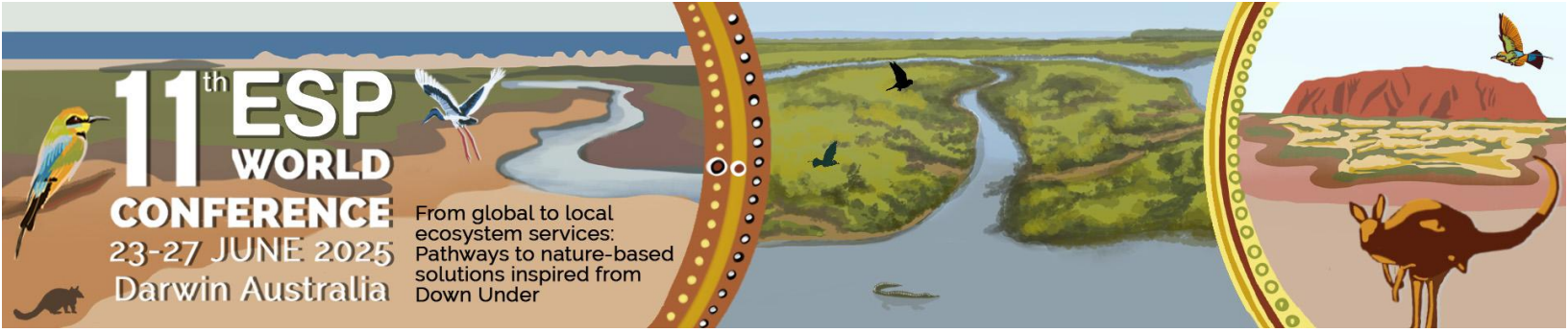


BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: T7b

Making Nature Count: Global and local applications of monetary valuation for transformation to nature-inclusive decision-making

Hosts:

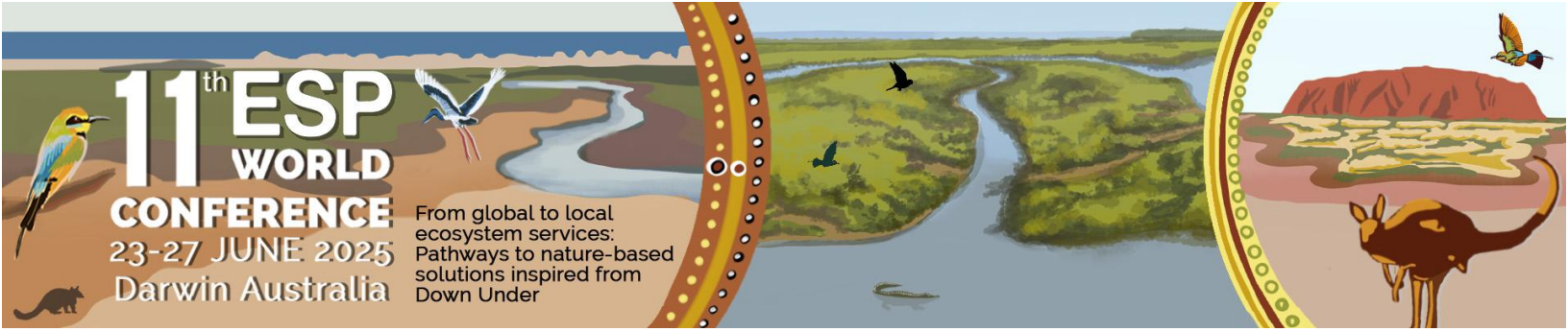
	Name	Organisation	E-mail
Host:	Vince van 't Hoff	Foundation for Sustainable Development	vince.vanthoff@fsd.nl
Co-host(s):	Mark Eigenraam Ziggy Gelman	IDEEA Group IDEEA Group	mark.eigenraam@ideeagroup.com ziggy.gelman@ideeagroup.com

Abstract:

To transform the current economic decision-making process, it is important to mainstream nature into different forms of private and public decision-making both at a global and a local scale. It is pivotal to showcase the benefits of nature to individuals, but also the public and the private sector with the need to finance nature. Additionally, it is important in showing that working with nature via Nature-based Solutions (NbS) and other nature positive initiatives, rather than instead of nature, is beneficial for both nature and human societies and economies.

The valuation of ecosystem services in general, and monetary valuation of ecosystem services in particular, is playing an increasingly important role in the integration of nature into private and public decision-making and in showing the benefits of NbS. Monetary valuation is institutionalized in official UN frameworks (SEEA-EA framework), is being addressed in private and influential initiatives (such as the Taskforce on Nature-related Financial Disclosures; TNFD) and has the potential to contribute to many of the targets of the Global Biodiversity Framework (GBF).

With the increase in available primary valuation studies (see e.g. ESVD), value transfer is increasingly used to estimate the (monetary) value of ecosystem services. These monetary ecosystem service values are important for sustainable natural resources management (by internalizing the value of nature) and natural capital accounting (by recognizing the value of nature in national accounts) and to show the value of Nature-based Solutions.



