

Technische Universität Dresden
International Institute Zittau
Chair of Ecosystem Services
Professor Dr Irene Ring

Internship Report

German Centre for Integrative Biodiversity Research, Leipzig, Germany

5 March 2018 – 6 April 2018

Seminar paper submitted by : Nur Liyana Binti Mat Nayan
Master Programme : Ecosystem Services
Module : Ecosystem Services in Practice – Basics
Semester : Summer 2018
Matrikel-No : 12175
Address : 0103 Schliebenstraße 27/D, 02763 Zittau
Email address : nur_liyana_binti.mat_nayan@mailbox.tu-dresden.de
Date of submission : 3rd May 2018

Contents

Introduction.....	1
Project.....	2
Methodology	5
Reflections	10
References.....	12
Annex.....	14

List of Abbreviations

ART	Attention Restoration Theory
BI	Biophysical indicators
CES	Cultural Ecosystem Services
EP	H2020 ECOPotential
EU	European Union
iDiv	German Centre for Integrative Biodiversity Research
NP	National Park
UFZ	Helmholtz Centre for Environmental Research
WP	Work Packages
ESS	Ecosystem Services
MENE	Monitor of Engagement with the Natural Environment
PRS	Perceived Restorativeness Scale

Introduction

Over the course of March through early April of 2018, I participated in a five weeks long internship with the German Centre for Integrative Biodiversity Research (iDiv) in Leipzig, Germany. iDiv is a research centre run and managed in cooperation with 11 consortiums science institutions. The centre provides an establishment for researchers from over 30 countries to conduct their scientific endeavours focusing primarily on the sustainable management of Earth's biodiversity.

There are nine core groups of iDiv which include Biodiversity Conservation, Biodiversity Synthesis, Ecosystem Services (ESS), Evolution and Adaptation, Experimental Interaction Ecology, Molecular Interaction Ecology, Physiological Diversity, Spatial Interaction Ecology, and Theory in Biodiversity Science. Each of the core group conducts significant projects and experiments which provide support and information for decision-makers to reach a viable solution for the current biodiversity crisis.

I chose to work with the ESS team led by the Head of Research Group Professor Aletta Bonn. My engagement with the team began a few months prior through reading and researching about the group's various interesting works. The research group specializes in the field of ESS and its linkages within biodiversity conservation in addition to human well-being ("Core Group - Ecosystem Services," n.d.). The group current research mainly encompasses three connected themes; assessing spatial-temporal distribution of biodiversity and ESS, analysing interrelationship between biodiversity and ecosystem function processes, and developing tools and strategies to preserve and conserve biodiversity and ESS.

iDiv is a partner institution to the Helmholtz Centre for Environmental Research (UFZ), a leading scientific institution which conducts research on sustainable use of natural resources. I chose to carry out my internship here to gain real-life experience of working in the academia field, specifically being a part of an environmental research academy. I am looking not only to be a part of a real-world project and enhance my working experience, I was also eager to see what skills and knowledge I could contribute. The projects conducted in the ESS group are very much closely related to the topics we learn in our master's program, such that to understand connections and implication between human and nature's services and discovering the comprehensive value of Earth's ecosystem.

Project

For my internship, I worked under the supervision of Dr Emilie Crouzat. Dr Crouzat is one of the research members of a European Union (EU) funded, large scale H2020 ECO-POTENTIAL (EP) project. Commenced in 2015, EP is a four-year long project which seeks to improve the ecosystem conditions through Earth's observation. It is one of the largest EU funded projects on ecosystem, with 47 partners and 23 protected areas covering all biogeographic regions in Europe.

Technical data that are obtained from geo-spatial information can be synthesized with interpretation tools for decision-makers to plan knowledge-based conservation and restoration policies. All the model results and data will be made readily available to the public using open platforms. EP project covers the entire chain of ESS, through;

- a. Developing ecosystem data services, particularly with Copernicus, the EU's Earth Observation Programme which provides satellite information and in-situ data
- b. Implementing model output services to distribute the result of modelling activities
- c. Estimating current and future ESS and benefits, combining ecosystem supply and demands ("Ecopotential-project," n.d.).

