Deliverable 3.4

InfoGraphs showing results of EA Wheel Tool

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Abstract	The aim of this deliverable was to illustrate case studies, within the Blue Bio Economy, of companies that are applying Ecosystem Approach or Ecosystem Services Valorisation tools.
Keywords	BlueBioClusters, blue bioeconomy, Ecosystem Approach, Ecosystem services Valorisation

HISTORY OF CHANGES		
Version	**Publication date**	**Changes**
1.0	23.05.2025	Initial version
2.0	31/05/2025	Adapted version after internal reviewers
3.0	05.11.2025	Version adapted after project review

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Acronyms

BBC	BlueBioClusters
EA	Ecosystem Approach
ES	Ecosystem Services

Executive Summary

As described in BBC Deliverables D3.3 *"User-manual for EA Wheel as decision support tool"* and D6.5 *"Guide for Use of EA Wheel at Regional Policy Level," several factors hindered* the operationalisation of the Ecosystem Approach (EA) Wheel as originally planned in the proposal stage.[1] As a result, the focus during the project shifted from immediate implementation to raising awareness about the EA and its application in the blue bioeconomy.

Interactions with blue bioeconomy companies revealed limited use or knowledge of the Ecosystem Approach or Ecosystem Services Valuation tools in their business planning. In addition to raising awareness and facilitating the adoption of the Ecosystem Approach (EA) by companies through various activities, active outreach was carried out to identify blue bioeconomy case studies where the EA or Ecosystem Services Valuation tools are used in decision-making. This was achieved through co-creation workshops, conference engagements, presentations, and one-on-one meetings. This deliverable aims to illustrate case studies of companies within the blue bioeconomy applying the Ecosystem Approach or Ecosystem Services Valuation tools and how their EA efforts were translated into an internal decision or to gain benefits from external parties.

The infographics of these case studies are compiled into the booklet *"Case Studies on the Ecosystem Approach in the Blue Bioeconomy"* which is available on the BlueBioClusters website and disseminated through our main communication channels, such as social media and the Blue Bio Match-portal.

[1] Please see BBC D3.3 *"User-manual for EA Wheel as decision support tool"* and D6.5 *"Guide for Use of EA Wheel at Regional Policy Level"* for more explanations. All BBC deliverables can be retrieved from: https://bluebioclusters.eu/outcomes/

Introduction

Europe's sea regions hold significant potential for the blue bioeconomy, offering marine-based resources for food, feed, pharmaceuticals, and more. However, the growing demand for resources and increasing environmental pressure, exacerbated by climate change, pose serious sustainability challenges. Ecosystem degradation, species loss, and declining water quality threaten biodiversity and economic stability. Unsustainable blue bio production practices, such as overreliance on wild fish feed or poor waste management, may harm ecosystems. Meanwhile, fragmented regulations, limited market access, and a lack of coordination hinder progress, especially for small enterprises. Effective, inclusive governance and long-term strategies are essential to mitigate these risks and support sustainable growth.

The Ecosystem Approach (EA) offers a way forward. By integrating environmental, social, and economic considerations into planning and management, EA helps assess trade-offs, minimise negative impacts, and enhance ecosystem services. These services, e.g. water purification, habitat provision, and carbon storage, are vital to the health of marine environments and the industries that rely on them. During the development of this deliverable, several tools and frameworks were identified that are helping companies and policymakers embed Ecosystem Approach (EA) principles into business models and decision-making. These resources illustrate practical steps for implementation and promote cross-sector collaboration. Examples include the SUMES methodology developed by the SUMES project, the Operational Decision Support System hosted by Blue Bio Sites, the Marine Ecosystem and Sustainability Assessment Tool (MESAT) by Emelia, the Go Ocean Impact Platform, the North Sea Conservation (NSC) tool, and the Digital Twin developed by Oyster Reef. These tools represent a growing ecosystem of resources that support the operationalisation of the EA within the blue bioeconomy. These resources highlight practical steps for implementation and promote collaboration across sectors. However, widespread adoption of EA still faces some hurdles: lack of awareness, unclear incentives, and insufficient data remain major barriers. Many tools lack pilot testing, and stronger links between tool developers and users are needed. Successful implementation depends not just on technology, but also on shifts in governance culture, policy support, and industry mindsets. Despite the challenges, momentum is building. With coordinated effort, emerging tools, and growing stakeholder engagement, the Ecosystem Approach can guide the blue bioeconomy toward a more resilient, inclusive, and regenerative future. Within the BlueBioClusters project, specific Online Awareness Tools were developed, one for companies to evaluate their current Ecosystem Approach activities and another for policymakers to outline actionable steps to implement the EA.

The booklet aims to visualise how different case studies applied an EA framework or Ecosystem Services valorisation tool to translate their EA efforts into an internal decision or to gain benefits from external parties (see Annex 1). The case studies highlight the positive impact that the production of various aquatic organisms may have on ecosystem services, as well as how these benefits are recognised and valorised through the Ecosystem Approach. This valorisation may come from food provisioning, contributions to nature enhancement, integration into broader production cycles, site sharing, and other synergistic effects. The outreach to companies on the Ecosystem Approach has shown that using ecosystem services valorisation tools is not yet a common practice in the blue bio-based production sector. However, their application is more evident in activities focused on nature enhancement or

restoration, where blue bio production can play a crucial role. This aligns with expectations, as quantifying ecosystem service impacts is key to validating the benefits of restoration. It also supports tool refinement, contributes to certification efforts, and may ultimately facilitate broader and more routine adoption within the Blue Bioeconomy.

Case Studies on the Ecosystem Approach in Blue Bio Economy

Table 1 shows an overview of the different case studies of companies using an EA framework or Ecosystem Services Valorisation tool that are displayed in the booklet *"Case studies on Ecosystem Approach in Blue Bio Economy"* and how they have benefited or helped the company develop its activities further. The booklet also includes a comparative assessment outlining the main specificities and trade-offs of the various EA tools, guiding potential users in selecting the most appropriate approach for their context.

*Table 1 Overview of case studies displayed in the booklet "*Case studies on Ecosystem Approach in blue bio economy*"*

Showcase study	Region	Framework/Tool used	Partners involved
Offshore wind farm with mussel farm	Belgium	SUMES	Parkwind SUMES
Bivalves culture	Portugal	NESEV	Oceano Fresco Haedes
IMTA in Estonia	Estonia	BlueBioSites	Red Storm Aqua Verde
Bio-stabilisation through musselculture	Belgium	MESAT	Coastbusters Emelia Mantis Consulting
Oyster restoration in offshore wind park	Netherlands	Impact Platform	Go Ocean Orsted Van Oord
Nature-based wastewater treatment	France	EA Ladder	ZENI Mantis Consulting
Lobster ranching in Windmiil parks	UK	NSC	RWE Whitbey Lobster
Offshore musselculture	Belgium	MESAT	Colruyt Group Emelia Mantis Consulting
Mangrove restoration for seafood value	Ecuador	EA ladder	Jan de Nul Mantis Consulting
Oyster Reef	Belgium	Oyster Reef Digital Twin	Oyster Heaven

References

Books and Reports

Adriaen, J., Veys K., & Herremans, B.. (2025). *Deliverable D6.5: Guide for Use of EA Wheel at Regional Policy Level.* BlueBioClusters. Retrieved from BlueBioClusters website.

Adriaen, J., Veys K., & Herremans, B.. (2025). *Deliverable D3.3: User-manual for EA Wheel as decision support tool.* BlueBioClusters. Retrieved from BlueBioClusters website.

Websites and Miscellaneous

Online Awareness Tools to evaluate a company's current Ecosystem Approach activities and outlining actionable steps to implement the EA for policymakers. https://bluebioclusters.eu/ecosystem-approach-tool/

Annex 1: Booklet “Case studies on Ecosystem Approach in Blue Bio Economy”

CASE STUDIES ON ECOSYSTEM APPROACH IN BLUE BIO ECONOMY

BLUE BIO CLUSTERS

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- Are you a company looking to evaluate your activities through the EA?
- Are you a policymaker looking for actionable steps to implement the EA in your region?
- What is the next step for my Ecosystem Approach implementation?

Check Out the Online Awareness Tools

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This booklet was made in the framework of the BlueBioClusters-project (2025).

If you need more information on the booklet, please contact info@blauwecluster.be

For more information on the project visit our website: https://bluebioclusters.eu/

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Blue Bio Clusters project is empowering Europe's coastal regions to grow a sustainable, innovative, and resilient blue bioeconomy.

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INTRODUCTION

Europe's sea regions hold major potential for the Blue Bioeconomy, offering marine-based resources for food, feed, pharmaceuticals, and more. However, the growing demand for resources and increasing environmental pressure, exacerbated by climate change, pose serious sustainability challenges. Ecosystem degradation, species loss, and water quality decline threaten both biodiversity and economic stability.

Unsustainable Blue Bio production practices, such as overreliance on wild fish feed or poor waste management, may harm ecosystems. Meanwhile, fragmented regulations, limited market access, and a lack of coordination hinder progress, especially for small enterprises. Effective, inclusive governance and long-term strategies are essential to mitigate these risks and support sustainable growth.

The Ecosystem Approach (EA) offers a way forward. By integrating environmental, social, and economic considerations into planning and management, EA helps assess trade-offs, minimise negative impacts, and enhance ecosystem services. These services, e.g. water purification, habitat provision, and carbon storage—are vital to the health of marine environments and the industries that rely on them.

Tools and frameworks such as the ones listed in the booklet are being created to help companies and policymakers embed EA principles into business models and decision-making. These resources highlight practical steps for implementation, and promote collaboration across sectors.

