

BOOK OF ABSTRACTS

- I. SESSION DESCRIPTION
- II. SESSION PROGRAM
- III. ABSTRACTS

I. SESSION DESCRIPTION

ID: T8

Cultural Ecosystem Services: Time to advance theory and practice

Hosts:

	Title	Name	Organization	E-mail
Hosts:	Dr.	Johannes Langemeyer	Autonomous University Barcelona	johannes.langemeyer@uab.cat
	Dr.	Sjerp de Vries	Wageningen Environmental Research	sjerp.devries@wur.nl
	Mr.	Jan Danek	CzechGlobe - Global Change Research Institute of the Czech Academy of Sciences	danek.j@czechglobe.cz

Abstract:

Cultural ecosystem services have long been treated as the intangible add-ons to the ecosystem services framework. ES are deeply rooted in the foundational economic metaphor of 'stocks of natural capital' that sustain the flow of benefits as well as in a narrow understanding of value as utility, shaped by economists at the forefront of the transition of ES from a policy metaphor to a scientific concept. As a consequence, ES valuation is still widely based on the premise of assessing and enhancing, what Randall (1987) has labelled, the 'total economic value'. However, most cultural ecosystem services are not well framed in an economic discourse based on a utilitarian perspective, which is reflected in their insufficient consideration in ES-based spatial planning approaches. This is critical since cultural ecosystem services may be of high societal relevance, despite of the difficulty of expressing their value in economic terms. Moreover, cultural ecosystem services are major incentives for the stewardship of ecosystems and thus the sustainable provision of many other ES. The need for a better recognition of cultural ecosystem services is both of theoretical and practical nature. It requires conceptual as well as methodological advances, which this session is meant to contribute to.



The first part of this session will discuss a quality-of-life approach as a possible complement to the total economic value approach, hence taking into account aspects of ES beyond their economic utility value. The second part of the session will focus on emerging methodological approaches for the spatially explicit assessments of CES based on the analysis of social media data. The third part aims to shed light on the epistemological dimension of research into CES and to find ways to bring objectivistic (assessing the value of nature) to mainly subjectivistic (studying people's values and perception) approaches together both in theory and in research.

Sub-session 1: Quality of Life instead of Total Economic Value: which ecosystem services matter most?

Hosted by Sjerp de Vries

Nowadays, natural capital accounting seems the dominant method to determine the value of ecosystem services. However, with its focus on economic exchange value, this method highlights certain benefits while neglecting others. In this sub-session, we propose to complement the natural capital accounting approach with one that focuses on the contribution of ecosystem services to the quality of life of citizens. We aim to take quality of life (QoL) as the overall endpoint, similar to total economic value (TEV) in an economic approach. Such an approach would also benefit from coming up with a systematic approach of which components quality of life is made up. In contrast to TEV, the values for different components cannot be simply added up. However, their relative importance might be established, given a specific context. By subsequently theorizing on which ecosystem services are likely to be important for which QoL-components, a research agenda could emerge, prioritizing those services, and their underlying ecosystems, that are likely to be most important for the quality of life of citizens. A priori, the focus is on services that mainly deliver benefits to those living near to or coming into contact with the ecosystem, as being highly relevant to spatial planning.

Sub-session 2: Assessing cultural ecosystem services through crowdsourced data from social media

Hosted by Johannes Langemeyer & Andrea Ghermandi

The use of geolocated social media content from platforms such as Flickr, Twitter, Strava, Weibo and others is gaining increasing popularity for assessing and mapping cultural ecosystem services (Illieva & McPhearson, 2018; Ghermandi & Sinclair, 2019). These crowdsourced media approaches present a unique way to understand people's appreciation and relationship with nature. Perhaps most uniquely, social media may be able to help unravel relational values (i.e. positive sense of place, well-being, and cultural identity) due to their spatial specificity (e.g.



place-based behaviour and appreciation) (Calcagni et al., 2019). While the innovation in this research frontier is rapidly emerging (Tabrizian et al., 2020; Clemente et al., 2019), there is currently little conceptual and methodological (including ethical) guidance on best practices. This session will provide critical direction on standard methods, potential biases, and appropriate interpretation of social media as an indicator of the value of cultural ecosystem services. The sub-session will include but is not limited to a collection of articles in a special issue in the *Ecosystem Services* journal.