The project mainly focuses on a set of targeted Protected Areas around Europe, specially focussing on mountains, semi-arid to arid regions, and coastal to marine ecosystems. They conduct spatial assessments by remote sensing, data analysis and modelling to observe current and future conditions of the ESS. The project also examines geosphere-biosphere interactions, the dynamics of landscape-ecosystem at both regional and national scales using geostatistical methods and other contemporary methods in Macrosystem Ecology and Earth Critical Zone studies, in the pursuit to address long-term and large-scale environmental challenges.

Each of the designated protected areas contains unique environmental condition and provides significant ESS. For instance, the Kalkalpen National Park (NP) which is situated in the Austrian Limestone Alps is studied for its representation of the montane forest belt on limestone bedrock of the European Alps. A large area of the region is still mostly unaffected by major human disturbance and provides habitat for many endemic species that represent about one third of all plant species in Austria. A significant ESS provided by the area is the provisioning of water, where 50% of drinking water resources for the Austrian population are

derived from the region, and the provisioning of mountainous recreation area of avid hikers and campers (“Austrian-limestone-alps,” n.d.).

The EP project is structured into 12 work packages (WP) that contain different sets of themes lead by different task leaders. The survey, which focused on assessing the CES over three NPs contributed to the twelfth WP; “Capacity building and knowledge exchange”. CES remains under-assessed and challenging in terms of quantification, economic valuation (Rewitzer, Huber, Grêt-Regamey, & Barkmann, 2017), and in geospatial mapping (Nahuelhual, Carmona, Laterra, Barrena, & Aguayo, 2014).

Data on CES over the NPs is produced through a three-way approach;

- a. Through software geophysical modelling, to map the potential supply of CES based on a set of biophysical proxies; mapping elevations, ground covers, tree coverages and other geographical characteristics in the three designated national parks
- b. Through consultation with local experts, to understand the actual use of CES and their drivers, by hosting focus group meetings for managers and representatives of interest groups for the national parks
- c. Through field work, to validate the actual use of CES, by carrying out surveys with the visitors in the protected areas and by using a mobile app for visitors to map the benefits from CES in the park.

The internship assisted to the setting up of questionnaire that will be used in the summer of 2018 in three NP; Kalkalpen NP in Austria, Swiss NP in Switzerland and Peneda-Gerês NP in Portugal. It must be noted that technically, survey and questionnaire differ in that questionnaires do not use the aggregation of data for statistical analysis but instead used to gather information for a single individual. However, the two terms were used interchangeably.

Ecosystem demand is defined as the “amount of a service required or desired by society” while ecosystem supply refers to the “capacity of the structures and processes of a particular ecosystem to provide a specific bundle of ESS within a given time period” (Mouchet et al., 2014). In short, ecosystem demand is what people seek out and supply is what the ecosystem offers. Ecosystem flow would then be the actual use of the ESS which can be measured directly or indirectly. The flow is not necessarily balanced, as more often than not, demand for services may exceed the ability of the ecosystem to continually function and provide.

Mouchet et al. (2014) also added that ESS may be observed as a set that appear together repeatedly, or “bundles”, and may be positively or negatively associated.

The questionnaire seeks to understand i) the motivations of individuals to visit the place, ii) the actual activities and locations enjoyed as well as the CES associated and iii) the benefits people obtain from the ecosystems. The task was integral to the overall project as it would allow testing the similarities and dissimilarities between potential supply of CES with the demands and actual use on the parks. A few overarching questions that would be answered by the questionnaires are:

- a. What are the motivations of visitors to come to the NPs? How do they relate to landscape or habitat quality and nature conservation?
- b. What are the natural landscape features that visitors perceive benefits from and to what extent?
- c. Which of the CES are perceived? Are the services perceived in bundles?
- d. Is the CES appreciation associated with visitors’ age, experience, or length of stay at the park? Does ESS realization differ for local and foreign visitors?
- e. What is the impact of NPs on the appreciation of nature and human well-being?

