortquote von ~48%.

Die angenäherte Zufallsauswahl, die hohe Zahl der Befragten, die vergleichsweise hohe Antwortquote und die Verteilung der Befragung auf zwei saisonal kontrastierende Wellen sprechen für eine hohe Repräsentativität der Befragung. Die Stichprobe hat einen leicht vergrößerten Anteil gut-gebildeter BürgerInnen als der Berliner Durchschnitt. Dieses sollte in der Interpretation der Daten berücksichtigt werden.

Abb. 1 Durch geschichtete Zufallsauswahl ausgewählte Ortsteile: (1) Berlin Mitte, (2) Altglienicke, (3) Mahlsdorf, (4) Heiligensee



Quelle: Amt für Statistik Berlin-Brandenburg 2014¹⁶, angepasst

Für die deskriptive Analyse der quantitativen Daten wurden statistischen Kenndaten, wie dem Pearson's Chi-Quadrat Verteilung für Verbindungen zwischen nominalen (Cramer's V), Spearman's Rankkorrelationen (Spearman's Rho) für ordinal skalierte und der Pearson Produkt-Moment Korrelation (Pearson's r) für metrische Variablen ausgewertet (die erste Ziffer zeigt die Stärke der Korrelation an, die zweite Ziffer die Stärke der Signifikanz). Da es eine geringe Anzahl fehlender Werte gab, wurden diese paarweise aus den Analysen ausgeschlossen. Neben deskriptiver Auswertung wurde eine Faktorenanalyse (Hauptkomponentenanalyse) mit den ipsatierten kulturellen ÖSL angefertigt. Ipsatierte Wichtigkeiten entfernen die generell übergreifende Wichtigkeit, das heißt die allgemeine Zustimmung, und hebt Unterschiede deutlicher hervor. Die Faktorenanalyse reduzierte die Bewertung der kulturellen ÖSL zu zwei bipolaren Dimensionen. So werden individuelle Wahrnehmungen räumlich dargestellt¹⁷. Eine lineare Regression der ipsatierten Kategorien kultureller ÖSL auf Einwohnerdichte wurde durchgeführt.

Zuletzt haben wir eine agglomerative (hierarchische) Clusteranalyse nach der WARD-Methode und quadrierter euklidischer Distanz mit den ipsatierten Variablen der kulturellen

ÖSL durchgeführt. Nach einigem Abwägen und Profiling der Cluster, stellen wir hier die zwei kontrastreichsten Cluster dar. Quantitative Analysen wurden mit dem Programm SPSS 21 (IBM Deutschland GmbH, Ehningen, Deutschland) durchgeführt.

Resultate und Diskussion

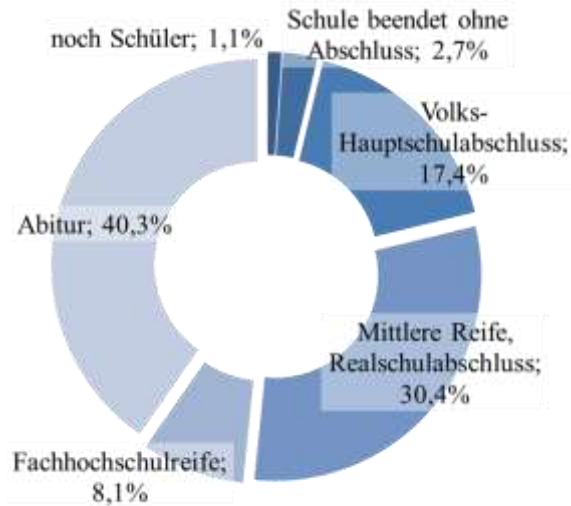
Sozialdemographie – Vorstellen der Stichprobe

Box 1 Sozialdemografie der Stichprobe

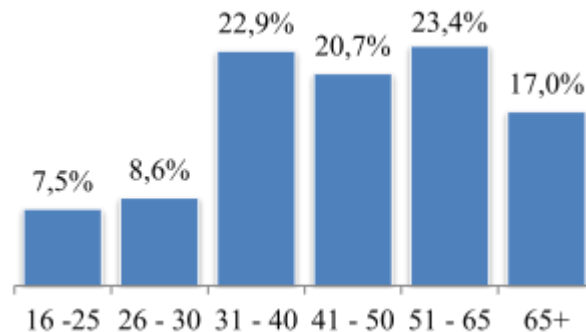
Geschlecht:



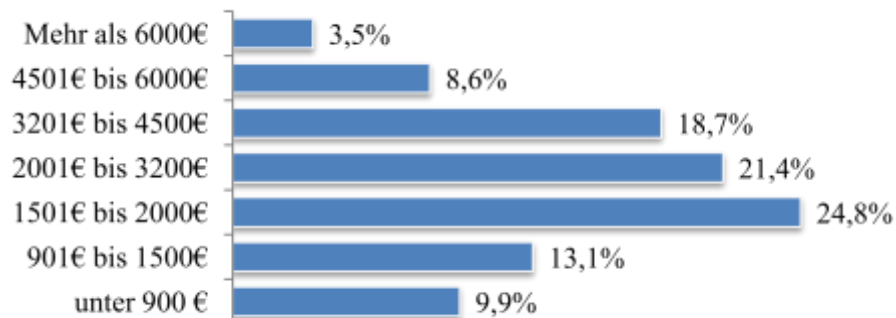
Schulbildung:



Altersgruppen:



Einkommensgruppen:



Box 1 gibt einen Überblick über die Befragten unserer Stichprobe bezüglich Geschlecht, Schulbildung, Altersgruppen sowie Einkommen. 90,3% der Befragten haben die deutsche Staatsbürgerschaft und insgesamt 18,1% gaben an einen Migrationshintergrund zu haben. Der älteste Teilnehmer wurde 1926 geboren, der jüngste 1998.

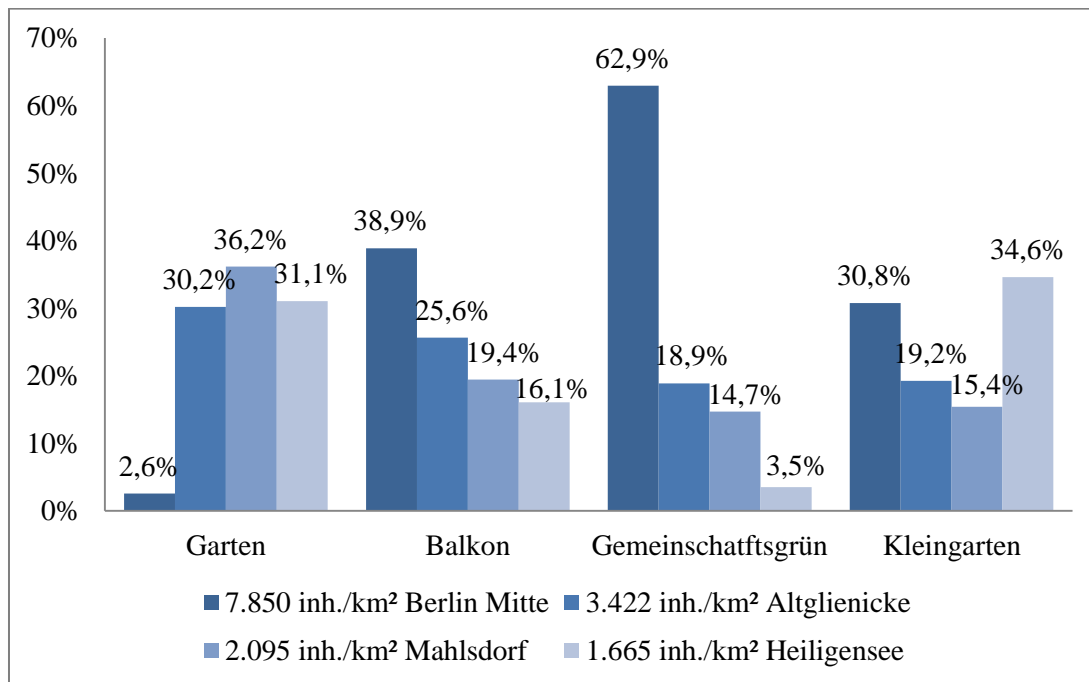
Im Folgenden gehen wir auf den urbanen–periurbanen Gradienten der Populationsdichte ein (Abb. 1). Höchste Populationsdichte besitzt Berlin Mitte, Heiligensee die niedrigsten Populationsdichte.

Zum einen existiert eine Korrelation des urbanen–periurbanen Gradienten mit der deutschen Staatsbürgerschaft (Cramer's V ,191; $p < .001$). Je höher die Populationsdichte, desto höher die Anzahl der Personen mit Migrationshintergrund. Ebenfalls ist der urbane–periurbane Gradient positiv mit Einkommen und Alter korreliert (Spearman Rho -,281; $p < .001$; Pearson's r -,240; $p < .001$). Das heißt je niedriger die Populationsdichte, je höher das Einkommen und das Alter.

Um einschätzen zu können, wie die Versorgungslage und Nachfrage nach öffentlichen Grünflächen ist, haben wir das Vorkommen von Garten, Balkon, Gemeinschaftsgrün und Kleingarten in der Bevölkerung erhoben. Abb. 2 zeigt die prozentuale Verteilung nach urbanen–periurbanen Gradienten: Sprich 2,6% der Gartenbesitzer leben in Gradient 1. Die Proportion der Balkonbesitzer nimmt mit Populationsdichte zu.

Gärten (Cramer's V ,664; $p < .001$) kommen häufiger in den periurbanen Gebieten vor, Gemeinschaftsgrün (Cramer's V ,306; $p < .001$) eher im dichter besiedelten Bereichen.

Abb. 2 Garten, Balkon, Gemeinschaftsgrün und Kleingarten vorkommen (%) nach urbanen–periurbanen Gradient.



Besuchsverhalten zum Stadtgrün in Berlin

In diesem Abschnitt gehen wir auf die Nutzung des öffentlichen Berliner Stadtgrüns ein. Dieses beinhaltet (1) Parks und offenen Grünflächen, (2) Wälder und waldähnliche Gebiete, (3) Wasserflächen, (4) vier offizielle Naherholungsgebieten, (5) das Brandenburger Umland, (6) naturnahe Friedhöfe und (7) naturnahe Spielplätze.

