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Experts' versus laypersons' perception of urban cultural ecosystem services

Maraja Riechers[1,2] · Eva Maria Noack[2] · Teja Tscharntke[1]

Abstract Urban cultural ecosystem services are understood differently by experts and laypersons. Yet, unaccounted differences 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 of cultural ecosystem services can be one tool to analyze these differences. We use expert and problem-centered interviews to assess differences in cultural ecosystem service perceptions for experts and laypersons in Berlin. Using an innovative approach, we combine inductive qualitative content analysis with a frequency analysis and multidimensional scaling. This explorative study innovatively merges qualitative and quantitative approaches to show new ways of analysis. Our results show that the experts' perceptions of nature appear to be more practical, management-centered, whereas laypersons appear to prioritize enjoyment of nature. Overall, multidimensional scaling indicates different perceptions and conceptualizations of cultural ecosystem service bundles, emphasizing the diverging understandings. If these different perceptions are not accounted for it could lead to social and political contrast.

They should therefore be acknowledged in decision-making and goal formulation for the management of urban green.

Keywords Bundles of services · Management of urban green · Millennium ecosystem assessment · Political conflict · Public participation · Qualitative research

Introduction

To achieve socio-ecological sustainability, sound management decisions are important. In the planning processes the use of the Millennium Ecosystem Assessment (MEA 2005) has become more frequent. The objective of the MEA is the assessment of changes of ecosystems and their effect on human well-being. The concept focusses on the needed action to foster a sustainable utilization while incorporating nature conservation (MEA 2005). These complexities have to be incorporated into the local planning process. Further, in planning processes the necessity of public participation in decision-making is commonly accepted (see list in Petts and Brooks 2006). The perceptions of the benefits of natural environment are often influenced by regional characteristics, actor groups or an urban-rural contrast (e.g. Cumming et al. 2014; Kabisch and Haase 2014). Accounting for local preferences should be common practice in environmental matters (e.g. Dooling et al. 2006; Friggens et al. 2014), yet experts, such as planners, are mostly those who decide on the management of ecosystems (Bendt et al. 2013; Plieninger et al. 2013). Community planners are experts and may try to consider inhabitants' preferences, but they are often unaware of inhabitants' perceptions and priorities and the outcome might be inconsistent with inhabitant's wishes (e.g. Faehnle et al. 2014). Being potential beneficiaries or 'victims' of planning, inhabitants are often best at assessing and possibly altering options proposed by

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experts (Renn et al. 1993; Bonnes et al. 2007; Herringshaw et al. 2010). In addition, the engagement of inhabitants in decision-making promotes civic empowerment and trust in authorities (OECD 2001).

Decisions that are not shared between experts and inhabitants could negatively impact inhabitants' compliance with environmental policies and long-term planning processes (e.g. Alberts 2007; Churchman and Sadan 2004). It is therefore essential to consider local inhabitants' perceptions and their (desired) use of natural resources in urban areas (Kabisch and Haase 2014). Inhabitants are increasingly unwilling to uncritically accept an experts' trained judgement causing difficulties for planners (e.g. Fischer 2000; Petts and Brooks 2006). In this paper, we therefore focus on the difference of perception between inhabitants and planning experts.

Despite the increasing importance of public participation in environmental decision-making (e.g. Beierle and Cayford 2002), there has been little research on the extent that expert – layperson perspectives of ecosystem service benefits differ. We argue that the evaluation of cultural ecosystem services (*CES*) could be one way to investigate these different perspectives and increase public involvement (see also Faehnle et al. 2014). Until now, most studies on experts' versus laypersons' perceptions on environmental concerns focus on risk (see list in Lazo et al. 2000; Fischer 2000; e.g. Bonnes et al. 2007), landscape values (e.g. Hunziker et al. 2008; Vouligny et al. 2009) or heritage values of historic sites (e.g. Coeterier 2002). Little is known about the differences in experts' and laypersons' perceptions of CES. Further, La Rosa et al. (2015) showed that existing CES indicators have a limited usability for urban planning and management.

