

BOOK OF ABSTRACTS

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I. SESSION DESCRIPTION

ID: O4

Guidelines, tools, databases and standards for implementing integrated ecosystem services assessments

Hosts:

	Title	Name	Organisation	E-mail
Hosts:	Dr.	Rudolf De Groot	Wageningen University	dolf.degroot@wur.nl
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	Dr.	Simone Quatrini	ETH Zurich, Switzerland	sq@aedis.earth

Abstract:

The general objective of this session is to contribute to the current debate on guidelines, tools, databases and standards for implementing integrated ecosystem service assessments. Today, many public and private initiatives demand environmental impact assessment and encourage comprehensive ecosystem foot printing analyses, valuation and standardization as tools to improve decision-making on ecosystem conservation, restoration and sustainable use. While high data collection and monitoring costs hinder these tasks, proven techniques for optimal ecosystem services assessment (ESA) and governance exist and innovative solutions are emerging.

Building on previous ESP conferences, notably ESP 9 World conference in Shenzhen, China (December 2017), and the ESP10 World Conference in Hannover, Germany (October 2019)



four main instruments are included in this session to allow cross-fertilizations between state-of-the-art practices, methods and tools for incorporating ESA in decision-making:

1) Guidelines. Guidelines for integrated ecosystem services assessment (ESA) have been developed (www.es-partnership.org/esp-guidelines/). In this session lessons learnt from ongoing applications and other guidelines will be shared and discussed to explore how they can be further improved.

2) Life Cycle Assessment (LCA). Recent efforts to combine ES-assessment and valuation methodologies with LCA related approaches show promising avenues to overcome the current taxonomic and methodological challenges to quantify and valuing ES.

3) Databases. To support the development of ESA and LCA, advances in databases are needed to improve our knowledge about value functions, assessments and dependencies as well as to increase data availability for benefit transfer. Several recent initiatives will be presented (e.g. ESVD and ESValues Salamanca).

4) Standards. Assessments and valuations can be criticized for lack of accuracy, comprehensiveness and quality, which in turn can lead to a 'credibility deficit' if they are not accompanied by robust verification, certifications and audits. Most certification programs to-date focus on a single resource or commodity or address only a narrow definition of sustainability. However, new initiatives that assess environmental protection, ecological restoration, ecosystem services, and sustainable production outcomes and impacts in an integrated manner are gradually emerging. An overview will be provided of the most promising certification and standardization processes, including those pursued by the International Organization for Standardization (ISO).

This session will explore common challenges, synergies and overlaps between complementary research fields, and interactive web-based databases to support environmental decision-making, creating the foundations for an international ES assessment and management standard as well as new directionalities to capture the value of environmental externalities and embed it into decision-making through robust guidelines, tools, databases and standards.

Goals and objectives of the session:

Public and private sector investors, multilateral and intergovernmental authorities, regulators, landowners and land users, require best-in-class, customized and harmonized standard monitoring and management practices, instruments and guidelines to systematically incorporate ES considerations in their decision-making processes. Mainstreaming ES knowledge into policy and decision-making practice requires the harmonization of definitions, the standardization of classification processes, the generation of comprehensive databases and the streamlining of methodological and



epistemological properties of ES accounting, quantification, valuation and mapping approaches.

- 1) Guidelines: the session aims to provide a platform to share and discuss the latest developments regarding ES-assessment Guidelines and Tools, including GIZ, WRI, ESERALDA, and others submitted by session participants. We will explore how the lessons learnt can be used to further develop the “ESP guidelines” and improve the web-based support interface (<https://www.es-partnership.org/esp-guidelines/>) and identify key application areas (e.g. explore options and costs & benefits of large scale landscape restoration as conducted by Commonland (www.commonland.com)).
- 2) Data bases: the session aims to expand the discussion on benefit or value transfer as a valuation approach for ES, going deeper into the main obstacles for the generation of databases, learn from best practices in the generation of benefit/value transfer databases and discuss the key elements that the next generation database for the valuation of ecosystems and their services must satisfy.
- 3) Life Cycle Assessment: the ES community could learn from the methodological standardization process that occurred over the last 20 years in the field of LCA and its family of related life cycle approaches (e.g. life cycle costing, carbon footprint, water footprint, environmentally-extended input-output analysis etc.), as well as from the various on-going initiatives devoted to bring more consensus among the variants of, or the complementary methods for, LCA (e.g. consequential Vs. attributional LCA, territorial LCA, organizational LCA, social LCA, etc.). In turn, LCA practitioners should make a step forward to better incorporate ES knowledge in the modelling framework for life cycle inventory and impact assessment. In this Session, contributions should therefore open up a new frontier of research that will build on the common challenges, synergies and overlaps between the ES and LCA.
- 4) Standards: the session will provide an overview of the main voluntary sustainability standards (VSS) and ISO-level standards that are closely related to environmental management (e.g. ISO 14007). It will focus on the modalities for the quantification and valuation of ecosystem services (e.g. costs and benefits) that are being adopted or used under these standards, highlighting potential issues, challenges and gaps, as well as opportunities for improvement and closer ESP involvement.

