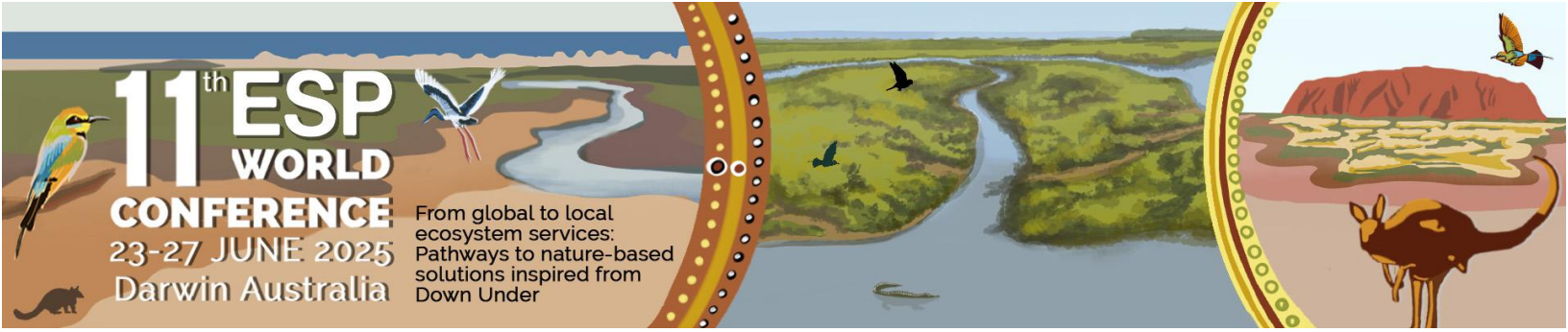


BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: T13

From Interaction to Restoration: Pathways to Nature-Based Solutions through Cultural Ecosystem Service (CES) in the Carbon Era

	Name	Organisation	E-mail
Host:	Yuehan Dou	Xi'an Jiaotong - Liverpool University	yuehan.dou@xjtlu.edu.cn
Co-host(s):	Tong Li	School of Agriculture and Food Sustainability, The University of Queensland	tong.li1@uq.edu.au
	Rajiv Pandey	Indian Council of Forestry Research and Education (ICFRE), Dehradun, India	rajivfri @yahoo.com

Abstract:

The Decade on Ecosystem Restoration (2021–2030) underscores the critical need for restoration strategies that address global environmental challenges while enhancing biodiversity, human well-being, and sustainable livelihoods. Cultural Ecosystem Services (CES)—non-material benefits such as recreation, aesthetics, and a sense of place—are pivotal for linking ecological outcomes to societal values and supporting communities' livelihoods dependent on restored ecosystems. However, CES remain underexplored in restoration science, with assessments often prioritizing biophysical and economic metrics over social and cultural dimensions.

To build truly inclusive and effective restoration strategies, it is essential to consider the interactions between human communities and their environments within social-ecological systems. Soil carbon management, particularly through improving soil organic carbon (SOC) stocks, plays a pivotal role in restoration by enhancing soil health, increasing carbon sequestration, and supporting ecological functions that underpin CES, such as aesthetic landscapes, cultural heritage, and sustainable livelihoods. This integration of CES and SOC provides a novel perspective, highlighting how carbon management not only addresses ecological challenges but also

enriches cultural and social values in restoration practices, offering a comprehensive essential framework for understanding the complex interplay between landscapes and human perceptions, ecosystem services and human well-being, enabling restoration efforts to align with community priorities and preferences.

We invite presentations that address but are not limited to the following themes:

- Innovative methodologies for assessing CES in restoration contexts, including spatial, participatory, and perception-based approaches.
- Case studies demonstrating the integration of CES in Nbs, focusing on public engagement and stakeholder collaboration.
- Theoretical advancements on the response mechanisms of CES and SOC to restoration interventions.
- Strategies for addressing conflicts or trade-offs between ecological objectives and cultural values in restoration projects.
- The Role of carbon management in enhancing community cultural identity and engagement
- Pathways for integrating carbon management and cultural landscapes in restoration practices

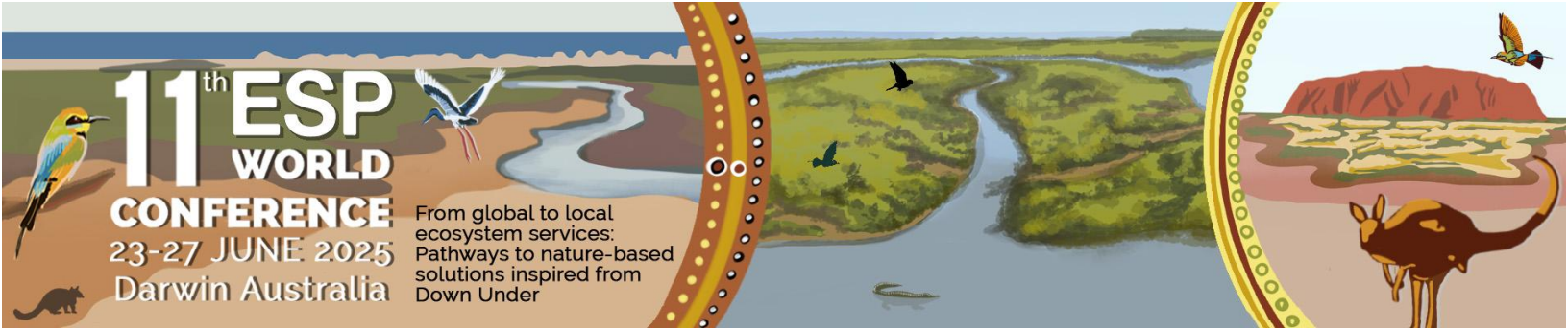
Goals and objectives of the session:

This session aims to explore the role of CES in advancing NbS by examining how restoration projects can better integrate cultural and social values into planning, implementation, and evaluation. By showcasing diverse perspectives and practices, this session seeks to position CES as a core component of NbS, promoting restoration strategies that are not only ecologically effective but also culturally and socially inclusive. An innovative focus will be placed on the intersection of CES and SOC management, highlighting the importance of sustainable land use practices in achieving restoration outcomes. By integrating SOC as a key indicator of ecosystem health, this session seeks to promote restoration strategies that support biodiversity, cultural values, and community livelihoods.

