



MARINE
SABRES

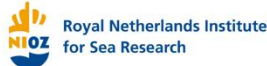


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The Simple SES Practice Abstract

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Description of the Marine SABRES Simple SES

Marine SABRES (Marine Systems Approaches for Biodiversity Resilience and Ecosystem Sustainability) is an EU-funded HorizonEurope initiative focusing on the conservation and protection of marine biodiversity. The project integrates the sustainable use of ecosystems and a resilient blue economy by convening international experts from both natural and social sciences. Its main activities include ecosystem management enhancement through the approach of a Simple Social-Ecological System (SES), which includes stakeholder engagement and the development of sustainable marine governance. By harmonising ecosystem health with sustainable usage, the project aims to create resilient marine environments. This goal is achieved through interdisciplinary collaboration, focusing on deriving innovative management strategies and recommendations for methods to implement sustainable policy development for marine managers. These principles guide the focus of the Simple SES as an operationalised approach to Ecosystem-based management.

Short summary for practitioners

The Simple SES approach is centred around defining stakeholder-driven focus issues, thereby facilitating targeted environmental and economic improvements in marine ecosystems which are holistically designed (Gregory et al., 2023). Working in three phases with various attached exercises, a practitioner will assess the focal circumstances/issue to set a foundation for their investigation; they will gather the relevant information and data needed to assess the social-ecological system; and use this information to make informed decisions, at the level of governance they intended to influence the system, through a Programme of Measures (PoM). The PoM is an integral part of implementing the relevant marine quality directives; these include the Marine Strategy Framework Directive¹, the Water Framework Directive², the Birds and Habitats Directive³, and the Habitats and Species Directive⁴. In the marine environment, the Marine Spatial Planning Directive⁵ is regarded as part of the PoM for implementing the Marine Strategy Framework Directive.

The intended outcomes and outputs of the Simple SES aim to include:

- Incorporation of logistics and management principles, known as the Process and Information Management System, to ensure data provenance and ethically considered foundations to undertake the Simple SES analysis.
- Development of Causal Loop Diagrams (CLDs) (a qualitative analysis tool) for prioritised impacts, enhancing understanding of systemic behaviours and challenges on a range of ecosystems in various countries.
- Implementation of the DAPSI(W)R(M) cause-consequences problem-solving framework to evaluate and address specific ecosystem impacts that encompass both the societal and natural elements.
- Creation of Behaviour-Over-Time (BOT) charts (also known as time series) for dynamic impact assessment and theory validation of various social-ecological elements within the system.
- Systematic analysis of data to validate causal theories and BOT charts, ensuring evidence-based approaches.
- Integration of individual Impact-based CLDs into a comprehensive Issue-based CLD, offering a holistic understanding of marine ecosystems.

¹ Marine Strategy Framework Directive (2008/56/EC)

² The Water Framework Directive (2000/60/EC)

³ The Birds Directive (79/409/EEC)

⁴ The Habitats Directive (92/43/EEC)

⁵ Maritime Spatial Planning (2014/89/EU)

- The continuous promotion of stakeholder communication and engagement throughout the different phases of the process to encompass various worldviews in designing response measures to the specific problem focus.

These outcomes are instrumental in guiding practitioners toward effective and sustainable marine management practices, emphasising cost-effectiveness and productivity in sustainable resource management and designing effective response measures at various levels of governance. The approach of the Simple SES aims to choose and then operationalise a pre-existing SES framework called the Integrated Systems Analysis approach (ISA) (Elliott et al., 2020). This was chosen through a thorough literature review and strengths, weaknesses, opportunities and threats analysis of existing frameworks to assess which of these would meet the goals of successful Ecosystem-Based Management the best (Smith et al., 2023). The discipline of Systems Thinking provides us with the tools to look at how and what we manage in a critical way (Gregory et al., 2023⁶). Under a systems approach, we recognise that changes in one part of this system can have ripple effects throughout the rest of the system. For example, overfishing can deplete fish stocks, which in turn affects seabirds that feed on those fish, and also impacts human communities that depend on fishing for their livelihoods. The aim of this approach is to ensure that the SES is able to provide services to society, such as aesthetic sandy beaches to visit and healthy ecosystems which supply the fish we eat.