In the MEA, CES are defined as the "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" and heuristically described in 10 categories (MEA 2005). Guo et al. (2010) show that CES are becoming increasingly important, especially in urban areas. The scarcity and pressure on ecosystems and their services in urban areas make decisions around green spaces even more important (Melichar and Kaprová 2013; Kabisch and Haase 2014).

Prior research showed connection between urban social sustainability and CES, as an ecological dimension of sustainability, suggesting an approximation if these concepts in policy and research (Riechers et al. 2016). This approximation could foster environmentally sound urban planning while strengthening public participation (Andersson et al. 2015b). Evaluation of CES in urban areas requires a consolidated understanding of ecological, socio-economic and cultural impacts of 'natural' urban environments (Green et al. 2015). The way social groups of people perceive nature depends on culturally defined value and belief systems (Faehnle et al. 2014; Kabisch and Haase 2014; Friggens et al. 2014) and consequently CES are described as difficult to assess and

value (Plieninger et al. 2013; Daniel et al. 2012). In regard to urban planning and management, the emphasis of the place-based context of CES as well as their regional scale is important (Andersson et al. 2015a; Riechers et al. 2016). These aspects are likely to pose problems in representing CES in decision-making processes (e.g. Gee and Burkhard 2010; Norton et al. 2012; Tengberg et al. 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 understand reactions to planning actions (Faehnle et al. 2014; Riechers et al. 2016). Values of CES can be critical driving forces in nature conservation and ecosystem management and crucial in communication about such matters to the public (Plieninger et al. 2013). Through the use of social research methods public participation could be strengthened leading to more public support of planning processes (Chan et al. 2012; Andersson et al. 2015b).

One example where problems in planning arose due to insufficient consideration of local preferences is the Tempelhofer Feld in Berlin. Here, in 2014, Berlin inhabitants outvoted the master plan of the Senate Department for Urban Development and the Environment on the Tempelhofer Feld, a large centrally located green area. The plan included the construction of 4700 apartments; a law followed forbidding future construction (e.g. Senatsverwaltung für Stadtentwicklung und Umwelt 2014a, 2015b; Demokratische Initiative 100% Tempelhofer Feld e. V. 2014). Already at this early stage, the costs of the project, were about 3.95 million € in total (Senatsverwaltung für Stadtentwicklung und Umwelt 2014b) – a large amount of money invested a cancelled project. While the project has a complex political context and the public was included, it is likely that contrasts in perception of demands contributed to the planning difficulties. Knowledge of these contrary perceptions and evaluations could circumvent future planning failures (Kabisch and Haase 2014).

In this paper, we aim to identify the differences and similarities between laypersons' and experts' understanding of urban CES in Berlin which have to be acknowledged to achieve sound urban green space management. We aim to show a novel methodological combination using semi-structured interviews, leading to an exploratory outcome. Objectives were to a) advance on the qualitative assessment of CES, b) while using a novel pluralistic approach for data analysis. With our results we c) stress perceptional differences of CES between inhabitants and planning experts to d) highlight contrasts and enhance political planning processes. The paper will first describe the methods used for data collection and analysis; it will then briefly 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. This paper is part of a larger study on urban cultural ecosystem services by the Georg-August-University Göttingen.

Methods

The study area was the capital city of Germany, Berlin. Berlin is a federal state as well as Germany's largest city with an area of 892 km^2. Berlin is a green city: more than 45% of its area is 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 (Amt für Statistik Berlin-Brandenburg 2014; Senatsverwaltung 2015a). With its manifold green spaces and a high and diverse population Berlin is an appropriate case study location to study different needs and wishes on green space utilizations.

Study design and data collection

For our case study, 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 et al. 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 et al. 2012; Hartel et al. 2014). For an overview of the study please see Fig. 1.

