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Marine SABRES WP2

Milestone 2.17

Stakeholder appraisal of baseline application

Second Overarching Stakeholders Workshop



MARBEFES WP1

Third Annex to Deliverable 1.2

Stakeholder recommendations

Second Overarching Stakeholders Workshop

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Marine SABRES Milestone 2.17 – MARBEFES Second Annex to Deliverable 1.2

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1. Abstract

The Second Overarching Stakeholders Workshop was held on 1 and 2 April 2025 in Zandvoort, the Netherlands, as part of the Horizon Europe projects Marine SABRES and MARBEFES. The event brought together 13 selected stakeholders and 22 researchers. The goal was to review results obtained in the projects during the last 2 years, to gather feedback on these results, improve shared understanding, participate in the co-design of the next steps of the project, and work together on practical tools that support better decisions for managing coasts and seas.

During the two-day workshop, participants tackled key topics in a combination of presentations, table and group discussions, and Mentimeter surveys. The workshop encouraged open discussion, allowing participants from different sectors, such as government, NGOs, research, and business, to share local knowledge and practical understanding together with scientific insights. Sessions focused on usefulness of approaches and tools, such as Causal Loop Diagrams, BowTies, the MARBEFES Toolbox (a collection of easy-to-use tools that help connect science with decision-making), effects of scenarios of change (based on future social and environmental changes), and a 'Shiny-app' as a prototype for a decision support system. These approaches and tools aim to illustrate and improve the understanding of how ecosystems, people, policies, and management are linked, and how different choices affect the future in the balance between these elements.

The key-factors governing the balance between nature, and socio-cultural and economic aspects as obtained from the earlier consultations in Marine SABRES and MARBEFES were largely confirmed. This means also that in the further development of regional policies and management, the importance of geographic position (north versus south, and mainland versus islands), of regional (cultural) differences, and stakeholder diversity have to be taken into account.

The major approaches and tools to connect the key factors, such as the Causal Loop Diagram and BowTie, were all largely understood and seen as useful for insight in the functioning and managing of the marine environment. Nevertheless, it was noticed that the tools could become complicated or too academic, and thus should be simplified and accompanied by simple guidelines.

Similarly, approaches like the PESTLE (Political, Economic, Social, Technological, Legal, and Environmental) framework, the SSPs (Shared Socio-economic Pathways), and Socio-cultural and Ecological Valuation, were seen as useful approaches to explore drivers of environmental change, perceptions on key challenges, trade-offs, and prioritising governance options for coastal and marine management.

It was recognised that key challenges for the management of Socio-Ecological Systems (SES) in the marine environment, and especially for Marine Protected Areas (MPAs) were mainly formed by the legal complexity beyond national jurisdiction and (the lack of) political willingness, which indicates that these governance issues need more attention to be tackled. Fragmentation of policy and regulatory overlap, with regard to impacts of e.g. climate change, alien species, and massive tourism, were indicated as the common concerns.

The stakeholders support strongly the construction of the Marine SABRES ShinyApp DSS (Decision Support System) and the MARBEFES Toolbox for integrating the discussed approaches and Tools, yet taking into consideration 1) a User-friendly design for a high diversity of stakeholder groups, 2) a clear structure and navigation to explore tools easily (free search, filters, as well AI guided), 3) search and filter functions by area, data type, ecosystem, and user-needs, and 4) inclusion of short guidelines (1 to 2 pages) and examples to support understanding and application of tools.

Stakeholder appraisal scores on the approaches and tools of the Marine SABRES as well of the MARBEFES project were very high, as was also the score for the organisation and content of the workshop. It demonstrates a clear joint interest of the stakeholders and project-researchers in an ongoing involvement in the co-design of useful and usable tools, and the collective commitment to shape a sustainable future for Europe's marine and coastal regions.

2. Introduction

A two-day stakeholder engagement workshop was held on 1–2 April 2025 in Zandvoort, the Netherlands, bringing together researchers from the Horizon Europe projects Marine SABRES and MARBEFES. The workshop aimed to:

- Share an overview of results gathered from stakeholder interviews and surveys conducted in 2023,
- Gather stakeholder feedback and appraisal on the preliminary outcomes produced across various project Work Packages (WPs),
- Foster collaboration between stakeholders and researchers to support the further development and co-creation of decision-making and management tools for marine and coastal areas.

Of the 231 stakeholders interviewed in 2023, a representative group of 13 Overarching Stakeholders was invited to join with 22 researchers for more focused and in-depth discussions at the Zandvoort workshop. The workshop provided a vital platform for engaging stakeholders, policymakers, and researchers, ensuring an inclusive and diverse range of perspectives and helping to consolidate views on the key elements of coastal social-ecological systems.

This marked an important step towards fostering collaboration, advancing stakeholder-supported decision-making and management practices for coastal areas, and strengthening the impact of research outcomes from both Marine SABRES and MARBEFES.

A combination of presentations, table and group discussions, and Mentimeter surveys was used to introduce the various sessions, to promote the interactive discussions, to obtain feedback, and to find joint conclusions for further steps to be taken.

The full results from the Mentimeter sessions conducted during the workshop, all PowerPoint presentations, a list of participating stakeholders, and a detailed program agenda, are given in the appendices .



By engaging with stakeholders and incorporating their perspectives, both projects seek to develop useful and practical tools and approaches that enhance planning and decision-making. They also aim to increase public awareness and understanding of the interconnections between ecosystems, biodiversity, society, and the economy in coastal regions. Ultimately, the goal is to promote sustainable use of marine and coastal areas while safeguarding the health of marine ecosystems and biodiversity.

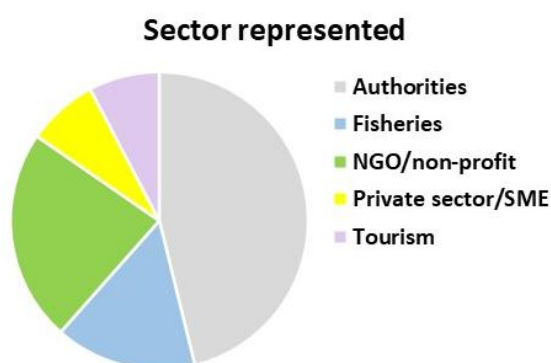


(photo credit Lars Olav Sparboe, Tromsø, Norway)

3. Stakeholder Participation

In the first surveys and interviews, during spring 2023 and winter 2024/25, stakeholders were consulted across several European research areas, distributed among five major regions: Macaronesia (Atlantic islands), Mediterranean, Atlantic Coast, Baltic, and Arctic (Fig. 3).

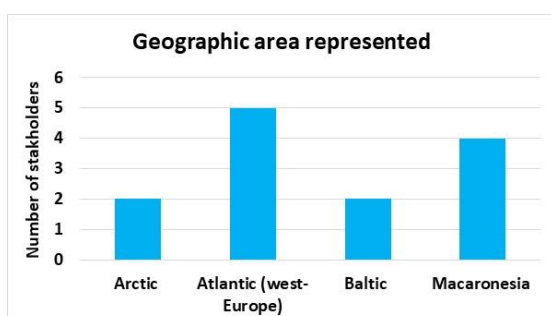
From this broader group, a subset of stakeholders was invited to participate in the Overarching Stakeholder workshops designed for more focused group discussions.



The stakeholders at the Zandvoort workshop in 2025 belonged to various sectors (Fig. 1).

Authorities were most represented, followed by those from **NGO/Non-profit** organisations (belonging to the category of Public audience"). For the category of "Industry and private sector" representatives from **SMEs**, **Fisheries**, and **Tourism** were present.

Figure 1. Stakeholder representation by professional sector at the Zandvoort workshop



Most stakeholders came from the western European mainland (east-Atlantic coast), followed by those from the south Atlantic (Macaronesia), and those from the Arctic and Baltic regions (Fig 3). The skewed geographic representation should be kept in mind when drawing conclusions from the results.

Figure 2. Geographic areas represented among Zandvoort workshop stakeholders.

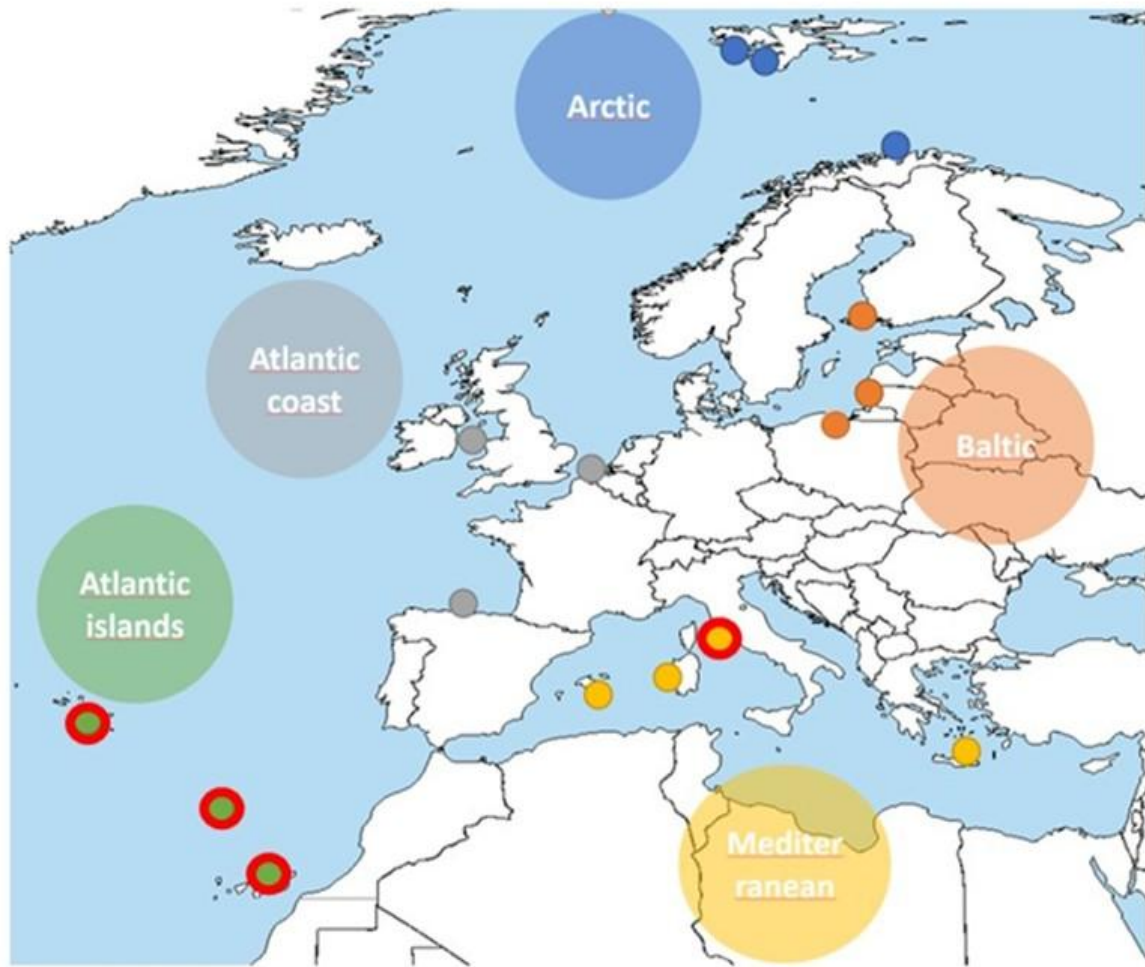


Figure 3. Location of Research Areas (red encircled locations are Demonstration Areas (DAs) in Marine SABRES, the other locations are Broad Belt Transects (BBTs) in MarBEFES (from Hummel et al. 2023. Marine SABRES Deliverable 2.1: Simple SES design brief, and MARBEFES first part of Deliverable 1.2: Stakeholders' recommendations regarding harmonization and integration of social-ecological frameworks. HuFoSS Foundation, Roosendaal, Netherlands, pp. 144)



4. Topics and Objectives

An overview of the topics, presenters, and objectives for each workshop session is given in Table 1.

Table 1. Topics and session objectives of the second Overarching Stakeholder workshop (session 1 and 2 were Welcome and Introduction)

Topics/ Presenters	Stakeholders Engagement Objective
3. Feedback on the second round of stakeholder consultations - first results (Herman Hummel)	- Sharing results of the Stakeholders interviews and surveys - Gather feedback and opinions on Stakeholder engagement outcomes
4. Causal Loops and BowTies (Gemma Smith, Anita Franco, Mike Elliott)	- Develop tools that link key environmental factors. - Help users see how different elements interact within coastal systems - Support smarter decision-making for managing and protecting coastal areas.
5. Scenarios of Societal and Environmental change under SSP1, SSP3 and SSP5 (Dorota Kolbuk, Tasman Crowe)	- The main impacts on the Coastal System - Stakeholder viewpoints on main changes in activities and pressures under the various SSP scenarios
6. Acceptance and options for governance: the PESTLE approach (Bruno Meirelles de Oliveira, Julie Bremner, Berthe Vastenhoude)	- Introduction to the exercises and instructions - Individual questionnaire for Options for Coastal Management - Group exercise on the acceptance of different pathways to management - Presentation of the Group Results and Discussion
7. Estimating effects of management and policy measures by means of SES models (Berthe Vastenhoude)	- Short overview of the approach - Testing the effects of measures and interventions on outcomes calculated by means of simple SES - How to interpret the analyses
8. Governance of marine ecosystems: Stakeholders' perspectives (Lea Ricard, Sabine Cochrane)	- Results on the stakeholder consultations about challenges, visions and solutions in governance - Stakeholders to prioritize challenges and visions in governance - Stakeholders' insights how to improve and operationalize pathways to solutions to overcome challenges
9. The MARBEFES Toolbox (Sabine Cochrane, Frida Cnossen, Cristina Huertas, Marie Nordström, Clement Garcia)	- Introduction on the concept of the Toolbox - Design and functionalities - Example tool: Broadscale biological traits - Example tool: Metric of habitat function
10. Tools & Stakeholders (Herman Hummel, Joanna Piwowarczyk)	- Appreciation of Tools - observations from the stakeholder workshops of winter 2024/25 - Enablers and limiters/barriers for stakeholders to using scientific tools
11. Decision Support Systems (DSS) (Arturas Razinkovas-Baziukas, Evelina Grinienė)	- Introduction to DSSs, their features and problems - Connections to GIS apps - The SES "Shiny-App"
12. Valuation of Coastal Systems (Ashley Cahillane, Tasman Crowe, Herman Hummel)	- Viewpoints of stakeholders on ecological, economic, and socio-cultural valuation systems: - Integration of valuation systems in decision-making - Appreciation of the valuation systems by stakeholders - Social and cultural ecosystem benefits - non-financial valuation of ecosystems - Introducing the concept - How are the concepts applied in case studies and what types of insight they provide
13. Marine Protected Areas (MPAs) (Lea Ricard, Sabine Cochrane)	- The main challenges experienced to implement MPAs in Europe. - Viewpoints on pathways to solutions - How to proceed?
14. Ocean Literacy (Joanna Piwowarczyk)	

5. Results

5.1. Feedback on second round of stakeholder consultations - first results concerning priorities

- **Workshop activity and purpose**

The key findings and analyses from the first and second round of stakeholder surveys and interviews conducted in the spring of 2023 and winter of 2024/25, respectively, were presented to participants (Appendix 3a). Through a Mentimeter survey (Appendix 4a) and open-floor discussions, participants' opinions and feedback on the results were collected.

The purpose was to gather feedback on the results of the second series of stakeholder consultations, whether the outcomes matched their expectations, and what additions they would advise.

- **Observations and key-findings**

During the first consultation round, 231 stakeholders were interviewed to identify key factors in balancing nature, the economy, and society in coastal areas. Key priorities that emerged included nature conservation, the effects of large-scale tourism, biodiversity, economic considerations, and pollution.

In the second round, which involved 175 stakeholders, feedback largely confirmed these initial findings, while also raising a few new priority issues such as urban development, offshore wind farms, climate change, invasive species, and the significance of cultural heritage.

Moreover, with regard to the stakeholders their interactions with governance levels, it was shown that stakeholders at islands are more connected to the local governance, whereas stakeholders at mainland locations were more connected to national governance.



These results were generally seen by the Overarching Stakeholders as logical, informative, interesting, useful, and meaningful.

A few additions were brought forward, such as better policies with regard to invasive species or protected areas, or the youth feeling disconnected from nature. The other elements mentioned were included in the main outcomes of the earlier consultations.

The analyses of stakeholder viewpoints are thereby largely complete.

- **Relevance**

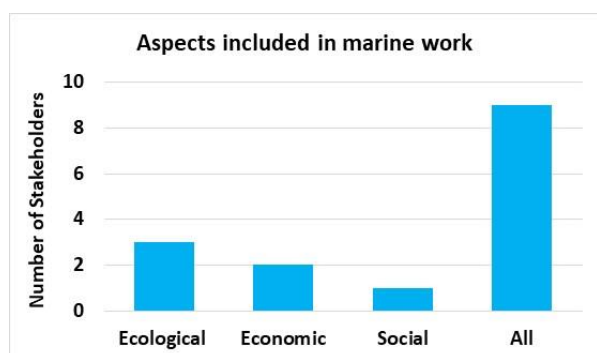
With regard to the key-factors in European regions, and how to use them for the further development of regional policies and management, the importance of geographic position (north versus south, and mainland versus islands), of regional (cultural) differences, and stakeholder diversity have to be taken into account.

5.2. Causal Loops and BowTies

• Workshop activity and purpose

In this session two key tools — the Simple Social-Ecological System (SES) model and the Bow-Tie analysis — were introduced to help stakeholders better understand and manage complex coastal and marine environments. These tools are used to simplify ecosystem assessment, risk management by highlighting risks and opportunities, and governance by connecting environmental factors and identifying intervention points. The tools were introduced in a couple of presentations (Appendix 3b), followed by Mentimeter surveys to gather stakeholder feedback on applicability and any barriers using the tools (Appendix 4b)

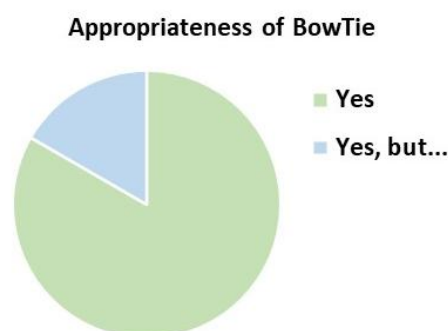
• Observations and key-findings



In response to the question whether in their work with (or managing) the marine environment, they include only ecological, social, or economic aspects, or all, the majority of the stakeholders indicated that they incorporate all aspects (Fig 4).

This suggests the tools have the capacity to serve the needs of the stakeholders and potential users.

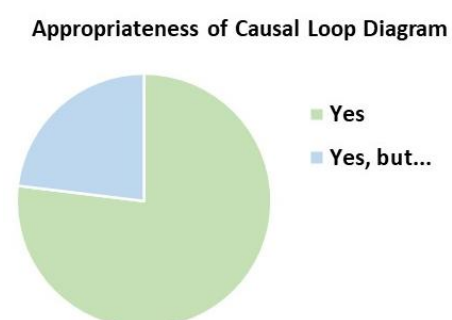
Figure 4. Aspects considered in stakeholders' marine work.



When the stakeholders were asked whether the BowTie approach is appropriate for addressing their management and sectoral questions, most considered it suitable (Fig 5). However, some descriptive comments suggested “Yes, but might be too complicated to use on a daily basis”. In the discussion it was also indicated that the tools can become too academic and should be simplified to be useful and usable by stakeholders.

In response to the question whether there is a reason NOT to use the tool, several stakeholders indicated the BowTie may be complex with endless relations, and thereby complicated to use.

Figure 5. Stakeholder views on the appropriateness of the BowTie approach.



When questioned on the Causal Loop Diagram (CLD) the stakeholders perceive this tool also to be appropriate for addressing their management and sectoral questions (Fig 6).

Nevertheless, one stakeholder replied “Yes, but it is large, and every factor is a potential error”.

In response to the question whether there is a reason NOT to use the tool, most stakeholders see no reason, several stakeholders indicated the tool may be complex with endless relations, and gets complicated very fast.

Figure 6. Stakeholder views on the appropriateness of the CLD

• Relevance

The two tools can be considered appropriate tools to better understand and manage complex coastal and marine environments. Nevertheless, quite some comments do emphasise the need for further simplifications and clear communication on the use and capacities of these tool's.

5.3. Scenarios of Societal and Environmental change under SSP1, SSP3 and SSP5

- **Workshop activity and purpose**

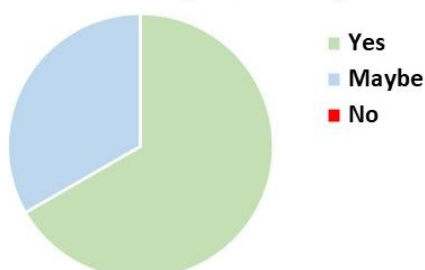
The session aimed to explore possible futures for marine and coastal ecosystems through three global Shared Socio-economic Pathways (SSP): Sustainability (SSP1), Regional Rivalry (SSP3), and Fossil-Fueled Development (SSP5). After a short presentation (Appendix 3c), the participants examined how these scenarios can be adapted through a downscaling process to local contexts and applied to assess drivers of biodiversity and habitat change, as identified by both scientific and stakeholder inputs. At the end a short Mentimeter survey was held (Appendix 4c).

- **Observations and key-findings**

The discussion surfaced key challenges, including the difficulty or lack of translating scenario outcomes into policy action, the tendency to refuse in politics from the worst scenario, and the limited accessibility for younger audiences since instruments are too difficult to them. The need for active citizen debate, stakeholder involvement, and clearer communication was stressed. Stakeholders also emphasized the importance of integrating public perspectives and cultural values to ensure relevance and inclusivity.

The stakeholders indicated their wish to use a more interactive tool and guidelines to be able to follow the best way for reaching the chosen scenario. This feedback from the session is a stimulus for the creation of a new online platform to explore scenarios in a Virtual Research Environment. This platform will draw on biodiversity and human impact data to model adaptive management options, helping to bridge global models with regional realities in support of sustainable marine governance.

Potential of using scenarios in your work



In response to the question “Do you see the potential of applying scenarios in your work?”, the majority of participants indicated “**Yes**”, a few answered “**Maybe**”, and nobody answered “**No**” (Fig. 7). This highlights a generally positive perception of scenario-based approaches and its relevance to the participants’ professional contexts.

Figure 7. Participant views on the potential of applying scenarios in their work.

- **Relevance**

The downscaling process of climatic and socio-economic scenarios used in the projects can help to explore in a useful and understandable way a range of possible future environmental changes in localized contexts, and thereby stimulate debate and support decision-making.



5.4. Acceptance and options for governance: the PESTLE approach

- **Workshop activity and purpose**

This section used after a short introduction (appendix 3d) structured questionnaires to be filled individually and in groups, with which the overarching stakeholder would reveal their preferences regarding the management options given to them, and through the group activity discuss the implications, costs, and acceptability of each one of them. This was followed by a presentation of group results and discussion. The aim was to gather stakeholder perspectives on marine governance using the PESTLE framework (Political, Economic, Social, Technological, Legal, and Environmental). The session explored perceptions of key challenges, trade-offs, and governance options for coastal and marine management. Moreover, a goal of this session was to investigate how overarching stakeholders understand the options for management that came from previous steps in the project and how they choose or accept the management proposals/goals presented to them.

- **Observations and key-findings**

Key themes included broad agreement on the ecological benefits of MPAs, recognition of the need for stronger regional collaboration, and concerns about political and jurisdictional complexity. The outcomes included insights from three thematic groups. **Group 1** examined the balance between Marine Protected Areas and tourism in Macaronesia, identifying political leadership as the key driver for resolving multi-sector challenges. **Group 2** focused on sustainable fisheries management in the Arctic, concluding that technological measures were the most effective and affordable solution, while political and legal frameworks remain slow and complex. **Group 3** addressed tourism and coastal ecosystem conservation in Tuscany, highlighting legal enforcement as the most impactful and cost-efficient approach to managing tourism pressures and protecting the environment.



By facilitating both personal reflection and group deliberation, using the PESTLE approach, the activity revealed insights into how stakeholders understand, accept, and prioritize governance strategies. Discussions highlighted the complexities of reaching consensus in accommodating diverse worldviews, mirroring real-world challenges in marine and coastal decision-making. Initial observations underscore the value of group exercises in surfacing conflicting interests, fostering dialogue, and reaching consensus/compromise on marine and coastal governance topics, such as tourism and fisheries.

- **Relevance**

The results informed both the ranking of priorities and the level of acceptance of different governance pathways, contributing valuable input for policy development and future planning.

5.5. Estimating effects of management and policy measures by means of SES models

• Workshop activity and purpose

The socio-ecological system (sSES) modelling approach was firstly explained (appendix 3e) and in groupwise discussions applied to understand the complex interactions between human activities and ecological processes. In the following sub-session the feasibility of establishing a marine corridor of MPAs in Macaronesia was explored using the sSES approach and thereby also using the earlier (2023) assessed stakeholder perspectives. Finally a Mentimeter polling was held to assess the stakeholders' viewpoints on MPAs through the methods used (appendix 4d).

• Observations and key-findings

For the first part, using the Tuscany case study, the model revealed that pressures such as boat moorings negatively affect critical components like *Posidonia oceanica* and seawater clarity, leading to system unsustainability. However, targeted management actions—such as anchoring restrictions—demonstrated potential to restore ecological balance and achieve long-term policy goals.

The sub-session underscored the value of systems modelling in identifying effective interventions and supporting evidence-based decision-making for sustainable marine governance.

The following sub-session focused on the feasibility of a marine ecological corridor connecting the Azores, Madeira, and Canary Islands. The corridor is intended to enhance connectivity, protect migratory species, and support ecosystem resilience. A stepwise assessment was used to weigh ecological, sociological, and economic benefits—such as conservation gains, tourism potential, and fisheries recovery—against trade-offs like maritime activity restrictions.

The most frequently selected top priority for Marine Protected Areas (MPAs) management was **"Improve biodiversity connectivity"** and the second choice was **"Support recovery of migratory species"** (Fig. 8). Other objectives such as **"Strengthen regional marine governance/cooperation"** and **"Support resilient fisheries"** were commonly ranked in the middle. In contrast, **"Enable sustainable tourism and blue economy"** ranked lowest, indicating it may be viewed as of minor concern.

As the top challenge in MPA management the Stakeholders identified **"Jurisdictional and governance complexity"**, followed by **"Political will/alignment"** (Fig. 9). These results highlight the structural barriers in governance that can impede effective MPA management. Surprisingly, **"Long-term financing"** formed only a minor challenge.

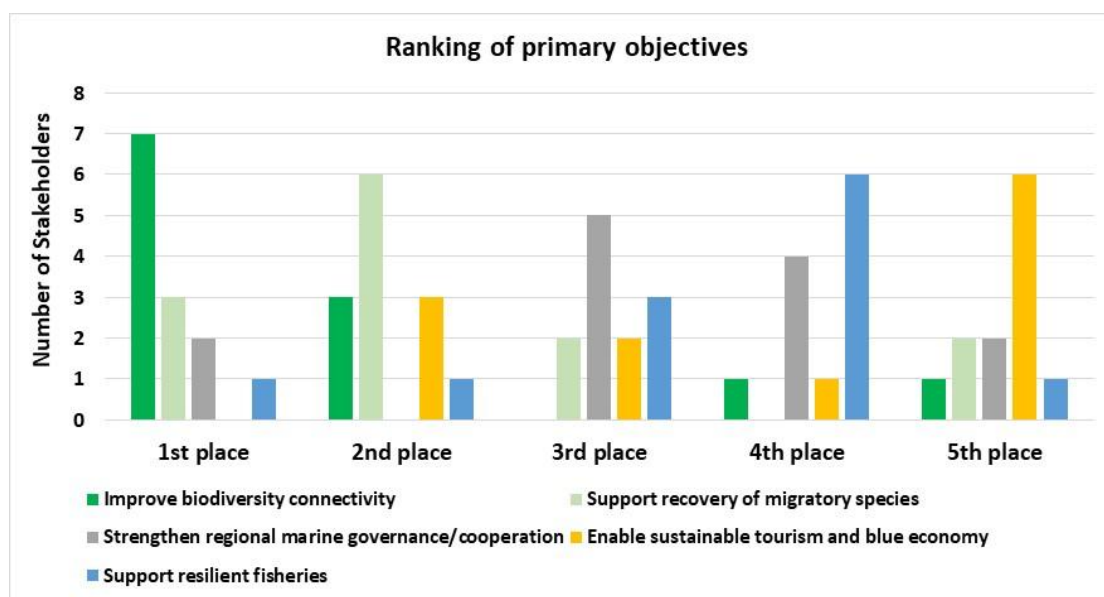


Figure 8. Stakeholder rankings of primary MPA objectives

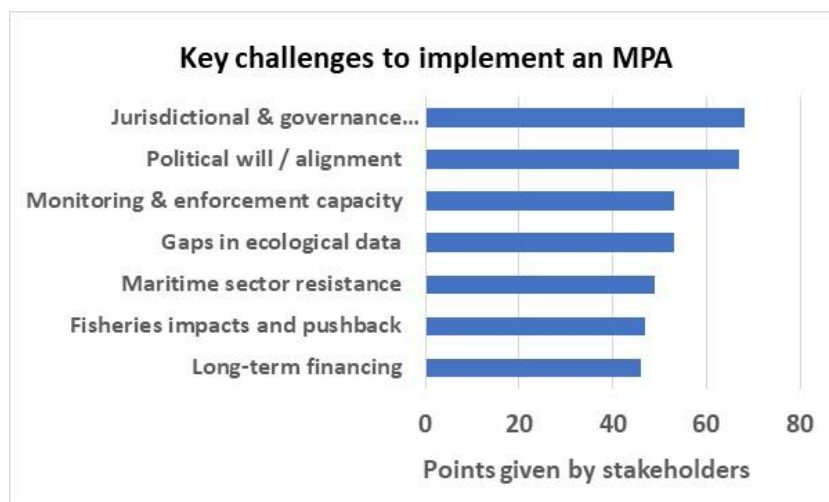


Figure 9. Stakeholder rankings of key challenges to Marine Protected Area (MPA) implementation (1 to 7 points to be given per stakeholder)

The stakeholders expressed a strong agreement on the statement that **“An MPA could deliver clear ecological benefits”**, next to that **“There is a need for more regional collaboration on marine protection”** (Fig. 10). In contrast, the statement **“The political conditions are favorable for advancing an MPA proposal”** got a low score, suggesting concern about the current political landscape for the implementation of an MPA.

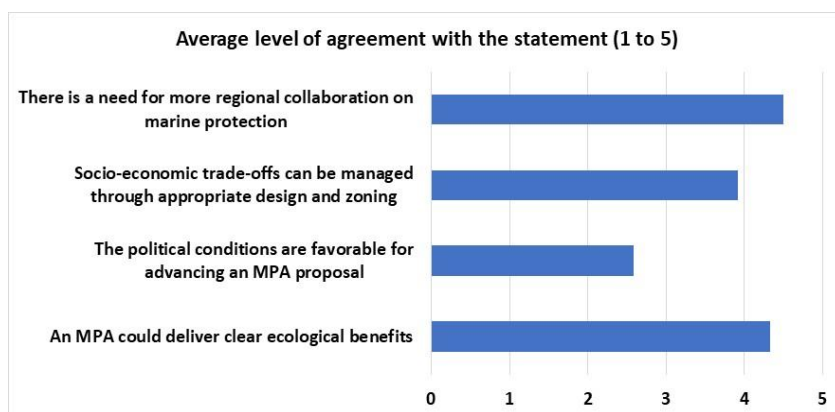


Figure 10. Average agreement (on a scale from 0 to 5) with statements regarding MPAs

- **Relevance**

The session emphasized the need for adaptive, cross-border governance and informed stakeholder collaboration. Key challenges for MPA management were formed mainly by the legal complexity beyond national jurisdiction and (the lack of) political willingness, which indicates that these governance issues need more attention to be tackled.

5.6. Governance of marine ecosystems: Stakeholders' perspectives

- **Workshop activity and purpose**

The session adopted a participatory format that encouraged storytelling and open dialogue to discuss governance practices related to marine ecosystems. As a basis the results from the MARBEFES consultations in winter 2024-25 were used, whereby stakeholders could highlight all the challenges in the governance of marine ecosystems they are facing, and also bring forward their visions and pathways for solutions. During the workshop the methodology and first results from the consultations were presented (appendix 3f), followed by group discussions to obtain additional feedback from the overarching stakeholders and to assess how unique each area with its own characteristics and dynamics is.

- **Observations and key-findings**

In the earlier consultations the fragmentation of policy and regulatory overlap, with regard to impacts of e.g. climate change, alien species, and massive tourism, were indicated as the common concerns through the BBTs. Discussions in the workshop also covered the role and relevance of Marine Protected Areas, with differing views on their effectiveness, the degree of protection, degree of enforcement, and implications for local communities. Despite the diversity of contexts that may differ for each study area, the same common concerns emerged in the workshop as in the consultations, reflecting shared governance struggles.



- **Relevance**

The session not only reinforced the importance of a bottom-up approach in governance practices but also ensured that the scientific tools being developed in the projects are grounded in the realities of local stakeholders, enhancing the potential of those instruments to be regionally relevant for long-term implementation.

5.7. The MARBEFES Toolbox

5.7.1. Introduction to the Toolbox and Toolbox design

- **Workshop activity and purpose**

The aim of the session on the Toolbox was to show the diversity of the 30+ instruments, i.e. tools, that will become available for stakeholders in the MARBEFES Toolbox, ranging from advanced molecular and trait-based methods—such as metabarcoding, eDNA, and telomere analysis—to broader modelling approaches like Bayesian Belief Networks (BBNs) and Structural Equation Modelling (SEM) used to explore ecological relationships (appendix 3g). These tools support knowledge expansion, environmental, social, and economic assessments, data innovation, and decision-making (appendix 3g.1). The Toolbox includes physical devices, guidebooks, species ID tech, data analysis methods, and citizen science tools. The toolbox will be flexible and user-driven, allowing filtering by data type, area, and ecosystem component. A prototype of the Toolbox-design and the outline of a dedicated website were shown (appendix 3g.2), and discussed through Mentimeter questions (appendix 4.e) and in open discussions.

- **Observations and key-findings**

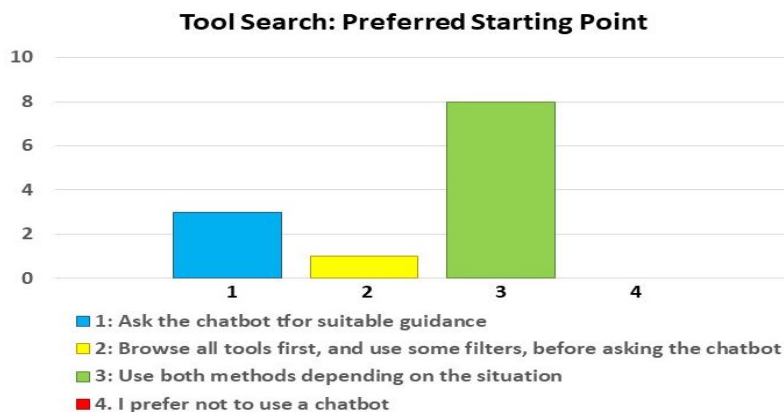
Participants discussed what the Toolbox should look like, how it should function, and what features would best support users, keeping in mind that it will be designed for diverse stakeholders—researchers, educators, communities, PA managers, policy-makers, marine planners, and industry.

Key considerations suggested by the stakeholders are:

- User-friendly design for the high diversity of stakeholder groups
- Clear structure and navigation to explore tools easily
- Search and filter functions by area, data type, ecosystem, and user-needs
- Integration of guidance and examples to support understanding and application of tools
- Interactive elements to enhance engagement and usability

Regarding the entry-modes of the Toolbox, to reach the right or preferred tool, the stakeholders were requested to choose from four options (Fig. 11) :

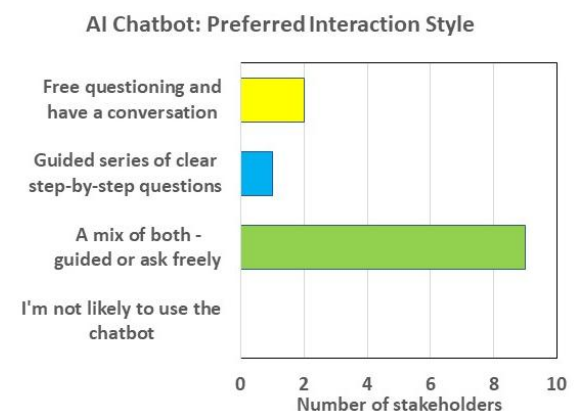
1. Ask the chatbot for suitable guidance
2. Browse all tools first, and use some filters, before asking the chatbot
3. Use both methods depending on the situation
4. I prefer not to use a chatbot



The majority of stakeholders preferred a flexible approach (Option 3), indicating they would use both user-modes depending on their needs. A smaller group preferred to ask the chatbot directly (Option 1), while only one stakeholder chose to browse all tools first before using chatbot assistance (Option 2).

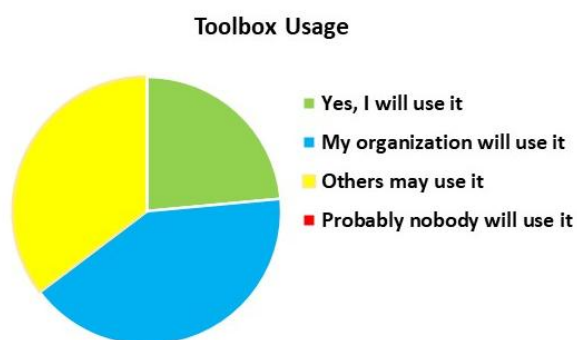
Figure 11. Stakeholder preferences for starting a tool search in the Toolbox

This suggests that while users value the efficiency of chatbot support, they also appreciate having the option to explore tools independently. Therefore, designing the Toolbox with both interactive chatbot support and robust filtering options will best accommodate varying user preferences and improve overall usability.



Regarding the interaction styles with the AI chatbot the majority of the stakeholders preferred a mixed approach—having the option to follow guided step-by-step questions, or ask open questions freely (Fig. 12). These results indicate that most users value flexibility and suggest the chatbot should support both structured and open-ended interactions.

Figure 12. Preferred chatbot interaction style among stakeholders.



The larger part of the stakeholders indicated they themselves or their organization will use the Toolbox, reflecting high individual and institutional interest. Another group felt others may use the Toolbox (Fig. 13). These results highlight a strong potential for both individual and organizational application and usage of the tools.

The stakeholders advised to add spoken tutorials, of only a couple of minutes, for each tool to improve the (correct) use of the tools.

Figure 13. Stakeholder interest and intent to use the Toolbox.

• Relevance

The interaction with the stakeholders helped to ensure the Toolbox website is practical, accessible, and adaptable to a wide range of marine ecosystem management contexts.

5.7.2. BROADSCALE BIOLOGICAL TRAITS AND METRICS OF HABITAT FUNCTION

- **Workshop activity and purpose**

In this section, as an example of the concepts available in the Toolbox, two tools were introduced in short presentations to offer opportunity for feedback and questions in an open group discussion. The tools being “Broadscale biological traits” focusing on describing functional diversity by analyzing species characteristics that define their ecological roles, rather than their taxonomic classification (appendix 3g.3), and “Metrics of habitat function” aiming to quantify and map ecosystem functioning across habitats within a specific area (appendix 3g.4).



- **Observations and key-findings**

The tool “Broadscale biological traits” helps to assess the variety of biological traits within an ecosystem to better understand ecosystem functioning and resilience. An example was given how it has been applied in regions like the Finnish Archipelago Sea (Fig. 14). The data, and maps on the data, help to link marine biodiversity and ecosystem functioning with ecosystem services to support sustainable marine management.

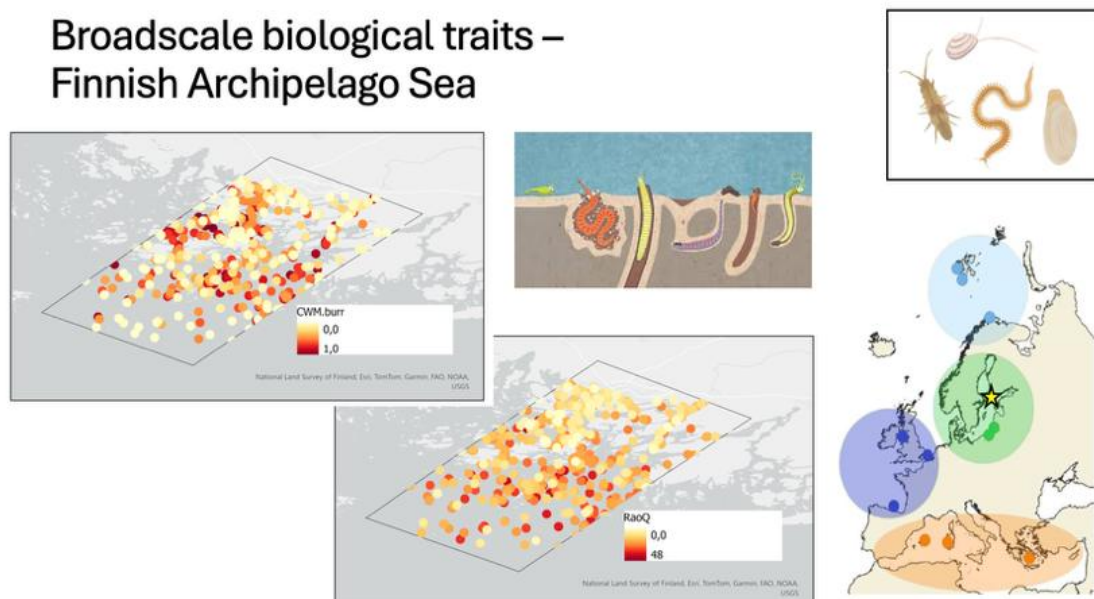


Figure 14. Broadscale biological traits, example from the Finnish Archipelago Sea BBT

The “Metric of Habitat Function” tool focuses on identifying key biological, geochemical, and physical processes that contribute to ecosystem services, thereby supporting effective environmental assessment and planning. To this end, it uses habitat maps, environmental data, and GIS layers to quantify and visualize ecosystem functions. An example was given how it has been applied in the Menorca Channel (Fig.15).

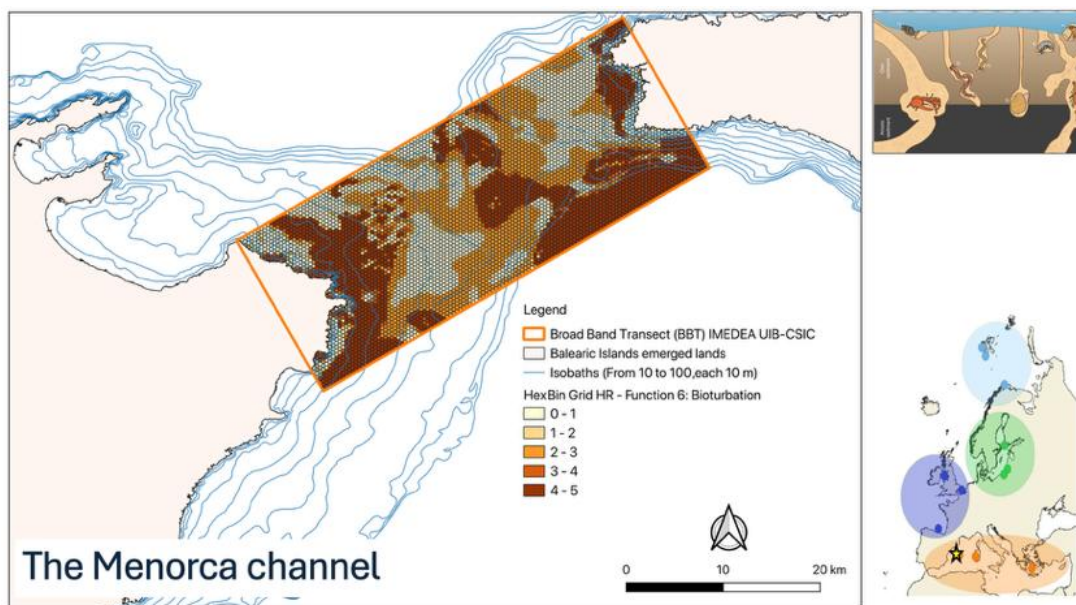


Figure 15. Metric of habitat function, example from the Menorca Channel BBT

The discussion included topics such as the possibility to include temporal aspects into the analysis (only spatial patterns were presented) as well as the availability of data and possibilities to obtain graphical elements (maps) through the tools. In all, these topics clearly show that the stakeholders were interested in the applications and saw potential in adapting the tools further.

- **Relevance**

These tools help integrate nature values and human pressures into marine spatial planning and decision-making processes. Overall, the engagement confirmed the relevance and potential for further adaptation of these tools, offering valuable insights for both tool and toolbox developers.

5.8. Tools & Stakeholders

- **Workshop activity and purpose**

This session summarized results of discussions held during the second series of stakeholder consultations in the MARBEFES and Marine SABRES projects, in which the stakeholders could indicate the appraisal of a couple of tools developed in the projects until now (appendix 3h).

- **Observations and key-findings**

The majority of stakeholders in the second series of consultations understood the concept of the BowTie completely or most of it, in such a way they would use the tool themselves. Yet, quite some stakeholders indicate that there could arise also difficulties in using the tool, and to this end clear guidelines should be given. For using the tool an online web-app is preferred above in the cloud or as a stand-alone program.

The stakeholders indicated that the essential environmental elements were all or at least partly included in the Causal Loop Diagrams that were developed for their areas. This means the consultations in the first year

- **Relevance**

5.9. Decision Support Systems (DSS)

- **Workshop activity and purpose**

The prime purpose of the session was to familiarise participants with the ShinyApp DSTs and to illustrate how this could improve the decision-making process, and to gather feedback on its relevance and usability.

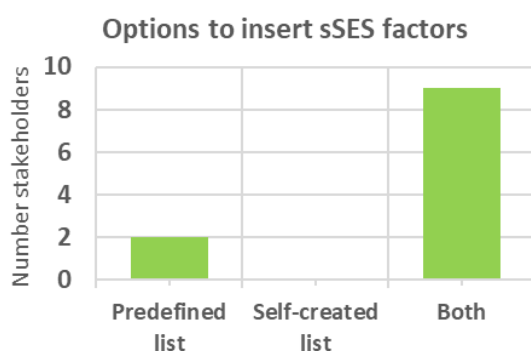


- **Observations and key-findings**

The stakeholders were very positive towards the applicability of the Shiny-App DSS tool and the important insights it may provide. Stakeholders indicated it could be vital in maritime spatial planning, particularly for Marine Protected Areas (MPAs).

Nevertheless, the stakeholders advised to focus on what stakeholders can use, i.e. the main processes and outcomes, and not to go into too much (technical nor scientific) detail, and not to mention all caveats and critical issues. Thereby, among the stakeholders a high interest was expressed in the “key drivers” in, and the “outcomes” of, the whole system, to understand the main factors driving the dynamics in the sSES, and to see the final consequence of the various cause-effect relationships in the system. In addition, interest was indicated in the recognition of bottlenecks and leverage points in the system.

A high-priority was given to include standardised methods for handling qualitative data, easy navigation and modification of system models, and clear mechanisms to prevent data misuse.

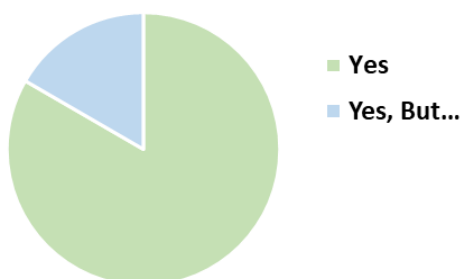


For selecting factors to be inserted in the ShinyApp DST tool the stakeholders would prefer to have a list with predefined factors as well as the possibility to create, or to add, themselves such a list (Fig. 17). Stakeholders also emphasized the need for spatial information and sector-specific impact assessment capabilities.