However, many questions regarding the implementation and transformative nature of monetary valuation remain. How does monetary valuation substantialize in private and public decision-making? How can we tailor and scale-up value transfer for better and more accurate decision-making? Or how can we use monetary valuation to close the biodiversity finance gap? Given these opportunities and challenges, it is important to critically explore methodological considerations, assess advances and discuss applications of monetary valuation – in particular in relation to their potential role to inform decision making, underpin natural capital accounting, and facilitate transformative change towards sustainable natural resources management.

Across this session we will seek to discuss recent considerations, advances and applications of monetary valuation for the integration of nature in private and public decision-making, specifically in NbS. These may be examples of monetary valuation in private or public decision-making, methodological advances and practical innovations in value transfer and/or critical contributions and thoughts on the mainstreaming and institutionalization of monetary valuation in public and private decision-making contexts.

Goals and objectives of the session:

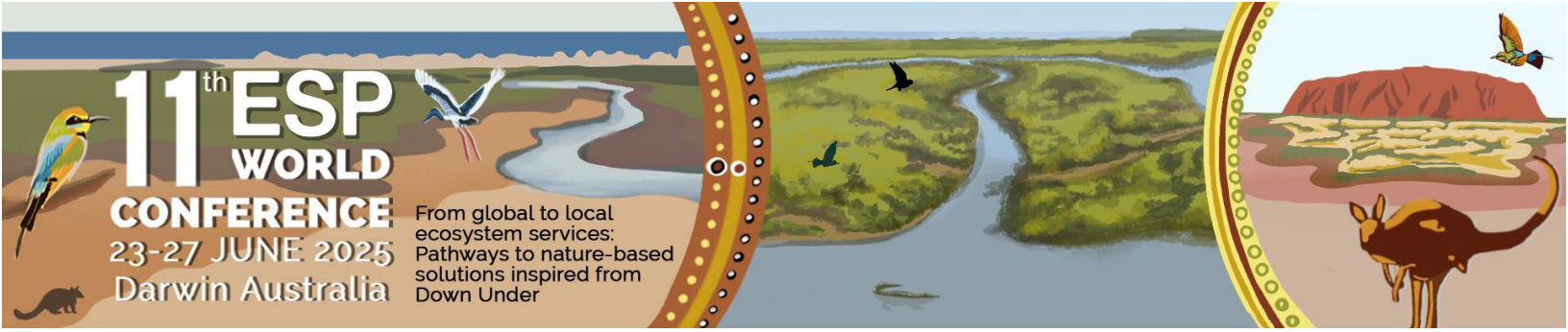
Researchers are invited to present their recent considerations, advances and applications of monetary valuation, underpinning the contribution and application towards NbS and sustainable natural resource management on a local and a global scale. This session will give insight in the opportunities, challenges and practices of using monetary valuation in private and public decision making.

Planned output / Deliverables:

Journal Special Issue about considerations, advances and applications of monetary valuation for transformation to nature-inclusive decision-making.

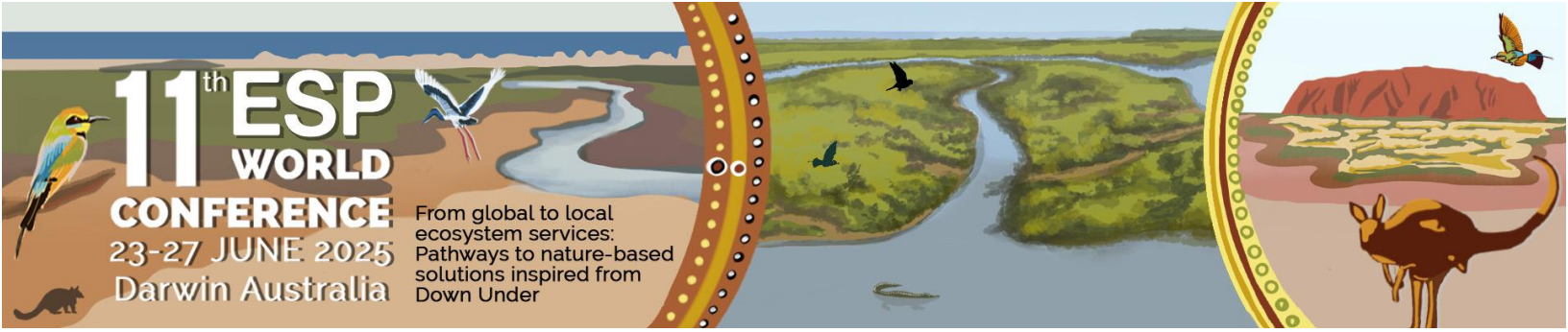
II. SESSION PROGRAM

Room: Waterfront 1
Date of session: 25-06-25
Time of session: Slot 1: 10:30-12:30 Slot 2: 16:00-18:00



Timetable speakers:

Time	First name	Surname	Organization	Title of presentation
			Timeslot 1	
			Monetary valuation in practice and methodological advancements	
10:30–10:40	Vince	Van 't Hoff	Foundation for Sustainable Development	Introduction to timeslot 1, monetary valuation and the ESVD
10:40–10:55	Huixin	Wang	Chiba University, Japan	Valuing the Recreational Ecosystem Services of Japan's National Park: Applying Mobile Data to the Travel Cost Method
10:55–11:10	Omprakash	Naik N	ICAR–Indian Agricultural Research Institute, New Delhi	An Evaluation of Soil Carbon Sequestration in Various Land Uses in Maharashtra's Konkan Region: An Ecological and Economic Perspective
11:10–11:15			*Wooclap breakout*	
11:15–11:30	Kätlin	Aun	Statistics Estonia	Valuing Nature's Contributions: Mapping and Semantics of the Methods for Ecosystem Service Valuation
11:30–11:45	Jialin	He	Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences	Internalizing externalities for Green is Gold: scenario analysis of sustainable agriculture in China's policy context
11:45–12:00	Jarrod	Kath	Centre for Applied Climate Sciences, University of Southern Queensland, Toowoomba QLD	Using scenario analysis and spatial mapping to identify nature-based solution 'win-wins' for rural communities and the environment
12:00–12:20			*General discussion*	
12:20–12:30	Mark	Eigenraam	IDEEA Group	Closing
			Timeslot 2	
			Integration and mainstreaming of valuation	
16:00–16:15	Vince	Van 't Hoff	Foundation for Sustainable Development	Introduction to timeslot 2, monetary valuation and the ESVD



Time	First name	Surname	Organization	Title of presentation
16:15–16:25 (online)	Uzma	Saeed	Government College University	Economic valuation of ecosystem services for indigenous communities of Chitral Valley in the Hindu Kush range, Pakistan
16:25–16:40	Nabila Nur	Septiani	Fisheries Resource Centre of Indonesia, Rekam Nusantara Foundation, Indonesia	From Economic Value to Management Implication: Case Study of Coastal Ecosystem Accounting in Indonesia
16:40–16:45	*Wooclap breakout*			
16:45–17:00	Amy	Basnett	Eco-Markets Australia	Harnessing Investment In Nature: Unlocking Private Finance for Environmental Restoration and Protection
17:00–17:15	Ziggy	Gelman	IDEEA Group	Recognising the value of ecosystem services with Natural Capital Dashboards
17:15–17:30	Li	Li	Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences	Mainstreaming Nature via Monetary Valuation in China's Soybean Expansion: A TEEBAgriFood Approach
17:30–17:50	*Breakout groups – discuss questions tbd*			
17:50–18:00	Mark	Eigenraam	IDEEA Group	Closing

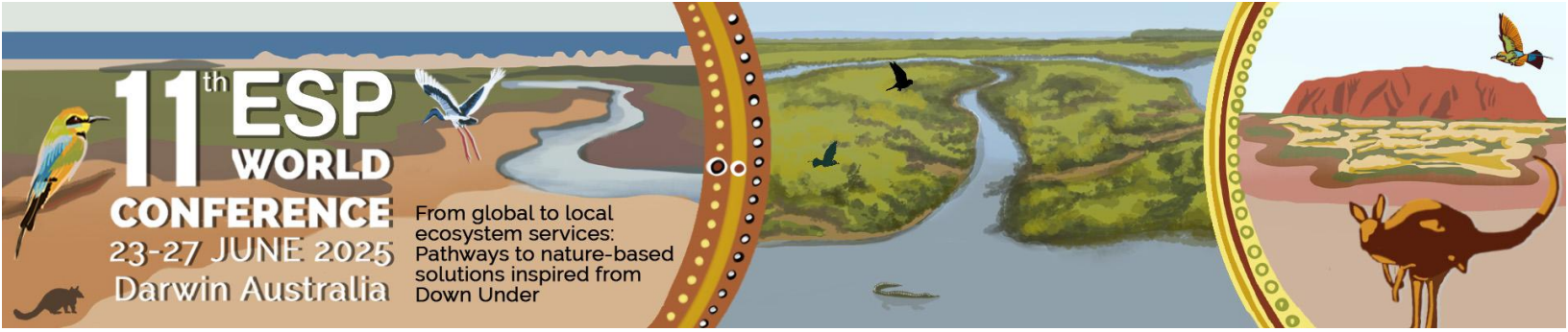
III. LIST OF ABSTRACTS

The first author is the presenting author unless indicated otherwise.

1. Economic valuation of ecosystem services for indigenous communities of Chitral Valley in the Hindu Kush range, Pakistan

First authors(s): Uzma Saeed

Other author(s): Muhammad Ali Nawaz



First author affiliation: Government College University

Contact: bretashlay@gmail.com

Keywords: Economic valuation, ecosystem services, focus group interview, Chitral Valley, Hindu Kush landscape, Pakistan

Understanding montane communities' dependence on ecosystem services (ES) is essential to developing relevant adaptation strategies. The ES in Chitral Valley, in the Hindukush range of Pakistan, provides a unique opportunity to explore this question. This underwork area is increasingly exposed to global climate change and the overexploitation of resources. Hence, this study aimed to identify the ES in this region and delineate indigenous communities' reliance on ES based on valuation in the Chitral Valley. ES were classified using semi-structured interviews and focus group discussions, guided by the CICES table and TEV Framework. Findings show indigenous communities' high dependence on the ES. The provisioning ES have 3.7 times higher total economic value than a household's (HH) average income, worth 7272 ± 481.6 USD/HH/yr. Forage for livestock holds the highest value as an ES in the Valley, 2219 ± 83 USD per household per year. The sustainable use of ES and climate change adaptation and mitigation have substantial cultural, economic, and ecological benefits for the Hindukush range.