Wir haben die StudienteilnehmerInnen gefragt, wie erreichbar sie die Grün- und Wasserflächen in Berlin finden. Abb. 3 zeigt die Antworten in Prozent nach urbanen–periurbanen Gradient. Im Gesamten findet fast 71% der Bevölkerung Berlins die Erreichbarkeit der Grünflächen entweder sehr gut oder eher gut (Cramer's V ,116, $p < ,001$). Befragte in Altglienicke empfinden das Stadtgrün als am wenigsten gut erreichbar.

Die zurückgelegte Strecke der Bevölkerung hat keinen Unterschied zwischen verschiedener Populationsdichte. 37% der Bevölkerung besucht im Durchschnitt Flächen in einem Radius von bis zu einem Kilometer, 77% der Bevölkerung legt im Durchschnitt keine längere Strecke als 5 Kilometer zurück (Abb. 4).

Abb. 3 Empfundene Erreichbarkeit zu öffentlichen Grünflächen in Berlin (%)

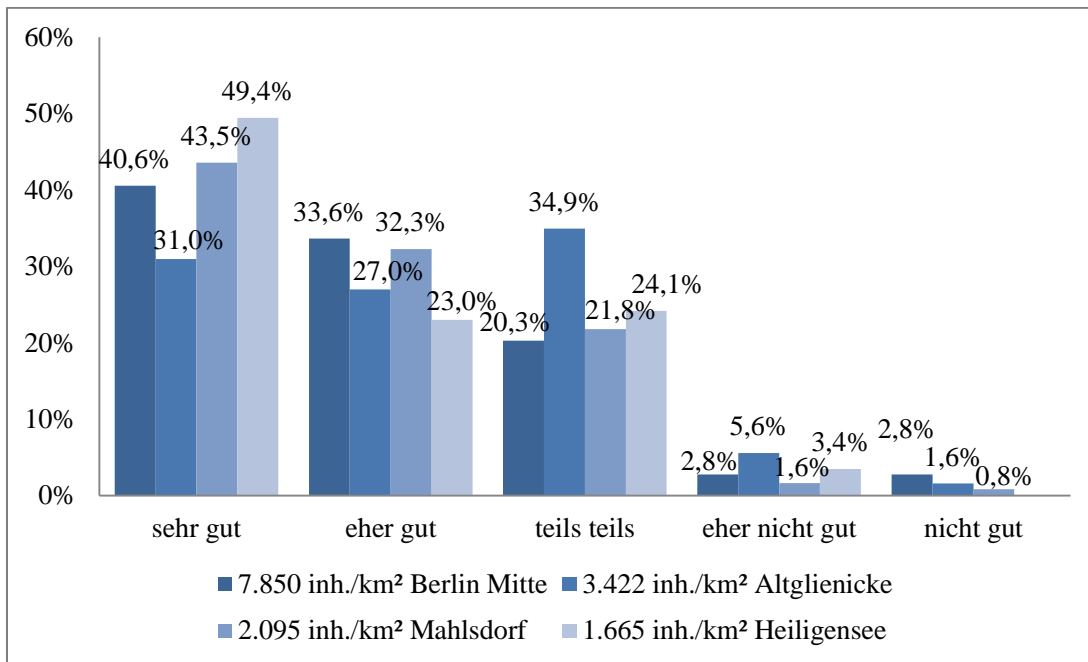
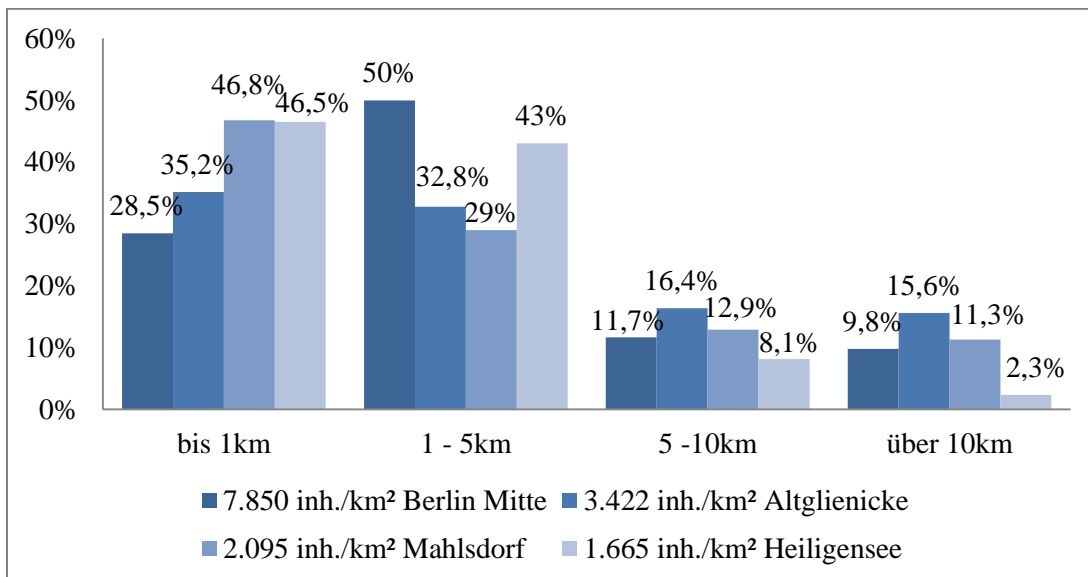
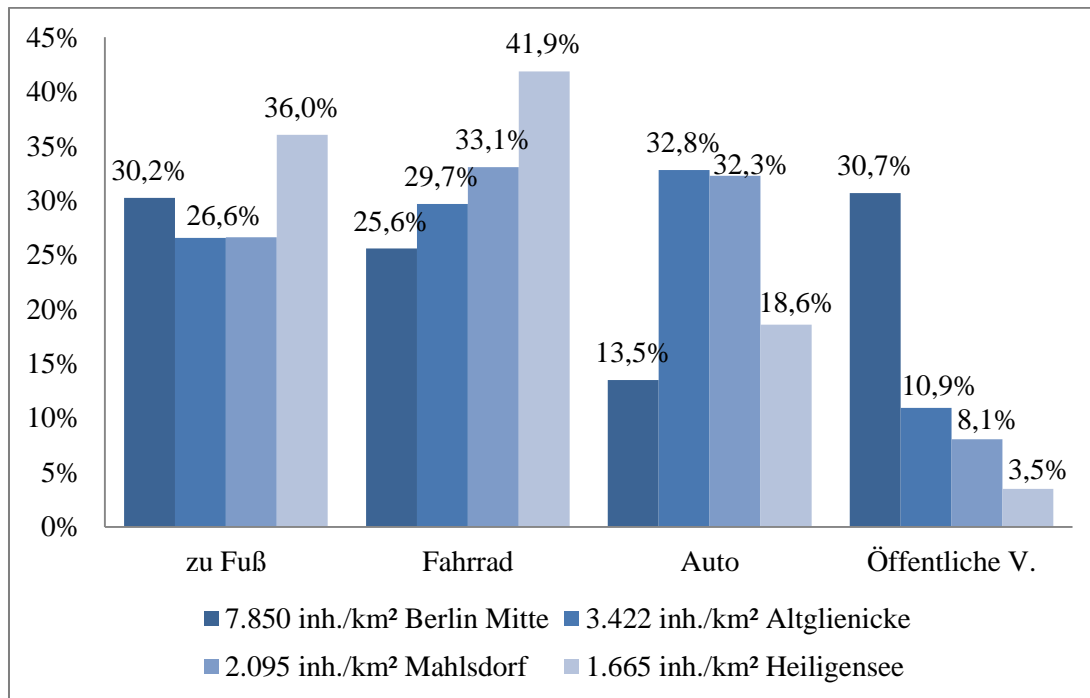


Abb. 4 Durchschnittlich zurückgelegte Strecke zur öffentlichen Grünfläche in Berlin (%)



Die Verkehrsmittelwahl ist beeinflusst durch den urbanen-periurbanen Gradienten (Cramer's V , .204; $p < .001$), wie Abb. 5 zeigt.

Abb. 5 Verkehrsmittelwahl zum Erreichen der öffentlichen Grünflächen in Berlin (%)

Bezüglich der Besuchshäufigkeiten von Stadtgrün haben wir erfasst, welche Grün- und Wasserflächen wie häufig benutzt werden. Parks und offene Grünflächen haben die höchste Besuchsfrequenz, gefolgt von Wasserflächen (Abb. 6). Die Populationsdichte hat einen Einfluss auf die Besuchshäufigkeit von Parks und offenen Grünflächen (Spearman Rho ,322; $p < ,001$, zunehmend mit höherer Populationsdichte) und die Häufigkeit von Wald- und Seebesuchen (abnehmend mit mit höherer Populationsdichte, Spearman Rho -,205; $p < ,001$ und ,127, $p = ,003$). Die Häufigkeit von Umlandsbesuchen ist ebenfalls abfallend mit dem urbanen–periurbanen Gradienten (Rho -,144, $p > ,001$)

Zusätzlich wurde die Länge des Aufenthalts auf den jeweiligen Flächen erfasst (Abb. 7). Es ist klar zu sehen, dass die Länge der Besuche im Brandenburger Umland, den Naherholungsgebieten, Seen und Wäldern am höchsten ist. Populationsdichte hat auf die Länge der Wald- und Seebesuche einen Einfluss, indem die Länge der Waldbesuche mit Stadtnähe zunimmt (Rho ,206; $p < ,001$; Rho ,171; $p > ,001$). Ebenso ist die Länge der Umlandsaufenthalte abfallend mit steigender Populationsdichte (Rho -,112; $p = ,029$).

