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Perceived Forest Values, Conservation Attitudes and User Conflicts in Urban Forests – A Survey conducted in Bruehl in North Rhine-Westphalia, Germany

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Abstract

Urban forests are associated with various functions. They are areas of recreation as well as valuable ecosystems. Urban forests provide habitats for many animal and plant species and have a positive influence on the regional climate. In this study the variety of functions are described as values which have been classified into three categories: individual use, community good and ecoservices. The Ville Forest near Bruehl, North Rhine-Westphalia was chosen to examine human attitude towards urban forests. A questionnaire was developed to determine which of these values offered by urban forests were perceived by forest visitors and the local public. Therefore, citizens were interviewed in the pedestrian zone of Bruehl and forest visitors at the Ville Forest entrance at Schnorrenberg. The questionnaire was also distributed via e-mail. In addition to determining perceived values, the survey included questions about user conflicts in the forest and attitudes on conservation. It was postulated that women were more conservation friendly than men. The analysis of question 15, “It makes sense to have sensitive habitats within the forest off limits to visitors” revealed gender differences in attitudes towards nature conservation. Thus, our hypothesis was partially confirmed. Furthermore it was expected that individuals who had spent their childhood in a rural area saw more value in urban forests than those who grew up in an urban environment. Data analysis did not confirm this assumption. This might be due to the fact that respondents had difficulties in defining the terms “rural” and “small village”. However, the results of the study showed that many respondents saw much value in urban forests in all three categories, especially individual use and ecoservices. Memories that respondents shared comprised emotional states of relaxation and peace as general values they gained from the urban forest. Survey results illustrate a great amount of information which could be a significant input for future researches related to the impacts of recreational activities on wildlife and social carrying capacity in urban forests.

Introduction

Urban forests consist on a “mix of native, naturalized, and exotic species that have far higher tree diversity than that of the surrounding landscape (Rogers, et. al., 2011).”Urban forests have both structural values and functional values. The former value includes the trees themselves and the consequent costs of replacing them. The latter value refers to the functions that trees perform in the ecosystem (Rogers, et. al., 2011). Urban forests have the following values: place of recreation, aesthetically pleasing, habitat for plant and animal species, increaser of surrounding property value, source of community pride, source of community identity, an open space, educational, place of relaxation, flooding and run off control, provider of oxygen, sequesters carbon dioxide and cleans air of pollutants, place of opportunity for children (Walker, 2004; Grisar et al., 2012).

The purpose of the study is to determine the perceived value of urban forests, attitudes of individuals towards nature conservation and presence of user conflicts. This will allow forest planners to focus management strategies on qualities of the forest that the public is most consciously connected to. The information can also be used as an indicator of aspects of the forest that may need to be developed in order to improve perceived values. A specific hypothesis of this point is; people who grew up in rural environments will perceive a higher overall value of the Ville Forest than the people who grew up in urban environment. Thus, assuming that there is a stronger human-environmental affiliation when there is a permanent contact with natural settings when people grow up. Wilson (1984) holds that there is a "biological base human need to affiliate with life and life processes", this is the basis of what he calls the Biophilia Hypothesis. Kellert (2005) further elaborates that our relationship with nature determines some aspects human identity and personal fulfillment. However, as Kahn (1997) suggests there is a series of concerns regarding how experience, learning and culture shape people's understanding of biophilia.

Additionally, the study analyses attitudes of urban forest visitors and inhabitants towards nature conservation. As Fetene et al. (2012) point out, nature conservation is a basic topic of the environmental agenda, since the outgoing human processes accelerate the loss of biodiversity and enhance ecosystem degradation, thus becoming a major global concern. To that extent, finding a balance between nature conservation objectives and the impacts of recreational activities and society's economic interests, is today's most pressing issue land managers must overcome (Marzano and Dandy, 2012). Regarding conservation a specific hypothesis the study pretends to validate is if women are more accepting of nature conservation methods at urban forest than men. Since several constituents of environmental sociology and ecofeminist research assert that given social, cultural, structural, and biological reasons women are more active than men; and therefore, more environmentally aware (Tindall et al., 2003). Sodhi (2010) asseverates that "understanding the role of gender in human's relationships with natural resources is one of the precursors to more sustainable management of the environment". She certainly has a point, there is strong evidence that women have greater conservation attitudes and concern over potential environmental risks than their male counterparts (Jackson, 1993; Blocker and Eckberg, 1997; and Tindall et al., 2003, Hunter et al., 2004). For instance, Tindall et al. (2003) point out that there is a larger representation of women in environmental organizations; and consequently, they are more willing to lead environmental movements.

Furthermore, this social study seeks to identify if user conflicts are occurring in the forest and, if they are, which users they are between. Being a public place, urban forests are visited by individuals with different recreational purposes. Presence of many different users can lead to occurrence of conflicts between them. According to Hunter (2003) urban forests have greater "conflict potential" than forests in general due to higher concentration of visitors with various recreational demands. The study will determine which activities visitors pursue in the urban forest and between which groups of users conflicts occur. This information will help forest authorities to identify existing conflicts and focus on user conflict resolution and sustainable forest management considering specific preferences of each group of users.

To that end, this paper is divided in four sections. The first part describes the method use in the present study, how the data was collected, the process of establishing the questionnaire and the selection of the statistical test to prove the hypotheses. The following section elucidates the most important findings of the survey, information supported with some figures and tables. The third section discusses each of the dimensions studied: perceived forest values, conservation attitudes and user conflicts at Urban Forests; moreover identifies strengths, weaknesses and proposes recommendations for future studies. The last part consists of the appendix section, where the survey and some tables extracted from the Excel spreadsheets can be observed.