The internship’s work also contributed to ensuring good articulation between the field surveys and the MapNat2 smartphone app that will be used by park visitors to identify locations where they benefitted CES. Complementarity between both tools is of high importance to support the relevance of follow-up analysis. The MapNat2 smartphone app aids in the development and operationalization of participatory mapping method based on sets of mapping tools and classification system from Millennium Ecosystem Assessment and the Economics of Ecosystem and Biodiversity. It was designed as a tool for citizens and scientists to map ESS, focusing on the actual use of ESS and the locations with which they are used. MapNat2 app can be utilized as a citizen science tool, enabling public to share their use of ESS on site and influence policy planning process on nature’s services, and as a research tool, with scientists observing the actual locations and modalities of ES use. Although the main focus of the app is on CES, they do include provisioning and regulating services (“MapNat App,” n.d.).

Methodology

To begin a survey design, it is important to first understand the methods of design and the anatomy of survey questions. The goal in any good survey design is developing questions that are most relevant to the research objectives, and at the same time are easily understood to the targeted respondents (Niederhauser & Mattheus, 2010). Three core components in a survey were described in a study in 2011; listed as the rater, the object, and the attribute (Dolnicar, 2013). The rater would refer to the person in question, or in most cases, a group of interest. An object would be the entity under study, while the attribute refers to what characteristics or issues regarding the entity that are being studied. An attribute of the study can be both a physical object or living being, or it could also be an abstract component such as perception and satisfaction. For our study, I discerned that the rater is the NP visitors and the object would then be the NP itself. Accordingly, attribute could be both physical (bio- and geophysical condition of the parks) and abstract (CES benefitted from the park).

Dolnicar (2013) further discussed on a few points that can be used in reducing variability of respondents' interpretation such as using everyday language that are familiar with the public and avoiding technical jargon or scientific terms. Questions should be short and precise, as the longer the query is, the risk of misunderstanding for respondents could increase. Further, she argued against using double-barrelled questions that include two attributes or two objects, such as "How satisfied are you with the service and food at this restaurant?". Double negatives, for instance; "Do you agree that people should not waste food?" are typically confusing for respondents and are to be avoided. Other biases including order effects, framing bias, and anchoring bias should also be kept in mind when designing questions (Dolnicar, 2013).

I began by reading through related literature on ecosystem mapping and survey designs. I had a meeting with Dr Couzat and another ESS group postdoctoral researcher, Dr Melissa Marselle who specializes in Environmental Psychology. As surveys are widely used in the social sciences field, Dr Crouzat brought in Dr Marselle to support me in starting my own survey questions. Dr Marselle strongly suggested that we avoid creating our own questions but instead refer to previous literature or technical reports to ensure integrity, transparency and transferability. By utilizing questions gathered from credible sources, we could altogether avoid risky biases in survey questions and provide support and references to our selection of questions.

I explored scientific literature particularly in journals of environmental psychology and ESS and delved into surveys and technical reports completed by government agencies and private research institutions that have similar questions and target respondents as ours. From there, I was able to extract comparable questions to be included in the survey. Alternatively, I also looked into rephrasing survey questions from other reports in a way that are more catered to answer our own questions. Ultimately, all the prompts that were asked in the questionnaire should always be justifiable and be supported by credible literature sources.

To start with the questionnaire design, there were a few elements that we needed and were interested to know. The following are thorough description of each of the elements in the survey and brief discussion on literature sources that were referred to. A sample of the survey along with its references is provided in the annex (page 14).

Firstly, we were interested in knowing why the visitors come to the NPs, that is to understand the motivation of visitors. The first question of the survey was taken from the Monitor of Engagement with the Natural Environment (MENE) technical report. The seven-year long survey was commissioned by Natural England, UK Department of Environment, Food and Rural Affairs and the UK Forestry Commission, seeking to understand the relationship between people and the natural environment through measuring the extent of visitors' participation in the natural environment. (National Statistics, 2017). Motivation prompts include "to spend time with family", "to learn something about the outdoors", "for peace and quiet" and "to enjoy wildlife".

However, motivation of a person does not necessarily translate directly to their behaviour, and so a subsequent element that we were interested in knowing was the visitors' behaviour itself, i.e. what activities they do undertake when they arrive at the park. I related each of the behavioural prompts to specific components of CES including recreation, social fulfilment, aesthetics, sense of belonging, spiritual experience and education. I included answers such as "I did physical activities", "I observed the beauty of nature" and "Me or my children learnt about nature or I used it for academic purposes". Prompts were adapted from Buchel and Frantzeskaki (2015) study on ESS utilized by urban park visitors in the Netherlands. In the paper, they used the Q methodology method, by asking respondents to rank statements from their own point of view on the services that were perceived in Rotterdam urban parks (Buchel & Frantzeskaki, 2015).