Abb. 6 Durchschnittliche Besuchshäufigkeit zu städtischen Grünflächen in Berlin (%)

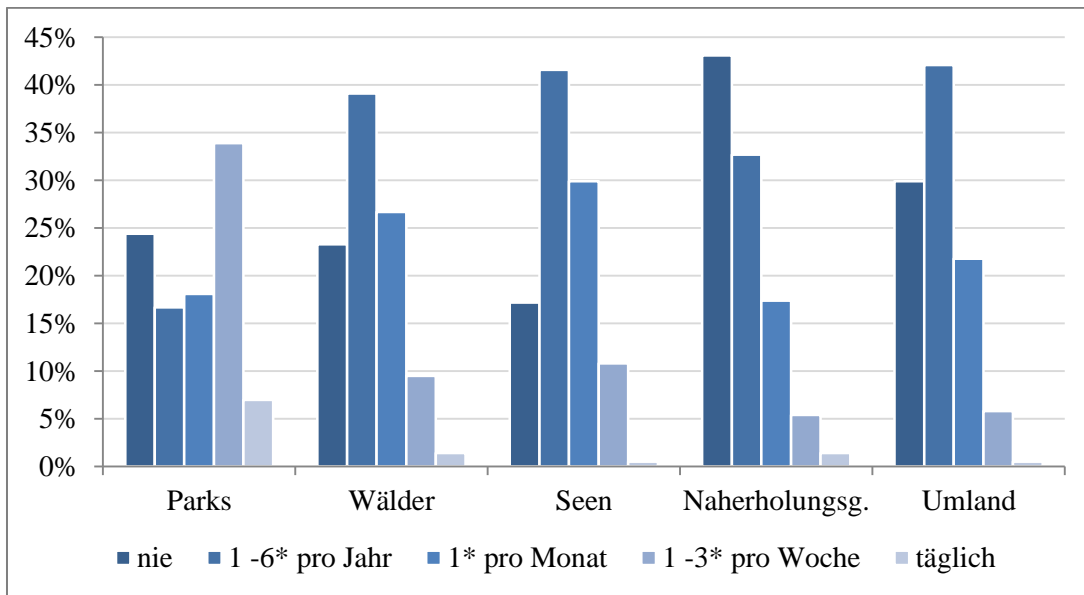
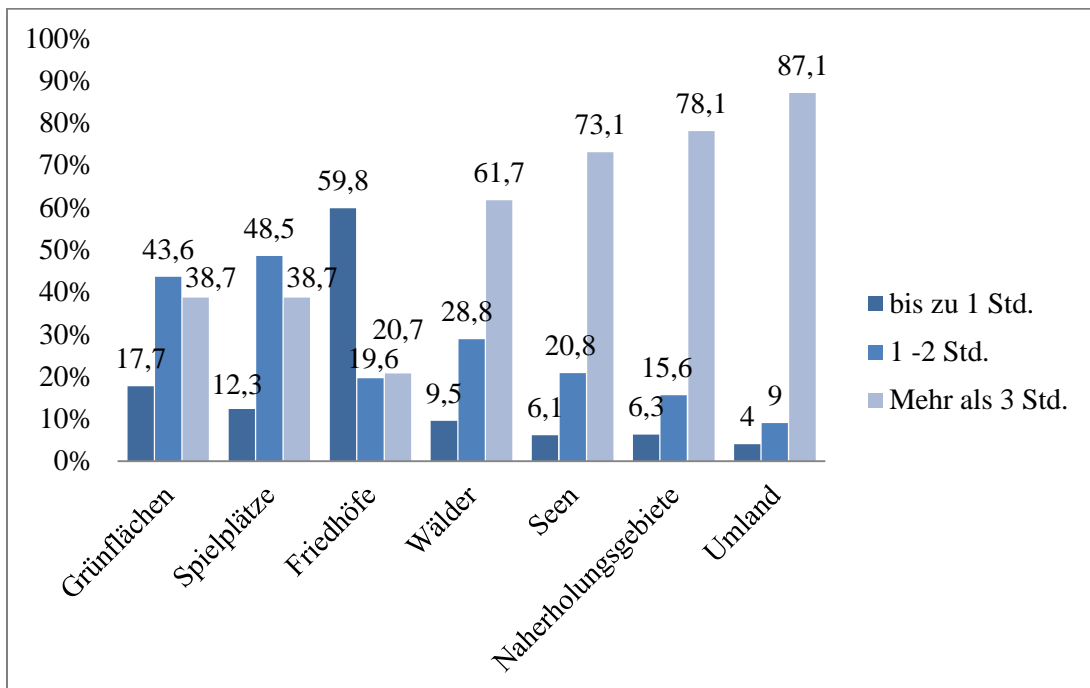


Abb. 7 Durchschnittliche Aufenthaltsdauer in städtischen Grünflächen in Berlin (%)



Unsere Analyse mit den soziodemografischen Daten ergibt, dass Bildung mit der Besuchshäufigkeit von fast allen Flächen positiv korreliert (Spearman Rho: Grünflächen ,209; $p < ,001$; Wald ,176; $p < ,001$; See ,266; $p < ,001$; Naherholung ,264; $p < ,001$; Umland ,248; $p < ,001$). Nur mit dem Besuch von Spielplätzen ist Schulbildung negativ korreliert (Rho -

,317; $p < ,001$). Einkommen ist lediglich schwach positiv korreliert mit der Häufigkeit von Besuchen im Berliner Umland (Rho ,196; $p < ,001$). Migrationshintergrund hat keinen Einfluss auf die Besuchshäufigkeit.

Kulturelle Ökosystemleistungen

Um die Hintergründe für den Nutzen und die Wichtigkeit verschiedener Aspekte der Einstellung zu den Ansprüchen an Grünflächen aufzuzeigen, haben wir das Konzept der kulturellen Ökosystemleistungen benutzt⁸. Kulturelle ÖSL sind Vorteile beziehungsweise Nutzenstiftungen, die von dem Berliner Stadtgrün zu Gunsten der AnwohnerInnen bereitgestellt werden⁸. Um die heuristische Einteilung der MEA mit genügend kultureller Sensitivität auf den Berliner Kontext zu beziehen, wurde anhand unserer qualitativen Studie das Verständnis dieser kulturellen Vorteile vom Stadtgrün erfasst. Dadurch entstanden 17 induktive, das heißt aus den Texten direkt gewonnene Kategorien (hier kursiv dargestellt). Diese 17 Kategorien wurden mit den offiziellen Kategorien kultureller ÖSL des MEA verglichen und daraufhin nochmals zu 11 Oberkategorien (hier mit dicker Schrift) zusammengefasst.

Die Ergebnisse unserer qualitativen Studie 2013 hat folgende Spezifikationen ergeben:

1. Werte für Erholung
 - a) *Natur als Erholungsraum*

Diese Kategorie beinhaltet Erholung, das heißt die Möglichkeiten für entspannende Tätigkeiten oder zu Sport in der Natur. Zusätzlich werden Werte für Erholung oft als Gegensatz zur Stadt genannt. Natur wird von den Befragten als Kontrast zur räumlichen und visuellen Beschränktheit, zur Enge der Gebäude und zum Stadtlärm aufgefasst. Natur gibt den BesucherInnen ein Gefühl der Ruhe und der Freiheit. Stadtplaner erkennen diese Funktionen und die Anforderung solche Grünflächen bereitzustellen.

- b) *Besuch von Naherholungsgebieten*

Codes, die Besuche zu Naherholungsgebieten beinhalten, wurden unter dieser Kategorie zusammengefasst.

2. Werte der Naturerfahrung

a) *Natur bewusst erleben*

Eine bewusste Erfahrung der natürlichen Umwelt mit allen fünf Sinnen spielte eine wichtige Rolle für die Befragten. Dieser sinnbasierte Ansatz zur Natur steht in Kontrast zum reinen Bildungsaspekt, da er sich ausschließlich mit der Wahrnehmung und den Erfahrungen beschäftigt. Gesprächspartner sagten, dass ohne den Kontakt zur Natur kein Bewusstsein für die Umwelt, Naturschutz oder Nachhaltigkeit entstehen kann.

b) *Naturentfremdung*

Diese Kategorie beinhaltet Aussagen zu persönlicher oder genereller Naturentfremdung in der Stadt – und ihr Gegensatz, wie man Personen, vor allem Kinder, wieder an die Natur heranführen kann.

3. Werte der Ästhetik

Schönheit in der Natur

Dieser Bereich enthält Wertzusprechungen auf Grund von Schönheit. Die Interviewten sagten aus, dass Schönheit oft von Vielfalt in der Landschaft, von Flüssen oder Seen oder einem breiten Panorama entsteht. Für die Gesprächspartner waren ästhetische Gefühle meist verbunden mit Flächen die natürlich erscheinen und wenig Einfluss von menschlicher Konstruktion oder Pflege haben.

4. Werte für Heimatgefühl

a) *Natur selbstgestalten oder aneignen*

Dieser Bereich umschließt Aussagen zur kreativen Gestaltung oder Aneignung von Stadtgrün, speziell mit Bezug auf den Trend des Urban Gardening. Die Interviewten hoben hervor, dass sie sich mehr mit ihrer Umwelt identifizieren, sofern sie aktiv ihre Umwelt oder öffentliche Grünanlagen gestalten können. So könne ein Gefühl der Zugehörigkeit und Heimat entstehen. Dieser Effekt wird aktiv in der Stadtplanung genutzt um BürgerInnen mit einzubeziehen und ein Gefühl von Gemeinschaft zu entwickeln.

b) Heimatgefühl durch Identifizierung mit Natur

Diese Kategorie bezieht sich auf die Einflüsse der natürlichen Umwelt auf Gefühle von Heimat und Zugehörigkeit im generellen. Aussagen bezüglich Erinnerungen an Natur, die zum heutigen Heimatgefühl beitragen, sowie Aussagen, dass ein bestimmter Wohnort wegen der Umwelt ausgesucht wurde, fallen in diese Kategorie.

5. Werte für soziale Beziehungen

Natur als Ort der Begegnung/ Kommunikation

Diese Kategorie beinhaltet die Ansichten von Natur als Platz für soziale Interaktionen, um die Isolation in der Stadt zu überkommen und soziale Beziehungen zu stärken. Offene Flächen werden hier als Ruhe- oder Treffpunkt, für Feiern oder als Wohnraum und Küche benutzt. Für Personen ohne eigenen Garten oder Balkon sind Grünflächen wichtige Möglichkeiten, um außerhalb der eigenen vier Wände sozial zu interagieren.

6. Werte für Bildung

Bildung über Natur

Dieser Bereich adressiert den Bildungsnutzen von Natur für die Öffentlichkeit, besonders für Kinder. Diese Kategorie beinhaltet Codes zur formellen und informellen Bildung und Aspekte vom gegenseitigen Lernen über Natur.