However, widespread adoption of EA still faces some hurdles: lack of awareness, unclear incentives, and insufficient data remain major barriers. Many tools lack pilot testing, and stronger links are needed between tool developers and users. **Successful implementation depends not just on technology, but also on shifts in governance culture, policy support, and industry mindsets. Despite the challenges, momentum is building. With coordinated effort, emerging tools, and growing stakeholder engagement, the Ecosystem Approach can guide the Blue Bioeconomy toward a more resilient, inclusive, and regenerative future.** Within the BlueBioClusters project, specific Online Awareness Tools were developed, one for companies to evaluate their current Ecosystem Approach activities and another for policymakers to outline actionable steps to implement the EA.

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This valorisation may come from food provisioning, contributions to nature enhancement, integration into broader production cycles, site sharing, and other synergistic effects. The outreach to companies on Ecosystem Approach has shown that the use of ecosystem services valorisation tools is not yet common practice in the blue bio-based production sector. However, their application is more evident in activities focused on nature enhancement or restoration, areas where blue bio production can play a crucial role. This is logical, as quantifying ecosystem services impacts is crucial for validating the benefits of restoration, which will also help to refine the tools, supports certification efforts, and may ultimately facilitate their broader and more routine adoption within the Blue Bioeconomy.

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ECOSYSTEM APPROACH TOOLS

The Ecosystem Approach can be implemented through a variety of tools, each designed with different objectives, levels of detail, and user requirements in mind. When choosing the right tool, it is important to consider what you want to evaluate — a company's business model, a value chain, or a specific project — as well as the type of data and expertise available and the key characteristics of the company itself. This booklet presents several case studies of companies applying an EA tool. The table below reflects our comparative assessment of their specificities and trade-offs, followed by more information on each tool.

Tool	Goals	Expertise Needed	Company Size Suitability	Quantitative/ Qualitative	Time Intensive	Showcase number
SUMES	Strategic sustainability assessment, ecosystem service quantification	High (academic, technical)	Medium to large companies, multi-use projects	Quantitative	High	1
Blue Bio Sites	Site selection, nutrient removal, aquaculture planning	Medium (spatial planning, environmental data)	SMEs to large companies	Quantitative	Medium to High	2
NESEV	Mapping ecosystem interactions, regenerative design	Medium (facilitation, systems thinking)	SMEs, large companies and concept developers	Qualitative	Medium	3
MESAT	ES assessment, sustainability alignment	Medium (semi-quantitative scoring)	MEs to large companies	Semi-quantitative	Medium	4, 8
EA Ladder	Continuous improvement, stakeholder engagement	Low to Medium (strategic planning)	All sizes	Starts qualitative, becomes quantitative	Medium	5, 9
Impact Platform	Monitoring, transparency, investor communication	Medium (data integration, reporting)	All sizes, especially investor-facing	Qualitative with real-time metrics	Medium	6
North Sea Conservation	Marine biodiversity enhancement, education	Low to Medium (conservation-focused)	Community and biodiversity projects	Qualitative	Low to Medium	7
Oyster Reef Digital Twin	Restoration planning, ES forecasting	High (technical, modelling)	Large-scale projects, R&D	Quantitative	High	10

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SUMES (Sustainability and Marine Ecosystem Services Methodology)

showcase number: **1**

Description: The SUMES methodology integrates Life Cycle Assessment (LCA) and Ecosystem Services Assessment (ESA) to quantify both the positive (handprint) and negative (footprint) impacts of Blue Economy activities across different geographical scales. It delivers a holistic environmental evaluation, combining ecological, social, and spatial insights.

Best for: Strategic sustainability assessments of business models and multi-use projects.

Trade-off: Highly comprehensive but data- and expertise-intensive, often requiring academic or technical support.

https://sumesproject.be/en

Blue Bio Sites

showcase number: **2**

Description: The ODSS, hosted on the Blue Bio Sites portal, is a web-based decision-support system integrating environmental data, spatial analysis, and predictive models. It helps identify optimal locations for sustainable low-trophic aquaculture (e.g. mussels, seaweed) and supports spatial planners, policymakers, and practitioners in managing marine resources effectively.

Best for: Best for: Operational planning, spatial analysis, and aquaculture site selection.

Trade-off: Trade-off: Strong on environmental and spatial performance, but less focused on economic or social dimensions of value chains

https://gis.sea.ee/bluebiosites/

NESEV

showcase number: **3**

Description: Description: NESEV is a cloud-based platform that conceptualizes ecosystems as multi-layered networks incorporating natural, social, and economic dimensions. The model functions like a living system — self-organizing and scalable — and allows companies or stakeholders to visualize reciprocal ecosystem relationships (services) between actors or activities.

Best for: Mapping ecosystem interactions and designing regenerative business models.

Trade-off: Excellent for conceptual understanding and systems mapping, but qualitative and requires facilitation to translate insights into measurable indicators.

https://haedes.eu/tools

MESAT (Marine Ecosystem & Sustainability Assessment Tool)

showcase number: **4, 8**

Description: MESAT is a qualitative and semi-quantitative tool that assesses marine projects across nine ecosystem services, aligning them with international sustainability frameworks such as the UN SDGs and EU Taxonomy. It builds a bridge between sustainability reporting and ecosystem service performance in the Blue Economy. MESAT is a living tool, periodically updated to reflect the latest environmental legislation and sustainability principles.

Best for: Best for: Evaluating projects, value chains, or concepts through sustainability and ecosystem service impact lenses.

Trade-off: : Visually clear and practical but simplifies complex data, so it's best used for communication and decision support, rather than deep scientific modelling.

emelia.be/advies-studies/duurzaamheid/mesat

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EA Ladder

showcase number: **5,9**

Description: The EA Ladder provides a stepwise framework for Blue Economy companies to evaluate their engagement with the Ecosystem Approach through four progressive levels. Each level assesses three dimensions — Insight, Commitment, and Communication — moving from qualitative awareness to quantitative target setting and transparent collaboration across the value chain.

Best for: Assessing and improving a company's ecosystem performance and commitment over time.

Trade-off: Trade-off: Broad and adaptable, ideal for both SMEs and policymakers, but requires complementary quantitative tools (e.g. MESAT, SUMES) for detailed impact measurement.

https://www.mantisconsulting.be/diensten/blauwe-economie

Impact Platform

showcase number: **6**

Description: The Impact Platform is a real-time dashboard that tracks ecosystem and project performance. It centralizes data from marine restoration projects and makes it accessible to stakeholders, including governments and investors. The platform supports impact reporting, sustainability communication, and investment justification, offering customizable dashboards and public visibility.

Best for: Monitoring and transparency for investors and regulators.

Trade-off: Focused on communication and traceability, not deep scientific modelling.

https://www.go-impact.be/en

North Sea Conservation

showcase number: **7**

Description: NSC operates projects focusing on conservation, education, and research. NSC's approach is grounded in ecosystem restoration, community engagement, and marine education

Best for: Marine biodiversity enhancement and community-based conservation.

Trade-off: Primarily qualitative and conservation-focused, with limited data modelling or quantification capabilities.

https://www.rwe.com/en/responsibility-and-sustainability/sustainability-report/

Oyster Reef Digital Twin

showcase number: **10**

Description: This tool uses digital twin technology to simulate and forecast the ecological performance of oyster reefs. It supports site selection, reef design optimization, and ecosystem service quantification.

Best for: Ecosystem restoration and predictive modelling of ecosystem service outcomes.

Trade-off: High technical complexity, mainly for R&D or large-scale environmental projects.

https://oysterheaven.com/science/

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OVERVIEW OF SHOWCASE STUDIES

	Showcase study	Region	Framework/ Tool used	Partners Involved	Contact Persons
1	Offshore wind farm with mussel farm	Belgium	SUMES	Parkwind Ugent	Laura Vittoria De Luca Peña laura.delucapena@ugent.be
2	IMTA in Estonia 	Estonia	BlueBioSites	Red Storm Aqua Verde	Jonne Kotta jonne.kotta@sea.ee
3	Bivalves culture	Portugal	NESEV	Oceano Fresco Haedes	Lénia Rato lenia.rato@haedes.eu
4	Bio-stabilisation through musselculture	Belgium	MESAT	Coastbusters Emelia Mantis Consulting	Tomas Sterckx sterckx.tomas@deme-group.com Sacha De Clercq sacha.declercq@emelia.be Emile Lemey emile@mantisconsulting.be
5	Nature-based wastewater treatment 	France	EA Ladder	ZENI Mantis Consulting	Jean-Michel Pommet jean-michel.pommet@ze-ni.com Bernd Herremans bernd@mantisconsulting.be

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OVERVIEW OF SHOWCASE STUDIES

	Showcase study	Region	Framework/ Tool used	Partners Involved	Contact Persons
6	Oyster restoration in offshore wind park	Netherlands	Impact Platform	Go Ocean Orsted Van Oord	Marte Greefs marte@goocean.be
7	Lobster ranching in Windmill parks 	UK	NSC	RWE Whitbey Lobster	Aurelia Pearson aurelia.pearson@rwe.com
8	Offshore musselculture	Belgium	MESAT	Colruyt Group Emelia Mantis Consulting	Stijn Van Hoestenberghe stijn.vanhoestenberghe@colruyt.be Sacha De Clercq sacha.declercq@emelia.be Emile Lemey emile@mantisconsulting.be
9	Mangrove restoration for seafood value 	Ecuador	EA ladder	Jan de Nul Mantis Consulting	Noa Ligot noa.ligot@jandenul.com Bernd Herremans bernd@mantisconsulting.be
10	Oyster Reef	Belgium	Oyster Reef Digital Twin	Oyster Heaven	Brecht Stechele brecht@oysterheaven.org