Figure 17. Number of stakeholders preferring to select sSES factors from a pre-defined list or to create a list with factors themselves

The stakeholders were strongly in favor of embedding Geographic Information Systems (GIS) into the ShinyApp DSS, and in majority would use it in their work. They would prefer in the GIS application for islands a spatial resolution at scales of 1 to 5 k), and for mainland areas finer scales (around 100 meters). These insights may help to guide the design and application of the Shiny-app DSS to be tailored to regional needs.

Is GIS helpful to construct a sSES for your area



The majority of participants were positive on the role of GIS in constructing a sSES for their area (Fig.18), indicating a strong trust in the utility of GIS for supporting SES development.

Figure 18. Stakeholder perception on the usefulness of GIS in constructing a Simple SES.

- **Relevance**

The information collected helps to develop both the functionality and interface of the ShinyApp DSS further, and to increase the practical applicability of the tool.

5.10. Valuation of Coastal Systems

- **Workshop activity and purpose**

At the start of the session the results of the earlier rounds of consultations were shown (appendix 3j). Stakeholders were then asked to evaluate the relevance and applicability of different valuation approaches—ecological, accounting, economic, and socio-cultural—in the context of marine biodiversity. For the second part of the session the stakeholders were meeting at the beach of Zandvoort to discuss the relevance of *in-situ* studies for socio-cultural valuation

- **Observations and key-findings**

In the first part it was shown that Ecological valuation of biodiversity and ecosystems is twice more preferred than the other types of valuation, whereby Capital Accounting is the least valued, and Economic and Socio-cultural valuation received intermediate scores.

The second part of the session brought participants outside to Zandvoort beach—an improvisation designed to energise participants, reframe our thinking, and connect with the local coastal environment. The aim was to consider the benefits of physically going to research sites as a research team studying cultural ecosystem services and benefits. At the start of the session, it was explained that *in situ* research helps to incite researcher empathy and foster ethical approaches to studying people and place. Such an approach with *in situ* interviews and workshops is very important for identifying and engaging local stakeholders with knowledge of, or interests in, cultural ecosystem services. The place itself may host cultural activities that are not apparent online, and which demand the inclusion of specific stakeholders. Visiting a place can be an ideal opportunity to make contact with these stakeholders



(photo credit Lars Olav Sparboe, Tromsø, Norway)

In this session at the beach the stakeholders and researchers were requested to ponder the value of visiting a study site as a research team at the beginning of a cultural ecosystem services study.

All stakeholders were forthcoming about discussing the value of *in situ*, or place-based, research at local study sites. Some of their observations included that observational and *in situ* research themselves are difficult to pin down—observations and opinions are dynamic and changeable aspects. Thereby, cultural value is often a lived value, that may not be fully captured by numbers or words, and moreover may change upon reflection in the days or months after an event. This makes it also difficult to capture/conceive a cultural value and even more difficult to incorporate it into policy?

Nevertheless, it is important to do long-term place-based engagement with locals, and can't just be done in one short visit. The reason is that local people can have long-term environmental or cultural knowledge which is not readily available elsewhere. Moreover, local people may also have quick and easy answers to ecological or cultural problems that researchers are struggling with for long periods of time.

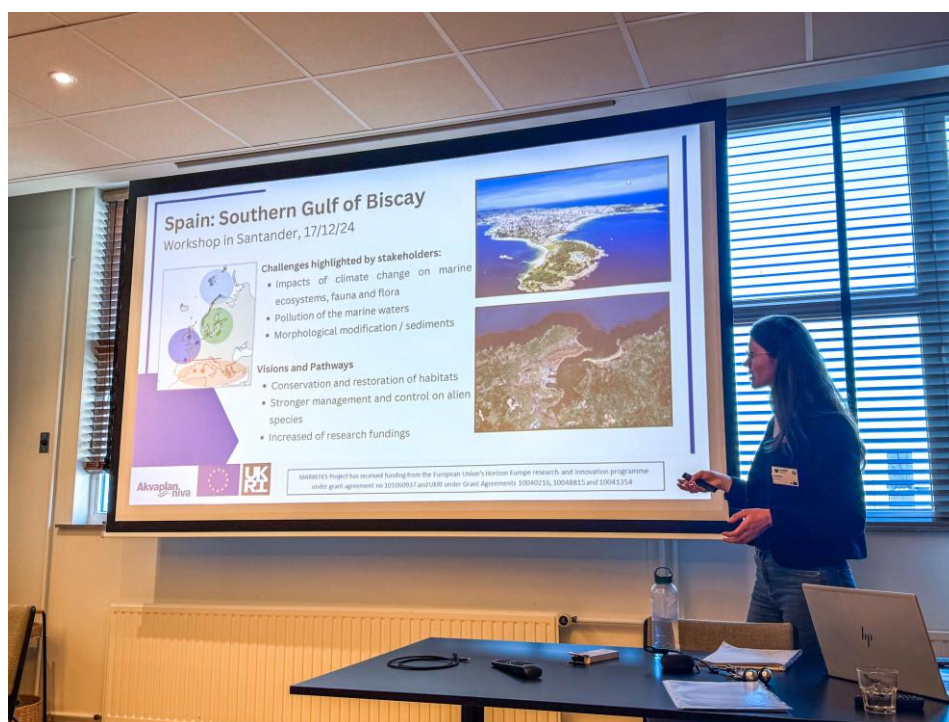
- **Relevance**

The session showed that Socio-cultural and Ecological valuation should receive a (more) prominent place in the policies, management and planning of marine and coastal ecosystems. Moreover, the session gained valuable feedback on *in situ* research approaches and Social and Cultural ecosystem values. This feedback will be incorporated into the guidelines for socio-cultural valuation in the MARBEFES stakeholder-facing handbook for ecosystem valuation.

5.11. Marine Protected Areas

- **Workshop activity and purpose**

In this interactive session, stakeholders participated in a role-playing exercise centered on the hypothetical creation of a new Marine Protected Area in their region (appendix 3k). Divided into small groups, each participant was assigned a role representing a different interest group—often differing from their real-life perspective—to encourage empathy and broaden understanding. The groups engaged in discussions, negotiations, and compromises to formulate a strategy for establishing the protected area. Group presentations at the end highlighted the various approaches taken by the stakeholders.



- **Observations and key-findings**

The final overviews given by the stakeholders revealed diverse approaches to protection levels and management strategies, while also highlighting shared difficulties in reaching consensus and developing concrete solutions. Although the activity was not intended for data collection, it served as a valuable exercise in exploring the complexities of marine conservation governance, reflecting real-world tensions frequently observed across various case study sites.

- **Relevance**

The session underscored the need for clearer initial information, but effectively showed the potential to foster engagement and awareness around stakeholder conflicts and the multifaceted nature of marine protected area implementation.

5.12. Stakeholder Evaluation and Appreciation of the Tools

At the end of each day the stakeholders were asked to fill in a Mentimeter survey to indicate their appraisal of the various tools and approaches that were presented (appendix 4g,4h). To this end the stakeholders could rate to what degree they understood the structure and function of the approaches and tools, to what extent they expected them to be successful, and whether the approaches and tools would be used in the management of their marine area.

All presented tools and approaches were understood to quite a high degree (Fig. 19), reflecting strong overall comprehension of the Marine SABRES and MARBEFES tools.

The principles and structure of the BowTie, SSP (Shared Socio-economic Pathway) scenarios, and the CLD (Causal Loop Diagram) were understood a lot or quite a lot, directly followed by the Toolbox and ShinyApp being understood somewhat or quite a lot. The Valuation of coastal systems, Biological traits and Habitat function were understood somewhat.

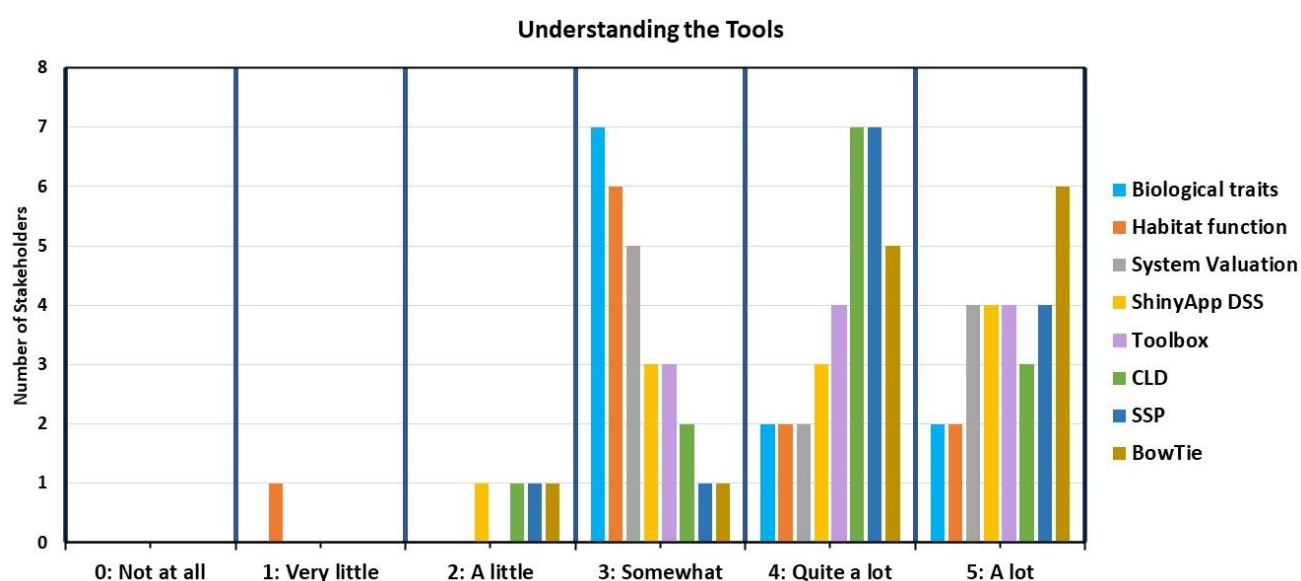


Figure 19. Level of understanding the structure and principles of the presented approaches and tools

The relevance of all tools was high for the professional sectors of the stakeholders, with the SSPs and Stakeholder Priorities as most relevant (Fig. 20). This indicates that the tools developed in Marine SABRES and MARBEFES strongly align with the stakeholders' professional interests, and are well suited for a wide range of stakeholders.

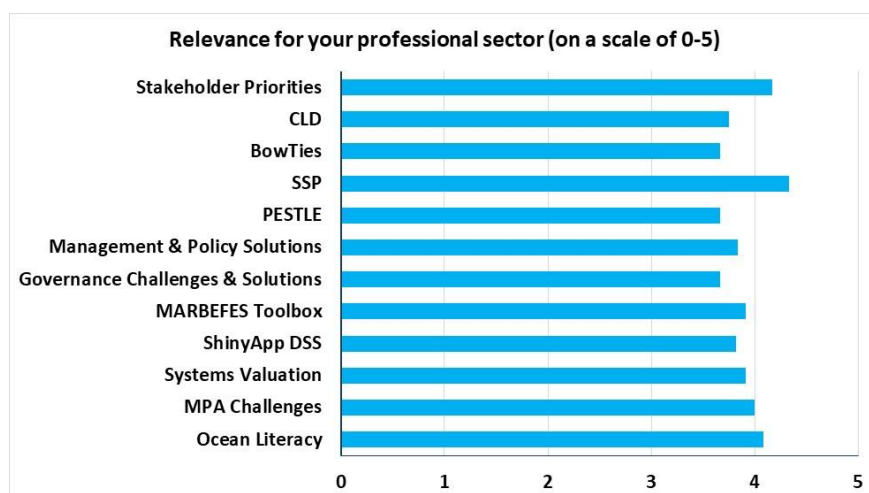


Figure 20. Average relevance (on scale from 0 to 5) of the tools and approaches for the stakeholder's professional sector

The stakeholders expected also all tools to be up to a high level successful, with the BowTie tool and PESTLE approach being the most successful (Fig. 21)

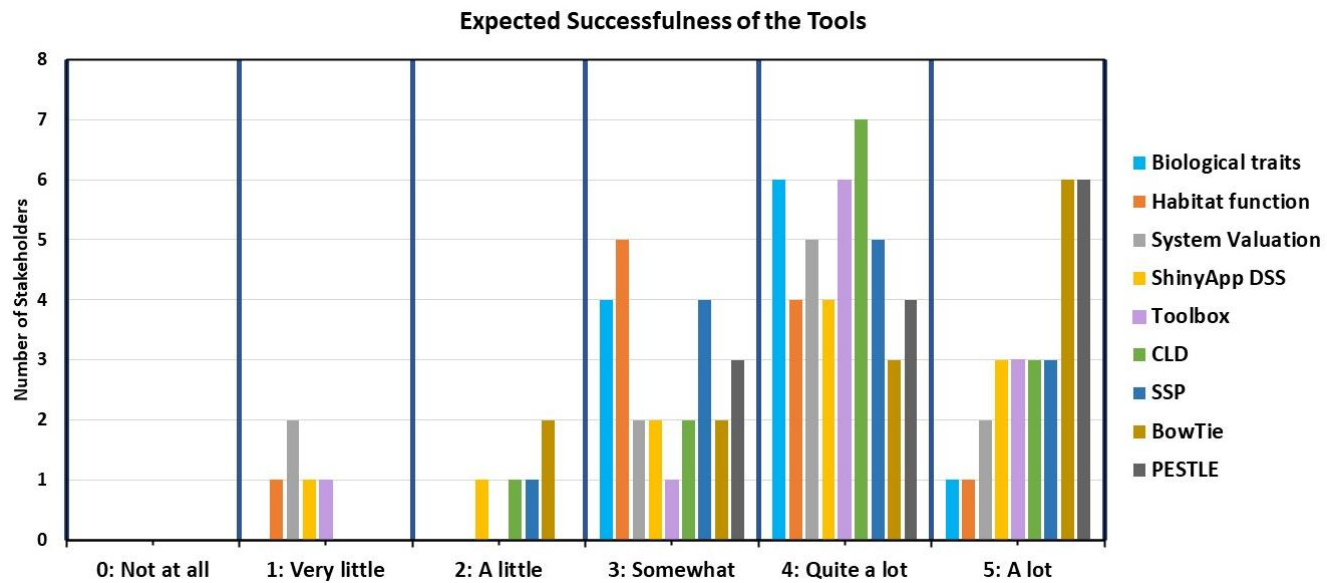


Figure 21. Level of success expected by the stakeholders for the presented approaches and tools

Stakeholders expressed very high expectations regarding the use of the instruments (Fig. 22). Up to 94 % of their answers were a positive Yes about using the tools for the management in their marine area, whereby two-third indicated it would be used by others in their area and one-third would also use it themselves.

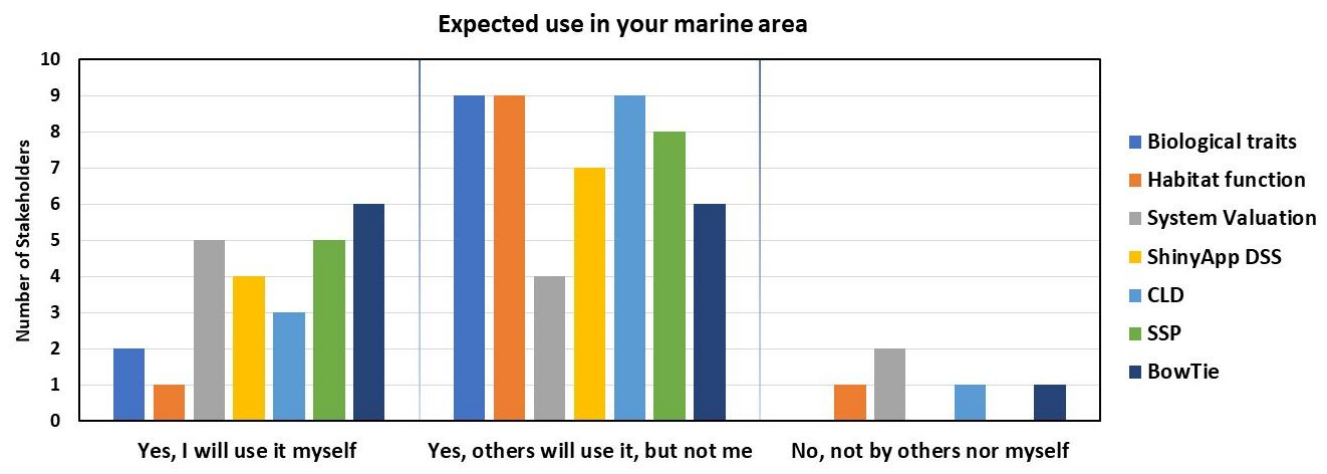


Figure 19. Level of understanding the structure and principles of the presented approaches and tools

These results highlight that stakeholders found all the presented tools relevant and useful and expect them to become integrated into the work in their area, though a few tools may need a further explanation to be fully understood and of use.

5.13. Stakeholder Evaluation of the Workshop

All general workshop aspects, as workshop organization, communication, timing and catering, were judged by the stakeholders to be very good (Fig. 21, appendix 4i), reflecting a well-organized event.

A small criticism was brought forward regarding the catering since some dishes were called vegetarian but there was fish in them, or vegan but there was cheese in.

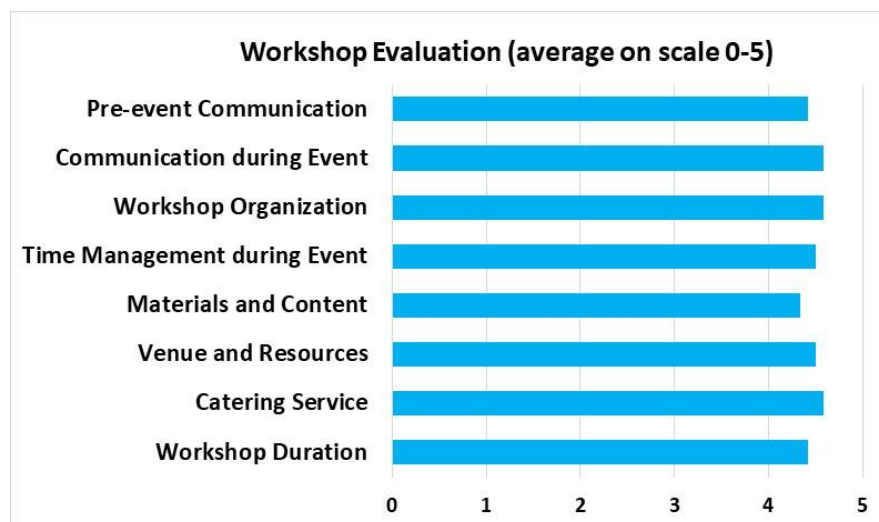


Figure 21: Average scores for the appraisal of general workshop aspects.

The stakeholders actively expressed strong interest in attending similar events in the future, and will strongly recommend the workshop, that met their expectations to a very high degree (Fig. 22).

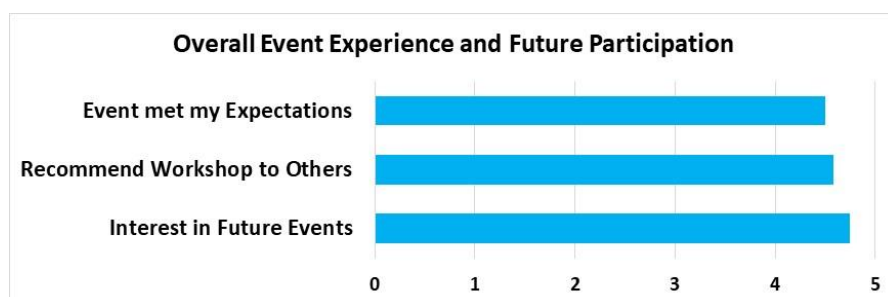


Figure 22: Stakeholders' appraisal and interest in future participation.

These results indicate that the stakeholders involved in Marine SABRES and MARBEFES experienced significant value in the workshop and most likely will remain engaged in future actions.

When questioned what issues they liked most, the stakeholders mentioned to "Participate in meaningful work", "The feedback from the researchers", "Great to see the progress on the tools from last year", "Learning new tools", "The networking with smart, kind people has been really enriching and pleasant", "The discussions", "Exchange of different experiences", "Wonderful friendly people", "Herman is very good moderator and keeps time scheduled", "Good atmosphere and location", "The good clima of cooperation between participants", "Group Spirit", "The participative approach", "The opportunity to contribute", "The high level of the presentations", being "Aware of different realities/knowledge", "Getting to understand somewhat complex issues by being clearly explained by the team in such a short time was very valuable", "You're heading in the right direction. Keep up the good work!!", and lastly "Thank you so much for another wonderful 2 days. I look forward to seeing the progress again next year too".

Also some issues that should be taken care of were mentioned, such as a "Tight schedule", "A bit of more time to interact", "Days were very long - would be better to do shorter days over 3 days", "Maybe a bit too busy program", "Some were detailed explanations", "Extensive theoretical contents", "Terms used by scientists (abbreviations) sometimes difficult communicated".

These evaluation indicated that, irrespective a tight schedule with sometimes too detailed theoretical sessions, the workshop was generally well-received, with strong satisfaction on the overall structure and content of the event and how the information was conveyed.

6. Conclusion

The Second Overarching Stakeholders Workshop, held in Zandvoort in April 2025, marked a significant step forward in advancing participatory, evidence-based approaches to marine and coastal governance. Bringing together a diverse group of stakeholders and researchers from across Europe, the event facilitated rich, constructive dialogue on pressing issues such as biodiversity loss, climate change, tourism, governance complexity, and the development of practical tools for sustainable management.

Through interactive sessions, scenario planning, tool demonstrations, and co-creative exercises, the workshop not only validated prior research findings but also generated new insights and actionable feedback. The presentations together with the co-creative exercises and vivid discussions helped to further increase understanding of the various approaches and tools that could previously have raised questions.

Participants expressed strong support for the integrated use of the developed tools—such as Causal Loop Diagrams, BowTie analysis, Socio-ecological models, and the ShinyApp Decision Support System—as well as for inclusive, regionally sensitive governance frameworks.

The engagement outcomes underscore the value of stakeholder engagement and cross-sector collaboration in developing tools that are user-friendly, adaptable, and aligned with real-world decision-making needs. By grounding scientific innovations in the lived experiences and expertise of stakeholders, Marine SABRES and MARBEFES have laid a foundation for more resilient, informed, and collaborative marine policy and practical tools and approaches.

The workshop's high levels of participant satisfaction, coupled with clear interest in ongoing involvement, demonstrate a collective commitment to shape a sustainable future for Europe's marine and coastal regions.

The insights gained during the workshop will directly inform the refinement of project tools and approaches by the project-researchers, in co-design with enthusiastic and committed stakeholders, ensuring their continued relevance and effectiveness in supporting both sustainable ecological integrity and societal well-being.

Finally, during a workshop mostly some remarkable or strong comments are made, some of which we would like to share with you:

- *People still do not know the costs of mitigation and adaptation – if they would know they might think different - make more clear that it costs a lot.*
- *Environment is only for the rich people, the other think with their pocket-money.*
- *Depropriation of fisheries-grounds should not be an issue, since the sea is not only for the fishermen, it is for all the community - we need a change in approach.*
- *The instruments are too difficult for young people – it has to be simplified - make instead of long written guidelines, spoken tutorials of a couple of minutes.*
- *We have to sell the products that are useful for the stakeholders, without mentioning all caveats and critical issues.*

Acknowledgements

We acknowledge the European Union's Horizon Europe programme for funding of the Marine SABRES project under grant agreement No. 101058956 and of the MARBEFES project under grant agreement No. 101060937. Without this support, such meaningful cross-regional, multi-stakeholder dialogue would not have been possible.

7. List of Appendices

Appendix 1. Programme of the Overarching Stakeholder workshop in Zandvoort, NL

Appendix 2. Participants to the Overarching Stakeholder workshop in Zandvoort, NL

Appendix 3. Powerpoint slides of all presentations

Appendix 4. Results of all Mentimeter surveys during the sessions

Marine SABRES Milestone 2.17 – MARBEFES Second Annex to Deliverable 1.2

Appendix 1. Programme of the Overarching Stakeholder workshop in Zandvoort, NL

Session nr.	Time	Duration (hours)	WP or Task MarineSABRES	WP or Task MARBEFES	Topic
Monday 31 March 2025			Arrival		
	19:00-21:00				Dinner
Tuesday 01 April 2025			Workshop Day 1		
	08:00-08:45				Breakfast
1	09:00-09:15	0,25	MS	MB	Welcome & Tour de table
2	09:15-09:30	0,25	MS	MB	Introduction of workshop
3	09:30-10:15	0,75	MS WP2	MB WP1	Second round Feedback by Stakeholders on the first results concerning Priorities
3.b					Feedback - mentimeter
	10:15-10:45	0,5			Coffee/Tea break
4	10:45-11:45	1	MS WP3 MS WP4	MB WP3	Causal Loops and BowTies: Tools to connect the most important factors in our environment, and understand Coastal Systems
4.b					Intermittently Feedback through round table discussions and paper-surveys
5	11:45-12:30	0,75	MS WP4 MS WP5	MB WP4	Scenarios of Societal and Environmental change under SSP1, SSP3 and SSP5 - The main impacts on the Coastal System - Stakeholder viewpoints on main changes in activities and pressures under the various SSP scenarios
5.b					Intermittently Feedback through round table discussions and paper-surveys
	12:30-13:30	1			Lunch
6	13:30-15:15	1,75	MS WP4 MS WP5	MB WP5	Acceptance and options for governance: the PESTLE approach - Introduction to the exercises and instructions - Individual questionnaire for Options for Coastal Management - Group exercise for the acceptance of the different pathways to management - Presentation of the Group Results and Discussion (Separate Parallel session for project-scientists: System archetypes and coastal issues)
6.b					Intermittently Feedback through round table discussions and paper-surveys
	15:15-15:45	0,5			Coffee/Tea break
7	15:45-16:30	0,75	MS WP5	MB WPx	Estimating the effects of management and policy measures and interventions by means of SE - Short overview of the approach - Testing the effects of measures and interventions on outcomes calculated by means of simple models - How to interpret the analyses
7.b					Intermittently Feedback through round table discussions, paper-surveys, and mentimeter
8	16:30-17:30	1	MS WP5	MB WP1.2	Governance: Rules and Regulations: - Results on the stakeholder consultations about challenges, visions and solutions in governance - Stakeholders to prioritize challenges and visions in governance - Stakeholders' insights how to improve and operationalise pathways to solutions to overcome challenges
8.b					Intermittently Feedback through round table discussions and paper-surveys
	18:30-20:00				Dinner

Marine SABRES Milestone 2.17 – MARBEFES Second Annex to Deliverable 1.2

Wednesday 2 April 2025					
	08:00-08:45				<i>Breakfast</i>
9	09:00-10:15	1,25		MB WP3 MB WP4	The MARBEFES Toolbox - a) Introduction on the concept of the Toolbox (SC - 5 min.) - b) Design and functionalities (FC - 10 min.) - c) Short show of two intended tools in the Toolbox (SC - 2 x 10 min.) - Group discussion (10 min.) - d) Two detailed examples of tools (MN, CG - 2 x 15 min.)
9.b					<i>Intermittently Feedback through round table discussions</i>
	10:15-10:45	0,5			<i>Coffee/Tea break</i>
10	10:45-11:30	0,75	MS WP2	MB WP1 MB WP5 MB WP6	Tools & Stakeholders - a) Appreciation of Tools - observations from the stakeholder workshops of winter 2024/25 (HH - 10 min.) - b) Enablers and limiters/barriers for stakeholders to using scientific tools (JP - 30 min.)
10.b					<i>Intermittently Feedback through plenary group discussions and mentimeter</i>
11	11:30-13:00	1,5	MS WP5	MB WP4	Decision Support Systems (DSS): - Introduction to DSSs, their features and problems - Connections to GIS apps - The SES "Shiny-App"
11.b					<i>Intermittently Feedback breaks (mentimeter)</i>
	13:00-14:00	1			<i>Lunch</i>
12	14:00-15:00	1		MB WP4	Valuation of Coastal Systems Updated overviews of the valuation methods, and how it may contribute to decision-making a) Ecological, economic, and socio-cultural valuation systems by stakeholders (HH: 10 min.) - Integration of valuation systems in decision-making - Appreciation of the valuation systems by stakeholders b) Social and cultural ecosystem benefits - non-financial valuation of ecosystems (AC: 50 min.) - Introducing the concept. - How are the concepts applied in case studies and what types of insight they provide
12.b					<i>Intermittently Feedback through round table discussions and paper-surveys</i>
	15:00-15:30	0,5			<i>Coffee/Tea break</i>
13	15:30-16:00	0,5	MS	MB WP1.2	Marine Protected Areas (MPAs): - The main challenges experienced to implement MPAs in Europe. - Viewpoints on pathways to solutions - How to proceed?
13.b					<i>Intermittently Feedback through round table discussions and paper-surveys</i>
14	16:00-16:45	0,75	MS WP7	MB WP7	Ocean Literacy
14.b					<i>Intermittently Feedback through round table discussions and paper-surveys</i>
15	16:45-17:15	0,5	MS	MB	Synthesis, Conclusions, Next steps
15.b					<i>Feedback break (mentimeter)</i>
16	17:15-17:30	0,25	MS	MB	Meeting closure
	18:30-20:00				<i>Dinner</i>
Thursday 3 April 2025					
	08:00-09:00				<i>Breakfast</i>
					<i>Departure</i>

Appendix 2. Participants to the Overarching Stakeholder workshop in Zandvoort, NL

Project	Territory / WP	Full name	Stakeholder category
Overarching Stakeholders			
M. SABRES	Iceland	Lísa Anne Libungan	Industry and Private sector
M. SABRES	Faroer	Eivind Jacobsen	Public audience & NGOs
M. SABRES	Azores	Bruno Sérgio	Industry and Private sector
M. SABRES	Madeira	Pedro Miguel Correia Sepulveda Monteiro	Public Authorities
M. SABRES	Porto Santo - Madeira	Rubina Brito	Public Authorities
M. SABRES	Fuerteventura	Antonio Gallardo Campos	Public audience & NGOs
M. SABRES	Gran Canaria	Javier Durán	Public Authorities
MARBEFES	Porsanger fjord	Joakim Rokstad Pedersen	Industry and Private sector
MARBEFES	Curonian Lagoon - Lithuania	Dalia Juškevičienė	Public Authorities
MARBEFES	Curonian Lagoon - Lithuania	Aistė Jurkienė	Public audience & NGOs
MARBEFES	Belgian coast - Dogger Bank	Sven van Haelst	Research and Academia
MARBEFES	Irish Sea	Eimear Manning	Public audience & NGOs
MARBEFES	Bay of Biscay	Gustavo Gutiérrez	MPA management
Project researchers			
M. SABRES	MS all WPs	Emma Verling	
M. SABRES	MS all WPs	Zacharoula Kyriazi	
M. SABRES	MS WP4	Bruno Meirelles de Oliveira	
M. SABRES	MS WP5	Berthe Vastenhou	
MARBEFES	MB WP1,6	Sabine Cochrane	
MARBEFES	MB WP1,6	Lea Ricard	
MARBEFES	MB WP1,6	Frida Cnossen	
MARBEFES	MB WP3	Tasman Crowe	
MARBEFES	MB WP3	Ashley Cahillane	
MARBEFES	MB WP4	Marie Nordström	
MARBEFES	MB WP4	Clement Garcia	
MARBEFES	MB WP7	Joanna Piwowarczyk	
MARBEFES	MB WP7	Jan Sliwinski	
MARBEFES	MB WP7	Joanna Potrykus	
MARBEFES	MB WP7	Jan Marcin Weslawski	
Both projects	MS WP2, MB WP1	Herman Hummel	
Both projects	MS WP2, MB WP1	Hanie Mataji	
Both projects	MS WP2, MB WP1	Shadi Sanatgar	
Both projects	MS WP3, MB WP3	Julie Bremner	
Both projects	MS WP3, MB WP4	Gemma Smith	
Both projects	MS WP3, MB WP4	Mike Elliott	
Both projects	MS WP5, MB WP5	Cristina Huertas	
Both projects	MS WP6, MB WP2	Evelina.Griniene	
Both projects	MS WP6, MB WP2	Arturas Razinkovas-Baziukas	

Appendix 3. Powerpoint slides of all presentations

Appendix 3a. Feedback on the Second round of Stakeholder consultations - first results



MARINE SABRES **MARBEFES**

Second Overarching Stakeholders Workshop
01-02 April 2025, Zandvoort, the Netherlands

Welcome & Introduction

Herman Hummel, Bram Sturm, Rob Segeren, Shadi Sanatgar, Hanie Matajinimvar
HuFoSS, Roosendaal, the Netherlands

Marine SABRES is funded by the European Union's Horizon Europe programme under grant agreement No.101058956



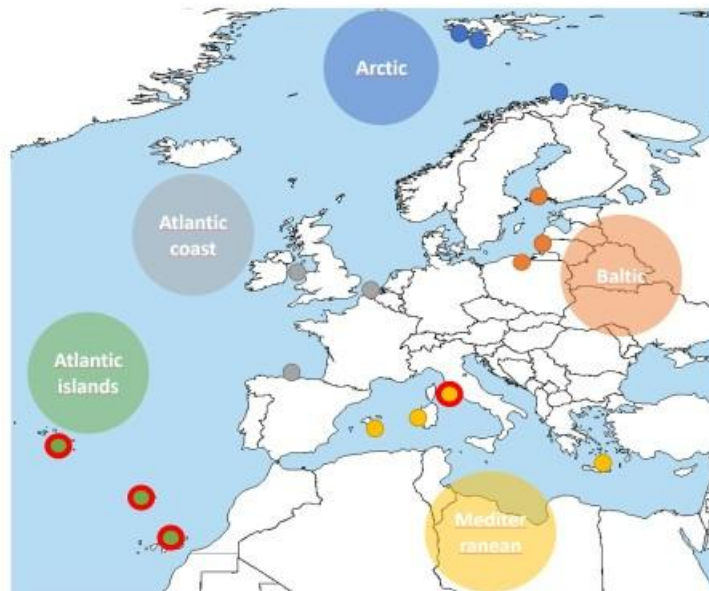
MARBEFES has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement no 101060937

Sessions 1 & 2. Zandvoort workshop

Stakeholder Consultations 2nd round November 2024 - April 2025

Content:

- Aims
- Methods used
- Results



First year:

Stakeholder engagement through interviews, asking the stakeholders:

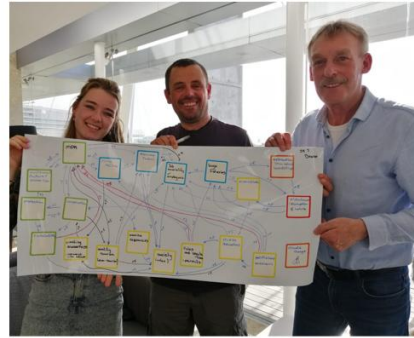
What are the most important elements in the balance between the ecology (nature), economy, and society in your coastal area, and what are the influences and pressures on this balance

Together in the sister -projects MARBEFES and Marine SABRES
in total 231 stakeholders were consulted

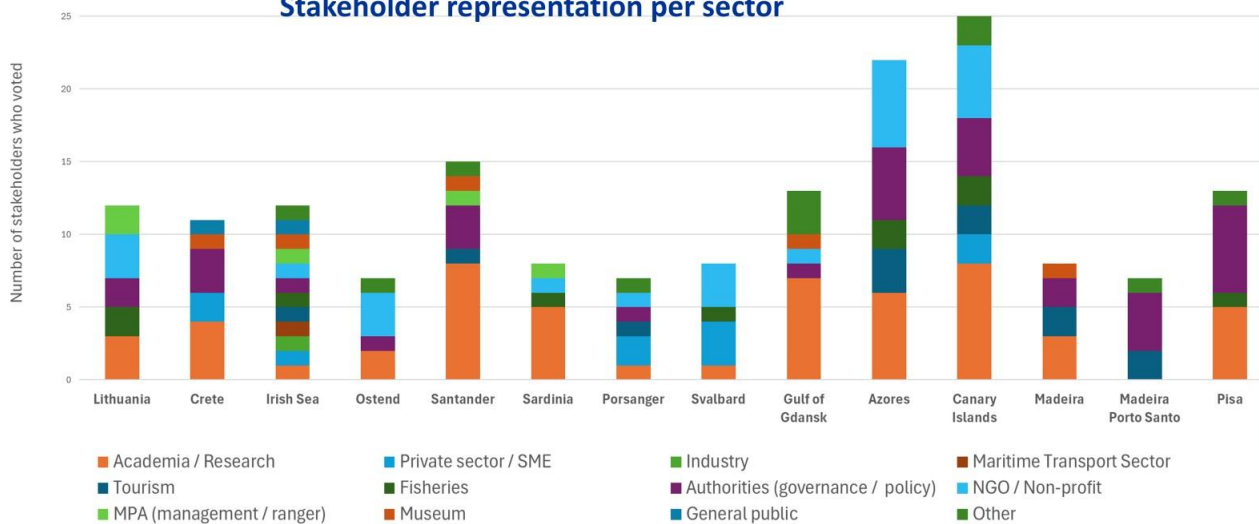
Second year:

Stakeholder engagement through group consultations, asking the stakeholders feedback on results

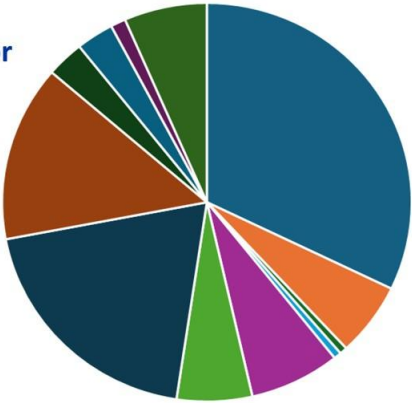
In total (until now) 175 stakeholders were consulted



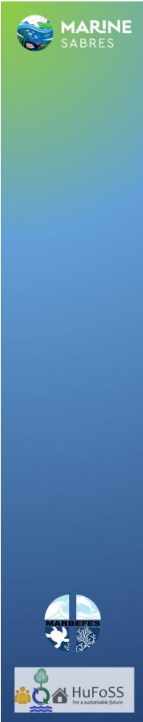
**2nd round of consultations:
Stakeholder representation per sector**



2nd round of consultations:
Stakeholder representation per sector
- 175 stakeholders



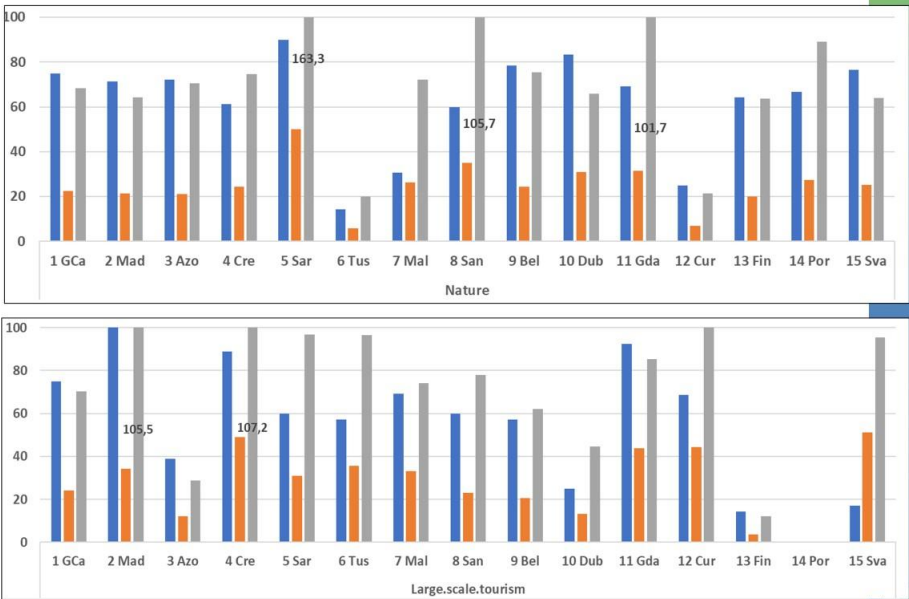
- Academia / Research
- Industry
- Tourism
- Authorities (governance / policy)
- MPA (management / ranger)
- General public
- Private sector / SME
- Maritime Transport Sector
- Fisheries
- NGO / Non-profit
- Museum
- Other



1st round of consultations: Very important variables at BBT / DA – stations all-over Europe

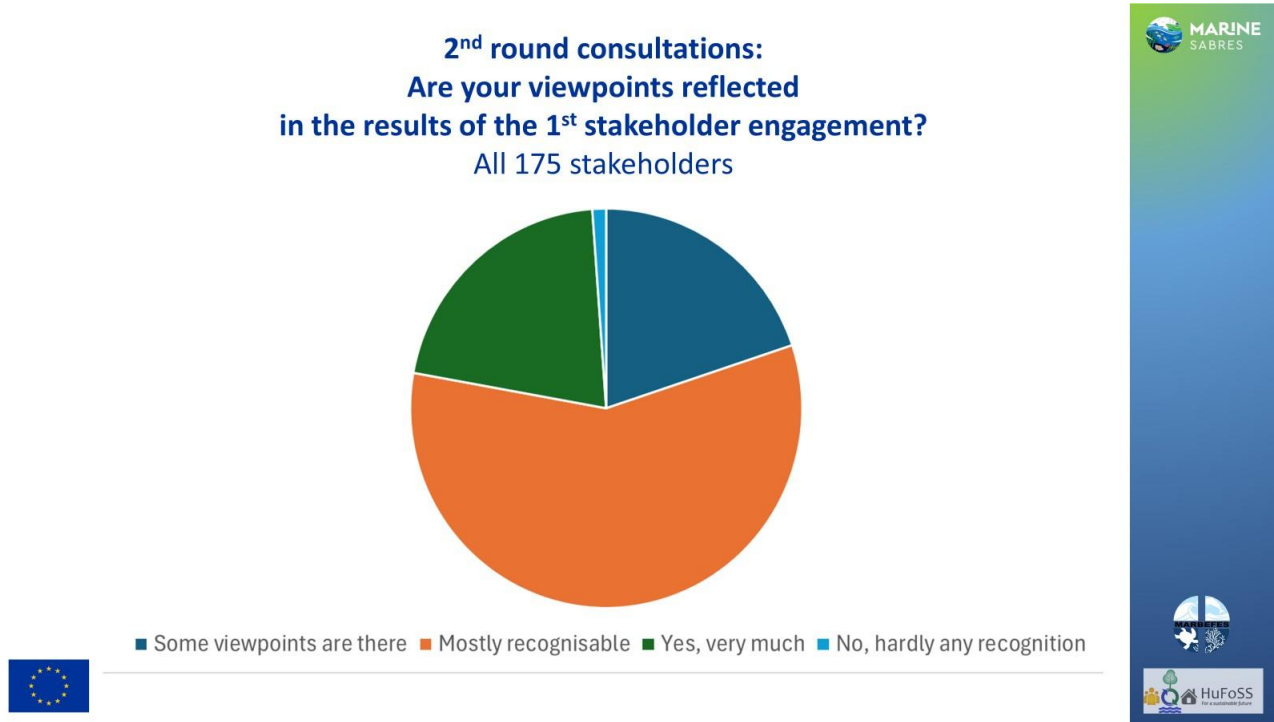
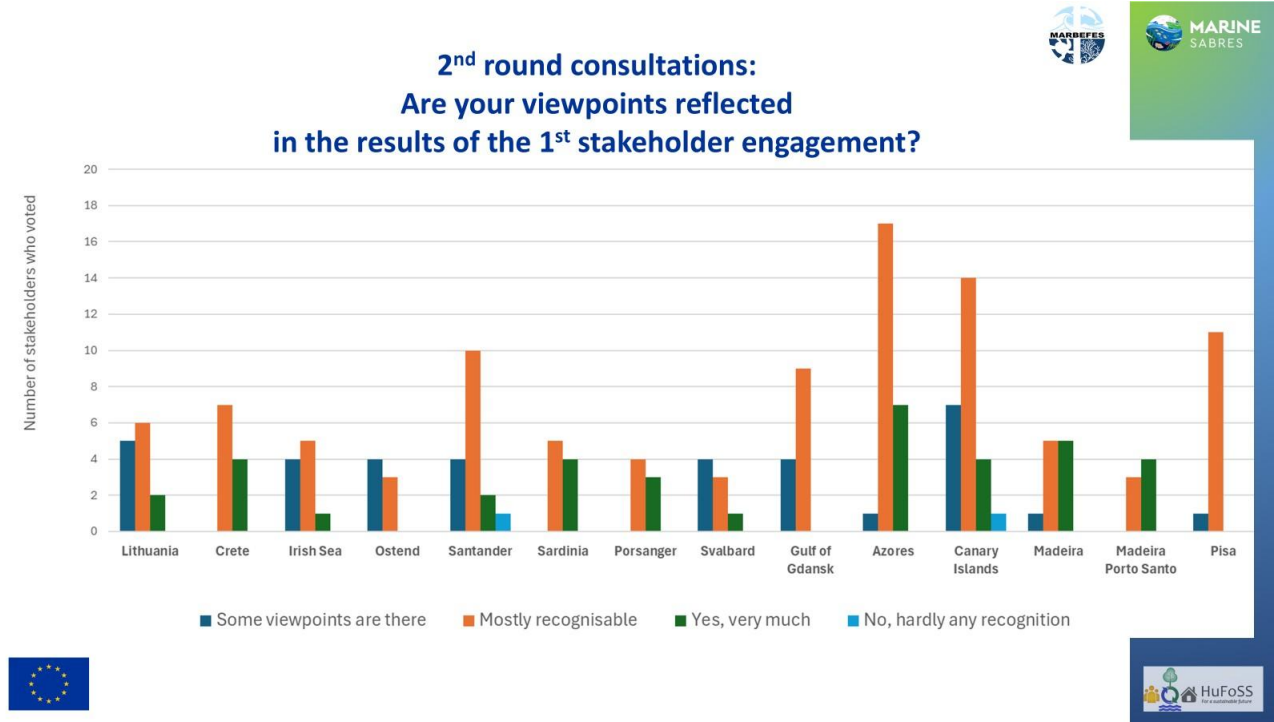
Most important
all-over Europe
are:
- Nature
- Large-scale tourism

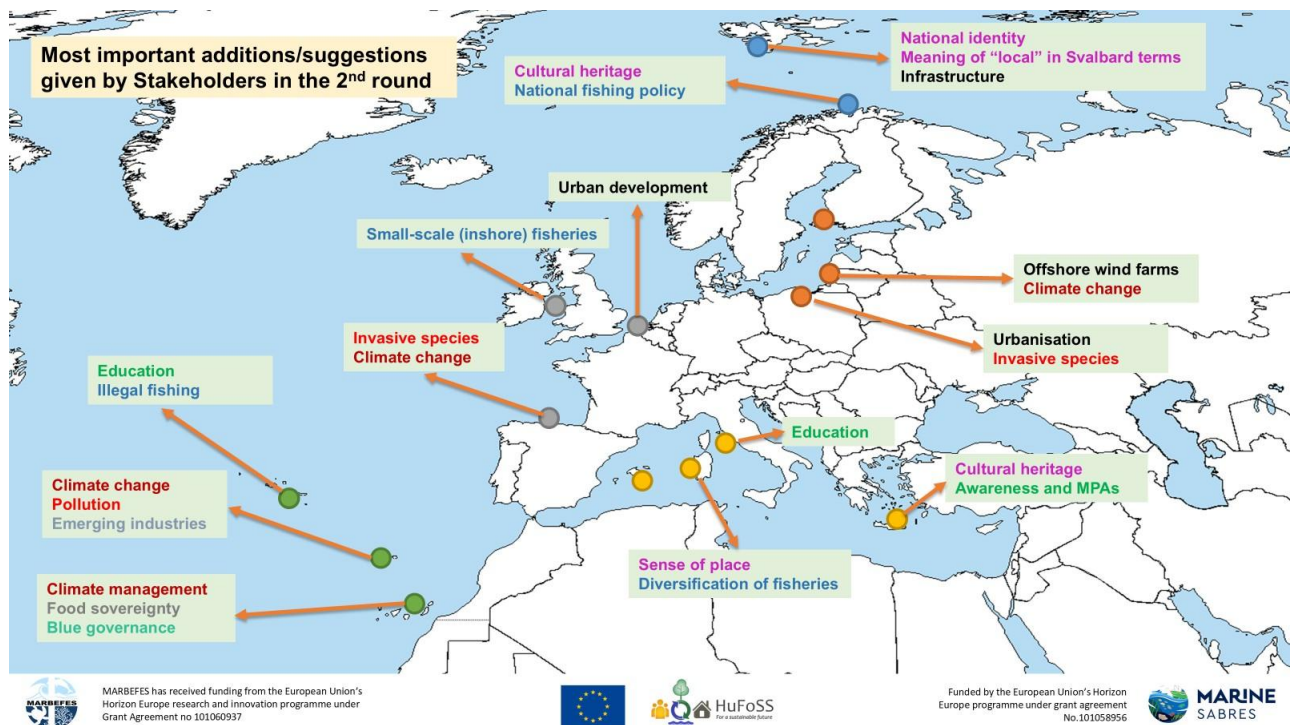
Other important
variables are :
- Biodiversity
- Economy
- Pollution



- % Occurrence in Interviews
- nr. Connections
- Strength of vectors







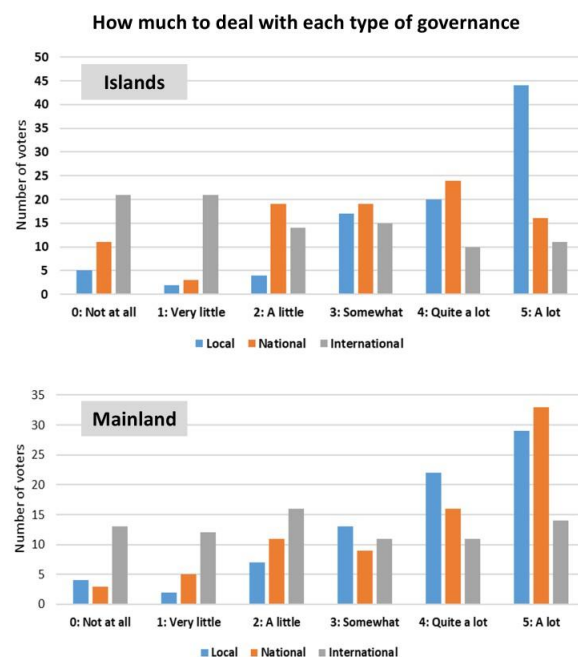
Engagement with Governance in Coastal Communities

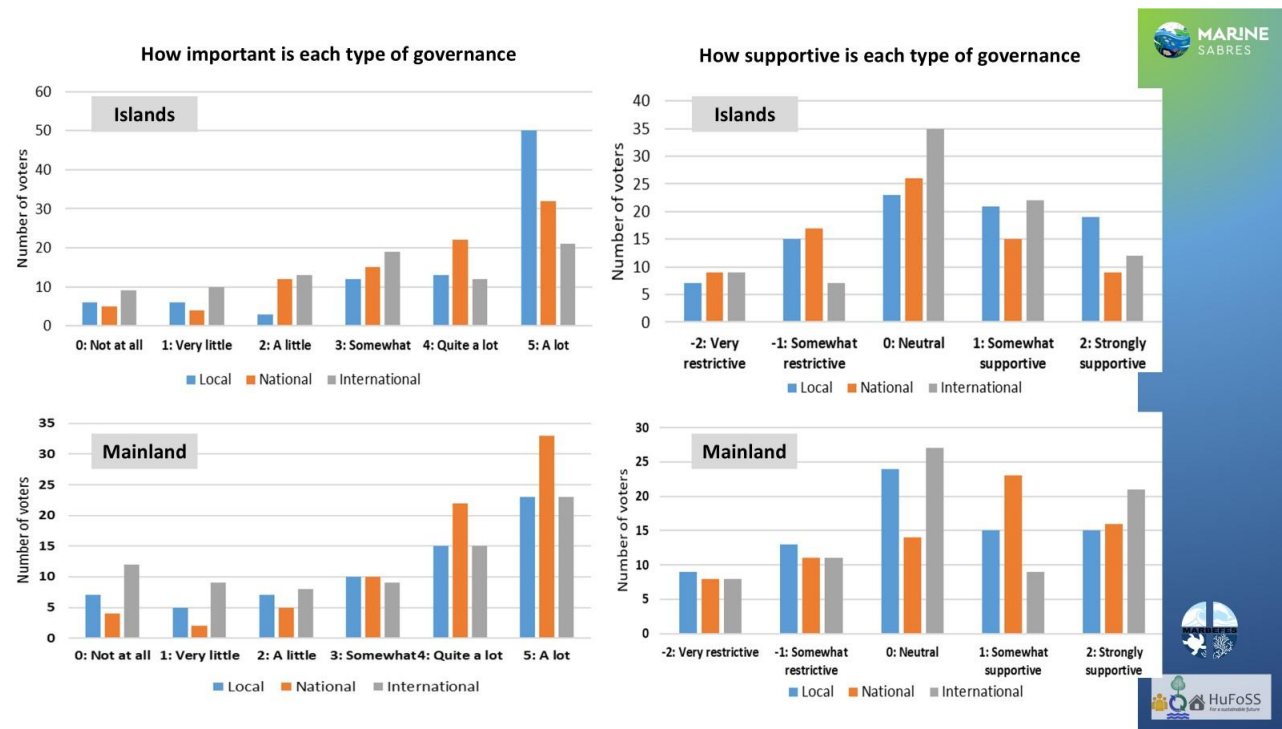
Stakeholders were asked to share their experiences in engaging with different levels of governance, i.e. Local, National, and International

Questions were:

- How much your sector has to deal with each type of governance
- How important to your sector is each type of governance
- How supportive to your sector is each type of governance

The difference in perceptions between "Mainland" and "Island" communities was emphasised







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MARBEFES

Thank you for your attention

Questions to us?

