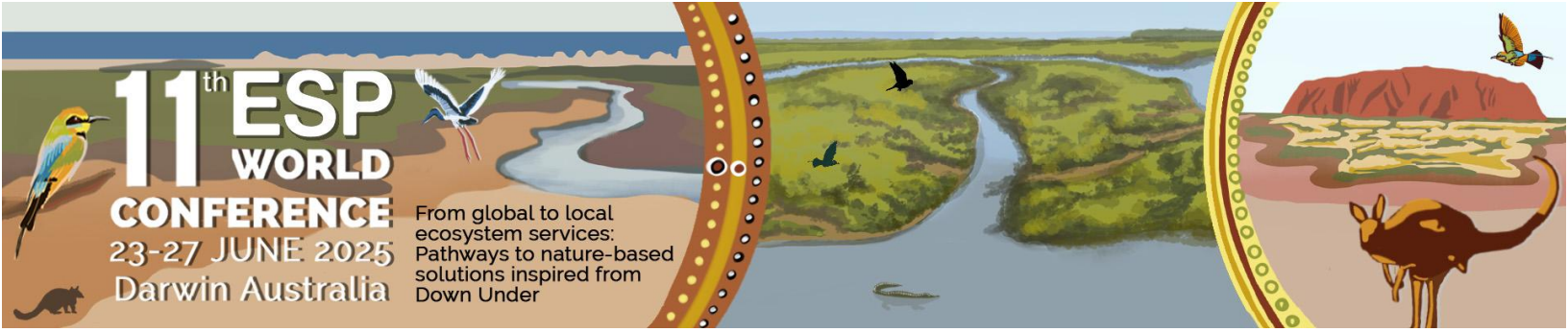


BOOK OF ABSTRACTS

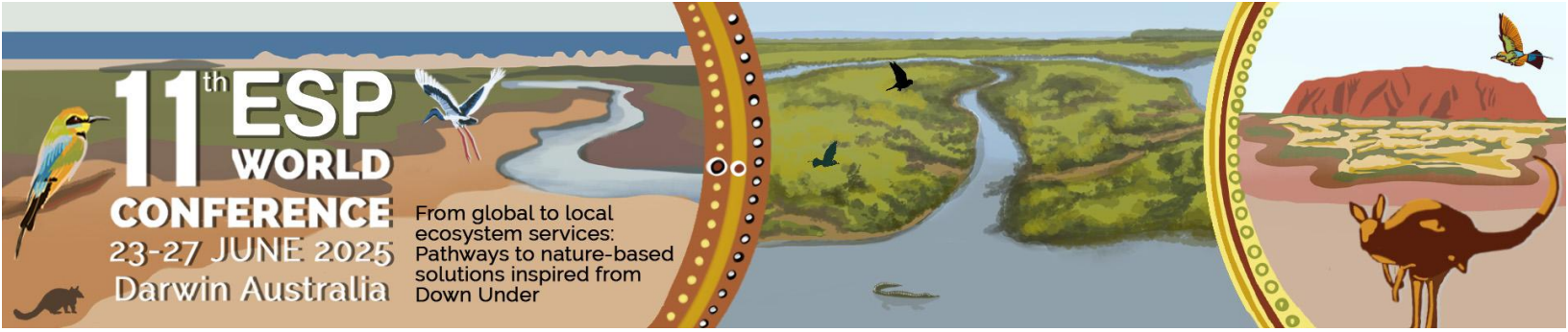
I. SESSION DESCRIPTION

ID: B1a

Blue carbon ecosystems – accounting and advocating for nature-based solutions for sustainable coasts

	Name	Organisation	E-mail
Host:	Kremena Burkhard	Ludwig Franzius Institute of Hydraulic, Estuarine and Coastal Engineering, Leibniz University Hannover, Germany	burkhard@lufi.uni-hannover.de
Co-host(s):	Miguel Inácio	Mykolas Romeris University, Lithuania	rinacio.miguel@gmail.com
	Luke Brander	Leibniz University Hannover, Germany	lukebrander@gmail.com
	Sabine Dittmann	UniSA Business, University of South Australia, Australia	sabine.dittmann@flinders.edu.au
	Joanne Tingey	UniSA Business, University of South Australia, Australia	Joanne.Tingey@unisa.edu.au
	Jeff Connor	UniSA Business, University of South Australia, Australia	Jeff.Connor@unisa.edu.au

Abstract:



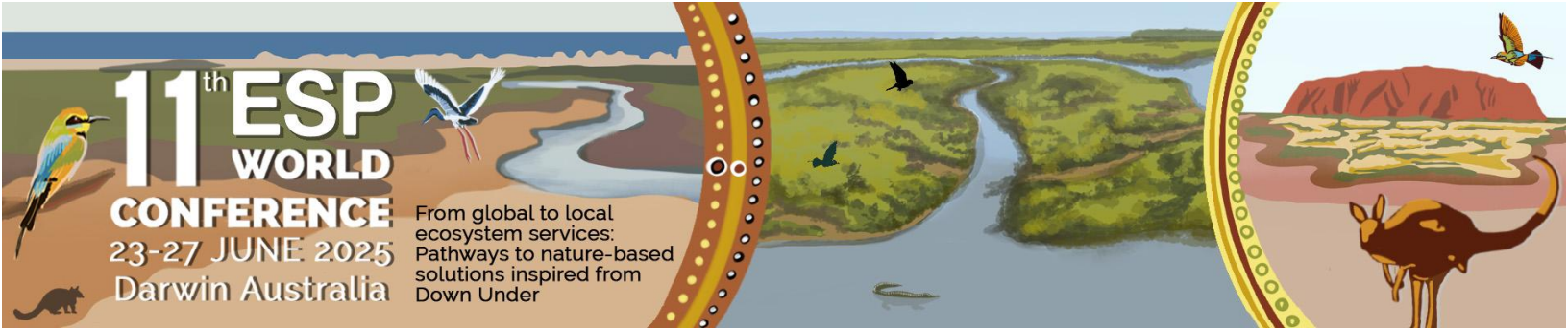
Blue carbon ecosystems (e.g., mangroves, seagrass meadows) play a significant role in decarbonisation initiatives due to their high efficiency for carbon capture and storage. Besides, these ecosystems are important suppliers of other ecosystem services (e.g., coastal protection, habitat provision, recreation and heritage) and support high biodiversity, both essential drivers of the vulnerable socio-ecological systems of coastal areas. These aspects led to the development and implementation of so-called blue carbon Nature-Based Solutions (e.g., mangrove restoration). Nevertheless, despite the role and importance of these nature-based solutions for both biodiversity and human wellbeing, there are still some barriers to its widespread implementation and scale-up, including a lack of understanding of costs and benefits. Measuring co-benefits and identifying beneficiaries of blue carbon initiatives is needed in order to incentivise investment and local implementation of conservation and restoration programs, as well as inclusion of those ecosystems in carbon markets. This is due to the fact that for example, the beneficiaries of carbon storage of blue carbon ecosystems are often spatially detached from those ecosystems, while the beneficiaries of coastal protection and fishing/habitat provision are usually adjacent. It is necessary to better acknowledge the interactions between service providing and service benefiting areas, as well as ecosystem services stocks and flows of blue carbon ecosystems, in order to facilitate their conservation, restoration and deserved role in green economies. This requires measurement and reporting which can be challenging given the temporal and spatial scale of restoration projects. In this session, we will explore the barriers and gaps as well as the necessary steps to further promote the implementation of blue carbon nature-based solutions.

