



POSITION PAPER

**“Blue Cluster
ecosystem approach
project portfolio”**

Introduction

The scope of this document is to provide an overview of Blue Cluster innovation projects on Ecosystem Approach (EA) and to outline and frame the current portfolio. The paper discusses where these projects are complimentary and how they relate to each other.

In 2020, Blue Cluster organised a number of webinars regarding ecosystem services and an ecosystem approach within the blue economy. These webinars culminated in a white paper describing the concept of the Ecosystem Approach Wheel. This whitepaper was created with input from both academics and the industry.

A major challenge today is **sustainable management and use of the marine environment**, especially as human activities tend to increase and diversify.

It becomes valuable for companies to understand and measure the environmental impact associated with their operational activities so that they can adjust their design, technologies, etc. towards more sustainable operations, giving them a competitive advantage and a social licence to operate.

Likewise, government actors are increasingly confronted with the balance between economic activities and achieving the environmental protection goals outlined in EU directives, including the Marine Strategy Framework Directive and the EU Zero Pollution Action Plan.

Taking into account ecosystem services, we can go beyond avoiding negative impacts and start developing activities in such a way that they have positive effects on the environment and on society. More sustainable marine activities can be designed in such a way that they reduce potential losses of local ecosystem services not only in the marine environment, but also along their entire value chain.

The growing competitiveness at sea due to increasing human activities, and the need for companies to take ownership of their responsibilities (e.g. environmental awareness) illustrate why companies aim to present ecosystem-based project solutions as competitive business cases beyond their own field of competence. These benefits can be transformed into advantages in both tendering and permitting protocols for new projects.

Since the whitepaper was released, three research projects have been conducted:

- **SUMES** (strategic basic research);
- **MEsP** (industry driven);
- **WABESCO** (industry driven).

For each of the projects, a description is included in this position paper together with the specific target group(s), the current state of play and an outlook to the future.

Recap

The reason for the efforts made by Blue Cluster within Ecosystem Approach is to get companies to start applying an ecosystem approach and choose a tool based on their specific needs, taking into account the current stage of the company or project, the desired output, and the effort the company wants to put in.

The input provided by the currently ongoing research projects shows there is still a need for further research and development. The **main gaps** in the portfolio **and shared challenges** are the following:

- Integration of tools and availability of a robust quantification method or tool. The wide scope of applying an ecosystem approach is both a pro and con of the concept, since it gives a broad perspective of progress towards sustainability, but requires a lot of data and results in a nuanced evaluation;
- Lack of data and poor quality of the available data, as it became clear that environmental parameters of (marine) ecosystems are not always of high quality, well-documented, quantified and/or accessible. The lack of high-resolution data on the current ecosystem status makes it difficult to incorporate the quantification of actual project-level impacts.

Outlook to the future and desirable **next steps and opportunities** for follow-up research projects:

- Develop specific monitoring programs to address the lack of trustworthy and sufficient data;
- Broaden the focus of the projects (currently limited to the Belgian Part of the North Sea): international extension and validation will provide valuable insights; the primary ambition is to make it fit for the full North Sea basin;
- Get the ecosystem approach applied within policy and public tender mechanisms. Both policymakers and the industry can gain from applying an EA. The former is demonstrated when an ecosystem-based design reduces the impact on the marine environment and results in a higher success rate in tendering procedures. Likewise, the success rate in obtaining permits (e.g. concession zone permits) for marine projects can be increased if environmental impact assessment reports for these activities more holistically describe and quantify both global impacts due to the value chain and local marine impacts because of operational activities in the North Sea.

SUMES

Sustainable Marine Ecosystem Services

<https://sumesproject.be/>

INTRODUCTION AND SCOPE OF THE PROJECT

The SUMES project, which is coordinated by Ghent University and has VLIZ and Antwerp University as partners, aims to develop a sustainability impact assessment methodology to measure and quantify both the positive and negative impacts of human activities on the marine ecosystem and beyond.