Herman Hummel, Shadi Sanatgar, Hanie Matajinimvar
Bram Sturm, Rob Segeren
HuFoSS, Roosendaal, the Netherlands

Marine SABRES is funded by the European Union's Horizon Europe programme under grant agreement No.101058956



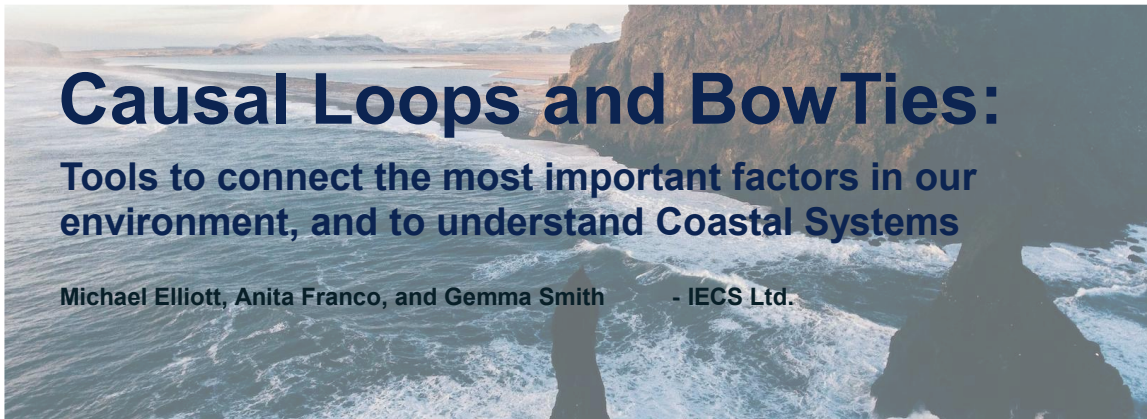


HuFoSS
For a sustainable future

MARBEFES has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement no 101060937

Appendix 3b. Causal Loops and BowTies

STAKEHOLDER CONSULTATIONS



Causal Loops and BowTies:

Tools to connect the most important factors in our environment, and to understand Coastal Systems

Michael Elliott, Anita Franco, and Gemma Smith - IECS Ltd.



Funded by
the European Union



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Objectives of the Session

1. Provide an overview of the Simple SES and Bow-Tie tools.
2. Explain how these may aid users in understanding a problem
3. Gain feedback and input from you as Stakeholder!



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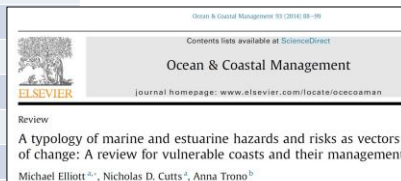
Management Questions:

- Where are the problems & What changes do they cause?
- What is the impact of these on ecosystem structure and functioning?
- What are the repercussions for ecosystem valuation based on economy-ecology interactions?
- What are the future environmental changes and economic futures?
- What governance framework is there, what do stakeholders need?
- What can we do about the problems?
- Where are the risks and how to address them now and in the future?
- What are the governance successes, failures and implications?
- How 'good' is the decision-making?
- What are the bottlenecks, showstoppers and train-wrecks?

Hazard leading to Risk (depending on assets)

- A) Surface hydrological hazards
- B) Surface physiographic removal by natural processes - chronic/long-term
- C) Surface physiographic removal by human actions - chronic/long-term
- D) Surface physiographic removal - acute/short-term
- E) Climatological hazards - acute/short term
- F) Climatological hazards - chronic/long term
- G) Tectonic hazards - acute/short term
- H) Tectonic hazards - chronic/ long term
- I) Anthropogenic microbial biohazards
- J) Anthropogenic macrobial biohazards
- K) Anthropogenic introduced technological hazards
- L) Anthropogenic extractive technological hazards
- M) Anthropogenic acute chemical hazards
- N) Anthropogenic chronic chemical hazards
- O) Anthropogenic acute geopolitical hazards
- P) Anthropogenic chronic geopolitical hazards

Hazard & Risk Typology:



Chapter 1

A Synthesis: What Is the Future for Coasts, Estuaries, Deltas and Other Transitional Habitats in 2050 and Beyond?

Michael Elliott^{a,*}, John W. Day^a, Ramesh Ramachandran^a, Eric Wolanski^b

(NB. All hazards and risks exacerbated by climate change)

Challenges for management (RA&RM; OA&OM):

Risk Assessment:

- Where are the problems and what changes do they cause? (ExUP & EnMP)
- What is their impact on ecosystem structure and functioning?
- What are the repercussions for ecosystem valuation based on economy - ecology interactions?
- What are the future environmental changes and economic futures?

Risk Management:

- What governance framework is there, what do stakeholders need & what are successes & failures?
- What can we do about the problems, hazards & risks and how to address them now and in the future?
- How 'good' is the decision-making?

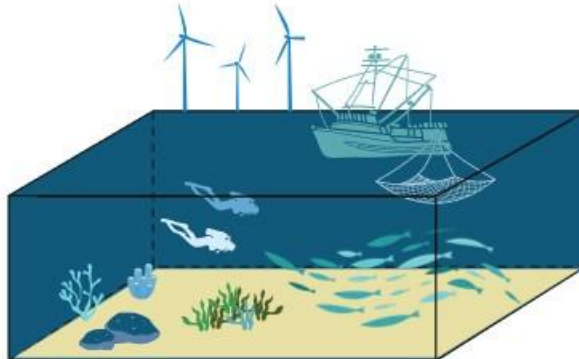
And the corollary: Opportunity Assessment and Management

(Elliott, 2014 Mar. Poll. Bull.; Cormier et al 2019 OCMA, and others)

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What is a Marine Social-Ecological System?

- A marine area where human and natural elements exist together and impact each other.



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The Simple SES Approach

Helps managing a complex marine system by understanding how it behaves as a whole.

It is as 'simple' as A, B, C...



Part A - **Understand the Priorities** in the area and what we are intending to improve.



Part B - **Gather information** on the system to inform upon how it works.



Part C - **Use the information** to design management interventions to improve the situation.



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Part A - Understand the Priorities in the area and what we are intending to improve.



Project Management



Risk Assessment



Stakeholder engagement and communication



The rules are in place (Policy) and who is responsible for management (Administration)



Define challenges, Priorities, and Scope of the approach with stakeholders



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Part B - Gather information on the system to inform upon how it works.



Identify indicators for Social and Ecological elements in the system.



Using data, expert opinion, and stakeholder knowledge assess the connections between indicators.

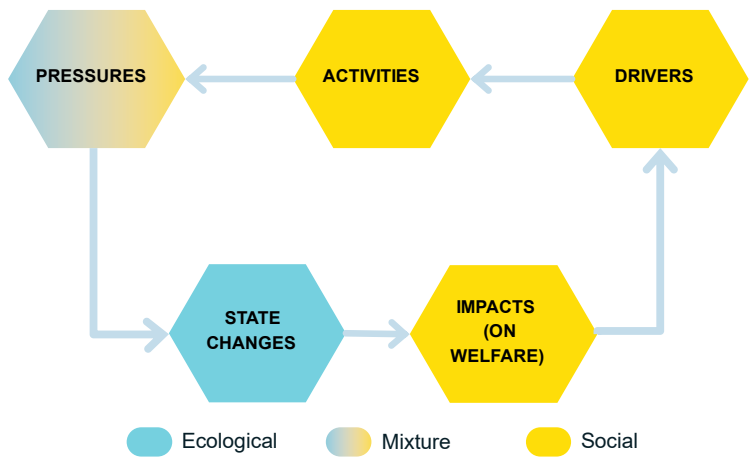


View the system in focus as a whole.

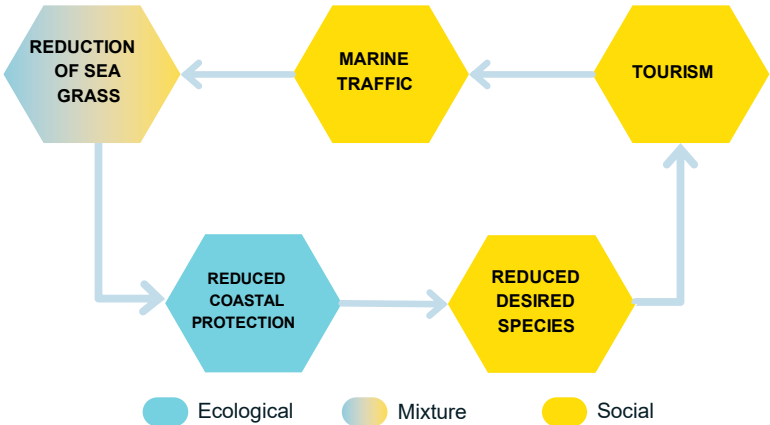


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Indicators



Indicators



Assessment

- Assess the related indicators

	Number of Tourists	
	+	Type of Relationship
Amount of Marine Traffic	Strong Positive	Strength of Relationship
	4	Confidence in Relationship 1 (low) - 5 (high)



- Use Decision Support tool to generate the model
- Reflect on the model and refine with stakeholders



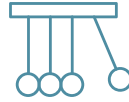
Full Model (Do not panic!)



Part C - Use the information to design management interventions to improve the situation.



Identify influential points for intervention



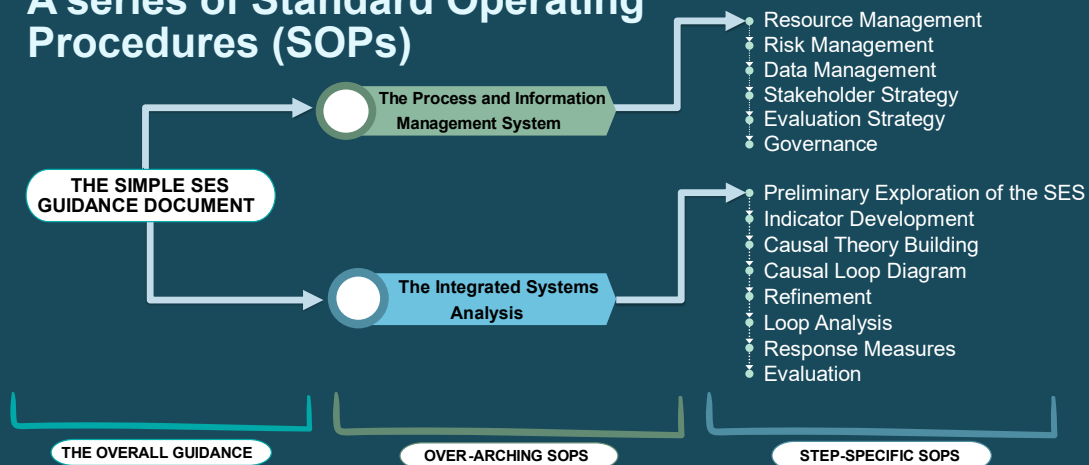
Explore unintended consequences

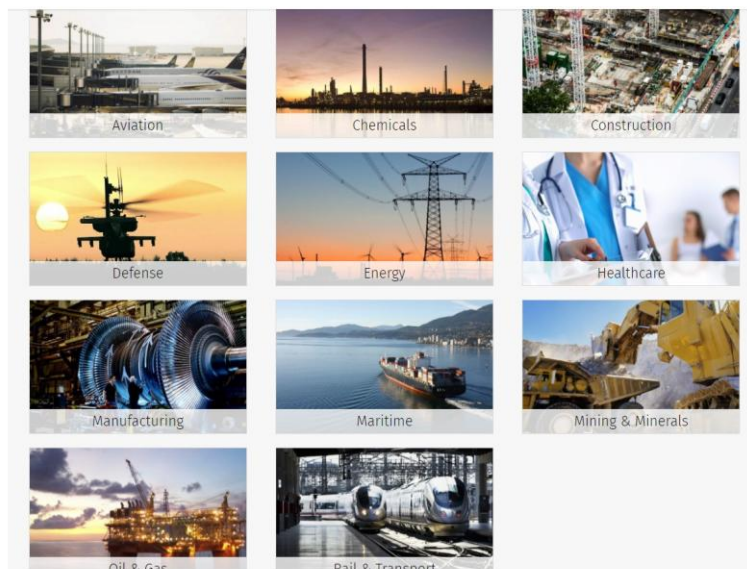
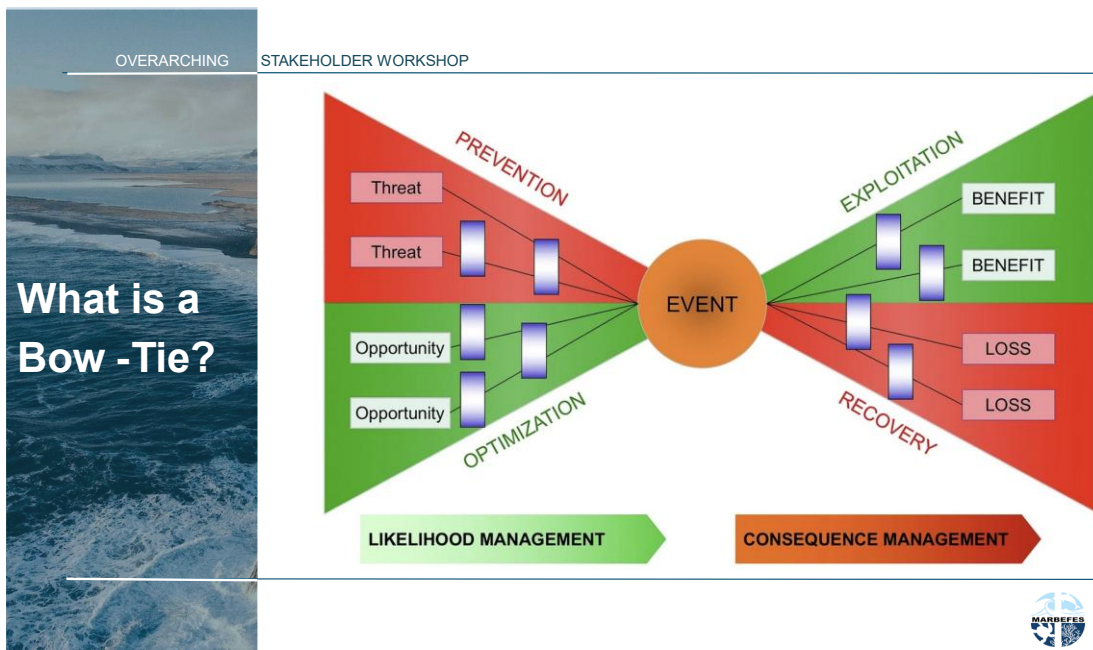


Design Management Response Measures



A series of Standard Operating Procedures (SOPs)





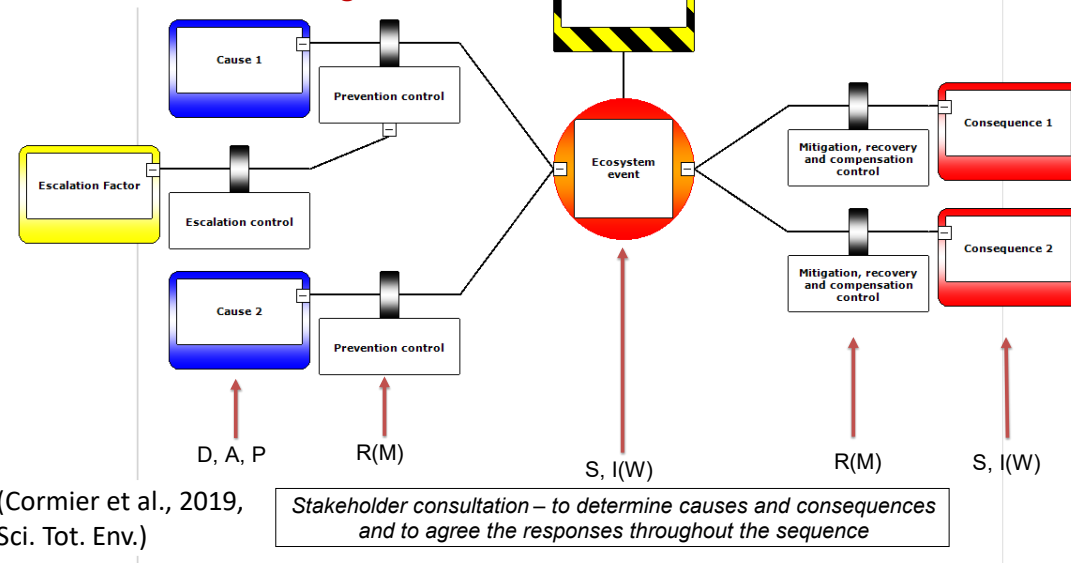
<https://www.cgerisk.com/industries/>

Proprietary Bow-tie analysis has been used by many industries (ISO accredited ISO 1818; IEC/ISO 2019) -

And:

- Commercial Businesses
- Consulting
- Educational
- Finance
- Food & Agriculture
- Fire & Rescue Services
- Government
- Tank Storage & Pipelines
- Water

Bow-tie Analysis – modelling risk assessment & risk management



OVERARCHING STAKEHOLDER WORKSHOP

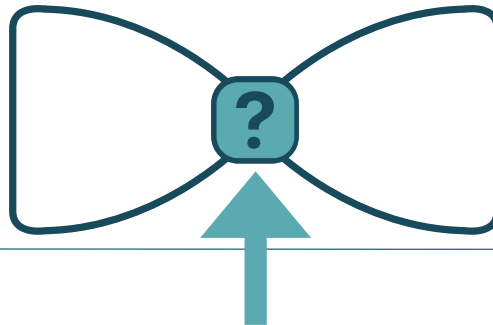
BowTies to connect important factors

- What is an/some issue(s) of concern in managing your area?
- Do you need a rigorous, ISO-standard method to tackle the issue(s)?
- What are the causes of the concern(s)?
- Can you rigorously determine prevention controls to remove the concern and mitigation controls to lessen the consequences?
- Can you determine the consequences (positive and negative) from the concern?
- If the consequences are not prevented or mitigated then do they lead to further chains of management?
- Do you need to carry out scenario analysis using a Bow-tie structure?

How to form a bowtie

Step 1: The central event

- Also known as the knot, the problem or the issue, this is key to forming the Bow-Tie or what is the problem I am worrying about?



The central event of Bow-tie in MARBEFES

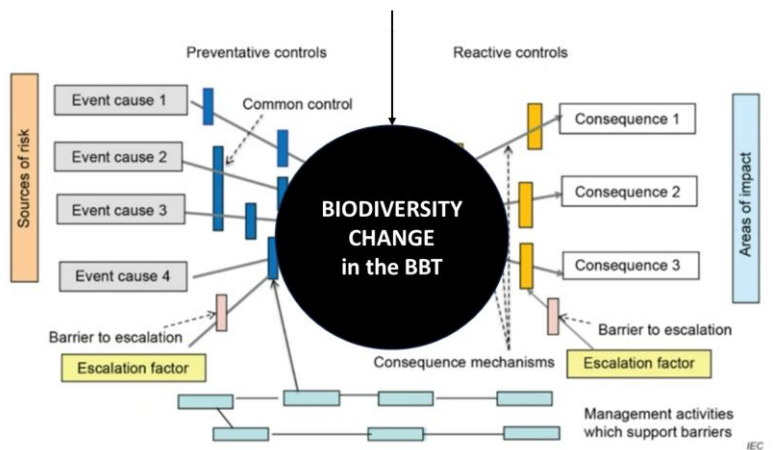


Figure B.2 – Example of Bowtie

Source: ECS/ISO (2019)

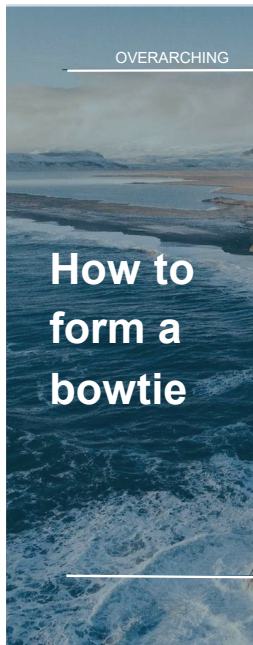
MARBEFES – ‘the big idea’ – the ‘central knot of the BT’

“What natural conditions and human activities (both local and global) are now reducing the value (in ecological and socio-economic terms) of biodiversity at your BBT or will reduce that in the future and what can/will marine management and governance do about it?”

Fulfilling this requires you to know:

- the type and value the biodiversity in its various forms,
- the endogenic and exogenic causes of changes to it,
- the consequences of those changes in ecological, socio-economic and socio-cultural terms,
- the types of solutions possible including governance and management, and
- the desires of stakeholders and their advisors.

To do all of that requires clear guidance for effective an efficient use



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STAKEHOLDER WORKSHOP

Step 2: Causes

- What are the causes of the central event/problem?
- What mechanisms can be used to prevent these causes from leading to the central event?
- What management measures that can be applied to reduce the magnitude of or likelihood of the central event happening due to the causes? (e.g. to adapt, control, mitigate or compensate?)
- What factors can enhance the management measures and what factors can cause them to fail?





Standardised lists for Bow-tie elements in MARBEFES



Causes (Activities & Pressures)

CAUSES of Biodiversity change: 1. Standardised vocabulary for ACTIVITIES		
Hierarchy	New ID#	Causes_1.Activities_name
Level 1	A1	PHYSICAL RESTRUCTURING OF RIVERS, COASTLINE OR SEABED (WATER MANAGEMENT)
Level 1	A2	EXTRACTION OF NON-LIVING RESOURCES
Level 1	A3	PRODUCTION OF ENERGY
Level 1	A4	EXTRACTION LIVING RESOURCES
Level 1	A5	CULTIVATION OF LIVING RESOURCES
Level 1	A6	TRANSPORT
Level 1	A7	URBAN AND INDUSTRIAL USES
Level 1	A8	TOURISM AND LEISURE
Level 1	A9	SECURITY/DEFENCE
Level 1	A1.1	Land claim
Level 1	A1.2	Canalisation and other watercourse modifications
Level 1	A1.3	Coastal defence and flood protection
Level 1	A1.3.1	Flood defence - hard engineering methods (e.g., seawalls)
Level 1	A1.3.2	Flood defence - soft engineering methods (e.g., beach nourishment, managed realignment)
Level 1	A1.4	Offshore structures (other than for oil/gas/renewables)
Level 1	A1.5	Restructuring of seabed morphology, including dredging and depositing of materials
Level 1	A2	EXTRACTION OF NON-LIVING RESOURCES
Level 1	A2.1	Extraction of minerals (rock, metal ores, gravel, sand, shell)
Level 1	A2.1.1	Coastal mining
Level 1	A2.2	Extraction of oil and gas, including infrastructure
Level 1	A2.3	Extraction of salt
Level 1	A2.4	Extraction of water
Level 1	A3	PRODUCTION OF ENERGY
Level 1	A3.1	Renewable energy generation (wind, wave and tidal power), including infrastructure
Level 1	A3.2	Non-renewable energy generation
Level 1	A3.3	Transmission of electricity and communications (cables)
Level 1	A4	EXTRACTION LIVING RESOURCES
Level 1	A4.1	Fish and shellfish harvesting (professional, recreational)
Level 1	A4.2	Fish and shellfish processing
Level 1	A4.3	Marine plant harvesting
Level 1	A4.4	Hunting and collecting for other purposes
Level 1	A5	CULTIVATION OF LIVING RESOURCES
Level 1	A5.1	Aquaculture — marine, including infrastructure
Level 1	A5.2	Aquaculture — freshwater
Level 1	A5.3	Agriculture
Level 1	A5.3.1	Use of biocides
Level 1	A5.3.2	Use of N-fertilizers
Level 1	A5.3.3	Use of P-fertilizers

From MSFD lists (Levels 1&2)

25



Bow-tie analysis in MARBEFES - Standardised vocabularies



Causes (Activities & Pressures)

CAUSES of Biodiversity change: 2. Standardised vocabulary for PRESSURES		
Hierarchy	New ID#	Causes_2.Pressures_name
Level 1	P1	BIOLOGICAL PRESSURES
Level 1	P2	PHYSICAL PRESSURES
Level 1	P3	SUBSTANCES, LITTER AND ENERGY
Level 1	P4	CLIMATE CHANGE
Level 1	P1.1	Input or spread of non-indigenous species
Level 1	P1.2	Input of microbial pathogens
Level 1	P1.3	Input of genetically modified species and translocation of native species
Level 1	P1.4	Loss of, or change to, natural biological communities due to cultivation of animal or MSFD list (amended EU 2017/845)
Level 1	P1.5	Disturbance of species (e.g., where they breed, rest and feed) due to human presence MSFD list (amended EU 2017/845)
Level 1	P1.6	Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing) MSFD list (amended EU 2017/845)
Level 1	P2	PHYSICAL PRESSURES
Level 1	P2.1	Physical disturbance to seabed (temporary or reversible)
Level 1	P2.2	Physical loss (due to permanent change of seabed substrate or morphology and to MSFD list (amended EU 2017/845)
Level 1	P2.3	Changes to hydrological conditions
Level 1	P2.4	New habitat creation
Level 1	P3	SUBSTANCES, LITTER AND ENERGY
Level 1	P3.1	Input of nutrients — diffuse sources, point sources, atmospheric deposition
Level 1	P3.1.1	TN load (from agricultural land into rivers and coast)
Level 1	P3.1.2	TP load (from agricultural land into rivers and coast)
Level 1	P3.1.3	TN concentration in effluents from water treatment plants
Level 1	P3.1.4	TP concentration in effluents from water treatment plants
Level 1	P3.2	Input of organic matter — diffuse sources and point sources
Level 1	P3.2.1	Sediments in water due to erosion
Level 1	P3.2.2	Quantity of wastewater (reaching treatment plants)
Level 1	P3.2.3	Inflow of untreated waste water (from scattered dwellings into rivers)
Level 1	P3.3	Input of other substances (e.g. synthetic substances, non-synthetic substances, radioactive substances)
Level 1	P3.4	Input of litter (solid waste matter, including micro-sized litter)
Level 1	P3.4+P3.2	Human impacts (litter, sewage, emissions)
Level 1	P3.5	Input of anthropogenic sound (impulsive, continuous)
Level 1	P3.6	Input of other forms of energy (including electromagnetic fields, light and heat)
Level 1	P3.7	Input of water — point sources (e.g. brine)
Level 1	P4	CLIMATE CHANGE
Level 1	P4.1	Mean annual air temperature

From MSFD lists (Levels 1&2)

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Step 3: Consequences and opportunities

- What are the consequences (negative) arising from the central event/problem if no actions were to be taken?
- Are there any opportunities (positive consequences) that arise from the central event/problem happening?
- What management measures can be applied to reduce the magnitude of or likelihood of the consequences?
- What enhancement measures can be applied to reduce increase the benefits from any opportunities (positive consequences)?
- What factors can enhance the management measures and what factors can cause them to fail?



Bow-tie analysis in MARBEFES - Standardised vocabularies

Consequences



A	B	C	D	E	F
1	CONSEQUENCES of biodiversity change: Standardised vocabulary				
2	Hierarchy	New ID	Consequences_name	Source	ID# and relation
3	Level 1	C1	Impacts on NATURE	Harmonisation of BTs from BBTs	Higher level consequence (theme); includes specific consequences of the biodiversity
4	Level 2	C1.1	Change in ecosystem /marine processes	Harmonisation of BTs from BBTs	This may include change in marine process that is behind the ability to deliver an E
5	Level 2	C1.2	Decrease* in provisioning ES	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
6	Level 3	C1.2.1	Decrease* in provision of fish & shellfish	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
7	Level 3	C1.2.2	Decrease* in provision of algae & seaweed	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
8	Level 3	C1.2.3	Decrease* in provision of genetic resources	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
9	Level 3	C1.2.4	Decrease* in provision of water supply	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
10	Level 2	C1.3	Decrease* in regulating ES	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
11	Level 3	C1.3.1	Decrease* in Climate regulation	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
12	Level 3	C1.3.2	Decrease* in Natural Hazard Protection	Harmonisation of BTs from BBTs + Higher ID	*Impact assumed to be decrease, but it may also be increase in case of arising opp
13	Level 3	C1.3.3	Decrease* in Waste breakdown and detoxification	Harmonisation of BTs from BBTs	*Impact assumed to be decrease, but it may also be increase in case of arising opp
14	Level 2	C1.4	Change in landscape/seascape	Harmonisation of BTs from BBTs	
15	Level 2	C1.5	Impacts on nature GOVERNANCE	Harmonisation of BTs from BBTs	changes in nature that are related to requirements of nature conservation policies
16	Level 1	C2	Impacts on ECONOMY	Harmonisation of BTs from BBTs	Higher level consequence (theme); includes specific consequences of the biodiversity
17	Level 2	C2.1	Increased costs	Harmonisation of BTs from BBTs	economic impact where specified as increased costs to undertake/increase addition
18	Level 2	C2.2	Decreased income	Harmonisation of BTs from BBTs	economic impact where specified as decreased income (e.g., from reduction of business
19	Level 2	C2.3	Decreased economic value	Harmonisation of BTs from BBTs	economic impact where specified as decreased economic value of assets
20	Level 2	C2.4	Negative impact on labor market	Harmonisation of BTs from BBTs	economic impact where specified as affecting labor market
21	Level 2	C2.5	Negative impact on the Blue Economy development	Harmonisation of BTs from BBTs	economic impact where specified as affecting Blue economy development
22	Level 2	C2.6	Other economic impact	Harmonisation of BTs from BBTs	economic impact specified otherwise
23	Level 1	C3	Impacts on SOCIETY	Harmonisation of BTs from BBTs	Higher level consequence (theme); includes specific consequences of the biodiversity
24	Level 2	C3.1	Decrease of aesthetic value/benefits	Harmonisation of BTs from BBTs	
25	Level 2	C3.2	Decrease in human health (and benefits for it)	Harmonisation of BTs from BBTs	also expressed as increased human health risk (may be physical and/or mental health)
26	Level 2	C3.3	Impact on sense of place	Harmonisation of BTs from BBTs	
27	Level 2	C3.4	Decrease in other cultural benefits	Harmonisation of BTs from BBTs	including decrease in activities leading to spiritual and cultural wellbeing (recreation)
28	Level 2	C3.5	Changed perception/behaviour	Harmonisation of BTs from BBTs	change may have positive or negative connotation (to specify)
29					
30					
31					
32					



Bow-tie analysis in MARBEFES - Standardised vocabularies



Controls

CONTROLS of Biodiversity change: Standardised vocabulary			
Hierarchy	New ID#	ID qualifier	Controls_name
Level 1	Ctrl1		NATURE PROTECTION
Level 1	Ctrl2		INNOVATION: TECHNOLOGY/ PRACTICES TOWARDS HIGHER SUSTAINABILITY
Level 1	Ctrl3		KNOWLEDGE BUILDING (MONITORING & RESEARCH)
Level 1	Ctrl4		GOVERNANCE (LEGAL & ADMINISTRATIVE MEASURES)
Level 1	Ctrl5		ECONOMIC CONTROLS
Level 1	Ctrl6		CULTURAL & SOCIAL MEASURES (BEHAVIOUR / EDUCATION / MARKETING)

A	B	C	D
1	CONTROLS of Biodiversity change: Standardised vocabulary		
2	Hierarchy	New ID#	ID qualifier
3	Level 1	Ctrl1	NATURE PROTECTION
4	Level 2	Ctrl1.1	strategy Nature conservation/management
5	Level 2	Ctrl1.2	strategy Nature restoration/enhancement
6	Level 3	Ctrl1.2.1	tool Habitat/Ecosystem restoration/remediation/enhancement
7	Level 3	Ctrl1.2.2	tool Species populations restocking (incl. of threatened and declining species)
8	Level 3	Ctrl1.2.3	tool Habitat creation or offsetting (compensation)
9	Level 2	Ctrl1.3	strategy Activities regulation (spatial, temporal and/or intensity)
10	Level 3	Ctrl1.3.1	tool Setting limits and restrictions (e.g. fishing quotas, number of visitors per season)
11	Level 3	Ctrl1.3.2	strategy Spatial (and temporal) management/planning
12	Level 3	Ctrl1.3.3	tool Relocate activities
13	Level 3	Ctrl1.3.4	tool Promote co-development of activities
14	Level 3	Ctrl1.3.5	tool Enforce/improve/establish MPAs or other protection measures (e.g. corridors)
15	Level 3	Ctrl1.3.6	tool Flexible spatial limits for management to improve habitats and productivity, include
16	Level 3	Ctrl1.3.7	tool Protect essential habitats, including temporal closure/dynamic MPAs
17	Level 3	Ctrl1.3.8	tool Adapt seasonality of activity based on species/habitat ecology (eg. reproduction n
18	Level 3	Ctrl1.3.9	tool Implement mitigation measures to reduce pressures
19	Level 1	Ctrl2	INNOVATION: TECHNOLOGY/ PRACTICES TOWARDS HIGHER SUSTAINABILITY
20	Level 2	Ctrl2.1	strategy Reduce fossil fuel consumption (and CO2 emissions) or increase alternative energy
21	Level 2	Ctrl2.2	strategy Technology improvements or adoption of alternative practices towards reduction
22	Level 3	Ctrl2.2.1	tool Building with nature-based solutions
23	Level 3	Ctrl2.2.2	tool Organic farming
24	Level 3	Ctrl2.2.3	tool Sustainable meat production
25	Level 3	Ctrl2.2.4	tool Nature land for crops
26	Level 3	Ctrl2.2.5	tool Crop rotation
27	Level 3	Ctrl2.2.6	tool Regionalised agriculture
28	Level 3	Ctrl2.2.7	tool Growth of non-native plantations
29	Level 3	Ctrl2.2.8	tool Controlled drainage
30	Level 3	Ctrl2.2.9	tool Erosion control on fields
31	Level 3	Ctrl2.2.10	tool Environmentally friendly energy generation
32	Level 3	Ctrl2.2.11	tool Technical improvements of waste water treatment plants related to aspects other

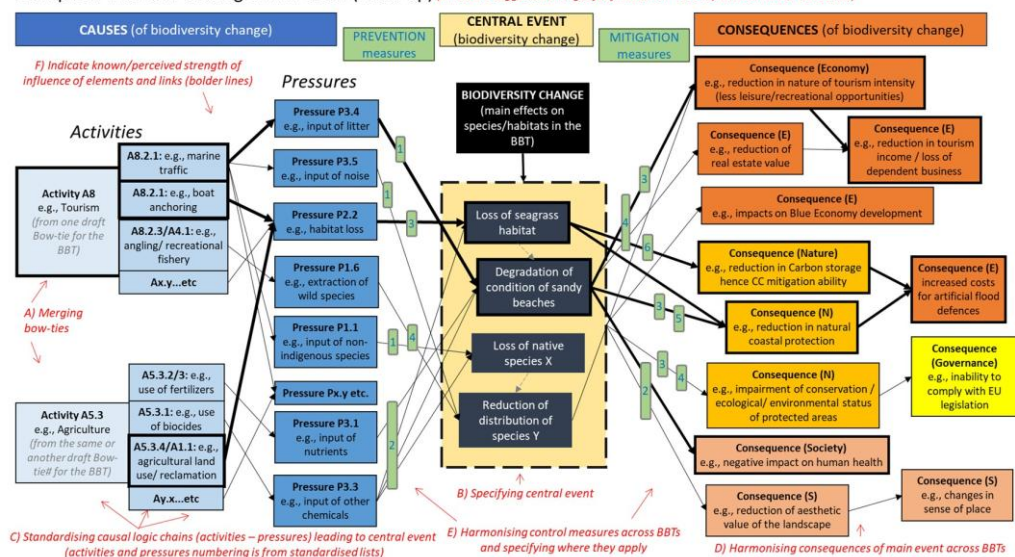
From CERES project + 10-tenets

29



Bow-tie template used by BBTs in MARBEFES

Example of final Bow-tie diagram for a BBT (mock-up) (in red are suggested changes for finalisation – see explanation in the text below)



30



High-level scenarios



Additional novel application of the Bow-tie:

Downscaling high-level socio-economic scenarios of change into the case-specific (BBT) Bow-tie

IPCC 6th assessment 2023
Shared Socio-Economic Pathways

Table 3. MARBEFES 3 high-level scenarios.

Shared Pathways	Socioeconomic	Name
SSP1		Sustainability
SSP3		Regional rivalry
SSP5		Fossil-fuelled development

"Taking the green road"

"A rocky road"

"Taking the Highway"

Representative Concentration Pathway⁴ (RCP) scenarios will be chosen at a later stage for modelling purposes.

31



High-level scenarios - Storyline overviews

	A	B	C	D	E	F
1	Shared socioeconomic pathway (SSP)	SSP1: Sustainability - Taking the green road	SSP3: Regional rivalry - A rocky road	SSP5: Fossil Fuelled Development - Taking the Highway	Comment	
2	Mitigation	High	Low	Low	Mitigation is the reduction of the sources or enhancement of the sinks of greenhouse gases.	
3	Adaptation	High	Low	High	Adaptation is the adjustment in natural or human system in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities	
4	Short description	The world shifts gradually, but pervasively, toward a more sustainable path, emphasizing more inclusive development that respects perceived environmental boundaries. Management of the global commons slowly improves, educational and health investments accelerate the demographic transition, and the emphasis on economic growth shifts toward a broader emphasis on human well-being. Driven by an increasing commitment to achieving development goals, inequality is reduced both across and within countries. Consumption is oriented toward low material growth and lower resource and energy intensity.	A resurgent nationalism, concerns about competitiveness and security, and regional conflicts push countries to increasingly focus on domestic or, at most, regional issues. Policies shift over time to become increasingly oriented toward national and regional security issues. Countries focus on achieving energy and food security goals within their own regions at the expense of broader-based development. Investments in education and technological development decline. Economic development is slow, consumption is material-intensive, and inequalities persist or worsen over time. Population growth is low in industrialized and high in developing countries. A low international priority for addressing environmental concerns leads to strong environmental degradation in some regions.	This world places increasing faith in competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as the path to sustainable development. Global markets are increasingly integrated. There are also strong investments in health, education, and institutions to enhance human and social capital. At the same time, the push for economic and social development is coupled with the exploitation of abundant fossil fuel resources and the adoption of resource and energy intensive lifestyles around the world. All these factors lead to rapid growth of the global economy, while global population peaks and declines in the twenty-first century. Local environmental problems like air pollution are successfully managed. There is faith in the ability to effectively manage social and ecological systems, including by geo-engineering if necessary.		
5	Main objective	Global sustainability	Regional security	Economic growth		
6	Drivers	Increasing evidence of social, cultural, economic costs of environmental degradation and inequality	Nationalism; competitiveness; security; regional conflicts	Economic success of industrialized and emerging economies		
7	Economy	Reduced inequality; connected markets; regional production	High inequality across countries; restricted markets; regional security	Reduced inequality; high international trade with strong specialization of production		

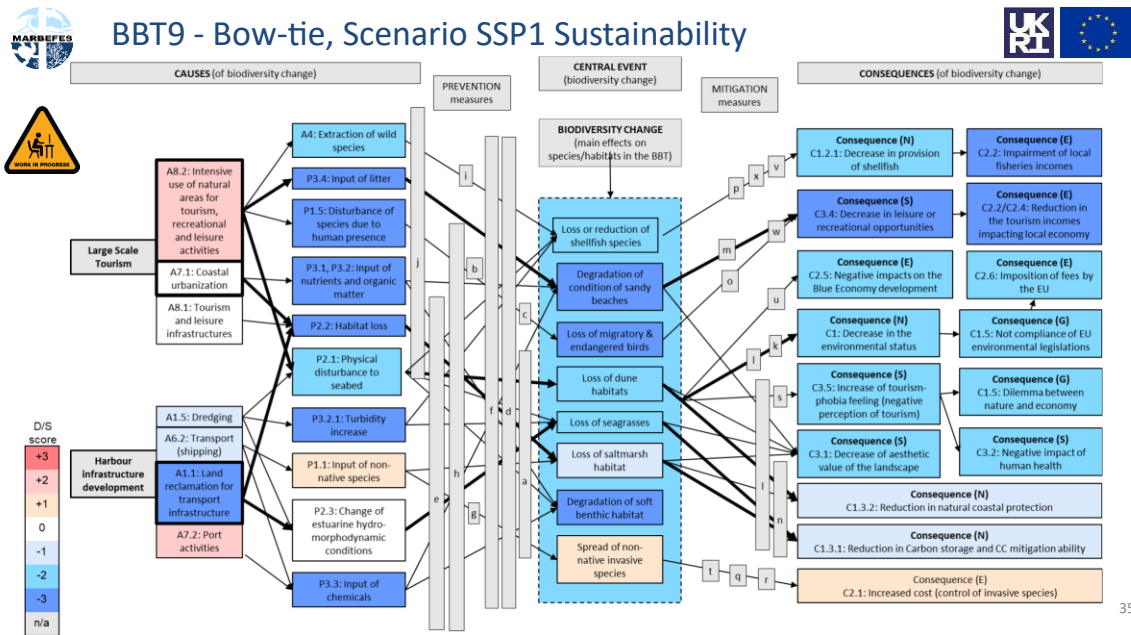
32

BBTs scored the expected change in each variable (causes, i.e. activities and pressures used in the Bow-tie) on a scale from -3 (strong negative change) to +3 (strong positive change) under the three scenarios



- | Downscaling scores | | D/S score |
|--------------------|-----------------|-----------|
| +3 Strong | positive change | +3 |
| +2 Medium | | +2 |
| +1 Weak | | +1 |
| 0 No change | | 0 |
| -1 Weak | negative change | -1 |
| -2 Medium | | -2 |
| -3 Strong | | -3 |
| | | n/a |





Re-cap: Recipe for tackling the problem and identifying opportunities:

- Define the central problem and the framework for opportunities
- Create risk- and opportunity-based generic Bow-ties with Drivers and Activities
- Analyse previous experience, projects and literature
- Incorporate the 10-tenets for management responses
- Produce a 'strawman' for discussion with stakeholders
- Refine and produce the site- and topic-specific Bow-ties
- Interrogate Bow-Ties to show the gaps and opportunities for nature and society
- Interrogate Bow-Ties to show the gaps and opportunities for science and management
- Downscale the high-level IPCC scenarios to be relevant to local issues



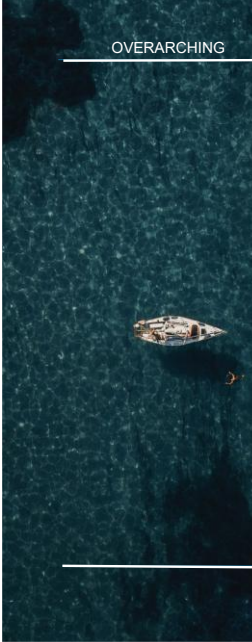
(Photo. Lauren McWhinnie, UVIC workshop, 2018)

OVERARCHING

STAKEHOLDER WORKSHOP

Benefits of engaging with these tools...