Sub-session 3: Bridging the intangible gap: “reality” and its construction in study of nature and its non-material values

Hosted by Jan Danek, Lubos Slovak & Tomas Danek

In the research of cultural ecosystem services, we may use a variety of methods from rather objectivistic (linking ecological structures and functions with cultural values and benefits, utilizing various indicators of actual use of nature by people, etc.) to outright subjectivistic (interviews with visitors of certain places, participatory and deliberative methods, etc.). Similarly, in the ethical dimension, value might be seen from the realist viewpoint as objectively found in nature or provided by nature to people, or from the constructionist viewpoint as constructed by our social practices and discourses (uses of or relationships with nature). But how do we understand the focal points of all this theory and research – nature itself and its values? In a trans- or inter-disciplinary research even contradictory epistemological and ethical assumptions and viewpoints may come together and result in conceptual conflicts or even inconsistent results. To bridge this gap, we should endeavour to make our epistemological assumptions explicit, discuss them and ultimately find ways to make them consistent or complementary. We invite researchers who would reflect on the epistemological and ethical viewpoints of their research into non-material values of nature / CES / NCP, especially those who combine objectivist and subjectivist methods, but also scholars that would provide theoretical reflection on the subject (particularly from the perspective of environmental ethics), with a potential to apply it for better grounding of research. We also encourage researchers who could provide examples of methods on how to explore or collect such data (e.g. from case studies), to share their suggestions and insights in this topic.

Goals and objectives of the session:

This merged session aims at discussing and advancing alternative conceptual frameworks and methodological approaches in order for cultural ecosystem services to: a) find stronger recognition in ES-based approaches for spatial planning; b) clarify the epistemological



underpinnings of different methods and explore new possibilities to bridge and overcome existing issues; c) reflect on appropriate interpretation of social media as an indicator of the value of cultural ecosystem services.

Planned output / Deliverables:

Sub-session 2 is related to a special issue in the journal of *Ecosystem Services*.

Other potential outputs will be discussed during the session.

Related to ESP Working Group/National Network:

Thematic Working Group: TWG 8 – Cultural services & Values

II. SESSION PROGRAM

Date of session: Thursday, 10 June 2021

Time of session: 9:30 – 15:00

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
9:30 9:45	Uta	Schirpke	University of Innsbruck & Eurac Research	People's perceptions related to cultural ecosystem services of mountain lakes
9:45 10:00	Rachael	Edwards	University of Waterloo	A "magic teleportation machine": Shared Cultural Ecosystem Benefits are drawn from nature across ethnically diverse urban green space users
10:00 10:15	Sue	Ranger	University of the Highlands and Islands	What goes around comes around. A novel, integrated model reflecting the non-linear interplay between ecosystems, human values and human wellbeing
10:15 10:30	Sjerp	De Vries	Wageningen Environmental Research	The relevance of cultural ecosystem services for quality of life
11:00 11:15	Johannes	Langemeyer	Autonomous University Barcelona	Introduction
11:15 11:25	Oleksandr	Karasov	University of Tartu	Mapping supply and demand for cultural ecosystem services with integrated analysis of remote sensing and social media data
11:25 11:35	Nina N.	Kaiser	University Duisburg-Essen	From sewer to nature: Social media analysis on the impacts of restoration

3rd ESP EUROPE CONFERENCE

Tartu, Estonia

2021 7-10 June

Ecosystem Services Science,
Policy and Practice in the
Face of Global Changes

Time	First name	Surname	Organization	Title of presentation
				on cultural ecosystem services and biodiversity
11:35 11:45	Samantha	Winder	University of Washington	Landscape-scale insights into recreational activities derived from image content and an open-source classifier
11:45 11:55	Nathan	Fox	University of Southampton	Reddit: A novel data source for cultural ecosystem service studies
11:55 12:05	Heera	Lee	Karlsruhe Institute of Technology	Artificial Intelligence for mapping cultural ecosystem services in Europe using crowd-sourced photos
12:05 12:15	Andrea	Ghermandi	University of Haifa	In the eye of the AI beholder: a comparative analysis of computer vision-assisted characterizations of human-nature interactions in urban green spaces
12:15 12:30				Discussion
13:30 13:35	Jan	Danek	CzechGlobe - Global Change Research Institute of the Czech Academy of Sciences	Introduction
13:35 13:50	Lubos	Slovak	Global Change Research Institute of the Czech Academy of Sciences & Charles University	Dealing with the ambiguous nature of cultural ecosystem services - participatory mapping and assessment of non-material values of nature in the Czech Republic
13:50 14:05	Maria	Felipe-Lucia	Helmholtz Centre for Environmental Research & German Center for Integrative Biodiversity Research	Enjoying nature? Bundles of cultural ecosystem services for different visitor groups in mountain National Parks
14:05 14:20	Barbara	Kostanjšek	University of Ljubljana	Addressing cultural ecosystem services in CICES classification: case study on characteristic cultural landscape types in Slovenia
14:20 14:35	Laura	Maebe	University of Liège	The numerous faces of the cultural ecosystem services
14:35 14:50	Emilia	Pramova	Center for International Forestry Research	Sensing, feeling, thinking: cultural ecosystem services beyond the cognitive
14:50 15:00				Discussion