We carried out semi-structured interviews ($n = 41$) to incorporate interviewees' preferences while including relevant topics. We interviewed three actor groups: 1) Professionals from planning and decision-making positions employed by the Berlin Senate Administration for City Development and Environment and the Berlin Forestry Commission office. These experts have participated in various projects involving urban green space management ($n = 9$). 2) User-representatives and heads from different governmental and non-governmental

organizations concerned with CES. This group includes decision-makers and active members of organizations concerned with, for example, local and regional traditions, forms of urban gardening, park management and social or educational work ($n = 10$) (see Table 3). As interviewees from these two groups were professionals with extensive prior knowledge, engagement or work within certain CES categories, these were defined as experts. They were interviewed using expert interviews (Flick 2006) to focus on their specific field of work, not on their personal evaluations. Group 3) consists of Berlin inhabitants, i.e. laypersons ($n = 22$). With these actor groups problem-centered interviews were carried out (Witzel 2000; Flick 2006), focusing on their personal benefits through green space utilization. The techniques and focus of semi-structured interviews was the same in all groups but the approach to the subject (professional vs. personal) differed in order to obtain comparable data. Tables 4 and 5 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 min. Five interviews were held in the presence of one or two other interviewees, if particularly asked for 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 of their work fields and projects. Laypersons were first approached in urban green spaces such as parks and lake banks in different districts in Berlin. At first we used snowball sampling to ease the access to interviewees. We then selected purposively those laypersons with possibly contrasting opinions (Flick 2006; Hunziker et al. 2008) – as indicated by, for example, education, occupation, length of residence in Berlin etc. We also balanced for gender and age. This contrast sampling was conducted after a first analysis of the interview contents to cover a broad range of opinions and as a form of internal validation to increase robustness (Flick 2006).

The interview guidelines were created based on intensive literature studies on CES (e.g. MEA 2005; Chan et al. 2012; Daniel et al. 2012). 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. Open-ended questions prompted the interviewees to talk freely. Due to this open interview situation interviewees' main foci and perspectives could be assessed. 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.
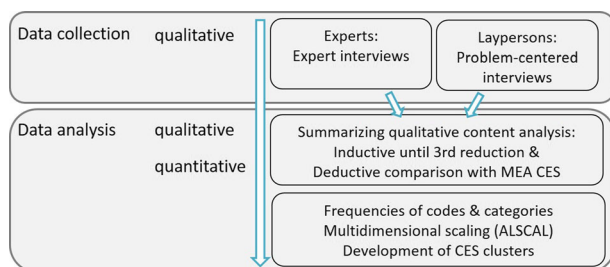

Fig. 1 Study design

Appendix Table 5 provides an example for an interview guideline.

Data analysis

Using the program F4 (Version 2013, Dr. Dresing & Pehl GmbH, Marburg, Germany) the interviews were fully transcribed. Codes, that is meaning units of the texts, were inductively created, meaning that codes were developed through the interview text and not based on existing theories. Using the summarizing qualitative content analysis (Mayring 2008), these codes ($n = 2506$) were aggregated in different steps with increasing abstraction level. After the 3rd aggregation level this inductive approach resulted in 17 codes (see Table 1). These 17 inductive codes were then compared to the 10 official CES of the MEA (2005) and based on this comparison aggregated into 11 CES categories (see Table 1). Tables 4 and 5 show the codes per interviewee.

Based on this qualitative content analysis, we carried out a quantitative data analysis (see Fig. 1). The relative frequency of the 17 inductive codes was ranked between experts and laypersons. Additionally, in-text proximity of the aggregated eleven CES categories was calculated with the complex retrieval tool of MAXQDA 11 (VERBI GmbH Berlin, Germany). The number of occasions of one 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 and Atkinson 1996:180).

