



### D2.6 BLACK SEA STRATEGIC RESEARCH AND INNOVATION AGENDA FINAL IMPLEMENTATION PLAN



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## Executive Summary

The 1st Draft of the Implementation Plan was developed using input from the Operational Network of Funders in addition to national-level input gathered through the consultations and input from European and regional level priorities and policies like the European Green Deal, Mission Ocean and Waters, Sustainable Blue Economy Partnership, and UN Decade of Ocean Science. Based on this initial draft, the second round of national and SRIA consultations were held.

Based on the 2nd round of consultations, an international-level workshop took place to complement the national-level input. The results of these workshops are incorporated into the Final SRIA (D2.4) and its Implementation Plan. This document provides the updated version of the Final SRIA Implementation Plan (both the initial working document and the formatted version, Annex 2) and the reports of the national and international consultations that took place February – March 2023.

The 2nd Round of National SRIA consultations aimed to get national-level input from a broader stakeholder group on the themes and concrete strategic joint (SJAs) actions drafted as an output of the 1st National SRIA Consultations. The participants are asked how feasible each SJA is (1st question) and what SJAs are that are not feasible within the existing capacities but necessary/important to implement (2nd question). They are also be asked for their general feedback on the themes and SJAs of the Implementation Plan. (3rd question). The goal of this exercise is to identify common strategic joint actions that different Black Sea countries find feasible and/or already in the progress of implementing so that synergies among the implementation of these actions can be aligned across different countries. In the international consultation, same methodology is followed.

Based on the outputs, it is observed that Themes 7, 12, 2, 6 and SJAs underneath came to front both in terms of feasibility and importance/necessity. However, it is important to note that most Black Sea SRIA IP Joint actions ranked high in terms of feasibility and importance/necessity among both national and international stakeholders. Almost all SJAs ranked above 3.00 (out of 5) at all consultations and scoring activities, pointing out the fact that Black Sea SRIA IP remains relevant for the stakeholders.

## BLACK SEA STRATEGIC RESEARCH AND INNOVATION AGENDA

With the support of the European Commission, a working group of experts from countries bordering the Black Sea gathered in 2017 to develop a shared agenda for research and innovation for the Black Sea and provide guidance to national and EU policymakers. The group collaborated with marine experts from top European marine institutes and organizations and produced the [Burgas Vision Paper](#), the key framework document for a shared vision of a productive, healthy, resilient, sustainable, and better valued Black Sea by 2030. The publication was introduced at the 2018 European Maritime Day in Burgas, Bulgaria (May 2018). It addresses the key pillars on which the Black Sea Strategic Research and Innovation Agenda (SRIA) is built on. The Ministerial Declaration towards a Common Maritime Agenda for the Black Sea (2019), endorsed by the same Black Sea countries, provided more backing for this approach and the context for its implementation. The Horizon 2020 Programme provided funding for the "Coordination of Marine and Maritime Research and Innovation in the Black Sea - Black Sea CONNECT" Coordination and Support Action (CSA) in 2019.

Creating a responsible and effective SRIA Implementation Plan based on the essential framework requirements to translate SRIA outputs into actions in collaboration with national research funders and key stakeholders is one of the goals of the [Black Sea CONNECT CSA](#). To do so, national level SRIA consultations were held in the Black Sea countries in the second half of 2020. These consultations provided direct input to the SRIA and its Implementation Plan with regard to country level goals and priorities. In order to ensure the involvement of funding agencies and ministries from Black Sea countries, a network called the Operational Network of Funders has also been established. Its goal is to strengthen regional cooperation among public research funders and facilitate the alignment of national priorities (such as research and innovation strategies) and prepare the ground for the focused funding of joint actions to address the key challenges and goals of the SRIA. The Operational Network of Funders will provide easy contact for joint actions with other relevant EU, national or regional initiatives.

The 1<sup>st</sup> Draft of the Implementation Plan was developed using input from the Operational Network of Funders in addition to national-level input gathered through the consultations. This was further complemented by input from European and regional level priorities and policies like the European Green Deal, EU Mission: Mission Restore our Ocean and Waters, Sustainable Blue Economy Partnership, and UN Decade of Ocean Science. Based on this initial draft, the second round of national and international SRIA consultations was held, and the results are incorporated into the Final SRIA and its Implementation Plan.

The Final SRIA and the Implementation Plan aim to set the foundational work for protecting the unique habitats of the Black Sea while supporting the development of sea-based sectors, which will then boost the blue economy and help create more jobs. The SRIA and its Implementation Plan will direct participants from academia, funding organizations, industry, policy, and society to address the fundamental challenges of the Black Sea, to promote the blue economy, build vital support systems and innovative research infrastructure, enhance education, and to build capacity. The Implementation Plan will be a long-lasting guide to catalyse new ideas and innovations towards and with the Black Sea community and beyond with adjacent regions, actors and instruments.

## BLACK SEA SRIA MAIN GOALS<sup>1</sup>

<b>Pillar 1 - Addressing fundamental Black Sea research challenges - Black Sea Knowledge Bridge</b>	
<b>MG1</b>	Developing innovative multi-disciplinary research, building on existing initiatives, including data-sharing mechanisms that will generate the knowledge needed to increase ecosystem resilience.
<b>MG2</b>	Providing new knowledge to mitigate the impacts of global climate change and the multiple environmental and anthropogenic stressors in the Black Sea from the land-sea interface to the deep basin.
<b>Pillar 2 - Developing innovation, solutions and clusters underpinning Sustainable Black Sea Blue Economy - Black Sea Blue Economy</b>	
<b>MG1</b>	Supporting marine and maritime research and innovation domains of all the Black Sea countries to create synergy, increase economic benefits, and reduce hazards in service of prospering, resilient and empowered communities deriving interest from the Black Sea basin.
<b>MG2</b>	Creating incentives for maritime innovation in existing and new, emerging blue economy sectors.
<b>Pillar 3 - Building of critical support systems and innovative Infrastructures - Key Joint Infrastructure and Policy Enablers.</b>	
<b>MG1</b>	Developing smart, integrated observing and monitoring systems in support of addressing scientific and socioeconomic challenges of the Black Sea, towards governance for a sustainable ecosystem, mitigation of climate change impacts, and accurate forecasting for adaptive management.
<b>MG2</b>	Advancing a harmonised set of working methodologies, standards and procedures on all aspects of coastal and marine research.
<b>MG3</b>	Developing new marine-based technologies by benefiting from the fourth industrial revolution for the Black Sea to promote the safe and sustainable economic growth of the marine and maritime sectors and the conservation and valorisation of marine cultural heritage.
<b>MG4</b>	Mechanisms to create, support and promote start-ups oriented towards the circular and blue economy in the Black Sea region
<b>Pillar 4 - Education and capacity building - Empowered Citizens and Enhanced Blue Skills</b>	
<b>MG1</b>	Supporting formal and informal learning, education, training and use of knowledge and technologies for established and emerging marine and maritime jobs.

<sup>1</sup> Only main goals of the SRIA is given here. Please read the full SRIA via [http://connect2blacksea.org/wp-content/uploads/2019/12/Black\\_Sea\\_SRIA\\_Final.pdf](http://connect2blacksea.org/wp-content/uploads/2019/12/Black_Sea_SRIA_Final.pdf)

<b>MG2</b>	Empowering ocean-engaged citizens contributing to a clean, plastic-free, healthy and productive Black Sea.
<b>MG3</b>	Contributing to enhanced science policy dialogue in formulating coastal and marine policies and programmes.

