

BOOK OF ABSTRACTS

This Book of Abstracts provides a comprehensive overview of the session content and is structured into three main sections:

- I. **Session Description** – an introduction to each session, including its objectives and expected outputs
- II. **Session Program** – a detailed schedule for each session, including speakers and timing
- III. **List of Abstracts** – a complete compilation of all accepted abstracts

I. SESSION DESCRIPTION

ID: T9

Healing nature: Exploring the multiple dimensions of Nature-Based Therapies from the Ecosystem Services perspective

Hosts:

	Name	Organisation	E-mail
Host (s):	Saraí Pouso	AZTI	spouso@azti.es
Co-host(s):	María C. Uyarra	AZTI	mcuyarra@azti.es

Abstract:

The central theme of the European ESP Conference 2026, “Advancing ecosystem services knowledge for achieving a nature-and people-positive Europe”, underscores the connection between ecosystem services, nature and people. Indeed, nature, through the diverse values and roles of ecosystem services, plays a vital role in enhancing human wellbeing.

Ecosystems, among other benefits, can serve as restorative spaces, where people with different conditions and realities experience a range of health improvements. Indeed, ecosystems are increasingly recognized as therapeutic sites where individuals can build and maintain various resilience resources. Recent evidences demonstrated how nature contact can support people with different medical conditions by promoting psychological health, physical health and wellbeing (Adewuyi et al., 2023; Gascon et al., 2017; Triguero-Mas et al., 2015). Moreover, contact with nature can help people improve aspects of their biological, psychological and social resilience (White et al., 2023).

In this context, nature-based therapy (e.g. forest bathing, horticultural therapy, surf therapy, green exercise, nature-based social prescribing) represents a relatively novel approach that involves the intentional use of nature for improving human health, whether for preventive or treatment purposes. In recent years, many research projects have focused on disentangling how nature can be used for therapeutic outcomes. These studies are generating robust scientific evidence to support the establishment of this emerging human activity, with findings focusing on direct health outcomes, indirect environmental and social outcomes, and sustainability of the activity from environmental, social and economic perspectives.

The concept of nature-based therapy is highly related to that of ecosystem services. While most of the studies in this area explore the activity from a psychological and medical perspective - focusing on nature’s health-promoting effect- other disciplines can provide complementary scientific evidence. As such, environmental and economic studies focusing on the diverse values of nature, as well as the benefits derived from cultural ecosystem services, can help to disentangle and better understand the advantages of nature contact.

Goals and objectives of the session:

In this session, we aim to synthesize key findings related to the therapeutic use of ecosystems and associated services. We invite contributions that elucidate how exposure to different ecosystems (e.g. urban parks, coastal and marine environments, blue inland spaces, agricultural landscapes) can aid in the prevention and treatment of different health conditions, by delivering physical and mental health benefits. We also call for contributions that investigate outcomes beyond health, including social and environmental impacts (positive and negative) associated with nature-based therapies.

We especially welcome contributions that (i) focus on the environmental aspects of therapeutic spaces (e.g. differences between green and blue spaces, focus on specific environmental elements or components, role of environmental quality); (ii) studies that extend beyond health-related outcomes (e.g. studies exploring environmental, social or economic aspects of NbTs); (iii) studies that explore synergistic benefits of nature-based therapies (e.g. effects on social cohesion, community engagement, environmental awareness, pro-environmental behaviors). Interdisciplinary or transdisciplinary studies are especially welcome.

Planned output / Deliverables:

Depending on the contributions received, we will prepare a collaborative review paper for publication

Session format:

1,5-hour session with 6-8 oral contributions

Related to ESP Working Group:

[TWG 9 – ES & Public health](#)

II. SESSION PROGRAM

Room: A3

Date of session: Tuesday, 19 May 2026

Time of session: 17:45 – 19:15

Timetable speakers:

Time	First name	Surname	Organization	Title of presentation
17:45	Charlotte	Emig.	Technical University of Munich	Where Humans Meet Nature: Biodiversity and Crowding Effects on Psychological Restoration in Mountain Landscapes
17:55	Francesc	Baró	Universitat Politècnica de Catalunya	Nature Behind Bars: the Role of Greenery and Nature-Based Therapies in Flemish Prisons
18:05	Duc	Nguyen	Independent Researcher	Healing Forests as Equitable Nature-Based Interventions: Linking Carbon Sequestration, Cultural Ecosystem Services, and Community Wellbeing
18:15	Sarai	Pouso	AZTI	Can Nature-Based Therapies Drive Pro-Environmental Behaviors?