Since we were interested to know if the length of stay in the NPs could influence visitors' behaviour and how CES benefits are perceived, the third question I introduced was the duration of their stay in the park. There are various time frame and time intervals options that could be asked, ranging from hourly, daily to monthly. For our study, Dr Crouzat agreed that we limit the time frame between one to two hours of visitation to an overnight visitation. The question was then adapted from the Survey of Public Attitudes Towards Forestry in Ireland conducted by the Irish Economic and Social Research Institute which used the similar time frame (ESRI, 1998).

In environmental psychology, place attachment is defined as the positive connection or bond that is present between a person and a particular place (Williams & Vaske, 2003). Williams and Vaske (2003) argued that a person's attachment to a place is strongly related to their familiarity of the place and the extent of contact that they have with said place. It would be interesting for us to observe how NPs visitors' place attachment to the park could play a role in influencing their experience. We then included a familiarity prompt as the fourth question in the survey to see how it would relate to the other prompts in the survey. I directly replicated the familiarity scale from Williams and Vaske (2003) paper which offered a nine-interval scale between "not at all familiar" to "extremely familiar".

Perceived naturalness of an environment, that is, environment that is seen to contain significant forest or woodland plays an important role in predicting human well-being. Marselle, Irvine, Lorenzo-Arribas, and Warber (2015) postulates that an environment that is perceived to be "more natural" is associated with a better psychological well-being, as opposed to an environment that is perceived as "less natural". For instance, in a green exercise study, they found greater reduction in anxiety in an environment that was perceived as more natural. (Marselle, Irvine, Lorenzo-Arribas, & Warber, 2015). I then included the perceived naturalness prompt into the survey, taking directly from Marselle et al. (2015) paper.

We were also interested in other perceptions of the visitors including perceived legibility, mystery, coherence and accessibility. Herzog and Kropscott (2004) hypothesized that legibility and coherence are strong positive indicators towards an environment's preference and mystery is negatively correlated to preference.

Definitions of each are as follows:

- a. Legibility: any feature of a large environment which aids in understanding through the building of a useful cognitive map (Herzog & Leverich, 2009)
- b. Mystery: any feature of a given environment that encourages one to understand more deeply and gain new information about said environment (Herzog & Kropscott, 2004)
- c. Coherence: a feature which helps in organizing or in understanding of a scene (Herzog & Kropscott, 2004)
- d. Accessibility: the meeting point of the physical environment's design to the demand or capacity of a person or a group (Brorsson, Öhman, Lundberg, & Nygård, 2011).

After a few discussions with Dr Crouzat, we agreed to include only perceived accessibility, specifically the accessibility inside the NPs themselves. We believed that it would be pertinent to understand how the easiness of navigation inside the NPs' perimeter could influence the perceived CES benefits enjoyed by the visitors. However, when searching through literature sources, a majority of the papers discussing accessibility were mainly focused on the accessibility of going to a specific location, i.e. transportation use, distance, time, instead of accessibility inside that location. Furthermore, studies on accessibility inside a location would focus more on the quality of man-made structures such as maps, signages and trails. Instead, we were more interested in the general quality of natural elements as an indicator of accessibility in the NPs. Thus, I adapted the ideas from Herzog and Leverich (2004) and Herzog and Kropscott (2005) by asking the difficultness of navigation around the setting, and using a Likert-type scale between "very difficult" to "very easy" (Vagias, 2006).

At the heart of this survey is none other than the question about the parks' biophysical indicators (BI). We are interested to discover how the BI in the park contribute to visitors' experience and how they would rate each of the BI's importance in influencing the perceived CES benefits. BI that were identified include distance to waterbodies, density of attractive landscape features, openness of the vegetation, landscape heterogeneity, wilderness, topographic variability, and biodiversity of cultural importance. By analysing how selected BI contribute to the visitors' experience in the park, we can compare the tangible data to geospatial mapping analysis and focus group meetings to observe different kinds of opportunities for CES in the three NPs. We will be able to observe gaps in supply and demand of CES and estimate CES flow, through evaluating tourists' hotspots in relation to the indicators. Ultimately, we wanted to ensure that all the data and information collected

from the three-way approach are in complement with each other, and thus by including the BI in the survey question we were able to observe a three-dimensional view of the parks' CES.

