

## MODULE 1: HARMONIZING METHODOLOGIES AND DATA TO ASSESS AND MITIGATE THE EFFECT OF MULTISTRESSORS

### 1. OBJECTIVES

- Understand the concept of *multistressors* and their cumulative influence on Black Sea ecosystems.
- Discover how harmonised methodologies and interoperable datasets enhance marine environmental assessments.
- Explore frameworks for integrating biological, physical, and socio-economic data.
- Examine examples of data harmonisation initiatives in the Black Sea (e.g., EMODnet, CMEMS, Black Sea Commission).
- Identify best practices to support evidence-based management and policy under the EU Marine Strategy Framework Directive (MSFD) and the Common Maritime Agenda.

### 2. INTRODUCTION

The Black Sea is a semi-enclosed basin subject to multiple concurrent pressures — eutrophication, climate change, overexploitation of resources, chemical pollution, and habitat degradation. These overlapping drivers, known as multistressors, interact in complex and often nonlinear ways, amplifying ecosystem vulnerability.

Understanding and mitigating these combined effects requires a harmonised methodological framework capable of integrating diverse datasets and assessment tools.

This topic explores how cross-border data harmonisation, standardised monitoring protocols, and integrated modeling approaches can enhance the capacity of scientists and policymakers to assess and mitigate multistressor effects. It draws on examples from the BRIDGE-BS project and related regional and European initiatives that promote data interoperability and open science for marine sustainability.

### 3. READING SUGGESTIONS

- Halpern, B.S. et al. (2015). *Spatial and temporal changes in cumulative human impacts on the world's ocean*. *Nature Communications*, 6, 7615. <https://doi.org/10.1038/ncomms8615>
- Borja, Á. et al. (2016). *Bridging the gap between policy and science in assessing the health status of marine ecosystems*. *Frontiers in Marine Science*, 3, 193. <https://doi.org/10.3389/fmars.2016.00175>
- Lazar, L., Spanu, A., Boicenco, L., Oros, A., Damir, N., Bisnicu, E., ... & Korpinen, S. (2024). *Methodology for prioritizing marine environmental pressures under various management scenarios in the Black Sea*. *Frontiers in Marine Science*, 11, 1388877. <https://doi.org/10.3389/fmars.2024.1388877>

- Bisinicu, E., Abaza, V., Boicenco, L., Adrian, F., Harcota, G. E., Marin, O., ... & Lazar, L. (2024). Spatial cumulative assessment of impact risk-implementing ecosystem-based management for enhanced sustainability and biodiversity in the Black Sea. *Sustainability*, 16(11), 4449. <https://doi.org/10.3390/su16114449>
- ANEMONE Deliverable 1.1, 2021. "Overview of monitoring programs, gaps identification, and research needs at Black Sea region", Valentina Todorova [Ed.], Ed. CD PRESS, 197 pp. [https://blacksea-cbc.net/wp-content/uploads/2021/12/BSB319 ANEMONE - Overview-of-monitoring-programsgaps-identification-and-reaserch-needs-at-Black-Sea-region EN.pdf](https://blacksea-cbc.net/wp-content/uploads/2021/12/BSB319_ANEMONE_-_Overview-of-monitoring-programsgaps-identification-and-reaserch-needs-at-Black-Sea-region_EN.pdf)

#### 4. EXTERNAL LINKS

- <https://emodnet.ec.europa.eu/en/black-sea-1>
- <https://marine.copernicus.eu/>
- <https://www.blacksea-commission.org/>