## BLACK SEA SRIA IMPLEMENTATION PLAN

<b>SRIA Pillar 1: Addressing fundamental Black Sea research challenges</b>			<b>SRIA Pillar 2: Developing innovation, solutions and clusters underpinning a Sustainable Black Sea Blue Economy</b>				
<b>Theme 1</b>	<b>Theme 2</b>	<b>Theme 3</b>	<b>Theme 4</b>	<b>Theme 5</b>	<b>Theme 6</b>	<b>Theme 7</b>	<b>Theme 8</b>
Digital Twin of the Black Sea	Effect of Multiple Stressors on the Black Sea Ecosystem	Changing Black Sea biodiversity and ecosystem resilience under climate change and multistressors	Ecosystem based fisheries, high-tech aqua- and mariculture	Blue Biotechnology	One Health Approach and Improved Safety for Black Sea Coasts	Marine Litter	Marine Renewable Energy
<b>SRIA Pillar 3: Building of critical support systems and infrastructures for the benefit of Black Sea communities</b>			<b>SRIA Pillar 4: Education and capacity building</b>				
<b>Theme 9</b>	<b>Theme 10</b>		<b>Theme 11</b>		<b>Theme 12</b>		
Innovative Observing Systems	Black Sea Underwater and Coastal Heritage		Innovative approaches to connect scientists, policymakers, industry and society		Blue Skills and Capacity Building on Marine Sciences		

## SRIA PILLAR 1: ADDRESSING FUNDAMENTAL BLACK SEA RESEARCH CHALLENGES

<b>Theme 1: Digital Twin of the Black Sea</b> The Digital Twin of the Black Sea will consist of real-time information from available database systems, high-resolution models of the sea and the Black Sea watershed supported by artificial intelligence tools and socio-economic models. The Digital Twin will further our understanding of the Black Sea ecosystem, help predict its state under changing climate and environmental stressors, test alternative socio-economic scenarios, and support decision-making. A Black Sea-specific ocean observing system should fundamentally support data sharing among participants and further contribute to the handling and management of Digital Twin of the Black Sea.	
<b>Strategic Joint Action 1.1</b>	<b>Develop the Digital Twin of the Black Sea, building on innovative models at regional and basin-scale that simulate climate change and multiple stressors and integrating them with socioeconomic trends, blue economy scenarios and system of systems approaches</b>
Proposed starting date	<i>3-5 years</i>
Policy, programmes	EU Mission: Mission Restore our Ocean and Waters, EU Mission: Adaptation to Climate Change, Space Strategy for Europe, UN SDG13 Climate Action, Smart Specialisation Strategies, Common Maritime Agenda for the Black Sea (CMA), Türkiye's Climate Council Decisions, Romanian National Plan for Research and Innovation IV
Funding Opportunities and Research Infrastructures	EU Mission: Mission Restore our Ocean and Waters, Horizon Europe Sustainable Blue Economy Partnership, Horizon Europe Cluster 6, INTERREG NEXT BSB 2021-2027, National Excellence Centre in Marine Ecosystem and Climate Research (Türkiye), , European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Interregional Innovation Investments (I3) Instrument, European Digital Twin of the Ocean (European DTO), Copernicus Marine Environment Monitoring Service (CMEMS), Relevant Ministries and Agencies from the Black Sea Countries, DANUBIUS-RI, H2020 DOORS
<b>Strategic Joint Action 1.2</b>	<b>Advance AI-powered decision support tools (DSTs) for ecosystem based management in the Black Sea</b>
Proposed starting date	<i>3-5 years</i>
Policy and programmes	EU Mission: Mission Restore our Ocean and Waters, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, UN SDG14 Life Below Water
Funding Opportunities and Research Infrastructures	EU Mission: Mission Restore our Ocean and Waters, Horizon Europe Sustainable Blue Economy Partnership, Relevant Ministries and Agencies from the Black Sea Countries



<p><b>Theme 2: Effect of Multiple Stressors on the Black Sea Ecosystem</b></p> <p>Forecasting how changes will affect the Black Sea environment and its services is only possible by understanding the impact of various stressors on the ecosystem. Studies tend to concentrate on understanding the individual effects of various stressors, such as climate change, fisheries, invasive species, and pollution, despite the fact that these stressors often interact with one another (such as fisheries and invasive species) or have difficult-to-distinguish and complicated dynamics (such as climate change and deoxygenation) in the wider context of the special Black Sea unique genesis, evolution and characteristics. The H2020-funded <a href="#">BRIDGE-BS</a> project's efforts to understand the effects of various stressors present difficulties and knowledge gaps regarding the synergistic and isolated effects of the stressors, highlighting the need for additional research on developing new tools and investigations to close the knowledge gaps.</p>	
<p><b>Strategic Joint Action 2.1</b></p>	<p><b>Organize synoptic/joint oceanographic expeditions to identify synergistic and individual effects of each stressor (such as climate change, deoxygenation, acidification, sulphide build-up) on the entire ecosystem, from coasts to the deep parts, covering also sea floor processes.</b></p>
<p>Proposed starting date</p>	<p>1-3 Years</p>
<p>Policy and programmes</p>	<p>EU Marine Strategy Framework Directive (MSFD), EU Mission: Mission Restore our Ocean and Waters, UN SDG13 Climate Action, UN SDG14 Life Below Water</p>
<p>Funding Opportunities (National &amp; International):</p>	<p>Horizon Europe, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Joint cruise H2020 BRIDGE-BS &amp; H2020 DOORS is a first step, EUROFLEETS, other R/Vs of countries, National Excellence Centre in Marine Ecosystem and Climate Research (Türkiye), Relevant Ministries and Agencies from the Black Sea Countries</p>
<p><b>Strategic Joint Action 2.2</b></p>	<p><b>Develop a source-to-sink (and river-to-sea) pilot study to identify the fluxes, transformation and impact of emerging contaminants (such as pharmaceuticals, antibiotics, anthropogenic nanoparticles) and identify hazards arising from their multiple biotic impacts on the marine ecosystem</b></p>
<p>Proposed starting date</p>	<p>3-5 Years</p>
<p>Policy and programmes</p>	<p>EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), EU Mission: Mission Restore our Ocean and Waters, UN SDG14 Life Below Water, The European Green Deal, EU Action Plan: "Towards Zero Pollution for Air, Water and Soil", EU One Health Action Plan</p>
<p>Funding Opportunities and Research Infrastructures</p>	<p>National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, DANUBIUS RI, Relevant Ministries and Agencies from the Black Sea Countries</p>

<p><b>Theme 3: Changing Black Sea biodiversity and ecosystem resilience under climate change and multistressors</b></p> <p>Studying an ecosystem's biodiversity is important, however, how changing environmental conditions affect an ecosystem's resilience also needs to be understood. To understand how biodiversity influences an ecosystem's health, production, and resistance to stresses, there is a need for novel, thorough, faster, and less expensive methods of mapping biodiversity. One of the subjects covered by recent research (such as <a href="#">BRIDGE-BS</a> project) is understanding the Black Sea ecosystem's adaptability in the past and future. However, there are still important gaps in assessing the resilience of the ecosystems. New methods such as e-DNA, acoustic, optical and chemical sensing and data are required to understand the resilience of the ecosystems better, as well as how biodiversity is affected by changes. Efforts should be integrated for mapping biodiversity with those for ecosystem dependency assessment.</p>	
<p><b>Strategic Joint Action 3.1</b></p>	<p><b>Cost-effective mapping of the Black Sea biodiversity via emerging tools (such as e-DNA) at genetic, species and ecosystem levels</b></p>
<p>Proposed starting date</p>	<p>3-5 years</p>
<p>Policy and programmes</p>	<p>EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), EU Birds and Habitats Directives (EU Nature Directives), EU Biodiversity Strategy, Global Environment Facility (GEF)/United Nations Development Programme (UNDP)/UNESCO Black Sea Ecosystem Based Management (EBM) projects/initiatives, FAO Climate Change Programmes, The new Sustainable Blue Economy approach in the EU, The European Green Deal, UN SDG14 Life Below Water</p>
<p>Funding Opportunities and Research Infrastructures</p>	<p>National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Relevant Ministries and Agencies from the Black Sea Countries</p>
<p><b>Strategic Joint Action 3.2</b></p>	<p><b>Uncover the extent of invasive species in the Black Sea and developing tools to forecast their impact in the context of the Black Sea multiple stressors as a basis for prevention, mitigation and adaptation policies.</b></p>
<p>Proposed starting date</p>	<p>5-7 years</p>
<p>Policy and programmes</p>	<p>EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), EU Biodiversity Strategy, Global Environment Facility (GEF)/United Nations Development Programme (UNDP)/UNESCO Black Sea Ecosystem-Based Management (EBM) projects/initiatives, FAO Climate Change programmes, The new Sustainable Blue Economy approach in the EU, The European Green Deal</p>
<p>Funding Opportunities and Research Infrastructures</p>	<p>National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Relevant Ministries and Agencies from the Black Sea Countries</p>

