



An overview of the Marine SABRES Approach on the Development and Integration of a Simple Social-Ecological System (SES) Framework and its Application to addressing Marine Biodiversity Loss, supporting Marine Ecosystem Sustainability and a Resilient Blue Economy

Marine SABRES - Marine Systems Approaches for Biodiversity Resilience and Ecosystem Sustainability - brings together 21 research partners to restore marine biodiversity and support a sustainable blue economy by increasing the uptake of ecosystem-based management in Europe.

Marine Policy & Governance Context

The European Union's Integrated Maritime Policy ([IMP](#)) is designed to streamline maritime activities and address related concerns by co-ordinating various policy areas to foster a sustainable blue economy. Key Directives underpinning the IMP are the Marine Strategy Framework Directive ([MSFD](#)) and the Maritime Spatial Planning Directive ([MSPD](#)). The MSFD mandates a Programme of Measures (POM) to ensure Good Environmental Status, with the MSPD playing a crucial role as it requires Member States to develop national maritime spatial plans to promote co-existence and sustainability of human activities in marine areas.

Marine governance frameworks operate at global, regional, and national levels, whereby individual countries are bound by global initiatives such as the UN Convention of the Law of the Sea ([UNCLOS](#)) and the Convention on Biological Diversity ([CBD](#)).

Within the European Union (EU), Member States strive to implement efforts that integrate management of human activities in our regional seas via spatial planning, habitat protection or cross-border co-operation, which requires integrated marine governance. In this context, the goals of the Directive 2014/89/EU are particularly pertinent in establishing a framework for Maritime Spatial Planning (MSP).

At national level, marine activities in many countries are managed by multiple national authorities and agencies. This leads to challenges i.e. when jurisdictions are overlapping, priorities are not clearly delineated and management objectives for different sectors conflict each other. Co-ordination among the varying marine sectors e.g., fisheries, energy, environmental conservation, or transport, is crucial to ensure effective marine governance for sustainable marine ecosystems and economies.

Relevant EU Directives

- The Marine Strategy Framework Directive (2008/56/EC)
- The Water Framework Directive (2000/60/EC)
- The Birds and Habitats Directive (79/409/EEC)
- The Habitats and Species Directive (92/43/EEC)
- The Marine Spatial Planning Directive (2014/89/EU)

The Marine SABRES Simple SES Framework

Marine SABRES aims to develop a Simple Social-Ecological System framework (Simple SES) to address the complex challenges of marine governance, biodiversity loss, and sustainable socio-economic development in facilitating the uptake of Ecosystem Based Management (EBM).

The Simple SES provides a framework for the analysis and comprehension of complex marine social-ecological systems and the interactions between the elements that comprise them. It builds upon a pre-existing SES framework entitled the Integrated Systems Analysis (ISA) approach, to better understand how different parts of a problem are connected and influence each other.

The framework provides problem-solving methods, qualitative mapping tools and process management resources designed to enable practitioners to gather and compile data on key issues and understand causal relationships within a defined marine SES. In doing so, the Simple SES approach will help ensure the flow of vital ecosystems services to society; allowing practitioners to make informed decisions and develop a Programme of Measures in the implementation of relevant EU Directives at Member States level.

The DAPSI(W)R(M) problem-solving method within the Simple SES approach

The problem-solving method that underpins the analysis in the Marine SABRES Simple SES is the DAPSI(W)R(M) method - pronounced *dap-see-worm*.

The DAPSI(W)R(M) framework provides a structured approach for ecosystem-based management by categorizing key features of **Drivers, Activities, Pressures, State Changes, Impacts** (on human Welfare), and **Response** (using management measures).

Through its comprehensive analysis capabilities, the framework facilitates a clearer and more comprehensive picture of the complex issues that affect both the social and ecological elements within a defined system. It is a process that is cyclic in nature, allowing for continual revisitation and refinement to address evolving challenges in marine management. This will lead to integrated and informed decision-making and improved management capabilities.

