BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: T19a

Ecosystem Services and Big Data: New Concepts, New Approaches, New Networks

Hosts:

	Name	Organisation	E-mail
Host:	Johannes Langemeyer	Universitat Autònoma de Barcelona	johannes.langemeyer@uab.cat
Co-host(s):	Michael Sinclair Andrea Ghermandi Fulvia Calcagni	University of Glasgow University of Haifa Universitat Autònoma de Barcelona	Michael.Sinclair@glasgow.ac.uk aghermand@univ.haifa.ac.il fulvia.calcagni@uab.cat

Abstract:

In an era where big data is revolutionizing our understanding of the world, the potential it holds for enhancing ecosystem services (ES) research is immense. Bridging the gap between big data analytics and ES understanding has the potential to illuminate novel pathways to a sustainable future. ESP Thematic Working Group 19 stands at the forefront of this transformation, advocating for the integration of novel digital data sources – such as user-generated content and mobile phone data – with innovative social, environmental, and spatial data science techniques. This session will delve into the innovative ways big data can illuminate the co-production of environmental values and knowledge and offer new insights into human-nature relationships. Join us at the forefront of this exciting frontier, where new concepts, approaches, and networks emerge to redefine the understanding of our relationship with the natural world and the interdependence of human, ecosystems, and planetary health.

Goals and objectives of the session:

- To stimulate debate: Create a platform for discussions on the challenges and opportunities presented by big data in ES research.
- To facilitate communication: Strengthen the network among ES researchers, practitioners, and policymakers focused on the intersection of big data and ES.
- To gain novel insights: Creating novel understanding of (cultural) ES and relational values from a digital perspective.
- To promote big data application: Showcase cutting-edge research and methodologies that leverage big data for the characterization of ES
- To develop methods and support: Offer guidance on best practices, data access, reproducibility, ethical data use, and navigating regulatory landscapes.
- To foster interdisciplinary collaboration: Encourage synergies between social, ecological and computational science to unfold in ES research and beyond.

Aligning with Conference Themes:

- Ecosystem Services and Health: This session will explore how big data can reveal the complex interactions between ecosystem services and public health, emphasizing the potential for transformative policies and practices that enhance both ecological and human well-being.
- Ecosystem Services and Conditions for Transformative Change: We will discuss how insights from big data can inform and catalyze conditions for transformative change towards sustainability, including the promotion of the UN Sustainable Development Goals, and focusing on digital relational values and the co-creation of knowledge for action.

Planned output / Deliverables:

New Concepts, New Approaches, New Networks under ESP Thematic Working Group 19

Session format:

10 min presentations will be followed by a facilitated discussion and networking session for participants to build connections, share experiences, and forge collaborative projects.

II. SESSION PROGRAM

Room: Expert Street 2

Date of session: 20th of November 2024
Time of session: 11:00 – 12:30

Timetable Speakers

Time	First name	Surname	Organization	Title of presentation
11:00 – 11:10	Andrea	Ghermandi	University of Haifa	Social media data and cultural ecosystem services: Lessons learned and new research frontiers
11:10 – 11:20	Fulvia	Calcagni	Universitat Autònoma de Barcelona	Objectivizing the subjective: co-creation of a standard protocol for cultural ecosystem services coding based on social media content
11:20 – 11:30	Michael	Sinclair	Urban Big Data Centre, University of Glasgow	Mobile Phone Applications: A new Frontier of Big Data Collection
11:30 – 11:40	Luning	Li	Urban Big Data Centre, University of Glasgow	Understanding urban green space usage from mobile phone application data
11:40 – 11:50	Johannes	Langemeyer	Universitat Autònoma de Barcelona	Virtual Communities for Transformative Change: How Human-Nature Experiences Trigger Digital Relational Values
11:50 – 12:00	Xueyuan	Liang	Vrije Universiteit Brussel	The identification and classification of digital relational values of urban natural environments in the weibo virtual community.
12:00 – 12:30	Discussion and Networking Opportunities			

III.ABSTRACTS

The first author is the presenting author unless indicated otherwise.