The challenge in constructing a question for the biophysical indicator was threefold; first; a limited amount of time restricted me from performing thorough literature search that would contain survey questions for each one of the BI. Secondly, since our interest regarding the BI and visitor's experience are specific, finding suitable questions to adapt into our questionnaire was tricky. Third, I needed to make sure that the BI prompts would be easily understood by the public translate scientific jargons into everyday language. After scouring through technical reports, sample questionnaires, and literature resources, none of the survey prompts were comparable enough to our intended questions. Finally, we agreed that the BI question should be our own original design. I discussed with Dr Crouzat on suitable laymen terms that I could use to reflect the BI in the survey, and followed a rating scale of zero to six adapted from the Perceived Restorativeness Scale (PRS) study (Hartig, Korpela, Evans, & Gärling, 1997).

For our eighth question, we wanted to measure how the NPs contributed to the visitors restorativeness, by using the PRS developed by Hartig et al. (1997). Perceived restorativeness quality is another method in environmental psychology which analyses the connection of nature and human well-being (Marselle et al., 2015). Marselle et al. (2015) discussed the Attention Restoration Theory (ART) which posits that certain quality in an environment facilitates a person's restoration of attention or concentration. In the original study by Hartig et al. (1997), they discussed four main factors of ART;

- a. Being away: Distance away from daily routine of a person's life is a necessary condition for restoration;
- b. Fascination: Fascinating stimuli encourages effortless attention allowing restoration;
- c. Coherence: An environment with rich stimuli foster the perception of being in a different world;
- d. Compatibility: An environmental setting should fit with one's preference for it to be restorative.

We were interested in observing how perceived restorativeness can aid as a moderator in an environment-behaviour relationship, as natural environment with a higher restorativeness quality is hypothesized to encourage better human well-being compared to environment with a lower restorativeness quality (Marselle et al., 2015). For this, I directly followed the

original 1997 PRS scale of sixteen items on a seven-point scale (0=Not at all, 6=Completely), with random arrangement according to Marselle et al. (2015).

For the last four questions, we wanted to analyse the NPs visitors' demographic information. CES facets may be experienced differently according to age or gender and may be appreciated differently by local visitors compared to international visitors. It would also be interesting to observe a difference of experience when a visitor travelled alone, with other adults, or with children. I added the age prompt from the Yakima Basin Reservoir Recreation Survey carried out in Denver, Colorado. (U.S Department of the Interior Bureau of Reclamation, 2008). Gender, location and visitor's company were taken from the same MENE technical report (National Statistics, 2017).

After a few rounds of drafts editing and consultation with Dr Crouzat and Dr Marselle, it was time to test the survey in the real-world. Before the survey can be used at the actual NPs, it was pertinent to do a "pilot test" in a similar setting. A pilot test can assist in determining if the survey questions are effective, clear and readable for the respondents, and are not too time consuming to complete (Niederhauser & Mattheus, 2010). Hence, on a sunny Easter holiday, I went to the Lene-Voigt Park located in the eastern part of Leipzig city to test the questionnaire to the park visitors. I managed to approach eight park visitors who consented to complete the survey. I shortly disclosed to the volunteers that it was only a pilot test for larger NPs, and that their survey submission would not be collected and analysed, but instead would help in improving the survey design.

All in all, the respondents agreed that the survey was easy to understand and did not take too long to complete. However, there was some minor formatting that needed to be corrected and some clarification or examples were needed for the BI prompt. Since the survey was written in English, we also limit our respondents to English speakers. However, it would not be an issue for the NPs since we would translate the survey into several languages including German and Portuguese. After the pilot test was completed, I submitted the final draft of survey to conclude my internship work.

Reflections

When designing the survey, I learnt that creating questions was not as easy as it sounded. It was critical to understand the research objective fully and know exactly what kind of information we were interested in analysing before we can include any questions in the

survey. There were many interesting questions we wanted to gather from the NPs visitors, but ultimately, we need to be concise and limit to questions that were most pertinent to our objectives. Having credible sources was paramount to ensure validity of our questions, and thus reading relevant scientific literatures and technical reports were very helpful during the designing process. Consultation with other experts was also necessary, and by consulting with Dr Marselle I was able to tap into relevant environmental psychology literature sources and construct the survey in accordance to a proper social science methodology.