III. ABSTRACTS

Abstracts are ordered based on the session program. The first author is the presenting author unless indicated otherwise.

1. Type of submission: Abstract

T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice

People's perceptions related to cultural ecosystem services of mountain lakes

First author: Uta Schirpke

Other author(s): Rocco Scolozzi, Alexander Kiessling, UlrikeTappeiner

Affiliation: University of Innsbruck, Austria; Eurac Research, Italy

Contact: uta.schirpke@eurac.edu

Mountain regions are rich in small natural lakes, but little is known about the cultural ecosystem services (CES) and benefits people associate with such lakes. Therefore, this study aimed to assess people's perceptions related to CES of mountain lakes in the European Alps. We used an online questionnaire, which was made available in three languages (English, German, and Italian) and distributed via diverse channels (e.g., newsletters, social media). Based on 526 responses from people living inside and outside the European Alps, our results indicate that most appreciated CES include bequest, symbolic and aesthetic values, whereas representation, entertainment, scientific research and recreational activities are deemed less important. Perceived benefits are mostly related to passive recreation (e.g. nature observation), particularly creating connection to nature and relaxation or generating feelings such as freedom and peace. Respondents also indicated that overcrowding, noisiness, touristic exploitation, and anthropogenic modifications are the most decisive factors that reduce the benefits or even impede a visit to mountain lakes. Our findings advance the understanding of relationships between CES and subjective well-being and provide valuable insights for decision-making that can support the development of management strategies to preserve such sensitive ecosystems and associated CES.

Keywords: perception survey, benefits, tourism, cultural values, European Alp



2. Type of submission: Abstract

T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice

A “magic teleportation machine”: Shared Cultural Ecosystem Benefits are drawn from nature across ethnically diverse urban green space users

First author: Rachael Edwards

Other author(s): Brendon Larson, Andrew Church

Affiliation: University of Waterloo, Canada

Contact: r7edwards@uwaterloo.ca

Green spaces are vital to the wellbeing of urban communities, largely due to the many Cultural Ecosystem Benefits (CEB) that nature contributes to outdoor recreation (e.g., relaxation, spiritual enrichment). To ensure equity in the distribution of these benefits, it is necessary to understand them, and the recreational activities through which they emerge, in the context of ethnicity. Prior research on CEB and ethnicity is, however, very limited. Through 100 in-situ semi-structured interviews with green space users in the Lee Valley Regional Park, London, U.K., this research explored ethnic variation in the CEB of urban nature in the context of preferred outdoor recreation experiences. Green space preferences and CEB were compared between white and black, Asian or minority ethnic (BAME) users of two distinct types of urban green space: parks and more biodiverse protected areas (PAs). Both white and BAME visitors to parks prioritized games/sports and built features when compared to visitors to PAs (white and BAME) who more often undertook wildlife viewing and prioritized natural features. Conversely, we found that white and BAME users of both types of urban green space derived similar CEB from urban nature. Peace and relaxation were primary among these benefits, a result of both nature interaction (e.g., sights, sounds), and its contrast to the urban environment. To acknowledge these shared values associated with urban nature, environmental organizations should broaden their conceptualization of connecting to nature beyond traditional Western outdoor pursuits and ideologies. Failing to provide opportunities for culturally varied activities within all types of urban nature perpetuates an Anglocentric view of the human-nature relationship and will exclude much of the community.



Future research is needed to explore CEB variation within and among distinct ethnic communities to capture the diversity of lived experiences and human–nature relationships.