Methods

Data was collected using questionnaires. The questionnaires were completed by individuals at Schnorrenberg, Ville Forest and the pedestrian zone in Bruehl with the assistance of an interviewer. These questionnaires were filled in on October 26, November 9, and December 6, 2013 at Ville Forest, and on November 2, and November 5, 2013 at Downtown Bruehl. Questionnaires were also completed online by being sent to the e-mail addresses from the 50 Thousand Trees Initiative's e-mail database and the surveyors' personal e-mail lists. Online surveys were completed from October 25 until November 16, 2013. The total sample size was 117 (N=117).

Initially a target audience for the survey was the Ville Forest visitors and people who have visited the Ville Forest at least once, for this reason the original version of the questionnaire makes reference to "Ville Forest". Later, in order to increase a sample size it was decided to broaden our area of research and consider urban forests in general. Thus, the results of this survey and recommendations provided can be applicable to other urban forests with characteristics similar to those of the Ville Forest in Germany. The Ville Forest in Bruehl, North Rhine-Westphalia, is a part of the Naturpark Rheinland, an urban forest located between Cologne and Bonn. This forest represents an important destination for recreation in the Rhein-Erft District as well as an

integral part of the regional project for the development of the third green belt of Cologne (Grisar et al., 2012).

The questionnaire comprised two pages and consisted of five identification questions, two user conflict multiple choice questions, ten questions completed using a Likert scale, one short answer question, and one question that asks if the participation would like to be involved in a follow study (see appendix for questionnaire). The questions related to user conflicts where derived from another survey applied in Wuppertal and developed at Bochum University (2010). The questionnaires were made available in both German and English.

The identification questions asked the surveyed person their gender, age, how they would describe where they grew up, how they would describe where they live currently, and how they spent their time in urban forests. All of these questions were multiple choices. These identification categories were used to stratify and interpret the received data.

The next two questions regarded user conflicts in urban forest. These were multiple choice questions that sought general insight into whether urban forests users perceived any user conflicts and how they thought they could be resolved. This information was gathered for the purpose of forest management planning.

Based on Walker (2004) and Grisar et al., (2012) values of a park, i.e. place of recreation, aesthetically pleasing, habitat for plant and animal species, increaser of surrounding property value, source of community pride, source of community identity, an open space, educational, place of relaxation, flooding and run off control, provider of oxygen, sequesters carbon dioxide and cleans air of pollutants, and place of opportunity for children. It was summarized that values could be categorized into three dimensions relevant for the study: individual use, community good, and ecoservices. Six statements were devised two focusing on individual use values, two focusing on community good values, and two focusing ecoservices values (See table 1).

The aforementioned statements were evaluated using the Likert scale. The Likert scale was chosen because it is a "usual questionnaire approach to measure urban green spaces attitude" and can be used to "operationalize the attitude construct" (Balram and Dragicevic, 2005). For this Likert scale we presented the six statements where the interviewee must decide if they (1) Strongly Disagree, (2) Disagree, (3) Neither Disagree nor Agree, (4) Agree, (5) Strongly Agree (Vegas, 2006). Points were assigned to each statement of the Likert scale; strongly disagree is 1 point, disagree is 2 points, neither disagree nor agree is 3 points, agree is 4 points, and strongly agree is 5 points.

Table 1. Statements Associated with Values

Value:	Individual Use Value	Community Good Value	Ecoservices Value
1st Statement:	The Ville Forest is a good place to relax.	The Ville Forest improves the quality of life in your cuty	The Ville Forest provides clean air to the city.
2nd Statement:	In The Ville Forest, many recreational activities can take place.	Having Ville Forest in Brühl increases property values .	Many plants and animals live in The Ville Forest.

In addition to the value questions on the Likert scale, there are three questions on nature conservation attitudes and one on frequency of visits to urban forests. These questions were used to determine how willing users of urban forests were to accept basic methods of nature conservation at this location as well as to identify park visitation practices.

The Likert scale analysis was used to show respondents attitude towards individual items of the questionnaire. Thus the analysis method for ordinal measurement scale can be chosen. The ordinal data scale shows that one variable is greater than another, however, does not imply how much greater (Boone, 2012). The analysis procedures for these types of scales were: median for central tendency, frequencies of response in each category for variability (Velleman and Wilkinson, 1993).

Results of the questionnaires were tested for randomization using a non-parametric Mann -Whitney U test. The test allows us to compare responses of two samples (Clark-

son and Dormody, 1994). We have chosen the Mann Whitney because this statistic method is well-suited for studies which use the Likert scale data, since it cannot be assumed that the underlying population fits a normal distribution. The test requires two statistically independent samples and ordinal observations (Bertram, 2007). According to Nachar (2008) the Mann-Whitney U test null hypothesis (H_0) assumes that two populations are homogeneous, alternative hypothesis H_1 suggests that the first population differs from the second population.

Our analysis aims to test if there is a tendency in conservation attitudes of men and women. Therefore, one-tailed Mann-Whitney test should be chosen. One-tailed test alternative hypothesis (H_1) implies that “dependent variable measurements” of the first population (women in our case) are “significantly larger than those of the second population” (men in our case) (Nachar, 2008). Median of two populations can be compared in order to test null hypothesis and see if there is a tendency in the answers from both populations (Nachar, 2008). According to Quinn and Keough (2002) in order to accept or reject a null hypothesis probability (p-value) should be compared with chosen significance level, if the probability to obtain the value is smaller than significance level the null hypothesis should be rejected. We have chosen a significance level of 0.05, which is commonly used in social sciences. Moreover, a "significance level of '0.05', for example, indicates that the result is extreme enough as to have a 95% probability of appearing if the null hypothesis were true" (Noymer, 2008).