By bringing together interdisciplinary expertise, this session aims to highlight innovative approaches and actionable strategies that enhance the effectiveness of restoration practices. Emphasis will be placed on sharing practical insights and lessons learned, encouraging participants to exchange knowledge, address challenges, and co-create solutions that align ecological restoration with cultural and social priorities. Contributions are welcomed from researchers, practitioners, and policymakers working across disciplines to bridge the gap between ecosystem restoration, carbon management and human well-being.

Planned output / Deliverables:

1. Special Journal Issue: Propose a special issue in a peer-reviewed journal dedicated to the session's theme, showcasing high-quality contributions that explore the integration of CES and SOC management into NbS and ecosystem restoration. Submissions will prioritize interdisciplinary approaches that bridge cultural, social, and



ecological dimensions, emphasizing their role in advancing sustainable livelihoods and addressing global restoration challenges.

2. Thematic Working Group Engagement: This session will propose the formation of a dedicated sub-group under the ESP Thematic Working Group "TWG 13: Role of Ecosystem Services in Ecosystem Restoration," focusing on the interaction of SOC management, CES, and community livelihoods. The sub-group will explore policy perspectives and actionable strategies for integrating these dimensions into restoration practices.

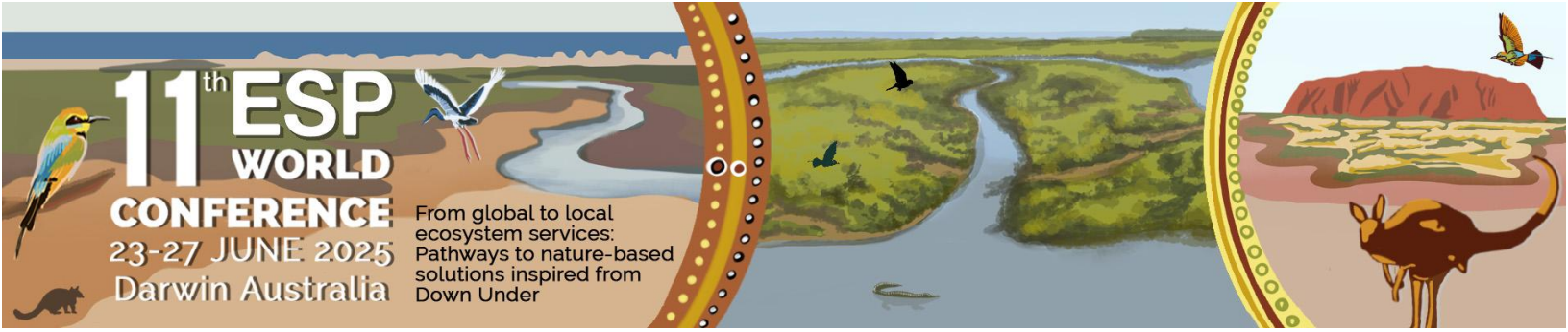
3. Dissemination of Outcomes: Develop a perspective paper based on the intensive discussions and diverse insights shared during the session. This paper will capture key findings, innovative approaches, and emerging research priorities, with an emphasis on the role of SOC and CES in fostering sustainable livelihoods through restoration practices. co-authored with session participants to ensure a comprehensive and interdisciplinary viewpoint, contributing meaningfully to the global dialogue on sustainable ecosystem restoration and carbon management.

II. SESSION PROGRAM

Room: Hall 1
Date of session: 23 June 2025
Time of session: 14:00-17:30

Timetable speakers:

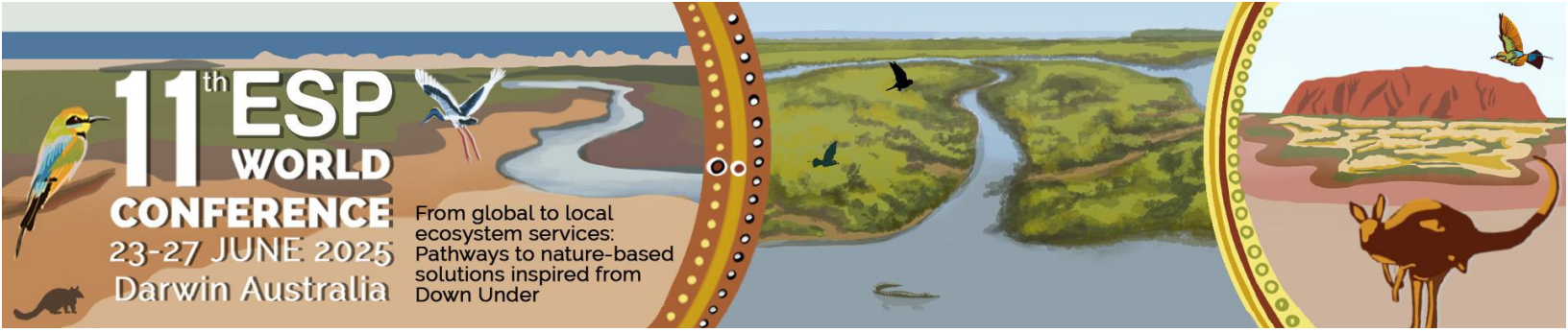
Time	First name	Surname	Organization	Title of presentation
14:00-14:12	Giovanni	Avila-Flores	Autonomous University of Baja California Sur	Cultural Ecosystem Services in Mangroves and Salt Marshes of Baja California Sur, Mexico: A Comparative Analysis and Conservation Challenges
14:13-14:24	Eduardo	Gomes	Centre of Geographical Studies (CEG), Associate Laboratory TERRA, Institute of Geography and Spatial Planning (IGOT), Universidade de Lisboa	Assessing Cultural Ecosystem Services in a changing landscape: land-use dynamics and restoration pathways in Alqueva, Alentejo
14:24-14:36	Malgorzata	Blicharska	Uppsala University	Small Waters, Big Values: Integrating Cultural and Regulating Ecosystem