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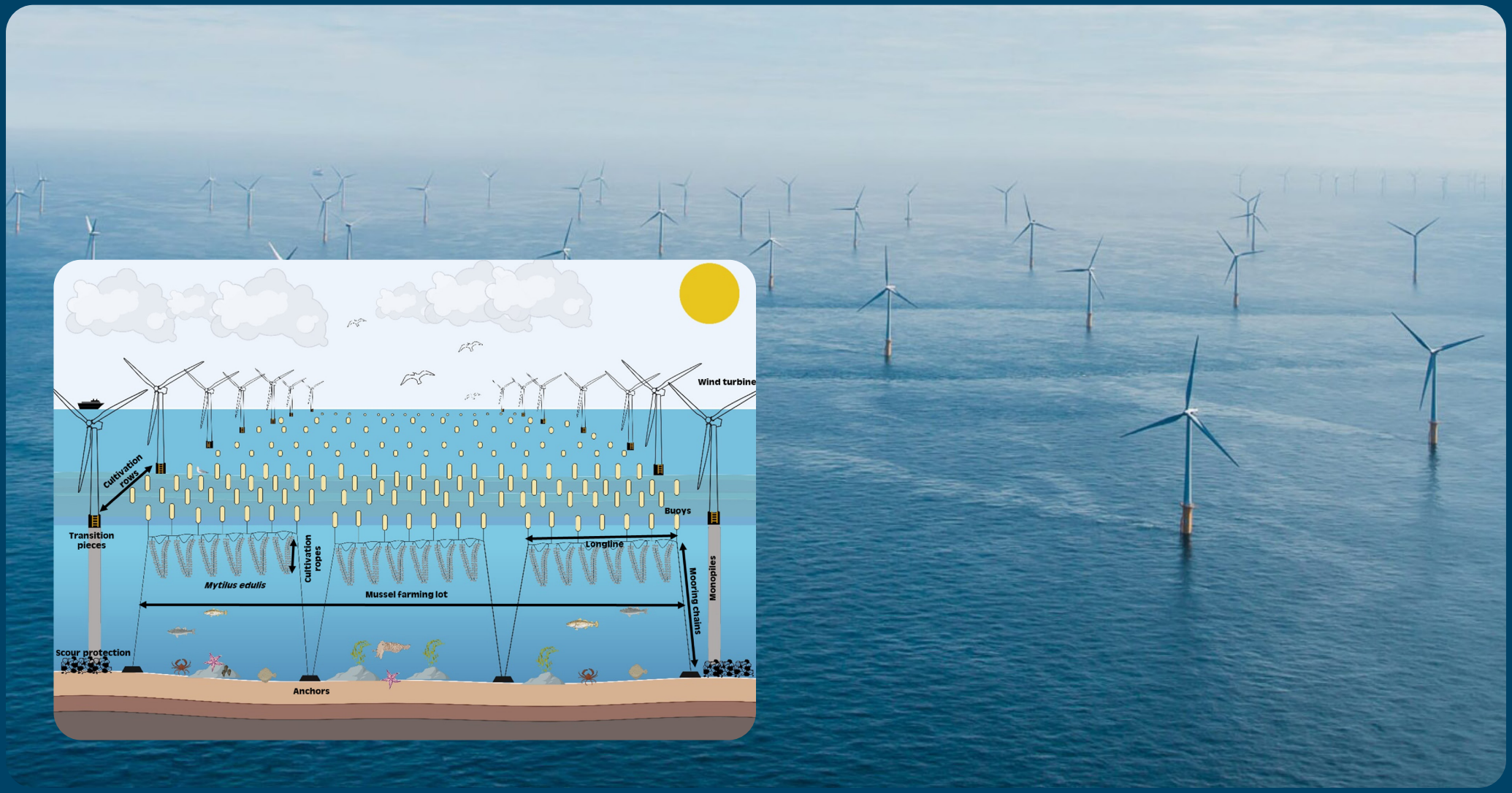
PARK WIND
JERA GROUP

SHOWCASE 1

OFFSHORE WIND FARM WITH MUSSEL FARM

SUMES
Sustainable Marine Ecosystem Services

FRAMEWORK/
TOOL USED



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SHOWCASE 1

OFFSHORE WIND FARM WITH MUSSEL FARM

FRAMEWORK/ TOOL USED

THE COMPANY – PARKWIND

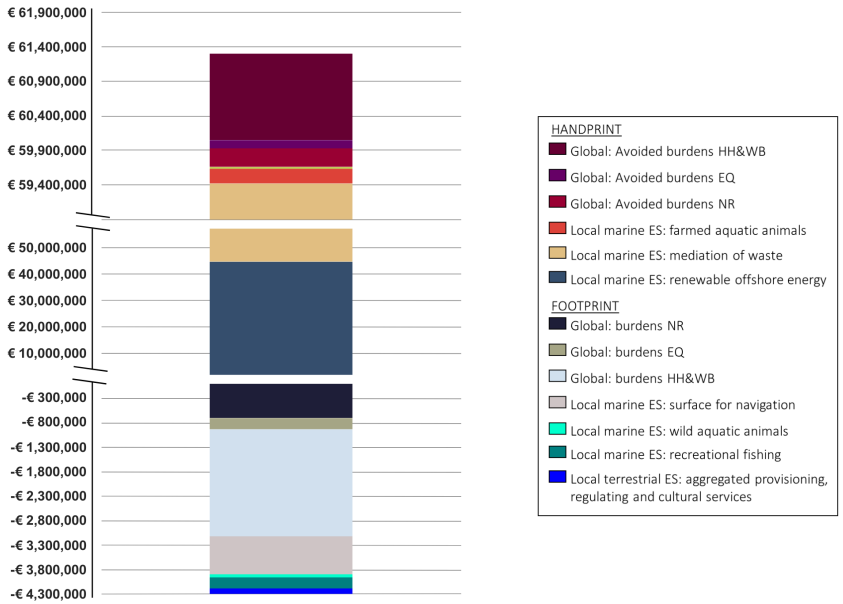
Parkwind N.V. is a Belgian company founded in 2012 and has a comprehensive approach that has led to the success of our current portfolio of four offshore wind farms off the Belgian and German coast with 225 turbines with a production capacity of 800 MW. That is enough to power the equivalent of almost 1,000,000 households with the conviction that wind energy is key to a sustainable future.

DECISION MAKING

Decision-making: “Recognizing the significant increase in benefits demonstrated by a substantially larger handprint—and thus a more positive impact on ecosystem services—PARKWIND is considering a more prominent role for blue bio-production in a multi-use scenario.”

CASE STUDY AND SUMES METHODOLOGY

The SUMES project developed a comprehensive environmental sustainability assessment methodology to quantify both the positive (handprint) and negative (footprint) impacts of Blue Economy activities across different geographical scales. This approach integrates Life Cycle Assessment (LCA) and Ecosystem Services assessment (ESA) to provide a holistic evaluation.
The methodology was applied to a case study of a multi-use offshore farm in the Belgian part of the North Sea, combining an offshore wind farm (by Parkwind) with a hypothetical mussel farm. The results revealed a net positive handprint, primarily driven by local marine ecosystem services, particularly renewable offshore energy and waste mediation. Conversely, the footprint was mainly attributed to the supply chain impacts of manufacturing wind farm and mussel farm components. By expressing the results in euros per year, the findings become more tangible and accessible, facilitating clearer communication for decision-making.



Visualization of the handprint and footprint of a multi-use offshore farm combining an offshore wind farm and mussel farm. HH&WB: human health and well-being; NR: natural resources; EQ: ecosystem quality; ESs: ecosystem services; FU: functional unit (yearly electricity and mussel production)

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SHOWCASE 2

IMTA IN ESTONIA

BLUE BIO SITES

FRAMEWORK/
TOOL USED

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SHOWCASE 2

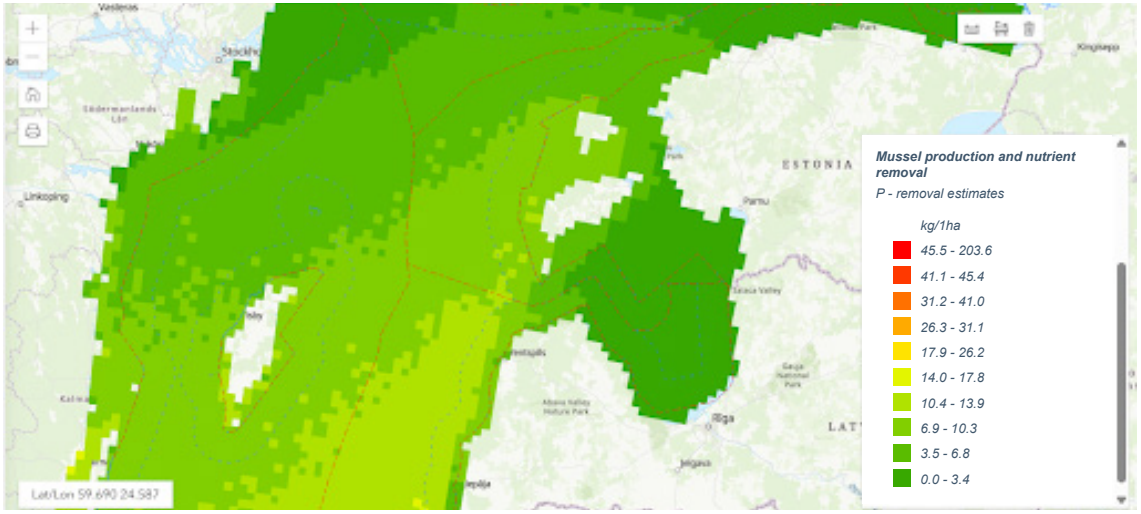
IMTA IN ESTONIA

BLUE BIO SITES

FRAMEWORK/
TOOL USED

THE COMPANIES

Redstorm specializes in sustainable rainbow trout farming in the sea, with a focus on humane and responsible practices.
To assure the aquatic ecosystem, Redstorm collaborates with Aqua Verde through integrating traditional fish farming with mussel and seaweed cultivation. In such way they achieve near-zero nutrient discharge into the sea while enhancing the diversity of cultivated species.
The Operational Decision Support System (ODSS) demonstrated the nutrient removal benefits of mussel and seaweed farming and supported the near-zero discharge strategy of their integrated aquaculture. This approach allowed securing the permit from the Environmental Board