7. Spirituelle und religiöse Werte

a) Spirituelles und Religiöses

Diese Kategorie beinhaltet die Einstellung, dass die Natur ein Teil der "Kreation Gottes" ist, oder einen Raum für Kontemplation und Meditation darstellt.

b) Naturliebe

Tiefverwurzelte Gefühle der Naturliebe im Dasein "majestätischer Natur" wurden in diese Kategorie kodiert, sofern sie keinen direkten spirituellen oder religiösen Zusatz hatten.

8. Werte für kulturelle Vielfalt

a) Nutzerspezifische Bedürfnisse an die Natur

Viele der Interviewten unterstrichen, dass sich die Anforderungen und Bedürfnisse an öffentliche Grünflächen zwischen sozialen Gruppen unterscheiden.

b) Sozialgerechte Planung von Natur

Basierend auf der Annahme, dass sich die Anforderungen und Bedürfnisse zwischen Gruppen unterscheiden, hoben die Experten den sozialen Aspekt im Grünflächenmanagement hervor. Sie sagten aus, dass unterschiedliche Gruppen verschiedene Möglichkeiten und Voraussetzungen an Stadtgrün haben, auf die eingegangen werden sollte.

9. Werte für kulturelles Erbe

Wichtige/ typische Kulturlandschaft

Diese Kategorie beinhaltet die Wertschätzung von Kulturlandschaften so wie Agrarland im Außenbereich von Berlin, oder historische Parks und Gärten. Sofern ein direkter Bezug zur Natur bestand, wurden Aussagen zu historischen Plätzen und deren Erhaltung in diese Kategorie kodiert.

10. Werte für soziale und motorische Entwicklung

Soziale und motorische Entwicklung von Kindern

Dieser Bereich richtet sich an soziale und motorische Entwicklung von Kindern, die durch "arbeiten" und zusammen in der Natur spielen, entsteht. Diese Aspekte wurden meist im Zusammenhang mit der Freiheit von Einschränkungen genannt – als Kontrast zu stark regulierten und sehr künstlichen Spielplätzen innerhalb Berlins.

11. Werte für Inspiration

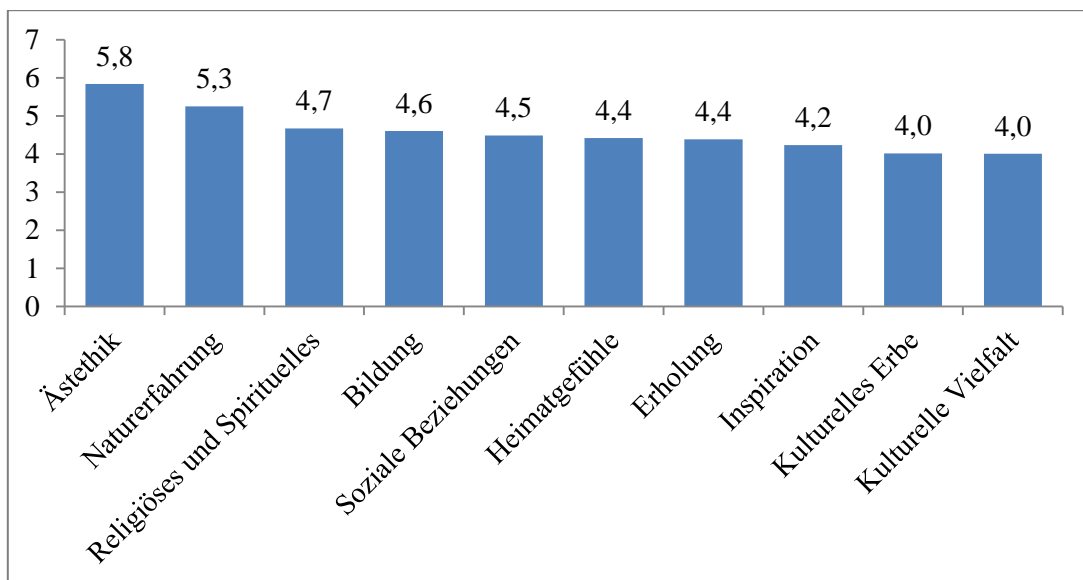
Natur und Inspiration

Dieser Bereich beinhaltet künstlerische Aspekte, wie die Inspiration in der Natur für Kunst, oder Kunst mit Naturprodukten. Außerdem beinhaltet sie Aspekte des Reinigens und Ordners von Gedanken, während man sich in der Natur aufhält.

Auf Grundlage dieser qualitativen Arbeiten wurde der quantitative Fragebogen konstruiert, um die Wichtigkeit von verschiedenen Variablen kultureller ÖSL abfragen zu können. Abb. 8 ist ein Ergebnis verschiedener Fragebogenteile. Generell ist zu sehen, dass die Wertschätzung aller 10 Kategorien als eher hoch angesehen werden kann. Daher wurden die Daten für folgende statistische Berechnungen ipsatiert, das heißt die allgemeine Zustimmung abgerechnet.

Wichtigste Vorteile und Nutzen des Stadtgrüns Berlins ist nach gemittelter Auskunft der Befragten der ästhetische, folgend von der direkter, sinnlichen Naturerfahrung sowie religiösen und spirituellen Werten.

Abb. 8 Wichtigkeit von kulturellen Ökosystemleistungen in Berlin. Skala von 1 (niedrigste) bis 7 (höchste)

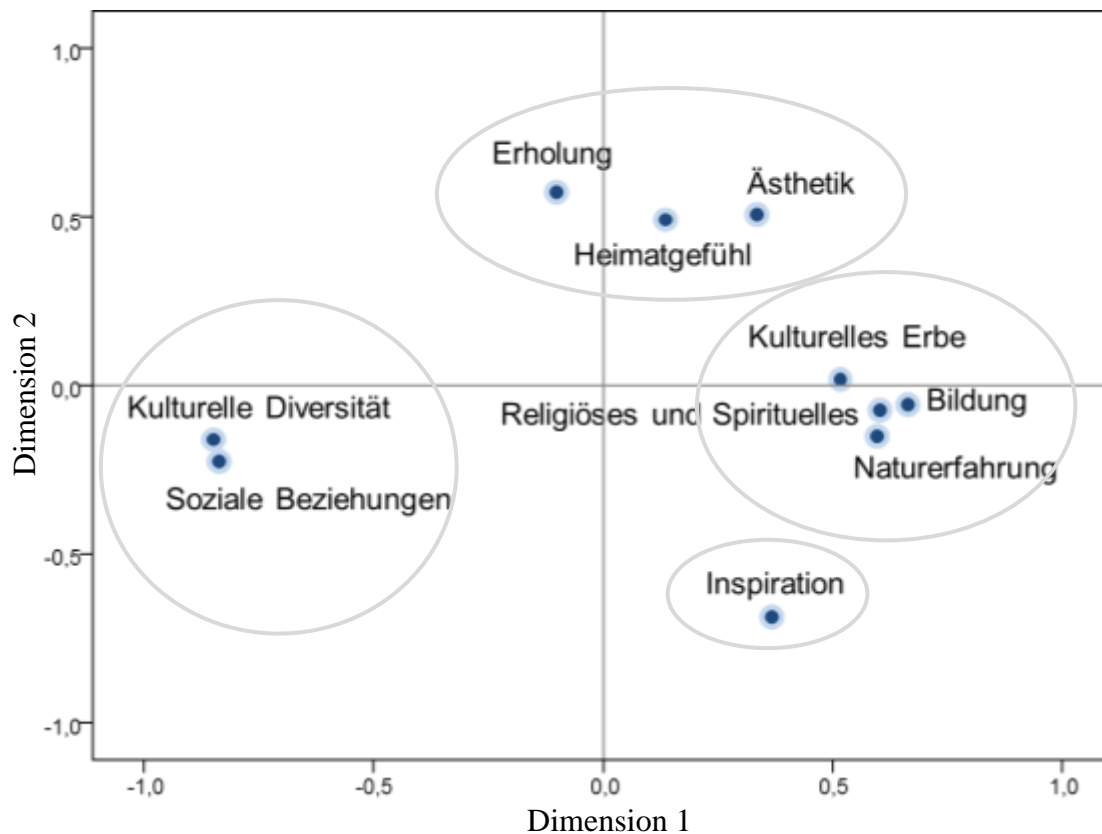


Um die Verbindungen der einzelnen Kategorien der kulturellen ÖSL untereinander aufzuzeigen, haben wir eine Faktorenanalyse durchgeführt. Diese Hauptkomponentenanalyse fasst die Bewertung der kulturellen ÖSL zu zwei bipolaren Dimensionen zusammen und stellt die individuellen Wahrnehmungen der Befragten räumlich dar. Variablen, die an zwei unterschiedlichen Enden einer Achse liegen, werden als Gegenpole wahrgenommen.

Die Faktorenanalyse zeigt vier Gruppen von kulturellen ÖSL, die wir in Abbildung 9 umkreist haben: (1) Kulturelle Diversität und soziale Beziehungen als soziale Leistungen wird von den Befragten als ähnlich angesehen. Diese Gruppe könnte man als „Soziale Interaktionen“

bezeichnen. (2) Erholung, Ästhetik und Heimatgefühl bilden eine weitere Gruppierung. (3) Die Kategorien des kulturellen Erbes, der religiösen und spirituellen Werte sowie Bildung und Naturerfahrung bilden die dritte Gruppe. (4) Inspiration steht alleine. Für spätere quantitative Erhebungen, bei denen der zeitliche Aufwand begrenzt ist, könnte also auf diese Einteilung zurückgegriffen werden, anstatt alle 10 Kategorien zu erheben.

Abb. 9 Faktorenanalyse mit 10 Kategorien kulturellen Ökosystemleistungen. Mögliche Gruppen manuell umkreist



Betrachtet man die horizontale Achse, erkennt man eine Unterscheidung zwischen den Werten für kulturelle Diversität und sozialen Beziehungen, und den anderen Variablen (wobei Erholung als eher mittig dazu angesehen werden kann). Öffentliches Stadtgrün kann also auf der einen Seite primär als Möglichkeit der sozialen Interaktion, als Treffpunkt und Lebensraum wertgeschätzt werden. Auf der anderen Seite wird es auf Grund der Naturerlebnisse wertgeschätzt. Diese Zweiteilung könnte auf Nutzer spezifische Konflikte hindeuten – da sich diese Nutzungsmöglichkeiten möglicherweise gegenseitig ausschließen.