Goals and objectives of the session:

- Identify pathways to bring forward the conservation and restoration of blue carbon ecosystems as nature-based solutions for climate change mitigation, adaptation and green economy;
- Exchange know-how and experience from case studies around the world on related measurement and reporting tools, practices and incentives, e.g. SEEA, carbon offsets and credits;
- Identify gaps, obstacles and steps needed to advance blue carbon nature-based solutions.

Planned output / Deliverables:

Short report on global initiatives and tools for supporting the implementation of conservation and restoration of blue carbon ecosystems as nature based solutions for sustainable coasts.

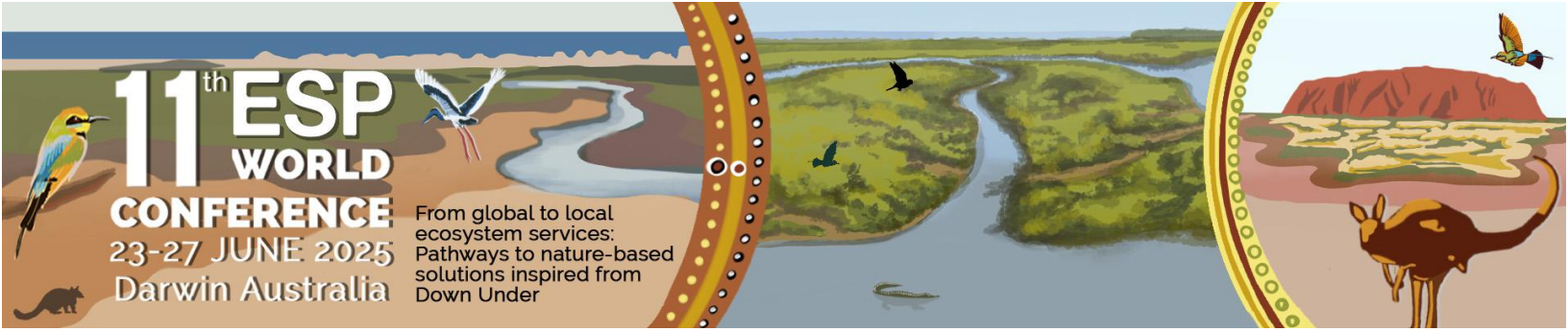


II. SESSION PROGRAM

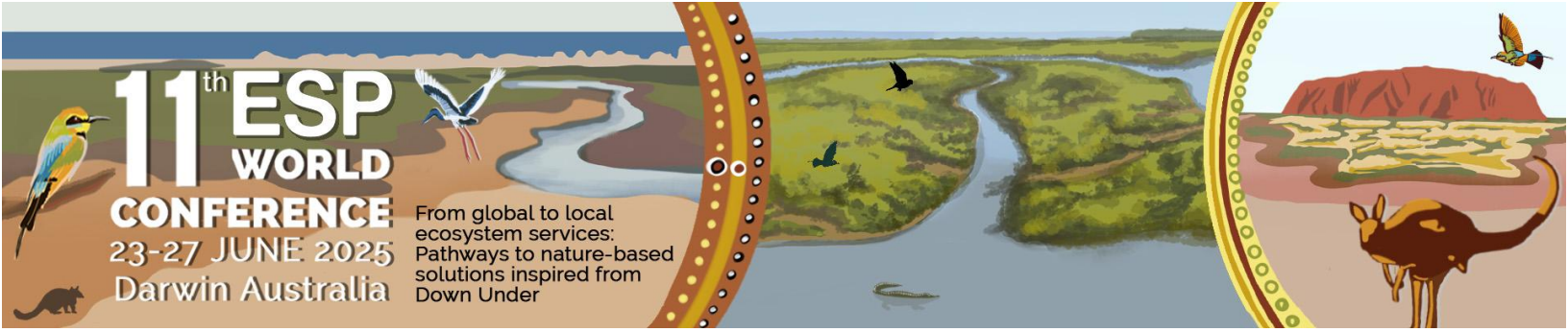
Room: Waterfront 2
Date of session: Wednesday, 25 June 2025
Time of session: 10:30–12:30 and 16:00–18:00