18:25	Elisabeth	Wiegele	UNESCO Chair on Sustainable Management of Conservation Areas / Carinthia University of Applied Sciences	Nature for Peace: Protected Areas and OECMs for Wellbeing and Social Cohesion
18:35	Jessica C.	Fisher	Durrell Institute for Conservation and Ecology (DICE), University of Kent	A psychometric tool for measuring the human wellbeing benefits of biodiversity'
18:45	Aaliya	Aaliya	Duke University	Glacial lake outburst floods (GLOFs): A growing threat to the mental health of remote mountain societies
18:55	María	C. Uyarra	AZTI	When healing meets nature: a methodological approach for assessing environmental risks of Nature-based Therapies (NbTs)
19:05	10 minutes for GENERAL DISCUSSION			

III. LIST OF ABSTRACTS

The first author is the presenting author unless indicated otherwise

1. Where Humans Meet Nature: Biodiversity and Crowding Effects on Psychological Restoration in Mountain Landscapes


First author: Charlotte Emig

Other author(s): Ana Stritih, Manuel Ebner, Daniela Becker, Rupert Seidl, Bettina Spornbauer, Michael Maroschek, Kilian Frühholz

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Protected mountain areas face the challenge of conserving biodiversity while also providing restorative spaces for a growing number of visitors. Understanding how ecological characteristics influence visitor restoration is crucial for management that aims to balance nature protection with the delivery of cultural ecosystem services, particularly health and recreational benefits. This study investigated how perceived biodiversity and perceived crowding influence psychological restoration in mountain landscapes. We surveyed visitors (N=742) in Berchtesgaden National Park, Germany, collecting data on perceived biodiversity (species richness of birds, plants, and insects), crowding perception, and psychological restoration using the Restoration Outcome Scale, combined with participatory mapping of visitors' routes. This mapping allowed us to combine information on routes with spaceborne remote sensing data and ground-based species richness measurements, enabling comparison between perceived and objective biodiversity exposure. We hypothesized that perceived biodiversity would positively predict psychological restoration, while crowding would negatively affect restoration and weaken the biodiversity-restoration relationship. We further expected that actual biodiversity would align with perceived biodiversity, particularly among visitors that expressed an intention to experience biodiversity in nature. To test these hypotheses, we used linear mixed effects models, which revealed that perceived biodiversity and the intention to experience biodiversity were robust positive predictors of psychological restoration. For exploratory purposes we disaggregated perceived biodiversity by taxonomic group and found that perceived bird diversity emerged as the strongest individual predictor. Perceived crowding was not significantly related to psychological restoration. Our findings suggest that perceived biodiversity



enhances psychological restoration, while crowding does not seem to diminish restorative benefits. This supports management approaches that prioritize biodiversity perception to maximize nature's healing capacity.

Keywords: Restorative spaces, perceived biodiversity, crowding perception, psychological restoration, cultural ecosystem services

2. Nature Behind Bars: the Role of Greenery and Nature-Based Therapies in Flemish Prisons

First author: Francesc Baró

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Access to natural environments is a fundamental driver of human well-being, yet its restorative potential is repeatedly overlooked in the design and management of carceral facilities. Prisons represent a unique case of prolonged exposure to restrictive, often "sterile" environments where punitive traditions frequently take precedence over environmental and restorative considerations. This study examines the role of greenery and nature-based therapies (NBT) within the Flemish penitentiary system, addressing the persistent knowledge gap regarding their implementation and perceived value in this particular settings. Adopting a qualitative approach, the research utilizes ten semi-structured interviews with twelve diverse stakeholders—including prison directors, academic researchers, non-profit organization representatives, and an incarcerated individual—to explore the social and psychological resilience fostered by nature interaction within prison settings. Findings demonstrate that NBT, such as horticultural therapy and gardening, serves as a vital tool for humanizing prison environments and promoting rehabilitation. Engagement with greenery offers significant emotional relief, reducing stress and anxiety while providing a symbolic sense of growth and hope. NBT initiatives can enhance social cohesion, improve staff-inmate relations, and support rehabilitation through the development of professional skills critical for post-release employability. Additionally, greenery is increasingly considered for its contribution to climate resilience by mitigating heat stress within aging prison concrete infrastructures.