Time	First name	Surname	Organization	Title of presentation
				Services in Pond and Wetland Restoration
14:36-14:48	Yang	Chen	The Hong Kong Polytechnic University	Bridging people and nature: Public preference for different Nature-based solutions and the underlying factors
15:48-15:00	Lingshang	Sheng	Fudan University	Nature-based Solutions (NbS) in China: implementation and practice modes
15:00-15:12	Liqing	Pan	Xi'an Jiaotong-Liverpool University	Investigating the influence of species characteristics on habitat ecosystem services: The Migratory Bird Sanctuaries along the Coast of Yellow Sea-Bohai Gulf of China (Phase I), a UNESCO World Natural Heritage Site
15:12-15:24	Takahiro	Ota	Osaka University	Incorporating Biodiversity Value in the Commercialization of Medicinal Herbs from A Carbon Project Site: A Case Study from Central Kalimantan, Indonesia

Break-15mins

Time	First name	Surname	Organization	Title of presentation
15:40-15:52	Ulrike	Kachel	Charles Darwin University	Building community for climate action, environmental engagement and nature-based solutions: A university's social events as experiments
15:52-16:04	Lydia	Chibambo	Zambia Climate Change Network	Promoting Agroecology and Indigenous Knowledge in Sustainable Food System - Nyimba District, Zambia.



Time	First name	Surname	Organization	Title of presentation
16:04-16:16	Sudeep Budhaditya	Deb	Government of West Bengal	Natural Resources, Participation and Communities: An Hypothesized Framework for a Change Hierarchy
16:16-16:28	Tong	Li	University of Queensland	Integrating Soil Carbon Modeling into Restoration Practice to Support Cultural Ecosystem Services
16:28-16:40	Guoxiang	Niu	Lushan Botanical Garden, Chinese Academy of Sciences	Optimizing forest soil carbon multi-pool management through nature-based fauna solutions

Break-10mins

Time	Discussion
16:50-17:30	With all presenters and any other participants in the session

III. LIST OF ABSTRACTS

The first author is the presenting author unless indicated otherwise.

1. Cultural Ecosystem Services in Mangroves and Salt Marshes of Baja California Sur, Mexico: A Comparative Analysis and Conservation Challenges

First authors(s): Giovanni Avila-Flores

Other author(s): Adriana Carolina Flores-Díaz, Juan Manuel López-Vivas, Pablo Hernández-Morales, Liliana Paredes-Lozano, Marco Antonio Pérez-Serrano, Daniel Cano-Ontiveros, Macario Savín-Amador, Eliseo Hernández-Hernández,

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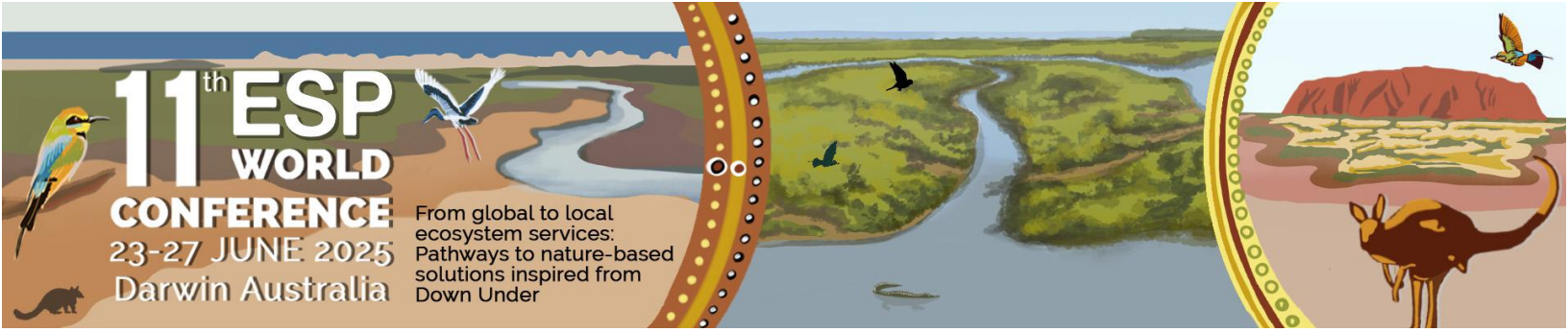

Keywords: Conservation, Ramsar, Tourism, Valuation, Wetlands

Cultural ecosystem services (CES) play a vital role in shaping local identity, promoting recreation, and enhancing community well-being in coastal ecosystems. However, research on CES remains relatively limited compared to other ecosystem services, such as carbon sequestration, largely due to disparities in funding availability. This study compares the provision of CES in two coastal ecosystems of Baja California Sur, Mexico: the mangroves of Bahía de La Paz and the salt marshes of Cabo del Este. Through a literature review and participant observations, we assess the recreational use of these ecosystems by local populations and the impacts of tourism-related developments on access to these areas. Our findings indicate that the mangroves have benefitted from significant scientific attention, resulting in stronger environmental regulations that support their conservation. Conversely, salt marshes are less studied, rendering them more vulnerable to land-use changes, tourism development, and restricted public access. Despite the methodological limitations of this study, its significance lies in underscoring the urgent need for expanded research on CES in understudied coastal ecosystems. The lack of allocated funding for CES research hinders their integration into environmental decision-making processes. We contend that reinforcing the scientific foundation on CES could improve conservation strategies and promote more inclusive and sustainable coastal management policies.

