

Advancing Black Sea Research and Innovation for a Sustainable Blue Economy

Background

The Black Sea is vital to its coastal communities and supports a vibrant blue economy, with new technological innovations offering significant potential to further enhance its sustainability. However, it is impacted by several stressors, including climate change (i.e. warming, acidification, deoxygenation), eutrophication, marine litter, chemical pollution, overfishing, invasive alien species, and war-related impacts. BRIDGE Black Sea (BRIDGE-BS) developed new tools and capabilities to predict the long-term impact and emerging risks from these stressors, to identify a safe operating space, and to respect ecosystem boundaries, within which a sustainable blue economy can flourish. These include innovative environmental monitoring, data integration, climate scenario modelling, analysis of the resilience of Black Sea ecosystems, their ecosystem services and tipping points, and risk assessments to support ecosystem-based management. Co-development with local communities and policy makers identified key management measures for a resilient and productive Black Sea to ensure the long-term sustainability (to 2050 and 2100) of its blue economy.



Recommendations

To limit the impact of human activities on the health and resilience of the Black Sea, preserve core ecosystem services, and provide a safe operating space for the development of a sustainable blue economy, the following actions should be achieved within the next five years.

Recommendations for policy makers:

- **Develop and update national and regional blue economy strategies, regulations, and enforcement** to align with the adaptive management recommendations developed by BRIDGE-BS, including to: prioritise small-scale fisheries; reinforce sustainable fisheries policies and ecosystem-based fisheries management; adopt green transport solutions for vessels and port infrastructure; develop offshore wind energy and sustainable aquaculture; reduce pollution from watersheds and coastal areas; and promote innovative and sustainable tourism;
- **Further strengthen the science-policy interface and dialogue in the Black Sea region** by supporting existing mechanisms and improving coordination between e.g. the Black Sea Commission (BSC), Black Sea Economic Cooperation (BSEC), and the General Fisheries Commission for the Mediterranean and Black Sea (GFCM);
- **Implement systems and resilience thinking in the management** of the blue economy, and integrate participatory stakeholder approaches into adaptive management strategies using BRIDGE-BS scenario development and stakeholder engagement methods;
- **Develop a dedicated financial framework for blue economy grants, financial incentives, and regional coordination** among national level financing actors, and national and regional acceleration/incubation mechanisms and establish a long-term framework to support future editions of the Black Sea Accelerator and the High Tech Summit to consolidate its role as a reference forum for regional innovation in the Black Sea;

Find out more about the BRIDGE-BS Policy Brief “Advancing Black Sea Research and Innovation for a Sustainable Blue Economy” at: <https://www.marineboard.eu/publications/advancing-black-sea-research-and-innovation-sustainable-blue-economy>

- **Implement a consistent ecosystem-based approach to marine spatial planning** in each Black Sea country and at basin-scale using the BRIDGE-BS tools. This will strengthen and ensure effective management of the current network of marine protected areas, including the regulation of human activities (e.g. fisheries, transport, tourism) in and around MPAs;
- **Update and harmonise marine monitoring programmes** across Black Sea countries based on newly tested technologies, methods, protocols and data gaps identified within BRIDGE-BS, and establish a regional monitoring framework to harmonise socio-economic data collection and open access across Black Sea countries to feed into the blue economy observatory and link to the BRIDGE-BS DTO demonstrator; and
- **Support the continuation and expansion of capacity building activities** developed under BRIDGE-BS including the Massive Open Online Course, Black Sea Young Ambassador programme, and the Black Sea Literacy Network.

Recommendations for research and operational services:

- **Further develop, coordinate, and deploy smart sensor technologies**, combined with traditional observational systems;
- **Continue to develop standardised methodology** for an integrated land-sea, multiple stressor, early warning system to harmonise monitoring;
- **Consolidate the integration of BRIDGE-BS observation data, models, and predictive management tools into the BRIDGE-BS Digital Twin Ocean (DTO) demonstrator**, and include new scenarios, use-cases and functionalities catering to stakeholder needs. Links between the BRIDGE-BS DTO, Copernicus Marine Service, EMODnet, and the European DTO should be defined and organised;
- **Facilitate training for policy makers** on the tools developed within BRIDGE-BS;
- **Include knowledge gaps in an updated version of the Black Sea Strategic Research and Innovation Agenda (SRIA)**, including: future resilience and tipping point assessments; under-monitored sources of stressors and improved links between pressures and drivers; model downscaling for higher resolution at local scale; identifying the boundaries of a safe operating space; further advancement of oxygen and hydrogen sulphide mapping; Ocean acidification assessments; Danube influence on the Black Sea; validation of the industrial potential of biomolecules; socio-ecological research using scenarios; and mitigation of war-related pollution in the Black Sea; and
- **Provide support to rebuild the research capacity of Ukraine.**

These recommendations support the implementation of policies, strategies and initiatives at a global level (e.g. the Kunming-Montreal Global Biodiversity Framework, the UN Decade of Ocean Science for Sustainable Development, the Sustainable Development Goals), EU level (e.g. EU Ocean Pact, EU Water Resilience Strategy, European Green Deal, EU Biodiversity Strategy, Marine Strategy Framework Directive, Marine Spatial Planning Directive, Nature Restoration Regulation, Birds and Habitats Directives, Mission Restore our Ocean and Waters), and regional level (e.g. Bucharest Convention, EU Black Sea Strategy, EU Danube Strategy, Black Sea Synergy, Common Maritime Agenda, Black Sea Strategic Research and Innovation Agenda and Implementation Plan). They will support the implementation and enforcement of this complex policy framework in the Black Sea region by all actors, particularly at the local level. More information on specific actions for stakeholders to implement these recommendations can be found in the '2030 Blue Roadmap for the Black Sea'.