Timetable speakers: 10 min presentation + 2 min Q&A

Time	First name	Surname	Organization	Title of presentation
10:30–10:40	Welcome and Introduction, 1st slot			
10:40–10:52	Joanne	Tingey-Holyoak	University of South Australia, UniSA Business, Australia	The South Australian Blue Carbon Project: Accounting and advocating for coastal restoration
10:53–11:05	Joanne	Tingey-Holyoak	University of South Australia, UniSA Business, Australia	Boundary setting, measurement and management: How accounting can help support decision making about the health of our coasts
11:06–11:18	Jeff	Connor	University of South Australia, UniSA Business, Australia	An Ecosystem Service Accounting Monetary Valuation Quality Assessment Framework and Application to Australian Blue Carbon Projects
11:19–11:31	Diane	Jarvis	James Cook University, College of Business, Law and Governance, Australia	First Nations perspectives on accounting for the benefits of wetland restoration on traditional Country
11:32–11:44	Jordan	Gacutan	UNSW, Centre for Sustainable Development Reform, Australia	Piloting SEEA EA in the Maldives – assessing blue carbon ecosystems, their management and implications for financial instruments
11:45–11:57	Agavia Kori	Rahayu	Rekam Nusantara Foundation, Fisheries Resource Center of Indonesia, Indonesia	Utilising ocean accounts to support blue carbon measurement and management in Indonesia
11:58–12:10	Tim	Carruthers	The Water Institute, USA	Options and opportunities for financially viable carbon offsets from



Time	First name	Surname	Organization	Title of presentation
				herbaceous tidal wetlands in dynamic coastal ecosystems
12:11-12:30	Discussion			
12:30-16:00	Break/ Plenary			
16:00-16:05	Welcome and Introduction, 2nd slot			
16:06-16:18	Kremena	Burkhard	Leibniz University Hannover, Ludwig Franzius Institute, Germany	Ecosystem Services of Blue Carbon Ecosystems – a Systematic Map
16:19-16:31	Solen	Le Clec'h	Wageningen University, The Netherlands	Seagrass Ecosystems as Blue Carbon Solutions: A Spatial Framework for Conservation and Planning
16:32-16:44	Annet	Forkink	GNS Science, New Zealand	Nature-based Solutions and Stakeholder Engagement for Informed Land-Use Decisions
16:45-16:57	Ben	Fitzpatrick	Planet Indonesia	Restoring coastal fisheries through sustainable development in Indonesia.
16:58-17:10	Chen	Shuzhen	HuaQiao University, China	Study on the Evolutionary Characteristics, Multi-Scenario Simulation and Ecosystem Service Optimization Strategies of Production-Living-Ecological Space on Land and Sea——The Case of Jinjiang Fishing Port Economic Zone
17:11-18:00	Discussion and closing			



III. LIST OF ABSTRACTS

The first author is the presenting author unless indicated otherwise.

1. The South Australian Blue Carbon Project: Accounting and advocating for coastal restoration

First authors(s): Joanne Tingey-Holyoak

First author affiliation: University of South Australia

Other author(s): Jeffery Connor, Sabine Dittmann, Dhafeena Ahmed, Onil Banerjee, Kieren Beaumont, David Bruve, Graham Carpenter, Beverley Clarke, Bethany Cooper, Steve Dettman, Troy Gaston, Michael Hillma, Greg Johnston, Emily Leyden, Noah Morris, Luke Mosely, Anthony Newbery, Gerrut Norval, Imogen Owen, David Short, Virginia Simpson, Vandana Subroy, Jade Teigler, Brett Thomas, Malcolm Worthing, Qifeng Ye

Contact: joanne.tingey@unisa.edu.au

Keywords: Tidal reconnection, blue carbon, coastal restoration, ecosystem accounting, UN SEEA

Blue Carbon ecosystem restoration provides climate mitigation, biodiversity, water quality, recreational and other ecosystem services that benefit people. Tidal reconnection is one important way to achieve ecosystem restoration. However, limited work has been undertaken on systematically accounting for the improved value of ecosystem assets and services that can result from advocating for tidally reconnected ecosystems.

The South Australian Blue Carbon Ecosystem Restoration Project is one of five projects under the DCCEEW Blue Carbon Program with a goal of developing ES accounts for projects with blue carbon ES impact objectives using the United Nations System of Environmental Economic Accounting (UN SEEA). A range of expertise was involved, including remote sensing, soil and water quality experts, ecologists specialised on vegetation, macroinvertebrates, fish, birds, reptiles and mammals, and a team of economists and accountants. Results provide an important baseline for further accounting and tracking of benefits. Resulting ecosystem accounts provide specific and representative information on the value of ecosystem assets and their service flows as an

important means of identifying stocks of ecosystems and the human-dependent services they provide.

The experience from down under illustrates lessons in applying the UN SEEA for smaller restoration projects. We found several challenges: the delineation of an ecosystem accounting area in relation to the locations of restoration and beneficiaries, the small scale of the project areal extent relative to course resolution and the required time frame to measure benefits which exceeds project funding. An additional challenge addressed is inclusion of SEEA SNA consistent monetary valuation as well as broader measures of environmental value. Our account design and discussion of how we addressed these challenges is relevant to further Blue Carbon and other restoration projects and clarification of pathways to improve ecosystem service impacts.

2. Boundary setting, measurement and management: How accounting can help support decision making about the health of our coasts