Planned output / Deliverables:

- 1) Further strengthening the ESP Task Forces on the ESA-Guidelines in combination with web-based support tools and databases (notably the ES Valuation Database (ESVD) and ESValues).
- 2) The session will present progress with a special issue in *Ecosystem Services* addressing LCA and ES research and application questions that integrate the science of ecosystem



services into a life cycle thinking approach, using methods that span from traditional LCA to life cycle costing, social LCA, life cycle sustainability assessment and related instruments. Quantitative approaches, rather than qualitative/theoretical advances, are preferred.

- 3) Developments regarding a multi-stakeholder platform to promote the development, application and uptake of best-in-class standards and techniques for the integrated ecosystem services assessment and certification.

II. SESSION PROGRAM

Date of session: Wednesday, 9 June 2021

Time of session: 13:30 – 17:30

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
13:30 13:45	Rudolf	De Groot	Wageningen University	Guidelines for Integrated assessment of costs and benefits of large-scale landscape restoration
13:45 14:00	Evangelina	Drakou	University of Athens	A novel approach toward ES guidelines, and Standards
14:00 14:15	Jean	Hugé	Open University of the Netherlands	Ecosystem services assessment tools: a review and user-informed classification
14:15 14:30	Chiara	Cortinovis	Humboldt, Universität zu Berlin	Synthesizing multiple ecosystem service assessments for urban planning: a review of approaches, and recommendations
14:30 14:45	Alessio	Bulckaen	Basque Center for Climate Change	ARIES (ARTificial Intelligence for Environment & Sustainability) for SEEA for rapid natural capital accounts generation: Towards fast, transparent and standardized yet customizable ecosystem accounts
15:30 15:45	Dolf	De Groot	Wageningen University	Services Valuation Database (ESVD): functionalities and use(rs)
15:45 16:00	Alice	Moreau	FAO	The Ecosystem Services Valuation Database (ESVD) and the Biodiversity Integrated Assessment and Computation tool (B-INTACT)
16:00 16:15	Fernando	Rodriguez	University of Salamanca	Affinity factors for benefit transfer
16:15 16:30	Benedetto	Rugani	Luxembourg Institute of Science and Technology	Expanding the boundary of life cycle costing with ecosystem services to support cost-benefit analysis of nature-based solutions



Time	First name	Surname	Organization	Title of presentation
16:30 16:45	Estefania	Orquera	Escuela Politecnica Nacional	Urban Agriculture and Ecosystem Services: a sustainable solution in the food security context
16:45 17:00	Simone	Quatrini	Directorate for Sustainable Resources, ISPRA	Use of ecosystem services in sustainability standards
17:00 17:15	Francesca	Leucci	University of Bologna	Unlocking the potential of liability laws through the ecosystem services or how to make polluters fully liable for environmental losses?
17:15 17:30				Discussion

III. ABSTRACTS

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

1. Type of submission: Abstract

O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment

Ecosystem services assessment tools: a review and user-informed classification

Presenting author: Jean Hugé

Other author(s): Anne-Julie Rochette, Luc Janssens de Bisthoven, Koen Vanderhaegen, Stijn Neuteleers