- Reduce the complexity of a holistic, multi -sector approach to marine environmental management challenges
- Contribute local knowledge to inform the model, enhancing its practical applicability
- Allows the practitioner to identify points in the system where management measures will be effective
- Contribute to the development of these tools to ensure they are fit for purpose and suits your needs as a stakeholder .



And now you have carried out all the management, assessment and reporting:

Ocean and Coastal Management 265 (2025) 107623

Contents lists available at [ScienceDirect](#)

 **Ocean and Coastal Management**

journal homepage: www.elsevier.com/locate/ocecoaman



Review

Managing marine resources sustainably – But how do we know when marine management has been successful?

Michael Elliott^{a,b,*} , Ángel Borja^c, Roland Cormier^d

OVERARCHING STAKEHOLDER WORKSHOP

Thank you!

Any Questions?

Michael Elliott, Anita Franco, and Gemma Smith - IECS Ltd.



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Gemma.Smith@iecs.ltd



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Appendix 3c. Scenarios of Societal and Environmental change under SSP1, SSP3 and SSP5

Scenarios of societal and environmental change



Ashley Cahillane, Dorota Kotbuk, Tasman Crowe
University College Dublin, Ireland

Overarching Stakeholder Workshops,
1st April 2025, Zandvoort



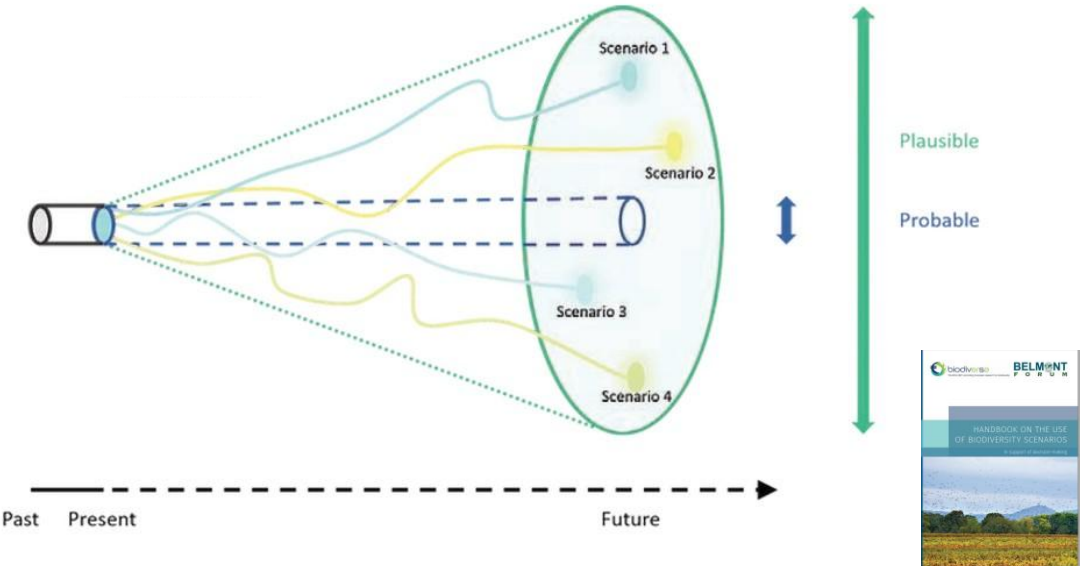


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Session 5. Zandvoort workshop

Scenarios enable us to explore possible futures



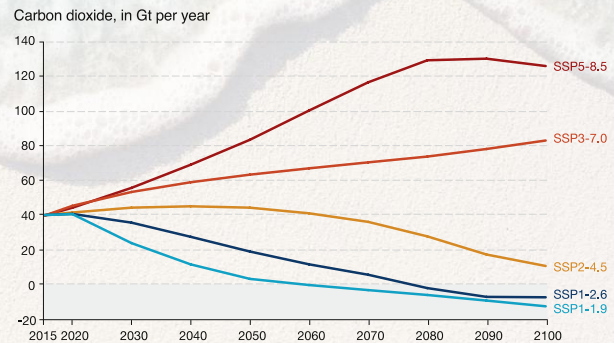
What are scenarios?

Scenarios are internally consistent **socioeconomic, emissions, and climate projections**

Common in large-scale management strategies, e.g.: **IPCC assessments**, where they support:

- **Climate modelling:** how different levels of greenhouse gas emissions may influence global temperatures, sea-level rise, etc.
- **Policy development:** potential outcomes of various emission pathways help policymakers in crafting strategies to reduce emissions and prepare for anticipated impacts.

FUTURE CO₂ EMISSIONS ACCORDING TO THE FIVE IPCC SCENARIOS
Source: IPCC, 1st working group, 2021



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Which scenarios are being used in MARBEFES?

In MARBEFES, scenarios can be used to describe **possible futures of coastal and marine ecosystems**.

Three scenarios selected for the project are:

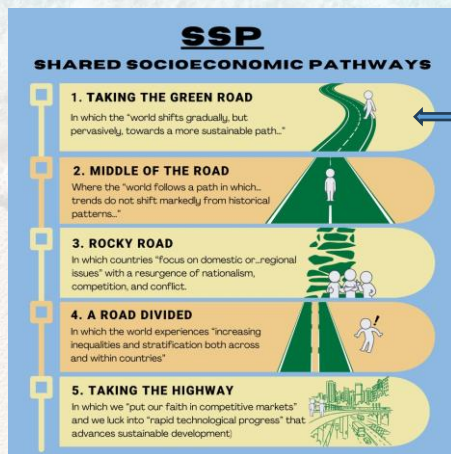


Figure by Nico Tutoni for PRIsEarth@Home project

Sustainability (SSP1):

- Global shift toward a more **sustainable path**, respect for perceived environmental boundaries.
- Management of the global commons slowly improves; educational and health investments.
- Emphasis on **human well-being** rather than economic growth.
- **Inequality is reduced** both across and within countries.
- Consumption is oriented toward low material growth and **lower resource and energy intensity**.
- High level of international **cooperation**.



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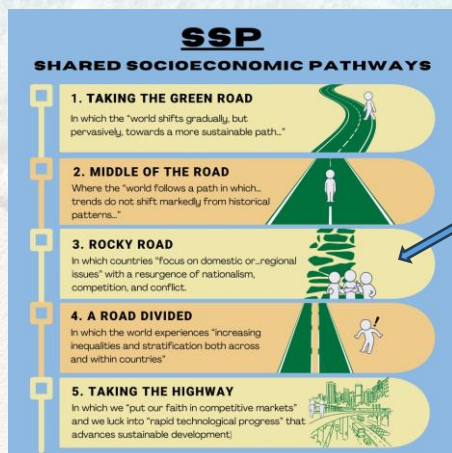


Figure by Nico Tuttoni for PRIsEarth@Home project

Regional rivalry (SSP3):

- Politically-driven focus on **domestic** or, at most, **regional** issues.
- Investments in education and technological development **decline**.
- Economic development is slow, consumption is material-intensive, and **inequalities persist or worsen** over time.
- Population growth is low in industrialized and high in developing countries.
- A **low** international priority for addressing **environmental concerns** leads to strong environmental degradation in some regions.



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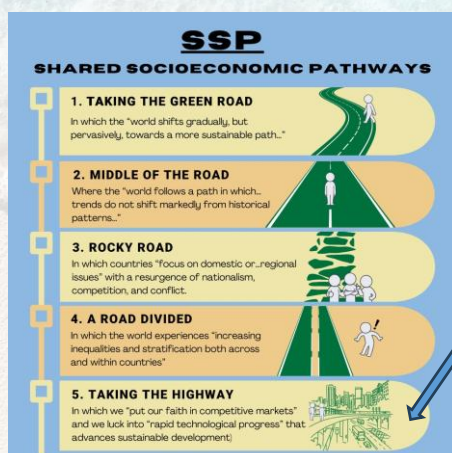


Figure by Nico Tuttoni for PRIsEarth@Home project

Fossil-fuelled development (SSP5):

- Competitive markets, technological innovation and participatory societies. **Rapid growth** of the global economy.
- Strong **investments** in health, education, and institutions to enhance human and social capital.
- But: **exploitation of abundant fossil fuel resources** and the adoption of **resource and energy intensive lifestyles** around the world.
- Local** environmental problems like air pollution are successfully managed, but: delayed global climate action



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Downscaling – making broad scenarios relevant to specific places

1. Each BBT developed a **bow-tie** with a central problem (biodiversity loss-related)
2. BBTs selected relevant **activities and pressures** driving central problems (e.g. renewable energy generation, tourism and leisure, transport by shipping, etc. – terms are standardized across BBTs) and assess if they will increase or decrease under each of the three scenarios
3. Changes estimated from **-3** (big decrease of activity/pressure) to **+3** (big increase of activity/pressure)

E.g. Menorca

Activity/Pressure	Sustainability	Regional rivalry		Fossil-fuelled
		SSP1	SSP3	SSP5
Mitigation measures	High	Low	Low	Low
Adaptation measures	High	Low	Low	High
ACTIVITIES				
A4 EXTRACTION OF LIVING RESOURCES				
A4.1 Fish and shellfish harvesting (professional, recreational)	-2	3	1	
A6 TRANSPORT				
A6.1 Transport infrastructure	0	1	2	
A6.2 Transport – shipping	-1	1	2	
PRESSURES				
P1 BIOLOGICAL PRESSURES				
P1.1 Input or spread of non-indigenous species	1	1	2	
P1.5 Disturbance of species (e.g. where they breed, rest, feed) due to human presence	-3	2	0	
P2 PHYSICAL PRESSURES				
P2.1 Physical disturbance to seabed (temporary or reversible)	-2	3	1	
P2.2 Physical loss (due to change of seabed morphology or extraction of seabed substrate)	-3	2	1	

Code from a standardized vocabulary



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Downscaling was done first by MARBEFES researchers and then with stakeholders

E.g.

Sardinia

Irish Sea

Activity/Pressure	Sustainability	Regional rivalry		Fossil-fuelled
		SSP1	SSP3	SSP5
Mitigation measures	High	Low	Low	Low
Adaptation measures	High	Low	Low	High
ACTIVITIES				
A1 PHYSICAL RESTRUCTURING OF RIVERS, COASTLINE OR SEABED (WATER MANAGEMENT)				
A1.1 Land cover				
A1.2 Canalisation and other watercourse modifications				
A1.3 Coastal defence and flood protection				
A1.4 Flood defence – hard engineering methods (e.g. seawalls)				
A1.5 Flood defence – soft engineering methods (e.g. beach nourishment, managed realignment)				
A1.6 Destruction of natural morphologies, including dredging and depositing of materials				
A2 EXTRACTION OF NON-LIVING RESOURCES				
A2.1 Extraction of water				
A2.2 EXTRACTION OF ENERGY				
A2.3 Renewable energy generation (wind, wave and tidal power), including infrastructure				
A2.4 Non-renewable energy generation				
A2.5 Transmission of electricity and communications (cables)				
A3 EXTRACTION OF LIVING RESOURCES				
A3.1 Fish and shellfish harvesting (professional, recreational)				
A3.2 Hunting and collecting for other purposes				
A4 DESTRUCTION OF LIVING RESOURCES				
A4.1 Agriculture				
A4.2 Use of fertilisers				
A4.3 Use of pesticides				
A4.4 Agricultural land use				
A4.5 Infrastructure (e.g. roads)				
A5 TRANSPORT				
A5.1 Transport infrastructure				
A5.2 Transport – shipping				
A5.3 Transport – air				
A5.4 Transport – land				
A6 URBAN AND INDUSTRIAL USES				
A6.1 Urban uses				
A6.2 Number of permanent residents				
A6.3 Number of secondary homes				
A6.4 Industrial uses				
A6.5 Waste treatment and disposal				
A7 TOURISM AND LEISURE				
A7.1 Tourism and leisure infrastructure				
A7.2 Tourism and leisure activities				
A7.3 Local recreation (e.g. walking, canoeing, ...)				
A7.4 Number of visitors				
A8 SECURITY/DEFENCE				
A8.1 Research, training and educational activities				

Activity/Pressure	Sustainability	Regional rivalry		Fossil-fuelled
		SSP1	SSP3	SSP5
Mitigation measures	High	Low	Low	Low
Adaptation measures	High	Low	Low	High
ACTIVITIES				
A1 PHYSICAL RESTRUCTURING OF RIVERS, COASTLINE OR SEABED (WATER MANAGEMENT)				
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A2 EXTRACTION OF NON-LIVING RESOURCES				
A2.1 Extraction of water				
A2.2 EXTRACTION OF ENERGY				
A2.3 Renewable energy generation (wind, wave and tidal power), including infrastructure				
A2.4 Non-renewable energy generation				
A2.5 Transmission of electricity and communications (cables)				
A3 EXTRACTION OF LIVING RESOURCES				
A3.1 Fish and shellfish harvesting (professional, recreational)				
A3.2 Hunting and collecting for other purposes				
A4 DESTRUCTION OF LIVING RESOURCES				
A4.1 Agriculture				
A4.2 Use of fertilisers				
A4.3 Use of pesticides				
A4.4 Agricultural land use				
A4.5 Infrastructure (e.g. roads)				
A5 TRANSPORT				
A5.1 Transport infrastructure				
A5.2 Transport – shipping				
A5.3 Transport – air				
A5.4 Transport – land				
A6 URBAN AND INDUSTRIAL USES				
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A6.5 Waste treatment and disposal				
A7 TOURISM AND LEISURE				
A7.1 Tourism and leisure infrastructure				
A7.2 Tourism and leisure activities				
A7.3 Local recreation (e.g. walking, canoeing, ...)				
A7.4 Number of visitors				
A8 SECURITY/DEFENCE				
A8.1 Research, training and educational activities				

Useful feedback from stakeholders, e.g.

- "activity [X] needs to be more specific",
- "fish and shellfish extraction should be separated",
- "industrial and small-scale fishing need to be separated",
- "timescales of the scenarios are likely to change the answers"
- "is regional rivalry an intermediate scenario?"



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What's next?

- Analysis of results from stakeholders from 6 BBTs in progress (report around May)
- Developing the scenario tool
- Tool will be made available in a dedicated Virtual Research Environment (by LW ERIC),
- Please share your thoughts on the proposed tool:



Scan this QR code or go to **menti.com** and use code **61415165**



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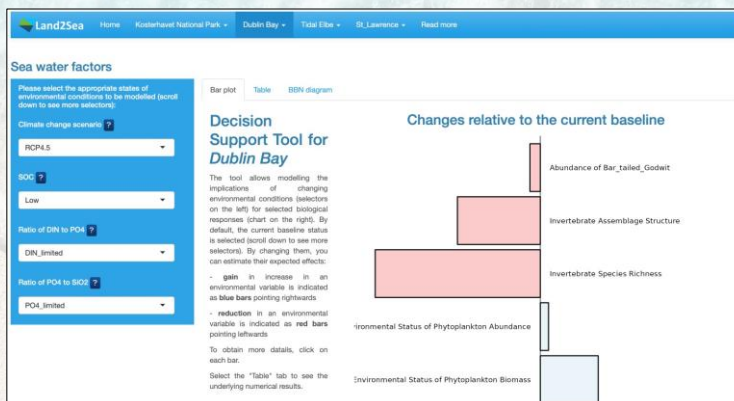


What's next?

Relevant tool was developed in the Land2Sea project (4 locations in Sweden, Ireland, Germany and Canada)

https://esdecide.shinyapps.io/Land2Sea_DST/

This example shows how certain parameters (e.g. invertebrate species richness) will change under: RCP4.5 intermediate scenario + low sediment organic carbon (SOC) + low DIN/PO₄ + low PO₄/SiO₂



If you have any questions, please contact:

tasman.crowe@ucd.ie or dorota.kolbuk@ucd.ie



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Appendix 3d. Acceptance and options for governance: the PESTLE approach



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**Acceptance and options for governance:
The PESTLE approach**

Marine SABRES WP5+WP4 and MARBEFES

Bruno Oliveira, Julie Bremner & Berthe Vastenhou

Zandvoort, 01/04/2025

 **Funded by
the European Union**

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& TECHNOLOGY ALLIANCE

   @MarineSABRES

Session 6. Zandvoort workshop

Program

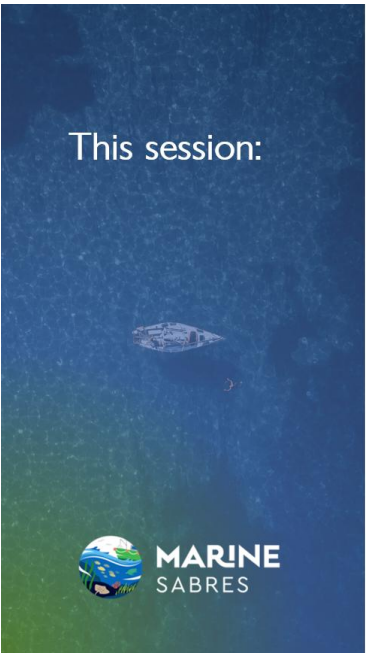
- 13:30-13:45 Introduction to the exercises and instructions
- 13:45-14:10 Individual questionnaire for Options for Coastal Management
- 14:10-15:00 Group exercise for the acceptance of the different pathways to management
- 15:00-15:15 Presentation of the Group Results and Discussion
- 15:15 End of session





Appendix 3e. Estimating effects of management and policy measures by means of SES models

Appendix 3e.1. Models measures and representation in DSS



T5.3: Models, measures and representation in the DSS

Mentimeter questions

T5.2: Scoping a marine corridor for Macaronesia

Mentimeter questions



DTU Aqua
National Institute of Aquatic Resources

- | | |
|---|--|
|  Environmental Impact Assess
Earth and Planetary Sciences |  Fisheries Management
Earth and Planetary Sciences |
|  Fishing Ground
Earth and Planetary Sciences |  Fishing Gear
Earth and Planetary Sciences |
|  Mesopelagic Zone
Earth and Planetary Sciences |  Atlantic Ocean
Earth and Planetary Sciences |
|  North Sea
Earth and Planetary Sciences |  Baltic Sea
Earth and Planetary Sciences |





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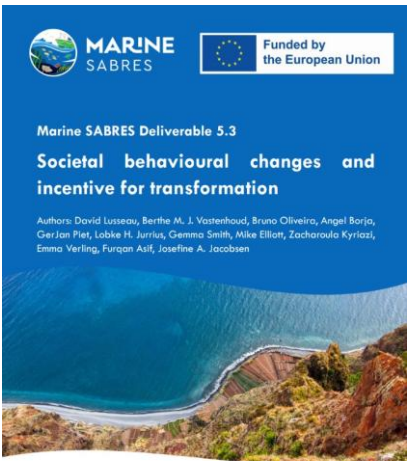
Socio-ecological systems: Models and measures

Berthe M. J. Vastenhouw & David Lusseau

Postdoctoral researcher, DTU Aqua
bmjv@aqua.dtu.dk



Funded by
the European Union



Marine SABRES Deliverable 5.3

Societal behavioural changes and incentive for transformation

Authors: David Lusseau, Berthe M. J. Vastenhouw, Bruno Oliveira, Angel Borja, Gerjan Piet, Lobke H. Jurrius, Gemma Smith, Mike Elliott, Zacharoula Kyriazi, Emma Verling, Furqan Asif, Josefine A. Jacobsen

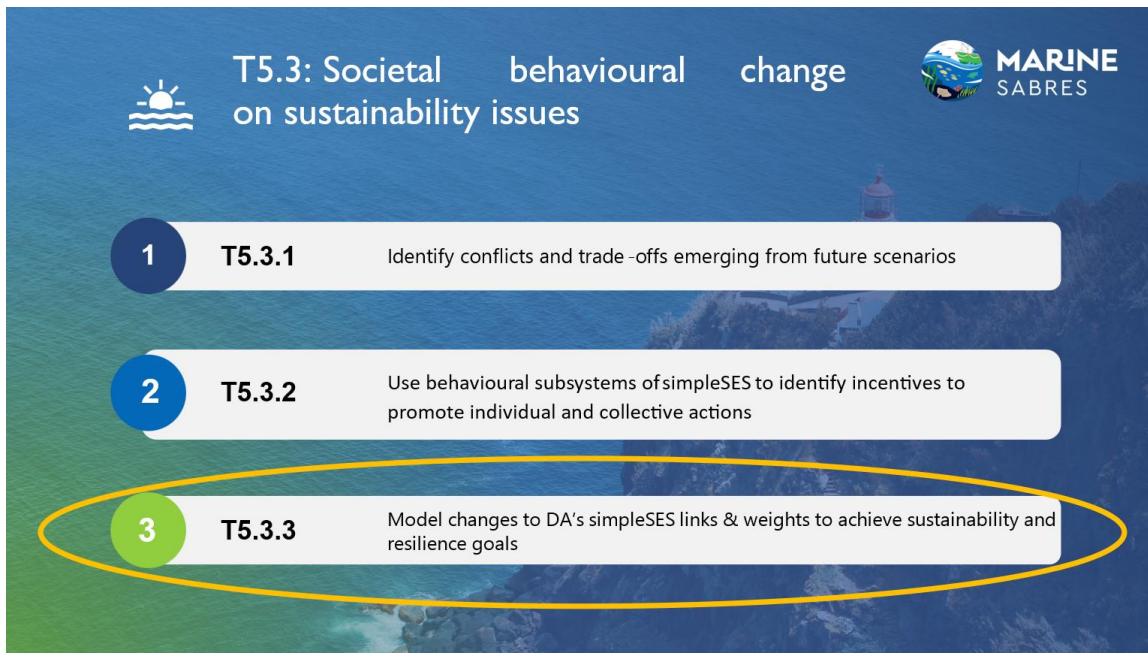


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Gemma Smith	IECS
Mike Elliott	IECS
Zacharoula Kyriazi	MI
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Ana Dinis	Marine and Environmental Sciences Centre (MARE-ARDITI, Madeira)



 **T5.3: Societal behavioural change on sustainability issues** 

- 1 T5.3.1** Identify conflicts and trade-offs emerging from future scenarios
- 2 T5.3.2** Use behavioural subsystems of simpleSES to identify incentives to promote individual and collective actions
- 3 T5.3.3** Model changes to DA's simpleSES links & weights to achieve sustainability and resilience goals



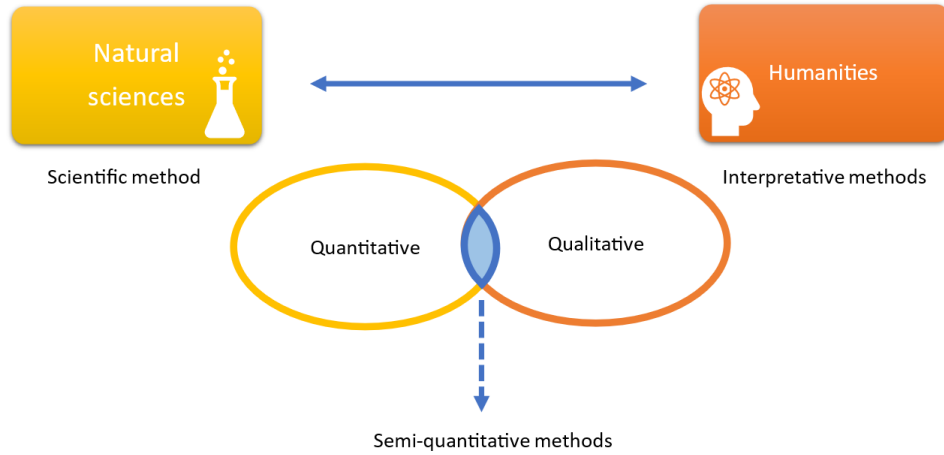
Feed code to T6.3 for DSS

Work with DAs for tailored solutions

Validate assumptions



Our (new) approach



What can we do?

Sustainability of the system

System behaviour

Are the desired outcomes (elements) sustained or improving in time?

Importance of network components

Identify the most important components in the fate of the network

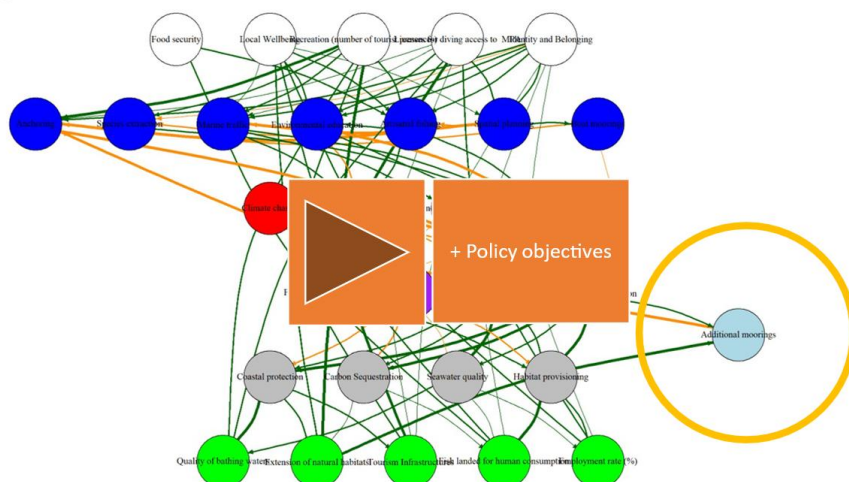
Interesting targets for application of management measures



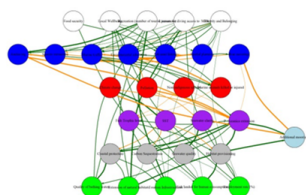
Test different management measures



Introducing a management measure

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Introducing a management measure



- **Policy objectives:**
 - *P. oceanica* extension
 - Extension of natural habitats
- The system is generally **sustainable**
- Strong negative effect of the intervention on '**Anchoring**' will lead to achievement of all policy objectives and sustaining of all Goods and Benefits

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 Over to you...



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Funded by the European Union's Horizon Europe programme under grant agreement No.101058956.

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Appendix 3e.2. Scoping a marine corridor for Macaronesia



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Scoping a marine corridor for Macaronesia

T5.2 Economic Opportunities and Costs

Ecologic Institute: Gregory Fuchs, Manuel Lago, Fenja Kroos

Contributions (Macaronesia DA):

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Anunciação Ventura
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Daniela Casimiro
Ana Dinis
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Candelaria Cecilia Ruano
Inma Herrera
Jesús Padrón García

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Setting the scene

- Macaronesia is a biodiversity hotspot with overlapping ecological and geopolitical frontiers
- A marine corridor **could be** a high-impact intervention to connect, protect, and manage marine biodiversity across boundaries
- With BBNJ, 30x30, and EU Biodiversity Strategy, policy momentum exists — **but what would this potential corridor actually entail?**



Task 5.2 Economic Opportunities and Costs



Objectives:

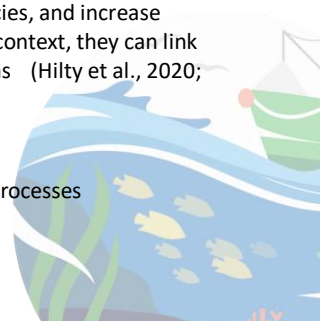
- **Assess the the scale of potential impacts** from management scenarios in the DAs
- Provide evidence-based **advice** to policymakers **on the consequences (costs, risks and benefits) of different interventions** to reach stated scenarios
- Use a stepwise **economic impact assessment** framework **to analyse responses**, using evaluation criteria



What is an ecological corridor?



- **CBD Legal Definition** (*Kunming-Montreal Global Biodiversity Framework, 2022*):
“A clearly defined geographical space that is governed and managed over the long term to **conserve or restore connectivity** between protected and other effective area -based conservation measures (OECMs), ecosystems, and important habitats.”
- **Scientific Perspective:**
Corridors are tools to counter habitat fragmentation, support migratory species, and increase ecosystem resilience to climate and anthropogenic pressures. In the marine context, they can link MPAs, support gene flow, and ensure spatial continuity of ecological functions (Hilty et al., 2020; Dudley et al., 2009).
- **Key Characteristics**
 - Facilitates species movement, life -cycle completion, flow of ecological processes
 - Reduce isolation of and enhance connectivity between habitats
 - May include seasonal, multi -use, or no-take zones
 - Require adaptive governance and cross -jurisdictional cooperation





A pragmatic, **hypothetical scenario** focused on:

- Scoping a **corridor vision** that is adaptive, politically and economically acceptable, and grounded in scientific evidence - but open to creative thinking and incremental steps
- **Taking into account political and institutional groundwork** (OSPAR, RFMO, IMO, EU, national levels)
- Identifying and gathering available data and knowledge gaps, stakeholder positions, barriers (e.g. legal uncertainties, enforcement concerns, etc.)
- Exploring feasibility and trade-offs - what would a corridor need to look like to be **plausible, meaningful, and effective**?



Aims and objectives of the marine corridor

Overall aim: Safeguard the ecological connectivity among European archipelagos of Macaronesia

Ecological objectives: contribute to a good conservation status of migratory species and the resilience of marine ecosystems

Socio-political objectives: Promote regional and transboundary cooperation, explore new governance approaches, support blue economy transitions

Multi-options approach:

- Soft corridors? (e.g. shipping measures: zoning, blue -label incentives)
- (Partial) strict protection? (e.g. no -take zones)
- ABNJ focus? EEZ-adjacent? Stepwise expansion?





Scoping exercise

- **Geographic scope:** Northeast Atlantic Ocean. Macaronesia EEZs: Azores (North limit), Madeira and Canaries (South limit) and their vicinity (including ABNJ)
- **Target species and habitats:** (e.g. cetaceans, seabirds) with known movement patterns, sea-bottom features like seamounts
- **Ecological criteria:** migratory routes, connectivity between existing MPAs, key biodiversity areas, etc.
- **Protection levels:** could vary across zones based on ecological value and current use
- **Measures** could include:
 - Lighting regulations (e.g. dimmed ship lighting zones)
 - Speed restrictions



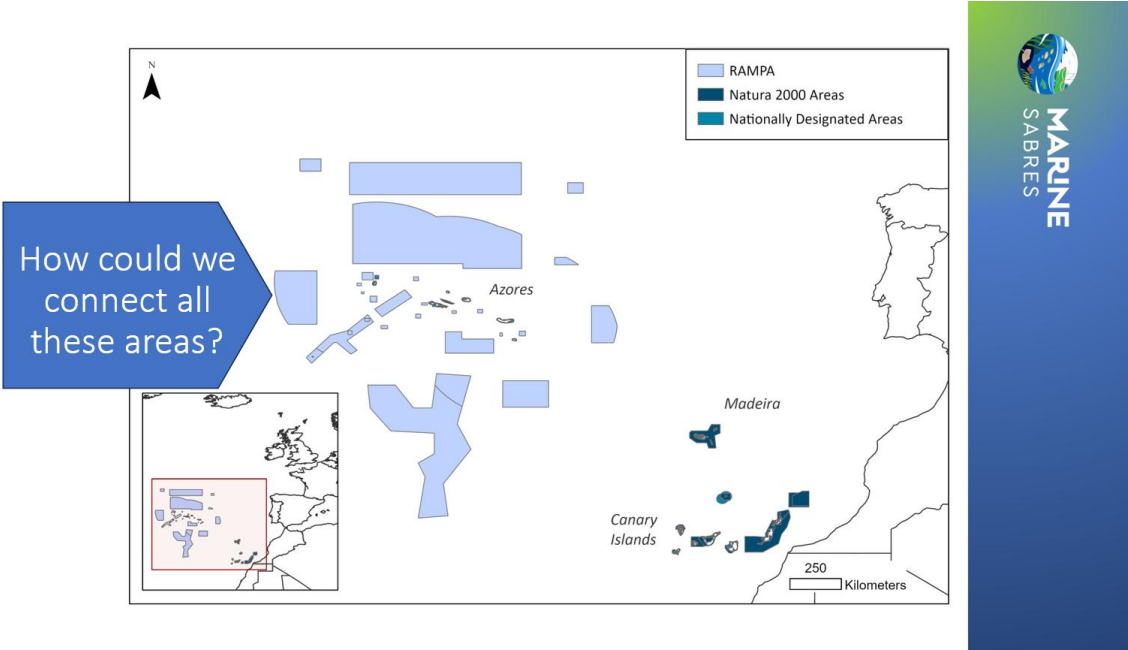
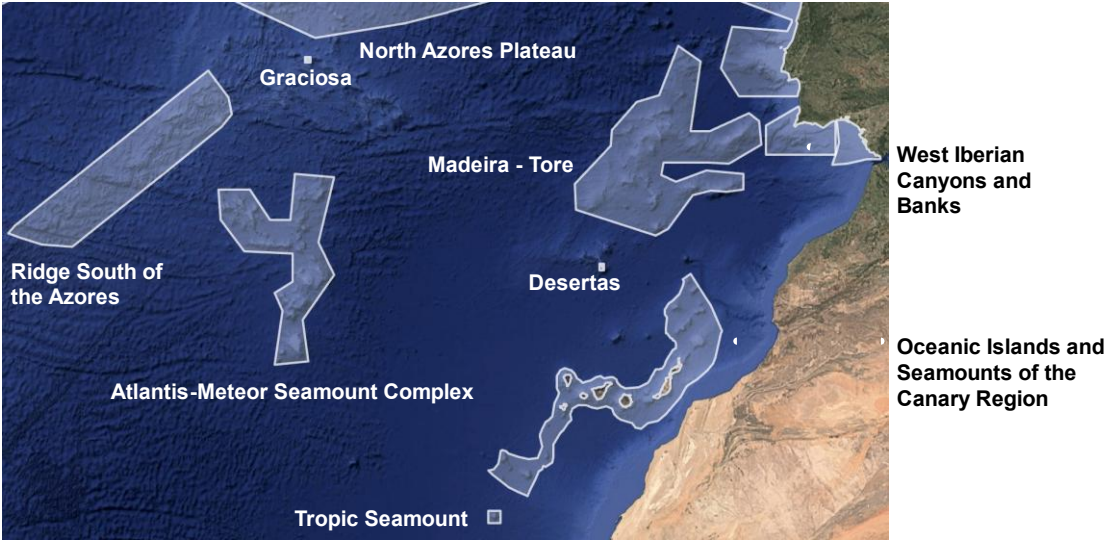
Pathways for implementation

Existing protection frameworks:

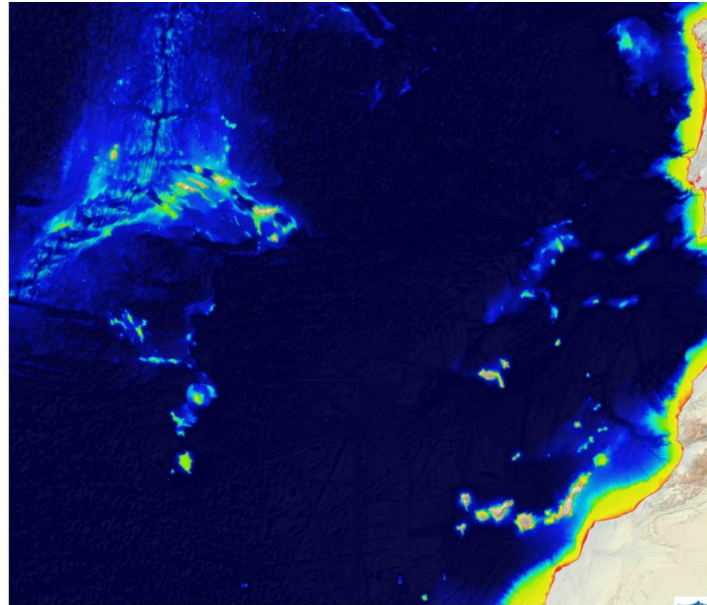
- **Natura 2000** (within EU waters): Includes *Special Areas of Conservation (SACs)* using zoning (conservation, restoration, transition zones) and assigning priorities for key habitats and species
- **OSPAR MPAs** in the North-East Atlantic, including some areas beyond national jurisdiction (ABNJ)
- **EBSAs** (Ecologically or Biologically Significant Marine Areas) identified under the CBD framework



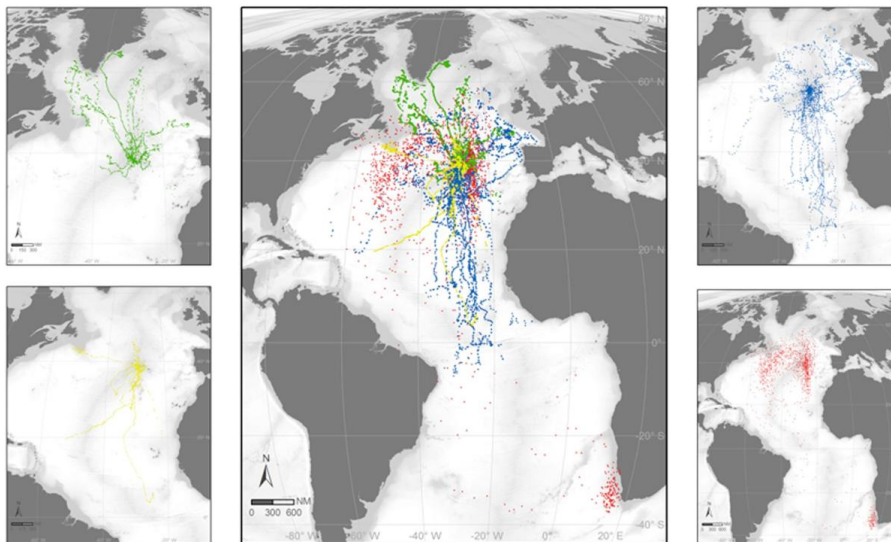
Ecologically or Biologically Significant Marine Areas (EBSAs)



Other areas of relevance for marine ecosystems and biodiversity: Seamounts. Sea-bottom topography.



Data from EMODnet.

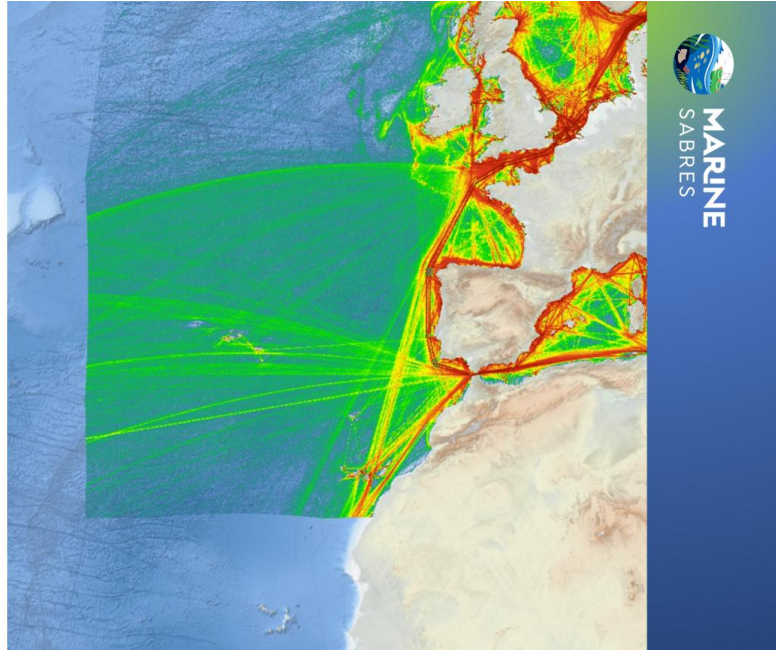


Graphic representation of various megafauna tracks obtained via satellite tagging programs implemented in the Azores archipelago. Dots represent estimated positions from individual baleen whales (green), seabirds (red), and large pelagic teleost (yellow) and cartilaginous (blue) fishes. Redrawn from data in published (see text) and unpublished reconstructed geolocations, GPS-logged or ARGOS positions.
FROM: Afonso et al. 2020, <https://doi.org/10.3389/fmars.2019.00826>



Interactions with
human activities such
as maritime traffic.
Vessel density

Data from EMODnet.



Expected Benefits & Trade-Offs:

Ecological benefits:

- Improved connectivity between archipelagos and MPAs
- Recovery of migratory species (e.g. tuna, sharks, cetaceans, turtles)
- Enhanced resilience of marine and coastal ecosystems

Socio-economic benefits:

- Boost for sustainable tourism (e.g. whale watching, diving)
- Long-term support for fisheries via spillover and stock recovery
- Research opportunities on connectivity and ecosystem function
- Potential financial incentives for compliant sectors (e.g. tax breaks)

Potential trade-offs:

- Adaptation of maritime transport
- Restrictions of future coastal/offshore wind siting
- Displacement of marine activities (e.g. fishing, marine traffic), with associated costs



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Challenges & barriers

- Legal complexity in ABNJ, requiring multi-level coordination between states and international bodies (e.g. OSPAR, IMO, RFMOs)
- Enforcement and compliance challenges, particularly across jurisdictional boundaries
- Political instability or institutional turnover may delay agreements or disrupt continuity
- Sectoral conflicts
- Data gaps on habitat use, and ecological thresholds – especially under climate change
- Shifting migratory patterns may render existing data obsolete without adaptive management



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Thank you!

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Appendix 3f. Governance: of marine ecosystems: Stakeholders' perspectives

Governance of marine ecosystems: Stakeholders' perspectives

From challenges to solutions



Task 1.2 Regulatory framework for policy and management

Léa Ricard, Sabine Cochrane, Charlotte Weber
Akvaplan-niva, Norway

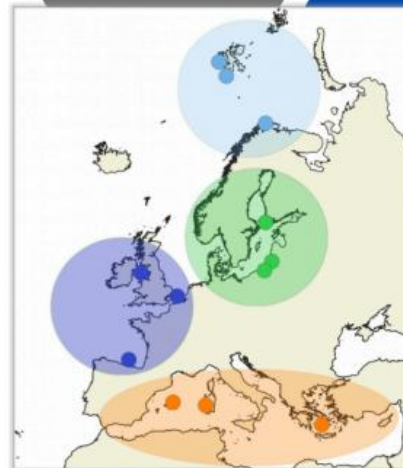
April 2025



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Objective:

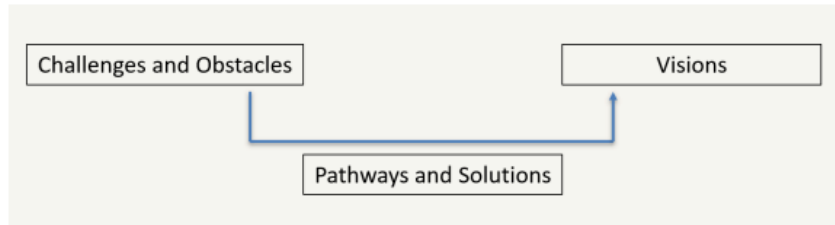
- Collecting the stakeholders' perspectives on marine biodiversity governance
- One day workshop in all the case studies
- As a photography of the coastal territorial identity



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Methodology:

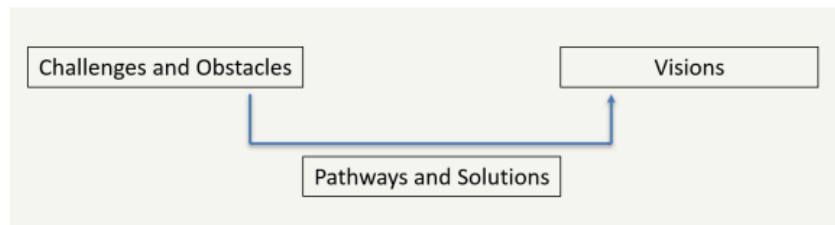
- 2 sessions:
 - Marine biodiversity governance
 - Marine Protected Areas (MPAs)



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Methodology:

- 2 sessions:
 - Marine biodiversity governance
 - Marine Protected Areas (MPAs)



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Examples of workshops days



Norway, Porsanger



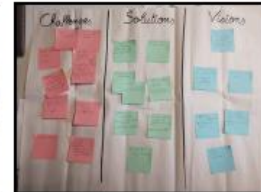
Spain, Santander



Svalbard, Norway



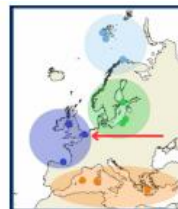
Ireland, Dublin



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Belgium: Dogger bank

Workshop in Ostend, 09/12/24



MAP: Something is moving at Sea: A marine spatial plan for the Belgian part of the North Sea, Federal Public Service Health, Food Chain Safety and Environment, March 2020
Maritime Spatial Planning information, Belgium, 2021



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Workshop in Ostend, 09/12/24

Workshop in Ostend, 09/12/24

- Marine Spatial Planning challenges
- Pollution of the marine waters and the coasts
- Policy fragmentation
- Erosion of territorial identity in Ostend

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- Pollution of the marine waters and the coasts
- Policy fragmentation
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- Communication on collective awareness
- Citizen science projects with schools
- Fisheries: centralised group
- Pollution: more power to local police

- Communication on collective awareness
- Citizen science projects with schools
- Fisheries: centralised group
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Workshop in Santander, 17/12/24

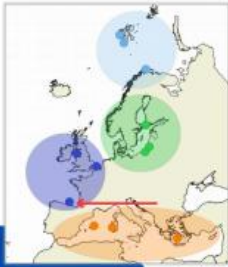
Workshop in Santander, 17/12/24



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Spain: Southern Gulf of Biscay

Workshop in Santander, 17/12/24



Challenges highlighted by stakeholders:

- Impacts of climate change on marine ecosystems, fauna and flora
- Pollution of the marine waters
- Morphological modification / sediments

Visions and Pathways

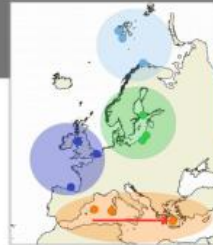
- Conservation and restoration of habitats
- Stronger management and control on alien species
- Increased of research fundings



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Crete, Greece: Gulf of Heraklion

Workshop in Heraklion, 06/02/25



Map: Heraklion Gulf BBT - HCMR
NextCloud



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Crete, Greece: Gulf of Heraklion

Workshop in Heraklion, 06/02/25

Challenges highlighted by stakeholders:

- Exponential urban development and human pressure with tourism
- Climate change and invasive species
- Fish prices
- Lack of efficient institutional frame

Visions and pathways

- Share best practices, and more spatial planning
- Quantification and monitoring of invasive species
- Find a way to use the invasive species



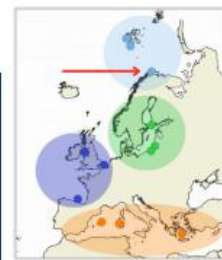
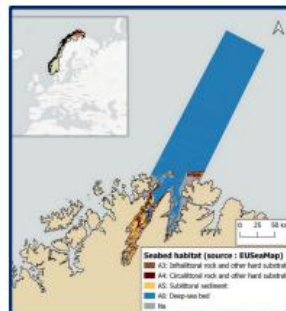
Map: Heraklion Gulf BBT - HCMR
NextCloud



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Norway: Porsanger fjord-Barents Sea

Workshop in Lakselv, 17/02/25



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Norway: Porsanger fjord-Barents Sea

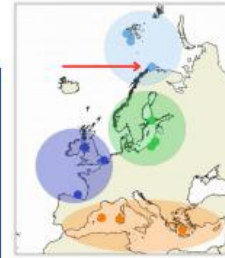
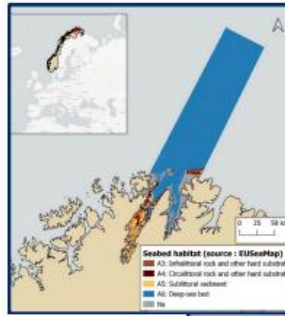
Workshop in Lakselv, 17/02/25

Challenges highlighted by stakeholders:

- Top-down approach
- Tourism fishing
- Industrial fisheries - depropriation feeling
- Invasive species
- Fish farming - local controverse

Visions and pathways

- Local knowledge taken into account
- Regulations regarding catch and release practices
- Place specific regulations for fisheries
- Keep working on ecosystems restorations projects



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What to take away from this?