Um diese Hypothese zu testen, führten wir eine hierarchische Clusteranalyse durch. Diese Methode gruppiert die Befragten anhand ihres Antwortverhaltens. Variablen für die Clusteranalyse waren die ipsatierten Wichtigkeiten der kulturellen ÖSL. Einfachheitshalber stellen wir hier die zwei kontrastreichsten Cluster dar. Vergleicht man den Mittelwert der kulturellen ÖSL Variablen zwischen den beiden Gruppen, sieht man, dass Cluster 1 eher homogene Werte hat, allerdings mit einer leichten Präferenz für Werte die wir als soziale Interaktionen bezeichnet haben. Cluster 2 zeigt hingegen deutlichere Unterschiede (Tabelle 1). Besonders werden die Werte der sozialen Beziehung und kulturellen Diversität geringer geachtet, als das in Cluster 1 der Fall ist.

Table 1 Mittelwerte, Unterschiede in den Clustern, Eta Koeffizienten, F-Werte und Signifikanzen

| Kulturelle ÖSL | Gruppe 1 | Differenz | Gruppe 2 | Eta | F-Wert | p-Wert |
|--------------------------|---------------------------|-----------|---------------------------|------|---------|--------|
| Religiöses/ Spirituelles | 4.2 | + 1.4 | 5.6 | .421 | 119.465 | < .001 |
| Kulturelles Erbe | 3.6 | + 1.3 | 4.9 | .360 | 82.933 | < .001 |
| Bildung | 4.2 | + 1.2 | 5.4 | .423 | 121.209 | < .001 |
| Naturerfahrung | 4.9 | + 1.1 | 6.0 | .355 | 79.790 | < .000 |
| Heimatgefühl | 4.1 | + 0.9 | 5.0 | .273 | 44.611 | < .001 |
| Inspiration | 4.0 | + 0.8 | 4.8 | .260 | 39.970 | < .001 |
| Erholung | 4.2 | - 0.5 | 3.7 | .210 | 25.744 | < .001 |
| Ästhetik | 5.6 | - 0.9 | 6.3 | .275 | 45.419 | < .001 |
| Kulturelle Vielfalt | 4.4 | - 1.3 | 3.1 | .372 | 89.163 | < .001 |
| Soziale Beziehungen | 5.1 | - 1.9 | 3.2 | .502 | 187.092 | < .001 |
| Verteilung | <i>n</i> = 419 (75.6%) | | <i>n</i> = 135 (24.4%) | | | |

Cluster werden hier in Relation zueinander dargestellt und nicht in absoluten Werten. Wenn man die zwei Cluster mit sozialdemografischen Variablen korreliert, ergibt sich folgendes Bild (siehe auch Tabelle 2):

Cluster 1 beinhaltet jüngere, mehr im urbanen Ballungsraum lebende Personen, die kulturelle ÖSL eher homogen bewerten. Diese Gruppe lebt noch nicht ganz so lange in Berlin, besucht Grünflächen weniger oft und findet sie auch weniger gut zugänglich wie die des zweiten Clusters. Cluster 2 ist demnach ein Zusammenschluss von eher älteren Personen, in weniger Dichten Gebieten, die schon länger in Berlin leben, oft Grünflächen benutzen und diese auch gut zugänglich finden. Schulbildung und Einkommen haben keinen Effekt auf die Cluster. Bei Schulbildung könnte der höhere Anteil der gut gebildeten Befragten eine Rolle gespielt haben.

Die Ergebnisse der Faktorenanalyse werden durch die Clusteranalyse also unterstützt. Es gibt eine Zweiteilung zwischen verschiedenen sozialen Gruppen, die auf mögliche Konflikte hinweist: Den jüngeren in dicht besiedelten Gebieten und den älteren in periurbanen Räumen lebenden. Die geringere Besuchsfrequenz und das Gefühl, das öffentliche Stadtgrün sei nicht ganz so gut erreichbar – im Vergleich mit Cluster 2 – könnte darauf hinweisen, dass es mehr Angeboten für Stadtgrün in Gebieten mit höherer Population geben sollte. Parks sind in Berlin oft überlaufen und werden, so unsere Gesprächspartner in den qualitativen Interviews, auch nicht als „richtige“ Natur wahrgenommen. Flecken, die eher der Vorstellung von Natur entsprechen, wie ruhige waldähnliche Gebiete und Wasserflächen, sind eher mit höherem Aufwand zu erreichen. Was vor allem für Feierabend oder Erholung in der Woche eine Barriere bedeutet.

Table 2 Korrelation mit soziodemografischen Variablen und zwei Clustergruppen, Eta Koeffizienten, F-Werte und Signifikanzen

| Gruppe 1 | Gruppe 2 | Eta | F-Wert | p-Wert |
|--|---|------|--------|--------|
| Jünger (42.56, SD 15.0) | Älter (54.91, SD 17.2) | .344 | 73.098 | < .001 |
| Kürzere Wohnlänge in Berlin | Längere Wohnlänge in Berlin | .312 | 32.961 | < .001 |
| Geringere Besuchsfrequenz | Höhere Besuchsfrequenz | .150 | 12.767 | < .001 |
| Höhere Einwohnerdichte | Niedrigere Einwohnerdichte | .135 | 10.261 | = .001 |
| Stadtgrün als weniger gut erreichbar angesehen | Stadtgrün als besser erreichbar angesehen | .112 | 7.028 | = .008 |

Naturschutz und Naturbelassenheit

Zusätzlich haben wir die Einstellung zu verschiedenen Naturschutzgründen erfasst, jedoch ohne Bezug zum Berliner Stadtgrün. Gefragt wurde wörtlich: „Wie wichtig ist Ihnen der Schutz der Natur für...“. Diese Naturschutzgründe basieren auf verschiedenen Werten/theoretischen Grundlagen, die in Klammern angegeben werden. So können verschiedene Grundeinstellungen zu unterschiedlichen Argumentationen für Naturschutz untersucht werden. Auch hier geht die Skala von 1, geringste Wichtigkeit, zu 7 höchste Priorität. Durch

Effekte wie der sozialen Erwünschtheit ist die Angabe der Wichtigkeit für Naturschutzgründen nach oben verzerrt. Die Unterschiede der einzelnen Gründe sollte deswegen größere Beachtung geschenkt werden.

Als wichtigste Begründung für den Naturschutz ist die Argumentation der Erhaltung der Natur für zukünftige Generationen. Der Existenzwert der tierischen und pflanzlichen Arten wird als zweit-wichtigst erachtet. Geringste Werte beziehen sich auf den Schutz der Natur als Rohstoffquelle der Industrie und Wirtschaft sowie auf den Schutz der Natur für einen späteren, noch unbekanntem Nutzen für die Menschheit. Diese beiden Argumentationslinien sind anthropozentrisch, instrumentell geprägt.

Abb. 10 Wichtigkeit von Naturschutzgründen (Wie wichtig ist Ihnen der Naturschutz für...). Skala von 1 (niedrigste) bis 7 (höchste)

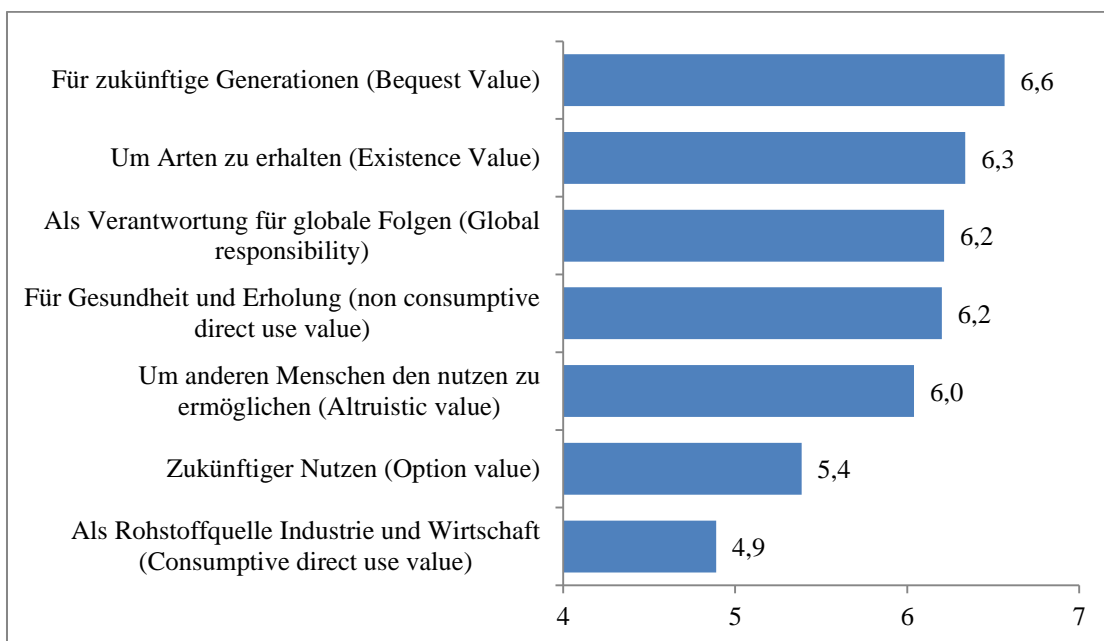
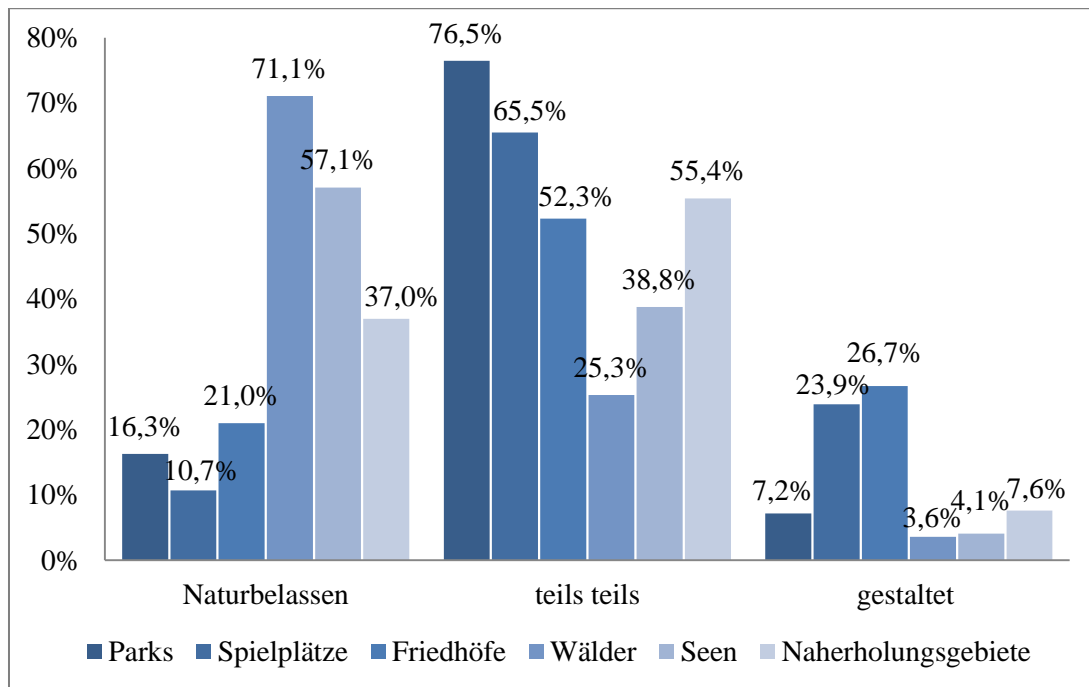