Keywords: cultural ecosystem services, ethnicity, outdoor recreation, urban green space, wellbeing

3. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)

What goes around comes around. A novel, integrated model reflecting the non-linear interplay between ecosystems, human values and human wellbeing

First author: Sue Ranger

Other author(s): Jasper Kenter, Rosalind Bryce, Katherine Irvine

Affiliation: Marine Conservation Society, University of the Highlands and Islands, United Kingdom

Contact: sue.ranger@mcsuk.org

Human wellbeing is a central component of the Ecosystem Services model – conceived of as the desired endpoint of benefit flows. It is now widely accepted that wellbeing is both an outcome and a process with interacting dimensions that have both subjective and objective components. Despite its pivotal importance, this multi-faceted conception of wellbeing has not been consistently integrated in the ES model. Perhaps because of the dominance of economic and ecological disciplines in the ES literature there has been a tendency focus on linear stocks and flows. Holistic and traceable accounts of the interplay between the physical and biological world and the component parts of wellbeing are frequently absent in assessments of the value (both monetary and non-monetary) of the environment. The ecosystem services (ES) model has already been widely integrated in policy and decision-support in many countries. While proponents consider it an effective framework for explaining and assessing the relationship between nature and people it is being challenged by others who feel it does not adequately reflect the central & pervasive role that culture plays in defining links between people & nature. We propose a novel framework which draws on the ES, human values and wellbeing literature to conceptualise how



environmental, socio-cultural and individual spheres interact to shape human wellbeing. The model challenges the tendency for assessments of the ‘value’ of the environment to be based on an incomplete account of ecosystem services, benefits or a narrow, purely subjective conception of wellbeing in favour of developing more integrated tools that better account for inter-linkage, diversity and complexity.

Keywords: 3D wellbeing, values, cultural ecosystem service

4. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)

The relevance of cultural ecosystem services for quality of life

First author: Sjerp de Vries

Affiliation: Wageningen Environmental Research, Netherlands

Contact: sjerp.devries@wur.nl

Valuing ecosystem services is often done from an economic perspective, taking the ecosystem as point of departure. The monetarization of benefits has proven to be especially difficult for cultural ecosystem services (CES). To begin with, whereas several taxonomies of ecosystem services are available (e.g. CICES 5.1), there is no widely accepted taxonomy of the benefits of CES. Furthermore, up till now the economic perspective has not resulted in much attention being paid to the health and well-being benefits of contact with nature, and their valuation. In this contribution, an alternative approach is presented, taken the beneficiaries as point of departure and looking at the relevance of different CES for their quality of life. It is attempted to reason back from quality of life (QoL), and its known determinants, to which CES are likely to be most influential in promoting QoL, and therefore merit more research attention. Developing a taxonomy of the benefits of CES and determining their relative importance for QoL proved to be difficult. What is clear, however, is that many CES require actual contact of the individual with the ecosystem, for benefits to be produced. Consequently, distances between ecosystems and citizens constitute an important factor. And since many people live in cities, urban and peri-urban ecosystems are likely to generate the most CES-based benefits (something that is clearly



exemplified during the ongoing COVID-19 pandemic). Furthermore, also incidental contacts with nature have been proven to be relevant for human well-being. This indicates that looking only at purposeful recreational visits to nature areas (with associated expenses) may miss out on important benefits. The conceptual model, at the moment still under development, will be presented, with ample room for discussion.

Keywords: cultural ecosystem services, quality of life, taxonomy of benefits, health & well-being, valuation

5. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)

Mapping supply and demand for cultural ecosystem services with integrated analysis of remote sensing and social media data

First author: Oleksandr Karasov

Other author(s): Stien Heremans, Mart Külvik, Artem Domnich, Iuliia Burdun, Ain Kull, Aveliina Helm, Evelyn Uuema

Affiliation: University of Tartu, Estonia

Contact: oleksandr.karasov@ut.ee

The spatially explicit assessment of cultural ecosystem services (CES) has been increasingly boosted by the methods that allow to couple social media and remote sensing data use. However, potential and possibilities of this approach has not yet been tested in the context of CES supply-demand relationships. Availability of CES supply within the areas of high population density (e.g. urban areas) constitutes a significant challenge to environmental justice. Therefore, we proposed a comprehensive framework for spatially explicit assessment of selected CES flows (actual events of landscape watching, wildlife watching, and outdoor recreation activities, depicted in Flickr and VK.com geotagged photographs in Estonia) and CES supply (the potential capacity of landscapes to provide opportunities for CES use), in relation to the population density (proxy for CES demand). In our research, we first revealed the relational value of selected CES by mapping the spatial density of CES flows, and their remoteness from urban areas as having the highest



population density and demand for CES use. Second, we predicted CES supply elsewhere in Estonia, based on ensemble niche model of a relative environmental suitability for taking CES-related photographs (proxy for CES flows). Third, we assessed the population density in areas of systematically low CES supply, revealing discrepancies between high demand for CES use and relatively low CES supply. The areas of this mismatch require further in-depth CES assessment with deliberative methods to analyse, why insufficient evidence of CES use and supply is received. Where appropriate, areas of CES supply-demand mismatch need to be prioritised for restoring, preserving, or enhancing CES supply. Due to the nearly global character of Earth observations from space and ground, our replicable methodology can contribute to the development of low-cost and robust operationalisation of the CES delivery chain across scales.