## SRIA PILLAR 2: DEVELOPING INNOVATION, SOLUTIONS AND CLUSTERS UNDERPINNING BLACK SEA BLUE GROWTH

<p><b>Theme 4 - Ecosystem based fisheries, high-tech aqua- and mariculture</b></p> <p>The study of fish stocks has dominated Black Sea fisheries science, but a more comprehensive understanding of the environment, in which fish populations play a key role, is needed. It is crucial to have a better understanding of the fish biomass and how fisheries interact across the different fish populations. Research focuses on how fisheries affect the target species. However, there is a need to understand the effect of fisheries on the overall ecosystem and the primary production of the Black Sea. Focusing on understanding fish production zones and expanding the Black Sea's extremely small protected areas is important since attaining sustainable fisheries is a hotly debated topic. These will be the first steps toward ecosystem-based fisheries, which is a poorly understood and unaddressed notion. Alternative methods of utilizing proteins and other nutritional products from the sea need to be researched while Europe aims towards zero carbon practices.</p>	
<b>Strategic Joint Action 4.1</b>	<b>Determine and validate of fish productivity zones and protected areas in the Black Sea using ecosystem-based approaches involving multi-actor platforms including artisanal (traditional) fisheries towards a basin wide network of complementary traditional fisheries and mariculture</b>
Proposed starting date	<i>3-5 Years</i>
Policy and programmes	EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD) EU Birds and Habitats Directives (EU Nature Directives), EU Maritime Spatial Planning Directive, GEF/UNDP/FAO/GFCM Black Sea Fisheries projects/initiatives, The European Green Deal, Smart Specialization Strategies, , UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Common Maritime Agenda for the Black Sea (CMA), Fisheries and Oceans package (Action plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries)
Funding Opportunities and Research Infrastructures	National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, ANPA (National Agency for Fisheries and Aquaculture, Romania), European Sustainable Blue Economy Partnership, Relevant Ministries and Agencies from the Black Sea Countries
<b>Strategic Joint Action 4.2</b>	<b>Develop carbon-neutral sustainable mariculture in the Black Sea, including supporting related research in alternative carbon-neutral protein sources</b>
Proposed starting date	<i>5-7 Years</i>
Policy and programmes	GEF/UNDP/FAO/GFCM Black Sea Fisheries projects/initiatives, The European Green Deal, EU Marine Strategy Framework Directive (MSFD), Smart Specialization Strategies, The European Sustainable Blue Economy, UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Common Maritime Agenda for the Black Sea (CMA), The EU Algae Initiative, Fisheries and Oceans package (Action plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries)
Funding Opportunities and Research Infrastructures	National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, ANPA (National Agency for Fisheries and Aquaculture, Romania), Romanian National Plan for Research and Innovation IV, Interregional Innovation

	Investments (I3) Instrument, Relevant Ministries and Agencies from the Black Sea Countries
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<p><b>Theme 5: Blue Biotechnology</b></p> <p>Marine waters include rich multicellular but also microbial biodiversity much of which is under-documented. This situation is further amplified in the Black Sea. Much of the basin has a unique biogeochemical structure, rendering this system as a habitat for anaerobic microorganisms and extreme eukaryotes. These organisms represent a large potential for new bio-inspired products and solutions. Besides, the productive surface waters of the Black Sea result in seasonal algal blooms which can further be cultivated for potential fuel and protein products. The joint actions in this theme will emphasize the documentation and sustainable use of this potential. They will be implemented with an interdisciplinary approach, connecting results from different points of view (oceanographic, geochemical, physical, and environmental processes).</p>	
<b>Strategic Joint Action 5.1</b>	<b>Establish a knowledge system of candidate species and habitats that support bioactive compounds, such as novel pharmaceuticals, biofuels, enzymes, fishmeal, and biopolymers, for sustainable development and food security in the region</b>
Proposed starting date	<i>1-3 Years</i>
Policy and programmes	The European Green Deal, EU Bioeconomy Strategy, UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Smart Specialization Strategies, Common Maritime Agenda for the Black Sea (CMA), The EU Algae Initiative
Funding Opportunities and Research Infrastructures	National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, European Marine Biology Resource Centre (EMBRC), LifeWatch ERIC, Interregional Innovation Investments (I3) Instrument, Scientific and Technological Research Council of Türkiye (TÜBİTAK), Relevant Ministries and Agencies from the Black Sea Countries, SRNSFG-Shota Rustaveli National Science Foundation of Georgia
<b>Strategic Joint Action 5.2</b>	<b>Transform hazards into resources: performing a feasibility study on the role of algae as biofuels, alternative protein sources and other natural products of the second generation</b>
Proposed starting date	<i>3-5 Years</i>
Policy and programmes	EU Mission: Mission Restore our Ocean and Waters, The European Green Deal, Common Maritime Agenda for the Black Sea (CMA), The European Circular Economy Action Plan, Türkiye's Climate Council Decisions, EU Bioeconomy Strategy, UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Smart Specialization Strategies, The EU Algae Initiative
Funding Opportunities and Research Infrastructures	Horizon Europe, Romanian National Plan for Research and Innovation IV, National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Interregional Innovation Investments (I3) Instrument, Scientific and Technological Research Council of Türkiye (TÜBİTAK), Relevant Ministries and Agencies from the Black Sea Countries

<p><b>Theme 6: One Health Approach and Improved Safety for Black Sea Coasts</b></p> <p>Adopting the One Health Approach to marine systems, this implementation theme will emphasize that the health and well-being of coastal populations cannot be separated from the resilience and health of the marine and coastal ecosystems. This theme will link the broad range of science and innovation included in the Implementation Plan with the health and well-being of communities and citizens living around the Black Sea. In this approach, the increasing frequency of climate-driven extreme events and the potential risk of marine geohazards (submarine landslides, earthquakes) will be considered along with disruptive activities affecting the resilience of coastal communities – including socioeconomic and psychological angles. The COVID-19 Pandemic was a sharp demonstration of the need for such an approach. The assessment of the impact of COVID-19 on the Black Sea ecosystem, long term and episodic (storm-related) sea level rise and coastal floods, estimation of geohazard related coastal risks, impact of pollution accidents, impact of armed conflict related activities (effects of ammunition, noise and episodic pollution events - unexploded ordnance), development of remote detection of shipwrecks with leaking chemicals, estimation of free-floating hazards such as mines are all current disruptive events in the Black Sea. Available monitoring, research and innovation tools need to be mobilized to better understand and predict these disruptive hazards for the well-being of citizens.</p>	
<p><b>Strategic Joint Action 6.1</b></p>	<p><b>Investigate the long term and episodic (extreme weather event and geohazard-related) changes related to marine heatwaves, sea level rise and coastal floods with associated impacts and adaptations including social aspects and nature-based solutions</b></p>
<p>Proposed starting date</p>	<p><i>3-5 Years</i></p>
<p>Policy and programmes</p>	<p>EU One Health Action Plan, EU Marine Strategy Framework Directive (MSFD), The European Green Deal, EU Mission: Mission Restore our Ocean and Waters, IOC's International Harmful Algal Bloom (HAB) Programme, UN SDG3 Good Health and Well-being and SDG14 Life Below Water, European Rural Development Policy, Strategies for Smart Specialisation, EU Climate Adaptation Strategy (2021), WHO One Health Joint Plan of Action</p>
<p>Funding Opportunities and Research Infrastructures</p>	<p>National Science Fund – Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Interregional Innovation Investments (I3) Instrument, EU Climate Adaptation Strategy (2021), Relevant Ministries and Agencies from the Black Sea Countries, EMSO ERIC, DANUBIUS-RI</p>
<p><b>Strategic Joint Action 6.2</b></p>	<p><b>Risk assessment of harmful algal bloom (HAB), jelly blooms and mucilage events at the regional level and their impact on ecosystem services, food safety and evaluation of their potential biotechnological applications</b></p>
<p>Proposed starting date</p>	<p><i>1-3 Years</i></p>
<p>Policy and programmes</p>	<p>EU One Health Action Plan, EU Marine Strategy Framework Directive (MSFD), The European Green Deal, EU Mission: Mission Restore our Ocean and Waters, IOC's International Harmful Algal Bloom (HAB) Programme, UN SDG3 Good Health and Well-being and SDG14 Life Below Water, Smart Specialization Strategies</p>
<p>Funding Opportunities and Research Infrastructures</p>	<p>National Science Fund – Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and</p>