The integration of ecosystem services (ES), environmental risk assessment (ERA) and life cycle assessment (LCA) allows quantification of both impacts on the local marine and terrestrial environment and more global impacts caused by the entire value chain such as global warming, while also taking into account potential co-benefits of activities to society. The model will be validated using case studies with activities in the Belgian Part of the North Sea (BPNS), and the sustainability impact of those cases will be compared to relevant benchmarks.

In addition to the overarching sustainability model, a supply-demand model for ES will be generated to better understand marine ecosystem functioning and causal relationships as well as to determine whether ES supply meets the demand in Flanders. The legal and political context of human marine activities is also to be examined, listing the key instruments available concerning sustainable marine management.

A database of quantitative and qualitative data will furthermore be compiled, quality-checked, stored and made available upon request. A SUMES user manual will also be developed to help stakeholders use the sustainability model and thus anticipate the impacts of human activities at sea, which should enable the development of adaptation and mitigation measures which address issues that are high on the EU agenda, such as climate change, food and energy security and public health.

The development of the SUMES model will involve various stakeholders (industrial, scientific and governmental) as they are vital to the success of the project. SUMES aims to facilitate the transition of (socio-)environmentally sustainable projects from concept status to full competitive business cases.



PROJECT SPECIFICATIONS

Project start and end date	August 2020- January 2024
Target group (users)	Government actors, companies active in the marine environment, companies performing sustainability and impact assessments, actors in the scientific community.
Scope (geographical area, sector, ...)	Geographical area: the Belgian Part of the North Sea in particular, and the marine continental shelf in general. Sectors: any human activity at sea that causes changes in the marine environment (dredging, energy, sand extraction, aquaculture, nature restoration activities, ...). as well as activities of Flemish (/European) government actors, where SUMES can provide support for the development of regulations.
End products (including visualisation of results)	<ul style="list-style-type: none"> ▪ conceptual model of marine ES in continental shelves of temperate zones ▪ SDES model (supply-demand ES model) ▪ LCA_{+ES}-ESA model (comprehensive sustainability impact assessment model) ▪ Data and information portal ▪ SUMES user manual
Services (for users)	<ul style="list-style-type: none"> ▪ SDES model – service towards application ▪ Metadata catalogue
Methods used	Life Cycle Assessment, Ecosystem Services Assessment, Environmental Risk Assessment, Monetary Valuation, and visualisation tools.
Prior knowledge of external users needed to apply the tool?	Yes, some background knowledge is needed with regard to the Life Cycle Assessment, Ecosystem Services Assessment & Environmental Risk Assessment methods.
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STATE OF PLAY:**What is currently possible and what is not? What limitations does the tool have?**