2. Assessing Cultural Ecosystem Services in a changing landscape: land-use dynamics and restoration pathways in Alqueva, Alentejo

First authors(s): Eduardo Gomes

Other author(s): Miguel Inácio, Luís Valença Pinto, Paulo Pereira

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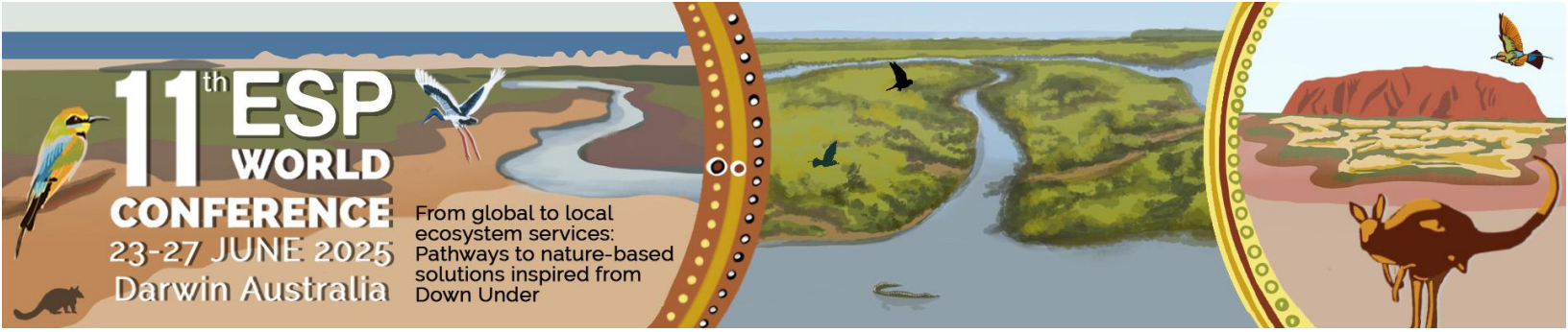
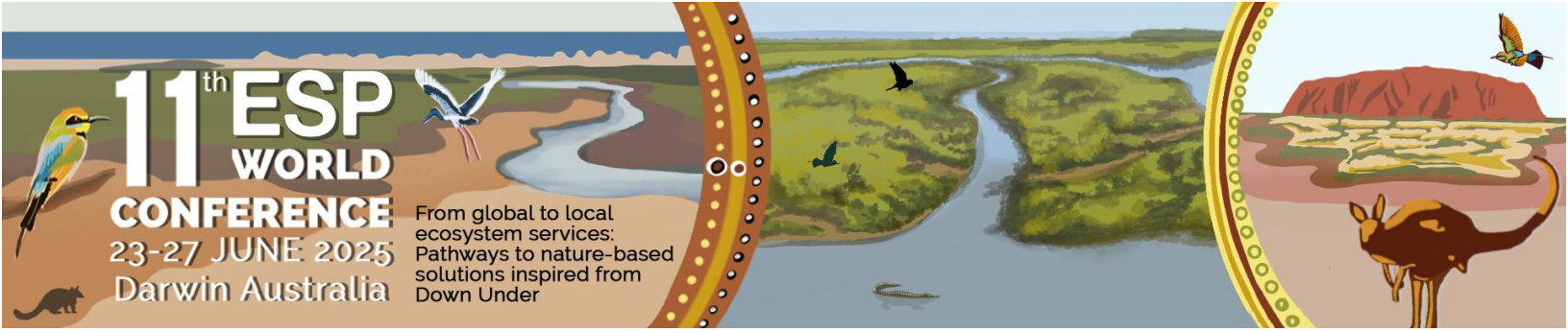


Keywords: Cultural ecosystem services, land-use and land-cover change, geospatial modeling, participatory GIS, Portugal

Cultural Ecosystem Services (CES) provide essential non-material benefits, such as recreation, aesthetics, and cultural heritage, yet they remain underrepresented in ES assessments due to their subjective and spatially complex nature. This study develops an innovative framework to assess the impacts of land-use and land-cover change (LULCC) on CES in the Alqueva region of Alentejo, Portugal, a landscape undergoing significant transformation following the expansion of irrigation infrastructure and shifts towards intensive agriculture. Traditionally dominated by Montado systems, this region exemplifies the tension between agricultural intensification and the preservation of cultural and ecological values. Using geospatial modelling, participatory GIS (PPGIS), and stakeholder engagement, we evaluate CES under a 2040 Business as Usual scenario. Preliminary findings suggest that maintaining current land-use trends results in a gradual decline of CES, particularly cultural heritage, recreation, and aesthetic value, with potential negative implications for regional identity and social cohesion. However, certain multifunctional landscapes within the current system continue to support CES and ecological integrity, emphasizing the importance of maintaining sustainable land management practices. Stakeholder inputs highlight concerns over landscape homogenization and culture loss, reinforcing the need for adaptive policies that integrate CES into restoration and land-use planning. This research advances CES assessment by integrating spatial and participatory approaches, bridging quantitative modelling with qualitative insights. It aligns with global sustainability initiatives, including the European Union Biodiversity Strategy 2030 and the United Nations Decade on Ecosystem Restoration, providing actionable recommendations for land-use planning and policy. By assessing the trajectory of Business as Usual, this study underscores the need to integrate CES into restoration strategies, ensuring that ecological conservation aligns with socio-cultural priorities in sustainable land management. The findings contribute to a broader understanding of how land-use transitions impact CES, offering a replicable methodology for other regions facing similar challenges.



3. Small Waters, Big Values: Integrating Cultural and Regulating Ecosystem Services in Pond and Wetland Restoration

First authors(s): Malgorzata Blicharska

Other author(s): Lotte van den Heuvel, Dennis Collentine, Martyn Futter, Pia Geranmayeh

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Keywords: cultural ecosystem services, Nature-based Solutions, perceptions, ponds, wetlands

Small ponds and wetlands are vital nature-based solutions (NbS) that provide many ecosystem services (ES), including carbon sequestration, nutrient retention, and water flow regulation. Beyond these regulating ES, they offer significant cultural ecosystem services (CES), such as recreation, aesthetic value, and a sense of place. Understanding the synergies and trade-offs between these ES is crucial for designing inclusive and effective restoration strategies that align with ecological goals while enhancing human well-being.

