
# BOOK OF ABSTRACTS



## I. SESSION DESCRIPTION

ID: T3

Indicators for monitoring Ecosystem Services and Nature-Based Solutions in relation to the Global Biodiversity Framework

### Hosts:

| | Name | Organisation | E-mail |
|---|---|---|---|
| Host: | Alexander Van Oudenhoven | Institute of Environmental Sciences, Leiden University | a.p.e.van.oudenhoven@cml.leidenuniv.nl |
| Co-host(s): | Roxanne Lorilla<br>Agnes Vari | Harokopio University of Athens<br>HUN-REN Centre for Ecological Research | |

### Abstract:

The adoption of the Kunming-Montreal Global Biodiversity Framework (GBF) marks one of the most ambitious environmental agendas of the 21st century, and features both ecosystem services (ES) and nature-based solutions (NbS) prominently. For instance, Goal B deals with ecosystem services and Target 11 focuses on restoring and enhancing ecosystem services and nature's contributions to people, but also suggests NbS as key to doing so. Eight other targets refer to ES. Also, Target 8 suggests NbS as key to minimising the impact of climate change. Other targets might not explicitly mention NbS, but can be interpreted as depending on the effectiveness of NbS. Hence, although biodiversity is key in the GBF, attention needs to be (re)directed towards monitoring well beyond biodiversity, taking the whole socio-ecological system into account.

This calls for clear measures to monitor ecosystem services and nature-based solutions, as well as indicators that address and link biodiversity, ecosystem services and multiple value types. The current lack of clear measures and indicators makes it challenging to implement the GBF in practice. Adding to the challenge is the absence of a clear definition of what ES are included

within the target, how inclusively they have been framed, and how the effectiveness of NbS can be assessed.

In this session of Thematic Working Group 3 (on Indicators), we want to explore how indicators for ecosystem services as well as nature-based solutions can support monitoring of the GBF targets. This session will compile insights from researchers' projects, perspectives by researchers, practitioners and decision makers. Note that indicators and monitoring should be central in your submission and presentation, rather than (general) information on assessments and projects. We also welcome work on indicators within existing frameworks that can be related linked to GBF monitoring, such as the GEO BON Essential Ecosystem Service Variables, IPBES assessments, or the One Health framework. Studies and perspectives can be regional, national or even local, but ultimately we expect the indicators suggested and discussed to be compatible with GBF targets.

This session invites contributions on how to advance ES and NbS monitoring, including the definition of indicators, and the integration of ES into wider sustainability reporting frameworks and agendas, among others.

## Goals and objectives of the session:

Identify and discuss indicators for ecosystem services and nature-based solutions that are suitable to monitor the Kunming-Montreal Global Biodiversity Framework (GBF) targets.

- Discuss how to advance ES and NbS effectiveness monitoring, e.g. through the definition of indicators, standardisation and harmonisation of data and concepts, and integration into wider policy and sustainability frameworks.
- Explore the biodiversity and human wellbeing outcome dimensions of NbS and how to monitor them, in the light of assessing NbS effectiveness. This can include but is not limited to ES that are provided by NbS.
- Discuss the future of the ESP Thematic working group on indicators, especially in relation to global targets, GEOBON and Nature-Based Solutions.

## Planned output / Deliverables:

Each presenter will be provided with predefined questions, to guide the presentation. Informed by the answers of each presenter, we will host a closing discussion / workshop, aiming towards establishing indicators and criteria / reasons for doing so.

## II. SESSION PROGRAM

**Room**: Expert Street 4

**Date of session:** 18th of November 2024
**Time of session:** 11:00–12:30

### Timetable speakers

| Time | First name | Surname | Organization | Title of presentation |
|---|---|---|---|---|
| 11:00 | Alexander | van Oudenhoven | Leiden University | Introduction to the session and its expected outcomes |
| 11:10 | Stefanie | Broszeit | Plymouth Marine Laboratory | Indicator selection – key to effective ecosystem services and biodiversity monitoring |
| 11:20 | Joana | Seguin | Leibniz University Hannover | Unravel the ball of interwoven ecosystem services and condition indicators: a systematic literature review |
| 11:30 | Ralf-Uwe | Syrbe | Leibniz Institute of Ecological Urban and Regional Development (IOER) | Nation-wide indicators on ecosystems and their services in the new IOER research data centre |
| 11:40 | Agnes | Vari | HUN-REN Centre for Ecological Research | Social-ecological indicators for global monitoring and locally relevant implementations |
| 11:50 | Meng | Li | Leiden University | Global assessment of nature-based solutions, urban challenges and outcomes |
| 12:00 | Lori | Giagnacovo | VITO – Flemish Institute for Technological Research | Nature-based solutions through the use of Essential Biodiversity Variables in Land Dynamics predictions. |
| 12:10 | Panel discussion | | | |

## III. ABSTRACTS

*The first author is the presenting author unless indicated otherwise.*

### 1. Indicator selection – key to effective ecosystem services and biodiversity monitoring

*First authors(s):* Stefanie Broszeit
*Other author(s):* Evangelia Drakou, Roxanne Lorillas, Anthony Ndah, Samantha Garrard
*Affiliation:* Plymouth Marine Laboratory, Plymouth, UK
*Contact*: stbr@pml.ac.uk

Anthropogenic drivers are a main cause of biodiversity loss and degradation of natural environments, with negative consequences for humanity and the natural world. To counter this trend, international organisations of the United Nations such as the Convention on Biodiversity and the Intergovernmental Platform on Biodiversity and Ecosystem Services are proposing goals and targets to reverse the decline. A key step in achieving a reduction in biodiversity loss is regular monitoring that allows us to understand not only if biodiversity recovers but also which pressures cause loss of biodiversity, and if goals are being achieved. The new Global Biodiversity Framework sets out a number of indicators that can help with this purpose.