We applied multidimensional scaling (ALSCAL) to this data with Euclidian metric through SPSS 21 (IBM Deutschland GmbH, Ehningen, Germany) with the calculated dissimilarities matrix. Multidimensional scaling (MDS) can be used to picture subjective perceptions spatially (Backhaus et al. 2006). This perceptional 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). Due to Kruskal's STRESS and in regard to a facilitated comprehension a two dimensional plot was chosen (see Figs. 2 and 3). Qualitative interviews give exploratory insights, which may be responsible for the relatively high Stress value. Through the MDS clusters, that is spatial proximities of CES, became visible. 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 (e.g. Backhaus et al. 2006). CES clusters were chosen by their proximity and place in the coordinate system. To facilitate interpretation, we encircled the chosen clusters manually. Naming these clusters and interpreting them is a subjective exercise and we present one way of organizing them. Yet, the figures 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.

Table 1 CES categories and the inductive codes as they resulted from this study. CES categories were rephrased from the original MEA (2005) wording adding the term of 'values' into each description to have comparable terms. Category 11 was included. The inductive codes directly adapt perceptions from the interviews, illustrate the regional specifications and sharpen the MEA categories

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 (*Heimatgefühl*) through nature
	12. Designing nature creatively; occupation of nature
9. Cultural heritage values	13. Cultural landscape / natural heritage
10. Values for recreation and tourism	14. Nature as recreational space
	15. Recreational activities in nature
	16. Visiting nearby recreational nature areas
11. Social and motoric development	17. Social and motoric development

Fig. 2 Multidimensional scaling (ALSCAL) for CES categories from expert interviews. Kruskal Stress Formula 1: 0.26, R^2 0.54
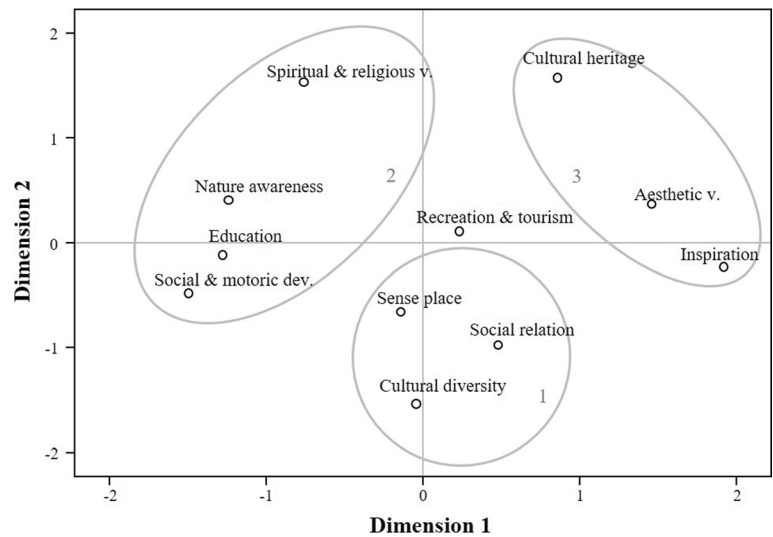

Results

The qualitative content analysis carried out first revealed nuanced, specific interpretations of CES: This inductive approach resulted in 17 codes. These codes were assigned to the CES of the MEA and aggregated into 11 CES categories (e.g. the inductive codes 1 and 2 where grouped together under the CES category of 'cultural diversity') (see Table 1). The qualitative results can be found in detail in Riechers et al. (2016). Here, we present a synopsis to facilitate the understanding of the quantitative results.