THE TOOL

The Blue Bio Sites portal hosts multiple tools to support the sustainability of aquaculture and marine spatial planning. Among these, the Operational Decision Support System (ODSS) is a web-based platform designed to assist in the planning and implementation of low-trophic aquaculture activities, such as mussel and seaweed farming, particularly in the Baltic Sea region. By integrating environmental data, spatial analyses, and predictive models, the ODSS enables users—including spatial planners, policymakers, and aquaculture practitioners—to make informed decisions about site selection and management for sustainable aquaculture development.

This visualization from the ODSS portal highlights the ecosystem service of nutrient removal, specifically illustrating the phosphorus removal achieved by offshore mussel farming

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SHOWCASE 3

BIVALVES' CULTURE

NESEV TOOL
FRAMEWORK/
TOOL USED

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the European Union

oceano fresco

SHOWCASE 3

BIVALVES' CULTURE

NESEV TOOL FRAMEWORK/ TOOL USED

BUSINESS CASE – OCEANO FRESCO

After identifying a unique opportunity for bivalves grow-out in 2015, Oceano Fresco founders established the company in Portugal - with the mission of promoting regenerative aquaculture, an effective blue economy, and sustainable oceans.

Financed by founders, 'business angels', public incentives and venture capital investors, which share the same vision, Oceano Fresco is the first clams' open sea farm in the world. Its goals: sustainable protein sources, restored biodiversity, positive carbon footprint, Sustainable Development Goals alignment, enhanced Ecosystem Services.

NESEV TOOL

oceano fresco

VERTICAL BIVALVES

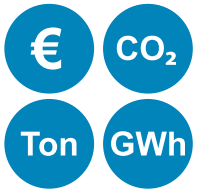
HAEDES

NESEV & HAEDES ADD-VALUE

1 Ecosystem description

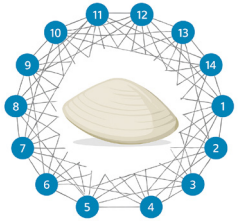
Ecosystem Services (ES) and dependencies assessment within the open sea farm ecosystem

2 Multi-currency Quantification



Flexibility and diversity in valuation methods and currencies, depicting system complexity

3 Socio-Ecological Network (SEN)



Interactions pinpointed in a dynamic network: view on impact and identifying opportunities for ES enhancement

OUTPUTS

Regenerative aquaculture backed by numbers

Ecosystem Enhancement

Sustainability Reporting

Financing Trust

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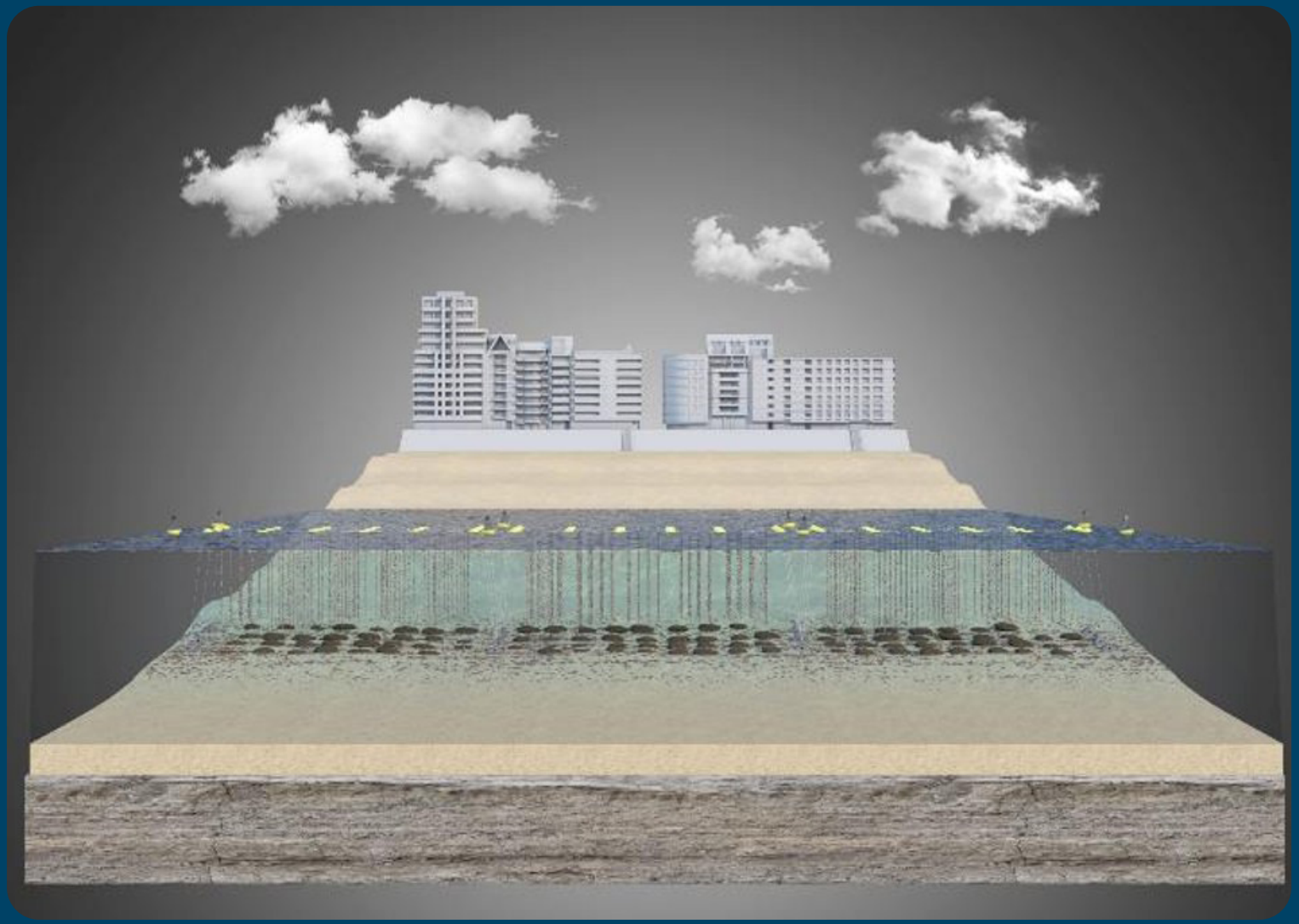
Coastbusters

SHOWCASE 4

BIO-STABILISATION THROUGH MUSSELCULTURE

MESAT

FRAMEWORK/
TOOL USED



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SHOWCASE 4

BIO-STABILISATION THROUGH MUSSELCULTURE

FRAMEWORK/ TOOL USED

THE PROJECT – COASTBUSTERS

The Coastbusters project investigates an innovative approach to coastal defense: ecosystem creation and/or restoration by building natural biogenic reefs,
using “biobuilder” species and living organisms that reinforce natural processes, biodiversity, flood and coastal protection with one overall long-term goal: nature-based solutions for large-scale ecosystem generation.

An example is the use of an aquaculture hanging musselculture system, adapted to initiate a mussel flux from the droppers towards the seabed to kick-start biogenic reef development.

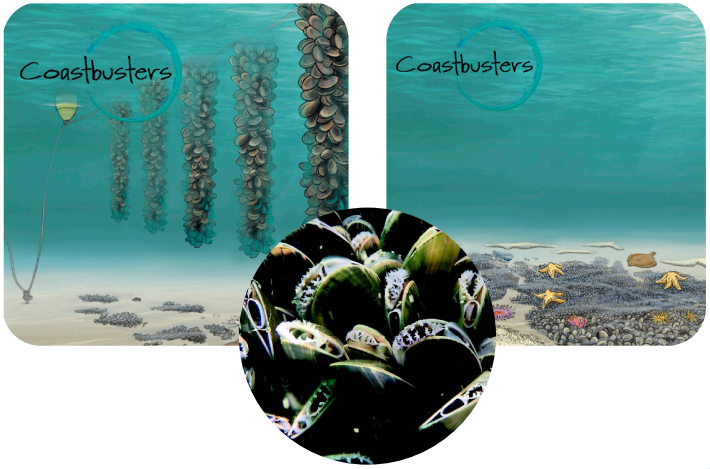
Using MESAT to assess ecosystem services impacts, Coastbusters demonstrated that a biogenic reef can offer a sustainable alternative with added ecological value.

“BIO-STABILISATION”, HOW DOES IT WORK?