Since the focus group meetings and the geospatial mapping aspect of the project are also still on-going, I had to be aware of minor changes in detailing and acknowledge uncertainties and thus be flexible in the framing of the survey questions. For instance, after a focus group meeting in Switzerland, we planned to include a question that asks respondents their location either inside the park or outside the park. Since the NPs contain designated areas that are restricted from any human activities, CES enjoyed by the visitors might not translate into those restricted areas. Nonetheless, since we decided to distribute the survey inside the NPs perimeter, it would not make sense to ask the question. It was important to be aware of current updates from the focus group and geospatial components of the EP project and keep a steady communication with other team members.

To summarize, I was incredibly grateful for the opportunity to complete an internship with iDiv. Specifically, it was an honour to work with an incredible team at the ESS group, directly supervised by Dr Crouzat. Dr Crouzat was genuinely appreciative of my work, incredibly supportive and insightful during the whole period of my internship work and was a pleasure to work with. Working for an on-going, large-scale EU project was an eye-opening experience, and I was excited to be a part of a significant project and contribute my time and skill. Working in an actual, distinguished environment research institute was an amazing experience that has enabled me to grow professionally and academically. I discovered that the field of ecosystem services is very multi-faceted, merging scientific studies in both social and natural sciences and has an enormous potential in realizing Earth's true value. I am excited to further delve into the field and hope to be involved in another ESS project again in the future.

References

- Austrian-limestone-alps. (n.d.). Retrieved from <http://ecopotential-project.eu/site-studies/protected-areas/28-austrian-limestone-alps.html>
- Brorsson, A., Öhman, A., Lundberg, S., & Nygård, L. (2011). Accessibility in public space as perceived by people with Alzheimer's disease. *Dementia*, *10*(4), 587–602. <https://doi.org/10.1177/1471301211415314>
- Buchel, S., & Frantzeskaki, N. (2015). Citizens' voice: A case study about perceived ecosystem services by urban park users in Rotterdam, the Netherlands. *Ecosystem Services*, *12*, 169–177. <https://doi.org/10.1016/j.ecoser.2014.11.014>
- Core Group - Ecosystem Services. (n.d.). Retrieved from https://www.idiv.de/groups_and_people/core_groups/ecosystem_services.html
- Dolnicar, S. (2013). Asking Good Survey Questions. *Journal of Travel Research*. <https://doi.org/10.1177/0047287513479842>
- Ecopotential-project. (n.d.). Retrieved from <http://www.ecopotential-project.eu/>
- ESRI. (1998). *Appendix 1 ESRI/UCD Attitudes to afforestation in Ireland questionnaire*.
- Hartig, T., Korpela, K., Evans, G. W., & Gärling, T. (1997). A measure of restorative quality in environments. *Scandinavian Housing and Planning Research*, *14*(4), 175–194. <https://doi.org/10.1080/02815739708730435>
- Herzog, T. R., & Kropscott, L. S. (2004). Legibility, mystery, and visual access as predictors of preference and perceived danger in forest settings without pathways. *Environment and Behavior*, *36*(5), 659–677. <https://doi.org/10.1177/0013916504264138>
- Herzog, T. R., & Leverich, O. L. (2009). Environment and Behavior. *Environment*, *35*(4). <https://doi.org/10.1177/0013916503251455>
- MapNat App. (n.d.). Retrieved from <http://www.ufz.de/index.php?en=40618>
- Marselle, M. R., Irvine, K. N., Lorenzo-Arribas, A., & Warber, S. L. (2015). Moving beyond green: Exploring the relationship of environment type and indicators of perceived environmental quality on emotional well-being following group walks. *International Journal of Environmental Research and Public Health*, *12*(1), 106–130.