SES in Context

In a marine context a **Social-Ecological System (SES)** includes all the **living things** in the sea (such as fish, plants, and microscopic life), the **physical environment** of the ocean (such as the water, the seafloor, and the coastlines), and all the ways that **humans** use, benefit from, and affect the ocean.

Under a SES approach, we recognize that **changes in one part** of the marine system can have **ripple effects** throughout the rest of the system i.e. overfishing can deplete fish stocks, which in turn affects seabirds that feed on those fish and impacts human communities that depend on fishing for their livelihoods.

DAPSI(W)R(M):

- **Drivers:** Basic needs and wants society has from the ocean, such as food and well-being
- **Activities:** Actions undertaken to fulfill these needs, including fishing and energy production
- **Pressures:** Activities that harm marine life, such as littering at beaches
- **State Changes:** Pressures leading to changes in the ocean, such as a decline in sea creature populations due to pollution
- **Impacts on Human Welfare:** State changes affecting humans, such as reduced enjoyment of recreational activities
- **Responses (Measures):** Steps taken to address problems, such as beach clean-ups and fishing regulations, ensuring a healthy co-existence between people and the ocean.

The Marine SABRES Demonstration Areas:

MarineSABRES operationalises and tests the Simple SES framework in three Project Demonstration Areas: the Tuscan Archipelago, the Arctic Northeast Atlantic and Macaronesia.

Work in the Demonstration Areas focuses on stakeholder-driven issues to facilitate targeted environmental and economic improvements. Each area conducts audits of their marine governance frameworks and identifies responsible organisations and agencies to inform site-specific management strategies, feeding into the co-development of the Simple SES with stakeholders.

Three regions will test the useability of the Simple SES with a different focus for each:

- The **Tuscan Archipelago** will focus on tourism and conservation of seagrass beds.
- The **Arctic Northeast Atlantic** will look at the impact of climate change and challenges surrounding commercial fisheries.
- **Macaronesia** focuses on the conservation and restoration of biodiversity and the benefits of ecotourism.

Outcomes and Outputs of the Simple SES:

Operationalising the Simple SES in the Marine SABRES Demonstration Areas will develop the following outputs and outcomes.

- **Process and Information Management System** to facilitate the incorporation of logistics and management principles and ensure ethical data handling to provide a solid foundation for Simple SES analysis.
- **Continuous Stakeholder Engagement** throughout the process to incorporate diverse perspectives in designing response measures to specific ecosystem challenges.
- Implementation of the **DAPSI(W)R(M) framework** to evaluate and address specific ecosystem impacts, considering both societal and natural elements.
- Creation of **Behaviour-Over-Time charts** or time series to assess dynamic impacts and validate theories related to various social-ecological elements within the system.
- Development of **Causal Loop Diagrams** as a qualitative analysis tool, to prioritise impacts and enhance understanding of systemic behaviours and challenges across diverse ecosystems in different countries.
- **Systematic Data Analysis** to validate causal theories and time series charts, ensuring an evidence-based approaches to decision-making.
- **Integration of Causal Loop Diagrams**, where individual Impact-based diagrams feed into a comprehensive Issue-based Causal Loop Diagram to provide a **holistic understanding of marine ecosystems**.

More information about the **Marine SABRES** Demonstration Areas can be found at the following links:

[The Tuscan Archipelago](#)

[The Arctic Northeast Atlantic](#)

[Macaronesia](#)

The **Marine SABRES** approach to marine environmental management integrates a Simple SES framework to enhance ecosystem resilience and sustainability.

The project implements this approach by addressing complex issues through stakeholder engagement and data-driven decision-making to guide effective marine governance and management practices.

The outcomes and outputs of the Marine SABRES Simple SES will be instrumental in guiding practitioners towards efficiencies in three key policy contexts:

- Effective and sustainable marine management practices
- Emphasising the cost-effectiveness of pathways towards sustainable blue economies and productivity in sustainable resource management
- Designing effective response measures at various levels of governance

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Marine SABRES Policy Brief 1 is directly underpinned by the body of work and content developed within 'The Simple Social-Ecological Guidance and Cross Cutting Briefing Papers' & 'The Simple SES Practice Abstract'.

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