	Innovation IV, The Scientific and Technological Research Institution of Türkiye, Interregional Innovation Investments (I3) Instrument, Copernicus Marine Environment Monitoring Service (CMEMS), Relevant Ministries and Agencies from the Black Sea Countries
<b>Strategic Joint Action 6.3</b>	<b>Identify of the ecosystem impact of civil and military disruptive activities (such as hazardous pollution and unexploded ordnance) affecting the resilience of coastal communities, integrating coastal scientific, socioeconomic and psychological angles</b>
Proposed starting date	<i>3-5 Years</i>
Policy and programmes	EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), The European Green Deal, EU Mission: Mission Restore our Ocean and Waters, Cluster 6 in Horizon Europe UN SDG14 Life Below Water, JPI Ocean Munitions in the Sea, JPI Oceans Underwater Noise in the Marine Environment, Common Maritime Agenda for the Black Sea (CMA), Joint Communication on an Enhanced EU Maritime Security Strategy and its Action Plan
Funding Opportunities and Research Infrastructures	National Science Fund – Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Relevant Ministries and Agencies from the Black Sea Countries , EURO ARGO, EMSO ERIC

<p><b>Theme 7: Marine Litter</b></p> <p>Marine litter is a common global challenge that is needed to be tackled with cutting-edge actions and as well as forming a platform of circular economy solutions. Following the mandate of the Marine Litter Action Forum organised under the EU H2020 Black Sea CONNECT in November 2022, the need to address marine litter at the source is of high importance. In addition, information on the distribution and the concentration of marine litter, and especially plastics, in the water column and sediments in the Black Sea is missing.</p> <p>The Black Sea Marine Litter Action Forum has been established as one Forum to present the actions in place for existing and new initiatives and projects and to best coordinate all efforts for future cutting-edge interactions at different stakeholder groups (such as policy, science, industry and NGOs) on marine litter pollution in the Black Sea. The establishment of the Marine Litter Action Forum as a recurring event will not only facilitate the discussion for decisions needed at the basin level but will leave a legacy in the region, in supporting the proper actions for the reduction, legal obligations and management of marine litter. Recycling, prevention of marine plastic and mitigation options to increase the blue circular economy and fulfil the goals of the European Green Deal will also be explored.</p>	
<b>Strategic Joint Action 7.1</b>	<b>Raise awareness on the marine litter pollution and solutions in the Black Sea targeting the broader public by linking with already existing initiatives and creating novel activities (such as activities of Black Sea Young Ambassadors and other Early Career Ocean Professionals (ECOPs))</b>
Proposed starting date	<i>1-3 Years</i>
Policy and programmes	EU Mission: Mission Restore our Ocean and Waters, Danube and Mediterranean Lighthouses, The European Green Deal, Common Maritime Agenda for the Black Sea, EU Strategy for Plastics in a Circular Economy, UN SDG14 Life Below Water, EU Zero Pollution Action Plan, EU Initiative Plastic Pirates Europe, The Convention on the Protection of the Black Sea Against Pollution
Funding Opportunities and Research Infrastructures	Horizon Europe, Romanian National Plan for Research and Innovation IV, INTERREG NEXT BS, Relevant Ministries and Agencies from the Black Sea Countries, Black Sea Economic Cooperation (BSEC) European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, World Bank, SRNSFG - Shota Rustaveli National Science Foundation of Georgia
<b>Strategic Joint Action 7.2</b>	<b>Enable the Black Sea CONNECT Marine Litter Action Forum as a recurring platform/forum to tackle the pollution crisis with close links to EU Mission: Mission Restore our Ocean and Waters</b>
Proposed starting date	<i>3-5 Years</i>
Policy and programmes	EU Mission: Mission Restore our Ocean and Waters, EU Danube and Mediterranean Lighthouses, The European Strategy for Plastics in a Circular Economy, UN SDG14 Life Below Water, The Convention on the Protection of the Black Sea Against Pollution, The European Green Deal, EU Action Plan: "Towards Zero Pollution for Air, Water and Soil"
Funding Opportunities and Research Infrastructures	Horizon Europe as well as the Sustainable Blue Economy Partnership, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Plastic Producer Associations, Black Sea Economic Cooperation (BSEC), Relevant Ministries and Agencies from the Black Sea Countries

<p><b>Theme 8: Marine Renewable Energy</b></p> <p>With the European Green Deal, the seas and oceans will have an elevated role in providing grounds for the development of carbon-zero, climate neutral blue and green industries. The seascape, with its abundance of wave and wind energy, will have a large role in the transition to a climate neutral economy. The Black Sea, in previous EU and nationally funded projects, has been shown as of a high potential for offshore wind and wave energy. Now a more robust roadmap and detailed feasibility studies will be needed, but the community will also need to start testing prototype renewable energy solutions that potentially integrate other blue carbon solutions such as macroalgal cultivation and hydrogen generation from biofuels. This theme and the associated Strategic Joint Actions suggest two implementable actions to start tapping the Black Sea's high renewable energy potential.</p>	
<b>Strategic Joint Action 8.1</b>	<b>Develop of an experimental renewable wind and wave energy demonstrator for identifying energy outputs, impact on the ecosystem and economic feasibility and social acceptability</b>
Proposed starting date	3-5 Years
Policy and programmes	The European Green Deal, The European Circular Economy Action Plan, European Marine Spatial Planning Directive, Türkiye's Climate Council Decisions, Energy Union and the Strategic Energy Technology Plan (SET-Plan), UN SDG7 Affordable and Clean Energy, Offshore Renewable Energy Strategy, Smart Specialization Strategies
Funding Opportunities and Research Infrastructures	Horizon Europe as well as the Horizon Europe Sustainable Blue Economy Partnership, Romanian National Plan for Research and Innovation IV, Horizon Europe European Clean Energy Transition Partnership, BlueInvest, Interregional Innovation Investments (I3) Instrument, Relevant Ministries and Agencies from the Black Sea Countries, Fisheries and Oceans package (Communication from the Commission: On the Energy Transition of the EU Fisheries and Aquaculture sector)
<b>Strategic Joint Action 8.2</b>	<b>Advance the concept, design and feasibility of future multi-use offshore platforms allocating zones for piloting solutions integrating solar energy, green hydrogen production, carbon capture underwater</b>
Proposed starting date	5-7 Years
Policy and programmes	The European Green Deal, The European Circular Economy Action Plan, Türkiye's Climate Council Decisions, MARINERG-i - ESFRI, UN SDG7 Affordable and Clean Energy, Offshore Renewable Energy Strategy, Smart Specialization Strategies, Fisheries and Oceans package (Communication from the Commission: On the Energy Transition of the EU Fisheries and Aquaculture sector)European Marine Spatial Planning Directive, EU Mission: Mission Restore our Ocean and Waters,, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls
Funding Opportunities and Research Infrastructures	Horizon Europe Sustainable Blue Economy Partnership, Romanian National Plan for Research and Innovation IV, Horizon Europe European Clean Energy Transition Partnership, BlueInvest, Interregional Innovation Investments (I3) Instrument, Relevant Ministries and Agencies from the Black Sea Countries, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls



## SRIA PILLAR 3: BUILDING OF CRITICAL SUPPORT SYSTEMS AND INFRASTRUCTURES FOR THE BENEFIT OF BLACK SEA COMMUNITIES

<b>Theme 9: Innovative Observing Systems</b>	
<p>The observation of key oceanographic features, essential ocean variables, and critical parameters that underpin MSFD (EU Marine Strategy Framework Directive) criteria are of great essence to addressing any issue related to marine health and a sustainable blue economy. These observations include those made through research-vessel-based seagoing expeditions, fixed platforms such as buoys, mobile platforms such as gliders, ROVs, AUVs and ARGOS, and also by remote sensing through satellites or via acoustic observations. These approaches generate a wealth of observations on the state of marine physical and ecosystem processes and they are increasingly logged in standardized, harmonized databases at least at the metadata level. There is a great need for all these observation actions to be realized in a coordinated, targeted way tailored to the need of the policymakers and scientific knowledge gaps. The concepts of cost-effective instrumentation, Open Data and Open Innovation are underlying and cross-cutting principles underpinning these Strategic Joint Actions.</p>	
<b>Strategic Joint Action 9.1</b>	<b>Design of an integrated joint observing system, including regular sea expeditions, standardized fixed observing systems supported by mobile platforms</b>
Proposed starting date	<i>1-3 Years</i>
Policy and programmes	DEKOSIM, BulArgo, European Data Strategy, EU4OceanObs
Funding Opportunities and Research Infrastructures	Activities started in H2020 <a href="#">DOORS</a> (System of Systems) with the integration of data from Danube Delta Supersite of DANUBIUS-RI, Romanian National Plan for Research and Innovation IV, Infrastructure for sustainable development in the field of marine research and participation in the European infrastructure EURO ARGO (MASRI), Relevant Ministries and Agencies from the Black Sea Countries, EMSO ERIC
<b>Strategic Joint Action 9.2</b>	<b>Advance the mobile component of the Black Sea observatory by expanding the ARGO and glider deployment in a coordinated way</b>
Proposed starting date	<i>3-5 Years</i>
Policy and programmes	DEKOSIM, BulArgo, Copernicus, EU4OceanObs
Funding Opportunities and Research Infrastructures	Horizon Europe, Infrastructure for sustainable development in the field of marine research and participation in the European infrastructure EURO-ARGO (MASRI), DANUBIUS-RI, EURO ARGO, Relevant Ministries and Agencies from the Black Sea Countries, EMSO ERIC, EMODNET, SeaDataNet