<https://doi.org/10.3390/ijerph120100106>

- Mouchet, M. A., Lamarque, P., Martín-López, B., Crouzat, E., Gos, P., Byczek, C., & Lavorel, S. (2014). An interdisciplinary methodological guide for quantifying associations between ecosystem services. *Global Environmental Change*, 28(1), 298–308. <https://doi.org/10.1016/j.gloenvcha.2014.07.012>
- Nahuelhual, L., Carmona, A., Laterra, P., Barrena, J., & Aguayo, M. (2014). A mapping approach to assess intangible cultural ecosystem services: The case of agriculture heritage in Southern Chile. *Ecological Indicators*, 40, 90–101. <https://doi.org/10.1016/j.ecolind.2014.01.005>
- National Statistics. (2017). *Monitor of Engagement with the Natural Environment Technical Report to the 2009-16 surveys*. The National Statistics UK.
- Niederhauser, V. P., & Mattheus, D. (2010). The Anatomy of Survey Questions. *Journal of Pediatric Health Care*. <https://doi.org/10.1016/j.pedhc.2010.04.013>
- Rewitzer, S., Huber, R., Grêt-Regamey, A., & Barkmann, J. (2017). Economic valuation of cultural ecosystem service changes to a landscape in the Swiss Alps. *Ecosystem Services*, 26, 197–208. <https://doi.org/10.1016/j.ecoser.2017.06.014>
- U.S Department of the Interior Bureau of Reclamation. (2008). *Yakima River Basin Reservoir and River Recreation Survey Report of Findings*. Denver, Colorado. Retrieved from https://www.usbr.gov/pn/programs/storage_study/reports/ts-yss-15/recreation-survey.pdf
- Vagias, W. (2006). Likert-type Scale Rresponse Anchors. *Clemson International Institute for Tourism and Research Development*, 3–4. <https://doi.org/10.1525/auk.2008.125.1.225>
- Williams, D. R., & Vaske, J. J. (2003). The Measurement of Place Attachment: Validity and Generalizability of a Psychometric Approach. *Forest Science*, 49(6), 830–840. [https://doi.org/Retrieved from http://www.fs.fed.us/rm/pubs_other/rmrs_2003_williams_d001.pdf](https://doi.org/Retrieved%20from%20http://www.fs.fed.us/rm/pubs_other/rmrs_2003_williams_d001.pdf)

Annex

National Park Survey

With References

****THIS IS A PILOT TEST****

Dear park visitors, we need your help! Answering these questions will take only around 10 minutes, and the answers you give could help us study the benefit obtained in this park. Thank you for taking the time to answer these important questions.

(Text above adapted from Yakima Basin Reservoir Recreation Survey, U.S. Department of the Interior Bureau of Reclamation, Technical Service Center, Denver, Colorado. January 2008)

1. Why did you come here? (Select ALL of those which apply to you)

(From Monitor of Engagement with the Natural Environment MENE Technical Report, Q12, p42)

<input type="checkbox"/> To spend time with family
<input type="checkbox"/> To spend time with friends
<input type="checkbox"/> To learn something about the outdoors
<input type="checkbox"/> For fresh air or to enjoy pleasant weather
<input type="checkbox"/> For health and exercise
<input type="checkbox"/> For peace and quiet
<input type="checkbox"/> To relax and unwind

<input type="checkbox"/> To exercise my dog
<input type="checkbox"/> To enjoy scenery
<input type="checkbox"/> To enjoy wildlife
<input type="checkbox"/> To entertain children
<input type="checkbox"/> To challenge myself or achieve something
<input type="checkbox"/> To be somewhere I like
<input type="checkbox"/> Other: _____

2. What did you do here? (Select ALL of those which apply to you)

(Adapted from Buchel, S., Frantzeskaki, N., 2015: Citizen's voice: A case study about perceived ESS by urban park users in Rotterdam, the Netherlands. Supplementary materials)

<input type="checkbox"/> I did physical activities
<input type="checkbox"/> I observed the beauty of nature
<input type="checkbox"/> I observed the animals and plants
<input type="checkbox"/> Me or my children learnt about nature or I used it for academic purposes
<input type="checkbox"/> I get new ideas when I come here, or I meditated or prayed

<input type="checkbox"/> I connected to this place
<input type="checkbox"/> I collected plants or mushrooms
<input type="checkbox"/> I hunted animals
<input type="checkbox"/> Other: _____

3. On average, for how long did you spend here? (Select ONE which apply to you)

(Adapted from Survey of Public Attitudes Towards Forestry in Ireland, Summer 1998. Q10)