For the analysis of the hypothesis with the Mann-Whitney U test we used various sources. On the one hand, we used two online calculators in order to improve the efficiency of our analysis: the website Social Sciences Statistics developed by Jeremy Groomberg (2013)[1], and Mann-Whitney U test[2] developed by Leon Avery (2007): and on the other hand, we performed a manual random check of one of the questions in

[1] The online calculator is located at http://www.socscistatistics.com/tests/mannwhitney/Default.aspx, accessed 18.12.2013

[2] The online calculator is located at http://elegans.som.vcu.edu/~leon/stats/utest.html, accessed 18.12.2013.

Excel using a test tutorial from the Youngstown State University[3] in order to prove the accuracy of the online calculators. The random test proved that these are precise[4].
We used this statistic method to test the following hypotheses:

1. Women are more accepting of nature conservation methods at Urban Forests than men.
2. Individuals who grew up in rural environments will perceive a higher overall value of urban forests than those who grew up in urban environment

For Hypothesis 1 we tested questions 15, 16 and 17 which are related to conservation attitudes, and for Hypothesis 2 we tested from question 9 to 14, regarding values.

The short answer question was evaluated using key words to determine if it could be sorted into one of the three value categories. Common memories where characterized by finding the most typically used words within the answers. Words were counted using wordcounter.com. Pronouns and small words, such as *it* and *as*, were removed for the count. Words were grouped using their root word. If the original memory was recorded in German, it was translated to English before being used in the word counter.

Any emails provided in question eight of the questionnaire was organized into an e-mail database for future research use of Urban Forests.

[3] The tutorial is located at http://people.ysu.edu/~gchang/SPSSE/SPSS_WilcoxonRankSumTest.pdf, accessed 18.12.2013

[4] All these data can be doubled check in the Excel spreadsheets where the statistical analysis was performed.

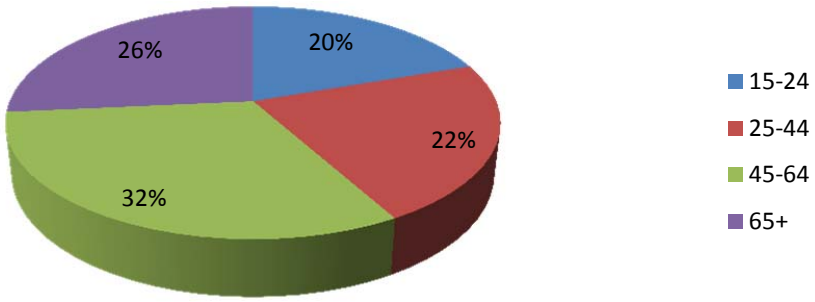
Results

General information (questions 1-5)

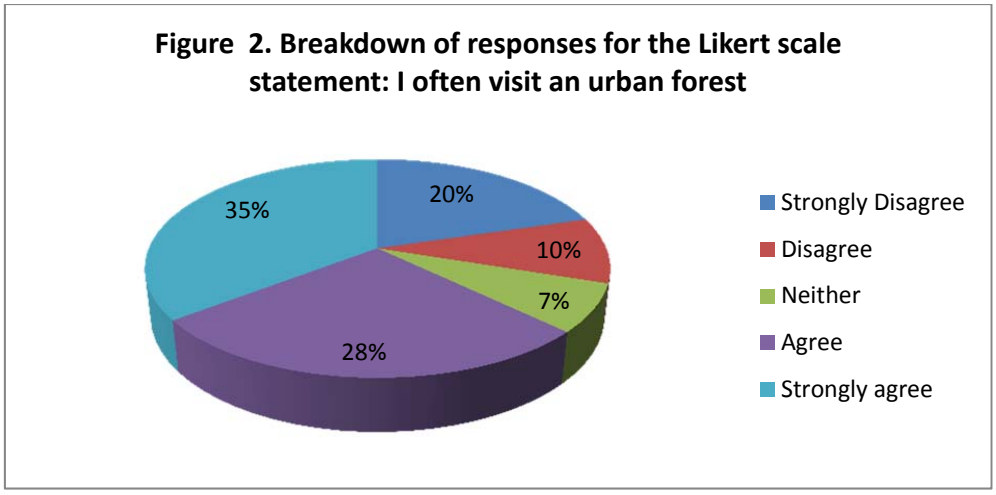
Analysis of identification questions of the survey showed that 52 % of respondents were female and 48% are male. Majority of the respondents (about 32%) were between 44 and 64 years old. Other age groups were represented almost equally (see Figure 1).

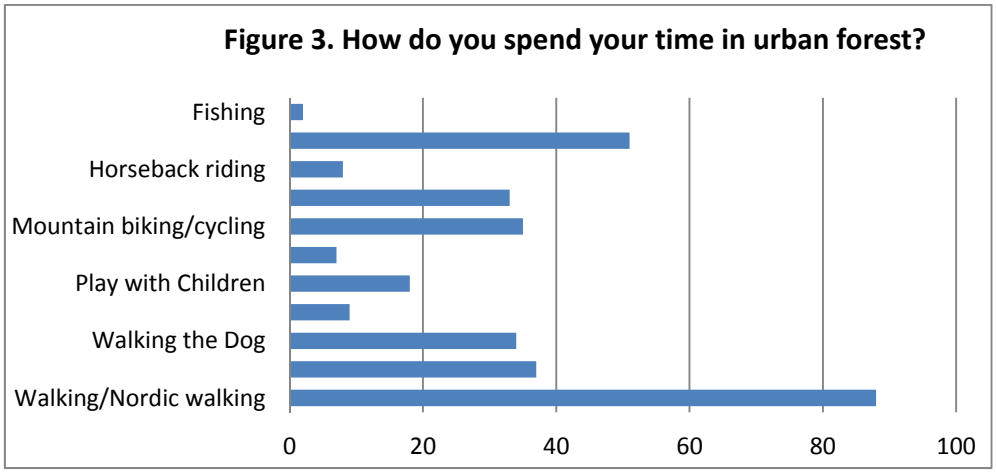
According to the survey results 46% of respondents grew up in urban, 34% in suburban and 20% in rural areas, 60% of the respondents identified their current living area as urban.