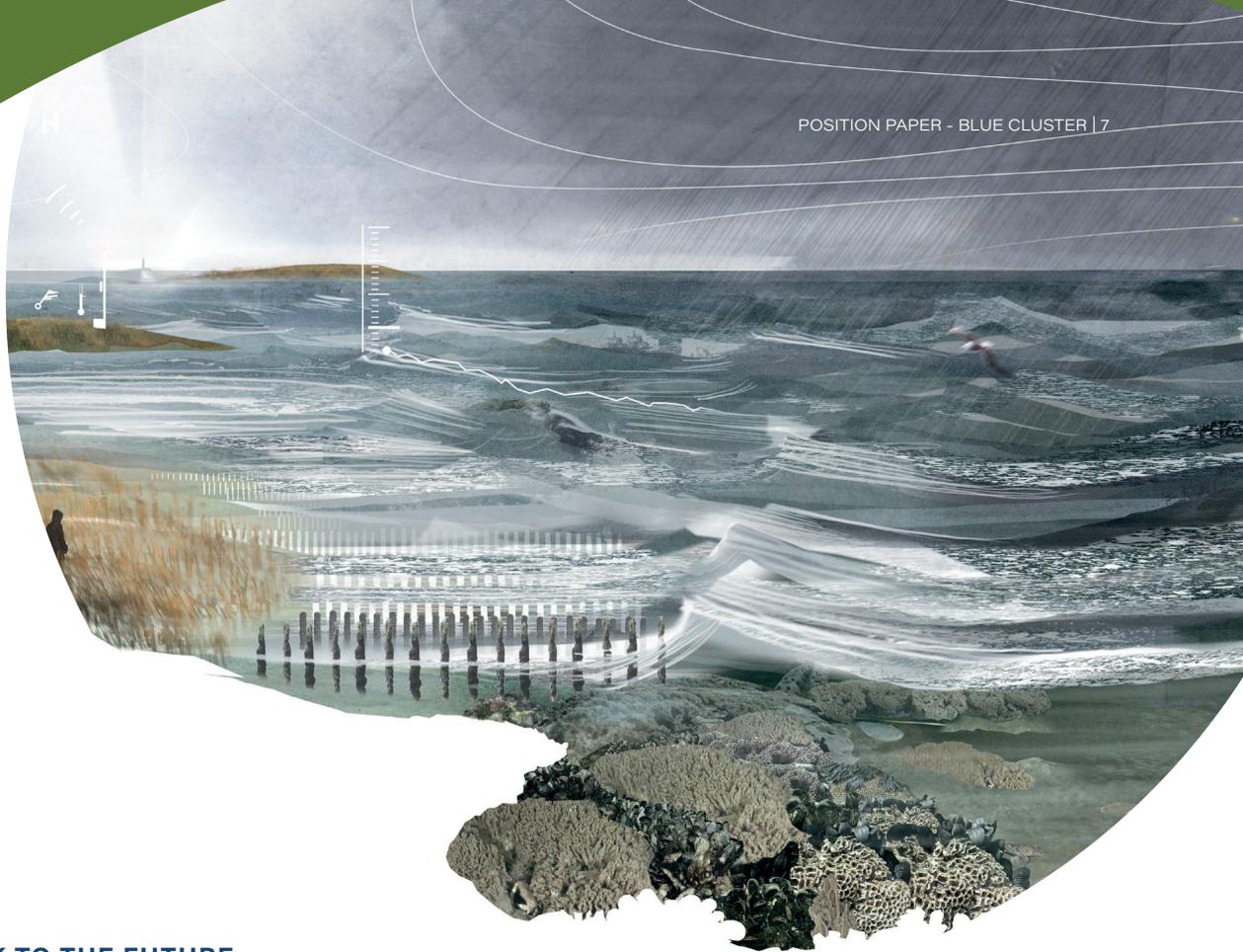
In SUMES, all knowledge on ecosystem functioning and ecosystem services in continental seas such as the BPNS was brought together and put into a cause-effect diagram. The important impact chains and ES are thus identified for that area. Furthermore, a link was made between marine activities and the impact on relevant ES (cf. through risk assessment).

As an example, the cause-effect chain of an offshore wind farm was mapped, showing an impact on 9 different ES, each having another background quantification method. In addition, the demand side of ES from Flanders is quantified, which led to the development of the supply-demand ES model where we can identify potential imbalances (self-dependence of ES). Furthermore, in addition to the local marine effects, changes in ES and other global environmental LCA impacts (e.g. global warming, human toxicity) associated with the value chain are quantified.

By taking ES into account, we can go beyond avoiding negative impacts and start developing activities in such a way that they have positive effects on the environment and on society. The showcase of wind energy illustrates that certain parameters have a major impact on ecosystem services (e.g. structural complexity of hard infrastructure and amount of steel used), which is why it is crucial to pay attention to this when developing new wind farms. Multi-use is analyzed through the application of the sustainability impact assessment model (LCA_{+ES}-ESA) to an advanced case (hypothetical offshore mussel farming combined with wind energy).

To summarise, the SUMES sustainability impact assessment method allows the quantification and monetization of local and global socio-environmental impacts, both benefits and burdens, of existing (well-monitored) and/or hypothetical (prospective) activities (single or multi-use format) taking place in the BPNS. Monetary valuation is used as an aggregation metric, having its intrinsic advantages and limitations.

SUMES allows the identification of (lack of) available data, as it becomes clear that environmental parameters of the (marine) ecosystems are not always of high quality, well-documented, quantified and/or accessible. The spatial/temporal coverage is often lower than for terrestrial activities, and the quality of the data more poor. A database is compiled with all relevant data needed to apply the framework to the showcase and advanced case. An information portal (website), listing the goal, scope, and main outputs of SUMES is under development, as was a manual intended for use by Blue Economy actors.