First authors(s): Joanne Tingey-Holyoak

First author affiliation: University of South Australia

Other author(s): Jeffery Connor, Bethany Cooper, Vandana Subroy, Onil Banerjee

Contact: joanne.tingey@unisa.edu.au

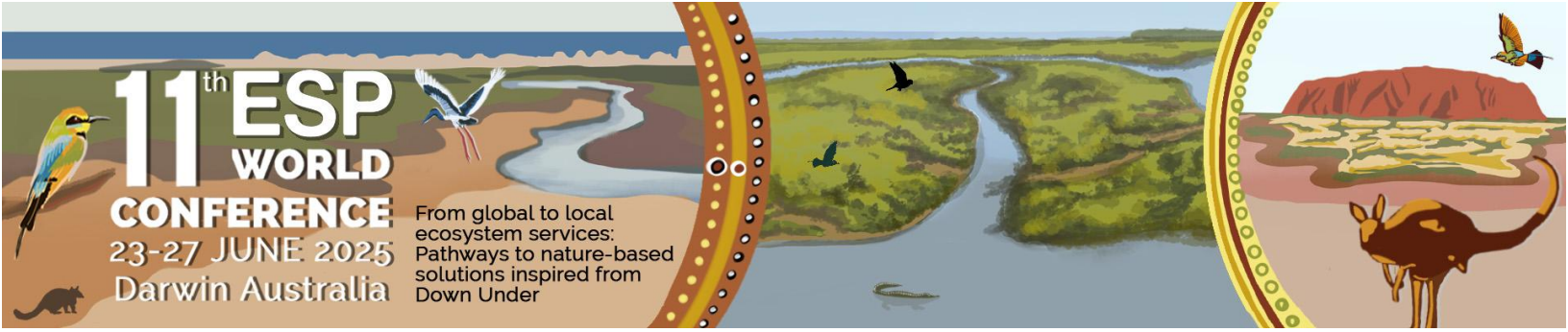
Keywords: Ecosystem accounting, boundary setting theory, coastal restoration accounting, ecosystem measurement, birdwatching travel cost

High quality coastal environments provide a variety of benefits to people, including climate mitigation, biodiversity improvement and recreational enjoyment. However, such habitats continue to be degraded with consequent losses in the values they generate. On a more hopeful note, some efforts to restore coastal ecosystems demonstrate how benefits from these environments can be enhanced with appropriate investment. One avenue to encourage investment is improving comparable and credible measurement and reporting of the benefits and costs of coastal restoration projects.

Arguably the most universal global system for such purposes is the United Nations (UN) System of Environmental Economic Accounting (SEEA). SEEA, now globally accepted and highly applicable at regional to national scales, enables comparisons across countries and time. Whilst built for global comparability and consistency with the System of National Accounts (SNA), SEEA-consistent accounting can be challenging when the framework is applied at the small project scale. One challenge is that project impact boundaries don't often align with broader regional data reporting. Another challenge is that the SNA-consistent approach to only considering exchange values could lead to systematic under representation of a range of environmental values that the public are likely to enjoy but that are not exchanged in markets or whose benefits are not fully expressed in market prices. Both challenges introduce uncertainties into the process of benefit accounting and a need for accountants to 'workaround' conventions.

In this talk we apply SEEA to a small-scale ecosystem restoration project in Australia to explore the benefits, challenges and evolutions that could improve applying SEEA to small scale restoration project assessment. The South Australian Blue Carbon Ecosystem Restoration Project is one of five projects funded by an Australian Commonwealth grant to scope potential of "Blue Carbon" sequestration in intertidal land. It involves establishing coastal reconnection through removal of blockages to previously coastal tide flow connected channels and is expected to increase mangrove areas and a range of ecosystem service stocks and flows. We will examine challenges in attribution at the small project scale and much courser regional data, and with significant public benefit in sources of value that are not traded in markets. Approaches to balance outcome attribution, and valuation that captures local context transparently to support decisions at small scales yet can consistently be scaled up to frameworks typically applied at larger scales (e.g. UN SEEA) will also be discussed.

We conclude with insights into how principles from the accounting discipline can be applied to ecosystem physical and monetary accounting for restoration projects at bounded scales and durations necessary for supporting decision making and investment along our coastlines.



3. An Ecosystem Service Accounting Monetary Valuation Quality Assessment Framework and Application to Australian Blue Carbon Projects

First authors(s): Onil Banerjee

First author affiliation: RMGEO Consultants Inc

Other author(s): Jeffery Connor, Joanne Tingey-Holyoak, Bethany Cooper, Vandana Subroy

Presenting author: Jeffery Connor

Presenting author affiliation: University of South Australia

Contact first author: obanerjee@gmail.com

Contact: joanne.tingey@unisa.edu.au

Keywords: Ecosystem service valuation, ecosystem accounting, UN SEEA, quality assessment framework, blue carbon valuation

The System of Environmental-Economic Accounting (SEEA) framework values ecosystem service stock and flow accounts at exchange value based on prices observed in market trades. While this is important for consistency with system of national account (SNA) accounting, a challenge arising is that this often undervalues ecosystem services because exchange value not accounting for benefits for most "public goods" because they aren't exchanged in markets. When accounts are for entities that value environmental "public good" provision, for example in their charitable objectives (e.g. an environmental trusts or local government), "bespoke accounts" with more complete estimates of ecosystem services values including valuation reflective of total economic value to society can be as or more important than consistency with SEEA conventions.

In both SEEA consistent and bespoke accounts there is variation in the quality of methods and data applied in monetary valuation and good practice in accounting requires reporting this transparently. To that end, SEEA guidance already outlines consistent methods and ranks their quality with a three-tier quality framework. In bespoke accounts with valuation more reflective of total economic value, in contrast there is little specific guidance on quality of monetary valuation in ecosystem service accounts. To address this gap, we developed and applied a monetary

valuation quality assessment framework to rank valuation methods in "bespoke" environmental economic accounts that draws on related quality assessment work in natural resource economics and medical research evidence quality evaluation literature.

Application is demonstrated for a set of bespoke ecosystem service accounting case studies that aspire to present more complete accounting for public good benefit with a total economic value focus. Each case is for a different restoration effort. though all share intention to enhance carbon sequestration and other ecosystem service flows through coastal and intertidal environmental restoration projects in Australia. We explain how they vary in methods and approaches to assessing monetary values in ES accounts and apply the quality assessment framework developed for this study. We conclude the paper an overview of the learning from applying the quality of monetary valuation framework and discussion on how the assessment framework can be applied to other projects in other country and valuation contexts.