The capacity of ponds and wetlands to deliver ES is shaped by their characteristics, which influence both their ecological functioning and how they are experienced and valued by people. Public perceptions of NbS play a pivotal role in fostering connections between communities and restored ecosystems, ultimately shaping the societal benefits they provide. However, research indicates that NbS functioning and appearance do not always align with public preferences, potentially limiting their perceived social value. This misalignment underscores the need for methodologies that integrate human perceptions into restoration planning and management.

This study employs a novel perception-based approach to explore people's visual preferences for pond and wetland NbS. Using a photo-based survey with members of the Swedish public, we assess both use and non-use values linked to regulating and cultural ES. By linking public

perceptions to ecosystem functionality, our study contributes to a deeper understanding of how CES can be effectively integrated into restoration practices.

Our findings have direct implications for the design, placement, and management of pond and wetland NbS, providing insights into how these ecosystems can be optimized to enhance both ecological performance and societal benefits. In addition to advancing the literature on public perceptions of NbS, this research informs stakeholders on how to bridge ecological objectives with cultural values, ensuring that restoration efforts are not only ecologically sound but also socially inclusive.

4. Bridging people and nature: Public preference for different Nature-based solutions and the underlying factors

First authors(s): Yang Chen

Other author(s): Yuhong Wang

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Keywords: Nature-based solutions, Cultural ecosystem services, River restoration, Hong Kong, Public engagement, Sustainable cities.

Nature-based solutions (NbS) are increasingly recognized as transformative strategies to enhance ecological resilience and human well-being in urban environments. In high-density cities like Hong Kong, where rapid urbanization places immense pressure on the society, understanding public preferences for different NbS is critical for their effective implementation and long-term success. This study explores public perceptions of urban challenges and their preferred NbS types, aiming to bridge the gap between NbS and societal values in Hong Kong and understanding the underlying factors that affect the residents' preferences.

We conducted interviews and surveys to gauge public perspectives on various NbS, such as urban green spaces, green roofs, and vertical greening. Geographic Information Systems (GIS) were employed to analyze the surrounding environment of respondents, including population density, proximity to green spaces, and other contextual factors. Additionally, socio-demographic variables such as age, education level, and income were examined as potential factors affecting NbS preferences.

This study advocates for a participatory approach to NbS planning, emphasizing the need to integrate public values and preferences into urban development strategies. By fostering greater public support and engagement, NbS can serve as a powerful tool for creating sustainable, inclusive, and resilient urban landscapes in high-density cities like Hong Kong. The findings offer valuable insights for other global cities facing similar challenges.

5. Nature-based Solutions (NbS) in China: implementation and practice modes

First authors(s): Ling-sang Sheng

Other author(s): Ying-Ying Hao, Si-Qi Zhou, Bing Tan, Qi Yuan, Dong-Fan Xu, Bin Zhao, , ,

First author affiliation: Fudan University

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Keywords: Nature-based Solutions (NbS); China; Implementation; Ecological Practices

Nature-based Solutions (NbS) are innovative strategies that harness natural processes and ecosystems to address a spectrum of environmental and societal challenges in a cost-effective manner. Although global interest in NbS is increasing, empirical research on their practical implementation within the Chinese context is scarce. This study introduces a comprehensive paradigm and a practice analysis framework aimed at quantitatively evaluating the prevalence and operational modalities of NbS initiatives in China from 2021 to 2023. Through a systematic analysis of 168 NbS cases, we identified four predominant practice modes: government-led

initiatives, local government-led projects with diversified funding, multi-stakeholder engagement models, and traditional government-led ecological practices. Our findings reveal that the number of NbS initiatives in China significantly exceeds those documented on the international stage, underscoring the significant untapped potential of NbS within the nation. The vast majority of these initiatives (96%) tackle multiple societal challenges, with 75.60% successfully achieving social, economic, and environmental benefits, thereby validating their holistic efficacy. While government-led initiatives constitute the majority of NbS implementation (77.38%), there is a notable degree of stakeholder involvement (79.76%), suggesting a collaborative approach that bolsters the legitimacy and sustainability of these projects. For local practitioners, we recommend the integration of NbS into ongoing ecological practices, advocating for a synergistic approach that combines top-down and bottom-up strategies to maximize potential in tackling complex challenges. For future NbS endeavors, it is imperative to foster context-specific concepts that are attuned to local conditions and needs, thereby ensuring the maximization of effectiveness and benefits.

6. Investigating the influence of species characteristics on habitat ecosystem services: The Migratory Bird Sanctuaries along the Coast of Yellow Sea-Bohai Gulf of China (Phase I), a UNESCO World Natural Heritage Site

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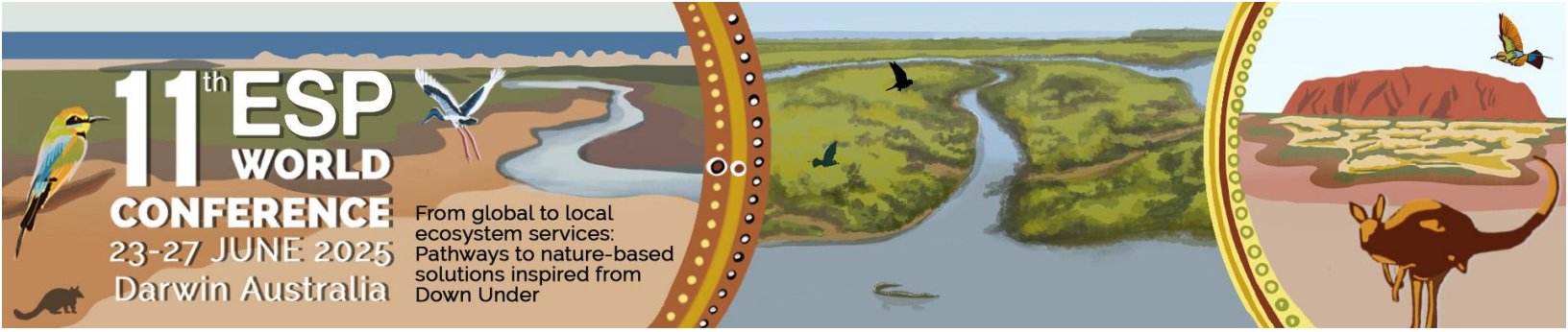
Keywords: Habitat Ecosystem Services, Species Characteristics, Migratory Waterbirds, Functional Traits, Cultural Services