Keywords: cultural ecosystem services, social media, remote sensing, landscape attributes, integrated valuation

6. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)

From sewer to nature: Social media analysis on the impacts of restoration on cultural ecosystem services and biodiversity

First author: Nina N. Kaiser

Other author(s): Christian K. Feld, Nadine Gerner, Stefan Stoll

Affiliation: University Duisburg–Essen, Department of Aquatic Ecology, Germany

Contact: nina.kaiser.aqua@uni-due.de

We use social media photo posts to investigate the effects of river restoration on the provision of cultural ecosystem services (CES) and associated values along a degradation–restoration gradient in the Emscher river catchment in Germany, the largest river restoration project in the world. We want to answer the question, which environmental and biological properties of river restoration are responsible for the provision of CES and associated values and (where) do trade-offs between biodiversity and CES occur? The actual flow of CES is evaluated with > 25 000 georeferenced social media photo posts regarding photo density and photo content analysis (Flickr, Instagram).



Statistical analysis of biological data, environmental parameters, and social media identifies which environmental structure and biological function contribute to the provision of CES and perceived values. Social media photo posts are a promising data source to relate the perceived values of river restoration to environmental conditions. The study area, the Emscher river catchment had been used as an open sewer system for the Ruhrgebiet agglomeration area in Germany with 5 Mio inhabitants. Since the 1990ies, the river catchment is restored with great effort. This catchment with still heavily degraded and already restored sections and with comprehensive hydromorphological and biological monitoring schemes implemented is ideal for testing which properties restoration must have to achieve a sustainable rehabilitation of biodiversity and the provision of CES, or where trade-offs between biodiversity and CES occur. With our research, we highlight the hidden contributions of river restoration to society. We underline the added value of taking CES and relational values into account when evaluating river restoration but also for the planning of future projects. Recommendations for adapted management techniques can help to ensure and sustain the co-benefit of river restorations for biodiversity and human well-being.

Keywords: CES, river restoration, social media, biodiversity trade-off

7. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)

Landscape-scale insights into recreational activities derived from image content and an open-source classifier

First author: Samantha Winder

Other author(s): Heera Lee, Bumsuk Seo, Emmi Lia, Spencer Wood

Affiliation: Outdoor Recreation and Data Lab, University of Washington, Seattle, Washington, United States of America

Contact: sgwinder@uw.edu

Maps of cultural ecosystem services (CES) provide insights into people's values and create opportunities to more effectively manage parks and protected areas. This study introduces and



applies a novel and open-source convolutional neural network (CNN) model to accurately classify recreational activities on public lands, based solely on images uploaded to the social media platform Flickr, and then explores how these activities are associated with the natural and built environment. At one location in the Mt. Baker-Snoqualmie National Forest (MBSNF) in Washington, USA, we train the CNN model to identify 14 activity classes which capture the most common recreational activities in the region. We compare the results from our CNN model with an on-site survey, and test its performance in a novel location of the same National Forest. We find that there is a strong correlation (0.77) between the number of survey respondents reporting their participation in an activity and the number of Flickr photos classified as that activity. The classifier performs nearly as well in the novel location as in the primary location (overall accuracy of 0.71 as compared to 0.60), suggesting that the model is broadly applicable across the National Forest, though performance varies by activity class. By comparing our map of recreational activities in the two locations to the underlying landscape, we find that natural features (such as rivers, lakes, and higher elevations) and some built infrastructure (campgrounds, trails, roads) support a greater diversity of activities in the MBSNF, while visitors are less sensitive to features such as picnic areas and wilderness designation. Even while respecting the limitations of the CNN model, these results provide actionable information to land managers by illuminating how the ecosystem service of recreation varies spatially and according to the recreational activities that are provided.