4. First Nations perspectives on accounting for the benefits of wetland restoration on traditional Country

First authors(s): Diane Jarvis

First author affiliation: James Cook University

Other author(s): Larson Silva

Contact: diane.jarvis1@jcu.edu.au

Keywords: System of Environmental Economic Accounting – Ecosystem Accounting (SEEA EA), First Nations /Indigenous peoples, First Nations knowledge perspectives and worldview, Wetland restoration, Reciprocal services disservices stewardship and benefit flows

It is widely accepted that the restoration of blue carbon ecosystems can provide multiple benefits to biodiversity and human wellbeing. To incentivise necessary investment in restoration activities, an appropriate method for measuring and presenting the full range of co-benefits and identifying beneficiaries is needed. The United Nations System of Environmental-Economic Accounting

Ecosystem Accounts (SEEA EA) has been identified as one method to satisfy this need, as SEEA EA provides a comprehensive framework for measuring ecosystem services, tracking changes in ecosystem extent and condition, valuing ecosystem services and assets, and linking this information to measures of economic and human activity.

However, the SEEA EA documentation provides no specific guidance on how First Nations knowledge and perspectives may be included within the SEEA EA accounts. When contemplating restoration on the traditional lands of First Nations people, the failure to reflect their knowledge and perspectives may result in accounts that are not representative or inclusive of First Nations communities' values and connections to Country, and thus may fail to recognise the full range and scale of benefits offered by the restoration activities.

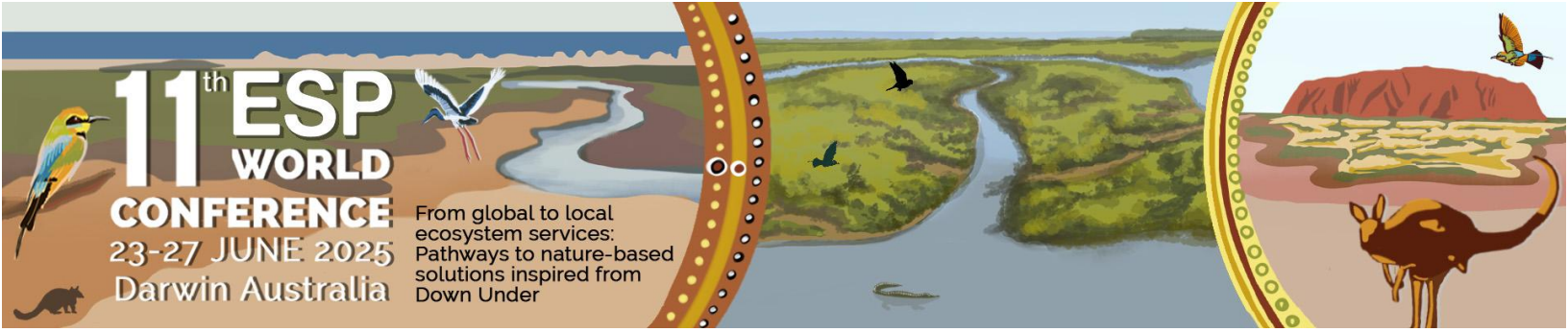
In this paper we focus on a wetland restoration site in north Queensland owned and managed by a First Nations group. In partnership with the Traditional Owners, we sought to develop baseline pre-restoration accounts, then develop forward looking expectations of benefits from restoration, using SEEA EA as our overarching approach, and present the current and anticipated improved flow of services within SEEA EA tables. Values and benefit flows are elicited from the traditional knowledge base, rather than determined by external 'experts'. We discuss the relevance of this approach for use in other ecosystems, for policy development and for a range of management interventions including but not limited to Nature Repair Markets, Blue Carbon Credits, and other nature-based solutions.

5. Piloting SEEA EA in the Maldives – assessing blue carbon ecosystems, their management and implications for financial instruments

First authors(s): Jordan Gacutan

First author affiliation: Centre for Sustainable Development Reform

Other author(s): Maria Alarcon, Shiraz Hassan, Shazly Aminath, Shaha Hashim, Rifga Mariyam, Lisama Sabry

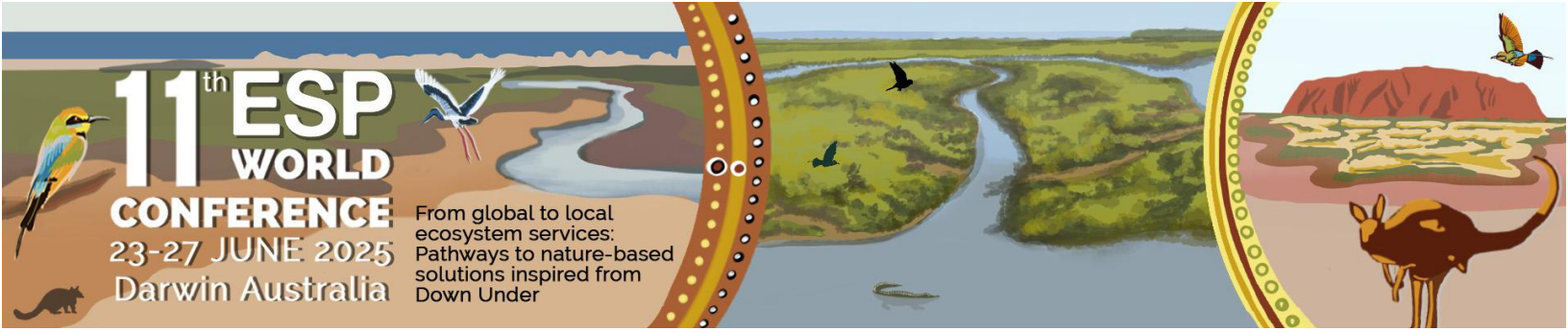


Contact: j.gacutan@unsw.edu.au

Keywords: SEEA EA, blue carbon, sustainable finance, small island developing states, Ecosystem Accounting

Marine ecosystems in the Maldives provide critical ecosystem services to communities and economic activities, supporting the nation's vision for development while facing challenges from climate change and human pressures. As the Maldives continues its conservation efforts, the concept of 'Nature-based Solutions' (NbS) further enhances awareness of these ecosystems' importance and there has been significant interest in the role of blue carbon ecosystems for both mitigation and adaptation actions in the Maldives. The feasibility of such ecosystems as an NbS that attracts finance, however, remains poorly understood. To measure and value the benefits of ecosystems to society and specific economic sectors, the first SEEA Ecosystem Accounts were compiled within the Maldives, as part of the GEF project, “Enhancing National Development through Environmentally Resilient Islands (ENDhERI)”.