Figure 1. Age of the respondents



More than half of the respondents would admit that they visit an urban forest often. The distribution of reactions on the statements about frequency of the forest visit is shown on the figure 2.





Regarding the activities that respondents pursue in an urban forest, the major user groups were people going to a forest for a walk and Nordic walking (75,2 %). Other groups of forest visitors include hikers (43,6%), nature watchers (31,6%), bicyclists and mountain bikers (29,9%), dog owners (29,1%) and joggers (28,2%). The least represented user group was fishers (1,7%). Figure 3 shows distribution of the activities respondents pursue in an urban forest.

User conflicts (questions 6 and 7)

Only 30% of the respondents said they were disturbed by other visitors during their forest visit. These respondents identified that conflicts often occur with bicyclists and mountain bikers. 22,2% of the respondents have pointed out this group of users. Visitors with dogs cause conflict situations for 19,7 % of the respondents. Disorderly visitors in a forest disturb 5,1% of the interviewees, visitors with children about 3% of the respondents (see Figure 4). Some respondents also mentioned that garbage and cars cause discomfort in the forest.

Figure 4. With which user group have conflicts occurred?

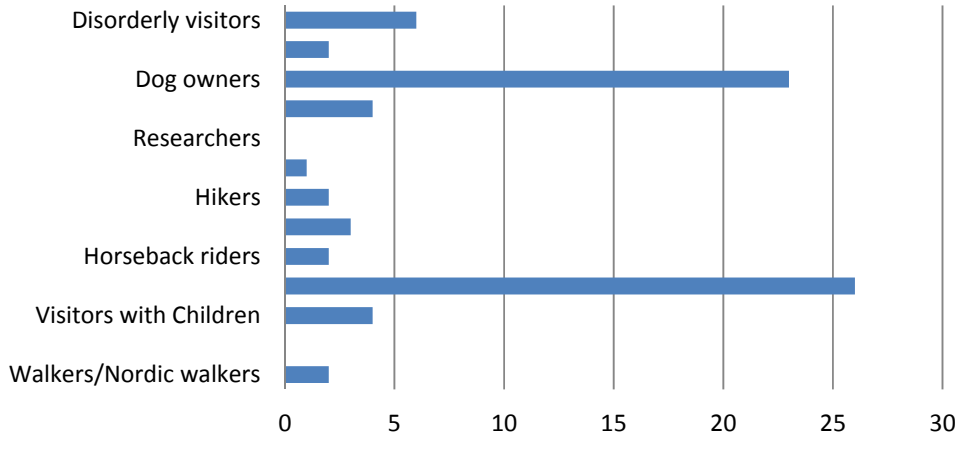
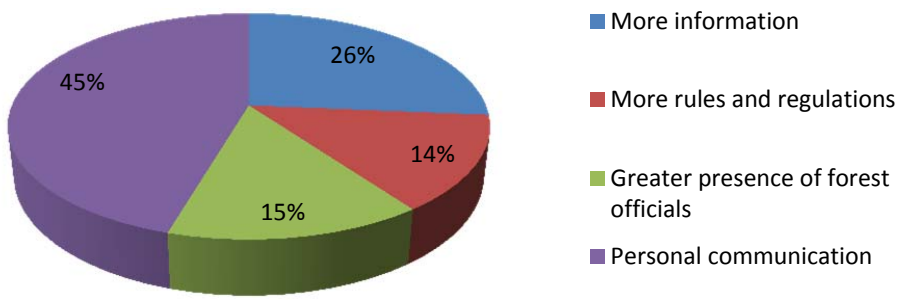


Figure 5. Distribution of answers on the question: how user conflicts can be solved in the future?

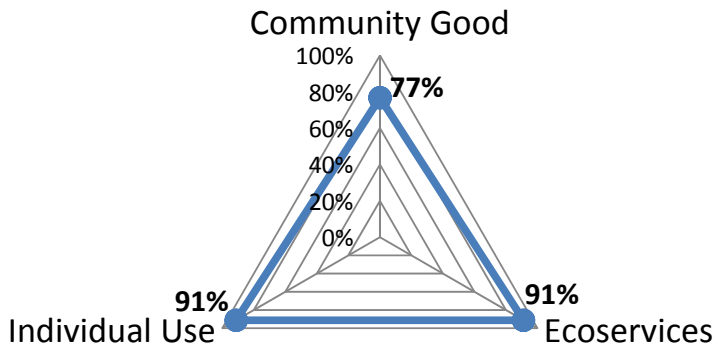


The majority of the respondents assumed that user conflicts can be in the future solved by personal communication (45, 5 %). About 26% of the respondents see the solution in more information provided. The rest of the respondents believe that conflicts can be solved by more rules and regulations and greater presence of forest officials (see Figure 5).

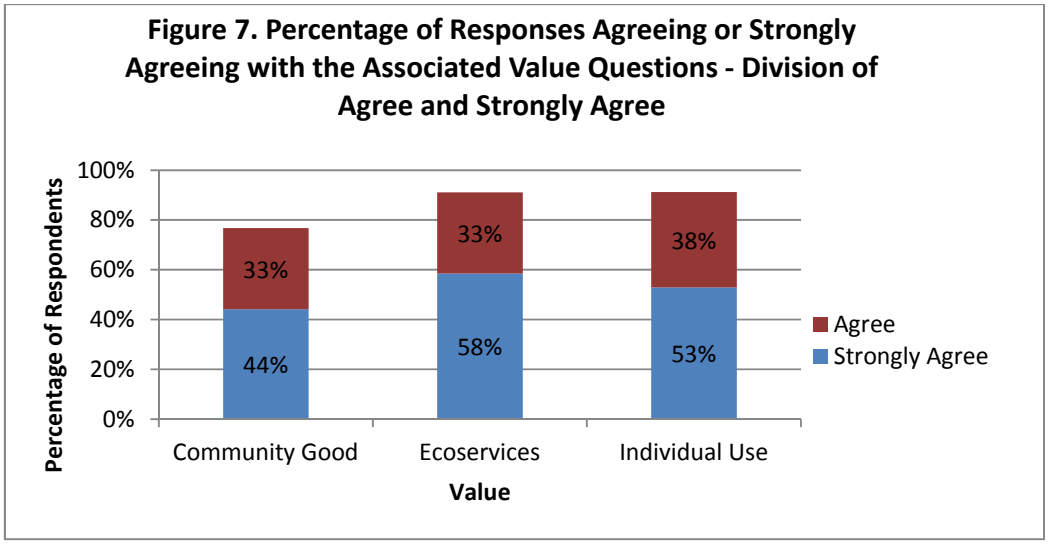
Urban Forest Values (questions 8-14)