Abb. 11 Präferenz der Struktur von öffentlichen Grünflächen in Berlin (%)

Zusätzlich haben wir nach der Präferenz nach Naturbelassenheit auf den Flächen gefragt (Abb. 11). Es zeigt sich, dass die Befragten Wälder und Wasserflächen in einem naturbelassenen Zustand bevorzugen. Parks und offene Grünflächen, Spielplätze, Friedhöfe und die Naherholungsgebiete werden teils künstlich gestaltet, teil naturbelassen gewünscht.

Einfluss der Erhebungsrunden

Vor der Studie hatten wir die Hypothese, dass die Jahreszeit einen großen Einfluss auf die Bewertung von kulturellen ÖSL und Aussagen zu Grünflächenbesuchen hat. Daher haben wir in zwei verschiedenen Jahreszeiten (Spätherbst und Frühling/ früher Sommer) Daten erhoben. Eine Analyse der beiden Runden ergibt ein eindeutiges Bild (Tabelle 3).

In den Sommermonaten werden 80% der kulturellen ÖSL höher bewertet und damit als wichtiger erachtet. Außerdem ist die angegebene Besuchsfrequenz bei fast allen Flächen (außer bei Friedhöfen und Spielplätzen) sehr viel höher, als im Spätherbst. Auch die angegebene Aufenthaltslänge ist viel länger für Spielplätze, Friedhöfe, Wälder und Wasserflächen, als dieses in den Herbstmonaten der Fall ist. Zusätzlich werden die

Grünflächen in wärmeren Monaten als deutlich Erreichbarer eingeschätzt (Cramer's V ,373; $p > ,001$) und die angegebene Strecke als Länger (Cramer's V ,341; $p > ,001$).

Die Ergebnisse zeigen also eine deutliche Verzerrung der angegebenen Daten je nach Jahreszeit. Die Befragten haben die Neigung ihre Einschätzung des eigenen, eigentlich durchschnittlichen Verhaltens mit dem Verhalten des Befragungsraumes zu vermischen. Eine Befragung an mehreren Zeiten im Jahr ist daher von Vorteil. Sofern nicht möglich, sollte diese Verzerrung in der Auswertung beachtet werden.

Tabelle 3 Korrelation von kulturellen ÖSL, Besuchsfrequenz und Aufenthaltslänge mit der Erhebungsrunde, Cramer's V, Signifikanzen markiert mit *

| Kulturelle ÖSL | Cramer's V | Bersuchsfrequenz | Cramer's V | Aufenthaltslänge | Cramer's V |
|--------------------------|------------|-----------------------|------------|-----------------------|------------|
| Ästhetik | ,182 | Parks/ offene Flächen | ,322*** | Parks/ offene Flächen | ,115 |
| Religiöses/ Spirituelles | ,281*** | Spielplätze | ,148* | Spielplätze | ,466*** |
| Erholung | ,314*** | Friedhöfe | ,129 | Friedhöfe | ,479*** |
| Naturerfahrung | ,411*** | Wälder | ,253*** | Wälder | ,287*** |
| Bildung | ,342*** | Wasserflächen | ,251*** | Wasserflächen | ,140* |
| Inspiration | ,382*** | Naherholungsgebiete | ,354*** | Naherholungsgebiete | ,107 |
| Kulturelle Vielfalt | ,274** | Umland | ,455*** | Umland | ,106 |
| Soziale Beziehungen | ,244** | | | | |
| Heimatgefühl | ,166 | | | | |
| Kulturelles Erbe | ,305*** | | | | |

* $p < 0,05$

** $p < 0,01$

*** $p < 0,001$

Zusammenfassung

In unserer Studie kam heraus, dass sich Bewertungen kultureller ÖSL zwischen verschiedenen dicht besiedelten Gebieten sowie zwischen sozialen Gruppen unterscheiden. Außerdem existieren qualitative und quantitative Wertequalitäten. Unsere Studie zeigt, dass eine detailreiche quantitative Erhebung kultureller ÖSL möglich und machbar ist. Zusammenfassend lässt sich sagen, dass eine ausdifferenzierte Reihe von kulturellen ÖSL unterschiedlich wertgeschätzt werden, und daher eine genaue Betrachtung sehr wichtig ist.

Eine undifferenzierte Erhebung kann zu verzerrten und falschen Ergebnissen kommen und die Resultate für die Planung negativ beeinflussen. Unsere Resultate zeigen aber, dass eine Bündelung von kulturellen ÖSL möglich sein kann: Vor allem die Unterscheidung zwischen kulturellen ÖSL die Vorteile für soziale Interaktionen und solchen die Naturerfahrung bereitstellen.

In unserer Untersuchung haben wir das Thema der unterschiedlichen Bewertungen für kulturelle ÖSL umfassend bearbeitet. Öffentliche Grünflächen werden anhand einer urbanen–periurbanen Gradienten unterschiedlich genutzt: z.B. Parks in dicht besiedelten Gebieten werden öfter besucht, Wälder eher in periurbanen Bereichen. Auch besteht eine Zerteilung von Nutzerpräferenzen zwischen älteren, in periurbanen Gebieten lebenden, und jüngeren im Ballungsraum angesiedelten Bevölkerungsgruppen. Deren Präferenzen auf öffentliches Stadtgrün liegen auf kulturelle ÖSL als Naturerfahrung versus kulturelle ÖSL für soziale Interaktionen. Diese Informationen könnten im urbanen Grünflächenmanagement zu einer Verbesserung der nachhaltigen Planung beitragen.

Zusätzlich stellen wir Methoden vor, die eine Erhebung von kulturellen ÖSL erleichtern. Im Allgemeinen steigert die Arbeit mit sozialwissenschaftlichen Methoden das Bewusstsein der Befragten zu dem Thema, was in Planungsprozessen oft gewünscht wird. Es wird ebenfalls ermöglicht Meinung und Ansprüche der AnwohnerInnen effizient mit in die Planungsprojekte mit einzubeziehen, um nachhaltigere Resultate zu erlangen.

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APPENDIX B
INTERVIEW GUIDELINES AND QUESTIONNAIRE



EXAMPLE OF INTERVIEW GUIDELINE: PROBLEM-CENTERED INTERVIEWS

Ist es in Ordnung, wenn ich das Gespräch aufnehme? Es wird natürlich nicht auf Sie zurück zu führen sein.

Das Projekt an dem ich arbeite zielt auf eine Verbesserung der Einbeziehung von kulturellen und sozialen Elementen in die Landschaftsplanung.

Daher interessiere ich mich besonders für Ihre Einschätzung der Natur hier in Berlin.

1. Machen Sie hin und wieder Ausflüge „ins Grüne“ am Feierabend hier in Berlin?
 - a. Was sehen Sie sich an?
 - b. Warum fahren Sie gerne zu diesen Orten, was schätzen Sie daran?
 - c. Was haben Sie dort gemacht?

2. Und wie ist das am Wochenende? Machen Sie dann auch Ausflüge „ins Grüne“ in Berlin?
 - a. Was sehen Sie sich an?
 - b. Warum fahren Sie gerne zu diesen Orten, was schätzen Sie daran?
 - c. Was haben Sie dort gemacht?

3. Wenn Sie von diesen Orten ausgehen, fällt Ihnen noch mehr ein, das für Sie in der Natur wichtig ist?
 - a. Wie denken Sie ist das für andere Leute, gibt es noch mehr Gründe, die einem in der Natur wichtig seien könnten?

INT: Nachfragen bezüglich der 10 Kategorien, wenn welche nicht genannt werden:

4. Denken Sie, dass Natur einen Grundlage für Wissen sein kann, dass man nicht unbedingt in der Schule oder ähnlichem lernt?
 - a. Was kann solches Wissen beinhalten?
 - b. Wie wird es gelehrt?

5. Wie sehen Sie den Stellenwert der Natur für Bildung und Wissenschaft im Allgemeinen?

6. Fallen Ihnen Beispiele ein, wie die Natur inspirieren kann?
 - a. Wie ist das für Sie?

7. Gibt es etwas in der Natur, dass Sie besonders schön finden?
 - a. Können Sie mir das genau beschreiben?

8. Verbinden Sie persönlich Religiosität oder Spiritualität mit Naturerlebnissen?
 - a. Können Sie mir das beschreiben?

9. Können Sie sich vorstellen, dass Natur Beziehungen zwischen Menschen beeinflusst?
Beispiel: Orte an denen man sich treffen kann, bestimmte Verhaltensweisen
 - a. Haben Sie Beispiele dafür? Welche wären das?

10. Für manche Menschen ist Heimat und Natur verbunden. Was glauben Sie, hat die Natur Einfluss auf Heimatgefühle?
 - a. Wie ist das für Sie?

11. Glauben Sie, dass Natur die Wirkung von Kulturgütern beeinflusst? Mit Kulturgütern meine ich hier (*Rückführung auf besuchte Orte*), Alt Marzahn oder Schloss Sanssouci.
 - a. Welche Arten von Kulturgütern fallen Ihnen noch spontan ein?