The content analysis revealed that the CES categories developed in the MEA can be applied in the urban setting of Berlin, yet some need adjusting to allow specific interpretations. For one, the CES 'social and motoric development' was included. This service addresses especially children's social

and motoric development achieved through 'working' or playing together in nature. For another, the CES of 'sense of place and regional identity' includes e.g. the category of 'Designing nature creatively; occupation of nature', which relates to statements with regard to the urban gardening trend. This self-design and occupation of urban green spaces led to identification with the laypersons' direct surroundings, 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.*" (Quotations from the interviews illustrating the findings were translated from German by the first author.). Experiencing nature is thus connected to home and belonging; this is also actively used by experts to activate

Fig. 3 Multidimensional scaling (ALSCAL) for CES categories from laypersons interviews. Kruskal Stress Formula 1: 0.33, R^2 0.26
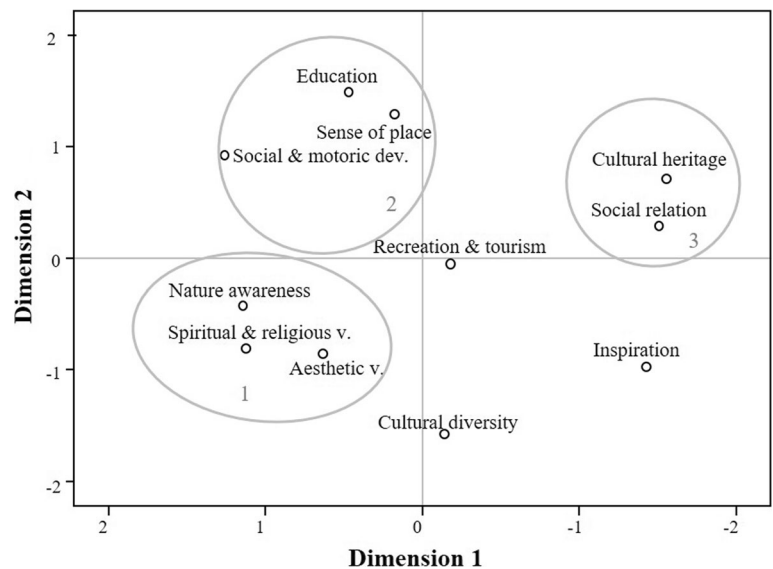
laypersons' participation and to foster social integration of different social groups into the community (e.g. neighborhood management projects, social city Berlin).

Another CES with specific perceptions differing 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, for example, fishermen or nomads. In the case of Berlin we applied this category to the different needs and uses of urban green spaces 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 space. Statements on specific needs and uses of nature, differing, for example, by age, migratory background or income 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 expressed that it is necessary to consider heterogeneous demands to guarantee a socially fair development of urban green spaces. The term 'socially fair development' was referred to by experts to name the inclusion of inhabitants with a migration background or different ages.

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. We substituted this category with the '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.

Following the qualitative analysis we carried out the quantitative content analysis, i.e. a frequency analysis and multidimensional scaling, to reveal 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 as well as the ranking order. The percentages already indicate some great differences between laypersons' and experts' ranking. A Spearman's rank correlation showed no significant correlation between expert and layperson ordering (r_s = .382, p = .131), suggesting a difference in ranking order.

While both name 'nature as recreational space' most frequent (with 17.3% and 13.7% for laypersons and experts, respectively), laypersons also prioritize 'aesthetic impressions of nature' (16.4%), followed by 'recreational activities in nature' (13.5%). Experts name issues of designing nature creatively and the occupation of nature (12.4%) more often than nature as meeting place (11.2%).

To gain a deeper insight into the understandings we used the distances between the codes of our CES categories for multidimensional scaling.

Figure 2 shows the multidimensional scaling (ALSCAL) of the 11 CES categories from experts (Stress 1: 0.26, R^2 0.54), Fig. 3 those from Berlin laypersons (Stress 1: 0.33, R^2 0.26). 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 forests "*(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 exploration of nature as important for factual learning in school. 'Values for recreation' located in the middle of the graphic can be seen as nearly similarly connected to all categories.

Clusters of laypersons' statements differ (Fig. 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.*

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 (*n* = 946 codes)		Laypersons (*n* = 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 of 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

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 o 'values for recreation and tourism' again lies close to the center.