Wetlands play a crucial role in providing ecosystem services, particularly as habitats for migratory waterbirds. Current conservation strategies predominantly focus on habitat protection, overlooking the species-specific contributions of migratory birds to ecosystem services. While research on regulating services (e.g., nutrient cycling, pest control) is well established, cultural ecosystem services (CES), such as recreation and cultural identity, remain underrepresented in conservation planning. This study aims to integrate functional trait-based assessments into the ecosystem service framework to improve our understanding of both the ecological and social contributions of migratory waterbirds. Specifically, we investigate (1) how functional traits (e.g., body length, wing shape, beak structure) influence ecosystem service provision, (2) the relationship between species diversity, population dynamics, and ecosystem stability, and (3) how habitat characteristics mediate these interactions. Using the Migratory Bird Sanctuaries along the Coast of the Yellow Sea-Bohai Gulf of China (Phase I), a UNESCO World Natural Heritage Site, as a case study, this research will employ trait-based modeling and social valuation methods to assess CES more comprehensively. Expected results will highlight the overlooked role of migratory birds in CES, informing conservation strategies that balance biodiversity protection and sustainable socio-economic benefits. This study contributes to ecosystem service research by bridging the gap between ecological function and cultural value, offering insights for more integrative conservation planning.

7. Incorporating Biodiversity Value in the Commercialization of Medicinal Herbs from A Carbon Project Site: A Case Study from Central Kalimantan, Indonesia

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Other author(s): Gergely Mohacsi, Aswin Usup

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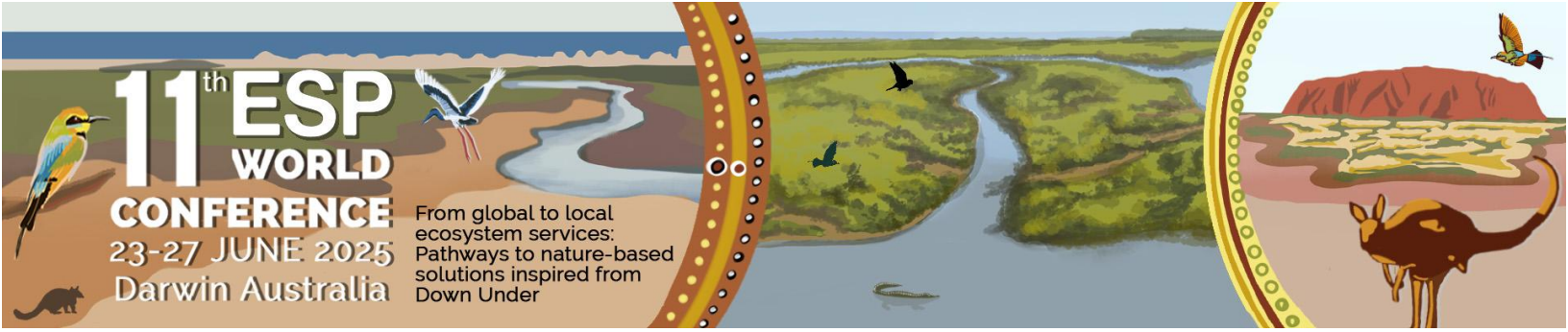

Keywords: Marketing, Community development, Carbon offset, Cultural ecosystem services, Traditional ecological knowledge

Many initiatives focus on enhancing carbon stocks through nature restoration activities such as afforestation and soil improvement. While these carbon projects contribute to environmental goals, they may also restrict the use of restored ecosystems by local communities and often incorporate empowerment initiatives, such as the creation of alternative livelihoods, as compensation for these limitations. A prominent example of such empowerment activities is supporting local communities in the traditional gathering of natural products from ecosystems. The collection of these natural products provides not only a provisioning service but also a cultural service. Thus, it is essential to design support mechanisms that enable the sustainable collection of natural products, while simultaneously preserving biodiversity and generating economic benefits through their sale. In particular, it is crucial to adopt a nature co-existence approach, wherein local residents recognize the importance of biodiversity for the natural products they harvest and, at the same time, acquire alternative livelihood opportunities. This study explores pathways for effective Nature-based Solutions (NbS) by examining the support provided to local communities in a carbon project in Central Kalimantan, Indonesia, as a case study. This region has a long tradition of collecting medicinal herbs from local ecosystems, which are utilized based on the guidance of a few experts. A diverse range of medicinal herbs, many of which are found in the nearby forests and restoration sites of the carbon project, are becoming less commonly used due to the growing prevalence of Western medicine. As a result, only a few herbal species with proven efficacy are sold in large quantities. In response, this study proposes a marketing strategy for medicinal herbs that acknowledges the value of biodiversity to carbon project stakeholders. This presentation will discuss strategies for involving local communities in the commercialization of medicinal herbs, raising awareness of the importance of biodiversity, and utilizing medicinal herb gardens as a component of vegetation management within carbon projects.

8. Building community for climate action, environmental engagement and nature-based solutions: A university's social events as experiments

First authors(s): Ulrike Kachel

Other author(s): Jennifer Pinkerton, Birut Zemits, Kamaljit Sangha, Steven Bird, Sarah Perrie

First author affiliation: Charles Darwin University

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Keywords: Climate Change, Community engagement, Resilience

It is often difficult to build pathways within an institution like a university that can lead to improved outcomes for the natural world in which it is situated. While an individual's research and public work may impact a range of areas, rarely do opportunities occur to connect with each other and with the broader community about shared issues such as climate change and biodiversity risks. This project in a small city university, brings together a group of like-minded lecturers from diverse faculty areas to address the challenges of protecting the local environment for its intrinsic value as well as to develop strategies for local resilience to climate change impacts.