This approach includes problem-solving methods, qualitative mapping tools and process management resources to be operational. The problem-solving method that underpins the analysis is the DAPSI(W)R(M) method (*pronounced dap-see-worm*) and is a tool to get a full picture of complex issues that affect both people and nature (the social and ecological elements within a system). This framework provides a structured approach for ecosystem-based management by categorising key features of **D**rivers, **A**ctivities, **P**ressures, **S**tate changes, **I**mpacts (on human **W**elfare), and **R**esponse (using management **M**asures) (See Figure 1; Elliott et al., 2017). This tool fits within the Integrated Systems Analysis, **ISA** for short. The ISA approach provides a method to understand better how different parts of a problem are connected and influence each other.

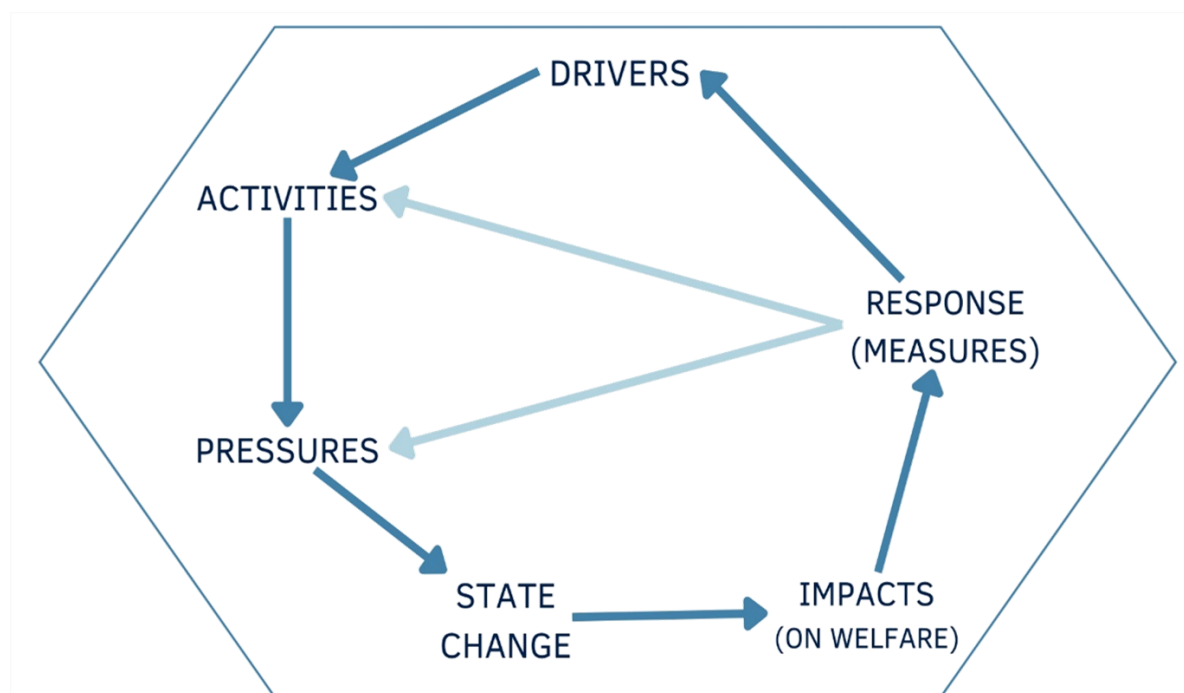


Figure 1: The DAPSI(W)R(M) Framework redrawn from Elliott et al., 2017.

⁶ See Part 1 of the Simple SES guidance for further information.