Reef facilitation infrastructure is installed in the foreshore zone, where mussels settle, break off and gradually form seabed reefs. These natural barriers reduce wave energy and stabilize sediments.

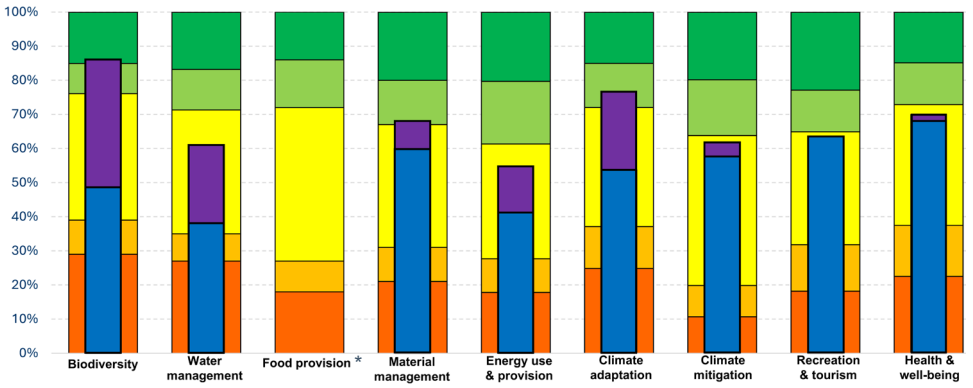
Mussels also improve water quality through filtration and contribute to carbon uptake during shell formation and growth. Their dense beds act as biodiversity “hotspots” – providing habitat, shelter and food for diverse marine life.

Coastal Protection | *Water Quality Regulation* | *Carbon Uptake & Storage* | *Biodiversity & Productivity*



ASSESSMENT OF ECOSYSTEM SERVICES?

The Marine Ecosystem & Sustainability Assessment Tool (MESAT, ©Emelia) was used to evaluate and compare ES impacts between a conventional coastal defense method -sand suppletion- and the Coastbusters project. MESAT assesses nine key ES using verifier criteria, aligned with international sustainability frameworks (SDGs, EU Taxonomy, etc.) and scientific expertise. Results are presented through clear, cumulative visualizations based on a qualitative scoring system intended for internal and external stakeholder communication.



* not applicable for both projects.

Sand suppletion
Coastbusters (score difference)
Best in class
Industry average – best in class
Industry average
Underperforming – industry average
Underperforming

Sand suppletion scores “industry average” across all relevant ES.

Coastbusters *creates significant added value for biodiversity, water management and climate adaptation with scores that range from “transition industry to best in class” and “best in class”.*

Funded by the European Union

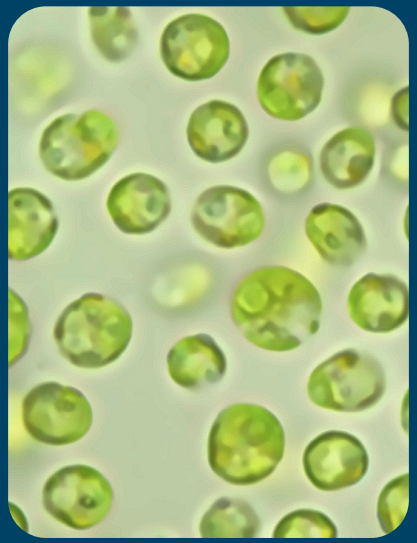
zeni
microalgae • water treatment

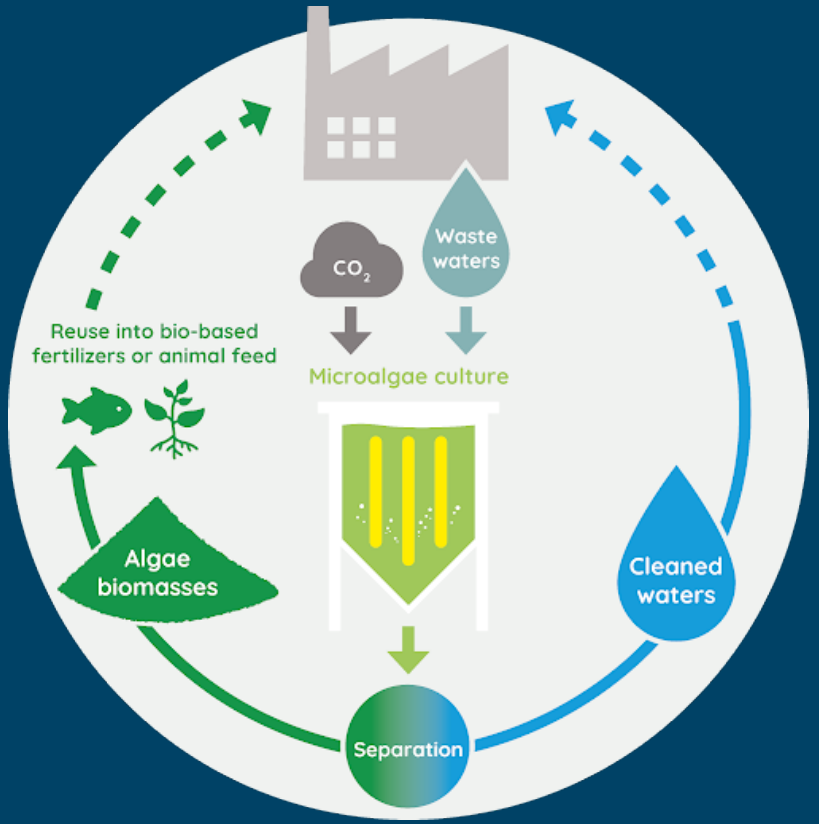
SHOWCASE 5

NATURE-BASED WASTEWATER TREATMENT

EA LADDER
FRAMEWORK/
TOOL USED

MAKING WASTEWATER TREATMENT AN ECONOMIC & ENVIRONMENTAL OPPORTUNITY





6 CLEAN WATER AND SANITATION

14 LIFE BELOW WATER

15 LIFE ON LAND

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SHOWCASE 5

NATURE-BASED WASTEWATER TREATMENT

EA LADDER FRAMEWORK/ TOOL USED

THE COMPANY – ZENI

ZENI is a French startup, founded in 2023, that specializes in cleaning industrial wastewater by using microalgae as a nature-based solution.

Their innovation leads to a circular approach for water reuse, while the remaining biomass can be revalued as protein input in feed & aquafeed or as biobased fertilizer & soil regeneration in agriculture.

THE COMMITMENT

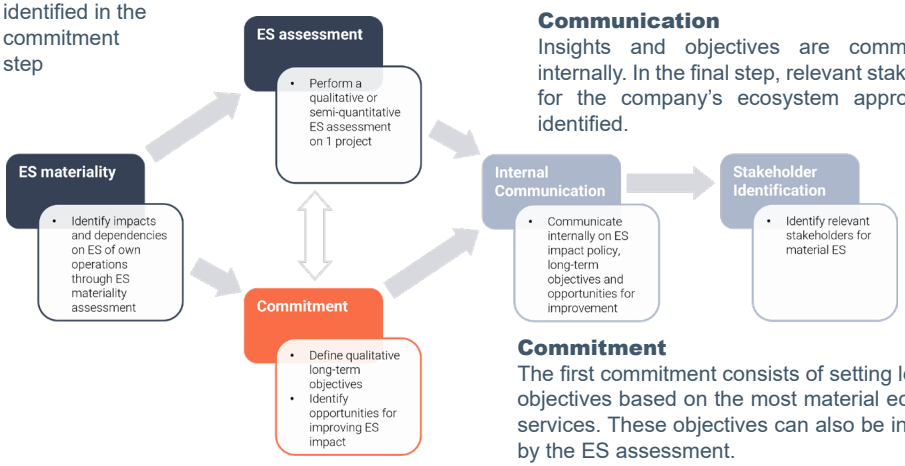
ZENI will use the EA Ladder to strengthen their sustainability claims and further improve their ecosystem impacts.

Additionally, ZENI will use the Ladder results to find additional support, for example, by convincing impact investors to get involved with ZENI, and showcasing to the investors that they are able to enter in EU funding programs

GENERAL PROCESS FOR ACHIEVING LEVEL 1 ON THE LADDER

Insight

Insights are obtained through an ES materiality analysis and a project-based ES assessment. The ES assessment can already showcase opportunities for improvement identified in the commitment step



Communication

Insights and objectives are communicated internally. In the final step, relevant stakeholders for the company's ecosystem approach are identified.

Commitment

The first commitment consists of setting long-term objectives based on the most material ecosystem services. These objectives can also be influenced by the ES assessment.

Ecosystem service	Dependency	Impact		Materiality
Provisioning				
Food provisioning			+	
(Clean) water provisioning			+	
Energy provisioning			+	
Raw abiotic materials			-	
Biotic materials			+	
Regulating				
Water quality regulation			+	
Climate regulation			-/+	
Cultural				
(Eco)tourism			+	
Educational values			+	
Supporting				
Nutrient cycling			+	

Legend: Low / Medium / High

Results of the ecosystem services materiality assessments of ZENI *(major component of the Ladder – Level 1):*

For this assessment, materiality is a combination of ZENI's dependency on the ecosystem service and their impact on the service. Dependencies, impacts and materiality are scored as low, medium or high (see legend). Impacts can be positive or negative, indicated by a + or – sign.

THE TOOL – EA LADDER

The Ecosystem Approach (EA) Ladder is a framework that encourages Blue Economy companies to engage in an EA by assessing their level of commitment to improve their impacts on ecosystems and the services these ecosystems deliver, based on continuous improvement.