<p><b>Theme 10: Black Sea Underwater and Coastal Heritage</b></p> <p>Since the dawn of history, the Black Sea has been at the crossroads of civilizations. Via shipwrecks, submerged ancient settlements and buried artefacts; the sea keeps unprecedented clues to ancient maritime trade routes, diplomatic relations or wars, and economic developments. The coastal zone of the Black Sea countries is especially rich in this respect, but the deeper water of the Black Sea safeguards uniquely preserved wooden shipwrecks that pave the way for new discoveries. These and many other coastal and deep-water heritage elements constitute not only exciting opportunities for international scientific cooperation, but they also provide pathways for inclusive, sustainable blue growth for the coastal cities and communities. The Strategic Joint Actions of this theme will emphasize both aspects and serve as a fruitful platform for cooperation and innovation in the region.</p>	
<b>Strategic Joint Action 10.1</b>	<b>Continue to map and select (for further promotion) the underwater heritage of the Black Sea and assess the sensitivity of heritage sites to climate change and multistressors</b>
Proposed starting date	<i>3-5 Years</i>
Policy and programmes	Potential Common Maritime Agenda for the Black Sea Underwater Heritage Technical Group, the UNESCO Convention on the Protection of the Underwater Cultural Heritage, Council of Europe
Funding Opportunities and Research Infrastructures	National Science Fund - Ministry of Education and Science Bulgaria, Horizon Europe, INTERREG NEXT BSB 2021-2027, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Creative Europe 2021-2027 European cooperation projects (Cultural heritage), Black Sea Economic Cooperation (BSEC), Relevant Ministries and Agencies from the Black Sea Countries
<b>Strategic Joint Action 10.2</b>	<b>Open the Common Cultural Heritage of the Black Sea coast to the wider public through the development of sustainable and innovative tourism models</b>
Proposed starting date	<i>3-5 Years</i>
Policy and programmes	Potential Common Maritime Agenda for the Black Sea Underwater Heritage Technical Group, Horizon Europe Sustainable Blue Economy Partnership, Joint Operational Programme Black Sea, the UNESCO Convention on the Protection of the Underwater Cultural Heritage, Council of Europe
Funding Opportunities and Research Infrastructures	National Science Fund - Ministry of Education and Science Bulgaria, Horizon Europe, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Creative Europe 2021-2027 European cooperation projects (Cultural heritage), Relevant Ministries and Agencies from the Black Sea Countries, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR)

## SRIA PILLAR 4: EDUCATION AND CAPACITY BUILDING

### **Theme 11 - Innovative approaches to connect scientists, policymakers, industry and society**

Identifying synergies, co-creating activities and designing new approaches that will actively engage and sustain an interest and commitment from stakeholders in the Black Sea is of utmost importance for the implementation of the SRIA. An engaging and participatory approach for all stakeholders is proposed, through appropriately chosen platforms that can promote and allow an ongoing dialogue at all societal levels, incorporating all current subjects of interest and facilitating exchanges among participants in a timely, efficient and engaging manner.

The information flow among all stakeholders needs to work in synergy for all parties involved and must provide clear benefits to all parties from the start in order to initiate interest.

Research and Innovation stakeholders can be engaged through sustainable platforms such as Living Labs, World Cafes. So that a participatory, interactive approach can be adopted, based on improved dialogue, and all parties can be fully aware of the issues discussed. The way to be accomplished can be adapted accordingly, depending on the audience.

Adopting and maintaining a coordinated approach, regularly connecting and projecting future scenarios on environmental change, impacts on ecosystems goods and services, blue growth scenarios as well as the impact on jobs and well-being of local communities can be crucial in addressing these stakeholders and achieving a continuous and fruitful interaction with them and preventing stakeholder fatigue.

<b>Strategic Joint Action 11.1</b>	<b>Develop mechanisms to continue the identification of new SRIA priorities and emerging topics of implementation</b>
Proposed starting date	<i>1-3 Years</i>
Policy and programmes	EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, Common Maritime Agenda for the Black Sea (CMA)
Funding Opportunities and Research Infrastructures	Joint Operational Programme for the Black Sea, New EU Mission calls, emerging EU calls (such as Erasmus+, EMFAF calls), European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries, SRNSFG-Shota Rustaveli National Science Foundation of Georgia
<b>Strategic Joint Action 11.2</b>	<b>Engage research and innovation stakeholders through sustainable stakeholder platforms such as Living Labs, Multi Actor Forum (MAF), World Cafes</b>
Proposed starting date	<i>1-3 Years</i>
Policy and programmes	EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls
Funding Opportunities and Research Infrastructures	DANUBIUS RI, European Green Deal projects such as ARSINOE, Horizon Europe and also related Horizon Europe Partnerships, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries

### Theme 12: Blue Skills and Capacity Building on Marine Sciences

The Black Sea has enormous potential to provide a sustainable blue economy and jobs and contributes not only to EU Mission Ocean objectives but also to those of other seas and ocean programs and initiatives such as the UN Ocean Decade. This will be possible if it is invested in blue skills and capacity building in the region. While it is evident that skills are a pathway to employability in the marine and maritime sectors, there is still a great divide between industry requirements and skills gained through formal education and training systems. To contribute to a more resilient labour market, and increase capacity and the attractiveness of blue careers, there is a need to tailor both formal and informal training programmes for a wide spectrum of stakeholders, ranging from undergraduate students to policymakers.

Raising public awareness and thus contributing to a more ocean-literate and empowered society is crucial for the sustainability of the region. Adopting the one health principle and participation in environmental education has been identified as the most important predictor of behaviour change. This can be accomplished by different ocean literacy activities such as citizen science. As well as this, ensuring youth involvement in ocean literacy activities has great importance to raise awareness of seas and oceans. The Black Sea Young Ambassadors Programme, which is going to continue through the BRIDGE-BS Project, could help re-connect missing links between science and society, and hence enhance marine citizenship. The Programme itself will help to bring the general public closer to the Black Sea Early Career Ocean Professionals (ECOPs). For the implementation of these joint actions, opportunities such as the EU Year of Skills (2023) will be exploited.

<b>Strategic Joint Action 12.1</b>	<b>Build on the momentum of the existing Black Sea Young Ambassadors Programme, new approaches for all ECOPS will be developed to engage the general public to create ocean literate societies such as the Citizen Science initiatives – actively involve citizens in science-related processes using innovative tools for learning by doing (water quality, biodiversity monitoring)</b>
<b>Proposed starting date</b>	<i>1-3 Years</i>
<b>Policy and programmes</b>	EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, Other sea and ocean basin Young Ambassadors/Youth Initiatives, European Marine Science Educators Association (EMSEA), UN Decade of Ocean Science and UN SDG4 Quality Education, UN ECOPs, 2023 European Year of Skills, Common Maritime Agenda for the Black Sea (CMA), EU4Ocean
<b>Funding Opportunities (National &amp; International):</b>	Existing projects (BRIDGE-BS, Black Sea CONNECT CSA), European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, EU Erasmus+ Calls, INTERREG NEXT BS 2021-2027, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries
<b>Strategic Joint Action 12.2</b>	<b>Develop an Intergenerational Training series (including summer school-type activities) for ECOPs and LATE COPS (peer training, involving late-career professionals as mentors) Adopt a "Train the Trainer" Programme Approach (through staff exchanges, secondments, mobility programmes etc.) to increase the capacity of mentors/researchers who can act as mentors to younger researchers.</b>
<b>Proposed starting date</b>	<i>3-5 Years</i>

<b>Policy and programmes</b>	EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, European Marine Science Educators Association (EMSEA), Black Sea Universities Network (BSUN), UN SDG4 Quality Education, UN ECOPs, 2023 European Year of Skills, Common Maritime Agenda for the Black Sea (CMA), Relevant Ministries and Agencies from the Black Sea Countries
<b>Funding Opportunities (National &amp; International):</b>	Existing projects (BRIDGE-BS, Black Sea CONNECT CSA), DANUBIUS-RI, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, INTERREG NEXT BS 2021-2027, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries

## ANNEX 1 National and International Consultations on the 1<sup>st</sup> Draft of IP and Reports

The 1st Draft of the Implementation Plan was developed using input from the Operational Network of Funders in addition to national-level input gathered through the consultations and input from European and regional level priorities and policies like the European Green Deal, Mission Ocean and Waters, Sustainable Blue Economy Partnership, and UN Decade of Ocean Science. Based on this initial draft, the second round of national and SRIA consultations will be held.