With the support of a small start-up research grant, a group of lecturers at Charles Darwin University in Darwin have built a strong group that seeks to extend institutional and local community awareness and action related to climate change, linking with other institutions with similar interests. Through a series of events including a resilience workshop, a film screening and regular brown bag lunches with guest speakers, information has been collected about what individuals believe they can do, and how new ideas and actions can be developed.

This paper presentation shall highlight the process of this experimental research alongside the personal experiences of one group member, what attracted her to this project, and the personal and professional benefits building such a community can bring. This is an ongoing project, and, in the spirit of action research, we hope that by sharing this process and our enthusiasm for this

activity, we can develop links with individuals and institutions with similar interests, addressing similar problems.

9. Promoting Agroecology and Indigenous Knowledge in Sustainable Food System – Nyimba District, Zambia.

First authors(s): Lydia Chibambo

Other author(s): No

First author affiliation: Zambia Climate Change Network

Contact: lydiachibambo@yahoo.co.uk

Keywords: Agroecology, Economy, Food-system, Indigenous, Restoration.

Agroecology is an interdisciplinary approach to agriculture that integrates ecological principles with traditional farming knowledge to promote sustainable food systems. This holistic framework emphasizes biodiversity, ecological balance, and the minimization of external inputs such as synthetic fertilizers and pesticides which contributes to Green House Gas Emission (GHG). Agroecology facilitates the creation of revenue-generating endeavors such as bee keeping, and agroecology farming, which serve as alternate sources of income and livelihood. This diversification will help alleviate pressure on natural resources and reduces dependency on resource-intensive practices.

In Nyimba District which is partially in the valley ecosystem experiences climatic shocks such as both droughts and floods in the same farming season, agroecology seeks to enhance the resilience of farming systems to environmental stresses, improve food security/nutrition, and empower local communities by fostering a closer connection between food producers and consumers. Through its emphasis on locally adapted practices and indigenous knowledge, agroecology supports the restoration of degraded ecosystems, enhances soil health, and reduces

the carbon footprint of agriculture. As a science, movement, and practice, agroecology offers a transformative alternative to conventional agricultural models, addressing pressing challenges such as climate change, land degradation, and social inequality in rural areas.

This abstract provides an overview of the principles, practices, and potential of agroecology to create a more equitable and sustainable future for food production and green economy. Additionally, agroecology promotes rural development and a social dimension that closely links farmers, consumers, governments and all other actors in the food value chain. Agroecology is knowledge driven. Agroecology reconnects people to their food and producers to consumers making healthy food accessible to all consumers, and available for its use in healthy and sustainable diets.

10. Natural Resources, Participation and Communities: An Hypothesized Framework for a Change Hierarchy

First authors(s): Sudeep Budhaditya Deb

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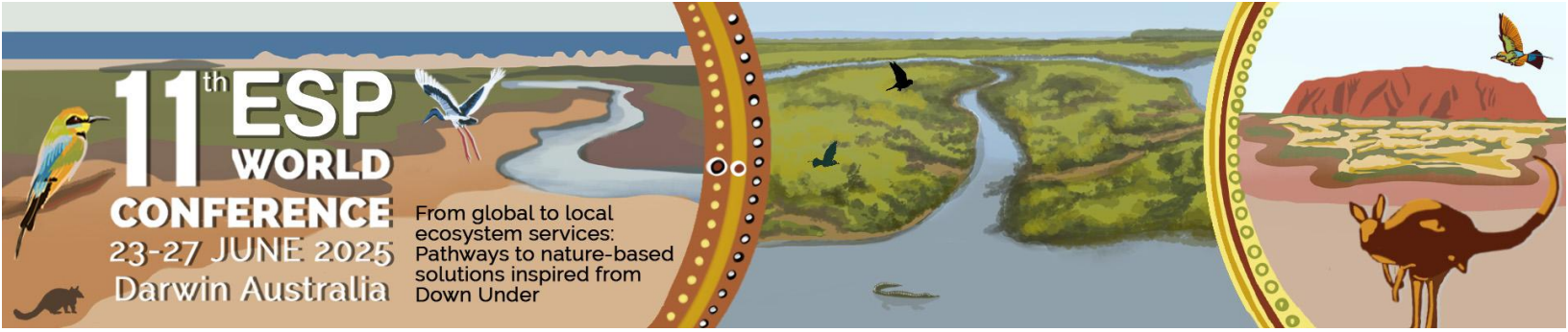
Keywords: Participatory Forest Management, participation, motivational drivers, hierarchic progression, Transition Theories.

Participatory Forest (or broadly, natural resource) management is a stakeholder-oriented participatory approach against some accruable benefits. A study of some select participatory natural resource management regimes indicate that motivational drivers necessary to sustain stakeholder interest in such, changes with time following a sequential hierarchy of hardship avoidance, tangible benefits, empowerment, intangibles and pure volition. This hierarchic

progression however is in no way unidirectional, but can be both progressive and retrogressive simultaneously depending upon the impacts from varied external stimuli. The proposed hierarchy evolves each time through these impact stabilizations and in the process becomes adept to wider range of socio-cultural, etc. parameters. Based upon these observations a hypothesized framework is being posited to understand this change dynamics better. In the long run, propositions made herein are posited to have wider significances that may even be applicable in the peoples' participatory dimensions in spontaneous social activism, social movements or social uprisings in the arena of conservation and restoration of natural resources.