Value questions on the Likert scale show that 91% of respondents either agreed or strongly agreed with the individual use value questions, 91% of respondents either agreed or strongly agreed with the ecoservices value questions, and 77% agreed or strongly agreed with the community good value questions (see Figure 6).

Figure 6. Percentage of Responses Agreeing or Strongly Agreeing with the Associated Value Questions



This is based on the average of percentage of respondents for both questions for each value. As the division of agree and strongly agree responses is graphed (see Figure 7), the data shows that the majority of respondents for all values was strongly agree.



The complete breakdown in responses for each of the values is seen in figure 8. This figure takes into account the responses of neither disagree or agree, disagree, and strongly disagree of respondents to value questions. As seen in the previous figures 6 and 7, the greatest majority of the responses was strongly agree. It is also noticed from these neutral and negative responses, the trend lays to the neither rather than the negative.

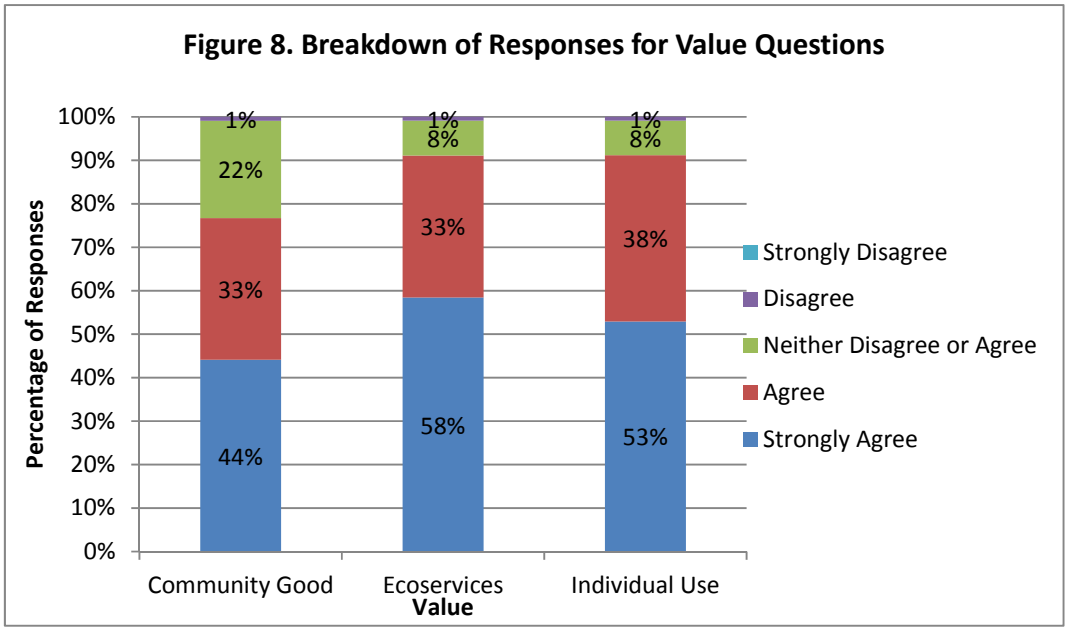


Table 2.11 Most Prevalent Words

from Memories	
Word	**Frequency**
nature	16
relax	12
walk	12
forest	9
beautiful	6
silence	5
peace	5
dog	5
feel	5
experience	5
recreation	5

The majority of the respondents - 87 out of 117 - shared their memory or thought about urban forest in question 18. Some of the memories were expressed just with single words. Some of them included a story or description of an event. The results of the memories show the two most common words from the memories, after *nature*, were *relax* and *walk*. Other prevalent words were; *forest, beautiful, silence, peace, dog, feel, experience*, and *recreation* (see Table 2).

The second hypothesis (H_2) "people who grew up in rural environments will perceive a higher overall value of urban forests than the people who grew up in urban environment" is part of this section. The Mann-Whitney test has been performed for the statements 9-13 to test this assumption. The results showed that p value is less than the significance level α only for the statement 12 “Having Ville Forest in Bruehl increases property values”. Thus, only for this question the result is significant (N_{rural} = 22, N_{urban} = 50, p = 0,007). For questions 9, 10, 11 and 13 the p value is not significant (N_{rural} = 22, N_{urban} = 50, p > 0,05) and, therefore the hypothesis should be dismissed.

Conservation Attitudes (question 15-17)

As it was mentioned in the methods section, two hypotheses have been tested during the data analysis. The first hypothesis was that women tend to have greater nature conservation values that men. Answers on the questions 15, 16 and 17 have been analyzed with the Mann-Whitney U test in order to prove or reject this hypothesis.