2. Valuing the Recreational Ecosystem Services of Japan's National Park: Applying Mobile Data to the Travel Cost Method

First authors(s): Huixin Wang

Other author(s): Yilan Xie, Katsunori Furuya

First author affiliation: Chiba University, Japan

Contact: 23hd0401@student.gs.chiba-u.jp

Keywords: Recreational ecosystem service value; Ecosystem service value assessment; National Park; Mobile phone data; Travel cost method

National parks often face the dual challenge of managing visitor pressure while ensuring environmental protection. Conducting a monetary valuation of their recreational ecosystem services—such as landscape aesthetics, relaxation, and health benefits—can help the public and policymakers better understand their contributions, thereby promoting more sustainable management. In recent years, the application of big data in tourism research has been increasing. Compared to traditional survey data, mobile signaling data can reduce random errors and visitor recall biases, providing a more reliable basis for valuation studies. This study employs mobile data combined with the travel cost method (TCM) to estimate the recreational ecosystem service value of Japan's Aso-Kuju National Park. We use mobile data collected near visitor centers within the park to infer visitors' places of residence, estimate regional visit rates, and apply a travel cost function to calculate consumer surplus, thereby deriving the monetary value of recreational ecosystem services. The novelty of this study lies in integrating mobile data with the TCM approach, which enhances the accuracy of ecosystem service valuation.

The findings of this study are expected to provide scientific support for natural capital accounting and ecological economic policies, as well as improve public and policymaker awareness of the ecological value of national parks, ultimately contributing to nature conservation and sustainable management.

3. An Evaluation of Soil Carbon Sequestration in Various Land Uses in Maharashtra's Konkan Region: An Ecological and Economic Perspective

First authors(s): Omprakash Naik N

Other author(s): No

First author affiliation: ICAR-Indian Agricultural Research Institute, New Delhi

Contact: omprakashniari@gmail.com

Keywords: Soil Organic Caron, Conservation Agriculture, Economic valuation

Over the past two decades, India has been actively promoting and implementing conservation-oriented agricultural techniques. These strategies include minimizing soil disturbance, maintaining soil coverage with crop residues or cover crops, and adopting diverse crop rotations. This study aimed to evaluate Soil Organic Carbon (SOC) concentrations across four primary land-use categories: cropland, conservation agriculture, agroforestry, and forest in the Western Ghats of Maharashtra, India. A total of 60 soil samples (4 land uses × 5 plots × 3 depths) were collected. Cropland recorded the lowest SOC concentrations at depths of 0–15 cm, 15–30 cm, and 30–45 cm, with values of 32.09, 25.5, and 21.66 Mg C ha−1, respectively. In contrast, conservation agriculture (CA), which has involved no-tillage practices for the past eight years, organic amendments, and crop residue incorporation, demonstrated significantly higher SOC levels—69.14, 44.27, and 42.17 Mg C ha−1 at the same depths. These findings indicate that cropland has a lower SOC sequestration potential compared to conservation agriculture.

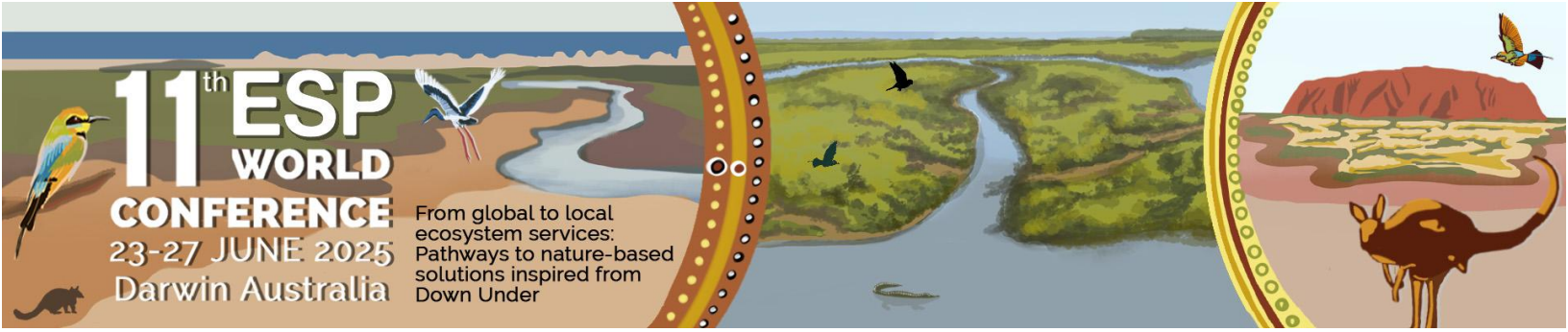
The economic value of carbon sequestration was assessed using the social cost of carbon, set at US$ 86 per Mg of CO_2. The estimated values were US$ 832.60 ha−1 year−1 for conservation agriculture and US$ 212.09 ha−1 year−1 for agroforestry. After accounting for the cost of nitrogen (N) required stabilizing carbon (C) storage, the net economic return for conservation agriculture was estimated at US$ 803.78 per hectare per year. India's carbon credit market is still in its early stages, with a recently launched framework for a Voluntary Carbon Market in agriculture. Based on this study, policy measures should be developed to facilitate additional income opportunities for farmers through carbon sequestration initiatives.