To understand the behavioural intentions for a participant to be conducive for the development of motivation towards participating constructively in a NRMR, the aspect of extrinsic and intrinsic motivational factors leading to such were studied. The insight gained therefrom leads to an understanding of a structural transitory hierarchic model of needs and its subsequent satisfaction. Alongside these cognitive dimensions, a study of the modernisation and transition theories provided an insight into the social process of stage by stage change in the societal wants and attributes as a society or a community transits through the prescribed stages. Both the cognitive criterion and the social development transitionary stages together appear to be impacting the motivating drivers responsible for the fruitful participation in the management and conservation of natural resources and its successful regeneration, with peoples' involvement. To test this concept further, a comparative analysis of cases from across the world were examined. The analysis yielded examples of change in motivational factors to sustain participants' interests in a NRMR, as the same aged or evolved with time. Hence the need arose to develop a frame-work to better understand this dynamic process. Using a methodology of comparative case studies, focussed upon the afore-mentioned theoretical presumptions, a hierarchic model of progressive transition of community motivators was derived. Thereafter through the theoretical application of the concept of dissipative structures, a hierarchical – panarchic framework was arrived at, finally culminating in the derivation of a proposed infinite loop. This hypothetical framework, so proposed, attempts to understand the dynamics of the progressive and retrogressive forces acting upon the motivational cognate in the participatory component in a Natural Resource Management Regime (NRMR).



11. Integrating Soil Carbon Modeling into Restoration Practice to Support Cultural Ecosystem Services

First authors(s): Tong Li

Other author(s): Yash Dang

First author affiliation: The University of Queensland

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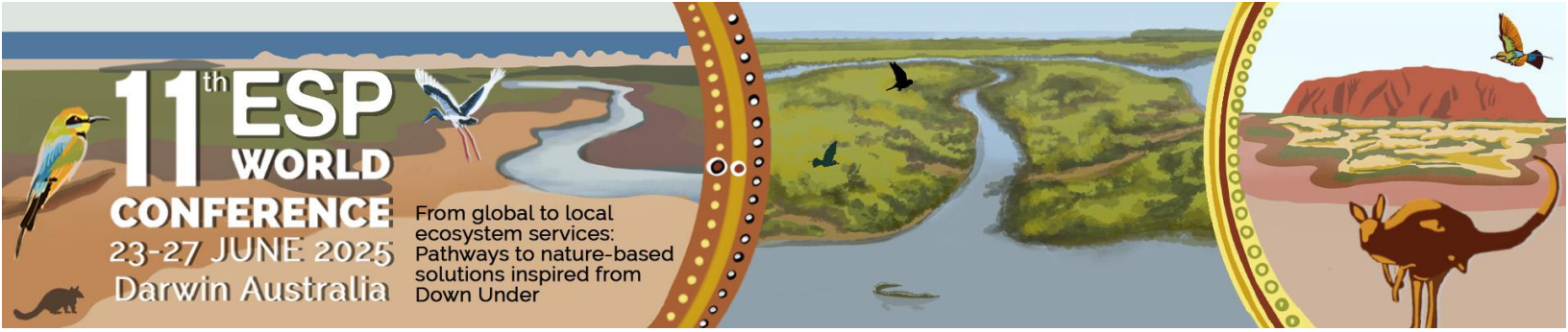
Keywords: Soil Organic Carbon (SOC); Cultural Ecosystem Services (CES); Ecosystem Restoration; PLS Regression; Regional Calibration; Carbon Management; Soil Health; Landscape Modeling

The UN Decade on Ecosystem Restoration calls for approaches that not only improve ecological functions but also reinforce cultural ecosystem services (CES) such as sense of place, landscape aesthetics, and community identity. Soil organic carbon (SOC) plays a critical role in land restoration, influencing soil health, biodiversity, and carbon sequestration—factors that underpin both biophysical and cultural values of ecosystems. However, integrating SOC management into CES-oriented restoration strategies remains underexplored. In this study, we evaluate the predictive performance of a national SOC model developed using partial least squares (PLS) regression and dry combustion reference data. Based on 15,350 soil samples across 431 Australian farms, we compare this model against Ziltek's South Australian Walkley-Black model. Our results show that SOC prediction accuracy improves significantly when using square-root transformations and regionally calibrated models, particularly in Western Australia (R^2 = 0.91) and Queensland (R^2 = 0.89). We also examine the effects of carbonate interference and propose strategies to improve model robustness across diverse landscapes. Accurate, locally adapted SOC prediction models provide a foundation for landscape-level restoration planning that incorporates CES. By enabling better-informed carbon management, these tools can support the design of restoration interventions aligned with community values, cultural heritage, and sustainable land use. Our findings demonstrate a pathway toward integrating ecological data and cultural context for inclusive, multifunctional restoration outcomes.



12. Optimizing forest soil carbon multi-pool management through nature-based fauna solutions

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Keywords: forest ecosystems, soil organic matter fractions, soil micro-food webs, litter decomposition, nature-based fauna solutions

Soil fauna has the potential to alter soil carbon storage fundamentally, but the related processes are challenging to track. Macrofauna (e.g., earthworms and millipedes) in forests constitute the majority of the total soil animal biomass and substantially contribute to soil food-web functioning. Here, based on the results of our field and lab experiments in subtropical forest soils and meta-analyses, we put forward a systematic fauna theoretical framework, which can inspire ecologists and soil scientists to improve soil carbon multi-pool management with nature-based soil solutions, especially under carbon-neutral conditions. Our results found that the life activities of soil macrofauna can shape the structure of soil micro-food webs, and macrofaunal activities (e.g., burrowing, feeding, and excretion) can spread microorganisms and nematode communities in their habitat to rebuild the micro-food web in the sterilized microcosm. The feeding and digestion of litter and soil organic matter by macrofauna promoted the enrichment of soil nutrients, and the processes significantly increased the microbial biomass and nematode abundances and promoted the greenhouse gas emission of the whole microcosm. Notably, all macrofauna additional treatments increased the organic carbon and total nitrogen content in mineral-associated organic matter fractions and decreased the 13C abundance. Similar findings were also observed in our field experiment and meta-analyses. According to the theoretical framework, we further addressed the main research gaps and further suggestions. We suggest

conducting experiments on the soil macrofauna rather than the whole soil fauna to verify and experimentally prove this framework.