In general, our study shows differences between laypersons and experts in CES perceptions. For example, laypersons focus on activities in nature and nature aesthetics, whereas experts emphasize 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 space but final decisions are mainly made based on expert opinions (e.g. Faehnle et al. 2014). In some cases, experts and laypersons do not share a common set of evaluation criteria (Bonnes et al. 2007). Our study indicated differing perceptions and priorities of cultural ecosystem services (CES) by experts and laypersons.

While experts and laypersons both named recreational value of nature most often, there were notable differences regarding other aspects. Distinct was the discrepancy for 'designing nature creatively; occupation of nature', which had a high frequency for experts only. Berlin laypersons named aesthetical values of nature second most often but these only made up 5% of all experts' statements. Experts instead emphasized group specific needs and uses of nature more than the interviewed laypersons did, probably because a large part of their work consists in balancing different user demands on space. Experts with public responsibility (similarly to representatives of major political parties) tend to care for a very broad and balanced mixture of interests, thereby deviating from the particular interests of individuals (Faehnle et al. 2014). This is in line with 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. Vouligny et al. (2009) concluded that experts base their landscape assessment on more formal criteria, missing out proximity, experience and atmosphere which form residents' set of assessment criteria – as it can also be

seen in this study. Hence, it seems unlikely that an assessment only built on experts' criteria will sufficiently cover all laypersons' elements of evaluation.

Especially the emotional aspects included in laypersons' evaluation (see also e.g. Lazo et al. 2000) should be acknowledged by experts. Our two multidimensional scaling plots support this claim by showing differences between the conceptual understandings of CES between experts and laypersons (for other approaches see e.g. Lazo et al. 2000; Turner et al. 2014). For experts the cluster 'human interactions' had the highest frequency in our ranking (see Table 2), while laypersons emphasized the cluster 'emotional connections to nature'. To highlight differences in the understanding of CES clusters we emphasized differences between the clusters of 'direct natural experiences' (experts) and 'emotional connections to nature' (laypersons). For experts the cluster included a wide spectrum of CES, yet the ranking showed that the focus of this cluster was the connection to educational values and natural awareness. The benefits of (fostering) creative playing and learning in natural environments for children might have gained importance as the digitalization of society in recent years led 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, in the laypersons' perception of nature awareness was not connected to education but to a strong sense of aesthetical values. The experience to be part of nature – instead of being outside of it – was an important element and stood only in loose connection with hard facts that are acquired through educational values. Hence against the background of experts' and laypersons' the differing prioritization of CES we interpreted the clusters as inherently different: Experts focused more on educational matters, achieved through nature awareness or vice versa, laypersons emphasized aesthetical experiences with 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). These strikingly different perceptions might be based on experts' concern for a broad and balanced mixture of interests, thereby deviating from the particular interests of most urban inhabitants. If laypersons' emotional aspects related to nature are assessed and specified this could avoid mismanagement and guarantee a more accurate urban green space management (e.g. Lazo et al. 2000).

Our study also revealed common perceptions: Both, expert and laypersons of our study region saw recreational values from nature clearly as the most important benefit. For example, in our multidimensional scaling 'values for recreation and tourism' was located in the middle of the coordinate system. We assume that the recreational value of nature could be the overarching theme behind other CES. This understanding challenges the CES MEA heuristic, as the category of 'recreation and tourism' would lie on a higher categorical level than the other mentioned CES, meaning that recreational values might be subliminally linked to other statements of CES values. This is important to note as it might impact quantification through, for example, double-counting, as recreational values would be counted within values of other CES and not distinctly.

Evaluation of CES is deemed to be difficult (e.g. Plieninger et al. 2013) with little understanding on problems for urban ecosystem services (Gómez-Baggethun and Barton 2013). Studies focusing only on some, selected CES without explaining this selection 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. Chan et al. 2012; Milcu et al. 2013), yet a systematic methodological approach and justification of bundling is missing. Milcu et al. (2013) state in a review that only a small number of studies 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 (Haslett et al. 2010; Turner et al. 2014). Additionally, study regions might differ in the perceptions and connections of CES (e.g. Gómez-Baggethun and 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 is an example of creating CES bundles through multidimensional scaling.