12. Können Sie sich Menschen oder Gruppen vorstellen, die die Natur unterschiedlich Nutzen?
 - a. Gibt es das auch hier in Berlin?
Beispiel: Altersgruppen, Migranten

13. Inwieweit brauchen Sie Natur um sich zu erholen?
 - a. Machen Sie oft Urlaub in Regionen, die Sie wegen ihrer Natur schätzen?

14. Was ist Ihre Einstellung zum Naturschutz?
 - a. Welche Gründe für und gegen den Naturschutz fallen Ihnen ein?

- Einleitungssatz zu dem Ort in dem man sich grade befindet: Sie leben hier ja eher/sehr städtisch, ländlich.*

15. Wie würden Sie ihre Wohngegend beschreiben? Eher städtisch, ländlich, Vorstadt-mäßig?

16. Identifizieren Sie sich eher mit dem Stadtleben oder dem Landleben?

17. Welchen Einfluss hat ihre Beziehung zur Natur auf Ihren Wohnort?

18. Haben sie schon immer *in einer Großstadt/am Rande einer Großstadt* gelebt?

INT: Wenn die Befragenden von Stadt / Land gewechselt haben:

19. Wenn Sie an den Wechsel von *Land zu Stadt/ Stadt zu Land* denken, fällt Ihnen etwas ein, was Ihnen in Bezug auf Naturerleben wichtiger oder weniger wichtig geworden ist?

- a. Was genau ist das? Können Sie das beschreiben?
- b. Können Sie bestimmen wieso es eine Veränderung gab?

20. Fällt Ihnen noch irgendwas zu Natur im Allgemeinen oder hier in Berlin ein?

In vielen Arbeiten werden manche der Sachen, die wir grade besprochen haben mit Zahlen bewertet. Ich habe hier so eine Art Fragebogen vorbereitet. Ich würde mich freuen, wenn Sie einmal versuchen würden, den auszufüllen. Sie können mir beim Ausfüllen natürlich alles sagen, was Ihnen dazu einfällt.

1. Was ist Ihre Meinung zu diesen Kategorien?

- a. Gibt es welche, die nicht sofort verstehen oder welche, die Ihrer Meinung nach ähnlich sind?
- b. Würden Sie etwas hinzufügen oder wegnehmen wollen?

EXAMPLE INTERVIEW GUIDELINE: EXPERT INTERVIEW

Ist es in Ordnung, wenn ich das Gespräch aufnehme? Es wird natürlich nicht auf Sie zurück zu führen sein.

Das Projekt an dem ich arbeite zielt auf eine Verbesserung der Einbeziehung von kulturellen und sozialen Elementen in die Landschaftsplanung.

Daher würde ich mich freuen wenn Sie mir ein Überblick über Ihr Projekt geben könnten.

1. Sie arbeiten mit dem Interkulturellem Garten Bunte Beete in Berlin. Können Sie mir etwas genauer erzählen was das Projekt ausmacht?
 - a. Was sind die Ziele und Beweggründe des Projektes?

2. Auf der Internetseite wird beschrieben, dass sie soziale Integrationsprozesse fördern, Fremdenhass vermindern und das Bewusstsein für unsere gemeinsamen natürlichen Lebensgrundlagen stärken wollen.
 - a. Wie kam es, dass Sie Natur und Kultureller Vielfalt vereinten?
 - b. Wie hilft Ihnen die Natur dabei?
 - c. Ist die Natur Ihrer Meinung eine Lösung für Konflikte?
 - d. Was sind Schwierigkeiten, die Sie in den Jahren angetroffen haben?

3. Was für Personen kommen meist in den Interkulturellen Garten?

4. Gibt es Personen oder Gruppen, die sich nicht beteiligen?

5. Wie versuchen Sie, alle Personengruppen mit einzubringen?

6. Was gefällt den Mitgliedern und Unterstützern so an dem Projekt?

Wie erreichbar finden Sie die Grün- und Wasserflächen in Berlin im Allgemeinen?

| | | | | |
|--------------------------|--------------------------|--------------------------|---------------------------|--------------------------|
| Sehr gut erreichbar | Eher gut erreichbar | Teils teils | Eher nicht gut erreichbar | Nicht gut erreichbar |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Weshalb besuchen Sie öffentliche Grün- und Wasserflächen in Berlin?
Bitte sagen Sie wie stark folgende Aussagen auf Sie zutreffen.**

Ich besuche die öffentlichen Grün- und Wasserflächen in Berlin:

| | Trifft voll und ganz zu | Trifft eher zu | Trifft eher nicht zu | Trifft überhaupt nicht zu |
|--|--------------------------|--------------------------|--------------------------|---------------------------|
| Weil Sie die Natur in Berlin schön finden. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Um die Natur und Ihre Umwelt bewusst zu erleben und zu entdecken. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Um Tiere zu beobachten und zu bestimmen oder was über die Natur zu lernen. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weil Sie die Natur inspiriert. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weil die Natur das Zusammenkommen von verschiedenen Menschen ermöglicht (verschiedenen Alters und Herkunft). | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weil Sie sich in der Natur gerne mit Leuten treffen oder Veranstaltungen besuchen. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weil Sie mit der Berliner Natur viele Erinnerungen verbinden. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weil Sie die Geschichte der Berliner Kulturlandschaft schätzen. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weil Sie einen emotionalen Bezug zur Natur haben. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weil Sie dort vom Stadtleben abschalten und sich erholen können. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Um sich dort zu bewegen und Sport zu machen. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Wie mögen Sie Grün- und Wasserflächen in Berlin am liebsten?

| | Komplett naturbe- lassen | Mit gestalteten und naturbelassenen Anteilen | Komplett gestaltet |
|---------------------------------|-----------------------------|--|--------------------------|
| Grün- und Parkanlagen | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Kinderspielplätze | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Friedhöfe | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Berliner Wälder | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Berliner Seen und Wasserflächen | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Naherholungsgebiete in Berlin | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Auf einer Skala von 1 bis 7, bei dem 1 unwichtig und 7 wichtig ist, wie wichtig sind Ihnen folgende Aussagen für die Grün- und Wasserflächen in Berlin?

| Wie wichtig finden Sie: | Unwichtig | | | | | | | Wichtig | | | | | | |
|---|-----------|---|---|---|---|---|---|---------|---|---|---|---|---|---|
| Dass Sie die Flächen optisch schön finden. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dass Sie in der Natur das Gefühl haben, es gibt etwas, das mächtiger ist als Sie. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dass es ruhig ist und Sie mal alleine sein können. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dass ermöglicht wird, Kinder an die Natur heranzuführen. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dass Schulen und Kindergärten draußen etwas über die Natur vermitteln können. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dass die Natur Kunst und Kultur inspiriert. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dass alle Menschen (unabhängig von Alter und Herkunft) die Möglichkeit haben die Flächen nach ihren Vorstellungen zu nutzen (grillen, kochen, Feste auf Grünflächen). | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dass Sie mit anderen Menschen was im Grünen unternehmen können. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

GUIDELINES & QUESTIONNAIRE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dass Sie verschiedenste Menschen kennen lernen und von ihnen lernen können. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|--|---|---|---|---|---|---|---|
| Dass Natur Ihnen hilft, sich in Berlin heimisch zu fühlen. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|---|---|---|---|---|---|---|

| | | | | | | | |
|--|---|---|---|---|---|---|---|
| Dass die historische Bedeutung der Berliner Landschaft dargestellt wird. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dass Sie dort verschiedene Sportarten ausüben können. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|

Auf einer Skala von 1 bis 7, bei dem 1 unwichtig und 7 wichtig bedeutet, wie wichtig sind Ihnen folgende Gründe zum Schutz der Natur im Allgemeinen?

| | | |
|--|------------------|----------------|
| Wie wichtig finden Sie den Schutz der Natur | Unwichtig | Wichtig |
|--|------------------|----------------|

| | | | | | | | |
|-----------------------------|---|---|---|---|---|---|---|
| Für zukünftige Generationen | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------------------|---|---|---|---|---|---|---|

| | | | | | | | |
|--|---|---|---|---|---|---|---|
| Um Tiere und Pflanzenarten zu erhalten | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Als Rohstoffquelle für Industrie und Wirtschaft | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|

Wie wichtig finden Sie den Schutz der Natur:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Für ungeahnte Möglichkeiten, die der Mensch zukünftig nutzen kann | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|--|---|---|---|---|---|---|---|
| Für Gesundheit und Erholung des Menschen | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|---|---|---|---|---|---|---|

| | | | | | | | |
|--|---|---|---|---|---|---|---|
| Um anderen Menschen die Nutzung von Natur zu ermöglichen | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|---|---|---|---|---|---|---|

| | | | | | | | |
|--|---|---|---|---|---|---|---|
| Weil Menschen Verantwortung für die globalen Folgen ihres Handelns übernehmen müssen | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|---|---|---|---|---|---|---|

Welche Strecke legen Sie im Durchschnitt zurück, um zu einer Grün- oder Wasserfläche in Berlin zu gelangen?

Bis 1 km

über 1 bis 5 km

Über 5 bis 10 km

Über 10 km

Und wie gelangen Sie normalerweise zu der Fläche?

| Zu Fuß | Mit dem Fahrrad | Mit dem Auto | Mit öffentlichen Verkehrsmitteln |
|--------------------------|--------------------------|--------------------------|----------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Die „Strategie Stadtlandschaft“ der Senatsverwaltung in Berlin hat ein Leitbild für die Zukunft der Berliner Stadtnatur entwickelt. Dadurch sollen zum Beispiel das Klima und die soziale Situation verbessert werden.

Auch wenn viele der Grünräume der Stadt gehören, sollen die Anlieger und Benutzer der Flächen mit in die Planung einbezogen werden.

Auch in Ihrem Bezirk gibt es einige Grün- und Wasserflächen, die vielleicht verändert werden könnten. Bitte stellen Sie sich eine Brachfläche hier in der Nähe vor. Diese Fläche hat keinen geregelten Nutzen. Nun könnten auf dieser Brache folgende Veränderungen geplant werden:

Zum einen könnten verschiedene Nutzungsmöglichkeiten auf den Flächen angeboten werden – so könnte Platz für Picknicken, Grillen oder Feste geschaffen werden. Oder der Platz wird für verschiedene Sportarten, so wie Joggen, Drachensteigen oder Ballspiele freigehalten. Auch könnte der Platz als reine Liegewiese gedacht sein.