The ladder consists of four levels, with increasing requirements on insights in ecosystem impacts, setting targets and installing measures to improve impacts, and transparency. For each level, three dimensions are evaluated: insight, commitment and communication. As we move up the ladder, assessments and commitments move from qualitative to quantitative, and the targets to be achieved, communication and collaboration need to be intensified, and the focus shifts from one's own operations to the value chain.

ZENI is testing the first explorative Level of the Ladder to setup and strengthen their EA, and to showcase their positive contributions to nature.

The EA Ladder is a tool conceptualized by Mantis Consulting

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SHOWCASE 6

OYSTER RESTORATION IN OFFSHORE WIND PARK

FRAMEWORK/ TOOL USED

Funded by the European Union

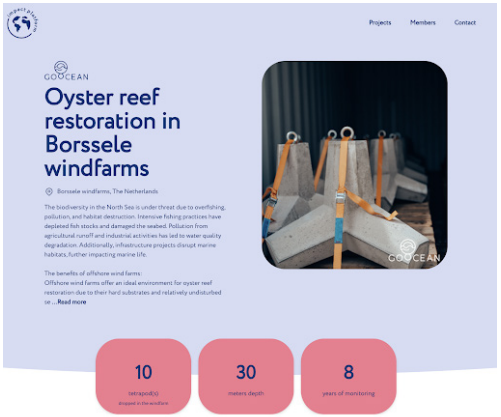
SHOWCASE 6

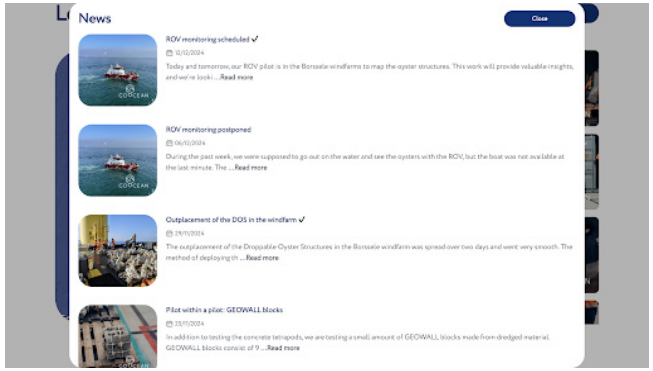
OYSTER RESTORATION IN OFFSHORE WIND PARK

FRAMEWORK/ TOOL USED

THE COMPANIES

Offshore companies like Ørsted and Ocean Health (an initiative by Van Oord) are looking for tools that monitor and communicate their impact. Go Ocean is a Belgian company, founded in 2024, and has the mission to accelerate the restoration of marine ecosystems and biodiversity worldwide. Because Go Ocean makes every project and its positive impact transparent and tangible via the Impact Platform, offshore marine companies/investors are willing to invest in the execution of the solutions. These investments lead to cooperation with Bluebio producers. One example is the installation of Droppable Oyster Structures in the Borssele offshore wind parks, in the Netherlands, in collaboration with Ørsted and Ocean Health and financed by the Go Ocean client Victrix Foundation. This project aims to strengthen the health of oyster reefs in the North Sea by introducing oyster structures in the wind farms.





THE MONITORING PLATFORM

The Go Ocean Impact Platform helps the project developers, Ørsted and Ocean Health, to monitor the impact of their marine activities and the oyster restoration, providing one central location to collect all the project results, and helps to communicate this to their investors. In this way, they can transparently pass information to the government or the investors to back their efforts for a positive impact on the ecosystem for which they were granted the tender or the investment.

THE IMPACT PLATFORM

The Go Ocean Impact Platform gives constant updates on the ecosystem parameters allowing real-time follow-up of the impact of the activities. Additionally, the platform provides a variety of information and content that can be used in sustainability reports or shared on websites, social media, newsletters, and so on. Public accessibility facilitates the process from A to Z. If necessary, a personalized client impact dashboard can be developed, so multiple projects and project impacts can be followed up in the same place.

The main benefit of the Go Ocean impact platform is that, although there are many parties involved in this project, everyone – and especially the investor (the government of business client) – is kept up to date on the project developments.

The installation of the Droppable Oyster Structures was reported through this platform and the future monitoring results collected, analysed, and reported on by Waardenburg Ecology and Wageningen University will also be shared through the platform.

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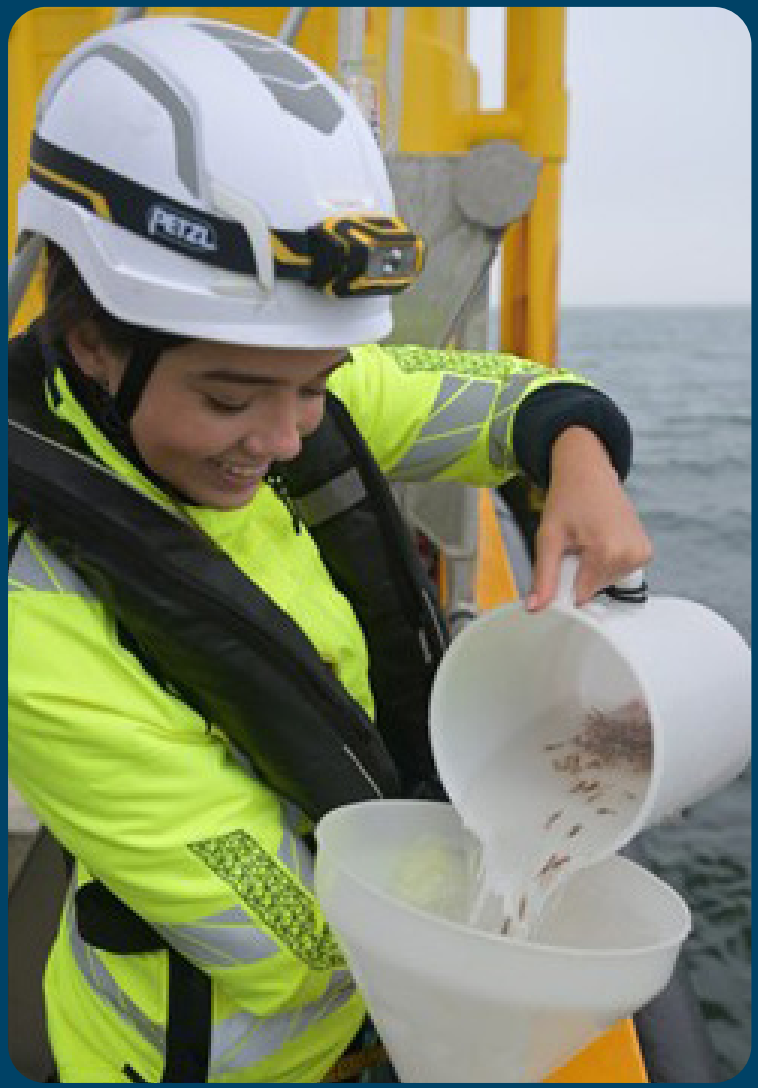
RWE WHITBY LOBSTER HATCHERY

SHOWCASE 7

LOBSTER RELEASE AT TRITON KNOLL OFFSHORE WINDFARM

FRAMEWORK/ TOOL USED



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SHOWCASE 7

LOBSTER RELEASE AT TRITON KNOLL OFFSHORE WINDFARM

FRAMEWORK/ TOOL USED

THE COMPANY – RWE

RWE is leading the way to a clean energy world. With its investment and growth strategy Growing Green, RWE is contributing significantly to the success of the energy transition and the decarbonisation of the energy system. Around 20,000 employees work for the company in almost 30 countries worldwide. RWE is already one of the leading companies in the field of renewable energy. RWE is investing billions of euros in expanding its generation portfolio, in particular in offshore and onshore wind, solar energy and batteries. It is perfectly complemented by its global energy trading. RWE is decarbonising its business in line with the 1.5-degree reduction pathway and will phase out coal by 2030. RWE will be net-zero by 2040. Fully in line with the company's purpose - Our energy for a sustainable life.

THE PROJECT

Experts found that the Scour protection at the base of specific turbines and the offshore substations is deemed an ideal habitat for Lobster to thrive. Lobsters are a crucial link in the food chain and help regulate the populations of smaller organisms, such as crabs and sea urchins, which prevents imbalances in reef ecosystems. In this collaboration project between RWE and Whitby Lobster Hatchery, 5,000 juvenile lobsters are released at the Triton Knoll offshore wind farm to help increase biodiversity in the North Sea. RWE are committed to protecting and enhancing biodiversity. The Lobster Hatchery project demonstrates how this is done and aligns with RWE's internal values. A monitoring programme is currently being developed alongside experts to monitor the success of the project and provide valuable data to both RWE and Whitby Lobster Hatchery. The monitoring will also to provide information for potential future biodiversity projects.

OUTCOMES

The Lobster Hatchery Project assists the objectieve of complying with RWE's internal Biodiveristy Policy and supports RWE's key ambitions for Community engagement by having active engagement and collaboration, fostering meaningful partnerships that create shared value. This supports bluebioproduction because the release of the juvenile lobsters will help increase the population which not only promotes marine wildlife but will also help to prevent imbalances in the ecosystem. This aims to improve biodiversity within Triton Knoll Offshore Windfarm and in the North sea as the lobsters migrate across the seabed.