However, systemic implementation is hindered by a pervasive culture of risk aversion, where natural elements are viewed primarily as security threats—potential weapons, fire hazards, or hiding spots for contraband. Architectural constraints, staffing shortages, and the lack of a centralized policy framework further marginalize these nature-based initiatives. The study concludes that greenery and NBT should not be treated as luxury features but as essential solutions for a rehabilitative and humane correctional model. Overcoming these barriers requires a fundamental shift in institutional culture and the adoption of policy-driven strategies to ensure the effective integration of nature behind bars.

Keywords: Carceral environments, inmate wellbeing, nature-based therapy, rehabilitation, qualitative data

3. Healing Forests as Equitable Nature-Based Interventions: Linking Carbon Sequestration, Cultural Ecosystem Services, and Community Wellbeing


First author: Duc Nguyen

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Rapid increases in chronic stress, cancer and non-communicable diseases have intensified demand for nature-based interventions that support both ecological restoration and human wellbeing. While nature-based solutions are widely discussed in urban contexts, fewer models explore how high-biomass forestry, cultural ecosystem services and community livelihoods can be integrated in rural landscapes. This paper proposes the concept of a "healing forest": a multifunctional retreat established through the plantation of tree species with high carbon sequestration potential, complemented by medicinal understory crops, mindful retreat facilities and community-based experiential activities.

The model addresses two urgent trends. First, nature loss and rising atmospheric CO₂ concentrations require scalable ecological restoration (IPBES, 2019; IPCC, 2022). Second, stress-related mental health



challenges are affecting large populations, with WHO (2021) estimating that anxiety and depression cost the global economy more than USD 1 trillion annually. Healing forests integrate these concerns by combining carbon storage with cultural ecosystem services such as restoration, spiritual fulfilment, social bonding and identity formation (Chan et al., 2012). The intervention is informed by Buddhist mindfulness practices—meditation, walking meditation and macrobiotic diets—which have been shown to improve resilience, emotional regulation and immune function (Kabat-Zinn, 2011; Creswell, 2017).

A central contribution of this model is its equity-centred governance. Local households are not positioned as passive labour, but as partners who host hands-on activities including planting cassava, rice and medicinal crops, caring for animals and preparing food from clean ingredients. This structure circulates economic benefits locally, supports livelihoods and preserves cultural knowledge embedded in agricultural practices (Pretty et al., 2009). The healing forest therefore enhances recognition, representation and redistribution, three principles essential for equity in nature-based interventions (Masterson et al., 2019).

Healing forests can generate four outcomes: carbon sequestration, improved wellbeing, community cohesion and strengthened identity. They demonstrate that ecological restoration, health promotion and local development are mutually reinforcing when grounded in mindfulness, compassion and long-term stewardship.

Keywords: nature-based interventions; healing forest; wellbeing; equity; carbon sequestration; cultural ecosystem services; mindfulness; community development.

4. Can Nature Based Therapies Drive Pro Environmental Behaviors?

First author: Sarai Pouso

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One of the multiple ways in which humans benefit from (cultural) ecosystem services is by spending time in contact with nature. Direct in-situ interactions with nature e.g. practicing outdoor recreational activities, have the potential to improve human health and well-being. Furthermore, an increasing contact with nature, e.g. spending more time in natural settings in a mindful manner, may induce behavioural change, enhancing nature connectedness and pro-environmental behaviours.

In this context, there is a growing body of scientific evidence showing that expending time in nature has significant positive effects on human health, e.g. reducing stress, and improving mental well being. Nature-based Therapies (NbTs) are defined as “planned therapeutic techniques performed in natural settings and based on nature–human active participation and connection”. Due to its benefits for human health, NbTs are progressively being incorporated in clinical research and social prescribing schemes. However, less evidence exists on the long-term environmental changes that such interventions may generate, e.g. in nature connectedness or pro-environmental behaviours. In the context of the European project RESONATE (<https://resonate-horizon.eu/>), we tested if NbTs can have a positive environmental spillover effect on NbT participants, by monitoring changes in environmental attitudes, pro-environmental behaviours, nature connectedness, and related characteristics. Using a randomized controlled trial design, we monitored changes in nature connectedness, perception of local nature and pro-environmental behaviour, after participating in a 5-week intervention. The NbT interventions combined accessible walks with mindfulness exercises, and were implemented in three European locations, including urban coast, rural mountains and urban green spaces. Results were analysed controlling for therapy site, sociodemographic characteristics (e.g. age, gender), and participants environment profile (e.g. childhood nature experiences, environmental values). Our results provide evidence of the potential of NbTs to improve not only human health but also induce long-lasting changes in participant’s environmental profile.