For the questionnaire statement 15 of the Likert scale “It makes sense to have sensitive habitats within the forest off limits to visitors” it was assumed that women are more conscious about protecting sensitive habitats in an urban forest than men. The null hypothesis H_0– attitudes of men and women regarding the statement 15 are the same, H_1 - women tend to express greater environmental conservation attitudes than men. The results received after running Mann-Whitney U test are shown in the Table 3 in the appendix. The mean of ranks for population “women” is higher than for men. Thus, we can assume that the median for the first population is larger than those for the second population. Calculated p-value is smaller than the significance level α. This supports that the result is significant (N_{women}= 58, N_{men}= 54, p=0,016) and the hypothesis H_1 is true.

Likert scale statements 16 “I can pursue my hobbies in the forest without disturbing protected areas” and 17 “One important goal of nature conservation is the maintenance of urban forests and green spaces” have been analyzed in the same way. The results are represented in tables 4 and 5 in the appendix. For the statement 16 and 17 p-value was found to be higher than the significance level α (Question 16: N_{women}= 58, N_{men}= 54, p>0,05; Question 17: N_{women}= 58, N_{men}= 54, p>0,05). Therefore, H_1 should be rejected for both statements.

Statistics for the questions 16 and 17 also shows that majority of women and men agree or strongly agree with the statements (see figure 9 and 10).

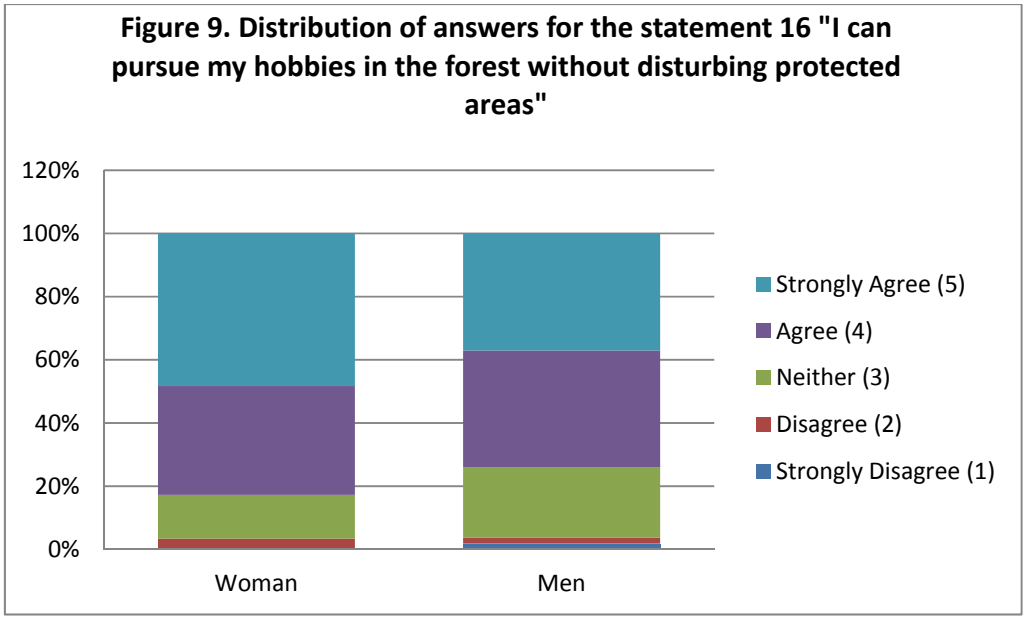


Figure 9. Distribution of answers for the statement 16 "I can pursue my hobbies in the forest without disturbing protected areas"
120%
100%
80%
60%
40%
20%
0%
Woman
Men
Strongly Agree (5)
Agree (4)
Neither (3)
Disagree (2)
Strongly Disagree (1)

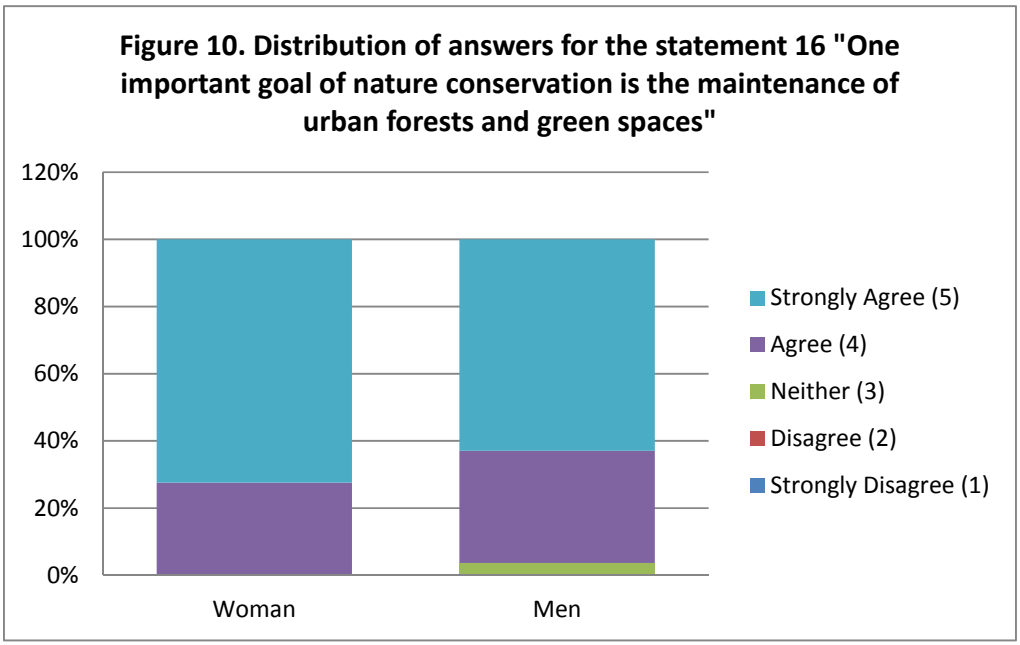


Figure 10. Distribution of answers for the statement 16 "One important goal of nature conservation is the maintenance of urban forests and green spaces"
120%
100%
80%
60%
40%
20%
0%
Woman
Men
Strongly Agree (5)
Agree (4)
Neither (3)
Disagree (2)
Strongly Disagree (1)

Discussion

The analysis shows that our sample was mainly represented by respondents of middle age or older (58%). The age group least involved in the research was younger people in the age from 15 to 24. During the research at the Ville Forest and in the pedestrian zone in Bruehl it was noticed that people from this age group seemed to have less interest in the survey and rejected to participate more often.