Based on the 2nd round of consultations, an international-level workshop took place to complement the national-level input. The results of these workshops are incorporated into the Final SRIA and its Implementation Plan. The Final Black Sea SRIA and the Implementation Plan aim to set the foundational work for protecting the unique habitats of the Black Sea while supporting the development of sea-based sectors, which will then boost the blue economy and help create more jobs. The SRIA and its Implementation Plan will direct participants from academia, funding organizations, industry, policy, and society to address the fundamental challenges of the Black Sea, to promote the blue economy, to build vital support systems and innovative research infrastructure, to enhance education, and to build capacity. The Implementation Plan will be a long-lasting guide to catalyse new ideas and innovations.

For the organization of the national consultations, a detailed concept note provided to the partners overviewing the methodology of the workshops and scoring activity, main objectives, target audience, preliminary agenda, practical considerations and outputs expected. The partners are asked to provide the participant list, photos, attendance sheets and national reports. In this document, national reports are provided with comments for the Themes/actions which are however anonymized. The other documents are available upon request.

### Scoring Activity

The 2nd Round of National SRIA consultations aimed to get national-level input from a broader stakeholder group on the themes and concrete strategic joint (SJAs) actions drafted as an output of the 1st National SRIA Consultations. The participants are asked how feasible each SJA is (1st question) and what SJAs are that are not feasible within the existing capacities but necessary/important to implement (2nd question). They are also be asked for their general feedback on the themes and SJAs of the Implementation Plan. (3rd question). The goal of this exercise is to identify common strategic joint actions that different Black Sea countries find feasible and/or already in the progress of implementing so that synergies among the implementation of these actions can be aligned across different countries.

A common survey with national languages and English are prepared by TSU colleagues which are used during the consultations (<https://arcg.is/1GK8Hr0>; survey is currently closed and therefore not accessible anymore). In some cases, this questionnaire is sent out to the participants prior to the workshop and they are also given time to complete the survey after the workshops.

In the national reports, for question 1 and 2, SJAs are ranked by average for feasibility and importance/necessity score and votes per SJAs are also provided for both questions. In each, the SJAs that ranked the highest is marked red, the second highest orange and the third highest in green.

It is important to note that the second consultations took place based on the 1<sup>st</sup> Draft of the IP and the input is used for the 2<sup>nd</sup> and Final draft of the IP (attached version). Some comments (Question 3) are integrated into the Final SRIA (D2.4) as SRIA aims to be a broader framework while the IP is more

concrete and actionable plan. In this Annex, however, all national reports with the extensive comments that are received are integrated. Deciding how to revise Final SRIA and IP based on the comment is executed by the expert opinion of the drafting team (Steering Committee, who also organized the consultations) through joint meetings in June 2023.

### Overall Comments

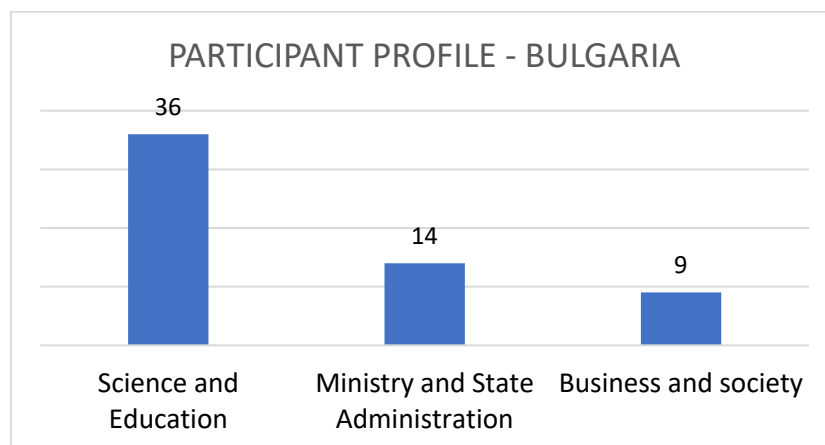
It is observed that most Black Sea SRIA IP Joint actions ranked high in terms of feasibility and importance/necessity among both national and international stakeholders. At the national level, Themes 7, 12, 2, 6 and the actions underneath are both found feasible and important and necessary to implement among the stakeholders. Even though still ranked feasible and important, some themes with a focus on more emerging trends and technologies (such as Theme 1, and Theme 5), more comments are received in terms of their operationalizability. At the international level, trends are also similar to the national ones in terms of the actions that ranked higher (Themes 7, 12, 2, 6).

However, it is important to note that at both national and international levels, all actions ranked above 3.00 (with a minor exception in Bulgaria for 2 actions) which points out the fact that all joint actions are found relevant, feasible and important for the stakeholders.

### National Consultations Outputs

#### Bulgaria

The Second National Consultation in Bulgaria took place on 17 February 2023 in Sofia. A total number of 59 stakeholders (out of 64 registered on the base of the official invitation sent) participated actively in the workshop. The diverse stakeholders' audience included representatives of Universities and Research Institutes, key National Ministries and Agencies, and the business and the society (**Figure 1**) with more women (62%) than men (38%) present



**Figure 1** Participants profile by stakeholder category in the Second National Consultation in Bulgaria

During the workshop the stakeholders scored the SJAs via two interactive Slido surveys. The first one focused on how feasible is each SJA (**Figure 2** and **Figure 3**) and the second one, which of the SJAs is necessary and important to implement (**Figure 4** and **Figure 5**) For both questions most of the stakeholders (between 67.8 and 100% for the Question 1 and between 79.7 and 98.3 % for Question 2) scored the actions with 3 to 5 considering them feasible and important to implement.

The second part of the workshop included active discussion where stakeholders shared their overall views for themes and Strategic Joint Actions of the Implementation Plan. In general, SRIA IP was received very positively by the stakeholders, who made critically useful comments, especially to the themes related to their expertise. The hot topics discussed in details during the national consultation

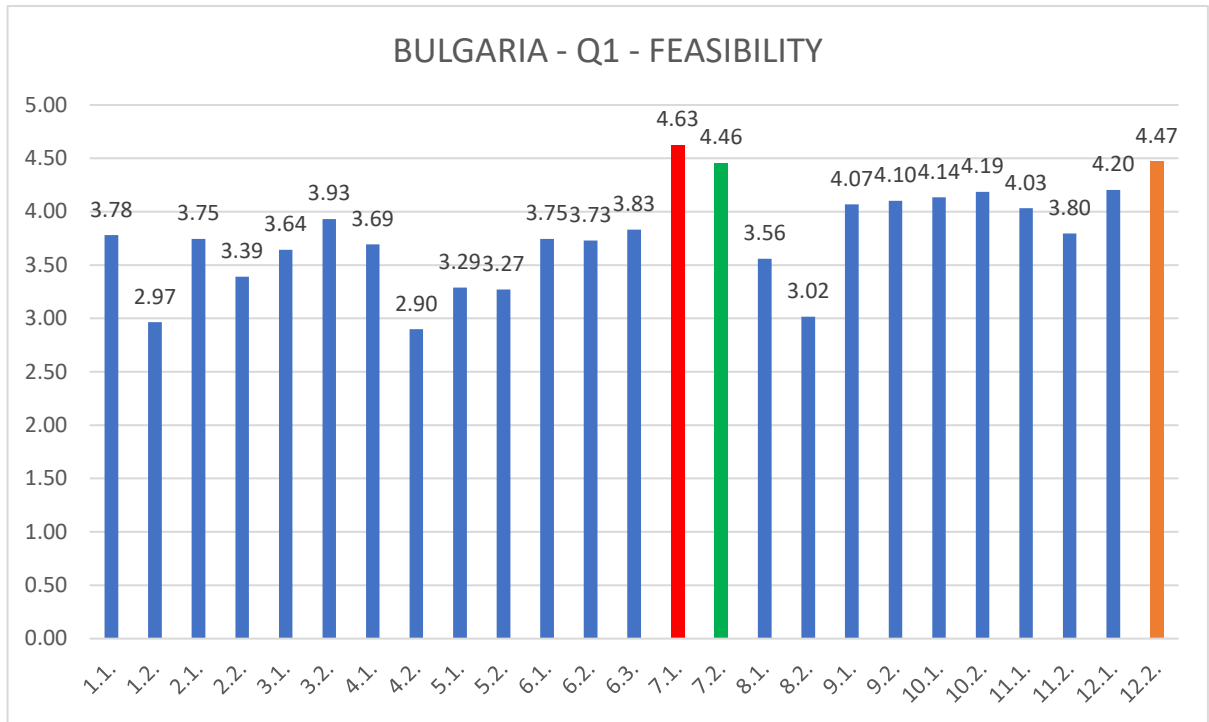
were focused on the strategic joint actions foreseen in Themes 1, 2, 4, 8, 10 and 12. The majority of comments of the participants were taken into consideration and further discussed within the SRIA and the IP update.