Keywords: human health, nature connectedness, restorative environments, environmental psychology, cultural ecosystem services

5. Nature for Peace: Protected Areas and OECMs for Wellbeing and Social Cohesion

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This abstract presents Nature for Peace (N4P) as a concept and actionable framework that links nature-based approaches with public health, social cohesion, and conflict transformation across rural, peri-urban, and protected landscapes. N4P synthesizes evidence and practice to articulate how shared engagement with nature can reduce stress, support mental wellbeing, build trust, and create safe spaces for dialogue in divided or fragile settings.

The framework rests on four pillars: (1) health pathways (stress reduction, restoration, physical activity, culturally meaningful contact with nature); (2) social cohesion (co-creation, shared stewardship, and inclusive participation that strengthen ties and reciprocity); (3) conflict sensitivity and peace outcomes (do-no-harm, conflict analysis, and design for dialogue, joint problem solving, and de-escalation); and (4) enabling governance and finance (fair access and rights, locally led institutions, and long-term, blended financing).

Core modalities include nature-based therapies, community stewardship and agroforestry, intercultural environmental programs, co-management of natural resources, transboundary and buffer-zone collaborations, and ecological restoration in (post-)conflict contexts. N4P emphasizes equitable access to high-quality green and blue spaces, recognition of land and resource rights, and safeguards for security and inclusion.

Implementation follows a cyclical process: context and conflict assessment; co-design with local and Indigenous communities; integrated programming that couples infrastructure with community leadership; and robust monitoring, including health, social cohesion, and peace indicators. Anticipated barriers—unequal access, contested rights, short funding cycles, and limited evaluation—are addressed through inclusive design, conflict-sensitive practice, and adaptive learning.

N4P positions access to well-designed, inclusive nature as a core component of contemporary public health and peacebuilding, offering scalable, context-adaptable pathways that support SDGs 3, 10, 15, and 16.

Keywords: Protected areas, peace and conflict, social cohesion, participatory conservation, adaptive management

6. A psychometric tool for measuring the human wellbeing benefits of biodiversity


First author: Jessica C. Fisher

Other author(s): Martin Dallimer, Kate Irvine, Natalia Zielonka, Ella Reilly, Sam Maddison, Gail Austen, Zoe G. Davies

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Despite compelling evidence linking ecosystems to human wellbeing, our understanding of how biodiversity contributes to the delivery of cultural service benefits remains limited. This knowledge gap limits our ability to manage natural environments that optimise biodiversity conservation as well as ecosystem service delivery. We developed a psychometric scale, BIO-WELL, to quantify the human wellbeing benefits derived from biodiversity. Firstly, we undertook a series of studies with nearly 3000 participants, incorporating qualitative methods (deliberative workshops, expert panels, focus groups and cognitive interviews), as well as quantitative approaches (classical testing theory and item response theory). We thus created a scale that measured ex situ responses to 17 metrics of biodiversity (e.g., species richness, abundance), as well as species' traits experienced by people (e.g., colours, sounds), across five domains of human wellbeing (physical, emotional, cognitive, social, and spiritual). Secondly, we tested and validated BIO-WELL in situ, conducting questionnaires with visitors to forests in England and Wales. Our results confirmed strong internal consistency and validity, meaning the scale is suitable for field-based ecosystem service valuation. Finally, we adapted the BIO-WELL scale for a specific cultural experience: birding in outdoor spaces (e.g., balconies, parks, and gardens). Through a new set of focus groups and cognitive interviews, we amended and refined the tool to be relevant to the specific traits of birds that people find meaningful and salient. Following a pilot with 500 participants ex situ, we selected the best-performing scale items to inform an app-based questionnaire run by an environmental charity. This enabled us to conduct a large-scale assessment of the impact of nature-based recreation



experiences for human wellbeing, underpinned by biodiversity. These developments demonstrate BIO-WELL's versatility for quantifying biodiversity's contributions to people, supporting evidence-based environmental governance, planning for ecosystem restoration, and equitable access to ecosystem services across society.