The analysis shows that there is a high diversity of recreational activities that take place in the forest. All user groups suggested by the authors in the questionnaire were represented. The majority of the respondents prefer walk, hike and watch nature in the forest. “Walkers” was the most dominant user group. It might also be the case that walkers and nordic walkers were combined into one group of users in the survey and therefore received the most answers.

The results from this study show a majority of visitors have not experienced a user conflict. At the same time the visitors who were disturbed during a forest visit could identify major groups of users with which conflicts occur. According to the survey results, the most disturbing were bicyclists, mountain bikers and visitors with dogs. Taking into account that the major forest visitors are walkers, it is possible to conclude that they are mainly involved in conflicts with disturbing user groups. A common answer to resolve conflict is that it be dealt with via personal communication. Many visitors, however, would like to have more information about the use of urban forests. A presence of forest staff should also not be underestimated. The results also display that “respondents are very susceptive when their personal minimum requirements for space are violated by the presence of others in close distance” (Arnberger and Haider, 2005).

Taking into account that dog owners, walkers and bicyclists are the user groups perceived as being the most conflictive, carrying out management strategies to decrease the potential conflicts among users is key, and the information regarding user conflicts gathered during the survey can be valuable for forest management. Arnberger (2006) suggests some options that could help to reduce conflicts through the creation of additional measures such as designating trails outside the forests, setting one way

systems for bikers, limiting speed and keeping dogs leashed may contribute to that aim. Nevertheless, as already mentioned the results indicate users emphasize the importance of strengthening communication rather than just establishing more rules or monitoring from forest officials. Thus, creative and less-costly campaigns could be focused on enhancing communication and providing more information, through social media and workshops.

The analysis of the questions referring to perceived values were conclusive. It was determined that the values that are perceived by the greatest number of people are individual use and ecoservices. The value perceived by the fewest amount of people was community good. However, all three of the values were perceived by a high percentage of participants. 91%, 91%, and 71% agree or strongly agreed that ecoservices, individual use, and community good values existed, respectively. This information can be used for campaigns to protect or preserve urban forest in two ways. Firstly, a campaign could play on the already well-established perceived values of ecoservices and individual use to convince Bruehl citizens to become involved. The other way to use this information would be to try to increase awareness about the community good value for the forest. This technique could be particularly well received as most of the respondents who did not agree or strongly agree with the value choose neither agree nor disagree (22%), as opposed to disagree or strongly disagree (1%). This suggests a lack of awareness of the value rather than a strong feeling in the opposite direction.

A stronger insight in to the specific characteristics from the values that people perceived can be gathered from the memories respondents shared. *Relax* and *peace* seemed to be theme of a value people see in forests. This would be an individual use value. This value could be directly contributed to the characteristic that the forest is near a city so people can take a break from busy city life very quickly and easily. This theme continues with the common word *silence*. Other individual use values that come up were the forest as a place for recreation, walking, and walking the dog.

Ecoservice values were described as seeing plants, animals and the beauty of nature.

A memory that stuck out from the bunch as being a memory that was a community good value was when one participant said that they choose to move to Bruehl specifically to be close to Ville Forest.

Analysis of the first hypothesis shows that women tend to appreciate an importance of separating sensitive habitats from common space in a forest. At the same time, it does not seem obvious that they also tend to pursue their hobbies in the forest without disturbing protected areas or admit the importance of maintenance of urban forests for the goal of nature conservation. The graphical analysis shows that both women and men admit an importance of maintenance of urban forests for nature conservation. They both believe to pursue their activities in urban forests without disturbing sensitive habitats.

Regarding the second hypothesis there was no conclusive evidence to support the statement "people who grew up in rural environments will perceive a higher overall value of urban forests than the people who grew up in urban environment". However, it is important to mention that there was a significant larger number of respondents who grew up in urban areas. This could have generated a margin of error that affected the results. Furthermore, according to Kellert (2005) "the presumption that only the materially advantaged and conveniently located can realize nature's value represents an arrogant characterization".

Strengths, Weaknesses and Recommendations for future studies

There exists possible weakness in the study. One observed weakness was that respondents to the questionnaire often had a hard time defining where they lived and grew up. The confusion was between the terms “small village” and “rural” in question number 3 and 4. This problem could be mitigated in the future by using slightly different vocabulary, such as suburbs instead of small village, or by quantifying the categories with a population range. Another question that caused confusion during interviews was question number 8, “I visit the Ville Forest often.” In future studies this question could be quantified to a number of visits per week or month. However the opinion value of going “often” can also be useful in its own right. For example, in a campaign to protect Ville

Forest the support of someone who considers themself to go often, at once a month, is just as valuable as someone who considers them self to go often at three times per week.

During the assessment of results it was noticed that question 16, the conservation question “I can pursue my hobbies in the forest without disturbing protected areas” tend to vary in answer from trends seen in answering the other conservation question 15. The question was initially designed to imply that those who think they can be in the forest without disturbing protected areas would be the most conservative minded Ville Forest visitors. Considering the range in answers for this question it seems that it is also possible many conservative minded visitors feel guilty or at least conscious that their presence in the forest would always create some impact to protected areas. This could be one of the reasons why during the hypothesis 1 testing there was no conclusive statistical evidence of women having greater conservation attitudes than men, unlike what the theoretical framework describes.