Keywords: social media, image content, cultural ecosystem services, convolutional neural network, recreational activities

8. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)

Reddit: A novel data source for cultural ecosystem service studies

First author: Nathan Fox

Other author(s): Katherine E Parks, Laura J Graham, Felix Eigenbrod, James M Bullock

Affiliation: University of Southampton, United Kingdom

Contact: nf2g13@soton.ac.uk



Social media sites are gaining traction as a source of novel data for cultural ecosystem service (CES) assessments. However, the social news aggregation and discussion-based website Reddit, has not been previously used in CES research, despite being used widely in other academic fields. We postulate that the lack of uptake in CES research is because 1) researchers may not being aware of the type of data available and its potential applications or 2) because posts on Reddit do not contain georeferencing information. Here, we demonstrate two methods for searching Reddit for data linked to CES. First, we demonstrate a key word search, returning all posts relating to keywords linked to a range of recreational activities. Second, as Reddit is split into different pages, or “subreddits”, themed around different topics, such as “hiking”, “travel” and “culture”, we highlight how researchers can harness the large number of posts from these forums to assess a range of CES including aesthetic views, recreation, spirituality and culture. Furthermore, we have developed an automated method of geocoding the approximate location of Reddit posts by extracting place names from the posts textual metadata using named-entity recognition. We compare posts relating to recreational activities from Reddit to those obtained using the same search criteria from Flickr. Though it is possible to georeferenced the location of posts from Reddit, the limitations associated with the georeferencing process constraints the use of Reddit for assessing the spatial variation in CES compared to other social media sites. Instead, we recommend that data from Reddit is better suited to assessing CES through image content analysis and the analysis of textual metadata. By demonstrating the value of big data from Reddit we hope to encourage its inclusion in future CES and environmental research.

Keywords: cultural ecosystem services, social media, Reddit, Flickr, recreation

9. Type of submission: Abstract

T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice

Artificial Intelligence for mapping cultural ecosystem services in Europe using crowd-sourced photos



First author: Heera Lee

Other author(s): Bumsuk Seo, Calum Brown, Mark Rounsevell

Affiliation: Karlsruhe Institute of Technology, Germany

Contact: heera.lee@kit.edu

Geotagging crowdsourced information has become an increasingly widely used method to quantify and map Cultural Ecosystem Services (CES). For example, crowdsourced photo archives such as Flickr and Instagram have been analysed to understand how people use natural resources for leisure activities. However, the potential of this method has not been fully explored. Previous studies have often analysed photo contents manually or using cloud image recognition APIs (e.g. Google Cloud Vision) which are primarily like a black-box. This hampers the transferability and the credibility of the results, as well as their application on CES themes beyond the model, which was trained for, especially at a larger scale. We present a new approach for quantifying and classifying CES by analysing crowd-sourced photos using machine-learning algorithms. We apply computer vision to the photos acquired from Flickr in the EU-28 (including the UK) area from 2005 to 2018 (ca. +70 million photos). We annotate the photos using established computer vision models based on convolutional neural networks (CNN) with fine-tuning for CES-relevant tags. For retraining the CNN model, a large number of randomly sampled (with stratification) photos are manually annotated, along with ES and biodiversity-related photos acquired from public databases (e.g., iNaturalists). The retrained model predicts CES-relevant labels for the entire Flickr photos. The relationships among the CES tags are investigated using keyword network analysis and spatial distributions are mapped across the EU-28 area. The resulting map provides spatially explicit information about different types of CES, which can support evidence-based ecosystem and biodiversity management policies.

Keywords: mapping cultural ecosystem services, social media photos, image annotation, keyword network analysis, computer vision

10. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)



In the eye of the AI beholder: a comparative analysis of computer vision–assisted characterizations of human–nature interactions in urban green spaces