Main questions raised in all the areas:

- Fragmentation of policy and articulation of geographical scales
- Invasive and alien species with impacts on ecosystems and fisheries
- Tourism regulation
- **BUT: the study first aims to take into account the singularity of each location, with its own characteristics, dynamics and concerns**
- And now? Complete analysis on process



THANK YOU!



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Appendix 3g. The MARBEFES Toolbox

Appendix 3g.1. Introduction to the Toolbox

MARBEFES tools

30 + tools developed and being tested
12 study areas – 2 external areas

Tools for:

- Expanding knowledge
- Assessing environmental issues
- Identifying social and economic issues
- Innovation in data collecting/ analysis
- Making decisions



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Toolboxes:

- how does yours look?

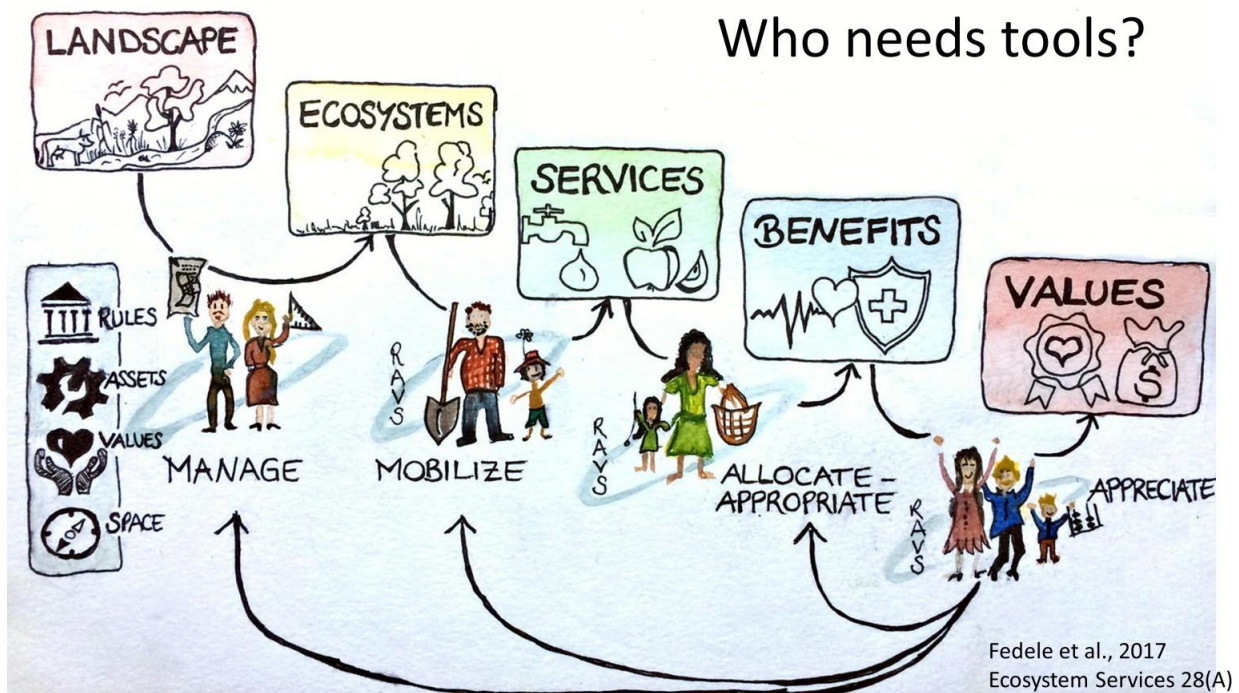


What is a tool?

- A physical thing/ measuring device
- A guidebook/ instruction manual
- Species identification technology
- Data analysis method
- Citizen science
 - Eg data collection, observations

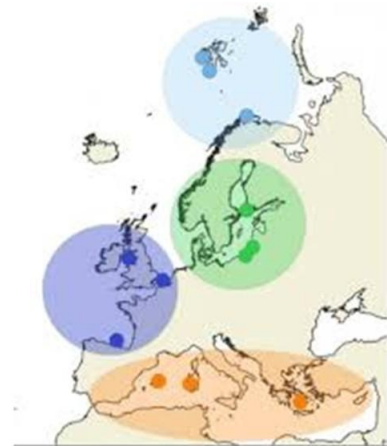


Who needs tools?



Who are the stakeholders?

- Research and education
 - Universities, schools etc.
- Society
 - Public groups, spiritual/religion, cultural heritage etc.
- Industry/commerce
 - Industry, retail, hotels, tourism etc.
- Governance
 - Local/regional regulatory authorities



**Marine
Ecosystems**



For Education

researchers, educators, students

For Society

communities, interest organisations

For Business

entrepreneurs, industry, commerce

For Governance

regulators, managers, policy-makers

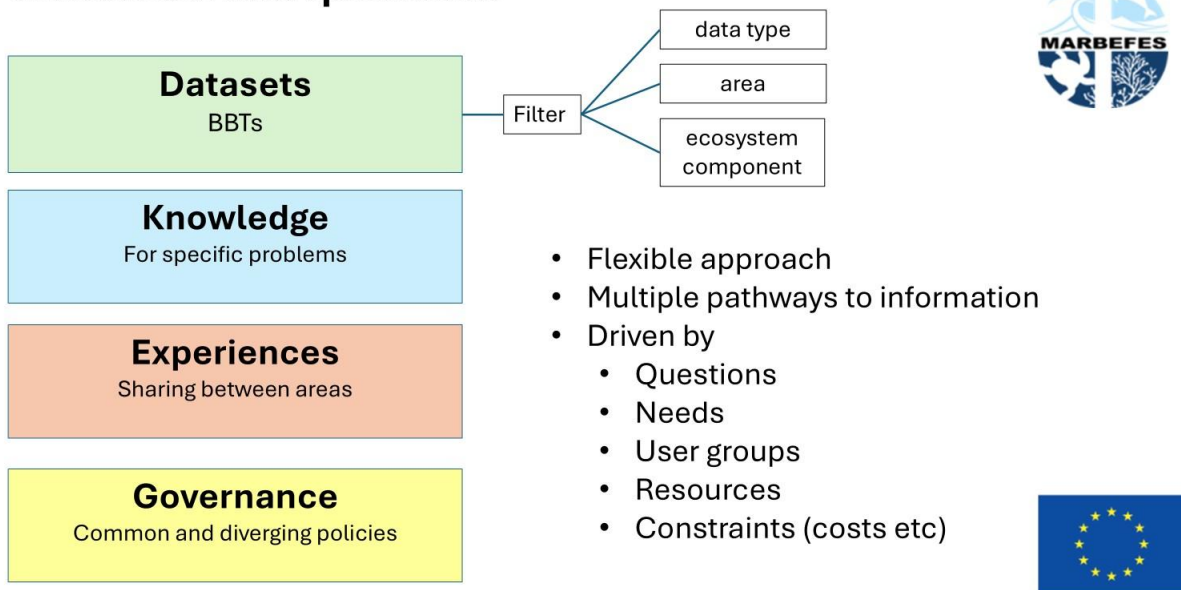
Welcome to the MARBEFES Toolbox

Here you find a selection of methods, approaches and guidelines for assessing the relationships between

- Nature
- Society
- Economy

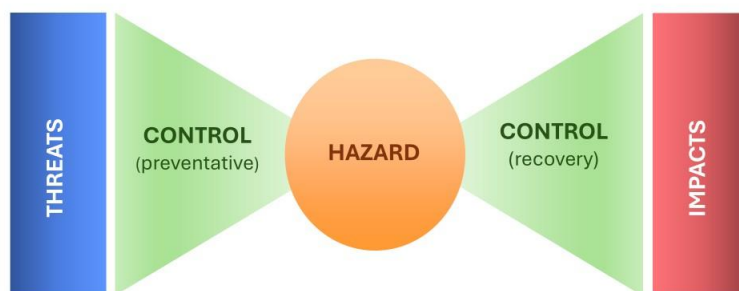


Resources and questions



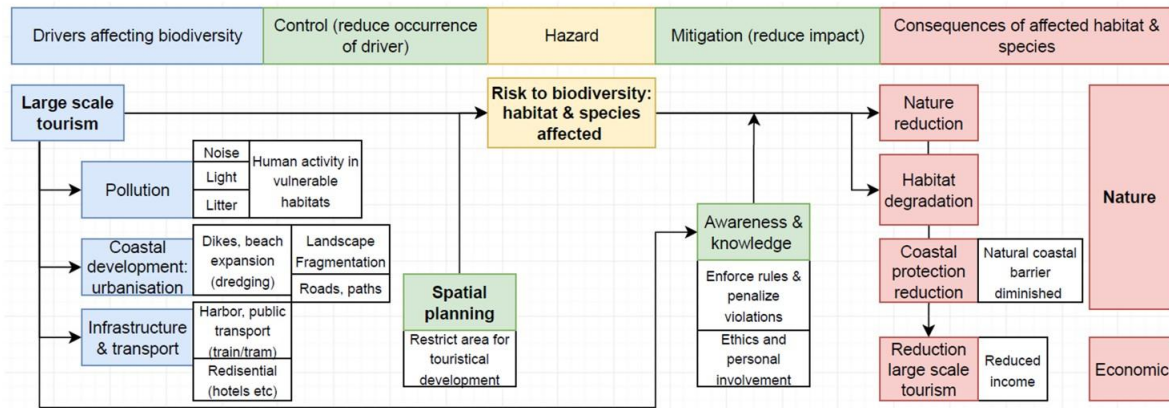
Challenge: how to assess the issues?

Conceptual visualisation of risks & consequences
– and appropriate management actions



"Bow tie" analysis

Example: Large-scale tourism



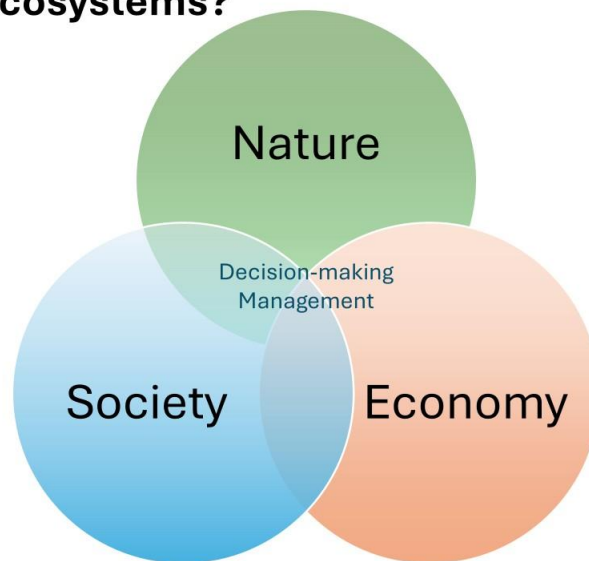
Challenge: how to value ecosystems?

3 of MARBEFES themes:

Ecological Valuation
Assessment (EVA) *

Socio-cultural values *

Financial and non-
financial valuation

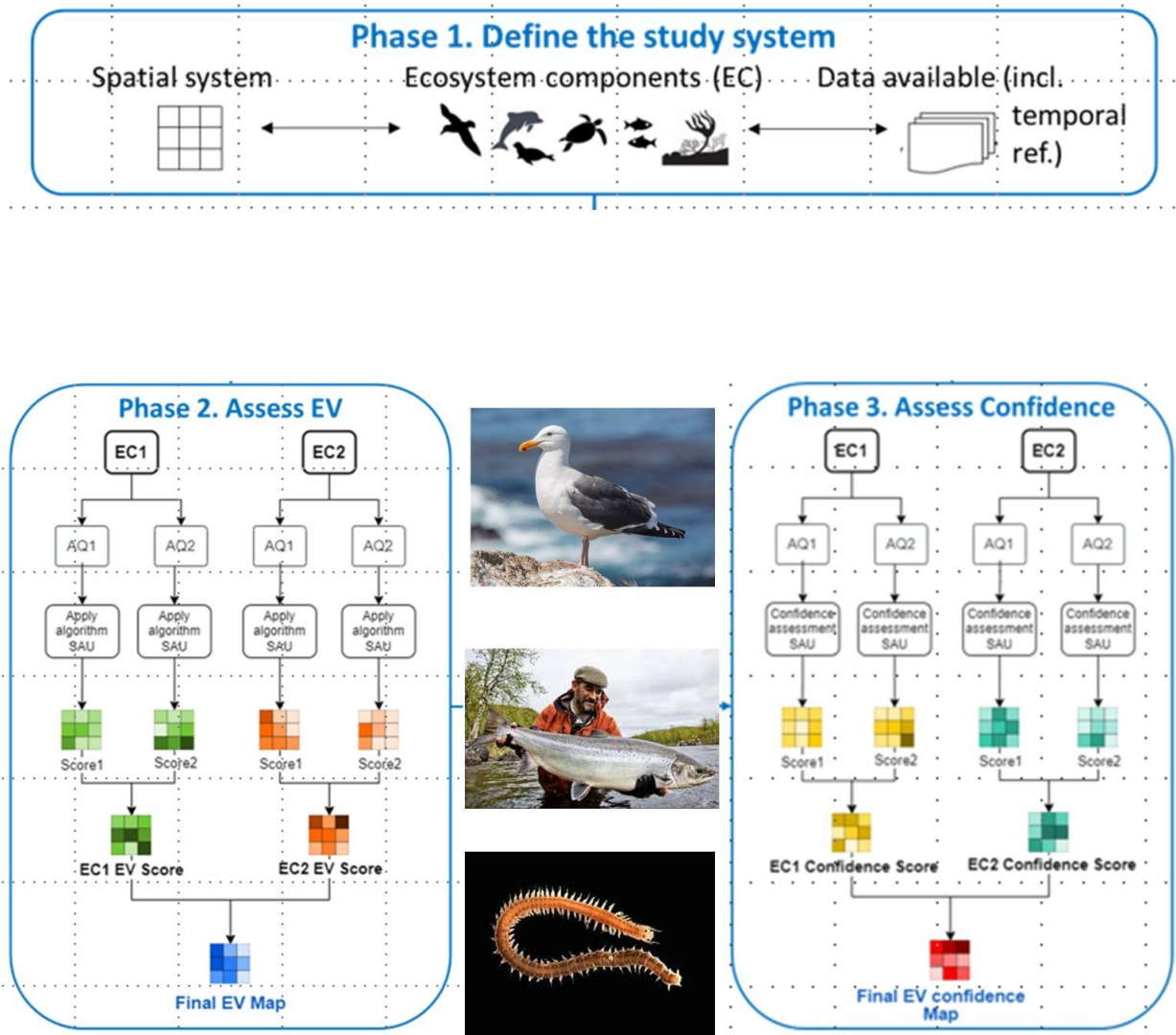


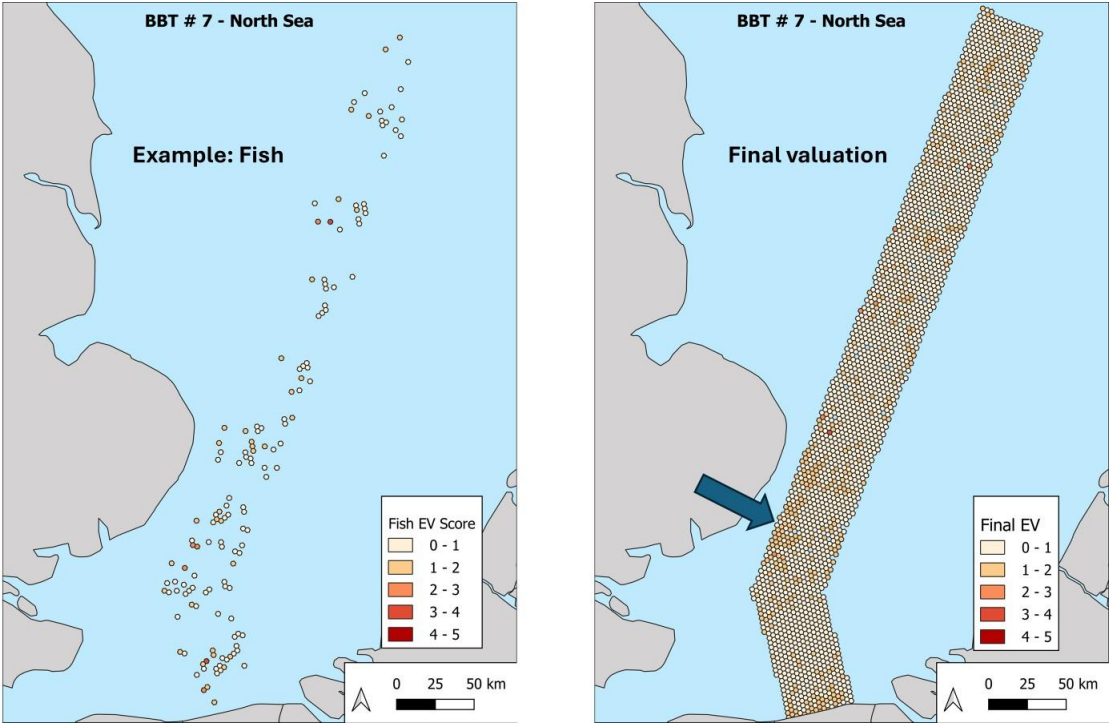
Example: Ecosystem Valuation Assessment

Aim – give a value to individual components – and then overall

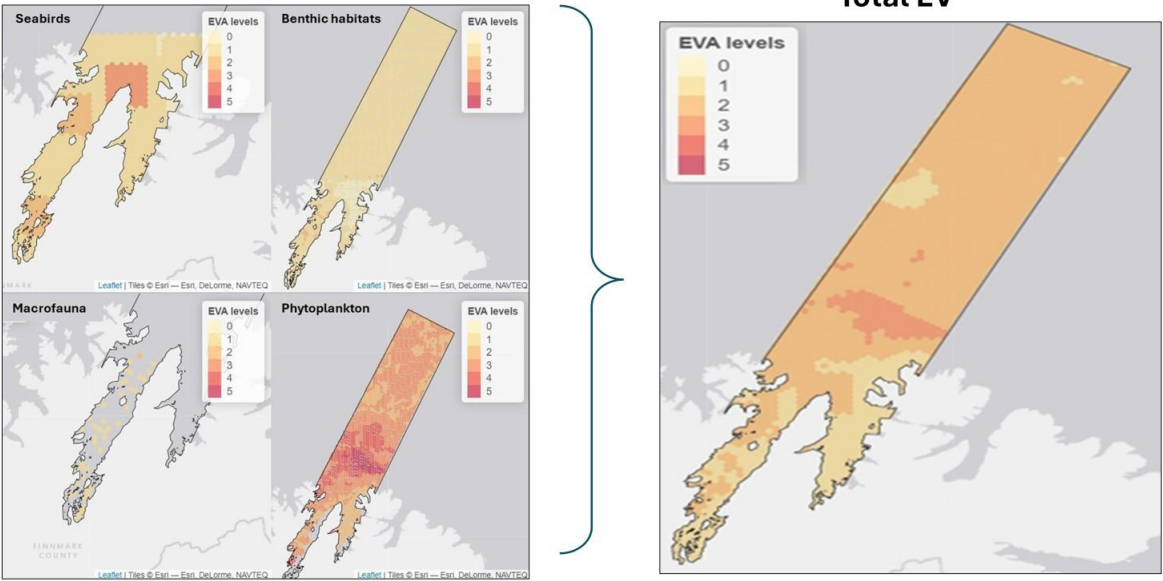
Who for? – Researchers, marine planners, industry, fisheries management, public...

How?





Example: Ecological Value Assessment (EVA) North Norway



Appendix 3g.2. Toolbox design



What should the Toolbox website be like?

Clear
Quick answers
Aesthetic
A living resource
Support different users
Engaging
Intuitive
User-friendly
Find the right tool
Find detailed information
Easy to update
Encourages learning
Accessible
Smart filters
Structured

[Go to Toolbox prototype](#)

Session 9b. Zandvoort workshop

Appendix 3g.3. Broadscale biological traits

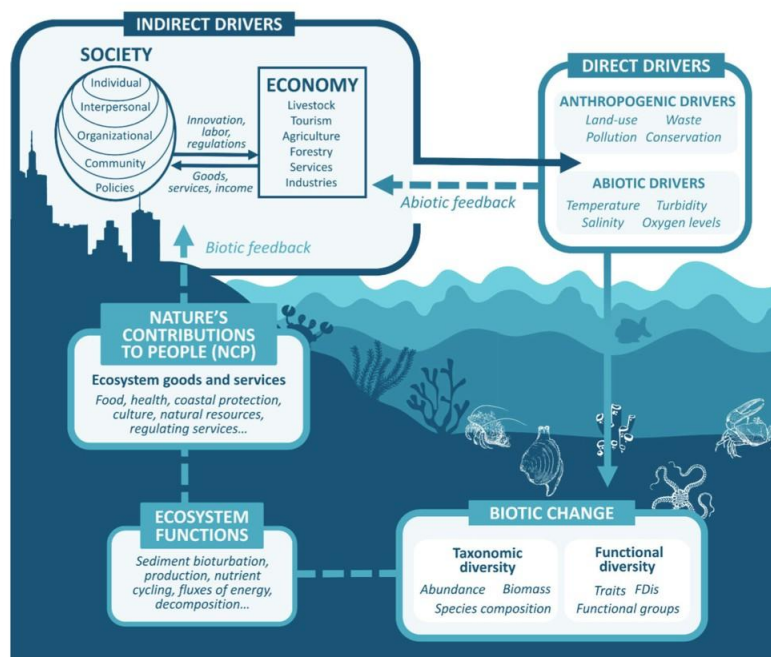
Marine biodiversity and ecosystem functioning leading to ecosystem services

Marie C. Nordström
University of Helsinki, FIN
Clement Garcia
Cefas, UK

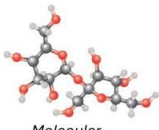
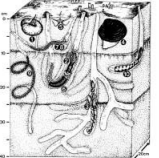
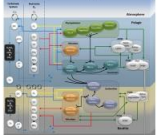
Zandvoort 02.04.2025



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The WP3 Tools – 15

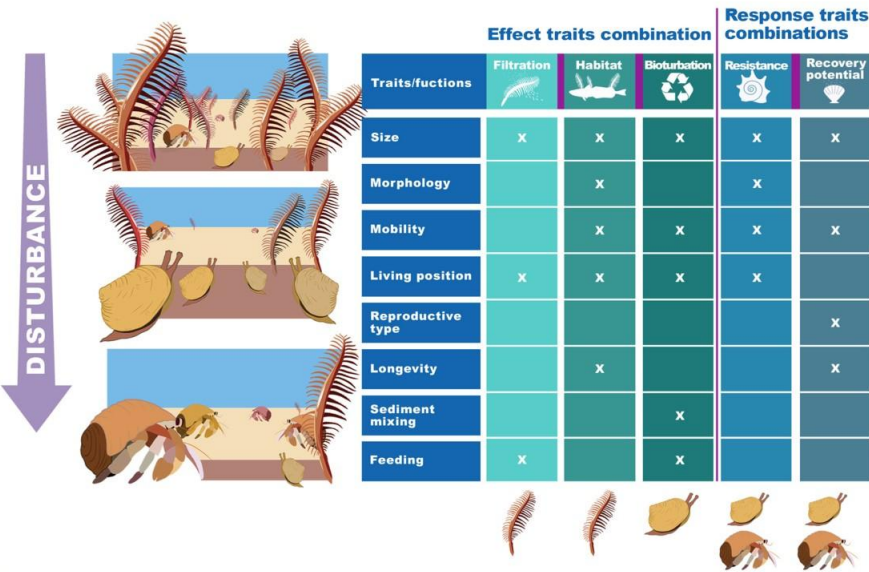
	Operational	R&D
 Molecular		Metabarcoding/eDNA Telomeres
 Trait	Broadscale trait-based approaches Ecological Interaction Networks Ecological vulnerability appraisal Metric of habitat function	Indicators of functional change Animal imager (ZooScan) Micro computer tomography (micro-CT) Ecological function decision tree
 Network	Ecological Interaction Networks Causal paths - Bayesian Belief Network (BBN)	Causal paths - Structural Equation Modelling (SEM)
 Large model	PlanWise4Blue (PW4B)	Biogeochemical modelling

TOOL: Broadscale biological traits

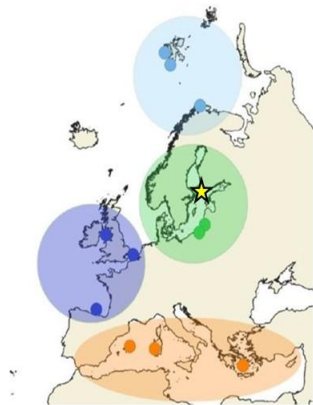
- Aim: to describe (functional) diversity
- Species characteristics that describe the ecological role of the organism



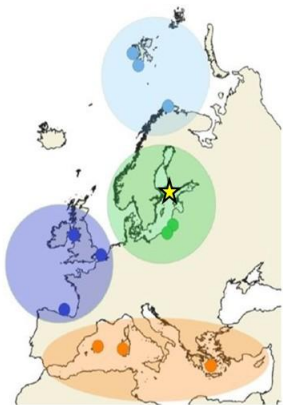
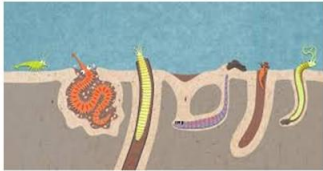
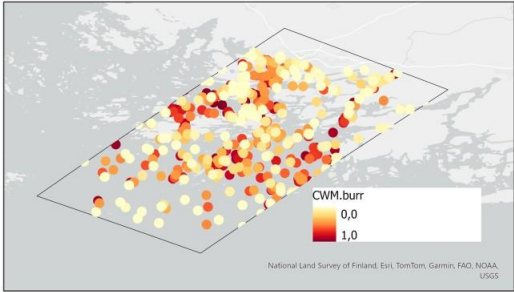
MULTIPLE TRAITS AND RELATED FUNCTIONS IN BENTHIC ECOSYSTEMS



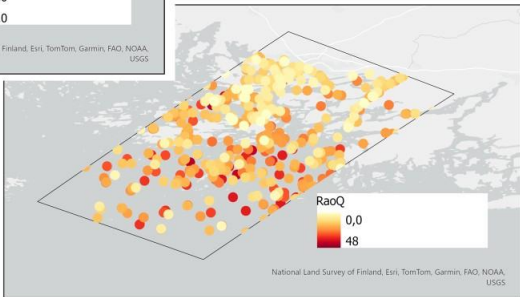
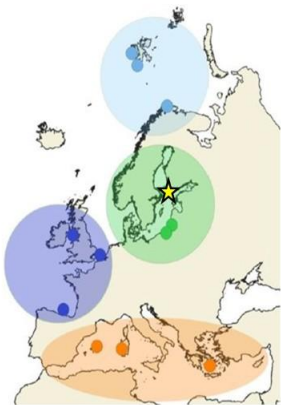
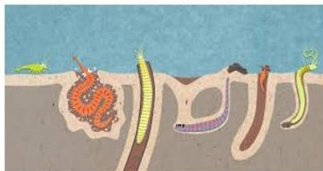
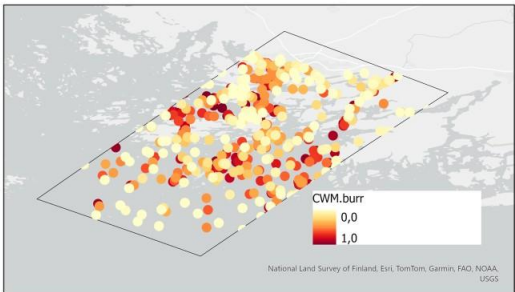
Broadscale biological traits –
Finnish Archipelago Sea

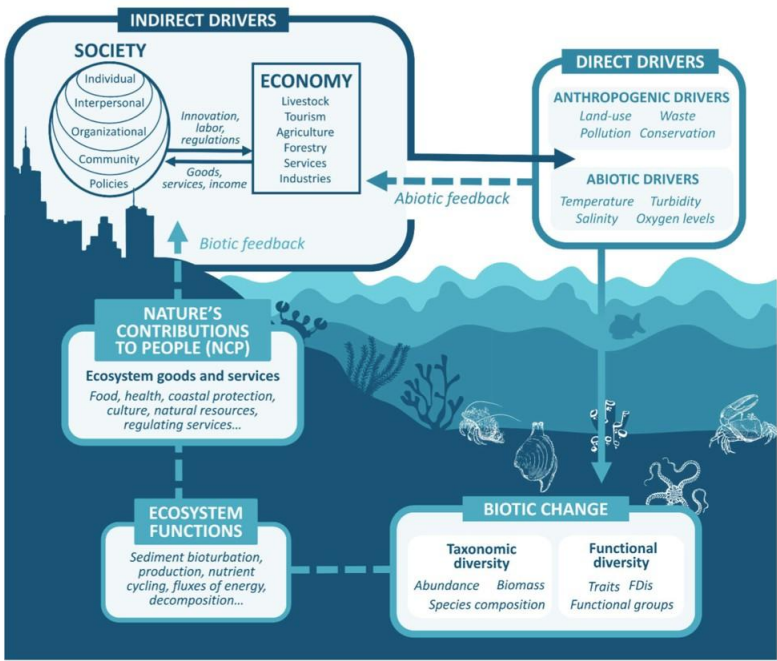


Broadscale biological traits –
Finnish Archipelago Sea



Broadscale biological traits –
Finnish Archipelago Sea

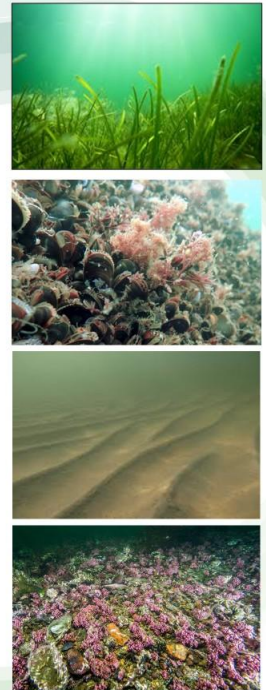




Appendix 3g.4. Metric of habitat function

TOOL: Metric of habitat function

- Aim: to quantify and map functioning across habitats in an area
- Ecosystem functions are the biological, geochemical and physical processes that take place within an ecosystem – feeding into ecosystem services



Workflow for developing the Metric of habitat function

Marine habitat information

- Habitat maps (EUNIS 2022)
- Oceanographic cruises
- Underwater services



Habitat distribution

- Habitat 1
- Habitat 2
- Habitat 3
- Habitat 4



Spatialization

GIS layer creation

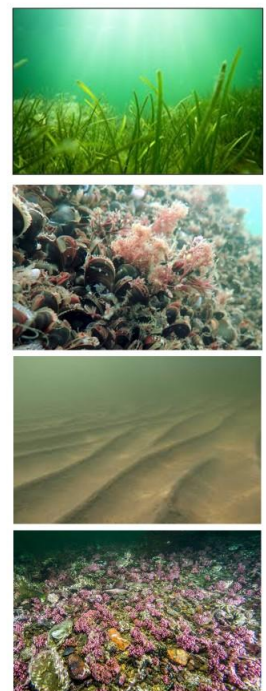
- Habitat presence/absence
- Hexagonal grid
- 1 km resolution

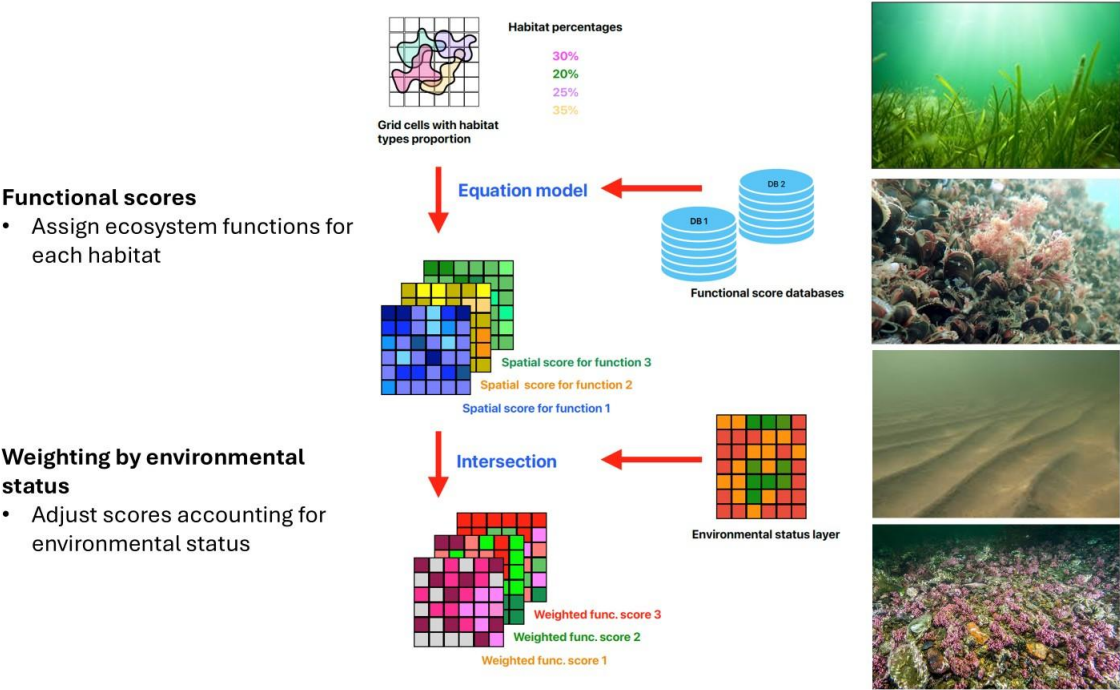


Habitat percentages

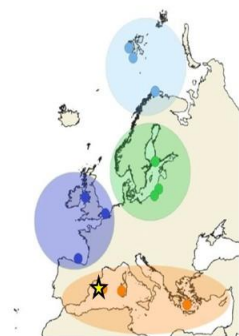
- 30%
- 20%
- 25%
- 35%

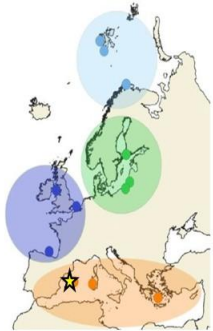
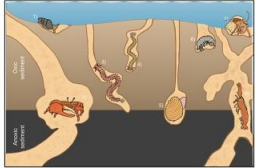
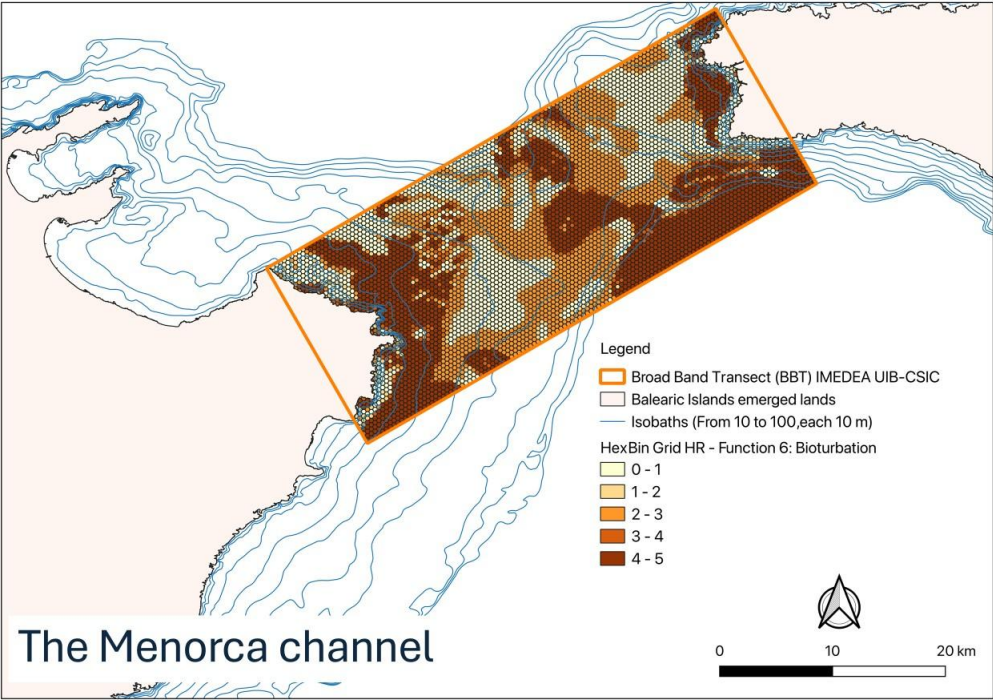
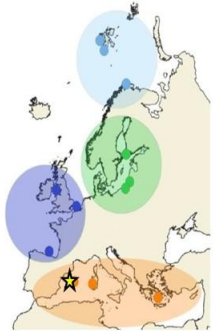
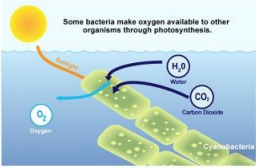
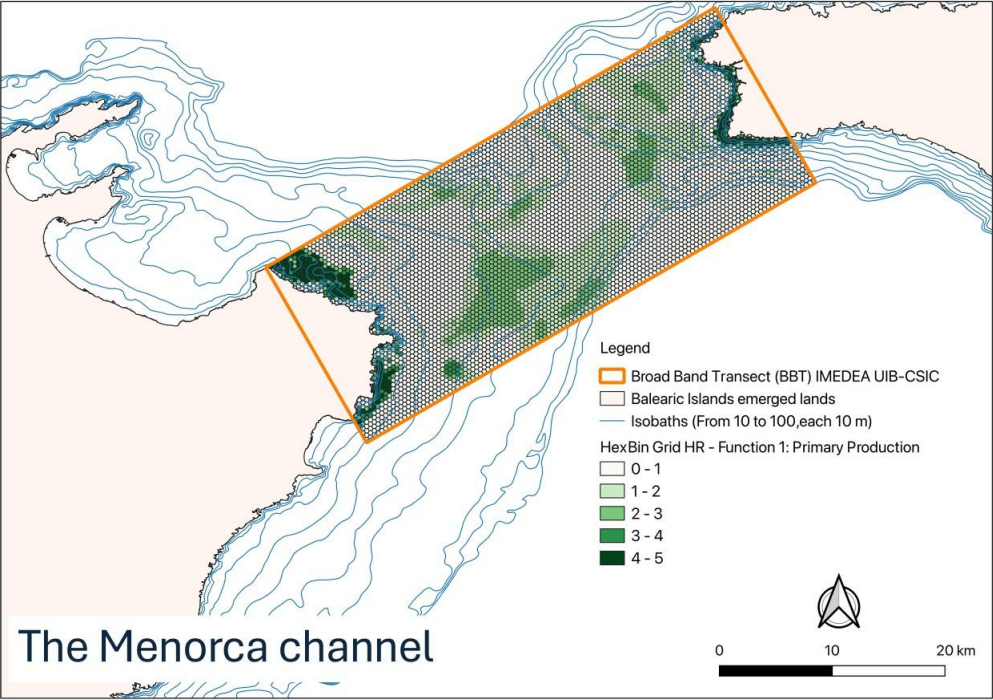
Grid cells with habitat types proportion

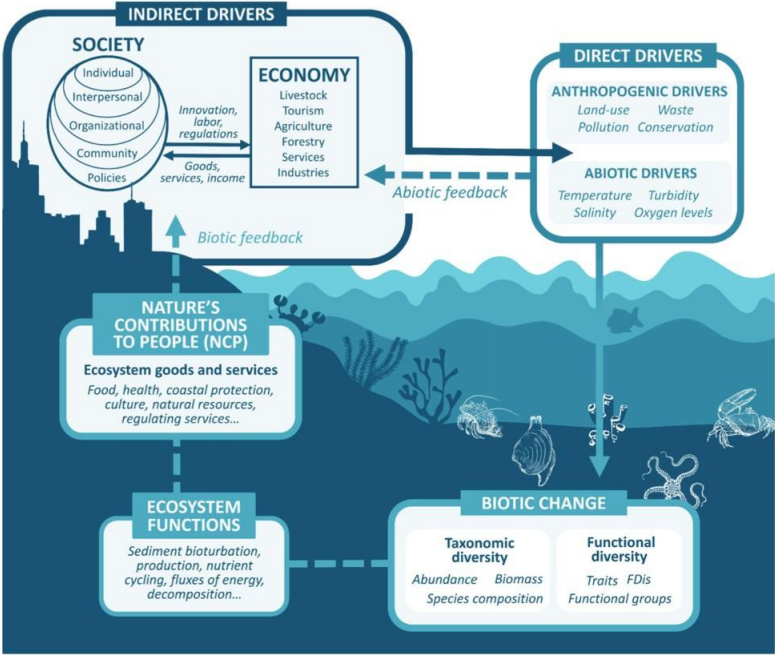
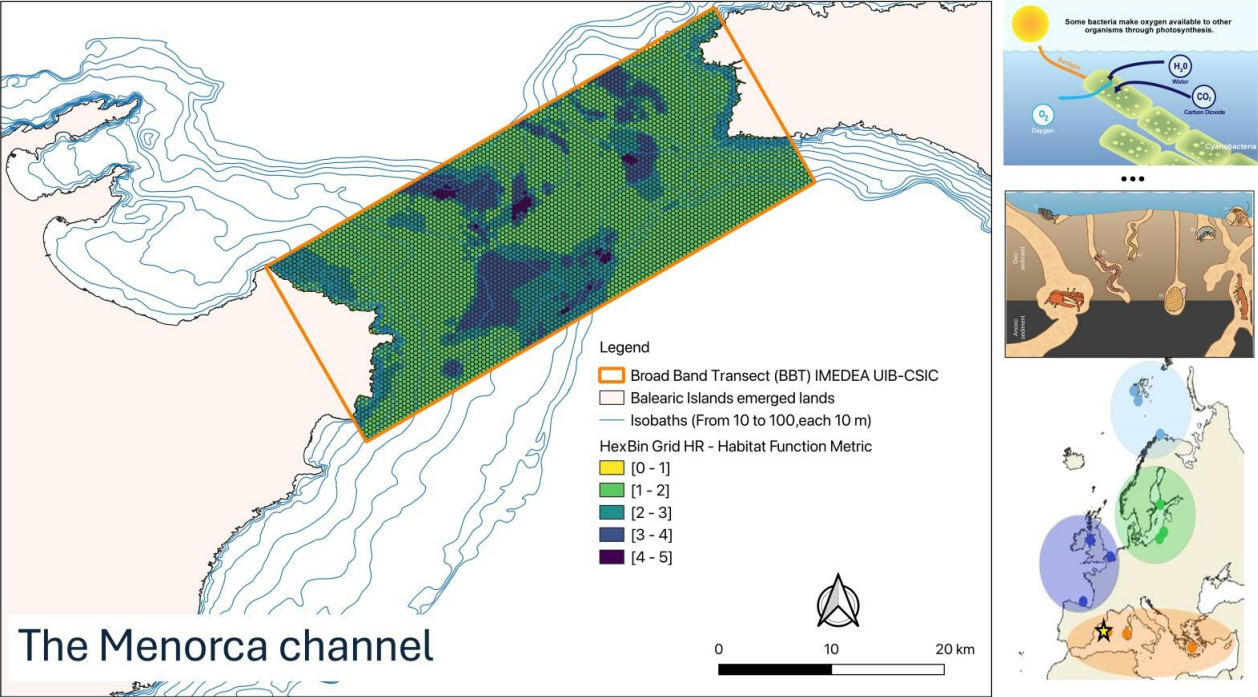




Metric of habitat function –
the Menorca channel

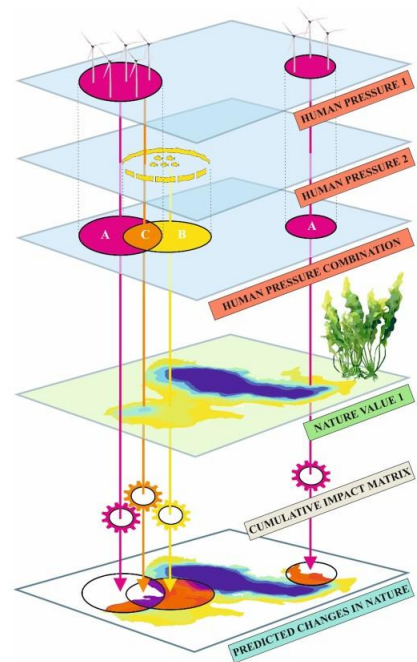




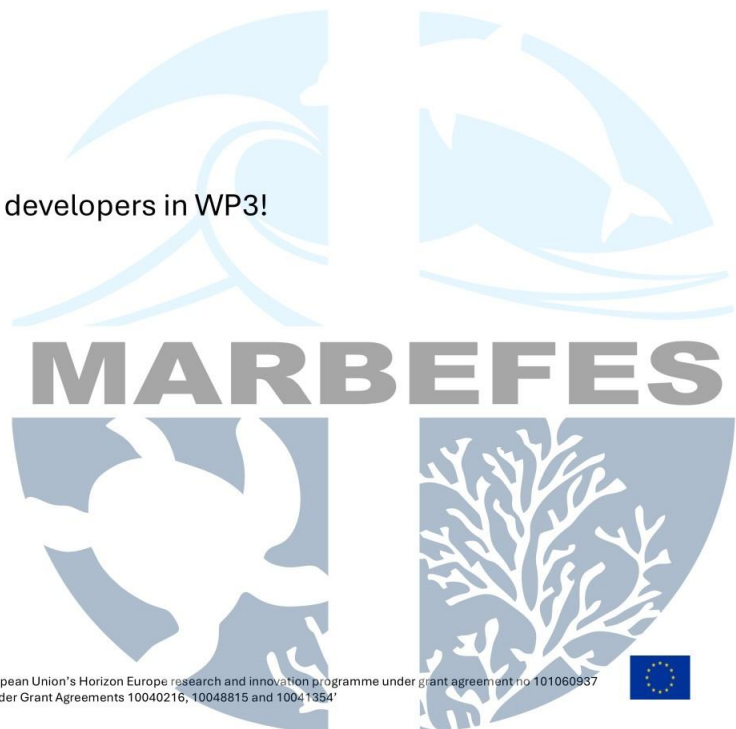


The tools provide knowledge for decision support

- Combines layers of nature values and human pressures
- Uses evidence of how human pressures affect nature values
- Helps us understand trade-offs



Thank you on behalf of all tool developers in WP3!