The compilation of accounts focused on the extent and condition of mangrove, seagrass and coral reef on Laamu Atoll, generating a time series between 2017 and 2024. The accounts compiled the accounts for the sequestration and stock of carbon by seagrass and mangrove on the atoll, in addition to the supply and use of other services including coastal protection, fish provisioning, sediment production, and recreational opportunities. The accounts could be used to inform the management and governance of Laamu Atoll, in addition to assessing the feasibility of voluntary carbon credit schemes. The findings suggest challenges to proving additionality in mangroves or seagrass, and that blue finance opportunities could extend beyond carbon markets to instruments that capture multiple ecosystem services. The standardized accounting approach provides the measurement foundation essential for scaling sustainable finance while ensuring environmental outcomes align with Maldivian development priorities.



6. Utilising ocean accounts to support blue carbon measurement and management in Indonesia

First authors(s): Agavia Kori Rahayu

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

Other author(s): Annisya Rosdiana, Nabila Nur Septiani, Luky Adrianto, Nurul Dhewani Sjafrie, Fiki Hidayati, Oktavianto Prastyo Darmono, Heidi Retnoningtyas, Jessica Pingkan, Irfan Yulianto

Contact: agavia.kr@rekam.or.id

Keywords: science-informed policies, blue carbon ecosystem conservation, climate mitigation, blue carbon ecosystem accounting, integrated coastal management

As a signatory to the Paris Agreement, Indonesia is committed to achieving net-zero greenhouse gas emissions by 2060 through its second Nationally Determined Contribution (NDC). This is achieved in part through the ecosystem service of "global climate regulation", through the sequestration and retention of carbon. There is growing global interest in conserving and restoring "blue carbon ecosystems" (commonly defined as mangroves, seagrass, and salt marsh) to enhance the amount of carbon removed from the atmosphere. The UN provides guidance for such measurement at the national scale through the System of Environmental-Economic Accounting (SEEA), which is further extended by the Ocean Accounts (OA) Framework.

This study provides an overview of OA's role in supporting Indonesia's blue carbon efforts towards achieving national targets. Using the OA framework, Indonesia has implemented ecosystem extent and condition accounting and carbon accounting to assess carbon reserves and sequestration potential within Marine Protected Areas (MPAs). The OA initiative has also piloted stock and flow measurements of blue carbon ecosystem services (ES) through ES budget matrix compilation, spatial mapping of ES providers and beneficiaries, and ES monetary valuation.

The information provided by OA, particularly on ES assessment, has been referenced in determining local-scale intervention projects, such as for identifying targeted restoration areas, promoting sustainable livelihoods for local communities, and designing capacity-building

programs to support ecosystem conservation and integrated coastal management. Furthermore, this study highlights OA's role in shaping policy recommendations at the national level (e.g. climate change mitigation action plans and carbon management prospectus).

7. Options and opportunities for financially viable carbon offsets from herbaceous tidal wetlands in dynamic coastal ecosystems

First authors(s): Tim Carruthers

First author affiliation: The Water Institute

Other author(s): Shawnn Doyle, Alicia Sendrowski, Garvin Pittman, JeanCowan, Ioannis Georgiou, Ashlee Minor, Ryan Seidemann

Contact: tcarruthers@thewaterinstitute.org

Keywords: Blue carbon, coastal wetlands, restoration, carbon credits, financial viability

One of the world's largest "blue carbon" ecosystems, Louisiana's tidal wetlands on the US northern Gulf coast, is rapidly being lost. Louisiana's strong legal, regulatory, and monitoring framework, developed for one of the world's largest tidal wetland systems, provides an opportunity for a programmatic approach to blue carbon accreditation to support restoration of these ecologically and economically important tidal wetlands. Louisiana has a favorable governance framework to advance blue carbon accreditation due to centralized restoration planning, long term coastal monitoring, and strong legal and regulatory frameworks around carbon. Additional restoration efforts, planned over 50 years through Louisiana's Coastal Master Plan, are projected to create, or avoid loss of, up to 81,000 ha of wetland. Current restoration funding, primarily from Deepwater Horizon oil spill settlements, will be fully committed by the early 2030s and additional funding sources are required. Existing accreditation methodologies have not been successfully applied to coastal Louisiana's ecosystem restoration approaches or herbaceous tidal wetland types. Achieving financial viability for accreditation of these restoration approaches and wetland types will require expanded application of existing blue carbon crediting methodologies or even new methodologies or standards. It will also require expanded approaches

for predicting the future landscape without restoration, such as numerical modeling, and approaches for cost efficient monitoring such as remote sensing. This presentation will summarize the governance framework, the science gaps, and the sensitivity of current methodologies to identify potential short term and longer-term opportunities that can increase viability of ecosystem based blue carbon offsets for tidal herbaceous wetlands. Due to the large spatial scale and diversity of tidal wetlands in coastal Louisiana, it is expected that progress here has high potential to be generalized to similar wetland ecosystems across the US northern Gulf and globally.

8. Ecosystem Services of Blue Carbon Ecosystems – a Systematic Map

First authors(s): Kremena Burkhard

First author affiliation: Leibniz University Hannover, Ludwig Franzius Institute of Hydraulic, Estuarine and Coastal Engineering

Other author(s): Tinka Kuhn, Maike Paul

Contact: burkhard@lufi.uni-hannover.de

Keywords: marine ecosystems, coastal resilience, environmental benefits, evidence synthesis

Coastal vegetated ecosystems play a significant role in coastal environments due to the bundles of ecosystem services they provide, contributing to coastal resilience and sustainability. Nevertheless, they are some of the most threatened and vulnerable ecosystems, which increases the relevance of highlighting their contributions to society and its well-being. Climate regulation through carbon storage has become one of the most appreciated services of coastal vegetated ecosystems, due to their significantly higher efficiency in comparison to terrestrial ecosystems. This gained them the nickname Blue Carbon Ecosystems. Here, a systematic map of the peer reviewed publications studying all ecosystem services of such Blue Carbon Ecosystems is conducted. The addressed ecosystems are mangrove and kelp forests, seagrass meadows and salt marshes. The high interest in blue carbon is confirmed by the results, where climate regulation is the most studied ecosystem service for mangrove forests, seagrass meadows and

salt marshes, while for kelp forests it is on third place and the most studied kelp forest ecosystem service is food provision. Overall, mangrove forests are the most studied ecosystems, followed by seagrass meadows, salt marshes and kelp forests. A good overview of most applied assessment methods, the geographical distribution and the management and political perspectives of the studies is also gained, providing a spatial and knowledge map. The systematic map is a key first step for the more in-depth exploration of Blue Carbon Ecosystems and their services and helps identifying knowledge gaps that require further attention.