To assess if these indicators can help at a local and regional level, indicators need to fulfil several criteria, such as showing a change in value in response to a change in the biodiversity aspect measured. Indicators also need to be fit for purpose to measure the correct habitat or species or community. This means that a selection process is critical in finding appropriate indicators to provide data reflective of what happens in the environment.

To assess if they are useful at small/local scale, we created a framework to test this purpose on a set of indicators from the GBF and other sources. This framework was tested, then the indicators were prioritised to a number of test case studies, including both terrestrial and coastal biomes.

To check the usefulness of the indicators for each case study site, we then contacted local stakeholder organisations to gain feedback on the indicator choices we had created for their case study. Overall, stakeholders in the respective case study sites are interested in many of the indicators that we suggested for them, while they only use few of them at this stage.

*Keywords*: Biodiversity loss, monitoring, indicator selection, scale

## 2. Global assessment of nature-based solutions, urban challenges and outcomes

*First authors(s):* Meng Li

*Other author(s):* Roy P. Remme, Peter M. van Bodegom, Alexander P.E. van Oudenhoven

*Affiliation:* Institute of Environmental Sciences CML, Leiden University, Einsteinweg 2, 2333 CC Leiden, The Netherlands

*Contact*: m.li@cml.leidenuniv.nl

In response to multiple societal challenges faced by urban areas, nature-based solutions (NbS) are gaining prominence as means to support sustainable and resilient urban planning. Despite their potential, widespread adoption of NbS can be enhanced by studying their effectiveness and multifunctionality. Here, we present findings from a systematic evidence mapping study. We synthesized 547 empirical cases of NbS in 197 cities globally, involving 799 outcomes (benefits) related to biodiversity, health and well-being, and regulating ecosystem services. We assessed the effectiveness of NbS by examining which urban challenges are addressed by NbS, how outcomes of NbS perform compared to alternative solutions and how multiple outcomes are provided and related to each other. Our findings reveal that forests & trees and parks commonly address health and well-being issues, while grasslands and gardens often address biodiversity loss. Our study also reveals that urban NbS generally yield positive effects compared to non-NbS, particularly in microclimate mitigation and mental health. Notably, NbS largely contribute to urban biodiversity, primarily enhancing the diversity and abundance of invertebrates and plants. We identified win-win solutions where biodiversity conservation aligns with other sustainability goals, showcasing the potential for multifunctional NbS. Nevertheless, evidence is scarce on NbS providing multiple outcomes related to biodiversity and well-being simultaneously. Furthermore, we address issues related to the indicators to measure different dimensions of urban NbS, and the role they play in assessing the effectiveness of NbS. Our study provides a foundation for further understanding NbS effectiveness and can inform urban planners and policymakers with evidenced-based targets for the application of NbS.

*Keywords*: Cities, Biodiversity, Ecosystem services, Effectiveness, Well-being, Systematic map

## 3. Unravel the ball of interwoven ecosystem services' and condition indicators: a systematic literature review

*First authors(s):* Joana Seguin

*Other author(s):* Paula Rendón, Isabel Nicholson Thomas, Sabine Lange

*Affiliation:* Leibniz University Hannover, Physical Geography and Landscape Ecology, Schneiderberg 50, 30167 Hannover, Germany

*Contact*: seguin@phygeo.uni-hannover.de

The integrated assessment of Ecosystem Services (ES) is a powerful approach to raise awareness on human dependence on a functioning, biodiverse environment. Since related initiatives such as the Mapping and Assessment of Ecosystems and their Services (MAES) initiative of the EU, it has become common practice that the consideration of Ecosystem Condition (EC) and the respective application of EC indicators are or should be an integral part of an ES assessment. For the implementation of the Kunming-Montreal Global Biodiversity Framework (GBF) as well as the System of Environmental Economic Accounting (SEEA), there is a clear need for robust indicators that allow for an integrated assessment and monitoring to regularly inform EU as well as national policies about the current state and temporal changes in ecosystem assets and related services.

In the scope of the EU Horizon project SELINA (Science for evidence-based and Sustainable decisions about natural capital), we have conducted a systematic literature review to analyze the integration of EC and ES information and indicators in the most recent scientific literature. The review focused on the identification of applied indicators, variables, and proxies and their features linking EC and ES. Questions guiding our work were among others: For which ecosystem types or services did we identify a clear lack of indicators? What can we learn for future integrated ecosystem services assessments?