OUTLOOK TO THE FUTURE

What further steps will be undertaken?

The SUMES model (LCA_{+ES}-ESA) could be developed further to also take into account the economic dimension (labour, taxes, CAPEX, etc.) of ongoing or planned marine activities. It can enhance efficient resource allocation (time, money, etc.), and integrating economics will show trade-offs between the implementation of environmentally-friendly solutions and possible competing economic interests. Furthermore, the creation of a user-friendly interface to support companies in applying the SUMES model to their activities would be extremely helpful, even though a certain level of knowledge and experience in LCA, ES and risk assessment modelling will be needed at all times.

The SUMES model is developed in a generic way so that it can be applied to different human activities. However, the validation of the model is done for two activities in particular: offshore wind energy combined with mussel farming in the BPNS. The impact of other (multi-use) activities in that area or beyond remains to be examined, but the same methodologies can be used, albeit with additional ES in scope relevant to the chosen activities or fed from other data points.

SUMES identifies data gaps or detects the poor level of data quality, which can lead to the development of specific monitoring programmes. Much of the data used to model local ES changes that is collected for the marine environment is very habitat- or location-specific, which limits its ability to be transferred or used in other places. Therefore, applying the SUMES model outside the BPNS requires new (monitored) data and appropriate testing.

The SUMES model and results could also facilitate policy making; showing the advantages/drawbacks of multi-use or the results of applying the framework to the case studies may for example be helpful 1) when preparing a new Marine Spatial Plan; 2) as a first step towards EU due diligence reporting; or 3) to elaborate the ES accounting approach at the Flemish level as proposed by the EU Marine Strategy Framework.

MESp Framework

Marine Ecosystem Performance Framework

<https://www.bluecluster.be/projects/mesp>

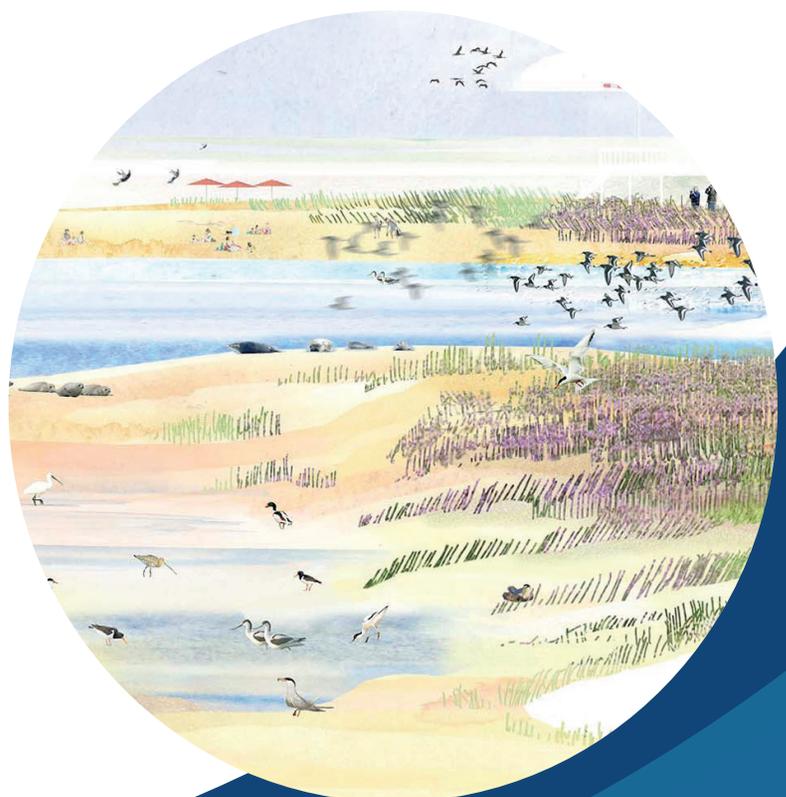
INTRODUCTION AND SCOPE OF THE PROJECT

One of the key knowledge gaps for blue economy businesses to speed up the transition of company strategies and activities from a traditional approach to a truly 'nature positive' approach is the lack of guidance on how to set company targets and the assessment related to marine ecosystems and the lack of indicators on how to measure progress to target. Both challenges are exacerbated by a substantial lack of data, in particular publicly accessible data which can be applied by the business community on a localised (project-level) scale.