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While the concept of ecosystem services which links biodiversity to human wellbeing, is by now well-known, its translation into actual management decisions is still uneven. Gaining robust knowledge about the provision, the use and the trends of ecosystem services-in and out of formally protected areas- is essential to ensure resilient management of ecosystems and the services they provide. The diversity of rapidly evolving ecosystem services assessment tools requires a systematic and informed selection, in order to ensure that prospective tool users select the most adequate tool, aligned to their needs and context. Many decision-



support tools have been developed in recent years, yet their applicability and user–friendliness are often context–, site– and user–specific. Moreover, their application is sometimes limited due to high demands of data, skills, time and resources. In order to structure and understand the diversity of these tools, we performed a review of widely applicable, rapid and affordable tools to assess multiple ecosystem services, building on the expectations of the prospective users of such tools (collected and analyzed by way of a Delphi survey). In this study, we review existing rapid ecosystem services assessment tools based on an integration of these user–generated criteria and criteria from the literature, and subsequently provide users with guidance on ecosystem services assessment tool selection, based on requirements regarding data input, necessary skills, outputs and types of ecosystem services addressed. We contextualize our findings by referring to other, complementary classifications and decision trees, and we reflect on how plural valuation of nature can be integrated in ecosystem services assessment tools.

Keywords: ecosystem services assessment tools, Delphi, review, plural valuation

2. Type of submission: Abstract

[O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment](#)

Synthesizing multiple ecosystem service assessments for urban planning: a review of approaches, and recommendations

Presenting author: Chiara Cortinovis

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While ecosystem service (ES) assessments become a more and more important source of knowledge, there is a need for synthesis approaches that make the results usable to support decisions. Effective synthesis approaches can reduce the information burden produced by multiple ES assessments and help decision–makers to compare alternative options and to assess their impacts. In this review, we focus on urban planning, one of the main decision–making processes that affect ES in cities, and investigate what synthesis approaches have been applied to support planning decisions. The aim is to identify the options available and to analyze their fitness to different urban planning decisions, thus providing a guidance to



potential users. We reviewed 62 studies selected through a search in two literature databases and identified six recurring synthesis approaches: diversity, average, weighted summation, multi-criteria analysis, optimization algorithms, and efficiency indicators; and a limited number of methods developed ad-hoc for specific applications. For each approach, we collected evidence about the suitability to different decision-making contexts, the applicability to different ES categories and types of assessment methods, and the occurrence of complementary analyses of ES interactions. Further, we built on the reviewed publications to identify pros and cons, including critical aspects related to the usability of the approaches, such as their complexity, transparency, and the level of stakeholder involvement. Based on the findings, we draw recommendations on how to select suitable synthesis approaches to support different urban planning decisions. Our results can contribute to the debate around guidelines and tools to support decision-making through integrated ES assessments.

Keywords: knowledge synthesis, evidence-based decision-making, urban planning, ecosystem service assessment, integrated valuation

3. Type of submission: Abstract

[O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment](#)

ARIES (ARTificial Intelligence for Environment & Sustainability) for SEEA for rapid natural capital accounts generation

Presenting author: Alessio Bulckaen

Other author(s): Ferdinando Villa, Stefano Balbi, Kenneth Bagstad

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The Artificial Intelligence for Environment & Sustainability (ARIES) team, in collaboration with the United Nation, is developing a web-based application for System of Environmental Economic Accounting – Ecosystem Accounting (SEEA-EA), enabling rapid and standard ecosystem account production, even in countries with limited resources or technical expertise. SEEA-EA quantifies changes in the extent and condition of ecosystems and the services they provide in physical and monetary terms. It has a strong emphasis on spatial modelling, which can be time-consuming, require substantial expertise and can be very challenging in data-limited locations. To overcome these limitations, ARIES technology enables automation of data



and model integration to provide transparent assembly and reporting in a faster, cheaper way than past ecosystem service modelling. The system identifies the content of a dataset or model, and is able to choose the best-available combination of web-hosted data and models (from global to local) for the analysis context. For example, the re-use of national data is automatically prioritized over global data, and a crop production account would only include those crops grown in the context where a user's analysis is focused. With the ARIES technology, scientific experts can contribute their knowledge, data and models more successfully and on a larger scale, reusing past data and models where appropriate. The ownership of data is also prioritized, with the system designed to guarantee that the data owner maintains control of data and that it is accessed only by authorised users. SEEA-EA already includes features of interest to the environmental modelling community, such as the integration of remote sensing data and access for data and models, both for experts and nontechnical users. This event could be a showcase to demonstrate the potential of this technology to the NCA community and boost the adoption of ecosystem service assessments and SEEA-EA applications across Europe.