<input type="checkbox"/> 1-2 hours
<input type="checkbox"/> 2-4 hours
<input type="checkbox"/> All day
<input type="checkbox"/> Overnight
<input type="checkbox"/> Other: _____

4. How familiar are you with this place? (Select ONE which apply to you)

(Adapted from Williams and Vaske, 2003. The Measurement of Place Attachment: Validity and Generalizability of a Psychometric Approach)

Not at all familiar								Extremely familiar
<input type="checkbox"/>								

5. How natural would you say the environment you walked in is overall? (Please put an X in the line below)

(From Marselle et al. 2015. Moving beyond Green: Exploring the Relationship of Environment Type and Indicators of Perceived Environmental Quality on Emotional Well-Being following Group Walks. Appendix A, Q6)

Natural	_____	_____	_____	_____	_____	_____	_____	Artificial
---------	-------	-------	-------	-------	-------	-------	-------	------------

6. How difficult was it to navigate around the setting? (Select ONE which apply to you)

(Adapted from Herzog and Leverich, 2004: Searching for Legibility; and Herzog and Kropscott, 2005: Legibility, Mystery, and Visual Access as Predictors of Preference and Perceived Danger in Forest Settings without Pathways. Environment and Behavior)

(Likert-Type Scale Response Anchor from Vagias, Wade M. 2006)

Very difficult							Very easy
<input type="checkbox"/>							

For each of the questions below, please **CIRCLE** one number for each statement. 0= Not at all 6= Completely

7. How important do these characteristics contribute to your experience here?

(Characteristics of biophysical indicators obtained from Word Doc ECO-POTENTIAL Workshop, March 2018 CES indicators. Rating follows the Perceived Restorativeness Scale)

Presence of waterbodies	0	1	2	3	4	5	6
Presence of attractive feature (i.e. historical tree, monument)	0	1	2	3	4	5	6
Openness of landscape	0	1	2	3	4	5	6
Diversity of land use and land covers	0	1	2	3	4	5	6

Absence of man-made structure	0	1	2	3	4	5	6
Mountainous topography	0	1	2	3	4	5	6
Presence of iconic species (i.e. red deer, lynx)	0	1	2	3	4	5	6

8. Please indicate the extent to which each statement describes your experience here.

(The Perceived Restorativeness Scale from Hartig, Evans, Korpela & Garling, 1997. A measure of restorative quality in environments)

Being here suits my personality	0	1	2	3	4	5	6
This place has fascinating qualities	0	1	2	3	4	5	6
My attention is drawn to many interesting things	0	1	2	3	4	5	6

I have a sense that I belong here	0	1	2	3	4	5	6
It is chaotic here	0	1	2	3	4	5	6
I can do things I like here	0	1	2	3	4	5	6

It is an escape experience	0	1	2	3	4	5	6
I want to spend more time looking at the surroundings	0	1	2	3	4	5	6
There is much to explore and discover here	0	1	2	3	4	5	6
Spending time here gives me a break from my day-to-day routine	0	1	2	3	4	5	6
There is a great deal of distraction	0	1	2	3	4	5	6

I have a sense of 'oneness' with this setting	0	1	2	3	4	5	6
There is too much going on	0	1	2	3	4	5	6
I can find ways to enjoy myself here	0	1	2	3	4	5	6
It is a confusing place	0	1	2	3	4	5	6
I want to get to know this place better	0	1	2	3	4	5	6

9. What is your age?

(From Yakima Basin Reservoir Recreation Survey, U.S. Department of the Interior Bureau of Reclamation, Technical Service Center, Denver, Colorado. January 2008. Q29, p94)

<input type="checkbox"/> Under 15
<input type="checkbox"/> 15 - 20
<input type="checkbox"/> 21 - 34

<input type="checkbox"/> 35 - 49
<input type="checkbox"/> 50 - 65
<input type="checkbox"/> Over 65

10. You are _____ Male _____ Female

(From MENE Appendix 2 Q1)

11. Who are you with? (Circle whichever appropriate)

(From MENE Q13 p43)

Alone	With other adults only	With adults and children	With children only
-------	------------------------	--------------------------	--------------------

12. What is your postcode? _____ **13. What is your country?** _____

(From MENE Q10 p41)

****Thank you for your participation! ****