The Mann-Whitney U test has many strengths[5], as well as some limitations. For instance, Nachar (2008) argues is his publication *The Mann-Whitney U test: a test for assessing whether two independent samples come from the same distribution that some methods* "that calculate a numerical value by using random or probabilistic processes, it was shown that the t-test is most of the time more powerful than the U-test. Hence, some of the data analyzed in the present document is subject to a margin of error. Furthermore, it is contended that non parametric methods are inappropriate to use with lots of tied ranks

In future studies using questionnaires it is recommended that some of the more ambiguous questions, particularly in questions designed to describe the demographic of the respondent, as opposed to the opinions of the respondent, be more quantifiable instead of qualitative. The length of the questionnaire seemed to be generally accepted with only a few complaints of it being too long in length. It is recommended that questionnaires in future studies remain this length or shorter. To get a more advanced

[5] As described in the method section.

perspective on the thoughts of forest visitors on a specific topic, such as user conflicts, this will mean that the questionnaire will need to be specific to just one topic and not include the larger overview.

Additionally, in further studies it is recommended to analyze how, why and between which user groups conflicts occur. In some studies, video observation was used to collect long-term data about forest visitors (Janowsky & Becker, 2003; Arnberger & Eder, 2007).

The survey results illustrate a great amount of valuable information which could be a significant input for future researches related to the impacts of recreational activities on wildlife and social carrying capacity in urban forests, for instance. Then, several questions that include an integrative analysis of how the social and ecological processes affect each other and the opportunity of broadening the scope for future studies arise. Identifying these aspects could help to recognize what kind of recreational activities have the most negative impacts and how to address awareness campaigns for conservation. Another aspect of this study that is most recommended for future research would be conservation attitudes for Ville Forest.

Appendix I

Questionnaire **Name of case handler**_____

Urban Forests: **Date**_____

perceived values, conservation attitudes, user conflicts **Serial Number**_____

Please do not write above this line

Date_____

1. Gender: Male ☐ Female ☐

2. Age: 15-24 ☐ 25-44 ☐ 45-64 ☐ 65+ ☐

3. How would you describe the place where you spent your childhood :

Urban ☐ Small Village ☐ Rural ☐ Don't Know ☐

4. How would you describe the place where you live today:

Urban ☐ Small Village ☐ Rural ☐ Don't Know ☐

5. How do you spend your time in the Ville Forest (check all that apply):

Walking/Nordic Walking ☐	Picnicking ☐	Playing with Children ☐
Mountain Biking/Cycling ☐	Horseback Riding ☐	Jogging ☐
Hiking ☐	Watching Nature ☐	Researching ☐
Fishing ☐	Walking the Dog ☐	Other: _____

6. Has there ever been a user conflict during your visit to the Ville Forest i.e. A user(s) disturbed your activities while at the forest:

Yes ☐ No ☐

If yes, with which user group have conflicts occurred (check all that apply):

Walkers/Nordic Walkers ☐	Picnickers ☐	Visitors with Children ☐
Mountain Bikers ☐	Horseback Riders ☐	Nature Watchers ☐
Hikers ☐	Joggers ☐	Researchers ☐
Fishers ☐	Dog Owners ☐	Forest Workers ☐
Disorderly Visitors (Loud music/drunk) ☐		Other: _____

7. How can user conflicts be solved in the future:

More Information ☐ More Rules/Regulations ☐ Greater Presence of Forest Officials ☐

Resolved with Personal Communication ☐ Other: _____

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Serial Number_____

Please complete the following statements (#8-17) by checking below the corresponding box :

Statements	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
8. I often visit Ville Forest	☐	☐	☐	☐	☐ ___*
9. Ville Forest improves the quality of life in Brühl	☐	☐	☐	☐	☐
10. Ville Forest is a place I can go to relax	☐	☐	☐	☐	☐
11. Ville Forest provides clean air to Brühl	☐	☐	☐	☐	☐
12. Having Ville Forest in Brühl increases property values	☐	☐	☐	☐	☐
13. In Ville Forest many recreational activities can take place	☐	☐	☐	☐	☐
14. Many plants and animals live in Ville Forest	☐	☐	☐	☐	☐
15. It makes sense to have sensitive habitats within the forest off limits to visitors	☐	☐	☐	☐	☐
16. I can pursue my hobbies in the forest without disturbing protected areas	☐	☐	☐	☐	☐
17. One important goal of nature conservation is the maintenance of urban forests and green spaces	☐	☐	☐	☐	☐

18. Please share a memory of Ville Forest in the space below: _____

19. Would you like to provide more of your thoughts on Ville Forest in the future? (If yes, please provide your name and email)

_____

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Appendix II

Table 3.Results of the Mann-Whitney hypothesis 1 testing. Statement 15 “It makes sense to have sensitive habitats within the forest off limits to visitors”

Test statistics

Mann-Whitney U	1197,50
Z score	2,1428
p-value	0,0162

Ranks

Population	N	Mean of Ranks	Sum of Ranks
Women	58	62,85	3645,5
Men	54	49,68	2682,5

Table 4.Results of the Mann-Whitney hypothesis 1 testing. Statement 16 “I can pursue my hobbies in the forest without disturbing protected areas”

Test statistics

Mann-Whitney U	1353,00
Z score	1,2374
p-value	0,1075

Ranks

Population	N	Mean of Ranks	Sum of Ranks
Women	58	60,17	3490
Men	54	52,56	2838

Table 5.Results of the Mann-Whitney hypothesis 1 testing. Statement 17 “One important goal of nature conservation is the maintenance of urban forests and green spaces”.

Test statistics

Mann-Whitney U	1402,00
Z score	0,9520
p-value	0,1711

Ranks

Population	N	Mean of Ranks	Sum of Ranks
Women	58	59,33	3441
Men	54	53,46	2887

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