The MARBEFES Project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement no 101060937 and UKRI under Grant Agreements 10040216, 10048815 and 10041354



Appendix 3h. Tools & Stakeholders

Appendix 3h.1. Appreciation of some tools

**MARINE
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Second Overarching Stakeholders Workshop
01-02 April 2025, Zandvoort, the Netherlands

**Feedback by Stakeholders in the Second-Round consultations
on the BowTie approach, the Causal Loop Diagram,
and Hydrodynamic and Biogeochemical modelling tools**

Herman Hummel, Bram Sturm, Rob Segeren, Shadi Sanatgar, Hanie Matajinimvar
HuFoSS, Roosendaal, the Netherlands

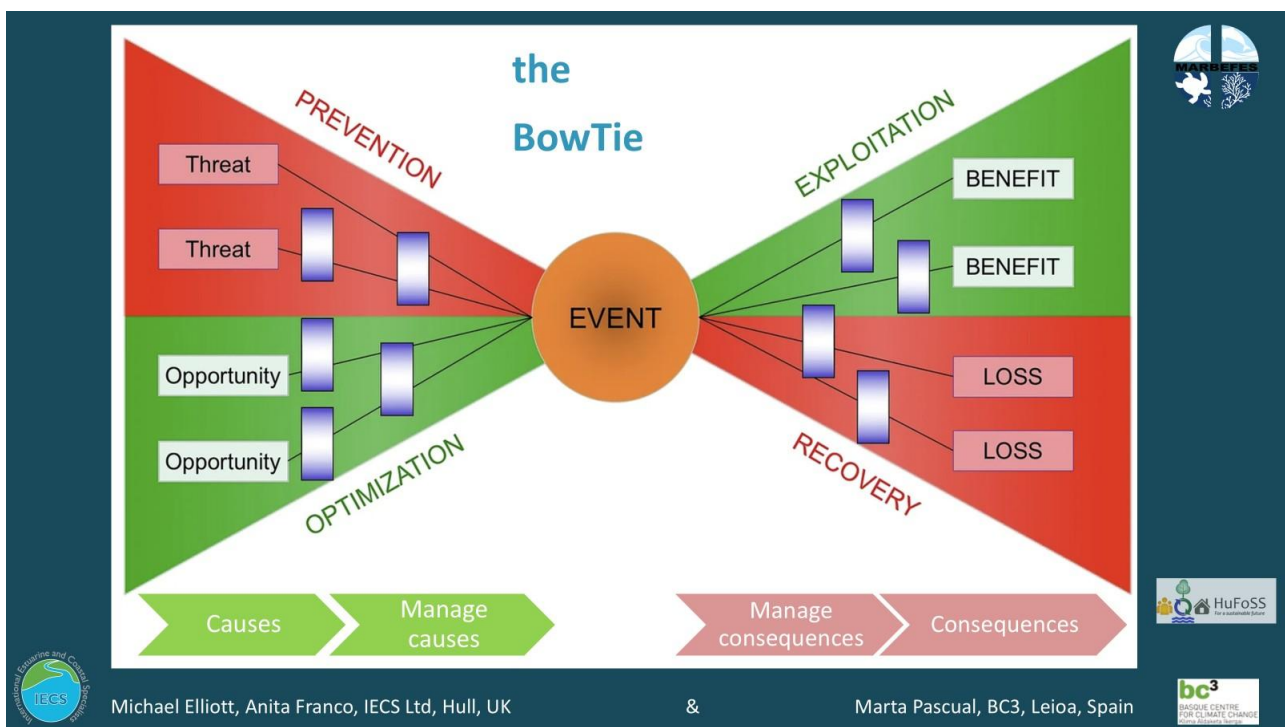
Marine SABRES is funded by the European Union's Horizon Europe programme under grant agreement No.101058956



**HuFoSS**
For a sustainable future

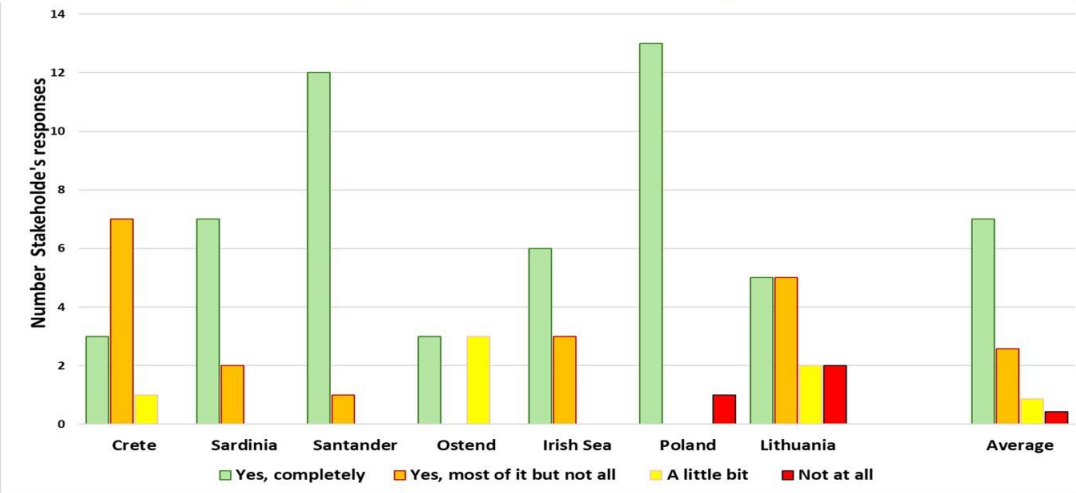
MARBEFES has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement no 101060937

Session 10. Zandvoort workshop



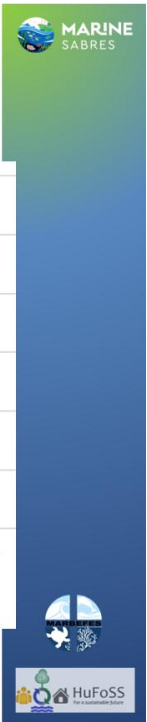
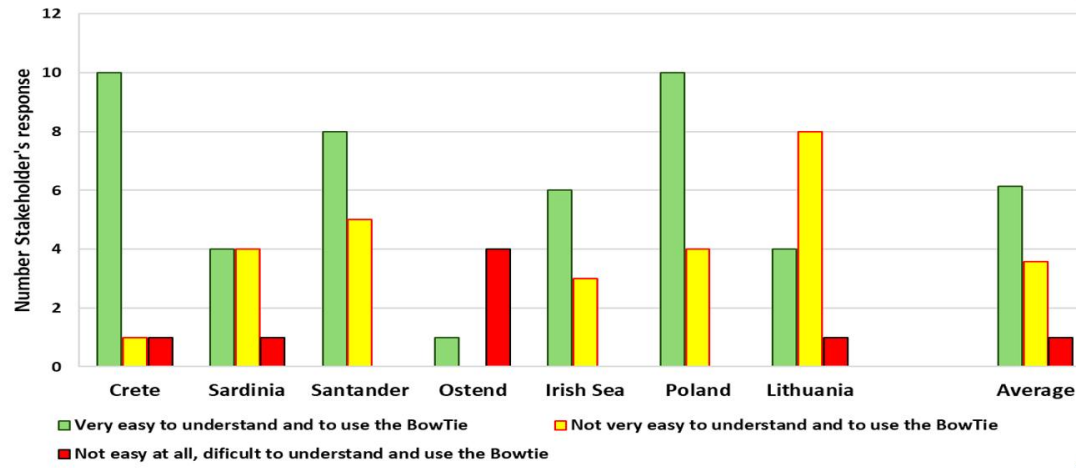
2nd round of Stakeholder consultations

Did you understand the BowTie concept ?



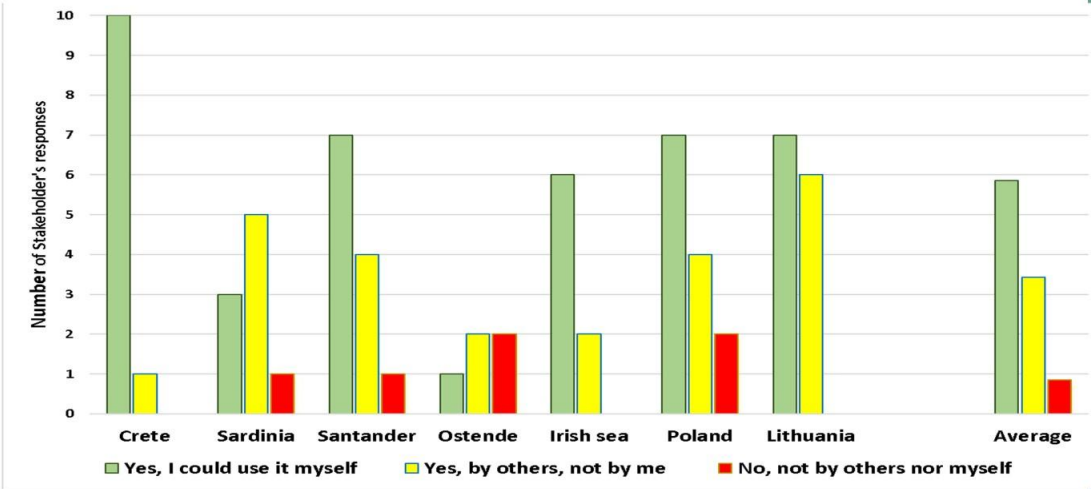
2nd round of Stakeholder consultations

Do you think you can easily use the BowTie for your specific purposes



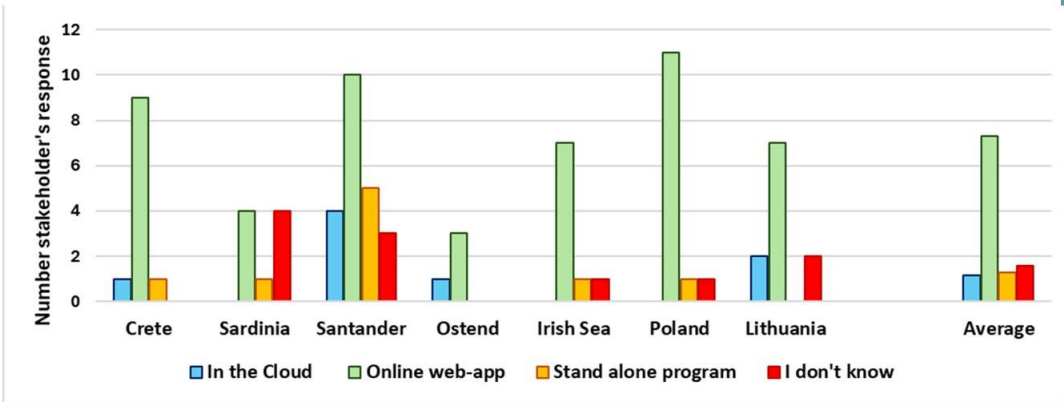
2nd round of Stakeholder consultations

Will you use the BowTie for your specific purposes



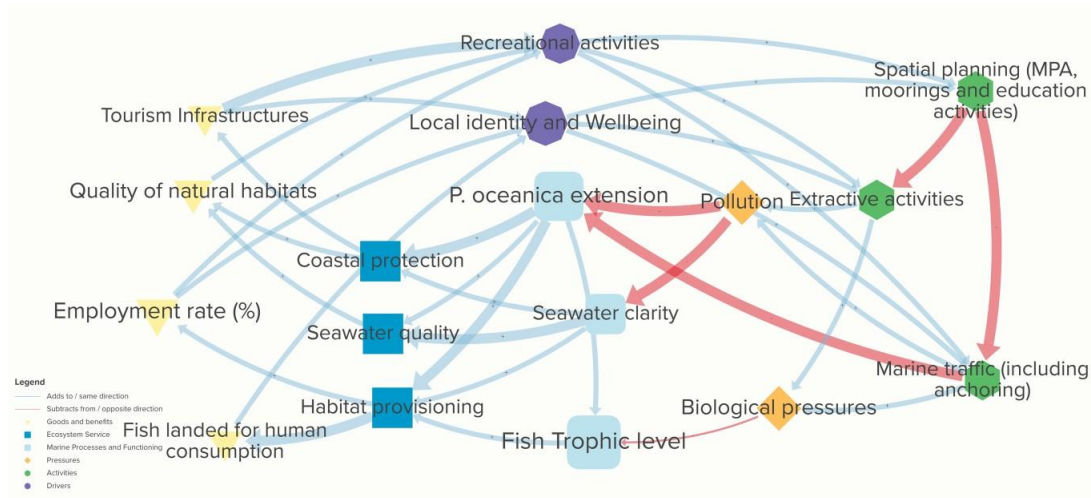
2nd round of Stakeholder consultations

What would be your preferred platform / interface to use the BowTie



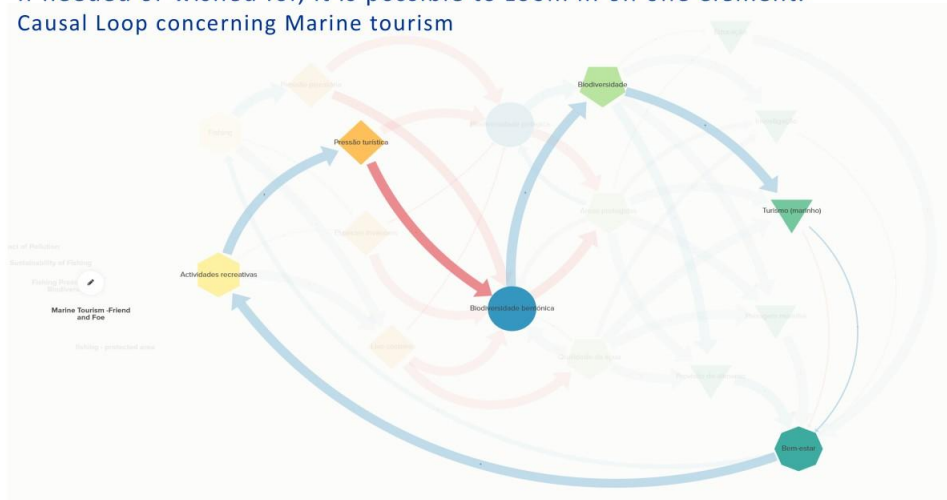
A Causal Loop diagram

includes several elements, based on cause-consequence relationships



This approach will also be used and shown in the afternoon (the Shiny-App)

If needed or wished for, it is possible to zoom in on one element.
Causal Loop concerning Marine tourism



We will discuss this approach and the results in small groups:

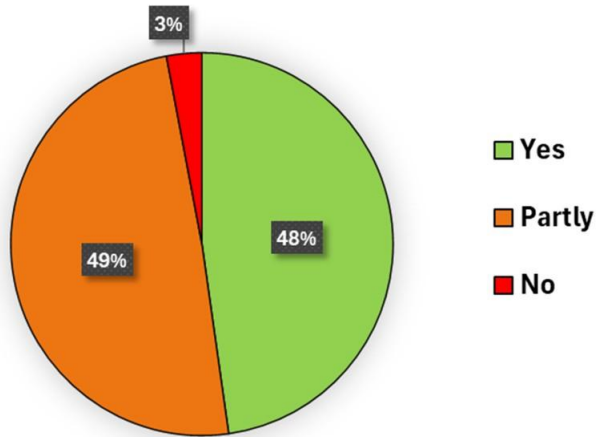
- What do you think about these results?
- Are there other elements to be added

You can insert your answer also in the Mentimeter that will follow after the discussion



2nd round of Stakeholder consultations

Are to your viewpoint in the Causal Loop Diagram the essential elements included



Other tools

In the MARBEFES Tool-Box

Additional tool 1

Hydrodynamic and Biogeochemical modelling tools

John Aldridge, Rob McEwan, Cefas, UK
Burak Kaynaroglu, Klaipeda University, Lithuania
Natalia Stamataki, Ioannis Tsakalakis, HCMR, Greece



MARBEFES Project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement no 101060937 and UKRI under Grant Agreements 10040216, 10048815 and 10041354



What are these Hydrodynamic and Biogeochemical (HBGC) modelling tools?

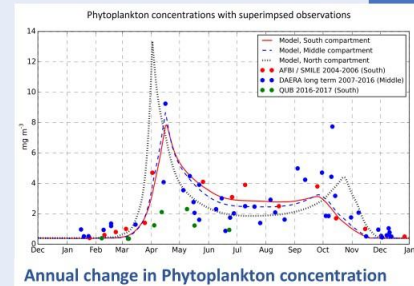
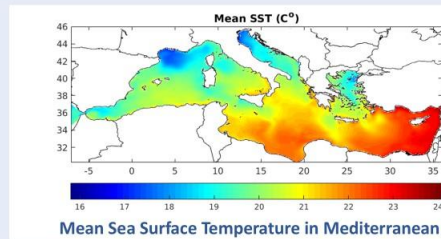
A computer representation of physical, chemical, and biological processes

Typically calculated by these models:

- Physical: Water movement, Temperature, Salt
- Chemical: Nutrients, Carbon
- Biological : Phyto- and Zoo-plankton

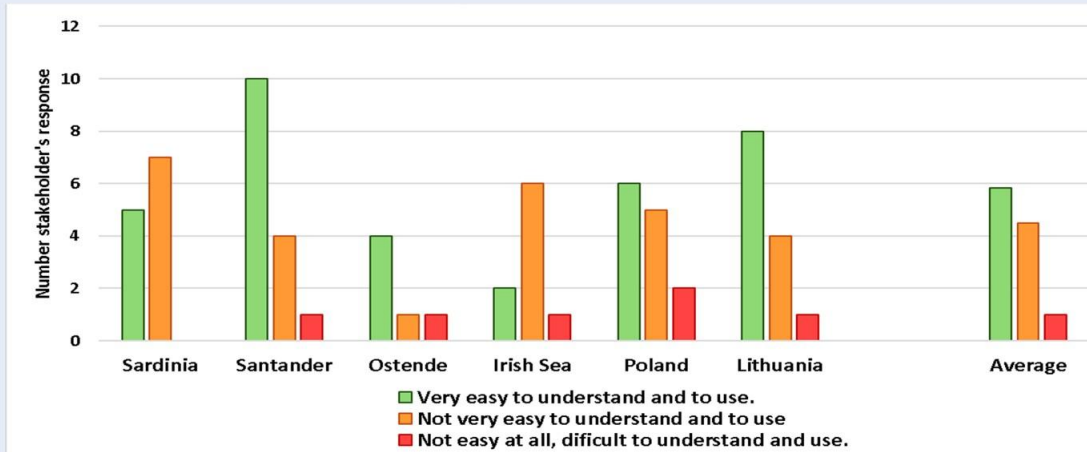
The outputs are (for both water and seabed):

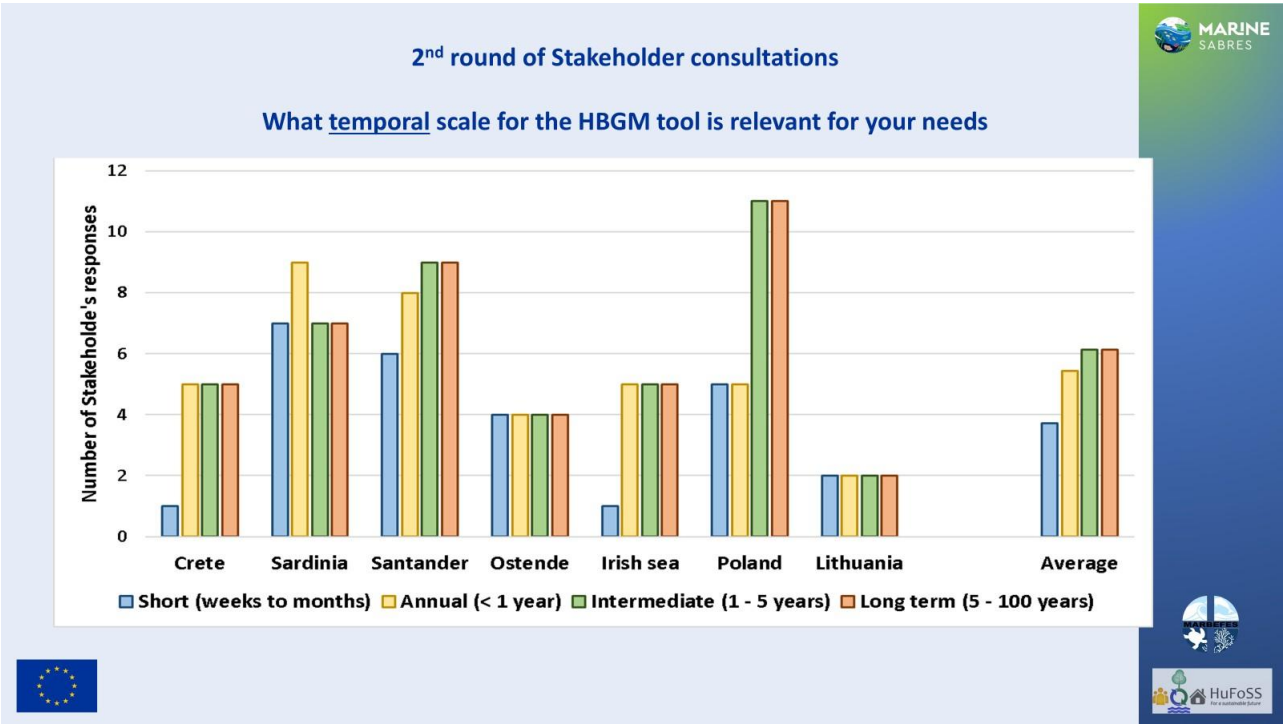
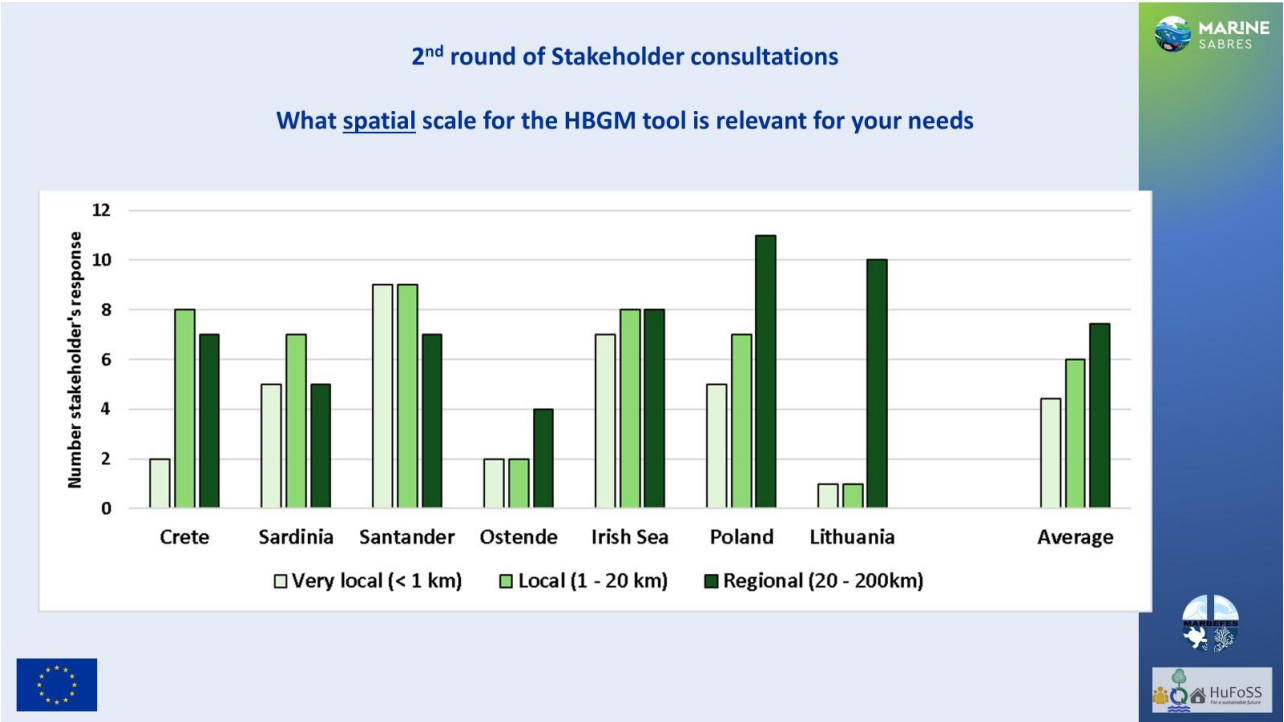
- time varying (e.g. daily averages over a year)
- space varying (often of a few kilometres)

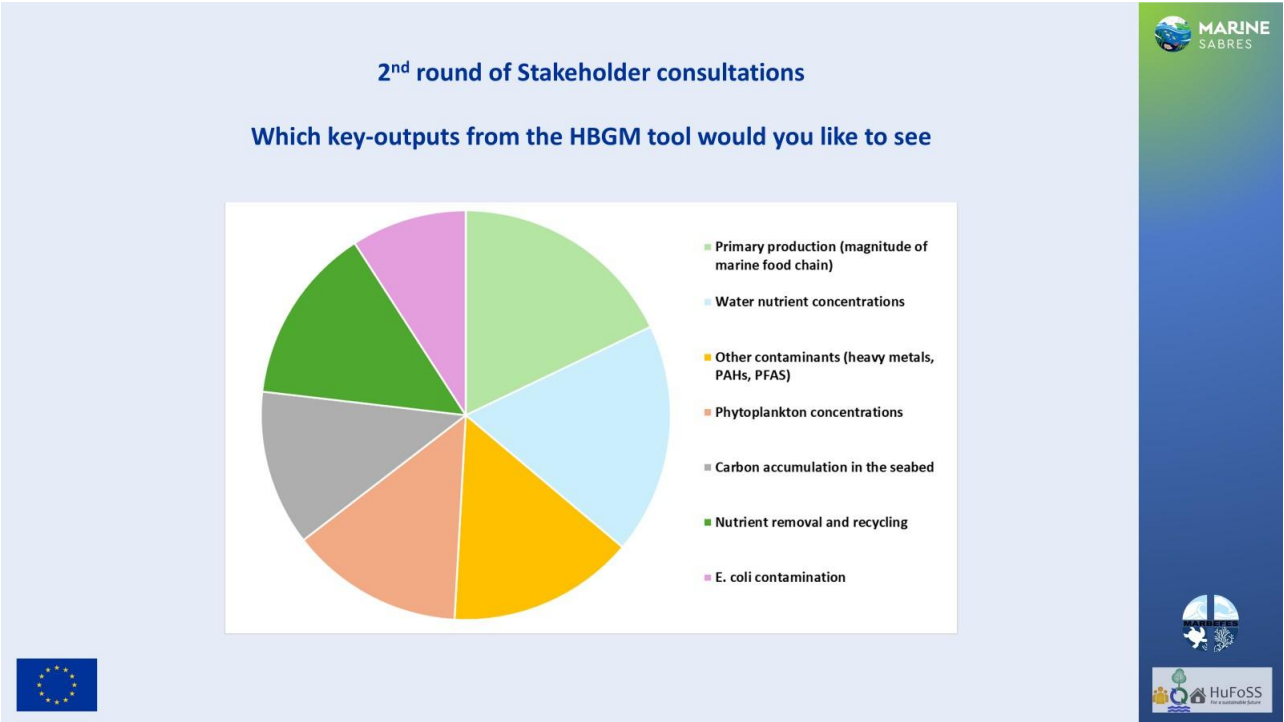


2nd round of Stakeholder consultations

Do you think you can easily use the HBGM tool for your specific purposes







All these elements can be inserted in the Tools of the Toolbox and/or the Shiny-App
On which Joanna will question you in the following subsession

The screenshot shows the MARBEFES TOOLBOX interface. On the left, a grey box contains the text "MARBEFES TOOLBOX" and "Tools for valuing marine biodiversity and ecosystem services", with a "VIEW TOOLS" button below. To the right is a large image of a blue boat on a sandy beach. Below the image, a cartoon starfish character with a speech bubble saying "Hello" is positioned next to a text input field. The input field contains the text "My name is Marby, how can I help you?". Below the input field is a "Start Conversation" button. At the bottom, there are four icons with labels: "Find tools based on topic of interest", "Find decision-support tools", "Discover tools based on your sector", and "Discover methods and approaches".

Logos: European Union, MARINE SABRES, HuFoSS

All these elements can be inserted in the Tools of the Toolbox and/or the Shiny-App
On which Joanna will question you in the following subsession

Joanna Piwowarczyk
Institute of Oceanology PAS
Sopot, Poland

What are the most important challenges for the practical uptake of the toolbox?

Please think about this question from the perspective of your own organization but also consider other entities that should or would use it

What could be done to enable a wider use of the toolbox?

Please think about the question from the perspective of your own organization but also consider other entities that should or would use it.



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MARBEFES



Thank you for your attention

Questions to us?

Herman Hummel, Shadi Sanatgar, Hanie Matajinimvar
HuFoSS, Roosendaal, the Netherlands

Marine SABRES is funded by the European Union's Horizon Europe programme under grant agreement No.101058956



MARBEFES has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement no 101060937

Appendix 3i. Decision Support Systems (DSS)

Appendix 3i.1. Introduction to the decision making and DSTs

Towards the DSS for biodiversity management

	Revisiting old stuff	Decision making What are DSTs How do DSTs support decision-making processes
	Results from stakeholder consultations (Evelina)	
	General outline and technical specifications for DSS	
	Links & demonstrations	
	Some still pictures	
	You pick my brains (discussions), then I will pick yours (mentimeter)	



What is a decision making process ?

A method that guides an individual or group through a series of tasks from problem identification and analysis to design of alternatives and selection of an alternative.

- Minzberg et al.(1976)

A decision-making process refers to the series of steps or stages that individuals or groups go through to identify, analyze, evaluate, and choose among alternative courses of action to address a particular problem or achieve a specific goal. The decision-making process can vary depending on factors such as the complexity of the decision, the availability of information, the preferences of decision-makers, and the context in which the decision is being made.

- ChatGPT (2024)

A decision-making process is a systematic series of steps individuals or groups follow to identify, analyze, and choose between alternatives to solve a problem or achieve a goal. It involves gathering information, evaluating options, and selecting the best course of action based on logic, values, and desired outcomes.

- DeepSeek (2025)





<https://www.umassd.edu/fycm/decision-making/process/>

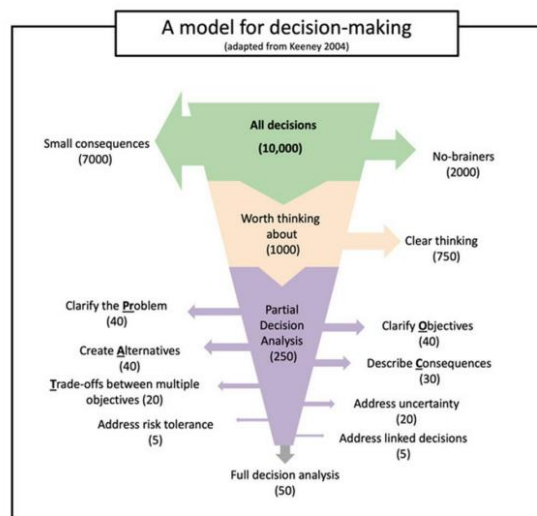
Conservation decisions are challenging, especially if resources and capacities are limited



Common questions in conservation decision making

- What actions should be implemented to protect endangered species and ecosystems within a region?
- How can a protected area network be designed to effectively conserve whole ecosystems under a changing climate?
- What actions will protect species and ecosystems while also considering the cultural and livelihood needs of people?
- How should an action be chosen when uncertainty impedes knowledge of the best action?
- When should researching a problem stop and implementation of a solution start?

Hemming et al., 2022



What is a decision support system(DSS) ?



A computer-based system composed of a language system, knowledge system, and problem-processing system whose collective purpose is the support of decision making activities

- Holsapple (2003)

A Decision Support System (DSS) is a computer-based tool that helps individuals or organizations make informed decisions by analyzing large amounts of data, identifying patterns, and providing recommendations. DSSs are widely used in business, healthcare, finance, and other industries to improve decision-making efficiency and accuracy.

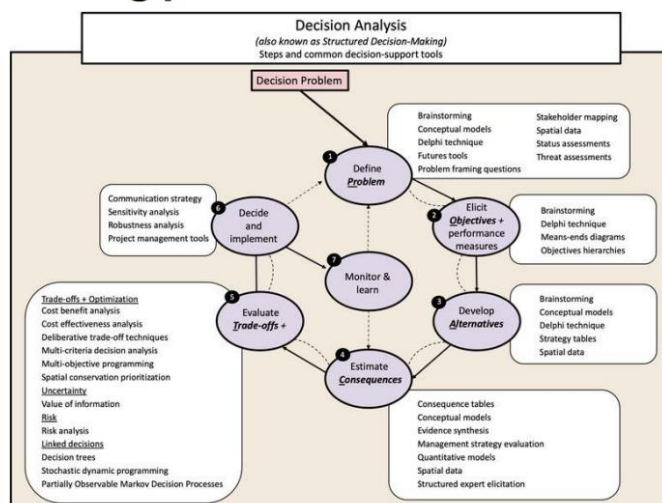
- ChatGPT (2024)

A Decision Support System (DSS) is a computer-based tool or software application designed to assist individuals or organizations in making informed decisions by analyzing data, modeling outcomes, and providing actionable insights. Unlike fully automated systems, a DSS enhances human judgment by offering data-driven recommendations rather than replacing decision-makers.

- DeepSeek (2025)



How decision support tools fit into a decision-making process ?



adapted from Garrard et al. (2017)

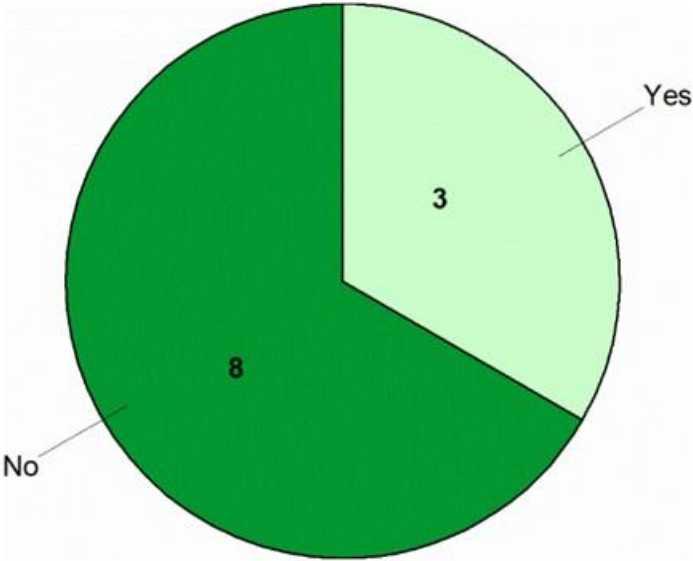
Each of steps (5 or 7) in a decision-making process makes use of different methods and decision support tools. Some are quite common – e.g. brainstorming



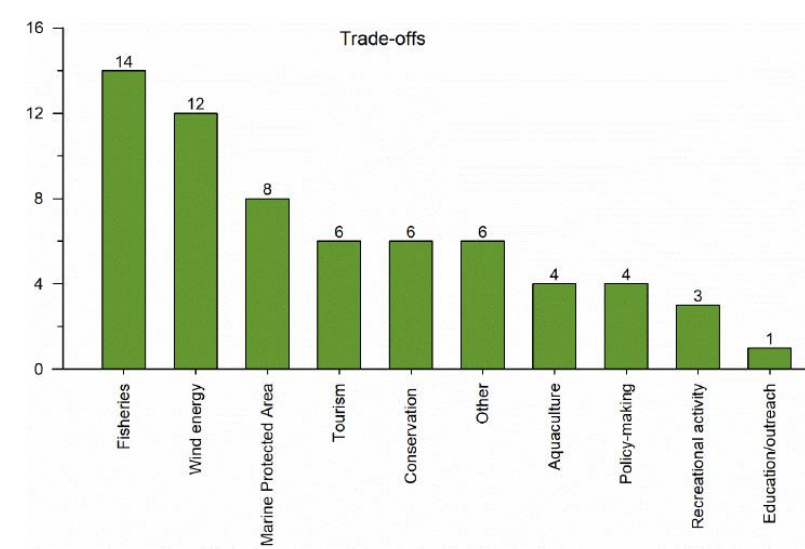
Results of stakeholder consultations

Full report in: Olsen, M.C., Grinienė, E., Laksá, U., Morkūnė, R., Razinkovas-Baziukas, A. 2025. Marine SABRES Decision Support System Design Specification. Marine SABRES Deliverable 6.1

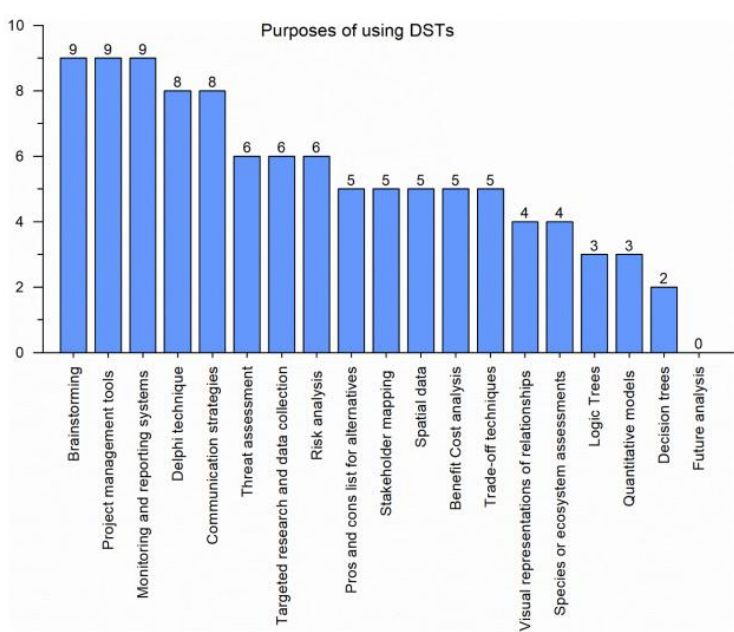
Do you use
DST?



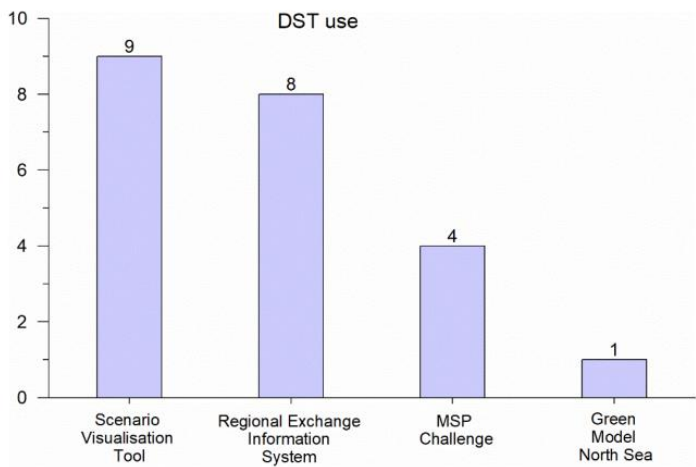
Trade-offs



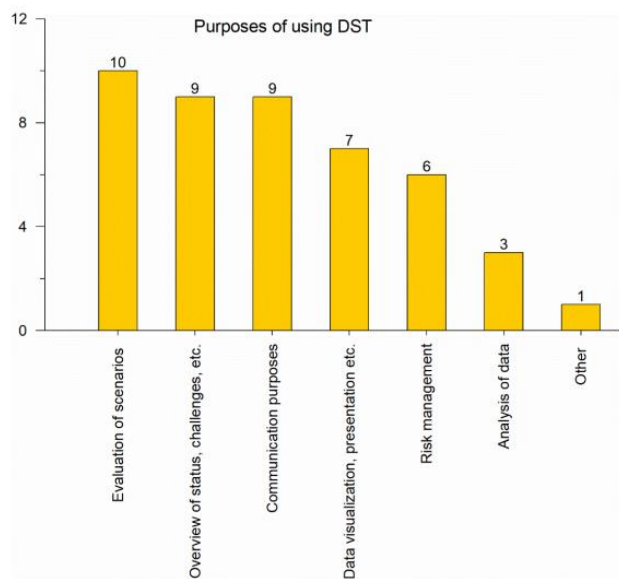
Purpose of using DST



Examples of decision support tools most likely to be used



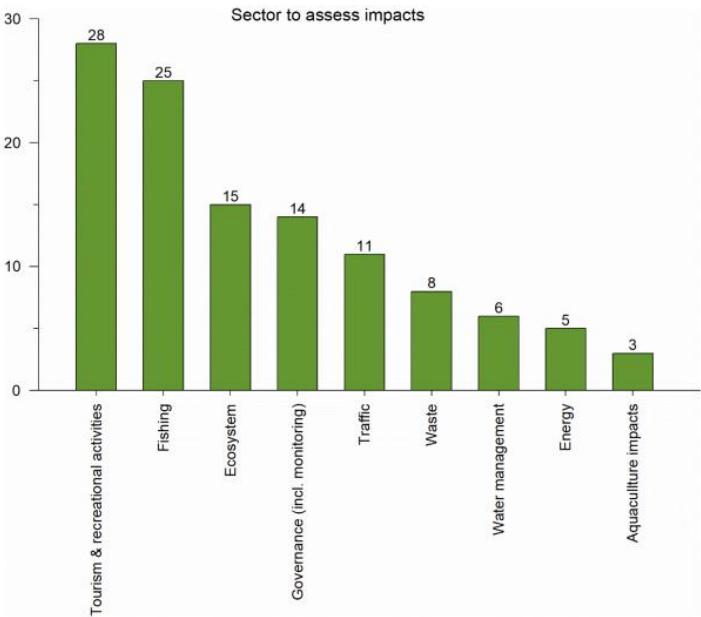
Purpose of using decision support tools



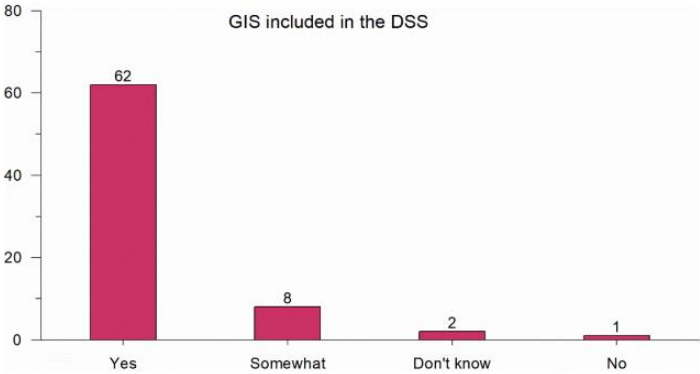
Word cloud
of desirable
decision
support tool
features



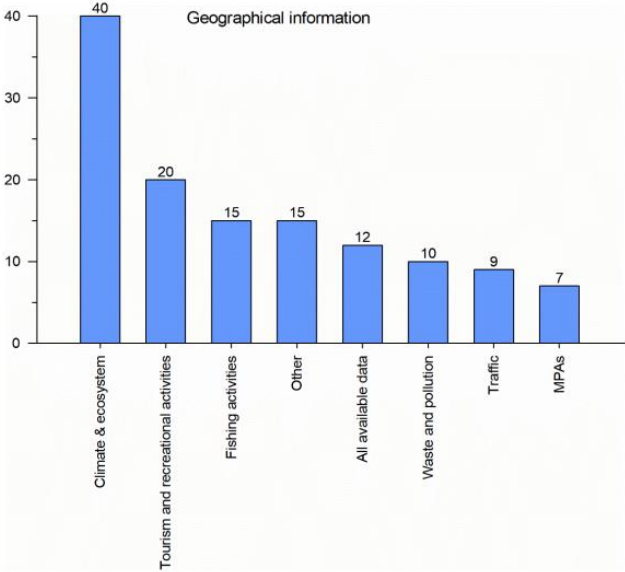
Sector to
assess
impacts



Do you need a GIS data supportive component in DST



What kind of spatial information should be included?

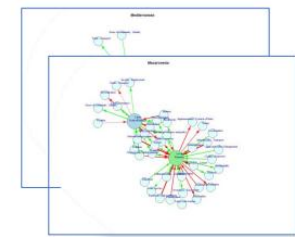


What will be characteristics of upcoming DST?

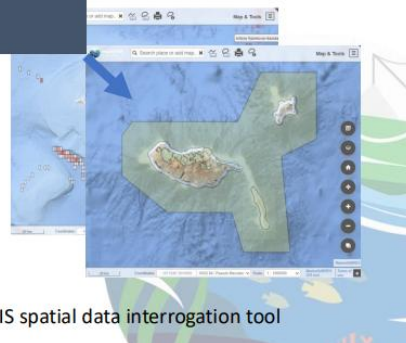
Full report in: Olsen, M.C., Grinienė, E., Laksá, U., Morkūnė, R., Razinkovas-Baziukas, A. 2025. Marine SABRES Decision Support System Design Specification. Marine SABRES Deliverable 6.1

DSS outline (maxed version)

Initial guidance
assessing specific
user needs

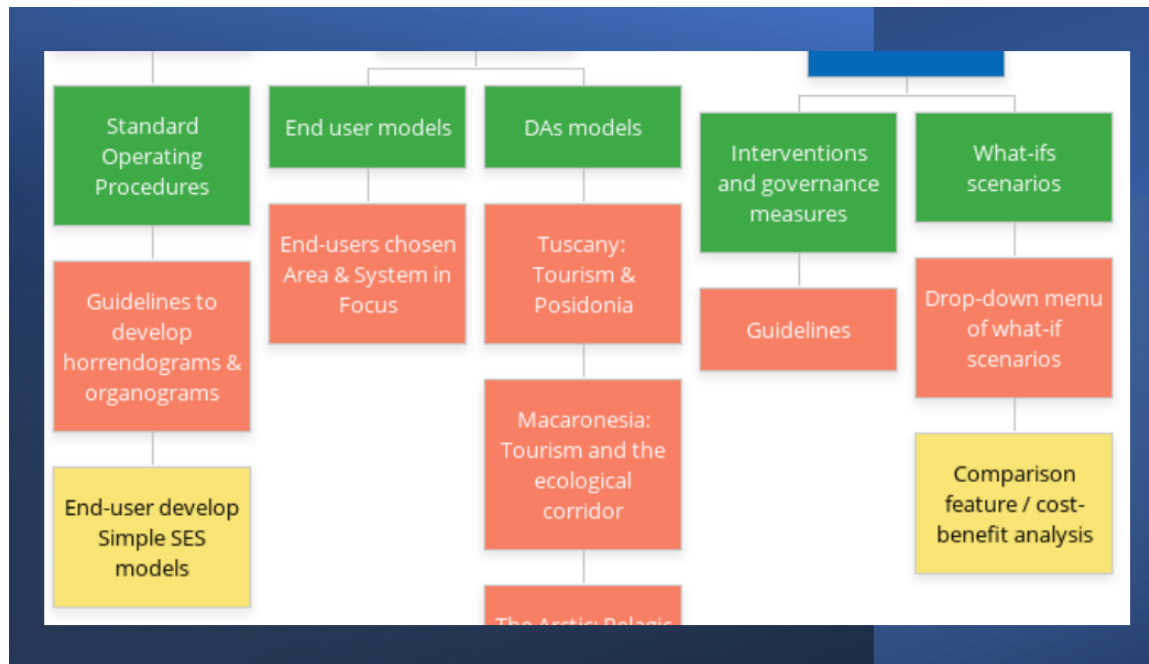


Sandbox SES constructor with guidance
and SES analysis tool (with interventions)



GIS spatial data interrogation tool

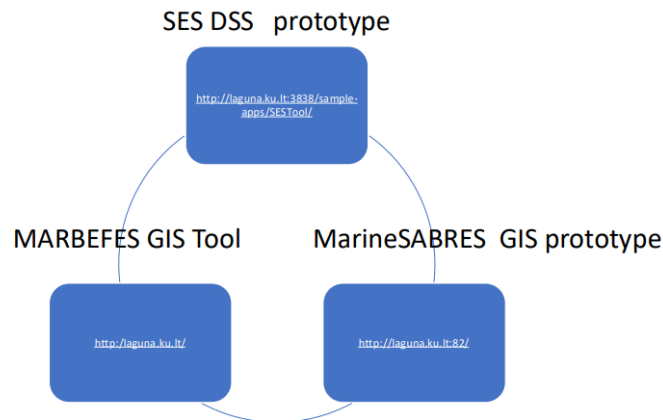
Marine SABRES Milestone 2.17 – MARBEFES Second Annex to Deliverable 1.2



Simple SES Constructor			
Requirement	Description	Priority	Acceptance Criteria
Standardised approach to handling qualitative data sources	Clear methods and approaches for handling qualitative data sources are necessary to avoid oversimplification and to increase trust and transparency in CLDs/models.	High	- Users understand what methods to apply when dealing with qualitative data sources.
Standardised approach to assess relationships	Historical data and assessing relationship between indicators, must follow a justifiable & standardised approach.	High	- Users assess relationships between elements following a standardised approach.
Easy navigation of models	Users must be able to easily navigate and analyse loops and types of interactions (e.g. balancing and reinforcing loops).	High	- Users can select certain loops, type of relationships, or other information to stand-out on the model.
Adjusting elements on the model	The users must be able to change and adjust CLDs/models and horrendograms and organograms on the system, without having to go back to the offline workbooks.	High	- Users can change connection, strength, and confidence level of elements on the system. - Users can make changes and updates to horrendograms and organograms.
Measures to prevent manipulation of data and results	There must be measures taken to prevent the misuse and manipulation of data and results by e.g. match data, audit logging, etc.	High	- Measures are incorporated into system to prevent misuse of manipulation of data, and thereby, results.
Data gaps	In most regions, data availability and high-quality data of indicators are limited – understanding these limitations must be communicated to and understood by users.	High	- Users understand data limitations in the tools.
Deep find search control	The DST must allow users to conduct a deep find search of Simple SES (e.g. the travers begins with the first node or element of a graph and repeats until reaching a targeted node or element).	High	- Users can conduct a deep find search of nodes and elements in the CLD models.