This research project has developed a Marine Ecosystem Performance framework (MESp Framework). The objective of the MESp Framework was to prepare the foundations for a business tool for assessing a company's performance in terms of impacts and dependencies on marine ecosystems.

We have investigated the necessary indicators to quantify the main ecosystem dependencies and impacts of blue economy actors and investigated the input (data) and output requirements to translate this into a performance assessment framework for marine businesses.

The performance assessment methodology has been presented in a dashboard design and currently allows certain offshore activities and businesses to score their marine ecosystem performance. This is done on a project level in a semi-quantitative way with respect to their contribution to local marine ecosystem units in the Belgian Part of the North Sea.



PROJECT SPECIFICATIONS

Project start and end date	01/01/2022 - 31/03/2023
Target group (users)	Blue economy companies and stakeholders
Scope (geographical area, sector, ...)	Offshore projects and activities. The geographical area of the demo tool is the offshore area of the Belgian Part of the North Sea (BPNS).
End products (including visualisation of results)	Framework and demo tool , including dashboard with graphic output.
Services (for users)	Ecosystem performance assessment for offshore activities on project level.
Methods used	Semi-quantitative scoring framework – underlying publicly available data layers (GIS platform).
Prior knowledge of external users needed to apply the tool?	Project information for user input on location and project scope in the area + types of activities to be considered
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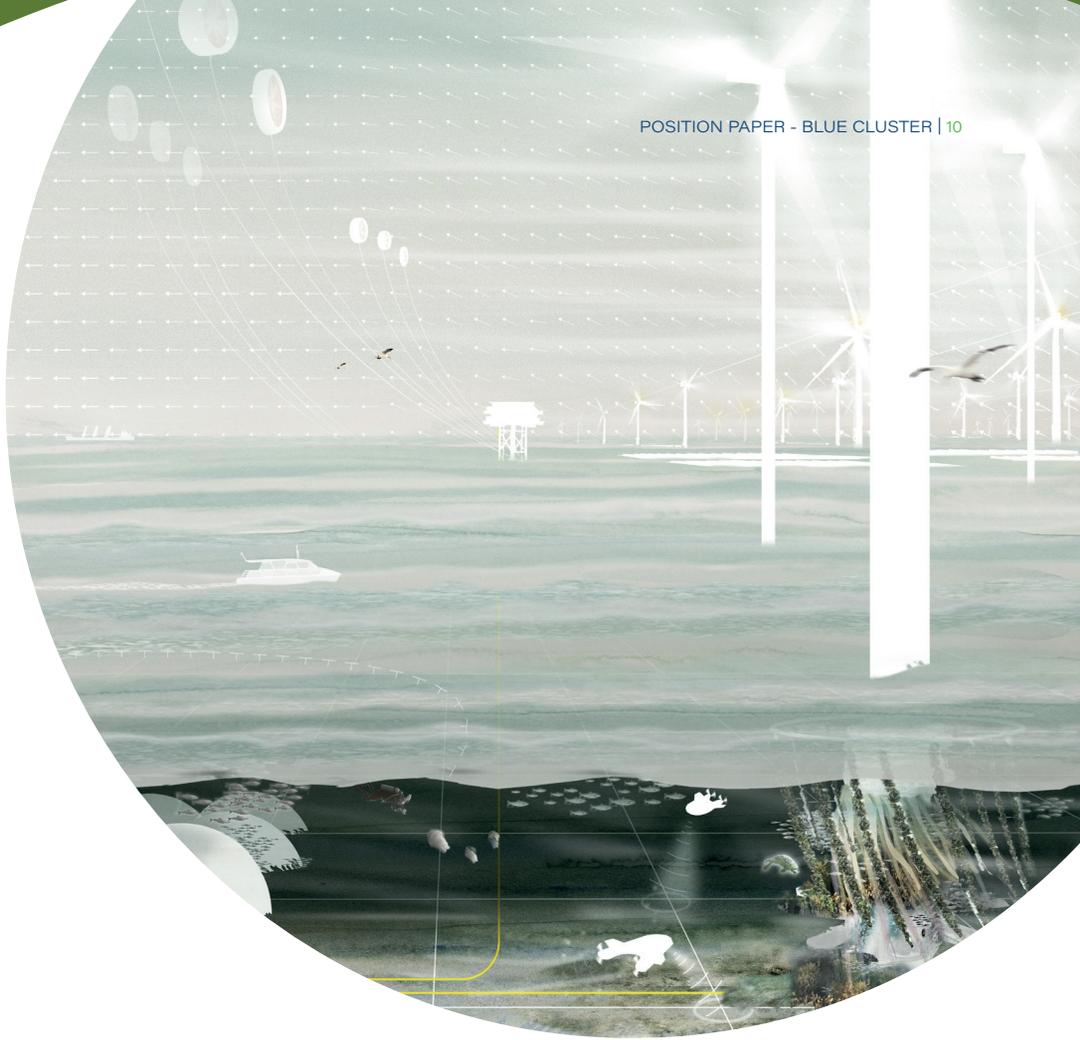
STATE OF PLAY:

What is currently possible and what is not? What limitations does the tool have?

Currently the tool is focused on activities related to offshore wind energy in the BPNS. The demo tool gives a qualitative/semi-quantitative review of the project impacts and the effects of mitigation measures.

The lack of high-resolution data on the current ecosystem status makes it difficult to incorporate the quantification of the actual project-level impacts. The quantification is one of the main objectives for future developments of the framework.

An additional issue is defining how we treat condition (environmental status of the ecosystem units) and how to tackle the indirect effects that the measures themselves may have on the ecosystem units.



OUTLOOK TO THE FUTURE

What further steps will be undertaken?

The framework is currently being developed for the Belgian Part of the North Sea and for a selection of activities. However, it could also be developed for global use and all blue economy sectors.

The case study for the demo tool is centred around offshore activities in offshore wind farms and related activities such as cable trenching in the BPNS. Metrics and measures can be added for specific sectors in order to automate the assessment based on project inputs.

The second objective of future project outcomes is to include all marine activities in the ecosystem performance tool, e.g. dredging, aquaculture, construction of coastal and offshore infrastructure etc.



WABESCO

Wheel of Assessment for Blue Ecosystem Services of a Company

<https://www.bluecluster.be/projects/wabesco>

INTRODUCTION AND SCOPE OF THE PROJECT

WABESCO stands for a Wheel of Assessment for Blue Ecosystem Services of a Company. In co-creation with 4 partners, we are developing an ecosystem assessment tool (MESAT) together with a sustainable management system namely the EA Ladder and a generic numerical network model MES.

In the blue economy there is a strong need for a holistic sustainability evaluation of marine projects. MESAT (Marine Ecosystem & Sustainability Assessment Tool) will perform such an evaluation to assess the impact of a marine project on the natural capital. The ecosystem services approach is used as a methodology for applying a holistic impact analysis. Building on internationally highly regarded criteria based on the EU Taxonomy for sustainable activities and the sustainable development goals (SDGs), sustainability will be divided into all relevant ecosystem services, which will form the output of the MESAT visualization. The tool has been designed from the start to be applicable across the entire EU.

Another need for marine projects is an incentive to incorporate sustainability into marine projects. This is provided by the EA Ladder, a project-based ecosystem services management framework. This tool is inspired by the CO2 Performance Ladder, but shifts from merely a carbon focus to a wider sustainability approach through ecosystem services. The goal is to evaluate engagement with, commitment to and progress towards ecosystem services for companies active in the Blue Economy, with every company having their own starting point and working towards better performance by climbing up the levels of the ladder.

Last but not least, current scientific marine ecosystem services (MES) tools are too complex, data demanding and case-specific. The creation of generic and universal applicable tools and methodologies to assess, qualify and improve both technical and financial investments from and for all stakeholders is required. Daily application by business stakeholders is one of the keys to success to achieve main market objectives. Therefore, WABESCO will build a generic MES dynamic network numerical model and will validate this network model with specific cases in co-creation. The MES model is a detailed instrument that can support MESAT and the EA Ladder.