4. Valuing Nature's Contributions: Mapping and Semantics of the Methods for Ecosystem Service Valuation

First authors(s): Kaia Oras

First author affiliation: Statistics Estonia

Other author(s): Sjoerd Schenau, Aveliina Helm, Eve Veroman, Üllas Ehrlich, Helen Poltimäe, Maie Kiisel, Aki Kadulin



Presenting author: Kätlin Aun

Presenting author affiliation: Statistics Estonia

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Contact: kaia.oras@stat.ee

Keywords: Keywords: ecosystem services, monetary valuation, regulative services, policy integration, sustainability

With the adoption of ecosystem accounting as a statistical concept and emerging standard, the need for enhanced statistical literacy and decision-support tools has grown. The ecosystem services account serves as a bridge between ecological processes and economic systems, helping decision-makers recognize the indispensable contributions of nature to societal well-being. However, monetary valuation methods for ecosystem services are subject to ongoing debate.

Statistics Estonia, in collaboration with Statistics Netherlands, national experts and stakeholders, has been evaluating a range of monetary valuation methods to assess ecosystem services. Understanding how to treat valuation of ecosystem services is important for all services but particularly important for regulatory services such as pollination, climate regulation, and air filtration. These services, often treated as public goods, are vital for economic stability and social well-being, yet their value is rarely reflected in market transactions. Our analysis aims to identify valuation approaches that are not only methodologically sound and compatible with the System of National Accounts (SNA) but also sensitive to the ecological realities underpinning service provision and sustainability.

This presentation showcases findings from valuation methods explored within the framework of Eurostat grants supporting environmental-economic accounting. We discuss methodological trade-offs, the implications of different valuation techniques for policy and strategies for communicating results to diverse audiences. By doing so, we aim to contribute to the ongoing dialogue on aligning ecosystem accounting with policy needs, supporting the valuation of ecosystem services to guide sustainable resource management and bridge the biodiversity finance gap.

The selection of valuation methods is based on the UN SEEA EA and Eurostat's recommendations. Our work highlights the complexities of valuing regulatory services and the necessity of methodological transparency to ensure ecosystem accounting becomes a reliable tool for fostering transformative change and nature-inclusive decision-making.

5. Internalizing externalities for Green is Gold: scenario analysis of sustainable agriculture in China's policy context

First authors(s): Jialin He

Other author(s): Li Li

First author affiliation: Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences

Contact: jialin.he@igsnrr.ac.cn

Keywords: Ecosystem Services, Scenario Analysis, Agricultural Externalities, Sustainable Transformation, Policy Pathways,

Background: Agriculture drives biodiversity loss, ecosystem degradation, and carbon emissions through overgrazing, excessive chemical use, and farmland expansion, while relying on ecosystems for food production, employment, and livelihoods.

Policy Context: China's "Green is Gold" principle, rooted in its Ecological Civilization framework, emphasizes nature's intrinsic value and aligns with ecological economics, advocating for sustainable agricultural practices. Translating this principle into actionable policies requires integrating sustainability goals into decision-making.

Study Focus: This study applies spatially explicit scenario analysis to support municipal-level agricultural planning in China, using Tengchong City, a nationally recognized ecological region in Yunnan Province, as a case study.

Methodology: Through consultations with local authorities, the study develops a scenario framework integrating three policy pathways (Business-as-Usual, Optimistic, Pessimistic) with two climate pathways (RCP4.5, RCP8.5). The TEEB AgriFood framework evaluates economic, environmental, and social trade-offs, quantifying ecosystem services and externalities to support nature-inclusive decision-making.

Key Findings:

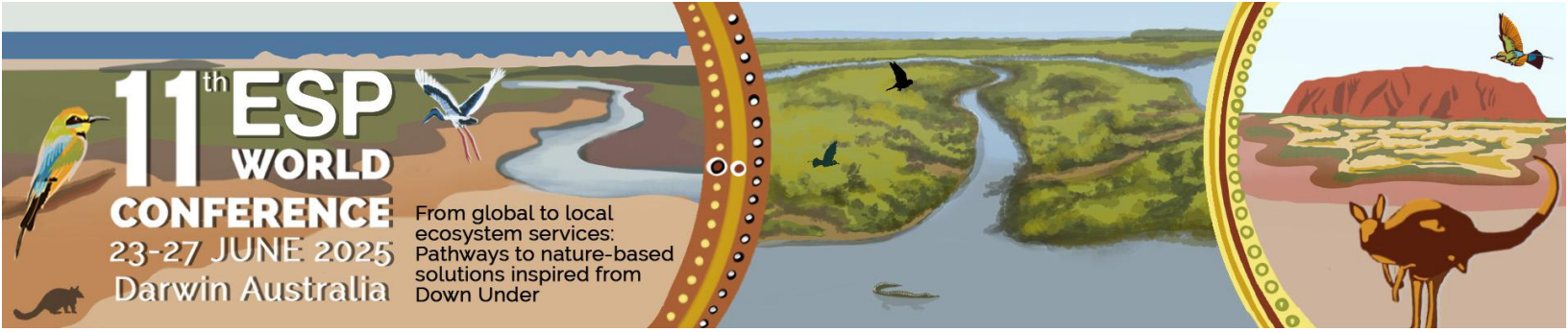
- The annual value of water, soil, and carbon-related ecosystem services in 2020 is estimated at 30 billion CNY, equivalent to Tengchong's GDP.
- In the Optimistic scenario, agricultural non-point source pollution control costs decrease by 45%, and health cost savings improve by 30% compared to the Pessimistic scenario due to reduced agrochemical use.
- Beef cattle industry emissions contribute 3%-5% of the total CO_2e sequestered by Tengchong's forests annually.

Conclusion & Implications: The study demonstrates how monetary valuation of ecosystem services can internalize externalities, supporting sustainable agricultural transformation under China's "Green is Gold" vision. Findings highlight agricultural water pollution as a development constraint, the need for emissions management in the beef cattle sector, and the importance of balancing ecotourism with conservation. It provides insights for integrating nature-inclusive economic assessments into policy planning, ensuring economically viable, environmentally sustainable, and socially beneficial growth.

6. Using scenario analysis and spatial mapping to identify nature-based solution 'win-wins' for rural communities and the environment

First authors(s): Jarrod Kath

Other author(s): Shahbaz Mushtaq, Kathryn Reardon-Smith

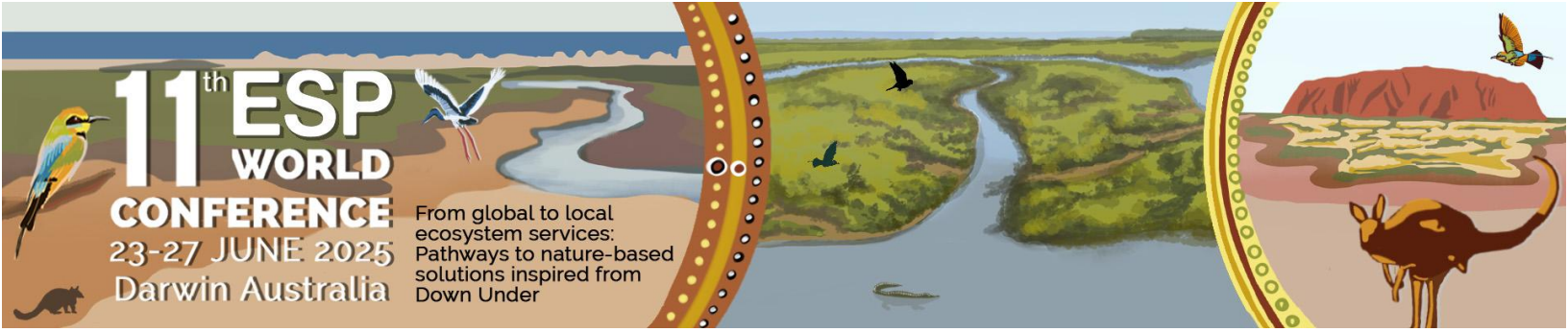


First author affiliation: Centre for Applied Climate Sciences, University of Southern Queensland, Toowoomba

Contact: jarrod.kath@unisq.edu.au

Keywords: Scenario analysis; Biodiversity credits; cropping; Natural capital

Nature-based solutions and associated carbon and biodiversity credit opportunities offer potential 'win-win' outcomes for rural communities by providing them with additional sources of income if agricultural productivity starts declining because of changing climatic conditions. To assess this, we used scenario analysis underpinned by agricultural profit mapping linked with biodiversity and environmental values to assess the potential benefit (or otherwise) of nature-based solution environmental credits across Queensland rural cropping communities. Specifically, we used scenario analyses to estimate the potential net value of environmental credit schemes, considering factors such as carbon sequestration potential, carbon prices, biodiversity credit values, and establishment costs. Despite uncertainties, environmental credit schemes demonstrated potential value under certain conditions, particularly in years with low agricultural gross margins. Farmers might consider switching to these schemes if average profits decline significantly, specifically to below 13 AUD per hectare per year. Conversely, in scenarios with strong positive externalities (e.g., from ecosystem services), the transition points for considering natural capital schemes were higher (above 101 AUD per hectare per year). We also ran scenarios to test the feasibility of long-term implementation of these initiatives through a hypothetical 25-year contract period. Our findings suggest that these schemes become more beneficial as the number of unfavorable years increases. Finally, we mapped the potential value of environmental credit schemes across rural communities where agricultural land has fallen out of production. This mapping showed that the value of nature-based solution associated credit schemes was highly spatially variable, with likely important implications for government policy and future planning decisions. While uncertainties exist, nature-based solutions linked to environmental credit schemes offer promise for enhancing agricultural sustainability and increasing farmer income in rural communities. Careful consideration of externalities and thorough scenario analysis is essential information supporting informed decision-making regarding the adoption of such schemes.