1. Social media data and cultural ecosystem services: Lessons learned and new research frontiers

First authors(s): Andrea Ghermandi
Affiliation: University of Haifa
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Since the pioneering studies of the early 2010s, which used counts of geotagged photographs from platforms like Flickr as proxies for investigating outdoor recreation in natural sites, the integration of social media data into ecosystem services research has advanced significantly. While early research primarily focused on counting relevant social media data items based on their metadata, the field has since evolved to analyze the semantics of the user-generated content itself—particularly of photographs and texts—including with the assistance of sophisticated data analytics techniques like natural language processing and computer vision. Recent advances in Artificial Intelligence promise to further revolutionize the depth and breadth of insights that can be derived from social media posts and to extend the scope of multimodal analyses. The field has also faced critical challenges. Recent restrictions on data access from platforms once central to this research, such as Twitter/X, have prompted the search for alternative, more sustainable data sources and led to question the long-term viability of this field of research. Additionally, foundational issues like data representativeness, and best practices for inclusive and ethical research remain underexplored. Here, I will discuss key lessons learned, current trends, and potential future directions through an up-to-date review of the growing body of literature that leverages social media data to study cultural ecosystem services. Furthermore, drawing on recent studies from natural parks in Israel, I will provide initial insights into pressing questions about differences in users' socio-demographics across platforms and differences in the content that users choose to share through various media formats and across the broad spectrum of available digital platforms—issues that have been inadequately explored to date. Finally, I will offer a forward-looking perspective on the discipline's trajectory, highlighting anticipated challenges and innovations.

Keywords: Cultural ecosystem services, Digital footprints, Passive crowdsourcing, User-generated content, VGI

2. Objectivizing the subjective: co-creation of a standard protocol for cultural ecosystem services coding based on social media content

First authors(s): Fulvia Calcagni

Other author(s): Johannes, Langemeyer, Andrea, Ghermandi

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In an urbanizing world with ecosystems increasingly being degraded and people lacking direct nature experiences and perceptions of dependency, cultural ecosystem services (CES) are increasingly gaining importance in maintaining and fostering people's relational values and environmental stewardship. However, assessments of CES - and associated relational values - still face methodological hurdles due to their subjective, context-specific and intangible nature. Recently, approaches based on crowdsourced data, such as photographs and texts from social media platforms (e.g., Flickr, Twitter, Instagram), have been gaining momentum. Yet, the development of such approaches is still at the experimental phase and lacks a shared and grounded protocol for application, covering both the technical aspects of classifying the individual CES revealed by the data as well as the ethical issues related to the management of the data and associated metadata. This hinders cross-study comparisons and validations, as well as the uptake of this promising technique by decision-makers and a wider societal acceptance of this research approach. Building on a literature review, 4 testing case-study applications, and a workshop session organized during the Ecosystem Services Partnership (ESP) conference in 2022, we present the collectively designed and tested standard protocol for the assessment of CES and relational values through the analysis of visual and text information retrieved from social media data.

Keywords: Cultural Ecosystem Services, Social Media, Standard coding protocol

3. Mobile Phone Applications: A new Frontier of Big Data Collection

First authors(s): Michael Sinclair
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Over the past decade, social media has played a pivotal role in advancing our understanding of cultural ecosystem services (CES), providing invaluable insights into human interactions with natural and cultural environments. This rich vein of research has produced a multitude of methodologies and applications, significantly expanding the CES landscape. As we look to the future, a pressing question emerges: what's next in the evolution of data sources for CES studies?

A burgeoning data revolution is taking place in the realm of location-based services, which may provide answers to this question. The advent of mobile phone applications on GPS-enabled devices has initiated a new era of data collection, characterised by a structural resemblance to social media metadata but distinguished by its immense volume and collection mechanisms. Data generated by a growing array of mobile phone applications offers a substantial increase in quantity and an unprecedented resolution in space and time, presenting untapped potential for new directions in CES research.

While this extensive data source offers considerable potential to further explore intricacies of human-nature and human-culture interactions, it also introduces significant ethical and technical challenges which may be even greater than those posed by social media. Addressing these challenges necessitates a careful examination of how location-based data can be ethically and effectively utilised to enhance our understanding of CES, while ensuring the privacy and security of individuals. This talk will explore such a question and what lies beyond social media data for CES research.