Keywords: SEEA-EA (System Environmental Economic Accounting – Ecosystem Accounting), natural capital accounting, interoperability, artificial intelligence, integrated modelling

4. Type of submission: Abstract

[O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment](#)

The Ecosystem Services Valuation Database (ESVD) and the Biodiversity Integrated Assessment and Computation tool (B-INTACT)

Presenting author: Alice Moreau

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The Biodiversity Integrated Assessment and Computation Tool (B-INTACT) seeks to extend the scope of environmental assessments to capture biodiversity concerns, which are not accounted for in conventional carbon pricing. The tool is designed for users ranging from national investment banks, international financial institutions and policy decision-makers, and allows for a thorough biodiversity assessment of project-level activities in the Agriculture,



Forestry and Land Use (AFOLU) sector. The biodiversity assessment in the tool takes on a quantitative and qualitative approach. The quantitative approach considers a set of relationships for anthropogenic impacts on biodiversity from land use changes, habitat fragmentation, infrastructure and human encroachment. Biodiversity responses are quantified in the mean species abundance (MSA) metric, which expresses the mean abundance of original species in disturbed conditions relative to their abundance in an undisturbed habitat. Non-quantifiable impacts to biodiversity from project activities are assessed with a qualitative appraisal of the biodiversity sensitivity, management activities and agrobiodiversity practices, to complement the quantitative assessment. Assuming that MSA is an indicator reflecting the level of damage to an ecosystem, it is possible to assign a monetary value per hectare to the MSA indicator. It is safe to presume that a complete loss of biodiversity corresponds to an equivalent complete loss of the supply of ecosystem services from a given area of intervention. The tool developers therefore decided to link the social value of biodiversity to the ecosystem service values estimated in the Ecosystem Services Valuation Database (ESVD). B-INTACT supports countries in accessing additional funds from international financial institutions and mechanisms to finance projects, programmes and policies. Its considerations can furthermore be included into Economic and Financial Analyses and help project designers to evaluate and prioritize project activities with the greatest economic benefit and potential for biodiversity conservation.

Keywords: ESVD, B-INTACT, biodiversity, tool, MSA

5. Type of submission: Abstract

[O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment](#)

Affinity factors for benefit transfer

Presenting author: Fernando Rodriguez

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The use of more and improved datasets will ease the way for benefit transfer, at least for two reasons. On one hand, a higher number of studies will allow for the application of more precise regression techniques, now constrained by the lack of enough observations to back the



required set of explanatory variables. On the other hand, the increased availability of data will make it possible to find new ways to parametrize the economic value of ecosystem services. This contribution will explore the possibility to identify and apply affinity factors between original and target sites to support benefit transfer applications, either to endorse regression results, to trace value influences back to the results of original studies or to pave the way to big data methods and processes.

Keywords: benefit transfer, ecosystem services, affinity factors, big data

6. Type of submission: Abstract

[O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment](#)

Expanding the boundary of life cycle costing with ecosystem services to support cost–benefit analysis of nature–based solutions

Presenting author: Benedetto Rugani

Other author(s): Javier Babí Almenar, Claudio Petucco

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The implementation of Nature–based solutions (NBS) (e.g. green roofs/walls, urban gardens, urban forests,...) in cities provides numerous societal benefits in the form of ecosystem services (ES). However, such benefits should be quantified and compared against both direct and indirect costs associated with NBS interventions in order to understand their net contribution to society. Such a comparison is also relevant to understand the dynamics of both costs and benefits to assess the project’s appeal from a financial and economic perspective. This work illustrates a novel cost–benefit analysis framework – developed within the EU–H2020 project “Nature4Cities” – aiming to support the implementation of NBS projects. This framework expands life cycle costing (LCC) with the integration of ES quantification and monetisation. LCC is a robust technique to inventory and distribute over the different production stages all the relevant costs of a project or an asset life cycle, from inputs acquisition through operation to final disposal. The novelty proposed here leverages the ability of LCC to handle the monetisation of impacts associated with NBS externalities. First, the proposed framework quantifies environmental impacts (positive and negative) in biophysical units based on LCC inventories and ES assessment methods. Second, both positive and