7. From Economic Value to Management Implication: Case Study of Coastal Ecosystem Accounting in Indonesia

First authors(s): Nabila Nur Septiani

Other author(s): Annisya Rosdiana, Agavia Kori Rahayu, Willy Puspa Irawan, Jessica Pingkan, Intan Destianis Hartati, Heidi Retnoningtyas, Irfan Yulianto

First author affiliation: Fisheries Resource Centre of Indonesia, Rekam Nusantara Foundation, Indonesia

Contact: septianinabilanur30@gmail.com

Keywords: coastal management, data-driven management, MPA management, policymaking, science-based policies

Indonesia is dependent on coastal and marine ecosystems for its economic prosperity and enhancing livelihoods. These ecosystems provide both direct and indirect benefits to economic sectors and communities through ecosystem services. Ocean Accounts (OA) can measure these complex relationships and identify the physical and monetary value of these services, aligned with international accounting standards that measure economic activity.

Indonesia has been developing OA to support decision-making and integrate these tools into development planning, including ANDALUSIA (Making Ocean Capital Visible initiative). Since 2021, Indonesia has also adopted OA to support Marine Protected Area (MPA) management, starting with pilot activities in Gili Matra MPA.

This study aims to explore the coastal ecosystem assets in Gili Matra MPA, in the terms of extent, services, and monetary value. The extent accounting was obtained from satellite images from 2015 and 2021 validated by ground survey. The ecosystem services were identified by using criteria of provisioning, cultural, regulating and supporting services. The monetary value was identified by using a benefit transfer method from the other countries, such as Philipine, Mexico, Kenya, the United States, and other regions within Indonesia, that adjusted into Gili Matra

contexts. This method also represents the value from two different approaches, including market and non-market prices. The total monetary value then resulted from calculation based on the ecosystem extent and benefit transfer.

The economic value of these environmental services contributes to the national ecosystem asset valuation in ANDALUSIA, which is part of the overall national ecosystem value. It helps policymakers integrate economic valuation into the national marine development plan. Understanding the trends in both extent and value is crucial for MPA managers and policymakers. Moreover, the findings suggest that OA can unveil essential data to inform integrated policy making and enhance the effectiveness of MPA management.

8. Harnessing Investment In Nature: Unlocking Private Finance for Environmental Restoration and Protection

First authors(s): Amy Basnett

Other author(s): No

First author affiliation: Amy Basnett is Head of Programs – Environmental Markets and Standards at Eco-Markets Australia.

Contact: amy.basnett@eco-markets.org.au

Keywords: Nature, Finance, Credit, Restoration, Protection

The need to protect and restore nature has never been more urgent, yet an estimated $700 billion annual funding gap threatens our ability to meet global biodiversity and climate targets. While government investment plays a crucial role, the scale of the challenge requires significant private capital.

Nature credit markets are emerging as a key solution to drive private sector investment in environmental restoration and preservation. These markets provide transparent, outcomes-based mechanisms that reward land managers for actions that improve biodiversity, water quality,

and ecosystem health. However, their success relies on integrity, trust, and independent oversight.

This session will explore the fundamentals of high-integrity nature credit markets. Drawing on five years of experience administering the Reef Credit Scheme, we will showcase how market-driven approaches can deliver measurable environmental outcomes. The discussion will also draw from learnings from our work on:

The development of a national water quality improvement credit market to drive investment in restoring and protecting marine and freshwater ecosystems across Australia.

Evaluating administration of the Cassowary Credit Scheme, a nascent biodiversity credit market supporting rainforest restoration and protection in the Wet Tropics.

Enabling Nature Credit stacking alongside ACCU projects, in collaboration with the Clean Energy Regulator, to provide landholders with diversified revenue streams and increased environmental outcomes while ensuring additionality.

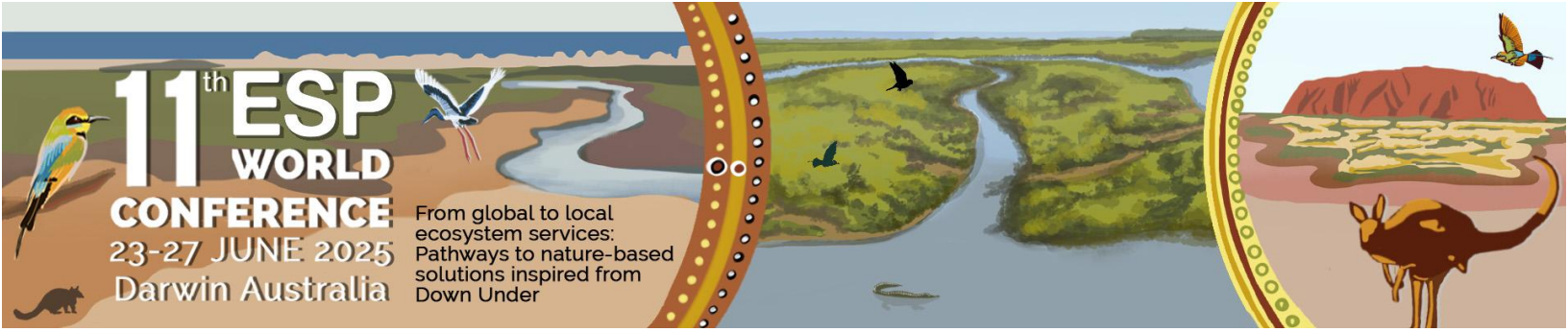
Working to better integrate Indigenous communities and traditional ecological knowledge into markets, ensuring meaningful engagement, and stronger environmental and cultural outcomes.

