

# Maritime regional sustainability, social-ecological resilience and complex systems governance: Linking the concepts in Atlantic Europe



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## Key Inferences

Social-ecological resilience and related concepts concerning change, persistence and identity in complex adaptive systems have important implications for the:

- Sustainability of linked ocean and coastal macroregional social-ecological systems.
- Integrated, cross-sectoral approaches to maritime affairs.
- Development of multi-level, multi-scale maritime governance frameworks.

## Introduction

Against the backdrop of rapid global change, the ability of linked social and ecological systems to both sustain and be sustained is of paramount importance to human well-being and security [1].

Problem clusters of unprecedented complexity challenge the 'sustain-ability' of maritime social-ecological systems.



Figure 1. Sustainability-focused science and policy must address multiple problems.

A social-ecological systems approach and a resilience perspective are supportive of the emerging Integrated Maritime Policy for the European Union (EU) and its environmental pillar, the EU Strategy for the protection and conservation of the marine environment, which incorporates an ecosystem-based approach.

## Social-ecological systems

These are complex adaptive systems of 'humans within nature' in which the co-evolving social and ecological dimensions (or subsystems) are dynamically interconnected and interdependent across different levels and scales [2].

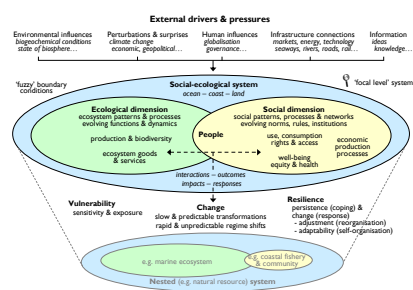


Figure 2. Conceptual model of focal level social-ecological system (composite based on literature).

## Social-ecological resilience

Here, the concept of resilience refers to a social-ecological system's ability to persist by absorbing disturbances and reorganising whilst adapting to and shaping change, and so retain its essential wholeness and identity [3].

## Governance

The EU Integrated Maritime Policy is a tool for achieving the sustainable development of Europe's maritime spaces and coastal regions. Translating the European vision into reality requires a framework for the integration of knowledge, normative policy implementations and adaptive management interventions.

Novel governance architecture is needed to mitigate complex problems and vulnerabilities, foster solutions, achieve balanced development, and facilitate capacity for adaptation to unavoidable global change [4].

To be effective, governance should function in a holistic and integrated manner at and across different system levels as well as across spatial, temporal, informational, organisational, functional, social and ecological scales [5].

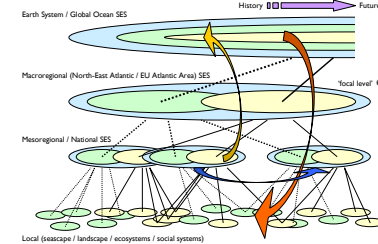


Figure 3. Nested hierarchical structure (aggregation and organisation) of complex adaptive systems, including social-ecological systems (SES), which require a multi-level governance system capable of addressing cross-level and cross-scale interactions (arrows).

Such a framework should also include actions tailored to Europe's maritime regions, including the transnational 'Atlantic Area'.



Figure 4. 'Atlantic Area' transnational space and identity.

Participants in governance need to understand and work with (rather than against) intrinsic attributes of complex adaptive systems, including self-organisation, emergence of complexity and other higher-level collective effects, nonlinear dynamics and feedbacks, nested hierarchical structure, cross-level and cross-scale interactions, scale mismatch, alternative stable states (system regimes) and multiple thresholds, abrupt and surprising regime shifts, variability and unpredictability, and persistent uncertainty multiple possible outcomes, and alternative developmental pathways [6].

## EASES

To examine the notion that governance may be focused on building social-ecological resilience to help achieve maritime regional sustainability, it has been proposed that a macroregional level ocean and coastal social-ecological system, in this case one that encompasses the Atlantic maritime margins of Europe, can be conceptualised and used as a unit of analysis\*.

The essential identity of this European Atlantic social-ecological system (EASES) is being explored in relation to existing structures and processes considered critical to the functioning of the whole system across multiple scales.

\* PhD thesis "Building resilience for social-ecological sustainability in Atlantic Europe".

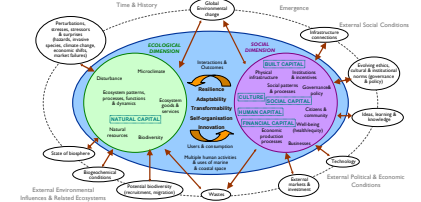


Figure 5. Initial conceptualisation of EASES (as start of Delphi-type exercise).

## Study objectives

- Identify and map key social-ecological components and interactions that determine resilience in EASES.
- Develop a framework for resilience analysis and building resilience in EASES.
- Link framework to scenarios reflecting possible trajectories EASES may follow due to external drivers and stakeholder actions.

## Method

Iterative Delphi-type consultation used to elicit opinion from geographically dispersed experts.

## References

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