First author: Andrea Ghermandi

Other author(s): Yaella Depietri, Michael Sinclair

Affiliation: University of Haifa, Israel

Contact: aghermand@univ.haifa.ac.il

Big data from photo-sharing platforms offer unique opportunities for the analysis and valuation of human–nature interactions and cultural ecosystem services. Research in this field increasingly relies on computer vision in artificial intelligence to identify elements of interest, preferences, and sentiments in photographs. As long as purposely developed, custom image recognition models do not become the standard in the field, studies largely rely on pre-trained models from one of several cloud-based, commercial image recognition services, but the extent to which findings depend on the implemented technology has not been explored. Here, we analyze ~10,000 outdoor photographs retrieved from three social media platforms and geolocated within green and blue spaces in Haifa (Israel) by means of machine tags from three popular cloud-based services. We find that clustering of the 45 investigated sites based on common characteristics of the photographs is considerably affected by the image recognition service chosen, especially for sites with limited data points (<80 photographs). Moreover, after associating the individual tags to specific aspects of the outdoor experience, we find substantial differences in the identification and ranking of outdoor recreational activities, characterization of the local biophysical environment (e.g., wildlife and vegetation), and feelings associated with the photographs. Consequently, we recommend that future studies exploring human–nature interactions and cultural ecosystem services through automated content analysis of social media photographs will not treat the choice of the computer vision service to rely on as purely dictated by convenience considerations. Rather, with no service clearly outperforming the others in all evaluation criteria, we argue that the optimal choice of service likely depends on the intended final application and that, time and resource permitting, combining information from multiple image recognition services might provide a characterization that is more nuanced and less prone to be affected by the idiosyncrasies of the individual technologies.

Keywords: big data, cultural ecosystem services, Flickr, passive crowdsourcing, social media



11. Type of submission: Abstract

T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice

Dealing with the ambiguous nature of cultural ecosystem services – participatory mapping and assessment of non-material values of nature in the Czech Republic

First author: Lubos Slovak

Other author(s): Jan Daněk, Tomáš Daněk

Affiliation: Global Change Research Institute of the Czech Academy of Sciences; Charles University, Faculty of Humanities, Czech Republic

Contact: danek.j@czechglobe.cz

Recently, there is an increasing attention to the assessment and mapping of cultural ecosystem services (CES) which have long been the odd and overlooked part of the ecosystem services framework. However, reductionist terminology, problematic generalizability, fuzzy category boundaries or contrasting paradigms and other discrepancies hinder faster advancement of the CES field. In our research we conduct a comprehensive assessment and mapping of CES combining various qualitative and quantitative approaches with participatory mapping of non-material values of nature. We conducted focus groups with experts on case study areas, field mapping of objects indicating their use related to CES and questionnaire survey with participatory mapping with visitors in order to explore both potential CES and actual benefits people obtain from nature and landscape. This endeavour, however, posits epistemological challenges related to the character of methods and ways of interpretation. One relates to the contrast between realism and (social) constructionism and manifests for instance when combining field data and data obtained from visitors. There is also tension, which Gould and colleagues identified as universalism v. anti-universalism, between choosing whether to interpret data in terms of universal CES categories or to seek to inductively develop a more specific account of people's perception and relations to places. In this contribution we will elaborate on these discords using the example of our research and discuss possibilities of bringing these diverse approaches and the produced knowledge together. Should we struggle to integrate them into a consistent whole or choose a rather pluralistic approach of complementarity?



Keywords: cultural ecosystem services, participatory mapping, assessment, epistemology

12. Type of submission: Abstract

T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice

Enjoying nature? Bundles of cultural ecosystem services for different visitor groups in mountain National Parks

First author: Maria Felipe–Lucia

Other author(s): Angel de Frutos, Emily Crouzat, Aletta Bonn

Affiliation: Helmholtz Centre for Environmental Research – UFZ; German Center for Integrative Biodiversity Research (iDiv), Germany

Contact: maria.felipe–lucia@idiv.de

Protected Areas are supposed to provide space for biodiversity and also offer wellbeing opportunities. Cultural ecosystem services (CES) are a way to assess the contribution of Protected Areas to human wellbeing through their intimate experiences with nature. However, management of Protected Areas often leads to conflicts, as different types of visitors may have different preferences for CES. Therefore, it is important to understand the linkages between visitor characteristics and their demand for particular sets of CES. Here we investigate stated preferences for CES combining information from individual on–site surveys and participatory mapping across visitors in three European National Parks. We assessed the match between clusters of visitors, socio–demographic information and most enjoyed areas of the National Parks and their surroundings. Our results show the characterization of different groups, or clusters of visitors, based on the set of CES they enjoy. We claim that a better understanding of tourists and locals expectations' regarding the way they experience nature is relevant for the environmental management of protected areas and their surroundings.