For corporate buyers, this session will highlight the importance of assessing supply chain dependencies on nature and integrating nature-positive outcomes into sustainability strategies. As global expectations shift, businesses must not only meet carbon commitments but also demonstrate nature stewardship across their entire supply chain. Nature credit markets offer a practical, verifiable way for companies to account for and mitigate their environmental impacts while strengthening their market position.

9. Recognising the value of ecosystem services with Natural Capital Dashboards

First authors(s): Ziggy Gelman

First author affiliation: IDEEA Group



Other author(s): Mark Eigenraam, Lachlan Dawson

Presenting Author: Mark Eigenraam

Presenting author affiliation: IDEEA Group

Contact: ziggy.gelman@ideeagroup.com

Keywords: Natural capital, Dashboard, Value, Decision-making, Natural resource management

Globally, there is growing recognition that natural resource management provides benefits from valuable ecosystem services. These services range from erosion control and carbon sequestration to recreation and water regulation.

Yet many organisations and investors lack the tools to effectively measure and communicate these benefits and integrate them into their decision-making. Consequently, tools which build organisations' natural capital understanding are essential since they can provide a clearer picture of the services and benefits – and associated value – flowing from management activities and investments.

Using a case study from a regional Catchment Management Authority, we demonstrate how a tailored Natural Capital Dashboard can enhance the value of natural resource management by showcasing the ecosystem services and benefits they provide. We explore how measuring these services highlights the benefits of strategic management and attracts outcome-focused investment.

The dashboard integrates spatially explicit data collected by natural resource managers with public data sources to quantify and visualise key ecosystem services and natural capital trends. This approach significantly advances the alignment of environmental and economic data, enabling natural resource managers to make informed decisions and target nature positive outcomes.

Dynamic maps, charts, and scorecards illustrate the benefits of high-quality natural resource management clearly and compellingly for both stakeholders and the market. The dashboard is

replicable, customisable to user needs, and aligned with international natural capital reporting standards, including the United Nations' System of Environmental-Economic Accounting.

Overall, Natural Capital Dashboards address communication gaps by integrating environmental data and ecosystem service analysis into an interactive, user-friendly platform that can report at any scale – from national to the farm scale.

Our session will give the audience clear insights into how natural capital reporting can enable natural resource managers to enhance their decision-making and communicate their positive impact on nature more effectively by recognising the value of ecosystem services.

10. Mainstreaming Nature via Monetary Valuation in China's Soybean Expansion: A TEEBAgriFood Approach

First authors(s): Li Li

Other author(s): Jialin He, Mingxing Sun

First author affiliation: Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences

Contact: li.li@igsnrr.ac.cn

Keywords: Monetary valuation, Soybean expansion, Ecosystem services, TEEBAgriFood, Policy implications

Mainstreaming nature into economic decision-making requires robust valuations of ecosystem services. In Heilongjiang Province—China's main soybean base—we applied the TEEBAgriFood framework to quantify the externalities and benefits of transitioning from maize and rice to soybean. Using FLUS and InVEST models, we evaluated Business-as-Usual, Soybean Priority, and Grain Priority policy pathways under RCP4.5 and RCP8.5 climate scenarios.

Our analysis highlights key insights for policymakers: by 2050, nitrate emissions in Soybean Priority scenarios will fall to nearly half of Business-as-Usual levels, cutting water pollutant costs

to about 130 million yuan—over 50% less than BAU. Water provisioning can rise by up to 3% under soybean-focused pathways, while greenhouse gas emissions and health-related costs decrease significantly due to reduced fertilizer and pesticide use. Although these changes yield substantial environmental and social benefits, immediate economic returns can be lower unless complemented by supportive measures.

Drawing on this study's final conclusions and policy implications, we stress that a holistic, multi-capital approach is crucial. Integrating these valuations into government planning—through ecological compensation credits, performance-based subsidies, or carbon pricing mechanisms—can help harmonize short-term economic goals with longer-term sustainability targets. Strengthening rural extension services, promoting women's participation in cooperatives, and investing in green financing solutions are equally vital to ensure inclusive benefits for local communities.

Overall, our findings reveal that strategic soybean expansion can serve as a viable Nature-based Solution, provided it is backed by comprehensive policy frameworks. By internalizing the previously hidden costs and benefits of land-use change, decision-makers gain more explicit evidence to align agricultural, environmental, and climate objectives. This analysis paves the way for profitably sustainable conservation strategies that protect ecosystem services while bolstering social equity and regional resilience.