Keywords: Mobile phone data, Bias, Big data, Ethics, Greenspace

4. Understanding urban green space usage from mobile phone application data

First authors(s): Luning Li
Other author(s): Michael Sinclair
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Parks and other green spaces play a crucial role in fostering sustainable, healthy, and socially equitable urban environments. Urban planning and green space management gain valuable insights from information on green space usage; however, collecting such data is often limited and requires significant effort. The temporally dynamic data generated by mobile phone applications offer a promising source for studying human mobility in urban areas. This data, derived from GPS and Wi-Fi signals collected by a variety of mobile applications, provides detailed information about people's movements over time. Such data open new possibilities for understanding the spatial and temporal dynamics and the interactions between humans and nature in various urban environments. Despite its potential, the novelty and limited access to this data mean that its utility and applicability are not fully explored. This study aims to investigate the types of information on urban green space usage that can be extracted from mobile phone application data. In our study, we assess the use of urban green spaces through several dimensions: visit counts, user dwell time, heatmaps, spatial and temporal patterns, demographics, and green space catchment areas. The analysis utilizes two extensive and independent datasets from Huq and Tamoco, each containing three years of data for a large and diverse urban region (Glasgow, Scotland). Our results indicate that mobile phone application data can provide valuable insights into the use and movement within urban green spaces, provided that the data's inherent limitations are acknowledged. By comparing these datasets as sources of knowledge on urban green space usage, we highlight the strengths, weaknesses, potentials, and challenges associated with using mobile phone application data to inform sustainable spatial planning and green space management in cities.

Keywords: Mobile phone data, Urban green space, Huq, Tamoco

5. Virtual Communities for Transformative Change: How Human-Nature Experiences Trigger Digital Relational Values

First authors(s): Johannes Langemeyer

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We witness the rapid loss of people's opportunities to experience nature—what Miller (2005) has referred to as 'the extinction of experiences'—and this has been assumed to create a downward spiral of people's willingness to protect nature. Yet, with half of the global population using the internet and an increasing number of people spending more of their time online than in nature, virtual communities counteract this trend. Positive relationship between the use of Twitter and Youtube and the propensity to advocate for environmental care have been shown. We argue that virtual communities are essential for shaping relational values of and about nature, in order to encourage environmental stewardship and to foster global

transitions. We introduce Digital Relational Values (DRVs) as fundamental and eudemonic values that are developed within virtual communities, triggered by indirect experiences of nature.

We trace these values across large social media networks and develop and apply innovative social-ecological computational approaches that allow to (a) identify DRVs across different social media platforms, (b) understand how they spread across virtual communities, and (c) examine the relationship between virtually produced DRVs and physical environmental stewardship.

We thereby aim to challenge the assumption of an "extinction of experiences" and the consecutive decline of nature values and care for the environmental. We further aim at strengthening the importance of relational values as a foundation for environmental stewardship and contribute to a novel understanding of a physical-virtual continuum in the generation of nature benefits and values.

Keywords: Digital relational values, Extinction of experiences, Social media, Environmental stewardship

6. The identification and classification of digital relational values of urban natural environments in the weibo virtual community

First authors(s): Xueyuan Liang

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The urbanization trend on our planet has led to the loss of opportunities to experience nature in the physical world, which is commonly referred to as "the extinction of experience". With the prevalence of social media platforms, virtual communities provide people with entertainment and information, allowing them to indirectly experience nature and shaping the so-called digital relational values (DRVs). However, the conceptualization of nature's DRVs is still in its infancy, and a well-developed classification system has yet to be established. Like Twitter and other social media platforms, Weibo, the most popular social media platform in China, also forms its unique virtual community where DRVs are shaped. This research aims to establish a classification system and provide replicable classification approaches for DRVs in the Weibo virtual community.

Weibo text and image data from June 1, 2023, to May 31, 2024, are collected by search terms related to multiple landscape types. A temporal sampling method is used to select subsample datasets to initiate the manual coding analysis of text and image content to identify and classify DRVs. In this process, coding lexicons and protocols are established for text and image data. The iterative manual coding is performed in different steps and by three different researchers. The relative performance of text and image data in capturing DRVs is compared through descriptive statistics of DRVs.

This research can help support the future understanding of DRVs and enhance comprehension of human-nature interactions in virtual environments, promoting the conservation and stewardship of the natural environments.

Keywords: Digital relational values; Human-nature relationships; Urban nature; Big data; Social media platform