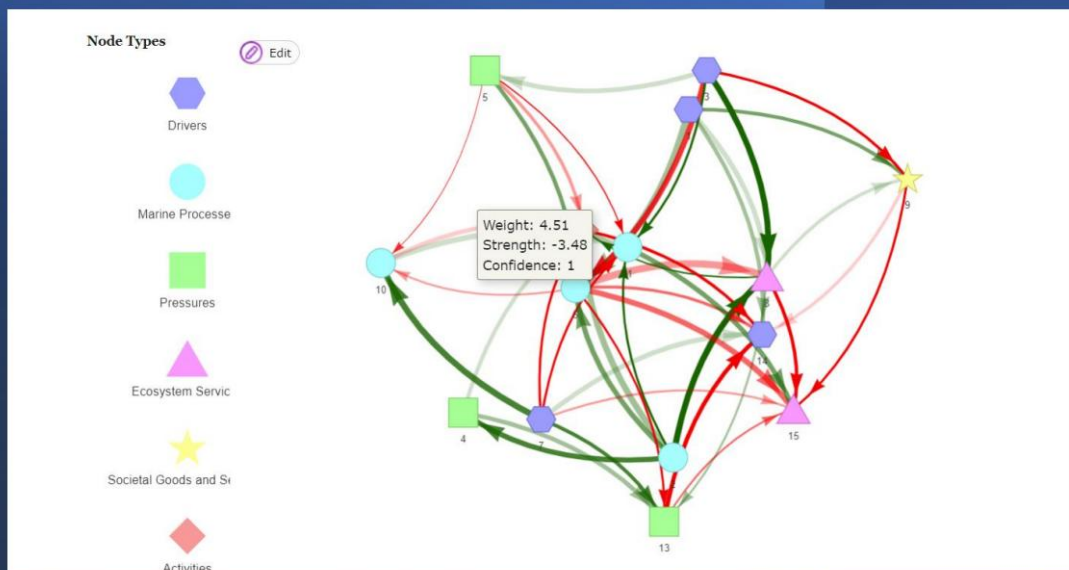
Simple SES analysis			
End users models and analytical functions	All analytical functions of the Simple SES must be responsive to users imported Simple SES models.	High	- The DSS analytical functions are responsive to end user models, developed in the Simple SES Constructor.
Loops and leverage points	The system must be able to support users in the conducting loop analysis by identifying and listing loops and potential leverage points of user models.	High	- Users get a list of loops and potential leverage points from the system. - Users successfully identify leverage points in their SES.
Models and interventions & measures	The system must provide a selection of interventions and measures to simulate the interactions of elements in the Simple SES under different conditions.	High	- Drop-down menu of all interventions and measures to select from. - Clear simulation of how each intervention and measure impacts the SES.
Models and what-ifs	The system must allow users to conduct what-if analysis on their models and provide users with common what-ifs scenarios to select from.	High	- Drop down menu of what-ifs scenarios. - Clear simulation of how different what-ifs scenarios impact the SES.
Comparing interventions and measures	Users should be able to compare interventions and measures, as well as what-ifs scenarios.	Medium	- Option to compare different interventions with clear visualisation of the different outcomes. - A summary of key changes in the system based on selected what-if scenarios or cost-benefit analyses.

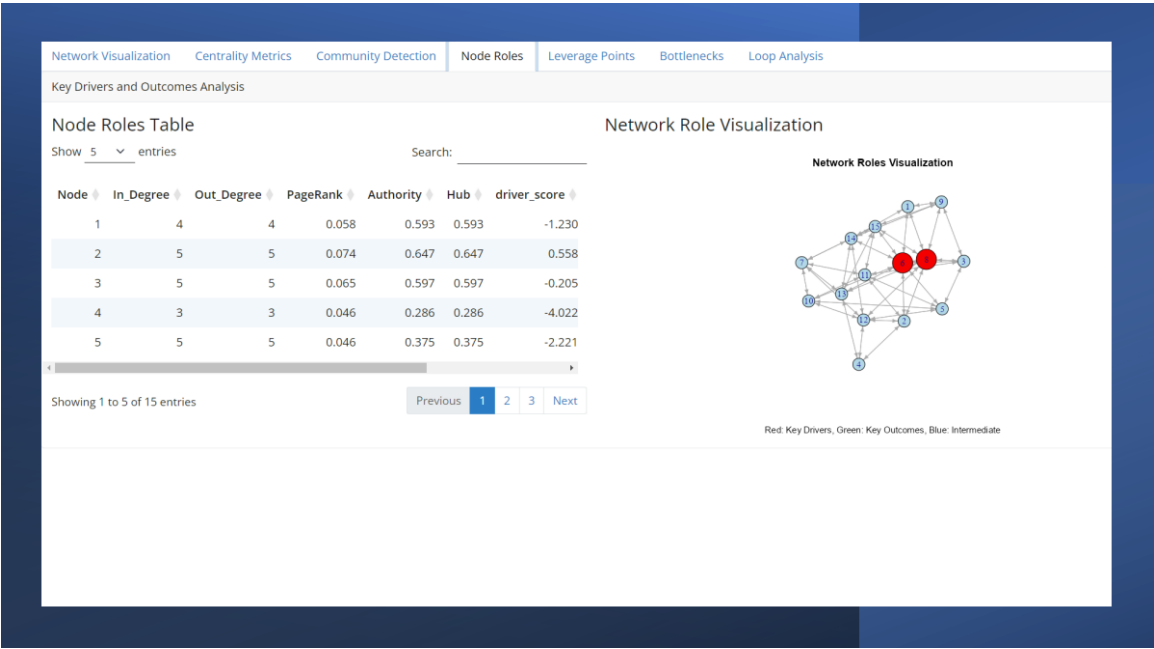
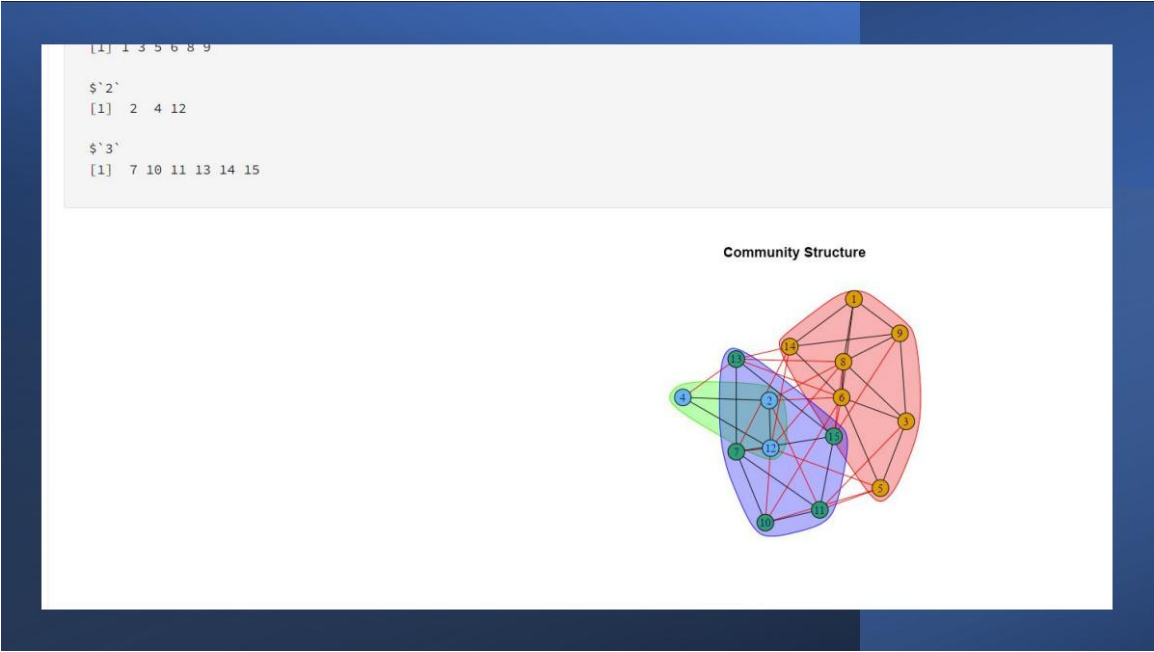
Links to the DST prototypes



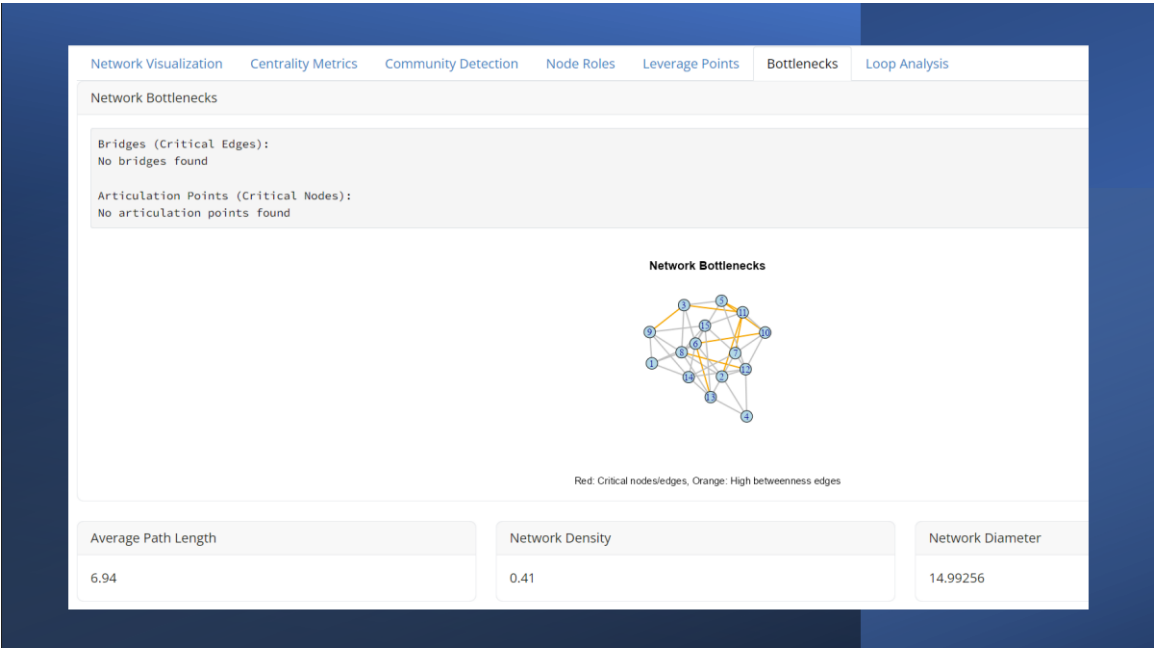
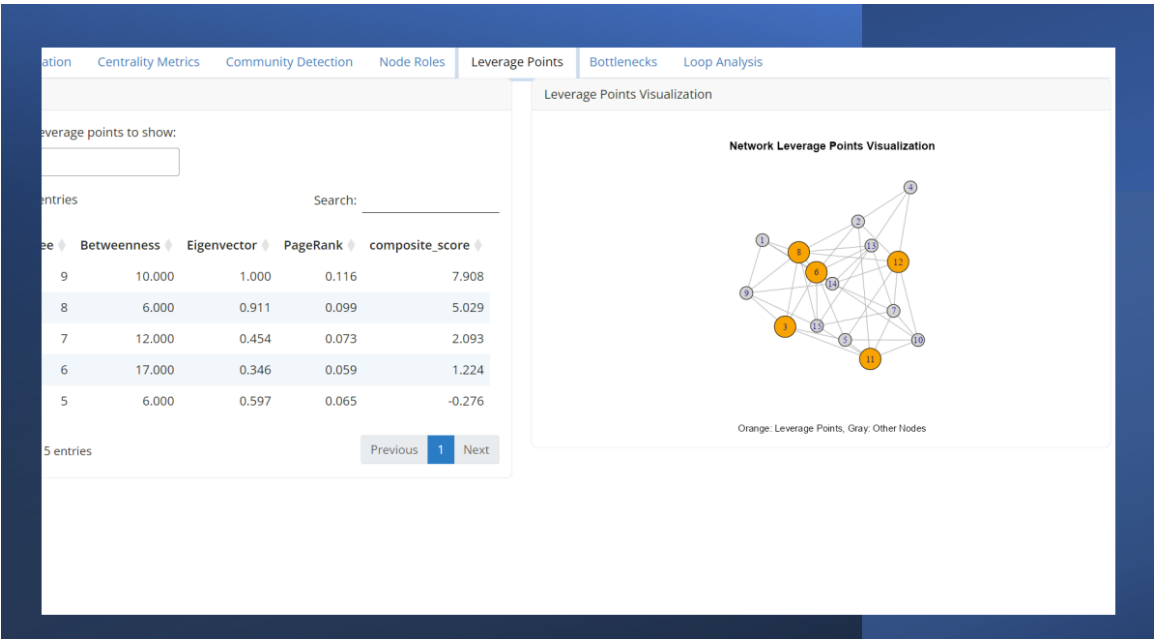
STILL PICTURES

Can't rely on real time tool presentation because of the Murphy's Law

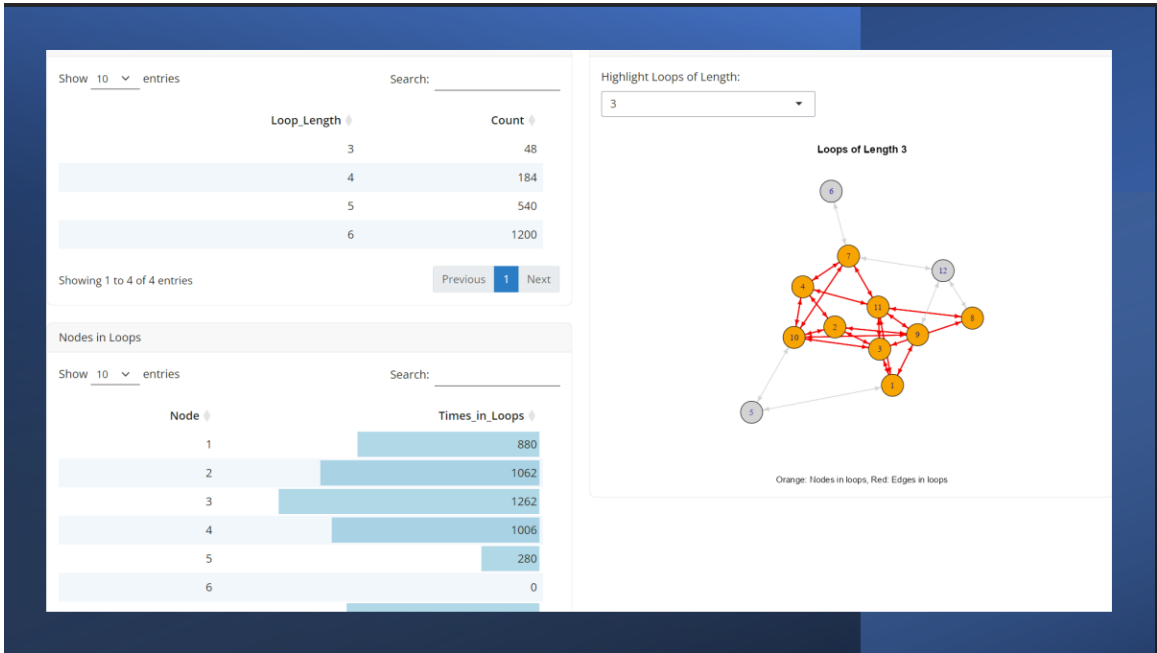
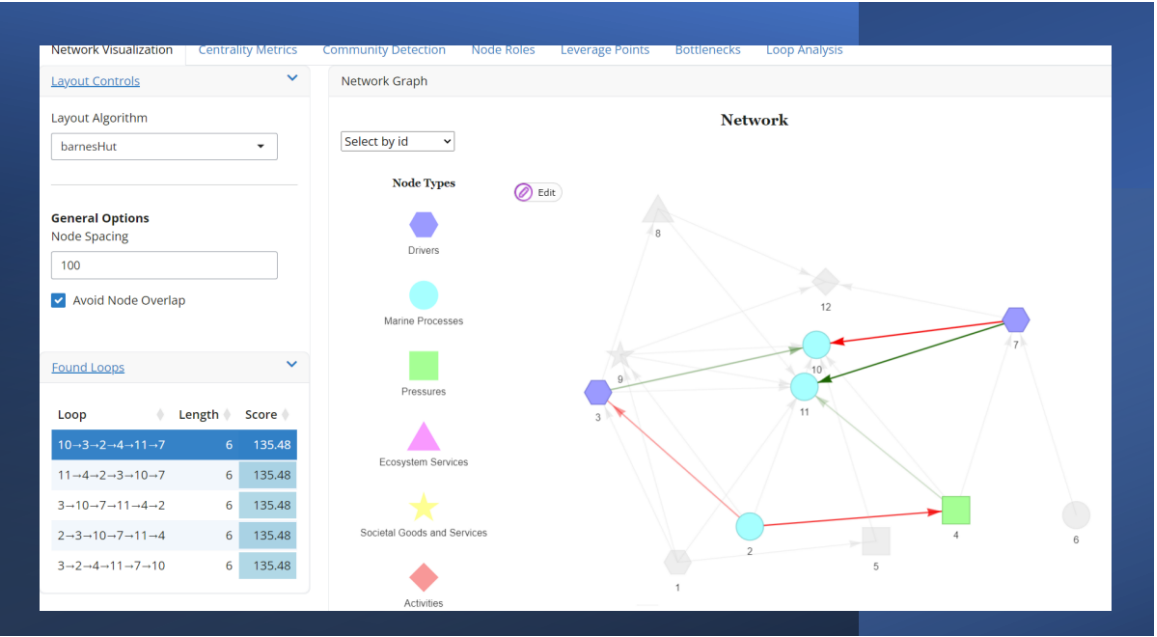




Marine SABRES Milestone 2.17 – MARBEFES Second Annex to Deliverable 1.2



Marine SABRES Milestone 2.17 – MARBEFES Second Annex to Deliverable 1.2



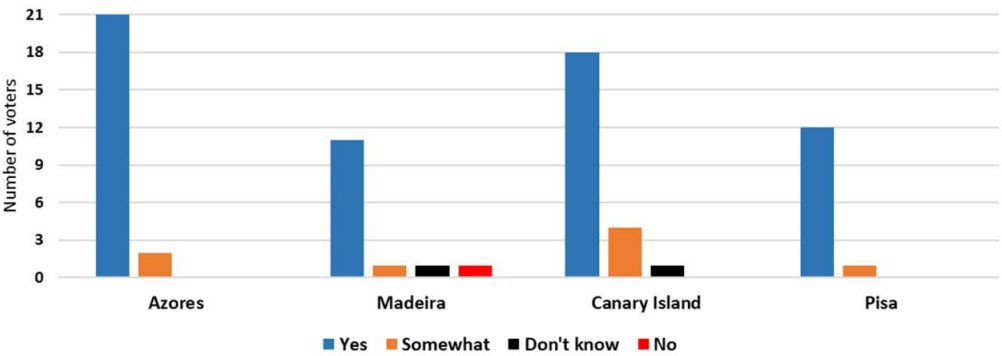


Follow-up - discussions
and MENTIMETER



Appendix 3i.2. GIS to Shiny-app

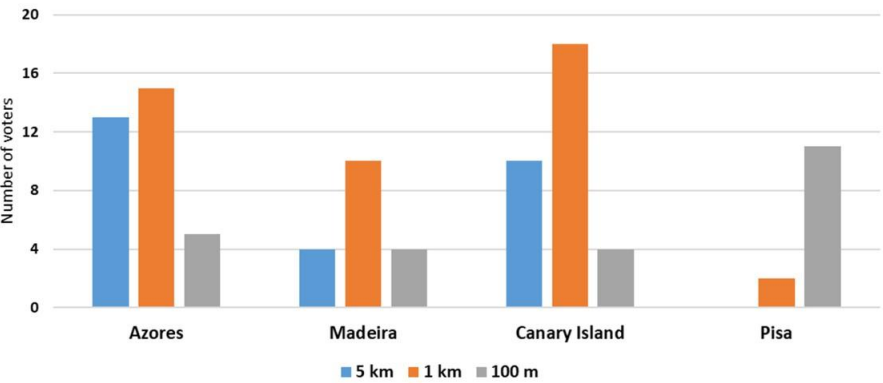
2nd round of Stakeholder consultations
(by HuFoSS)
Would you benefit if Geographic Information (GIS) is added to the final tool?



The majority of participants indicated that GIS would be beneficial



2nd round of Stakeholder consultations
(by HuFoSS)
What would be the optimal spatial scale for Geographic Information (GIS)



On the Islands larger scales of 1 to 5 km are preferred,
and on the Mainland a finer scale of 100 m



Appendix 3j. Valuation of Coastal Systems

Appendix 3j.1. Valuation systems - introduction

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Second Overarching Stakeholders Workshop
01-02 April 2025, Zandvoort, the Netherlands

Feedback by Stakeholders in the Second-Round consultations
on the first-round results **concerning Valuation**

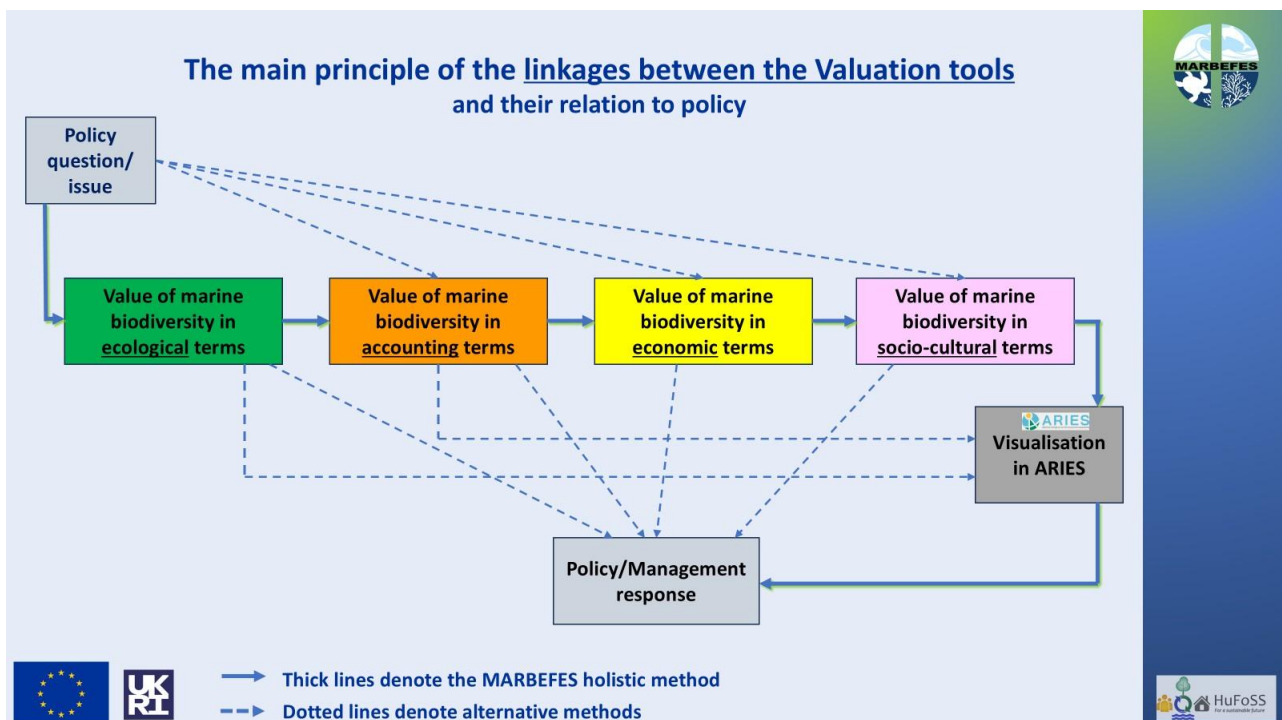
Herman Hummel, Bram Sturm, Rob Segeren, Shadi Sanatgar, Hanie Matajinimvar
HuFoSS, Roosendaal, the Netherlands

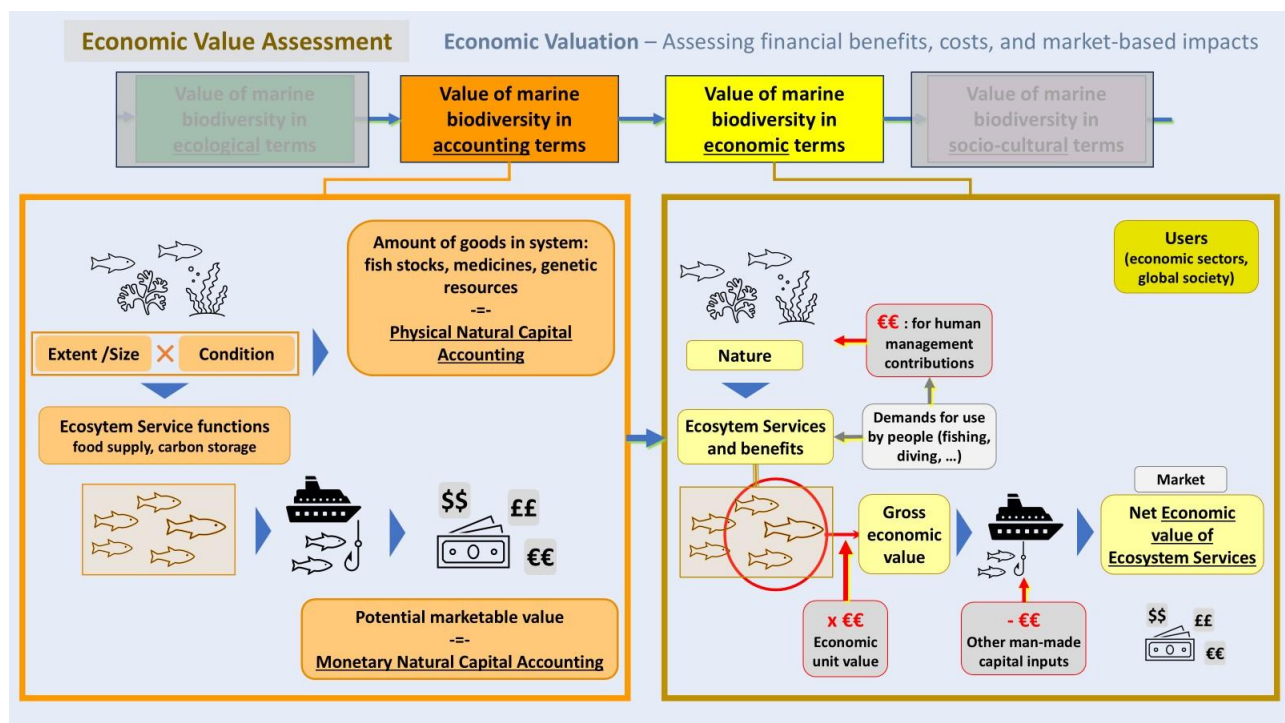
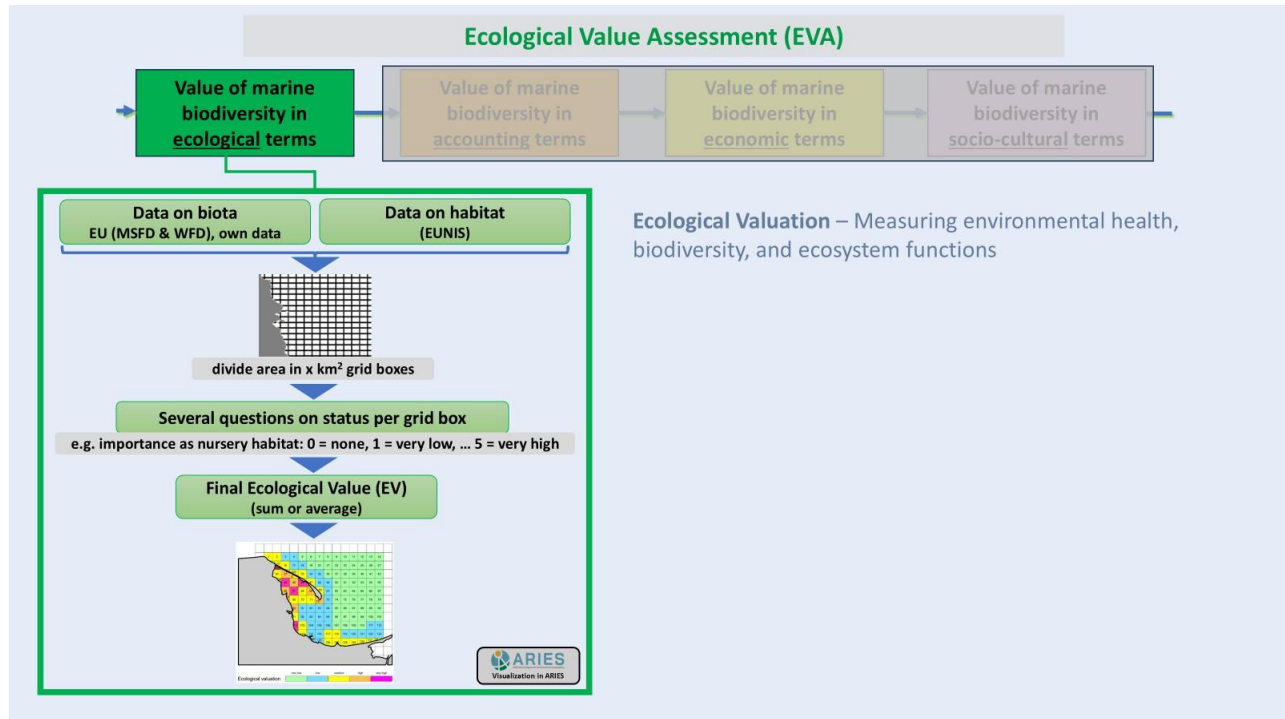
Marine SABRES is funded by the European Union's Horizon Europe programme under grant agreement No.101058956

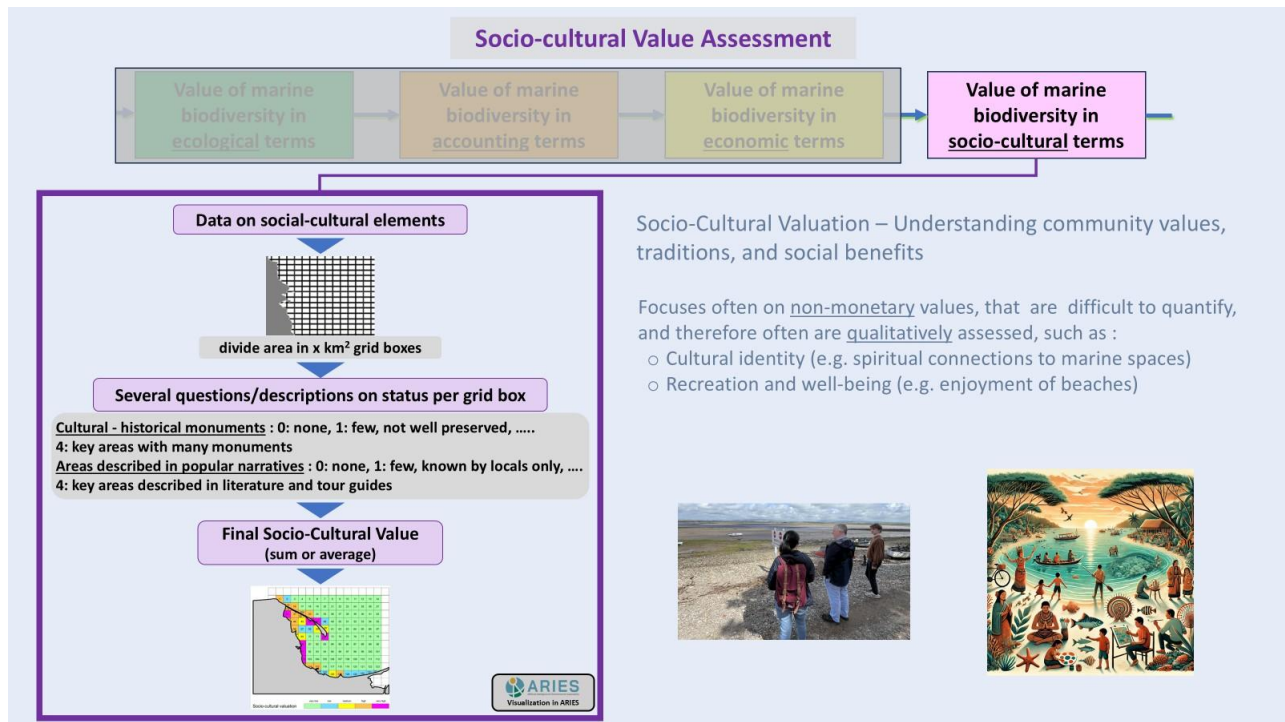


MARBEFES has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement no 101060937

Session 12a. Zandvoort workshop

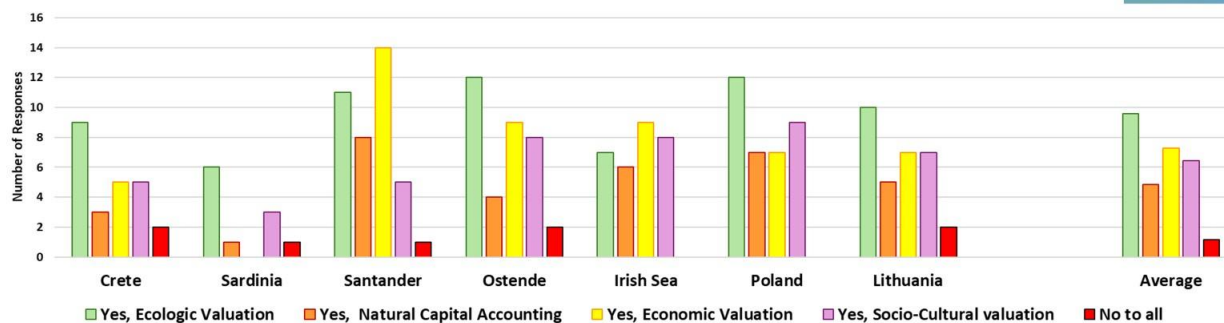






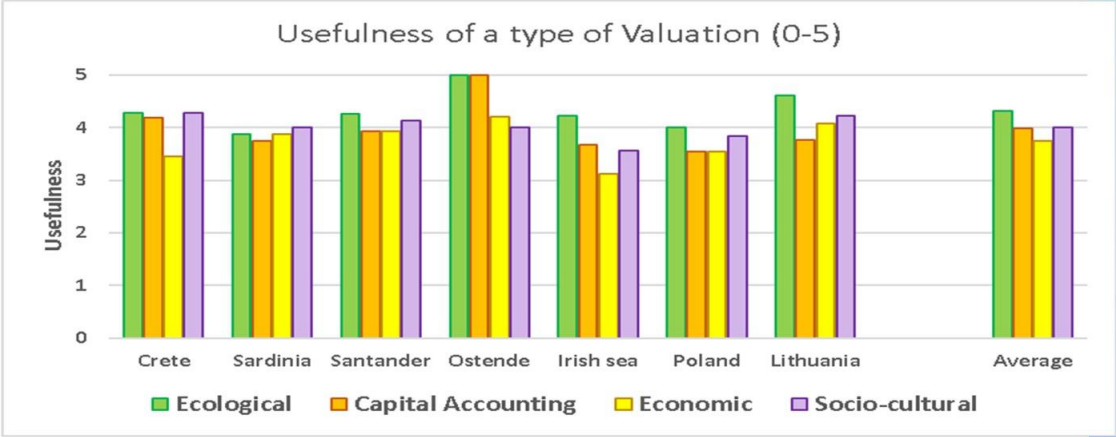
2nd round of Stakeholder consultations

Were you familiar with the various valuation concepts ?



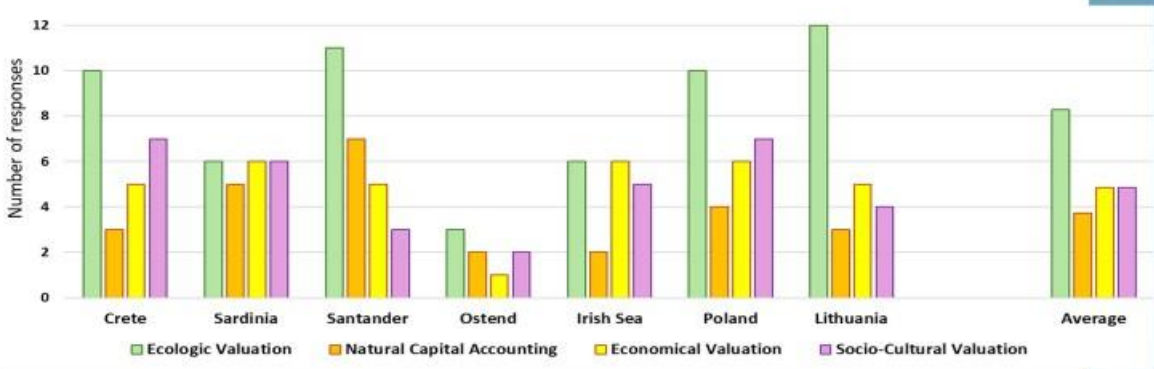
2nd round of Stakeholder consultations

How useful would each kind of valuation be for your sector ?



2nd round of Stakeholder consultations

What is the most preferred valuation concept for your sector ?





 **MARINE**
SABRES

MARBEFES 

Thank you for your attention

Questions to us?

Herman Hummel, Shadi Sanatgar, Hanie Matajinimvar
Bram Sturm, Rob Segeren
HuFoSS, Roosendaal, the Netherlands

Marine SABRES is funded by the European Union's Horizon Europe programme under grant agreement No.101058956



MARBEFES has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement no 101060937

Appendix 3j.2. Socio-Cultural valuation

Session 12b. Zandvoort workshop

Social and Cultural Ecosystem Benefits

WP4 Task 4.2c non-financial valuation of ecosystems

Ashley Cahillane, John Brannigan, Tasman Crowe -
-University College Dublin

Johanna Forster --- University of East Anglia



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Cultural ecosystem services and benefits

"the contributions ecosystems make to human well-being in terms of the identities they help frame, the experiences they help enable and the capabilities they help equip"

--Fish, Church, and Winter. "Conceptualising cultural ecosystem services..." (2016)

Produced through **nonlinear, relational, place-based** interactions between humans and environments.



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Approach

- Social perceptions
- Place-based
- Engaging locals, but also visitors, tourists, conservationists, cultural heritage officers, fishers, & more
- Builds on *The Cultural Value of Coastlines* project (2016-18)



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Socio-cultural valuation tools

- Online questionnaire (for general public)
- Participatory mapping
- In situ observations
- Interviews
- Focus groups
- Arts-based workshops
- Cultural representations analysis



Ask about **specific coastal places**:

- cultural ecosystem services and benefits
- environmental health
- environmental changes
- environmental management



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Public questionnaire in Gulf of Oristano, Sardinia

- Gulf of Oristano—home to archeological sites
- WP1 interviews: key factors are (i) sense of place, (ii) awe, (iii) mental & physical health, (iv) relaxation
- July-Dec 2024
- 200 responses



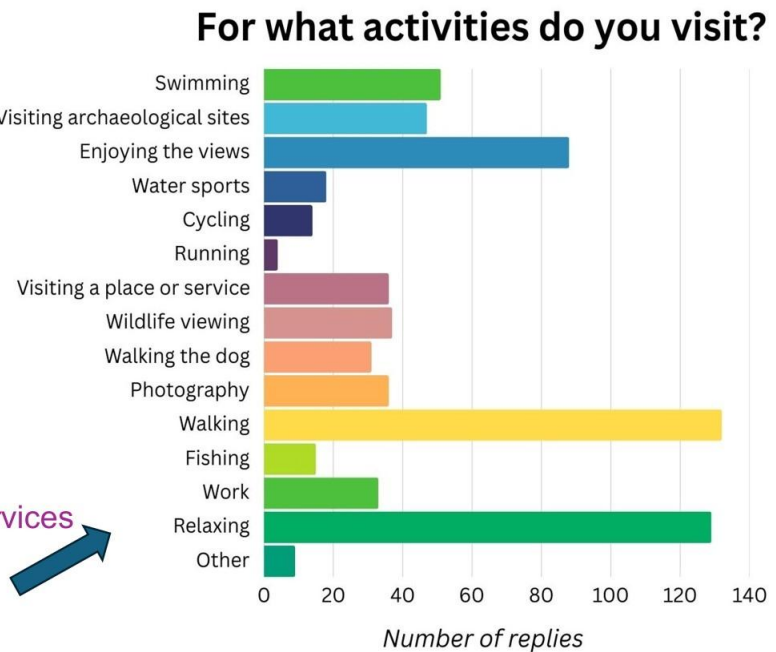
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Gulf of Oristano questionnaire

- Strong gender balance
- Age range mainly 26-65
- Residence: mainly locals (56%)
- Mainly visit daily, weekly, or monthly

Cultural ecosystem services

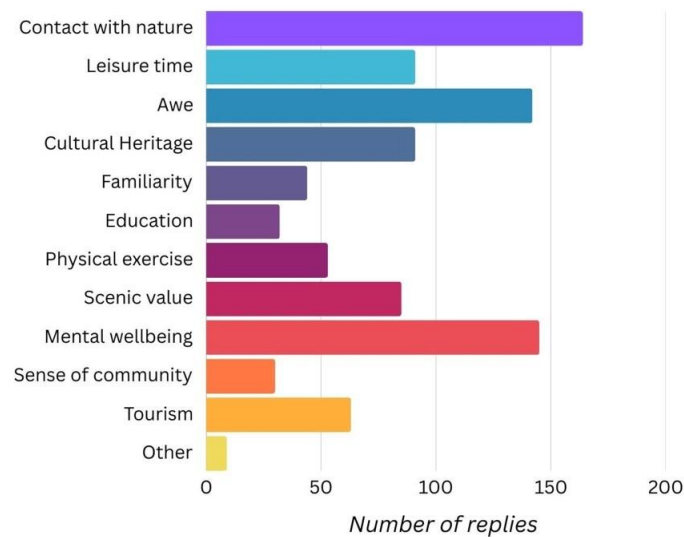


Gulf of Oristano questionnaire

Cultural ecosystem benefits



What do you associate with these places?

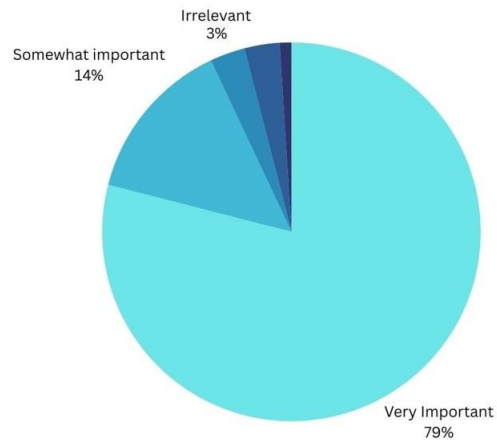


Gulf of Oristano questionnaire

- Linking cultural ecosystem services and benefits to environmental health.



Do you think that the health of the sea, coasts, and lagoons is important for how you use them?

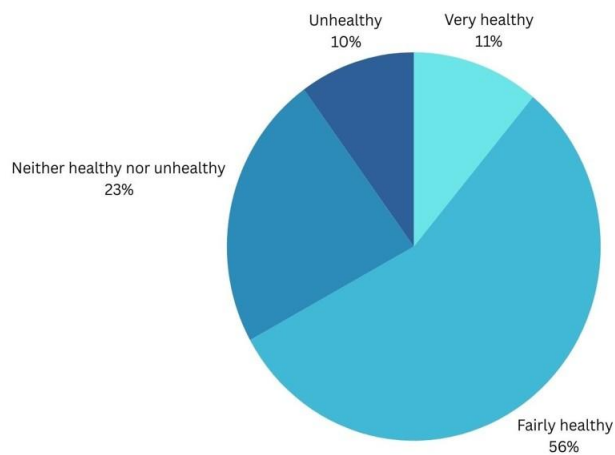


Gulf of Oristano questionnaire

- Ecosystems perceived as fairly healthy

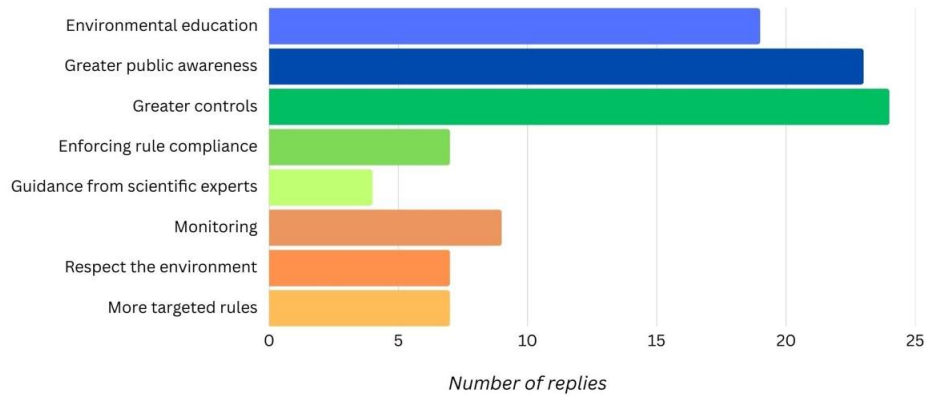


How healthy are the sea, coasts, and lagoons?



Gulf of Oristano questionnaire

How can these areas be protected in future?



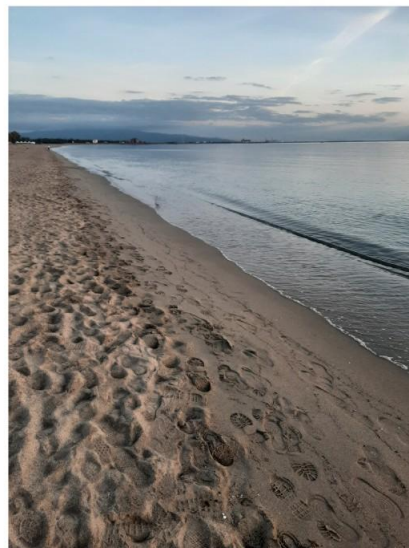
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Impact of socio-cultural questionnaire?

Place-based impact:

- Highlights key cultural ecosystem practices (services) & benefits
- Highlights links between cultural practices – wellbeing benefits – environmental health – environmental management
- Highlights socially-desired measures for environmental management



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Socio-cultural questionnaire

Completed (purple dots):

Irish Sea
Southern Bay of Biscay
Sardinia
Belgian Coast

In preparation (orange dots):

Gulf of Gdansk
Norway
Crete
Baltic Sea coast

8+ BBTs



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Appendix 3k. Marine Protected Areas (MPAs)

MPA implementation challenges

The Sabineville government has decided to create an MPA

- Environment** Coastal area
The biodiversity is good quality but is changing negatively due to climate change and human activities
- Society** Tourism for marine activities – whale watching, diving, watersports.
Small-scale fisheries and industrial/large vessels. Small-scale fishers are concerned the large vessels are pushing them out.
The government wants to build a windfarm, but there is local opposition



Task

How will you manage your MPA?
Justify your decision



Appendix 3I. Ocean Literacy

Q1. What are the most important environmental problems that the [BBT name] is now facing?