Some environmental problems are socially defined and laypersons' simplified understanding has to be taken into account (Petts and Brooks 2006). Possibly to this lay 'ignorance', experts see themselves as acting on behalf of the public instead of with them (Petts and Brooks 2006). However, urban green space is often value-laden and local inhabitants are emotionally attached to it (e.g. Ernstson 2013; Turner et al. 2014) – their perceptions do matter. Changes and transformation of urban green space is thus a difficult field for decision-makers due to the growing pressure and conflicting interests. Understanding the differing, in some cases opposing, perceptions on CES and their given importance can greatly enhance the decision processes and increase laypersons' satisfaction (e.g. Bonnes et al. 2007). In-depth understanding of opinions on and values of CES will help the process of negotiation and hopefully help towards a sustainable outcome (e.g. Churchman and Sadan 2004; Faehnle et al. 2014), especially as criteria and indicators of success of experts and laypersons are not necessarily the same

(Petts and Brooks 2006). These differences may affect effective management; being aware of them could thus facilitate communication between stakeholders (e.g. Martín-López et al. 2012; López-Santiago et al. 2014). In planning processes, many participation methods are already used, but a more frequent use of social research methods of the concept of ecosystem services would help to identify priority CES. Incorporating laypersons' perceptions in the decision-making process on urban green space management might ease communication between stakeholders. This can be one solution to the posed problem of a limited usability of CES indicators for urban planning and management (La Rosa et al. 2015). While assessing understanding and priorities of cultural ecosystem services of different groups can be time consuming, this time is well spent if disagreements between these groups can be minimized and approval for green space changes heightened. A more intensive inter- and transdisciplinary communication between various actors and stakeholders of CES, could increase the chance for a stable, long-term solutions for the management of urban green spaces.

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; Riechers et al. 2016). Combining qualitative data with quantitative analysis bridges the paradigms of both disciplines. Due to the number of interviewees and codes (Flick 2006) statistical tests for comparison and emphasis on differences could be made. However, the qualitative and explorative nature of our data has to be acknowledged. Through contrast sampling we included a wide range of opinions to create a robust and reliable account. Still, an increased sample size or the combination of different sources of information could increase robustness. Experts were sampled due to an affiliation to a certain CES category; they included various CES in their statements though and showed no significant bias towards one category. The presence of other interviewees in some of the interviews may have biased the answers, yet it can also positively enhance the variety of answers by group dynamical associations of CES and increase robustness. As interviewees wished to do so, it can be assumed that they felt at ease being with the other interviewees.

The results of our case study of Berlin cannot readily be transferred to other regions. Perceptions of laypersons in urban areas with less green might for example differ as might experts' views in cities with a less diverse population. These possible differences in understanding CES in different regions increase the need for a systematic bundling when assessing perceptions of different stakeholder groups.

Interviewees were guided towards narration, questions were altered and posed following the flow of the interview to cover all relevant aspects. The free narration and sequence set by the interviewees was a precondition for this study: 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 and Atkinson 1996:180) but stress the explorative and heuristic character of our results.

This paper breaks new ground in exploring differing perceptions of CES while highlighting the acknowledgment of dissonances for practical planning processes (e.g. La Rosa et al. 2015). We hope to strengthen effective and comprehensive strategies on management of urban green spaces. Our research aims to contribute to the improvement of effective participation in decision-making. With our methods used, the needs and wants of inhabitants can be included and therewith increase their acceptance of respective programs by laypersons.