A short overview of the analysis:

- Defining the Core Issue: Initially, determine the specific problem or situation that needs improvement. This will be the central focus of your analysis.
- Evaluating Impact on Well-being: Investigate how this central issue affects human well-being. Collaborate with stakeholders who have a direct interest in this issue to identify the most significant impacts. For these key impacts, develop Causal Loop Diagrams (CLDs). These diagrams will aid in understanding the connections and influences within the system, highlighting the primary concerns.
- Measuring and Documenting Impacts: Identify appropriate indicators for each impact and track their changes over time. This approach enables a clear view of the real-world effects on society and the environment.
- Implementing the DAPSI(W)R(M) Framework: Utilise this framework to deeper understand each impact. It helps in separating and analysing the complexities of the system, focusing on essential aspects to ensure clarity and consistency in understanding.
- Analysing Historical Data: Examine past data related to the key components of the issue. Develop Behaviour-Over-Time charts using this data. These charts are instrumental in forming and testing theoretical models.
- Constructing Impact-Based Diagrams: Create diagrams that focus on the identified impacts. These diagrams are useful for spotting trends, identifying critical change points (leverage points), and understanding the interplay between different system elements. Conduct hypothetical scenarios ('what-if' experiments) to anticipate potential changes and their effects on the system.
- Developing and Validating Theories: Use the created diagrams to establish theories about the interactions within the system over time. Test these theories against actual data to confirm their validity.
- Guiding Management Strategies: Employ the insights gained from this analysis to inform decision-making regarding the management and response strategies for issues within the marine ecosystem.

This method emphasises intention, significance, and reflection in management practices when analysing and improving a system, especially in the context of governing the marine environment. This approach facilitates a deeper understanding of the system in question, leading to better-informed management decisions. Unlike following a linear methodology, this process is cyclic in nature, allowing for continual revisitation and refinement to address evolving challenges in marine management. See Figure 2 for the operationalised model of the Simple SES.