In this talk, the main findings from this literature review will be presented. The focus of the presentation will be on the indicators and indicator types that have been identified as well as on the gaps that have been detected in the scientific studies.

*Keywords*: indicators, proxies, variables, linkages, integration

## 4. Nation-wide indicators on ecosystems and their services in the new IOER research data centre

*First authors(s):* Ralf-Uwe Syrbe

*Other author(s):* Claudia Dworczyk

*Affiliation:* Leibniz Institute of Ecological Urban and Regional Development (IOER)

*Contact*: r.syrbe@ioer.de

Research data represents an important part of the human's knowledge base, thus a free access to it should be one of the cornerstones of our future society. The Leibniz Institute of Ecological Urban and Regional Development (IOER) is developing a special kind of research data centre (RDC), as this service primarily comprises high-resolution object and spatial data with information on land use, settlements, buildings and ecosystems. The IOER RDC is aimed to support researchers, policy makers, NGOs, and the public interested in sustainable development. An important component of the RDC is the information on Germany's ecosystems. This part makes indicators on the extent, conditions and services of ecosystems available following the FAIR principles. Based on regular analyses of landscape-related data, figures of biodiversity, ecosystem services, quality of live, and environmental justice are calculated, evaluated and made available.

Examples that will be presented address indicators on biodiversity, climate protection by ecosystems, and cooling the local climate in cites by green infrastructure. These results serve as a basis for debates on strategies to conserve or redesign landscapes of a high live quality. Since the beginning of 2023, data on landscapes and ecosystems from our previous projects (in the MAES framework) and most recent research has step by step been included into the IOER RDC. The indicators are geodata, available for download, visualized in interactive maps and will regularly recalculated for monitoring the environmental development.

*Keywords*: Geodata, land use, FAIR data, monitoring, MAES

## 5. Social-ecological indicators for global monitoring and locally relevant implementations

*First authors(s):* Agnes Vari

*Other author(s):* Flavio Affinito, A. Sofia Vaz, Nuria Piston, Andrew Gonzalez, Elena Bennett

*Affiliation:* McGill University

*Contact*: agnes.vari.sec@gmail.com

At COP 15 in December 2022 nations committing to the Kunming Montreal-Global Biodiversity Framework signed up to target the maintenance and restoration of both biodiversity and ecosystem services (ES), and to monitor their progress towards the goals. Monitoring is essential in order to track progress towards these targets, and to detect shortcomings. The development of indicators for this global monitoring of ecosystem services is under rapid development. Implementing the monitoring of ES would be a great step towards the sustainable use of resources and conservation measures in a way that acknowledges the role of people in complex social-ecological systems. However, it has proven hard to design global monitoring in a way that is suitable for nationwide reporting, but also effective and meaningful locally. Working with the GEOBON Ecosystem Services Working Group and drawing from insights from the NSREC ResNet project's Landscapes across Canada, we developed a set of indicators that can be used at global scales and interpreted at different local scales. While there are many possible interpretations of the different aspects of ES in a social-ecological system, and there is no one "right way" to do it, this compilation provides some workable solutions and gives guidance on how to design variables for multi-level monitoring.

*Keywords*: monitoring, indicators, Global Biodiversity Framework, social-ecological systems

## 6. Nature-based solutions through the use of Essential Biodiversity Variables in Land Dynamics predictions.

*First authors(s):* Lori Giagnacovo

*Other author(s):* Bruno Smets, Dr. Marcel Buchhorn, Karolien Vermeiren

*Affiliation:* VITO

*Contact*: lori.giagnacovo@vito.be

Target 8 and 11 of the Global Biodiversity Framework (GBF) aim to restore, maintain and enhance ecosystem services and evaluate policy and management that minimize negative impacts and stimulate positive impacts on biodiversity. However, there are still substantial data gaps for reliable estimates in services provided by ecosystems to people and how positive

climate action is incorporated by countries. To fill this gap, we need to evaluate essential ecosystem service variables (EESVs) and essential biodiversity variables (EBVs). The state of the biodiversity within an ecosystem is key in determining the ecosystem integrity and is therefore a very important indicator in assessing the capacity of an ecosystem to provide its potential ecosystem services. This is illustrated by the theory that a resilient and intact ecosystem will have a higher level of functional redundancy in comparison to a degraded ecosystem. EBVs can be designed to focus on ecosystem structure or ecosystem functioning. In the OBSGESSION project, we will create data cubes composed by a large number of different datasets (i.e. remote sensing data, in-situ data, citizen science, eDNA, etc.), from which an EBV can be derived by a specific metric. Time series analyses of EBVs may point out where and when biodiversity is declining. As an example, EUNIS habitat maps can serve as ecosystem distribution EBV. We plan to use this EBV in the SONATA project for Serbia. There we will evaluate alternative land use scenarios to spatially optimize nature-based solutions (NbS) in the area. This way, we aim to gain insights in how, where and which NbS can best be implemented in targeting conservation and/or restoration of biodiversity and ecosystem services.

*Keywords*: EBV, ecosystem structure, ecosystem function, land dynamics, scenario analysis