Problem	Pollution	Climate change	Overfishing	Invasive species
# of appearances	34	25	19	15

63 answers collected in total. The problems listed above appeared in at least one survey from each BBT.

Other prominent issues listed included mismanagement, overexploitation, overtourism, coastal erosion and eutrophication.



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Q3. Based on your experience and interactions with the public, what are the most common false opinions or beliefs about the [BBT name]?

There are too many seals that steal fish from fishers' nets	The Heraklion Gulf is not at any risk from climate change
Cormorants eat all the fish [in the Curonian Lagoon]	Climate change will not affect the Irish Sea
Fish from Gulf of Gdańsk are harmful/not suitable for consumption	Irish seas have very little life in them
You can't do anything in the coastal areas (e.g. picking mushrooms) [in the Curonian Lagoon]	The Gulf of Gdańsk is a desert without [any] life
[The] government promotes deforestation [in the Curonian Lagoon]	The [Heraklion] Gulf doesn't have a lot of biodiversity
	The Porsangerfjord is "dead"
	Natural spaces are something inexhaustible



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Appendix 4. Results of all Mentimeter surveys during the sessions

Appendix 4a. Feedback on the 2nd round of stakeholders consultations

SH	Q1. Which sector are you representing?
1	Private sector/SME
2	Fisheries
3	Tourism
4	NGO/non-profit
5	Fisheries
6	Authorities
7	Authorities
8	NGO/non-profit
9	Authorities
10	Authorities
11	Authorities
12	NGO/non-profit
13	Authorities
SH	Q2.Which (geographic) area are you representing?
1	Arctic
2	Arctic
3	Macaronesian
4	Atlantic (west-Europe)
5	Atlantic (west-Europe)
6	Atlantic (west-Europe)
7	Baltic
8	Atlantic (west-Europe)
9	Macaronesian
10	Macaronesian
11	Macaronesian
12	Baltic
13	Atlantic (west-Europe)
SH	Q3.Are there any other topics/elements to be added?
1	Harnessing invasive species, better policies
2	Temperature, species move, live and die within a temperature
3	Marine Protected Areas
4	Livelihoods
5	
6	Atlantic Cultural Heritage
7	-
8	Coastal urban development
9	Water and energy
10	Geopolitical issues,climate change,governance ,
11	
12	
13	Nothing
SH	Q4.Are there any other topics/elements to be added?
1	Protection, implementation of MPE
2	

3	
4	Youth. Feeling disconnected from nature.
5	
6	
7	
8	
9	
10	Make easy the decision making no CT
11	
12	
13	

SH	Q5.Any other remarks?
1	
2	
3	
4	
5	
6	Nope
7	No
8	
9	
10	
11	Not really
12	No remarks
13	

Appendix 4b. BowTie and Causal Loop Diagram

SH	Q1. Which sector are you representing?
1	Private sector/SME
2	Fisheries
3	Tourism
4	NGO/non-profit
5	Fisheries
6	Academia/research
7	Authorities
8	NGO/non-profit
9	Authorities
10	Authorities
11	Authorities
12	
13	Authorities
SH	Q2. Which (geographic) area are you representing?
1	Arctic
2	Arctic
3	Macaronesian
4	Atlantic (west-Europe)
5	Atlantic (west-Europe)
6	Atlantic (west-Europe)
7	Baltic
8	Atlantic (west-Europe)
9	Macaronesian
10	Macaronesian
11	Macaronesian
12	
13	Atlantic (west-Europe)
SH	Q3. In your work with (or managing) the marine environment, do you include only ecological, social, or economic aspects, or all?
1	All the above
2	All the above
3	All the above
4	All the above
5	Ecological
6	Economic aspects
7	All the above
8	Economic aspects
9	Ecological
10	All the above
11	All the above
12	All the above
13	All the above
SH	Q4. Do you consider the BowTie to be appropriate for answering your management and sectoral questions?
1	Yes
2	Yes,
3	Yes and would love to try it 😊

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- 4 Yes, can see the potential for sure
- 5 Yes
- 6
- 7 Yes
- 8 It is indeed appropriate for certain managements challenges
- 9 Yes
- 10 Yes .but it may be digitalized including AI
- 11 Yes, but might be too complicated to use on a daily basis
- 12 Yes
- 13 It could help...

SH	Q5. Do you consider the Causal Loop Diagram to be appropriate for answering your management and sectoral questions?
1	Yes
2	Yes, but it is large. And every factor is a potential error
3	Yes
4	Yes, I like the fact that it's a closed loop so can keep circling the issue
5	Yes
6	Yes, I guess so
7	Yes
8	It is
9	Yes
10	Yes but put in place sensor for the part A and compiterizind the algorithm
11	Yes
12	Yes
13	It Can Help

SH	Q6. Do you consider the Causal Loop Diagram to be appropriate for answering your management and sectoral questions?
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	No
13	

SH	Q7. Are there any reasons why you would NOT use the BowTie?
1	No, but relevance is key
2	No
3	If its to complicated to use Would need more time/knowledge to be able to see if there are case studies
4	where it would be inappropriate to use. Seems comprehensive, but very open to human error (missing items/misinterpreting)
5	No
6	No

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7	No
8	It can be complex and unnecessarily for certain very simple challenges
9	Sometimes bow ties might get too complex and endless relations
10	Time
11	Might be too complex
12	No
13	Not to the type of work (daily basis)

SH	Q8. Are there any reasons why you would NOT use the Causal Loop Diagram?
1	No, but it gets complicated very fast
2	No
3	Nop
4	Same response on needing more time to assess. Interested to see how the loop could "expand" with more info.
5	No
6	No
7	No
8	No
9	Same (endless interactions)
10	No, but is complex anyway
11	Might need a very complete set of inputs from stakeholders, making it complex to use for simple issues.
12	
13	

SH	Q9. Are there any reasons why you would NOT use the Causal Loop Diagram?
1	
2	
3	
4	
5	
6	
7	No
8	
9	
10	
11	
12	
13	

SH	Q10. Any other remarks? :
1	
2	
3	Is there any AI being used here to help on the system?
4	Thank you for presentation :)
5	
6	no
7	-
8	No
9	No
10	

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11	No
12	
13	

Appendix 4c. Scenarios of Societal and Environmental change under SSP1, SSP3, SSP5

SH	Q1. Which professional sector are you representing?:
1	Industry / SME
2	Industry / SME
3	Industry / SME
4	NGO
5	Industry / SME
6	Academia / Research
7	Authorities (governance / policy)
8	NGO
9	Authorities (governance / policy)
10	Authorities (governance / policy)
11	Authorities (governance / policy)
12	Authorities (governance / policy)
SH	Q2. Do you see the potential of applying scenarios in your work?:
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Maybe
7	Maybe
8	Yes
9	Yes
10	Maybe
11	Yes
12	Maybe
SH	Q3. Based on your experiences/preferences, what kind of scenarios-tool would you need? :
1	Both a interactive tool or a mindmap
2	2
3	With guidelines showing the best way to reach the choosed scenario
4	Something on the follow-up. What to DO with the information obtained from the best/worst-case scenarios.
5	Both a interactive tool and mindmap is useful
6	3
7	Written guidelines
8	Both interactive tool and mind map are good
9	1, 2
10	2
11	Interactive tool would be usefull, but I wouldn't call it a need
12	Q3. Based on your experiences/preferences, what kind of scenarios-tool would you need? :
SH	Q4. Any comments, uncertainties?:
1	Scenarios must be updated underway, not a sett course
2	No
3	In the end it will all end up in politicians decisions
4	
5	No

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6	no
7	No
8	Nope
9	No
10	This will be a factor to consider . Ej take as indicator the insurance prices
11	No
12	Q4. Any comments, uncertainties?:

Appendix 4d. Management and policy measures in the Marine Corridor

SH	Q1. Which professional sector are you representing? :
1	Private sector/SME
2	Fisheries
3	Tourism
4	NGO/Non-profit
5	Fisheries
6	Academia/Research
7	Authorities (governance/policy)
8	NGO/Non-profit
9	
10	Authorities (governance/policy)
11	Authorities (governance/policy)
12	Authorities (governance/policy)
13	NGO/Non-profit
14	Authorities (governance/policy)
SH	Q2. What (geographic) area are you representing? :
1	Arctic
2	Arctic
3	Macaronesia
4	Atlantic (West-Europe)
5	Atlantic (West-Europe)
6	Atlantic (West-Europe)
7	Baltic
8	Atlantic (West-Europe)
9	
10	Macaronesia
11	Macaronesia
12	Macaronesia
13	Baltic
14	Atlantic (West-Europe)
SH	Q3. TOOL: Would you use this tool to test management measures? : I would use this tool to test management measures
1	3
2	5
3	5
4	4
5	4
6	3
7	3
8	4
9	4
10	4
11	3
12	5
13	2
14	
SH	Q4. TOOL: I would like to see the tool being validated:
1	Yes

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2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes

SH	Q5. MPA: What words come to mind when you hear about an MPA in your area?:
1	Yes_please Coexistence Restricting
2	Environent
3	Ocean_Conservation Protected_Corridor Shared_management
4	Just_Transition Climate_Justice Economy
5	Biodiversity Protecting_the_ecosystem
6	No_fishing
7	Protection_of_biodiversit Pollution Invasive_species
8	Thriving_biodiversity
9	Ecosystemic_resilience Coexistence ES_provision_maintenance
10	conflict_of_interest
11	Opportunity Balance Protección
12	Impossible Protection Conservation
13	Curonian
14	biodiversity conservation legal_issues

SH	Q6. What should be the primary objective(s) of an MPA in your region?: Improve biodiversity connectivity
1	2
2	5
3	1
4	2
5	1
6	1
7	2
8	1
9	1
10	1
11	1
12	4

SH	Q7. What should be the primary objective(s) of an MPA in your region?: Support resilient fisheries
1	4
2	1
3	4
4	3
5	4

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6	5
7	4
8	4
9	3
10	3
11	
12	4
13	2
14	

SH	Q8. What should be the primary objective(s) of an MPA in your region?: Strengthen regional marine governance/cooperation
----	---

1	3
2	4
3	3
4	4
5	3
6	4
7	3
8	5
9	5
10	4
11	
12	3
13	1
14	1

SH	Q9. What should be the primary objective(s) of an MPA in your region?: Enable sustainable tourism and blue economy
----	---

1	5
2	2
3	5
4	5
5	5
6	3
7	5
8	2
9	4
10	2
11	
12	5
13	3
14	

SH	Q10. What should be the primary objective(s) of an MPA in your region?: Other (please elaborate when answering the next question)
----	--

1	
2	
3	6
4	6
5	
6	
7	6

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8	6
9	6
10	
11	
12	6
13	
14	

SH	Q11. What should be the primary objective(s) of an MPA in your region?: Support recovery of migratory species
1	1
2	3
3	2
4	1
5	2
6	2
7	1
8	3
9	2
10	5
11	
12	2
13	5
14	2

SH	Q11. What should be the primary objective(s) of an MPA in your region?: Support recovery of migratory species
1	1
2	3
3	2
4	1
5	2
6	2
7	1
8	3
9	2
10	5
11	
12	2
13	5
14	2

SH	Q12. If you have answered 'other' for the previous question, could you please elaborate?:
1	
2	
3	
4	
5	
6	
7	
8	
9	

10
11
12
13
14

SH	Q13. Rank the key challenges to implementing an MPA, from your perspective: Long-term financing
1	4
2	3
3	7
4	6
5	5
6	6
7	7
8	2
9	4
10	5
11	6
12	5
13	3
14	3

SH	Q14. Rank the key challenges to implementing an MPA, from your perspective: Jurisdictional & governance complexity (EEZ vs. ABNJ)
1	5
2	6
3	5
4	7
5	7
6	3
7	2
8	1
9	1
10	1
11	3
12	1
13	1
14	1

SH	Q15. Rank the key challenges to implementing an MPA, from your perspective: Political will / alignment
1	2
2	7
3	1
4	1
5	3
6	4
7	1
8	5
9	2
10	2
11	2

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12	
13	5
14	2

SH	Q16. Rank the key challenges to implementing an MPA, from your perspective: Gaps in ecological data
1	7
2	1
3	6
4	2
5	1
6	7
7	3
8	6
9	7
10	6
11	1
12	2
13	2
14	

SH	Q17. Rank the key challenges to implementing an MPA, from your perspective: Monitoring & enforcement capacity
1	3
2	5
3	4
4	3
5	6
6	5
7	4
8	4
9	3
10	4
11	5
12	3
13	6
14	4

SH	Q18. Rank the key challenges to implementing an MPA, from your perspective: Maritime sector resistance
1	1
2	2
3	3
4	4
5	4
6	1
7	6
8	3
9	6
10	3
11	7
12	
13	7

14

SH	Q19. Rank the key challenges to implementing an MPA, from your perspective: Perceived fisheries impacts and sectoral pushback
1	6
2	4
3	2
4	5
5	2
6	2
7	5
8	7
9	5
10	7
11	4
12	4
13	4
14	

SH	Q20. To what extent do you agree with the following statements?: “An MPA could deliver clear ecological benefits.”
1	4
2	
3	5
4	4
5	5
6	4
7	3
8	5
9	5
10	5
11	
12	5
13	4
14	3

SH	Q21. To what extent do you agree with the following statements?: “The political conditions are favorable for advancing an MPA proposal.”
1	2
2	
3	1
4	2
5	2
6	3
7	3
8	3
9	2
10	3
11	
12	4
13	3
14	3

SH	Q22. To what extent do you agree with the following statements?: “Socio-economic trade-offs can be managed through appropriate design and zoning.”
1	4
2	
3	3
4	3
5	4
6	3
7	5
8	4
9	5
10	4
11	
12	5
13	4
14	3

SH	Q23. To what extent do you agree with the following statements?: “There is a need for more regional collaboration on marine protection.”
1	4
2	
3	5
4	5
5	5
6	5
7	3
8	5
9	5
10	4
11	
12	5
13	4
14	4

SH	Q24. What would you need to see, know, or understand in order to support an MPA in your region?: 1
1	Long time plan, open for adoption and adjustment in the future. Depending on findings and social adjustments
2	A specific study on the exact area indicating benefits
3	A viable plan
4	Compared results with other already implemented MPAs
5	Advantages on implementing one for all the sectors with Ecological base
6	How livelihoods would be supported for those who utilize the area
7	Mapping of the seafloor and pictures of the sea bottom to justify why it should be an MPA
8	The effects of an MPA
9	Long time plan
10	A good participatory process which assures local community engagement
11	Valuation of benefits from conservation
12	Planning and relocation of the rest of activities developed previously in those areas

SH	Q25. Who do you see as "champions" and/or "spoilers" for initiating an MPA in your region? :
1	Regulations are for ever, regulations are for ever
2	No opinion
3	Chapions - Ecological Defenders and Scientists Spoilers - Extract activities
4	Champions: the local community. Local government.
5	Spoilers: large-scale fishing industry, transport industry, sea mining, and offshore energy.
6	Champions Ecological enthusiastic people
7	
8	Champions: local small organisations. Spoilers: local governments
9	Implementation, enforcement
10	climate change deniers
11	Ecologist ,and
12	Champion – researchers Spoilers -(sometimes) reality
13	
14	
SH	Q26. What narrative could help to support the initiation of an MPA? :
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	Participatory process, which includes the views and the trade-offs for all interested parties
13	
14	
SH	Q27. What is the most important condition for an MPA to succeed? : 1
1	Local authorities make the decision, not national
2	Support from those affected
3	Perceptable advantages
4	Ocean Conservation Literacy
5	Agreement between user parts
6	Local buy-in & appropriate monitoring/governance
7	Regional benefits
8	Agreement between the different parties involved (stakeholders)
9	
10	Local benefits
11	Implementation, enforcement
12	monitoring and inspections of applicable regulations
13	Social consensus. Good cience
14	
15	International cooperation
16	Beneficts for biodiversity

SH	Q28. Any other remarks? :
1	
2	
3	Beers are getting warm
4	
5	No
6	nope
7	
8	No
9	
10	No

Appendix 4e. Toolbox Design

SH	Q1. Which sector are you representing? :
1	Private sector/SME
2	Fisheries
3	Tourism
4	Fisheries
5	Academia/research
6	Authorities
7	NGO/non-profit
8	Authorities
9	Authorities
10	Authorities
11	NGO/non-profit
12	Authorities
SH	Q2.Which (geographic) area are you representing? :
1	Arctic
2	Arctic
3	Macaronesian
4	Atlantic (west-Europe)
5	Atlantic (west-Europe)
6	Baltic
7	Atlantic (west-Europe)
8	Macaronesian
9	Macaronesian
10	Macaronesian
11	Baltic
12	Atlantic (west-Europe)
SH	Q3.What was your first impression of the toolbox website?:
1	We need this ;)
2	Good, easy to use,
3	Good and practical
4	I thought it was useful and it is a good idea to have the “Marby” linked to ChatGBT
5	Handy
6	Clear
7	Great first impression
8	Good, clear and simple
9	Frendly
10	Pretty and practical
11	Seems ok
12	Good
SH	Q4.How would you prefer to start searching for the right tool?:
1	It depends — I might use both the filters and the chatbot depending on the situation
2	Browse all tools first and use filters to narrow down relevant options before I ask the chatbot
3	It depends — I might use both the filters and the chatbot depending on the situation
4	Ask the chatbot to guide me to a suitable tool right away

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- 5 It depends — I might use both the filters and the chatbot depending on the situation
- 6 It depends — I might use both the filters and the chatbot depending on the situation
- 7 It depends — I might use both the filters and the chatbot depending on the situation
- 8 It depends — I might use both the filters and the chatbot depending on the situation
- 9 Ask the chatbot to guide me to a suitable tool right away
- 10 Ask the chatbot to guide me to a suitable tool right away
- 11 It depends — I might use both the filters and the chatbot depending on the situation
- 12 It depends — I might use both the filters and the chatbot depending on the situation

SH	Q5.For the AI chatbot, which interaction style would you find most helpful?:
1	A mix of both — I like having the option to follow guidance or ask freely
2	Open — I'd rather type my question freely and have a conversation
3	A mix of both — I like having the option to follow guidance or ask freely
4	A mix of both — I like having the option to follow guidance or ask freely
5	A mix of both — I like having the option to follow guidance or ask freely
6	A mix of both — I like having the option to follow guidance or ask freely
7	Open — I'd rather type my question freely and have a conversation
8	A mix of both — I like having the option to follow guidance or ask freely
9	A mix of both — I like having the option to follow guidance or ask freely
10	A mix of both — I like having the option to follow guidance or ask freely
11	Guided — I prefer answering a series of clear, step-by-step questions
12	A mix of both — I like having the option to follow guidance or ask freely
SH	Q6.Is there anything about the design or layout of the website that you think could be improved?:
1	
2	No
3	Looks clear
4	Can we chose the color of the seastar?
5	Guidance on how data should be that goes into the app
6	don't know for the moment
7	Nope
8	Maybe a map would be useful?
9	No
10	More colored.
11	Not at first sight, but I would have to test it on my own to answer this properly
12	No
SH	Q7.Is there anything about the functionality of the toolbox that you think could be improved? :
1	
2	No opinion.
3	Looks clear but I would loww to try it to discover more
4	Need more info on the toolbox to be able to answer this question
5	don't know for the moment. Should be able to use and test it
6	Need to try it before say more
7	A few filtered options to access the filters, although the use of the chatbot would make it useless. But could be interesting for people not used to chatbots and that kind of interactivity
8	Save projects, connect them to our websites, and allow external users to interact with the tool within our project.
9	It is intermodal with different interfaces?
10	Need to test it on a practical situation to properly answer
11	I'd like to try
12	I must try
SH	Q8.Would you, your organization, or others use the toolbox?: 1
1	Others may use it
2	Yes, I will use it
3	Others may use it
4	My organization will use it

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- | | |
|----|-----------------------------|
| 5 | My organization will use it |
| 6 | My organization will use it |
| 7 | Others may use it |
| 8 | My organization will use it |
| 9 | Others may use it |
| 10 | |
| 11 | Yes, I will use it |
| 12 | My organization will use it |

SH	Q9. Who would be the most important users of the tool box?:
----	---

1	University's and scientists
---	-----------------------------

2	
---	--

3	
---	--

4	
---	--

5	
---	--

6	
---	--

7	Technicians mainly, but also relevant stakeholders, like environmental organizations, students or seafood gatherer orgs, as some examples
---	---

8	
---	--

9	
---	--

10	
----	--

11	
----	--

12	
----	--

SH	Q10. Any other remarks? :
----	---------------------------

1	
---	--

2	No
---	----

3	
---	--

4	
---	--

5	No
---	----

6	
---	--

7	No
---	----

8	No
---	----

9	No
---	----

10	
----	--

11	No
----	----

12	
----	--

Appendix 4f. Decision Support System - Shiny App_

SH	Q1. Which sector are you representing? :
1	Private sector/SME
2	Fisheries
3	Tourism
4	Fisheries
5	Academia/research
6	Authorities
7	NGO/non-profit
8	Authorities
9	Authorities
10	Authorities
11	NGO/non-profit
12	Authorities
SH	Q2.Which (geographic) area are you representing? :
1	Arctic
2	Arctic
3	Macaronesian
4	Atlantic (west-Europe)
5	Atlantic (west-Europe)
6	Baltic
7	Atlantic (west-Europe)
8	Macaronesian
9	Macaronesian
10	Macaronesian
11	Baltic
12	Atlantic (west-Europe)
SH	Q3.What specific decisions or actions can our tools help you with? : 1
1	Creating a layout specifically for needs
2	Helpful as a map of spatial mapping of activity
3	More used areas and importance
4	To define MPAs
5	To define the impacts and importance of each activity
6	How to justify to stakeholders why MPAs are important. Enlighten stakeholders
7	Monitoring shipwrecks
8	MPA planning,educational perspective,monitoring
9	Many... Zonation, protection levels...
10	Relations between climate change variables
11	Trade offs
12	Interaction with industrial activities ,
SH	Q4.Do you prefer to select SES indicators from the pre-defined list or create the indicators yourself?:
1	Both
2	Both might be needed.
3	Both. So you can pit something there maybe its not there
4	Both
5	both
6	Both

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7	Pre-defined seem to be quite direct, but some locally important might be missing
8	Both
9	Yes, will be more useful but open to ad local thing
10	
11	Both
12	Both possibilities

SH Q5.How many loops found in the SES you would like to be displayed? :

1	
2	No opinion. Too many give an unclear picture
3	You should be able to add or remove loops like the price list on booking
4	20
5	5
6	10
7	Around 10
8	As many as you need, but beeing able to chose what i want to see
9	5 to 10
10	I wanna see it all, and to then be able to isolate some of them (by importance, for example)
11	The more the better
12	10

SH Q6.Please rank the following SES metrics based on their usefulness, according to you. : Designation of an element type (bottleneck, neutral, leverage point)

1	2
2	1
3	3
4	2
5	3
6	3
7	2
8	3
9	2
10	2
11	1
12	

SH Q7.Please rank the following SES metrics based on their usefulness, according to you. : Reinforcing or balancing character of loops

1	1
2	2
3	2
4	3
5	2
6	2
7	3
8	2
9	
10	3
11	2
12	

SH	Q8.Please rank the following SES metrics based on their usefulness, according to you. : Key drivers and Outcomes of the whole SES
1	3
2	3
3	1
4	1
5	1
6	1
7	1
8	1
9	1
10	1
11	3
12	

SH	Q9.What other metrics you would like to be presented by the SES tool? :
1	Not sure
2	No
3	Not sure
4	Don't remember what metrics SES presented
5	No idea for the moment
6	For this moment,looks like no,but you never know
7	Not now.
8	Not sure
9	No
10	I don't identify any at the moment

SH	Q10.Do you feel the GIS tool will assist you in constructing a simple SES for your area? :
----	--

1	Yes
2	Yes
3	Yes
4	Yes
5	yes, But
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes, But

SH	Q11.What are your recommendations for future developments of decision support tools to ensure practical relevance for end-users?:
----	---

1	
2	No opinion.
3	KISS - KEEP IT SUPER SIMPLE
4	Need to test the ones you have first
5	have none for the moment
6	Sorry,no recommendations
7	None
8	Not yet
9	Simplifying
10	I don't have any
11	The future will show
12	Promote testing exercises with the stakeholders

SH	Q12.Any other remarks? :
----	--------------------------

1	No
2	No
3	
4	No
5	nope
6	Nope
7	No
8	No
9	
10	No
11	No
12	

Appendix 4g. First day overview of tools -Appreciation by Overarching Stakeholders

SH	Q1. What professional sector are you representing?:
1	Private sector/SME
2	Fisheries
3	Tourism
4	NGO/non-profit
5	Fisheries
6	Academia/Research
7	Authorities
8	NGO/non-profit
9	Authorities
10	Authorities
11	NGO/non-profit
12	Authorities
13	Authorities
SH	Q2.What (geographic) area are you representing? :
1	Arctic
2	Arctic
3	Macaronesia
4	Atlantic (West-Europe)
5	Atlantic (West-Europe)
6	Atlantic (West-Europe)
7	Baltic
8	Atlantic (West-Europe)
9	Macaronesia
10	Macaronesia
11	Baltic
12	Atlantic (West-Europe)
13	Macaronesia
SH	Q3.Did you understand the structure and principle of the following tools: : Session 4: Causal Loop Diagram
1	4
2	5
3	5
4	3
5	4
6	4
7	3
8	5
9	4
10	4
11	4
12	2
13	4
SH	Q4.Did you understand the structure and principle of the following tools: : Session 4: BowTie
1	3
2	5
3	5

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4	5
5	4
6	4
7	4
8	5
9	4
10	5
11	5
12	2
13	4

SH	Q5.Did you understand the structure and principle of the following tools: : Session 5: SSP scenarios of Societal and Environmental Change (SSP1, SSP3, SSP5)
----	---

1	4
2	4
3	5
4	3
5	4
6	4
7	4
8	5
9	5
10	4
11	4
12	2
13	5

SH	Q6.I expect this tool to be successful for management and policy: Session 4: Causal Loop Diagram
----	---

1	4
2	4
3	5
4	4
5	5
6	4
7	3
8	4
9	4
10	3
11	5
12	4
13	2

SH	Q7.I expect this tool to be successful for management and policy: Session 4: Bow-Ties
----	--

1	2
2	5
3	5
4	5
5	5
6	4
7	3

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8	4
9	3
10	5
11	5
12	4
13	2

SH	Q8.I expect this tool to be successful for management and policy: Session 5: SSP scenarios
----	--

1	3
2	5
3	5
4	3
5	5
6	4
7	3
8	4
9	4
10	2
11	4
12	4
13	3

SH	Q9.Will the Causal Loop Diagram be used in the management of your marine area?:
----	---

1	Yes, others will use it, but not me
2	Yes, I will use it myself
3	Yes, others will use it, but not me
4	Yes, others will use it, but not me
5	Yes, others will use it, but not me
6	Yes, others will use it, but not me
7	Yes, others will use it, but not me
8	Yes, others will use it, but not me
9	Yes, I will use it myself
10	Yes, others will use it, but not me
11	Yes, I will use it myself
12	Yes, others will use it, but not me
13	No, not by others nor myself

SH	Q10. Will the BowTie be used in the management of your marine area?:
----	--

1	Yes, others will use it, but not me
2	Yes, I will use it myself
3	Yes, others will use it, but not me
4	Yes, I will use it myself
5	Yes, others will use it, but not me
6	Yes, others will use it, but not me
7	Yes, I will use it myself
8	Yes, others will use it, but not me
9	Yes, I will use it myself
10	Yes, I will use it myself
11	Yes, I will use it myself
12	Yes, others will use it, but not me
13	No, not by others nor myself

SH	Q11. Will the SSP scenarios be used in the management of your marine area?:
1	Yes, others will use it, but not me
2	Yes, I will use it myself
3	Yes, others will use it, but not me
4	Yes, others will use it, but not me
5	Yes, I will use it myself
6	Yes, others will use it, but not me
7	Yes, others will use it, but not me
8	Yes, others will use it, but not me
9	Yes, I will use it myself
10	Yes, others will use it, but not me
11	Yes, I will use it myself
12	Yes, others will use it, but not me
13	Yes, I will use it myself

SH	Q12. Do you think the following approaches can be useful for management and policy-making? : Session 6: Acceptance and options of governance: the PESTLE approach
1	4
2	5
3	5
4	3
5	5
6	4
7	3
8	4
9	3
10	4
11	5
12	5
13	5

SH	Q13. Do you think the following approaches can be useful for management and policy-making? : Session 7: Estimating the Effects of Management and Policy Measures and Interventions
1	
2	5
3	5
4	4
5	5
6	4
7	3
8	4
9	1
10	5
11	4
12	5
13	3

SH	Q14. What do you think are the major problems in using the tools and approaches you saw today?: 1
----	---

- 1 Accessibility and/or hindrance in usage
- 2 I don't have any
- 3 I did not notice any
- 4 They look straight forward. But limited time can make my assessment be wrong
- 5 Proper understanding on how they work. Combine the results with decision makers.
- 6 Describing how to use them. Capturing all contexts where they can be used.
- 7 I liked them, I don't see a problem with them
- 8 I think the time obstacle could be a problem. That people don't have time to study how to use the different measures and methods. But they are very useful for people that have time to learn them
- 9
- 10 Clarity of the tools
- 11 Incorporating it to a daily basis work
- 12 A variable learning curve for different tools. Some can be more tricky to master
- 13 Digital development needed, adaptación for specific functions
- 14 The complexity
- 15 A matter of time .must be simplify
- 16 Thinking of problems should be more rational
- 17 Be aware of all the inputs
- 18 On the technical level, and on academic level, they are useful. Difficult to use on the political/decision-making level
- 19 Although useful, they need a perfect understanding of the principles and the reach, making it difficult to have a wide and repeated use. They also need participatory processes, not likely to happen...

SH Q15.What do you think are the major problems in using the tools and approaches you saw today?: 2

- 1
- 2
- 3
- 4
- 5 I liked them, I don't see a problem with them
- 6
- 7
- 8 Incorporating it to a daily basis work
- 9
- 10 The complexity
- 11
- 12
- 13 On the technical level, and on academic level, they are useful. Difficult to use on the political/decision-making level

SH Q16.What do you think are the major problems in using the tools and approaches you saw today?: 3

- 1
- 2 I don't have any
- 3
- 4
- 5
- 6

7
8
9
10
11
12
13

Appendix 4h. Second day overview of tools: Appreciation by Overarching Stakeholders

SH	Q1.What professional sector are you representing?:
1	Private sector/SME
2	Fisheries
3	Tourism
4	NGO/non-profit
5	Academia/research
6	Authorities
7	Authorities
8	Authorities
9	Authorities
10	NGO/non-profit
11	Authorities
12	NGO/non-profit
SH	Q2.What (geographic) area are you representing? :
1	Arctic
2	Arctic
3	Macaronesia
4	Atlantic (West-Europe)
5	Atlantic (West-Europe)
6	Baltic
7	Macaronesia
8	Macaronesia
9	Macaronesia
10	Baltic
11	Atlantic (West-Europe)
12	Atlantic (West-Europe)
SH	Q3.Did you understand the structure and principle of the following tools? : Session 9a: the MARBEFES Toolbox - general principles and design
1	4
2	4
3	5
4	
5	3
6	5
7	4
8	3
9	5
10	4
11	3
12	5
SH	Q4.Did you understand the structure and principle of the following tools? : Session 9d1: detailed tool 1 (Maria)
1	3
2	4
3	5
4	
5	3
6	3

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7	4
8	3
9	3
10	3
11	3
12	5

SH Q5.Did you understand the structure and principle of the following tools? : Session 9d2: detailed tool 2 (Clement)

1	3
2	1
3	5
4	
5	3
6	3
7	3
8	4
9	3
10	4
11	3
12	5

SH Q6.Did you understand the structure and principle of the following tools? : Session 11: Decision Support Systems - a "Shiny App"

1	2
2	4
3	5
4	
5	3
6	5
7	5
8	4
9	3
10	4
11	3
12	5

SH Q7.Did you understand the structure and principle of the following tools? : Session 12: Valuation of Coastal Systems

1	3
2	3
3	5
4	
5	3
6	4
7	5
8	5
9	3
10	4
11	3
12	5

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SH	Q8.I expect this tool to be successful for management and policy : Session 9a: the MARBEFES Toolbox - general principles and design
1	5
2	4
3	5
4	
5	3
6	4
7	4
8	1
9	4
10	4
11	4
12	5

SH	Q9.I expect this tool to be successful for management and policy : Session 9d1: detailed tool 1 (Maria)
1	3
2	4
3	5
4	
5	3
6	3
7	4
8	4
9	3
10	4
11	4
12	4

SH	Q10.I expect this tool to be successful for management and policy : Session 9d2: detailed tool 2 (Clement)
1	4
2	3
3	5
4	
5	3
6	3
7	3
8	1
9	3
10	4
11	4
12	4

SH	Q11.I expect this tool to be successful for management and policy : Session 11: Decision Support Systems - a "Shiny App"
1	4
2	3
3	5
4	
5	3
6	4

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7	4
8	1
9	2
10	5
11	4
12	5

SH Q12.I expect this tool to be successful for management and policy : Session 12: Valuation of Coastal Systems

1	4
2	4
3	5
4	
5	3
6	3
7	4
8	1
9	1
10	4
11	4
12	5

SH Q13.Will the detailed tool 1 (Maria) be used in the management of your marine area?:

1	Yes, others will use it, but not me
2	Yes, others will use it, but not me
3	Yes, others will use it, but not me
4	
5	Yes, others will use it, but not me
6	Yes, others will use it, but not me
7	Yes, others will use it, but not me
8	Yes, I will use it myself
9	Yes, others will use it, but not me
10	Yes, I will use it myself
11	Yes, others will use it, but not me
12	Yes, others will use it, but not me

SH Q14.Will the detailed tool 2 (Clement) be used in the management of your marine area?:

1	Yes, others will use it, but not me
2	Yes, others will use it, but not me
3	Yes, others will use it, but not me
4	
5	No, not by others nor myself
6	Yes, others will use it, but not me
7	Yes, others will use it, but not me
8	Yes, I will use it myself
9	Yes, others will use it, but not me
10	Yes, others will use it, but not me
11	Yes, others will use it, but not me
12	Yes, others will use it, but not me

SH	Q15.Will the Decision Support Sytem ("Shiny App") be used in the management of your marine area?:
1	Yes, others will use it, but not me
2	Yes, others will use it, but not me
3	Yes, others will use it, but not me
4	
5	Yes, others will use it, but not me
6	Yes, I will use it myself
7	Yes, I will use it myself
8	Yes, others will use it, but not me
9	Yes, others will use it, but not me
10	Yes, I will use it myself
11	Yes, others will use it, but not me
12	Yes, I will use it myself

SH	Q16/Will the "socio-cultural valuation of coastal systems" be used in the management of your marine area?:
1	Yes, I will use it myself
2	Yes, others will use it, but not me
3	Yes, others will use it, but not me
4	
5	No, not by others nor myself
6	Yes, others will use it, but not me
7	Yes, I will use it myself
8	Yes, I will use it myself
9	No, not by others nor myself
10	Yes, I will use it myself
11	Yes, others will use it, but not me
12	Yes, I will use it myself

SH	Q17.Do you think the following approaches can be useful for management and policy-making? : Session 14: Marine Protected Areas: Challenges, Visions, and Pathways to Solutions
1	4
2	4
3	5
4	
5	3
6	3
7	3
8	4
9	4
10	4
11	5
12	5

SH	Q18.Do you think the following approaches can be useful for management and policy-making? : Session 15: Ocean Literacy
1	4
2	4
3	5
4	
5	3

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6	3
7	3
8	5
9	4
10	4
11	5
12	5

SH	Q19.Any other remarks? : 1
1	Thank you for yet a mening foul few days
2	No
3	
4	
5	No
6	No
7	No
8	Congratulation to all the team for the good work
9	It's good to have theoretical background, but time should be more balanced in order for the stakeholders "working time" is enough for a more widely and complete discussion and conclusions
10	No
11	Questions often assume you are a MPA manager
12	No
13	No
14	No

Appendix 4i. Evaluation Questionnaire

SH	Q1.What professional sector are you representing?: 1
1	Tourism
2	Fisheries
3	Tourism
4	NGO/non-profit
5	Academia/Research
6	Authorities
7	Authorities
8	Authorities
9	Authorities
10	NGO/non-profit
11	Authorities
12	NGO/non-profit
13	Private sector/SME

SH	Q2.What (geographic) area are you representing? :
1	Arctic
2	Arctic
3	Macaronesia
4	Atlantic (West-Europe)
5	Atlantic (West-Europe)
6	Baltic
7	Macaronesia
8	Macaronesia
9	Macaronesia
10	Baltic
11	Atlantic (West-Europe)
12	Atlantic (West-Europe)

SH	Q3.The workshop was well organised.:
1	4
2	5
3	5
4	5
5	4
6	4
7	4
8	4
9	5
10	5
11	5
12	5

SH	Q4.The duration of the workshop was appropriate:
1	4
2	5
3	5
4	4
5	3
6	4

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7	5
8	4
9	5
10	5
11	5
12	4

SH	Q5.The catering service met my expectations and allowed me to engage in conversations with other event attendees.:
----	--

1	5
2	5
3	5
4	3
5	4
6	4
7	5
8	4
9	5
10	5
11	5
12	5

SH	Q6.The pre-event communication was adequate and motivated my attendance.:
----	---

1	5
2	5
3	5
4	5
5	4
6	5
7	3
8	5
9	5
10	5
11	1
12	5

SH	Q7.The communication during the event was adequate and encouraged my participation in its activities.:
----	--

1	4
2	5
3	5
4	5
5	4
6	5
7	5
8	5
9	4
10	5
11	3
12	5

SH	Q8.The venue and resources chosen for the workshop were appropriate.:
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1	4
2	4
3	5
4	5
5	4
6	4
7	4
8	5
9	5
10	5
11	4
12	5

SH	Q9.The timing was managed correctly during the event.:
1	3
2	5
3	5
4	5
5	3
6	4
7	5
8	5
9	4
10	5
11	5
12	5

SH	Q10.The materials and content provided were useful and facilitated my understanding during the workshop.:
1	3
2	5
3	5
4	5
5	4
6	4
7	4
8	5
9	4
10	5
11	3
12	5

SH	Q11.The topics covered during the sessions of day 1 are relevant to the sector/professional field to which I belong.: Session 3: Stakeholder Priorities: Results of the 2nd round of Consultations
1	3
2	4
3	5
4	5
5	3
6	4
7	4
8	5

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9	5
10	5
11	2
12	5

SH	Q12.The topics covered during the sessions of day 1 are relevant to the sector/professional field to which I belong.: Session 4: Causal Loops
1	3
2	4
3	4
4	4
5	3
6	4
7	4
8	4
9	3
10	5
11	2
12	5

SH	Q13.The topics covered during the sessions of day 1 are relevant to the sector/professional field to which I belong.: Session 4: BowTies
1	2
2	4
3	5
4	3
5	3
6	4
7	4
8	4
9	3
10	5
11	2
12	5

SH	Q14.The topics covered during the sessions of day 1 are relevant to the sector/professional field to which I belong.: Session 5: Scenarios of Societal and Environmental change
1	4
2	4
3	5
4	5
5	3
6	4
7	5
8	5
9	5
10	5
11	2
12	5

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SH	Q15.The topics covered during the sessions of day 1 are relevant to the sector/professional field to which I belong.: Session 6: Acceptance and options for governance: the PESTLE approach
1	3
2	4
3	4
4	4
5	3
6	4
7	3
8	4
9	3
10	5
11	2
12	5

SH	Q16.The topics covered during the sessions of day 1 are relevant to the sector/professional field to which I belong.: Session 7: Estimating effects of Management and Policy Measures and Interventions
1	3
2	4
3	5
4	4
5	3
6	4
7	4
8	4
9	4
10	5
11	2
12	4

SH	Q17.The topics covered during the sessions of day 1 are relevant to the sector/professional field to which I belong.: Session 8: Governance - Rules and Regulations - Challenges, Visions and Pathways to Solutions
1	4
2	4
3	5
4	4
5	3
6	4
7	4
8	5
9	4
10	5
11	2
12	5

SH	Q18.The topics covered during the sessions of day 2 are relevant to the sector/professional field to which I belong.: Session 9: the MARBEFES Toolbox
1	4
2	4

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3	5
4	
5	3
6	4
7	3
8	4
9	4
10	5
11	2
12	5

SH	Q19.The topics covered during the sessions of day 2 are relevant to the sector/professional field to which I belong.: Session 10: Tools and Stakeholders: Appreciation of Tools by Stakeholders
----	---

1	4
2	4
3	5
4	
5	3
6	4
7	4
8	5
9	4
10	5
11	2
12	5

SH	Q20.The topics covered during the sessions of day 2 are relevant to the sector/professional field to which I belong.: Session 11: Decision Support System: the simple SES "Shiny app"
----	---

1	2
2	4
3	5
4	
5	3
6	4
7	4
8	4
9	4
10	5
11	2
12	5

SH	Q21.The topics covered during the sessions of day 2 are relevant to the sector/professional field to which I belong.: Session 12: Valuation of Coastal Systems
----	--

1	3
2	4
3	5
4	5
5	3
6	4
7	4

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8	5
9	2
10	5
11	2
12	5

SH	Q22. The topics covered during the sessions of day 2 are relevant to the sector/professional field to which I belong.: Session 13: Marine Protected Areas: Challenges, Visions, and Pathways to Solutions
----	---

1	4
2	4
3	5
4	4
5	3
6	4
7	3
8	5
9	4
10	5
11	2
12	5

SH	Q23.The topics covered during the sessions of day 2 are relevant to the sector/professional field to which I belong.: Session 14: Ocean Literacy
----	--

1	4
2	4
3	5
4	5
5	3
6	4
7	3
8	5
9	4
10	5
11	2
12	5

SH	Q24.I am going to USE the following tool/approach/result in my work.: Session 4: Causal Loops
----	---

1	3
2	4
3	2
4	2
5	2
6	3
7	3
8	5
9	2
10	4
11	1
12	5

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SH	Q25.I am going to USE the following tool/approach/result in my work.: Session 4: BowTies
1	1
2	4
3	2
4	4
5	2
6	3
7	3
8	5
9	2
10	5
11	1
12	5

SH	Q26.I am going to USE the following tool/approach/result in my work.: Session 5: Scenarios of Societal and Environmental change
1	2
2	4
3	3
4	4
5	2
6	3
7	4
8	5
9	3
10	5
11	4
12	4

SH	Q26.I am going to USE the following tool/approach/result in my work.: Session 5: Scenarios of Societal and Environmental change
1	2
2	4
3	3
4	4
5	2
6	3
7	4
8	5
9	3
10	5
11	4
12	4

SH	Q27.I am going to USE the following tool/approach/result in my work.: Session 6: Acceptance and options for governance: the PESTLE approach
1	3
2	4
3	2
4	3
5	2
6	3

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7	3
8	4
9	3
10	4
11	1
12	5

SH	Q28.I am going to USE the following tool/approach/result in my work.: Session 7: Estimating effects of Management and Policy Measures and Interventions
1	3
2	4
3	3
4	
5	2
6	3
7	4
8	4
9	3
10	4
11	4
12	4

SH	Q29.I am going to USE the following tool/approach/result in my work.: Session 8: Governance - Rules and Regulations - Challenges, Visions and Pathways to Solutions
1	4
2	4
3	2
4	
5	2
6	3
7	4
8	4
9	4
10	4
11	1
12	5

SH	Q30.I am going to USE the following tool/approach/result in my work.: Session 9: the MARBEFES Toolbox
1	4
2	4
3	3
4	
5	2
6	3
7	4
8	1
9	4
10	4
11	1
12	5

SH	Q31.I am going to USE the following tool/approach/result in my work.: Session 9d1: Detailed tool 1 (Maria)
1	2
2	4
3	3
4	
5	2
6	3
7	3
8	4
9	2
10	4
11	4
12	4

SH	Q32.I am going to USE the following tool/approach/result in my work.: Session 9d2: Detailed tool 2 (Clement)
1	2
2	4
3	3
4	
5	2
6	3
7	2
8	4
9	2
10	4
11	1
12	4

SH	Q33.I am going to USE the following tool/approach/result in my work.: Session 11: Decision Support System: the simple SES "Shiny app"
1	3
2	4
3	3
4	
5	2
6	3
7	4
8	5
9	2
10	5
11	1
12	5

SH	Q34.I am going to USE the following tool/approach/result in my work.: Session 12: Valuation of Coastal Systems
1	4
2	4
3	3
4	3
5	2

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6	3
7	3
8	5
9	1
10	5
11	4
12	5

SH	Q35.I am going to USE the following tool/approach/result in my work.: Session 13: Marine Protected Areas: Challenges, Visions, and Pathways to Solutions
1	4
2	4
3	3
4	4
5	2
6	3
7	3
8	5
9	4
10	4
11	1
12	5

SH	Q36.I am going to USE the following tool/approach/result in my work.: Session 14: Ocean Literacy
1	3
2	4
3	4
4	5
5	2
6	3
7	3
8	5
9	2
10	5
11	1
12	5

SH	Q37.The event met my expectations.:
1	4
2	5
3	5
4	5
5	3
6	4
7	4
8	5
9	5
10	5
11	4
12	5

SH	Q38.I would recommend attending the next workshop to others in my professional network.:
1	4
2	5
3	5
4	5
5	4
6	4
7	5
8	5
9	5
10	5
11	3
12	5

SH	Q39.Would you like to participate in future events of the project?:
1	5
2	5
3	5
4	5
5	4
6	4
7	5
8	5
9	5
10	5
11	4
12	5

SH	Q40.What did you like the most about the workshop?:
1	Participate in meaningful work The feedback from the researchers
2	Herman is very good moderator and keeps time scheduled. Wonderful friendly people Discussions
3	Individual participation Contents
4	Great to see the progress on the tools from last year. Lovely group of people.
5	the discussions the networking
6	Exchange of different experiences.
7	good atmosphere, sharing knowledge and experiences, learning new tools The good clima of cooperation between participants
8	The Haig level of the presentations The participative approach Atmosphere and location
9	Contents presented
10	The opportunity to contribute It was useful in many ways: introduced tools, making contacts with participants, finding out something new, etc

- | | |
|----|--|
| 11 | Group Spirit
Organization
Aware of different realities/knowledge
Networking with smart, kind people has been really enriching and pleasant. |
| 12 | Getting to understand somewhat complex issues by being clearly explained by the team in such a short time was very valuable. |

- | | |
|----|---|
| SH | Q41.What did you like the least about the workshop?: 1 |
| 1 | Some were detailed explanations |
| 2 | |
| 3 | Maybe more stakeholders from the Azores could participate |
| 4 | Days very long. Would be better to do shorter days over 3 days in my opinion, or remove some tools to make the day shorter. |
| 5 | The maybe a bit too busy program |
| 6 | The head wasn't working properly on the second day evening, too much information. |
| 7 | |
| 8 | A bit of more time to interact
Extensive theoretical contents |
| 9 | |
| | Lack of time for stakeholders to develop more elaborated contents |
| 10 | It was a great workshop |
| 11 | Terms used by scientists (abbreviations) sometimes complicated communication |
| 12 | It takes a bit of time to putting the dynamics to work, so sometimes I feel the timing is too tight |

- | | |
|----|---|
| SH | Q42.What did you like the least about the workshop?: 2 |
| 1 | Tight schedule |
| 2 | |
| 3 | |
| 4 | This is not about the workshop, but the food options for vegetarians/vegans we're not many. They also told people dishes were vegetarian but there was fish in them, or vegan but there was cheese. |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |

- | | |
|----|--|
| SH | Q43.What did you like the least about the workshop?: 3 |
| 1 | Going overtime on a lot of topics |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |

11

12 Q43.What did you like the least about the workshop?: 3

SH Q44.If you have any other suggestions, please include them in this space.:

1

2

3

4 Thank you so much for another wonderful 2 days. I look forward to seeing
the progress again next year too.

5 no

6 -

7

8

9 You're heading in the right direction. Keep up the good work!!

10

11

12 None