NORTH SEA CONSERVATION (NSC)

The North Sea Conservation (NSC) was established to operate the Whitby Lobster Hatchery. Whitby Lobster Hatchery conserve lobster populations by a member of the local fishing community bringing in egg bearing female lobsters, lobster eggs are released and captured in the hatchery system, juvenile lobsters are developed in the hatchery increasing survival rates compared to the wild then the lobster juveniles are released back into the wild in locations such as Triton Knoll Offshore Windfarm. NSC utilises its three key pillars of conservation, education & research to bring balance back to our oceans, boosting the sustainability of our fishing communities and aiming to bring an ecosystem approach to marine conservation.

In accordance with both NSC's and RWE's values, biodiversity projects are being developed to protect the important local marine ecosystem and conserve lobster populations in the area, demonstrating RWE's commitment to biodiversity and sustainability at its operational offshore sites.

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COLRUYTGROUP

SHOWCASE 8

MUSSEL CULTURE

MESAT

FRAMEWORK/
TOOL USED

Funded by
the European Union

COLRUYTGROUP

SHOWCASE 8

MUSSEL CULTURE

FRAMEWORK/ TOOL USED

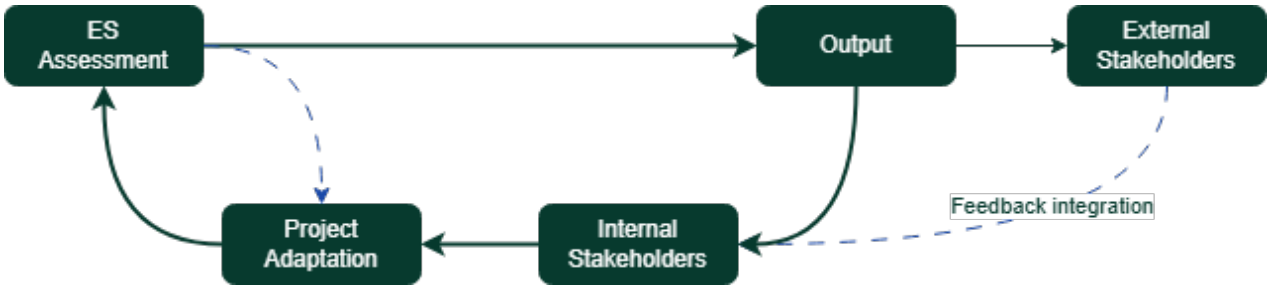
THE COMPANY – COLRUYT GROUP

Colruyt Group is a prominent Belgian retail group that works in several sectors, including food distribution, food services & green energy production. Since 2020, Colruyt Group has been developing the first commercial sea farm in the Belgian part of the North Sea (BPNS): Zeeboerderij Westdiep.
The farm is an example of extractive aquaculture, as the mussels effectively remove excess nutrients from the water and contribute to the health of marine ecosystems. These enabling conditions along with the BPNS's regulatory framework creates a conductive environment for pioneering aquaculture projects like Colruyt's Westdiep Zeeboerderij.

THE TOOL - MESAT

Before launching the project, a comprehensive EIA was conducted to obtain the permit and ensure ecological responsibility. In 2023, MESAT (© Emelia) was used to evaluate the project's performance against its initial projections. This evaluation helped to identify both areas of success, which enhance ecosystem services, and aspects requiring further attention and improvement,

MESAT'S THEORETICAL FLOW PROCESS



The MESAT questionnaires serve as a catalyst for internal discussions and insights concerning the project's design. Furthermore, it's insights provide the ability to inform and optimize the next stages of the project's design & planning

BIODIVERSITY & PRODUCTIVITY

WATER QUALITY REGULATION

FOOD PROVISION

LOCAL PRODUCTION & JOB CREATION

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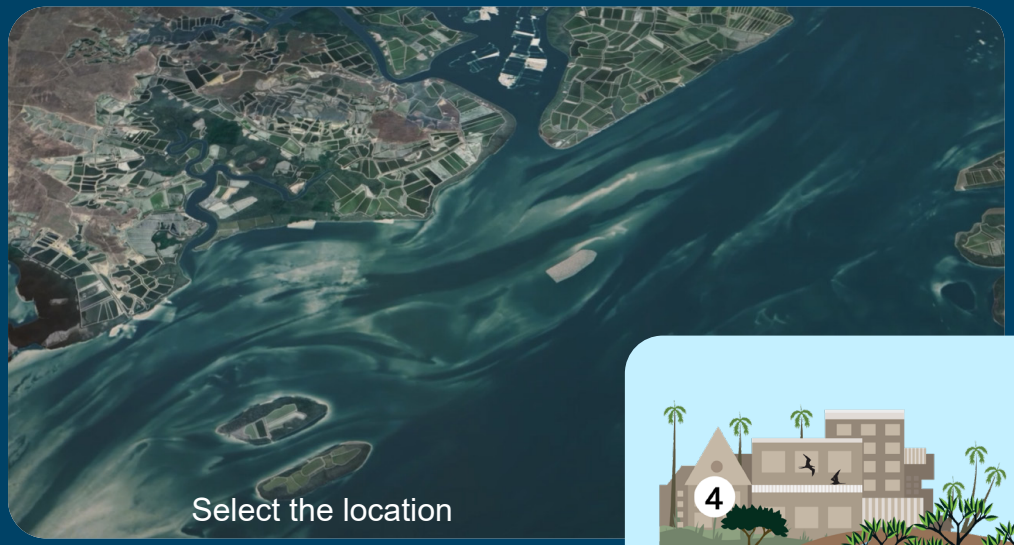
JAN DE NUL

SHOWCASE 9

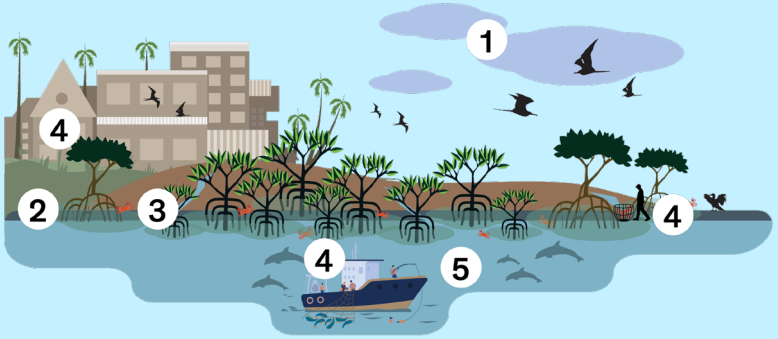
MANGROVE RESTORATION FOR SEAFOOD VALUE

EA LADDER
FRAMEWORK/
TOOL USED



Select the location

Elevate the tidal flat



Ecosystem service benefits of mangroves

Protect the island

Plant mangroves trees

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the European Union

JAN DE NUL

SHOWCASE 9

MANGROVE RESTORATION FOR SEAFOOD VALUE

EA LADDER
FRAMEWORK/ TOOL USED

THE PROJECT – AQUAFOREST

AquaForest is a unique collaboration between governmental organisations, industry, scientists and local communities, developing a 50-hectare mangrove habitat from scratch in Ecuador through the circular reuse of dredged sediments.

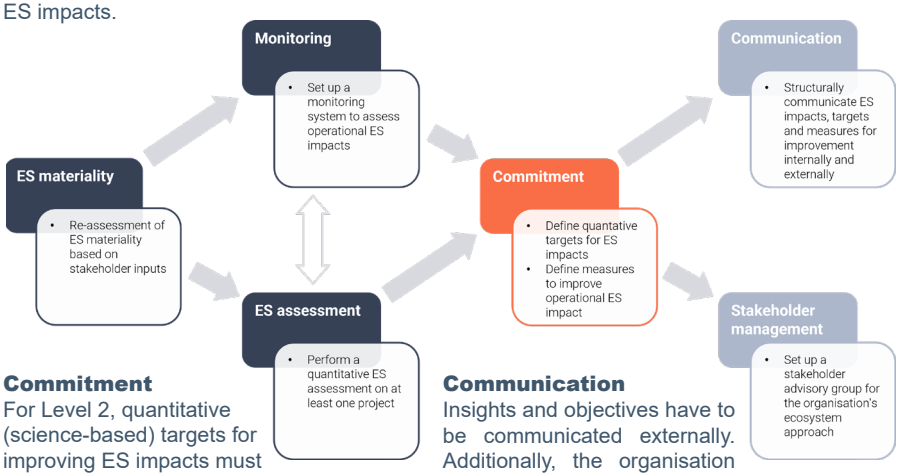
Mangrove forests provide a wide range of ecosystem services including carbon sequestration, water filtration, and coastal protection. Additionally, they support socio-economic activities such as ecotourism and sustainable fishing. In AquaForest these ecosystem services have been quantified to assess their positive impact on local communities and the environment.

BlueBio benefit: Within the EA Ladder framework an ES assessment has been performed to quantify the ecosystem services of mangroves. This assessment shows a clear added value for local and traditional fisheries. With these results JDN creates awareness and engagement within local fishery communities, strengthening the support for the further development of the AquaForest project.

AQUA FOREST

GENERAL PROCESS FOR ACHIEVING LEVEL 2 ON THE LADDER

Insight
Level 2 insights entail a reassessment of the ES materiality with stakeholder inputs, a quantitative ES assessment for at least one project, and setting up a monitoring system for ES impacts.



Commitment
For Level 2, quantitative (science-based) targets for improving ES impacts must be defined, together with measures to improve the operational ES impacts.

Communication
Insights and objectives have to be communicated externally. Additionally, the organisation needs to set up a stakeholder group that will advise their ecosystem approach.