negative externalities are estimated in monetary terms. Finally, total net benefit is obtained as the sum of both financial benefits and costs and the externalities generated by NBS. The proposed framework explicitly takes the temporal dimension into account allowing to perform a wide-ranging analysis of costs and benefits over the entire life cycle of NBS (implementation, operational and end-of-life phases). This includes both cash flows and the monetised values of the relevant environmental and social impacts. The methodological pros and cons related to the use of this framework are discussed considering the results of a Nature4Cities pilot project of urban forest.

Keywords: ecosystem service(s) – ES, cost-benefit analysis, life cycle costing – LCC, Nature4Cities, nature-based solution(s) – NBS

7. Type of submission: Abstract

[O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment](#)

Urban Agriculture and Ecosystem Services: a sustainable solution in the food security context

Presenting author: Estefania Orquera

Other author(s): Luis Inostroza, Benedetto Rugani

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Urbanization worldwide is facing several challenges, one of which is represented by food provision. Food demand will substantially increase as a consequence of urban population growth, which is expected to reach 75% globally by 2050. In that context, Urban Agriculture (UA) has emerged as a promising sustainable farming alternative to secure food within cities. Most UA research studies have focused on the provision of food without considering other Ecosystem Services (ES) influence in the sustainability context. ES are the relative contributions from ecosystems that do not just flow from nature to support human wellbeing. Significant and complex ES' interactions not completely understood can also procure human benefits. Therefore, this study proposes to consider the Life Cycle Assessment (LCA) methodology in order to assess all the benefits provided by ES and thus, as an environmental sustainability assessment tool for UA systems. For that purpose, the CICES V5.1 classification system has been used to identify the ES in UA. Then, by harmonizing ES in the life cycle inventory of inputs



and outputs flows of UA system, ES factors have been developed which allow to complement the assessment of environmental cost and benefits in LCA methodology. Comparisons among traditional LCA and the proposed LCA methodology combining with ES allowed to establish the direct and indirect UA benefits which appear to be an important input to address food demands and food security in sustainable cities.

Keywords: urban agriculture, food security, food demand, ecosystem services, LCA

8. Type of submission: Abstract

[O. Open sessions: O4 – Guidelines, tools, databases and standards for implementing integrated ecosystem services assessment](#)

Unlocking the potential of liability laws through the ecosystem services or how to make polluters fully liable for environmental losses?

Presenting author(s): Francesca Leucci

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The potential of liability laws of preventing environmental accidents is often underestimated due to various issues that might hinder both their efficiency and their effectiveness. Among them, the uncertain level of monetary damages to be paid in litigation is likely not to induce polluters to invest adequate money on prevention. The aim of this presentation is therefore threefold. First, it wishes to shed a light on the current legal system of environmental liability at the EU level (at regional and national level), based on the American model. Secondly, it highlights advantages and pitfalls of specific methods to calculate ecological damages in the courtroom (contingent valuation, HEA, travel cost method, etc.). While judges have been employing for decades stated-preferences and revealed-preferences methods, they seem more at ease with the restoration-cost method. Yet, this approach cannot pass the efficiency test due to many reasons (e.g., uncertainties regarding baseline conditions or the real remediation of impaired sites). From an economic standpoint, inaccuracy in the assessment of damages can provide polluters with efficient incentives to avoid accidents only in case of small accidents. But large accidents would need to be assessed through more accurate methods in order to make sure that future potential polluters will receive adequate incentives to avoid their occurrence. Apparently, the ecosystem services approach would provide a possible way



forward to make liability laws more efficient and effective. Courts have discussed its application in some recent cases (e.g., the Deepwater Horizon or the Costa Rica case) and many issues of validity have been raised. After identifying the specific bottlenecks in the judicial decision-making, the last aim of the author is to investigate how the ES approach (e.g., what types of classifications) could enhance the likelihood of judges of introducing it in litigation, hence raising the deterrent effect of environmental liability laws.

Keywords: liability, accidents, courts, environmental damage assessment, ecosystem services approach