In summary, the general comments and recommendations addressed the following:

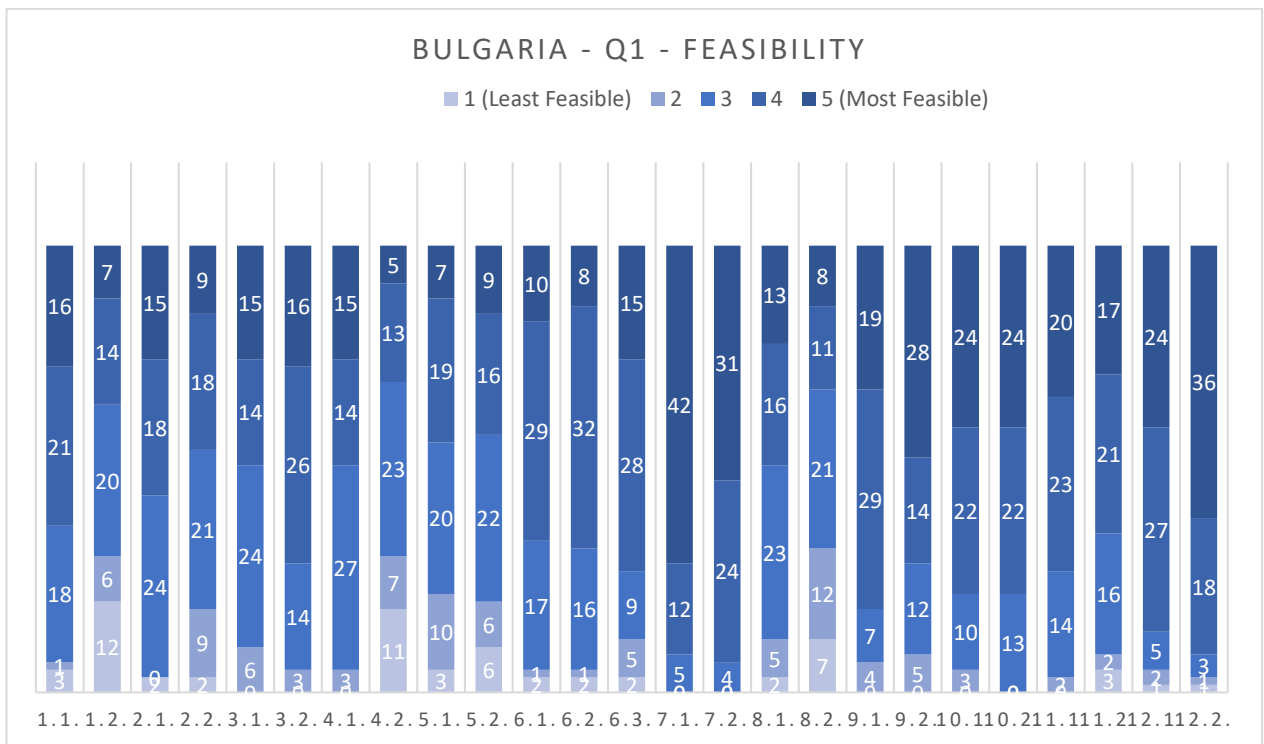
- Further strengthening the focus on innovation in industry in the proposed actions;
- Further strengthening the interaction between science and business for a successful implementation of the technologies;
- Achieving synchronization between policy and research, by the implementation of updated flexible policy frameworks in accordance with the research development.

The unstable geopolitical situation in the Black Sea region was highlighted as a major obstacle for the smooth organization and implementation of joint expeditions.