9. Seagrass Ecosystems as Blue Carbon Solutions: A Spatial Framework for Conservation and Planning

First authors(s): Solen Le Clec'h

First author affiliation: Wageningen University

Other author(s): Aritta Suwarno

Contact: solen.leclech@wur.nl

Keywords: Seagrass, marine spatial planning, framework, nature-based solutions

Seagrass ecosystems is a blue carbon nature-based solution that contributes to climate change mitigation and adaptation. They provide other essential ecosystem services and support biodiversity and local livelihoods. Despite their importance, seagrass meadows and other blue carbon ecosystems face significant threats from unsustainable practices and climate change, especially in regions like Indonesia, where coastal and marine ecosystems are under pressure. This research offers a holistic framework to assess and map the spatial distribution of seagrass ecosystem services to integrate these ecosystems into marine spatial planning and broader conservation efforts.

The framework follows a step approach. First step identifies key ecosystem services provided by seagrass meadows that directly benefit local people. The second steps identifies barriers and opportunities for management of these ecosystems. The third step relies on the quantification

and mapping of these services, specifically carbon sequestration. The forth step offers spatially targeted management interventions to optimize these services within Marine Spatial Planning frameworks, using scenario modelling with decision support systems to assess various spatial planning approaches and analyse trade-offs.

Our framework advocates the integration of ecological data, socio-economic data, and policy data, e.g. from census, satellite images and stakeholders workshops, into various data analysis and modelling to comprehensively address the role of seagrass ecosystems in spatial planning.

The research aims to create a socio-ecologically resilient coastal economy that values seagrass ecosystems as environmental assets and foundations of community livelihoods and economic opportunity. It aligns with global initiatives like the Sustainable Development Goals, the UNFCCC, and Indonesia's National Action Plan on Climate Change Adaptation and Mitigation, for long-term environmental and socio-economic resilience.

10. Nature-based Solutions and Stakeholder Engagement for Informed Land-Use Decisions

First authors(s): J. Roger

First author affiliation: GNS Science

Other author(s): A. Forkink, S.R. Uma, X. Wang, L. Hughes, A.R. Gusman, V.K. Sadashiva

Presenting author: Annet Forkink

Presenting author affiliation: GNS Science

Contact presenting author: a.forkink@gns.cri.nz

Keywords: tsunami hazard, Aotearoa New Zealand, nature-based solutions, coastal ecosystems, mitigation

Aotearoa New Zealand's coastal communities are vulnerable to multiple natural hazards including tsunami hazards. Traditional hard structures, such as seawalls and breakwaters, are often used

to protect coastal communities. However, these structures can be costly to build and maintain and can lead to unintended negative impacts. In response to these challenges, Aotearoa NZ government is promoting Nature-based Solutions (NbS) as a more sustainable alternative to mitigate hazards while enhancing environmental and societal resilience.

Despite the growing interest in NbS and related ecosystem services in mitigating coastal hazards, there is a lack of scientific studies demonstrating their effectiveness in reducing tsunami risks and providing guidance for stakeholders to make well-informed decisions. The researchers adopted a participatory approach to generate outputs that are useful for potential stakeholders and identify how technical hazard and risk information can be translated into more suitable data.

We organised two workshops with representatives from 15 organizations, to understand local needs and objectives with respect to tsunami risk reduction, learn about stakeholder experiences and resources regarding NbS, and provide insights into tsunami modelling capabilities considering the ecosystems via the construction and integration of roughness layers in the simulation process. By incorporating stakeholder input into the research process, this study aimed to develop modelling tools to help stakeholders make more informed land-use change decisions while enhancing the relevance and effectiveness of NbS.

11. Restoring coastal fisheries through sustainable development in Indonesia.

First authors(s): Ben Fitzpatrick

First author affiliation: Oceanwise Australia, IUCN CEM

Other author(s): Adam Miller, Andrew Davenport, Abrar Ahmad

Contact: ben.fitzpatrick@oceanwise.com.au

Keywords: Nature Based Solution, Mangroves, Subsistence fisheries, Locally Managed Marine Area, Restoration

This case study highlights nature-based solutions for sustainable development in coastal communities, focusing on the 15,000-hectare mangrove ecosystem of Kubu Raya, West

Kalimantan. The project engaged six communities through a conservation cooperative approach, fostering equitable development alongside environmental protection.

The initiative provided community-driven services to address key socio-economic challenges, including public health, education, bargaining power, and sustainable enterprise. In return, communities led mangrove restoration efforts, introduced fisheries management plans, rehabilitated degraded areas, and established patrols, ensuring long-term conservation and resource management.

Key achievements included the launch of a microfinance program to support local fishers, an ongoing literacy and numeracy program for women and youth, and family planning and sanitation initiatives. As a result, household incomes rose from US$80 to US$260 per month. The project also led to the creation of Borneo's first Locally Managed Marine Area and contributed to the national designation of a new marine park.