PROJECT SPECIFICATIONS

Project start and end date	01.04.2022 – 31.03.2024
Target group (users)	Blue economy companies and stakeholders.
Scope (geographical area, sector, ...)	Small and large companies in the blue economy as well as relevant blue economy authorities. The blue economy scene in Belgium. The project has international potential, however.
End products (including visualisation of results)	MESAT tool, EA Ladder, MES model. Availability of reports as well as tools. Website providing an overview of results.
Services (for users)	Numerical model open for use via web application.
Methods used	Research, use cases, workshops, software development.
Prior knowledge of external users needed to apply the tool?	If users are working in or for the blue economy , no prior knowledge needs to be built up and user-friendly methodology guidelines will be provided in support of the tools.
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STATE OF PLAY:**What is currently possible and what is not? What limitations does the tool have?****MESAT**

Currently, a first version of MESAT is available. MESAT can be applied to compare projects, to assess the current sustainability state of a project and to find bottlenecks in the path to sustainability/ecosystem services delivery.

The main limitation at this stage is that the tool has only been tested with stakeholder cases on a limited scale. However, in the next few months, the main focus will be relevant stakeholder implementation and feedback (based on projects within every sector of the current and subsequent project scopes).

The strength of our tool lies in its ability to provide an assessment of 9 different ecosystem services based upon an in-depth analysis.

EA LADDER

In the current version of the EA Ladder, projects are evaluated on engagement with ecosystem services by assessing insight in and commitment to ecosystem services, transforming business models and strategies and transparent communication. To reach higher levels on the ladder, more stringent requirements on these topics have to be met.

The main limitation is the need for a robust quantification method or tool, which is ideally provided by the MES Network Model and/or the MESAT tool. The wide scope (holistic tool) is both a pro and a con of the tool since it gives a wide view of progress towards sustainability, but requires a lot of data and results in a nuanced evaluation. This is, however, handled by integrating a materiality analysis in the tool and lowering the requirements for organisations exploring the framework.

MES MODEL

A first version of the model is available off-line for the use case of offshore wind. Further effort is required for this model to detail the links between actors and ecosystem services. Meanwhile, new use cases are being built up.

As planned, the 2nd year of the research project will also focus on front-end and back-end development of a web-based numerical model which allows interaction with end users. A prototype is available internally.

OUTLOOK TO THE FUTURE

What further steps will be undertaken?

MESAT

In the first place we hope that - within this project or a follow-up one - we can make MESAT applicable for every relevant sector within the blue economy. Next to that, another path we want to explore in follow-up projects is to extrapolate the tool to land based-projects. This will not only expand the possibilities of the MESAT application, but will also be relevant for integration in the daily operation activities of BOVA ENVIRO+.

Next to scope broadening, another future opportunity is the creation of a MESAT variant especially designed to compare the ecosystem services impacts of different project scenarios.

EA LADDER

One of the first steps that will be considered for the management framework is the commercial development and application of the tool within the blue economy. Other steps include the integration of different sustainability frameworks and tools within the management framework and potentially an expansion of the scope, i.e. expansion towards different Blue Economy sectors, expansion beyond the BPNS, etc.

MES MODEL

Actors in the Belgian blue economy have shown interest in the model, and a first logical step would be to interact in depth in a project with a large company (offshore, coastal resilience, marine & coastal authorities, ...). The numerical model has no geographical limits. Different actors in the offshore wind energy and marine aquaculture sectors in countries such as the Netherlands, France and Portugal have expressed their interest.

As we operate internationally with our other activities and the model will have a web-based interface, the MES model will have international ambitions as from 2024 onwards. A first step in that direction is the selection of our company by the EU for the organisation of a specific workshop in this field on the European Maritime Day (Brest, May 2024).



PARTNERS

Sumes



MEsP



WABESCO



Please refer to the present position paper as follows:

Blue Cluster (June 2023). Blue Cluster Ecosystem Approach Project Overview.

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VLAIO



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