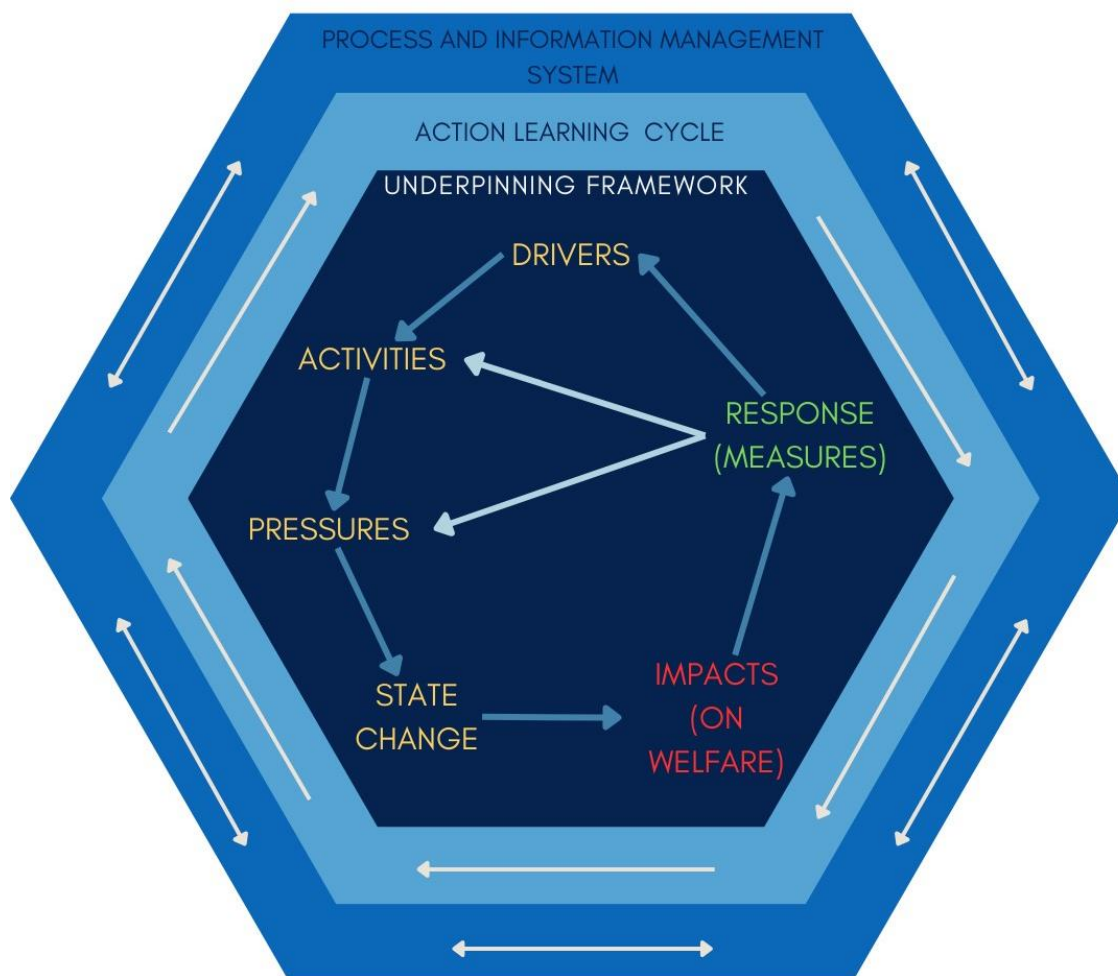


Figure 2: The operationalised Integrated Systems Analysis used in the Simple SES approach (Gregory et al., 2023).

Other materials and supporting links:

Marine SABRES Project: Marine Systems Approaches for Biodiversity Resilience and Ecosystem Sustainability. Funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101058956 Project website: <https://www.marinesabres.eu/> UK Research and Innovation Fund, UKRI Project no. 10050525

Causal loop diagrams: <https://thesystemsthinker.com/causal-loop-construction-the-basics/>

Simple SES: <https://www.marinesabres.eu/post/using-systems-thinking-to-design-a-simple-socio-ecological-system>

The DAPSI(W)R(M) Framework Elliott, M., Burdon, D., Atkins, J. P., Borja, A., Cormier, R., de Jonge, V. N. & Turner, R. K. (2017) "And DPSIR begat DAPSI(W)R(M)!" - A unifying framework for marine environmental management. *Mar Pollut Bull*, 118(1-2), 27- , <https://doi.org/10.1016/j.marpolbul.2017.03.049>

The ISA approach: M Elliott, Á Borja, R Cormier, Managing marine resources sustainably – Ecological, societal and governance connectivity, coherence and equivalence in complex marine transboundary regions, *Ocean & Coastal Management*, Volume 245,2023,106875, <https://doi.org/10.1016/j.ocecoaman.2023.106875>

The Simple SES Guidance Document: Gregory, A.J., Atkins, J.P., Smith, G., Elliott, M. (2023). Simple Social-Ecological Systems Guidance, Deliverable 3.1. Marine SABRES, European Union's Horizon Europe research and innovation programme under grant agreement no. 101058956. and the UKRI Project Number 10050525

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- Gregory, A.J., Atkins, J.P., Smith, G., Elliott, M. (2023). Simple Social-Ecological Systems Guidance, Deliverable 3.1. Marine SABRES, European Union's Horizon Europe research and innovation programme under grant agreement no. 101058956. and the UKRI Project Number 10050525
- Marine Strategy Framework Directive (2008/56/EC)
- Maritime Spatial Planning (2014/89/EU)
- Smith, G. Gregory, A, Atkins, J.P., Elliott, M. (2023) Review of the Literature on Social-Ecological Systems. Deliverable 3.1 Marine SABRES, European Union's Horizon Europe research and innovation programme under grant agreement no. 101058956. and the UKRI Project Number 10050525
- The Birds Directive (79/409/EEC)
- The Habitats Directive (92/43/EEC)
- The Water Framework Directive (2000/60/EC)



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