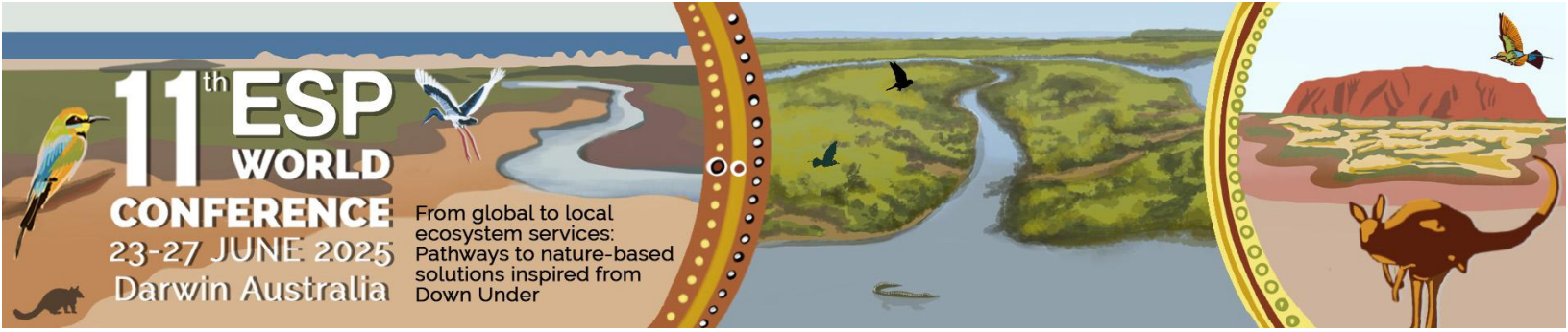
By aligning with global sustainability efforts, this initiative contributed to the UN Sustainable Development Goals (SDGs) and the CBD Kunming-Montreal biodiversity targets. It addressed SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 3 (Good Health), SDG 4 (Quality Education), and SDG 5 (Gender Equality), while also supporting SDG 13 (Climate Action) through mangrove conservation and SDG 14 (Life Below Water) by preventing ecosystem degradation.

This model demonstrates how integrating conservation with socio-economic development can create lasting environmental and community benefits, serving as a replicable framework for sustainable coastal management.

12. Study on the Evolutionary Characteristics, Multi-Scenario Simulation and Ecosystem Service Optimization Strategies of Production-Living-Ecological Space on Land and Sea – The Case of Jinjiang Fishing Port Economic Zone

First authors(s): Chen Shuzhen

First author affiliation: Huaqiao University



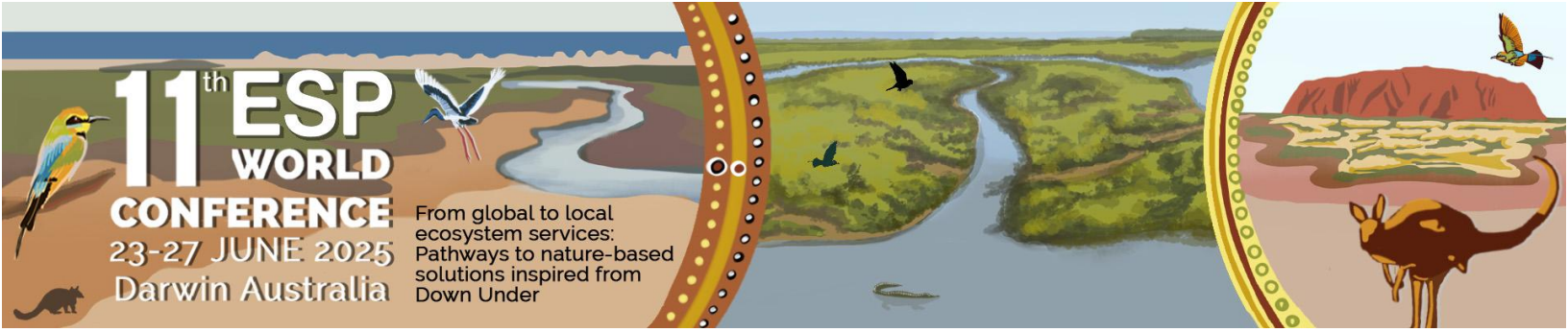
Other author(s): Shaofeng Wu

Contact: 767083421@qq.com

Keywords: Production-Living-Ecological Space(PLES), Coastal Economic Units, Land-Sea Ecosystem Service Trade-offs, Fishing Port Economic Zones (FPEZs), multi-scenario simulation

With the acceleration of urbanization and over-exploitation of marine resources, the imbalance of land-sea Production-Living-Ecological Space(PLES) threatenes the sustainable development of human living environment. As critical Coastal Economic Units linking land and sea, Fishing Port Economic Zones (FPEZs) required integrated spatial planning to coordinate land and marine utilization, ensuring efficient resource allocation while mitigating conflicts. A rational PLES layout is essential for balancing economic activity, social needs, and ecological conservation, supporting the sustainable development of coastal regions.

This study examines the Jinjiang FPEZ, Fujian Province, China, constructing a PLES classification system based on Human-Nature Coupling and spatial equilibrium theories. Using a land-use transition matrix, gravity-shift analysis, standard deviation ellipse models, and the TOPSIS model, we analysed spatial evolution characteristics of PLES in 2004, 2014 and 2024, revealing the transition relationship of production, living and ecological spaces, and discussed the reasonableness of the existing layout based on the multi-scenario simulations.Findings indicate that: 1) From 2004 to 2024, ecological land declined while production land expanded due to industrialization. Living space remains fragmented, reducing land-use efficiency. 2) The current layout shows spatial imbalances, particularly between economic and ecological functions. 3) Multi-scenario simulations highlight that ecology-prioritized planning better harmonizes land-sea interactions, mitigating environmental degradation while supporting economic sustainability.From the perspectives of Nature-based Solutions (NbS), Cultural Ecosystem Services (CES), and land-sea integration, we proposed optimization strategies, including ecological protection through green infrastructure, integrated functional zoning for balanced development, and adaptive spatial planning to enhance long-term marine spatial governance and sustainability.



This study develops a decision-support framework for sustainable marine spatial planning, offering practical insights for optimizing FPEZ spatial structures and promoting resilient coastal economies. It provides a transferable methodology for managing land-sea spatial conflicts and advancing integrated coastal zone management.