Außerdem könnte mit Sitzgelegenheiten zum Ausruhen Platz geschaffen werden zum ruhigem Wandern und Spaziergehen. Auf der Fläche könnte auch ein Naturkindergarten hergerichtet werden, oder es könnte ein Naturlehrpfad angelegt werden. Eine andere Möglichkeit ist das Anlegen eines interkulturellen Gartens.

Als separaten Raum auf der Fläche könnte Platz für ein Ruhebereich eingerichtet werden. Es könnte ein kleiner Ruhebereich angelegt werden, der noch etwas Lärm durchlässt. Oder einen großen Ruhebereich, der keinen Lärm mehr durchlässt.

Stellen Sie sich außerdem vor an dieser Stelle ist eine interessante alte Ruine aus früheren Zeiten Berlins. Dieser historisch wichtige Fund könnte ignoriert werden, oder mit kleiner oder großer Schaustellung hervorgehoben werden.

Die Veränderungen werden durch eine einmalige Gebühr am Ende des Jahres mitfinanziert.

Bitte vergleichen Sie die Zustände der folgenden Optionen und wählen Sie den aus, der Ihnen am meisten zusagt. Sie haben die Wahl zwischen Option A und B sowie dem heutigen Zustand der Fläche. Insgesamt möchten wir Sie 6 Mal um eine Auswahl bitten.

Machen Sie sich bitte bei der Auswahl der Karten klar, dass Sie wegen der Gebühr in den kommenden Jahren jeweils den entsprechenden Betrag weniger zur Verfügung haben.

Choice Experiment Nummer 1

| | |
|-------------------|--------------------------|
| Option A | <input type="checkbox"/> |
| Option B | <input type="checkbox"/> |
| Keines von Beiden | <input type="checkbox"/> |

Choice Experiment Nummer 2

Option A

Option B

Keines von Beiden

Choice Experiment Nummer 3

Option A

Option B

Keines von Beiden

Choice Experiment Nummer 4

Option A

Option B

Keines von Beiden

Choice Experiment Nummer 5

Option A

Option B

Keines von Beiden

Choice Experiment Nummer 6

Option A

Option B

Keines von Beiden

Filter, wenn Keines von Beiden angekreuzt wurde:

Sie haben auch die „Option der unregelmäßigen Nutzung“ angekreuzt. Ist das weil:

Sie die Veränderungen für eine Gebühr nicht gut genug finden?

Weil Sie generell gegen Gebühren vom Staat sind?

Sie andere Flächen haben, die Sie stattdessen besuchen möchten?

Sonstiges:

Auf einer Skala von eins bis fünf, bei der 1 nicht verwirrend und 5 sehr verwirrend ist, bitte sagen Sie, wie verwirrend die Auswahl Aufgabe war:

Nicht verwirrend
verwirrend

Sehr

1

2

3

4

5

Sind sie Mitglied einer Organisation /eines Vereins die sich mit Natur beschäftigt?

Ja

Nein

Filter, wenn Nein überspringen:

Wenn ja, welcher: _____

Bitte geben Sie an, wie sie sich politisch einschätzen. Die Skala geht von 1 (ganz links) bis 10 (ganz rechts). Die Nummern 5 und 6 machen die Konservativ/ Mitte aus.

Links

Konservativ/ Mitte

Rechts

1

2

3

4

5

6

7

8

9

10

Seit welchem Jahr wohnen Sie hier?:

Haben Sie schon vorher in Berlin gewohnt?

Ja

Nein

Wenn ja, wann?: _____

Und in welchem Stadtteil?: _____

Wie viele Personen, Sie eingerechnet, leben in Ihrem Haushalt?

1 Person

2 Personen

3 bis 4 Personen

Mehr als 4 Personen

Wohnen Kinder unter 12 Jahren in Ihrem Haushalt?

- Ja
- Nein

Bitte nennen Sie Ihr Geburtsjahr: 19__

Welche Staatsbürgerschaft haben Sie?: _____

Ist einer Ihrer Eltern oder Großeltern nicht in Deutschland geboren?

- Ja
- Nein

Wenn ja, in welchem Land? _____

Was ist der höchste allgemeinbildende Schulabschluss den Sie haben?

- Noch Schüler
- Schule beendet ohne Abschluss
- Volks-/Hauptschulabschluss bzw. Polytechnische Oberschule mit Abschluss 8. od. 9. Kl.
- Mittlere Reife/ Realschulabschluss bzw. Polytechnische Oberschule mit Abschluss 10. Kl.
- Fachhochschulreife (Abschluss einer Fachoberschule etc.)
- Abitur bzw. Erweiterte Oberschule mit Abschluss 12. Klasse (Hochschulreife)
- Anderen Schulabschluss, und zwar:

Welchen beruflichen Ausbildungsabschluss haben Sie? Mehrfachnennung möglich

- Beruflich-betriebliche Anlernzeit mit Abschlusszeugnis, aber keine Lehre
- Teilfacharbeiterabschluss
- Abgeschlossene gewerbliche oder landwirtschaftliche Lehre
- Abgeschlossene kaufmännische Lehre
- Berufliches Praktikum, Volontariat
- Fachschulabschluss
- Berufsschulabschluss, Berufsgrundbildungsjahr abgeschlossen
- Meister-, Techniker- oder gleichwertiger Fachschulabschluss
- Abgeschlossenes Studium an Fachhochschule (auch Abschluss einer Ingenieurschule), Schule des Gesundheitswesens

- Hochschule/Universität: Zwischenprüfung, Vordiplom, Bachelor
- Abgeschlossenes Studium an Hochschule, Universität, Akademie, Polytechnikum (Diplom, Magister, Master, Staatsexamen)
- Promotion; Habilitation
- Anderen beruflichen Ausbildungsabschluss, und zwar: _____
- Keinen beruflichen Abschluss

**Können Sie uns ungefähr sagen, wie hoch Ihr monatliches Netto-Haushaltseinkommen ist?
(Das Einkommen, das Ihrem gesamten Haushalt pro Monat zur Verfügung steht.)
Bitte wählen Sie das entsprechende Einkommen aus.**

- C H Z L B U F

Platz für Notizen

Abbrecher?

Warum?

Sonstiges:

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PUBLICATIONS

Peer-reviewed publications

Riechers, M., Barkmann, J. and Tschardtke, T. (submitted): Perceptions of cultural ecosystem services from urban green.

Riechers, M., Noack, E.M. and Tschardtke, T. (submitted): Experts' versus laypersons' perception of urban cultural ecosystem services.

Riechers, M., Barkmann, J. and Tschardtke, T. (submitted.): Cultural ecosystem services of urban green along an urban-periurban population density gradient.

Riechers, M., Barkmann, J. and Tschardtke, T. (in prep): Conflicting demands of different social groups on cultural ecosystem services along an urban–periurban gradient.

Further publications

Riechers M, Barkmann J, Tschardtke T (2015): Bewertung kultureller Ökosystemleistungen von Berliner Stadtgrün entlang eines urbanen-periurbanen Gradienten. Diskussionspapiere der Georg-August-Universität Göttingen, Diskussionsbeitrag 1507, ISSN 1865-2697

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Conference contributions

Riechers M, Barkmann J, Tschardtke T (in print): *Bewertungen kultureller Ökosystemleistungen in Berlin*. In: Feit, U.; Korn, H. (Hrsg.) (in print): Treffpunkt Biologische Vielfalt XV : aktuelle Forschung im Rahmen des Übereinkommens über die biologische Vielfalt, vorgestellt auf einer wissenschaftlichen Expertentagung an der Internationalen Naturschutzakademie Insel Vilm vom 24.-28. August 2015. – Bonn (Bundesamt für Naturschutz) (BfN-Skripten, in print)

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CURRICULUM VITAE

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Course of Studies

- 2012 - 2015** **Doctoral thesis**, Georg-August-University Göttingen, Germany
PhD Programs: Agricultural Sciences & associated with “Biodiversity and Society”
- 2010 – 2012** **MSc Global Studies**, Gothenburg University, Sweden
Focus: Human Ecology
- 2007 – 2010** **BA Social Science**, Leibniz University Hannover, Germany
Subjects (i.a.): Quantitative and qualitative research methods
- 2008** **Erasmus Student** at Uppsala University, Sweden
Focus: Peace and Conflict Research
- 2004 - 2007** **AHR (Abitur)**, Käthe-Kollwitz Gymnasium Hannover, Germany

Related Work Experiences

- 2013 - 2015** **Department of Agricultural economics and rural development, Environmental and resource economics group, Research Assistant**
- Internship project for Master students: Understanding and knowledge on ornithological biodiversity in the agricultural area of Göttingen.
 - Bachelor course: Resource economy and sustainable land use. Thematic conceptualization of the course, holding lectures, co-grading presentations and written assignments, student supervision.
 - Project: Characterization and Promotion of Biological Diversity and Ecosystem Services at German Federal Waterways and their Floodplains (funded by the German Federal Institute of Hydrology, BfG).
 - F+E project: Valuation of cultural ecosystem services in Germany (funded by the German Federal Agency for Nature Conservation, BfN)

March - June 2012 **School of Global Studies, Department of Human Ecology,
Course assistant in Master Program**

Master course: Sustainable Development: Conflicts, Communication, Collaboration. Co-advising of student working groups; Co-reading and commenting of group works and assignments for grading.

2011 - 2012 **School of Global Studies, Department of Human Ecology,
2-months Internship / Research Assistant, SECOA**

Project: Solutions for Environmental Contrasts in Coastal Areas, SECOA (EU-funded); project administration; main responsible in administrative organization of the 6th project conference.

April - May 2010 **Hochschul-Informations System GmbH (HIS), Research
Assistant**

Project: Academic Cooperation Association Mobility study produced for the Directorate General for Education and Culture (DG EAC) of the European Commission.

2009 –2010 **Hochschul-Informations System GmbH (HIS),
2-months Internship/ Student Assistant for
EUROSTUDENT**

Project: Organization of entrance to higher education: a comparison across seven European countries (EU-funded); Organization and support of the international OECD/INES working group meeting 2010; Organization of seminars and meetings in various countries; Cultivation of international contacts.

Scholarships

- Foundation under Public Law of Georg-August-University Göttingen (PhD Scholarship)
- MKW graduate school “Biodiversity and Society” (Summer school scholarship)