Ecosystem service (ES)	Baseline (sandflat)	AquaForest (mangrove)	Average added value
Provisioning			
Fish & shellfish production	0 k€/yr	28 – 415 k€/yr	221 k€/yr
Regulating			
Erosion/sedimentation, climate regulation, flood protection, water quality, habitat maintenance	342 – 400 k€/yr	510 – 940 k€/yr	359 k€/yr
Nursery function	0/+	++	/
Cultural			
Recreation and tourism	0 – 13 k€/yr	0 – 151 k€/yr	69 k€/yr
Aesthetic value	+	+/++	/
Cognitive development	0	++	/
Supporting			
Biodiversity maintenance	0/+	+/++	/
TOTAL MONETARY BENEFIT	**342 – 413 k€/yr**	**548 – 1505 k€/yr**	**649 k€/yr**

Summary of the AquaForest ecosystem services assessment
(major component of the Ladder – Level 2):

The table shows the estimated added (monetary) value provided by AquaForest compared to the baseline sandflat scenario. Services that could not be quantified have been assessed semi-quantitatively (indicated by –/0/+/++).

THE TOOL – EA LADDER

The Ecosystem Approach (EA) Ladder is a framework that encourages Blue Economy companies to engage in an EA by assessing their level of commitment to improve their impacts on ecosystems and the services these ecosystems deliver, based on continuous improvement.

The ladder consists of four levels, with increasing requirements on insights in ecosystem impacts, setting targets and installing measures to improve impacts, and transparency. For each level, three dimensions are evaluated: insight, commitment and communication.

The second Level of the Ladder focusses on quantification of insights and targets. JDN has used the AquaForest project for the ES assessment step, an essential step of this second Level.

The EA Ladder is a tool conceptualized by Mantis Consulting

MANTIS CONSULTING

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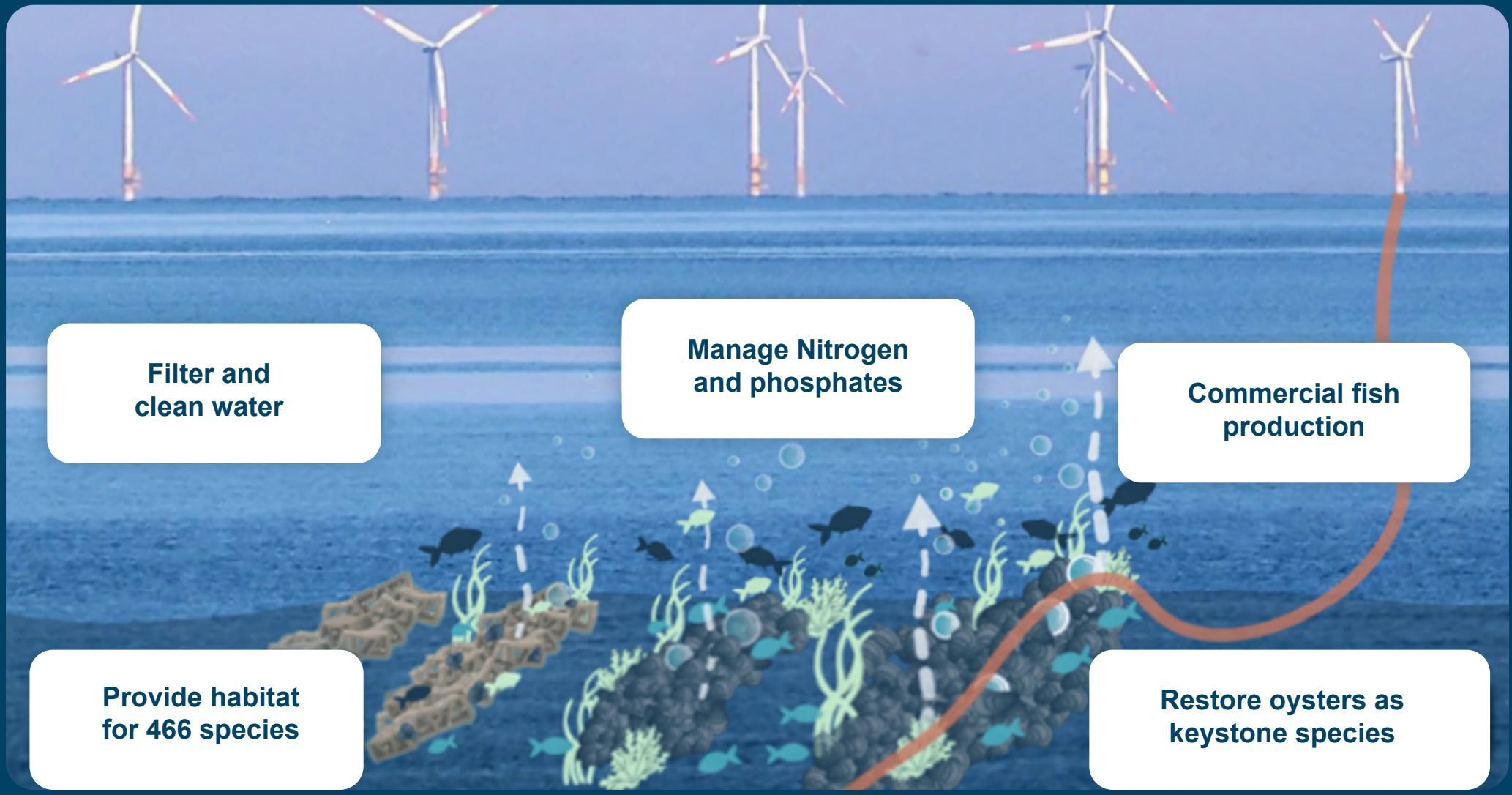
Oyster Heaven

SHOWCASE 10

OYSTER REEF

OYSTER REEF DIGITAL TWIN

FRAMEWORK/ TOOL USED



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Oyster Heaven

SHOWCASE 10

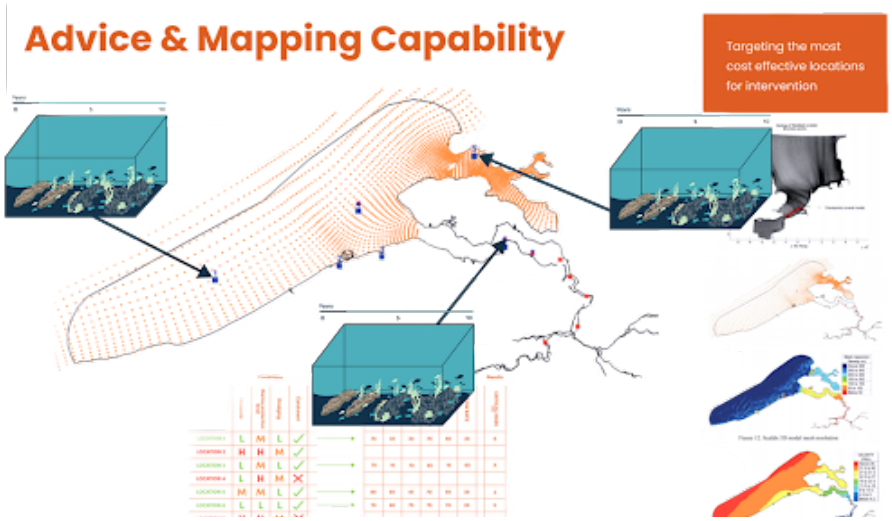
OYSTER REEF

OYSTER REEF DIGITAL TWIN

FRAMEWORK/ TOOL USED

THE COMPANY – OYSTER HEAVEN

Oyster Heaven is a marine conservation organisation dedicated to regenerating oyster reefs at scale. Using our unique, science-backed technology - the Mother Reef - we enable large-scale, cost-effective restoration projects that can be deployed anywhere in the world. The Mother Reef has been rigorously tested in laboratory and field settings, ensuring both ecological effectiveness and financial viability. By rebuilding oyster reefs, Oyster Heaven restores vital marine ecosystems, enhances coastal resilience, and delivers measurable environmental impact.



THE TOOL

Oyster Heaven is developing sophisticated modelling tools to allow developments of Oyster Reef Digital Twins for all the reefs that we have build or will build. The Digital Twin allows us to predict restoration success and quantify restoration benefits at different locations of interest. It is used for site selection, to optimize reef setup, support monitoring programs and quantify potential ES revenues. This technology is being iterated and refined to allow those that wish to develop reefs to do so in a style and setting that is likely to generate the most optimal outcomes, saving time, money and reducing risk.

THE BELREEFS PROJECT

BELREEFS is Belgium's first large-scale offshore oyster reef restoration project, commissioned by the Belgian Federal Public Health Service. It brings together government, industry, and science to restore the functionally extinct European flat oyster (Ostrea edulis) in historically rich areas, particularly the gravel beds of the Hinderbanken. Our technology, the Mother Reef, plays a central role in BELREEFS' restoration strategy by providing a cost-effective, degradable, and scalable solution for oyster larvae settlement. The restoration of the oyster reef habitat is not only critical for marine biodiversity but also provides measurable ecosystem services like water filtration, carbon and nitrogen cycling, and habitat creation that generate quantifiable economic value.Through the Oyster Reef Digital Twins metric predictions are made for investors, policy makers or ecologists and in the future ecosystem service quantification will be quanitifed.

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- Are you a company looking to evaluate your activities through the EA?
- Are you a policymaker looking for actionable steps to implement the EA in your region?
- What is the next step for my Ecosystem Approach implementation?

Check Out the Online Awareness Tools

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This booklet was made in the framework of the BlueBioClusters-project (2025).

If you need more information on the booklet, please contact info@blauwecluster.be

For more information on the project visit our website: https://bluebioclusters.eu/

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