Conclusion

In this paper, we have addressed differences and similarities between laypersons' and experts' understanding of urban cultural ecosystem services (*CES*) in Berlin, assessed through the analysis of interviews. We showed a novel methodological combination, leading to an exploratory outcome. Our results suggest that laypersons and experts may not share a common understanding how to use urban green space, 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 CES may contain contrasting perceptions depending on actor groups. Political decision-makers have the responsibility to maintain the provision of CES provided by urban green space as well as for a socially just provision and an equal access for all social groups. We therefore suggest the increased use of social research on the ecosystem service framework within political planning. This would strengthen public participation as well as the information flow between inhabitants and experts, possibly promoting civic empowerment and trust in authorities. Further, it is important to assess ecosystem services on a local or regional scale. If the local or regional assessment is not congruent with management decisions, a place-based and context-specific recommendation cannot be guaranteed. Due to the identified different perceptions, evaluation 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 areas, or different stakeholder groups were included, differences in understanding CES are likely to increase greatly. Further, perceptions of disservices such as crimes on green spaces, pollution etc. could be further assessed. A local specific and multi-methodological study including qualitative and quantitative research should hence be a guideline for CES evaluation.

Appendix

Table 3 Occupational areas of experts

	No.
Berlin Senate Administration for City Development and Environment	7
Berlin Forestry Commission Office	2
Limited Liability Corporations	3
(N)GO or foundations	7
Total expert interviews	19

Table 4 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		
11	77	58:28 min.
12	84	44:41 min.
13	23	12:28 min.
14	33	45:03 min.
15	56	1:12:58 min.
16	35	58:16 min.
17	79	55:44 min.
18	10	n.a.
19	6	n.a.

Table 5 Information on participants of problem-centered interviews

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

Example of an interview guideline

The interview begins with an informed consent about the recording and an explanation about the confidentiality of the interview. Following is a rough and easy to understand description of the first author's project. I therefore are very interested in your valuation of nature here in Berlin.

1. Do you do occasionally trips „into the green" here in Berlin?

   a. Which places do you usually go?
   b. Why do you choose to go to these places? What do you like particularly about these places?
   c. What do you do there?

2. Does your trip differ between ones after work and those on the weekend?

   a. How do they differ?

3. When you consider these places, do you remember more what might be important for you when in nature?

   a. How do you think this is for other people? Are there more reasons why nature would be important for someone?

(Following questions were asked as 'follow up' if the topic (even broadly) has not been covered at all.)

4. Do you think that nature could be a basis for knowledge that you not necessarily learn in school, or similar?

   a. What could be such knowledge?
   b. How is it taught?
5. How do you see weight of nature and research in general?
6. Do you know of instances where nature can inspire?

   a. How is that for you?
7. Is there something in nature that you consider especially beautiful?

   a. Can you described that in detail?
8. Do you personally connect religiosity or spirituality with nature experiences?

   a. Can you describe that in detail??
9. Can you imagine that nature has an impact on relations between humans?

   Example if hesitant: Places on which you can meet; certain behavior

   a. Do you have examples for this? Which would that be?

10. For some a sense of place and nature is connected. Do you think nature as an influence on sense of place?

    a. How is that for you?
11. Do you think that nature has an influence on the impact of cultural assets? With cultural assets I mean here *(return to previously named places by the interviewee, or local examples)*

    a. What kind of cultural assets to you think of spontaneously now?
12. Can you imagine humans of groups that use nature differently?

    a. Do you know of instances here in Berlin?
13. In how far do you need nature for recreation?

    a. Do you do vacation in regions which you value for their nature?

    Introduction Sentence in regard to the place they are living in: You live here rather/very rural/ urban

14. How would you characterize your living area? Rather rural, urban or suburban?

15. Do you identify rather with city life or with rural life?
16. Which influence has your relation with nature on your residence?
17. Have you ever lived in *the center of a big city/ in the suburb of a big city?*

    (If interviewees changed from rural/urban):

18. When you think about the change *rural/urban,* can you think of something which became more important of less important for you in regard of nature?

    a. What is this precisely? Can you describe that?
    b. Can you say, why there has been such a change?
19. Does something else come to mind regarding nature in general or here in Berlin which you want to add?

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