Keywords: nature contributions to people, stakeholders, survey, participatory mapping, protected areas



13. Type of submission: Abstract

T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice

Addressing cultural ecosystem services in CICES classification: case study on characteristic cultural landscape types in Slovenia

First author: Barbara Kostanjšek

Other author(s): Mojca Golobič

Affiliation: Department of Landscape Architecture, Biotechnical Faculty, University of Ljubljana, Slovenia

Contact: barbara.kostanjsek@bf.uni-lj.si

Cultural ecosystem services are not represented to the same extent in scientific discourse due to their intangible nature and, consequently, not well framed in ecosystem services assessments based on utilitarian perspective. In this study the ecosystem services assessment will derive from the landscape elements as the basic building units of ecosystems and the starting point for complementing the ecosystem services concept. The importance of landscape elements for provision of ecosystem services is examined and argued with the recognized functions that landscape elements provide. Landscape elements define the character and functionality of the landscape by the interaction of terrain, microclimate, land use and surface cover. Landscape elements occur in the form of vegetation, geomorphological features, water bodies and built-up elements. The identification of essential landscape elements for the provision of ecosystem services is performed through field surveys on representative landscape character types in Slovenia based on their contribution to structural and configurational heterogeneity as measured by diversity and shape metrics (Shannon's Diversity Index and SHAPE Index), followed by the assessment of landscape elements' capacities to provide ecosystem services according to the current CICES classification. It follows that the landscape elements' capacities for provision of ecosystem services depend not only on the characteristics of individual elements, but also on the spatial relationships between them and the physical manifestations of human activity in the environment, which are reflected in landscape elements. In order for the cultural ES to be better integrated into the ES evaluation in scientific literature, upgrading of the classification is proposed.



Keywords: cultural ecosystem services, cultural landscape, landscape metrics, ecosystem service capacity

14. Type of submission: Abstract

T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice

The numerous faces of the cultural ecosystem services

First author: Laura Maebe

Other author(s): Johanna, Breyne, Hugues, Claessens, Marc, Dufrêne

Affiliation: Forest is Life, Faculty of Gembloux Agro–Bio Tech, University of Liège, Gembloux, Belgium

Contact: laura.maebe@uliege.be

The assessment of the cultural ecosystem services (CES) still raises many epistemological, ethical and methodological questions. To answer some of them, we propose a methodology combining various methods and distinguishing ecosystem services (ES) performances (i.e. state or trend of an ES) from socio-cultural values (SCV) (i.e. perceived relative importance, how the ES and their benefits matter to a (group of) person(s)). We applied this methodology to the municipal forest of Sivry-Rance (Belgium). To assess ES performances, we (1) mapped the touristic infrastructures; (2) measured the forest attendance; (3) used economic valuation methods (contingent valuation, travel-cost, and choice experiments) based on surveys, and (4) determined the importance of the CES for the stakeholders through a participative workshop. The SCV were also assessed during the surveys and the participative workshop. The ES performances differ from one method to another as differ the SCV among stakeholders. For example, the mapping shows a well-developed touristic infrastructures. Regardless, the contingent valuation reveals that the recreational users are willing to pay several euros in taxes to improve the touristic infrastructures. Their recreational value is high whereas for other stakeholders (e.g. hunters), this SCV is very low compared to other SCV such as biodiversity and direct economic value. These results show the need to combine various assessing methods to reveal the diversity of CES performances. The recognition of SCV is also essential to acknowledge the different viewpoints of the stakeholders in order to take



appropriate management decisions which, for example, reduce potential conflicts between different user groups.

Keywords: integrated ecosystem services assessment, socio-cultural values, forest, participatory approach

15. Type of submission: Abstract

[T. Thematic Working Group sessions: T8 – Cultural Ecosystem Services: Time to advance theory and practice](#)

Sensing, feeling, thinking: cultural ecosystem services beyond the cognitive

First author: Emilia Pramova

Other author(s): Bruno Locatelli

Affiliation: Center for International Forestry Research (CIFOR), Lima, Peru

Contact: emilia.pramova@gmail.com

The cultural ecosystem services (CES) construct has evolved to accommodate multiple worldviews, knowledge systems and conceptualizations of nature and values, including relational and mental health values. However, CES research and practice has mostly focused on cognitive ways of constructing and expressing intangible values of, and relationships with, nature. But our immaterial relationship to nature also involves sensory and affective processes and experiences that are fundamental to how and why we construct and express value. We present a simple framework that encompasses the sensory, affective, and cognitive dimensions of human–nature interactions, as well as the scenery and experiential interactions giving rise to these psychological processes. We demonstrate its use in a case study where we used an inductive, exploratory approach to elicit experiences and interactions with non–human nature in the Peruvian Andes. A diversity of intangible values and intangible experiences emerged, and both are important for biodiversity conservation, human wellbeing, and environmental justice. We discuss the usefulness of such an approach for CES research and policy (including how it can contribute to the development of quantitative surveys), and for landscape planning and conservation.

Keywords: immaterial, connection, emotion, sensation, cognition