Keywords: biodiversity, birds, environmental psychology, health, psychometric scale

7. A psychometric tool for measuring the human wellbeing benefits of biodiversity

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Keywords: biodiversity, birds, environmental psychology, health, psychometric scale

Glacial lake outburst floods (GLOFs): A growing threat to the mental health of remote mountain societies


First author: Aaliya Aaliya

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Glacial lake outburst floods (GLOFs)—a rapidly intensifying hazard in High Mountain Asia due to human-induced climate change—pose growing threats not only to lives, livelihoods, and physical infrastructure, but also to mental health and social well-being. In Pakistan's Gilgit-Baltistan region of the Himalayan Karakoram ranges, the frequency of GLOFs has increased in recent years, with Hassanabad village in the Hunza Valley experiencing four major events between 2019 and 2022. Despite mounting evidence on the physical and economic tolls of these events, their psychological consequences remain unquantified. To address this gap, we conducted a descriptive cross-sectional survey in August 2024 to estimate the prevalence of anxiety, depression, and post-traumatic stress disorder (PTSD) among adults (18–60 years) living in Hassanabad.

Using a stratified random sample of 305 participants from 112 households, we administered the Generalized Anxiety Disorder-7 (GAD-7), Patient Health Questionnaire-9 (PHQ-9), and Impact of Event



Scale-Revised (IES-R). The prevalence of anxiety, depression, and PTSD was 15.1%, 15.4%, and 56.6%, respectively (clinical cut-offs: GAD-7/PHQ-9 \geq 10; IES-R \geq 33). Women exhibited significantly higher prevalence than men across all conditions ($p < 0.005$). Exposure intensity, measured by proximity to the flood channel and the cumulative number of GLOF events experienced, was positively associated with psychological distress. Multiple-regression models identified female gender and GLOF Impact Index as consistent predictors of all three outcomes ($p < 0.005$).

The results highlight the long-term mental-health burden of repeated climate-induced disasters on mountain communities, compounding existing gender and spatial vulnerabilities. Recognizing mental well-being as a social and cultural ecosystem service—one that sustains community resilience and adaptive capacity—is vital for integrating psychosocial care into disaster-risk reduction, early-warning, and climate-adaptation frameworks. The study underscores the global relevance of inclusive, gender-responsive, and culturally grounded mental-health interventions in building nature- and people-positive resilience for climate-sensitive ecosystems and societies.

8. When healing meets nature: a methodological approach for assessing environmental risks of Nature-based Therapies (NbTs)

First author: Zorita Izaskun

Other author(s): Izaskun Zorita, Iratxe Menchaca, Sarai Pouso, Ángel Borja, Asier Anabitarte, Bruno Meirelles, Maria C. Uyarra

Presenting author: Maria C. Uyarra

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Natural environments have the capacity to promote human health through both direct and indirect contact, offering psychological restoration, stress reduction, and opportunities for physical activity. In recent years, growing scientific interest has focused on nature-based therapies (NbTs), as interventions that may enhance physical and mental well-being. However, the increasing human presence in natural settings—whether for therapeutic purposes or for recreational activities—can generate ecological impacts in the environment upon which they depend, compromising their integrity. This study aims to propose an Environmental Risk Assessment (ERA) methodology designed to evaluate the environmental risks to which ecosystem components may be exposed during the implementation of nature based therapies (NbTs). The methodology considers the ecosystem components present in the area where the NbT is conducted, their sensitivity, the specific type of NbT (e.g., walking, meditation, shouting), and the magnitude of the activity. With this information a risk index is calculated for ecosystem components, allowing the therapy to be redefined to minimize or mitigate potential negative impacts. In this session, both the methodology and the results obtained from its application to three different NbTs carried out in three distinct environments will be presented. The findings suggest that even activities that appear environmentally harmless may generate negative impacts; however, by applying the NbT ERA methodology, these potential effects can be easily identified and addressed through minor adaptations, potentially even resulting in positive outcomes for the environment.

Keywords: Ecosystem sensibility, health, impact, therapy, sustainability