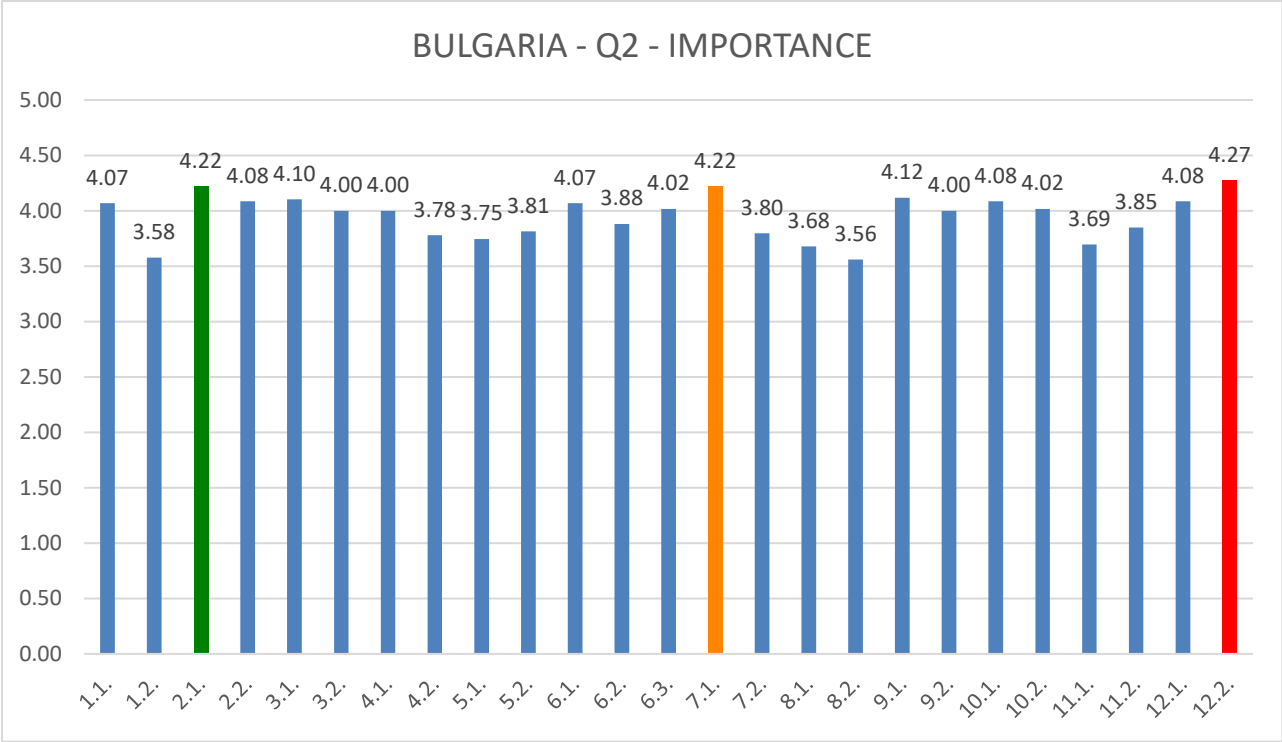




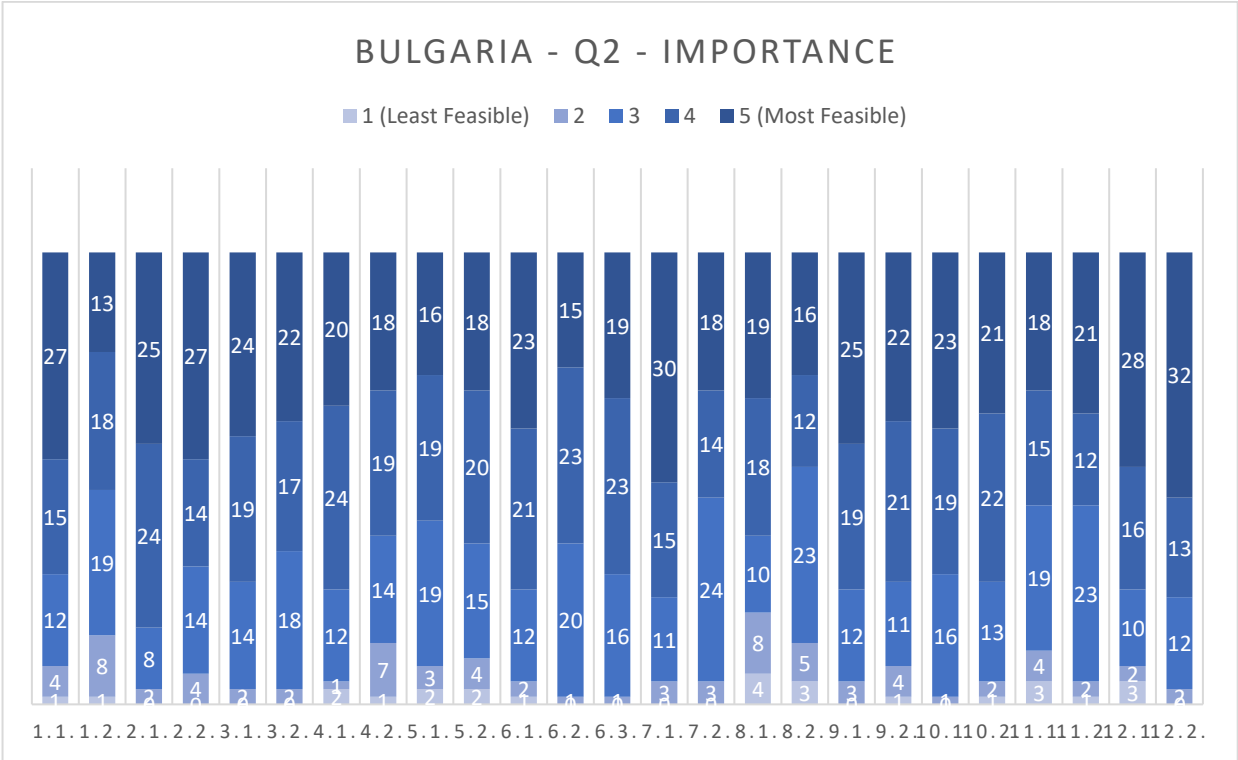
**Figure 2** Ranking of the SJAs by feasibility (Q1) by the Bulgarian Stakeholders based on the average scoring out of 5



**Figure 3** Number of votes per each SJA's feasibility (Q1) on the scale 1 to 5 provided by the Bulgarian Stakeholders



**Figure 4** Ranking of the SJAs by importance (Q2) by the Bulgarian Stakeholders based on the average scoring out of 5



**Figure 5** Number of votes per each SJA's importance (Q2) on the scale 1 to 5 provided by the Bulgarian Stakeholders

## General comments about Themes and Strategic Joint Actions:

### Theme 1: Digital Twin of the Black Sea

- I recommend the focus on innovation in the industry to be further strengthened in the actions, as general.
  - I have suggestion about the two actions:
    - To add “existing” models to the action since there may be models already created that will be suitable:
- 1.1 Developing the Digital Twin of the Black Sea, building on **existing and** innovative models at regional and basin-scale that simulate climate change and multiple stressors and integrating them with socioeconomic trends, blue economy scenarios and system of systems approaches
- To add “developing” and advancing AI-powered DSTs to the action because I am not sure if these tools are already developed:
- 1.2 **Developing** and advancing AI-powered decision support tools (DSTs) for marine ecosystem management in the Black Sea
- As a recommendation, more clarification is needed on how these at least three countries that will implement the actions will function.
  - In Europe there are many AI-based tools so I think that there are many innovations in this field and it will be quickly developed.
  - Action is difficult to achieve by 2030, as artificial intelligence is not yet technologically advanced enough.
  - The implementation of a technical solution using artificial intelligence requires the preliminary implementation of most of the other strategic joint actions.
  - A difficulty in carrying out this action will be attracting high qualified experts. In general, there are small number well-trained experts in this field and they are highly paid. So a significant funding is required in order to ensure the realization of the action.
  - In this particular case, it is best to replace the term “artificial intelligence” with “expert system” or “assistant system”, since the concept of technical implementation of artificial intelligence implies the presence of huge databases and a clear goal in terms of management, as well as the capacity to self-learning of the system.
  - I think that there will be a problem with hosting and data storage.

### Theme 2: Effect of Multiple Stressors on the Black Sea Ecosystem

2.1 Organizing synoptic/joint oceanographic expeditions to identify synergistic and individual effects of each stressor (such as deoxygenation, acidification, sulfide build-up) on the entire ecosystem

- The unstable geopolitical situation will hinder the planning and implementation of expeditions in the Black Sea.

### Theme 4: Ecosystem-based fisheries and high-tech aqua and mariculture

- I would like to ask for clarification on action 4.3 - what is meant by the term “protected areas” and within the framework of which legal document they are considered. If these are areas that will be protected in terms of biodiversity conservation or protected areas for fish, or protected areas at general.
- Definitely this term needs to be clarified – what will be protected within these “protected areas” and according to which legislative act?

- Where is the place of the ecologically and biologically significant areas (EBSAs) designated in the Black Sea, since they are not included in the strategic joint actions, but they are very important areas determined by scientific research? These areas could be used as a gene bank to perform other joint actions. I suggest to be included in the Implementation Plan, e.g. in Theme 3.

#### **4.2 Develop carbon-neutral sustainable mariculture in the Black Sea, including supporting related research in alternative carbon-neutral protein sources**

- Policy lags far behind research, and the implementation of this action requires changes to legislation, such as the Act on waters. This happens very hard and slowly.
- I believe that the question is not rated highly due to lack of clarity on the matter - e.g. Mussel farms are neutral aquaculture (according to the scientific articles/expert opinion in the field) but many people are not aware of that.

#### **5.2 Transforming hazards into resources: performing a feasibility study on role of algae (from algal blooms) as biofuels, alternative protein sources and other natural products of the second generation**

- Although this action is scored as not feasible from some of the participants, in my opinion, it is quite possible to implement, since it is a question of research/study and not a concrete decision. From threat to opportunity. Really feasible if there is a shared database and good communication between partners.
- In the context of what has been mentioned I think that it is possible some of the assessments of the activities to be scored as impossible to implement due to a lack of information in the field of the action. I would recommend a wider promotion or formation of expert groups for adequate assessment of the feasibility of the actions. For example, citizen science could be used to obtain input from a wider group of stakeholders about the actions.

### **Theme 8: Marine Renewable Energy**

- For the SJA 8.1 - developing a prototype would be problematic due to the short time horizon, and moreover, such prototypes are currently being worked on. The question of whose intellectual property will be this prototype is also complicated. Development should not be the subject of the Implementation plan, but rather pilot projects to test existing technologies.
- Investments in existing working prototypes should rather be stimulated.
- It is very important to strengthen the interaction between science and business for a successful implementation of the technology. In Bulgaria this interaction is still poor.

#### **8.2 Advance the concept and design and feasibility of a future multi-use off shore platforms or protected areas for piloting solutions integrating solar energy, green hydrogen production, and link to blue carbon (carbon capture underwater)**

- Although we know that there are good practices in this direction and, the lower assessment is due to the set time limit (2030) as well as the current situation in Bulgaria. That is, the action is, in principle, possible for implementation, but for Bulgaria, not in this time interval.
- The policies are still lagging behind - a complicated and lengthy permit procedure. The horizon for Bulgaria and the Black Sea is too short.
- Concept and design until 2030 are realistic, but implementation is not possible. It is good to specify the action (the focus of the action) - the concept and design are one thing, but the implementation is quite another.
- The wording needs to be refined and the action to be separated to two different actions. Wind-related energy is one issue (one action), and blue carbon is another (second action) and it needs to be specified exactly what carbon will be captured

- The technologies are not clear regarding the implementation in the Black Sea given the exact technological implementation of these activities – one is a prototype and another is the realization of the action. At the technology level, there are still many unsolved questions.

#### **Theme 10: Black Sea Underwater and Coastal Heritage**

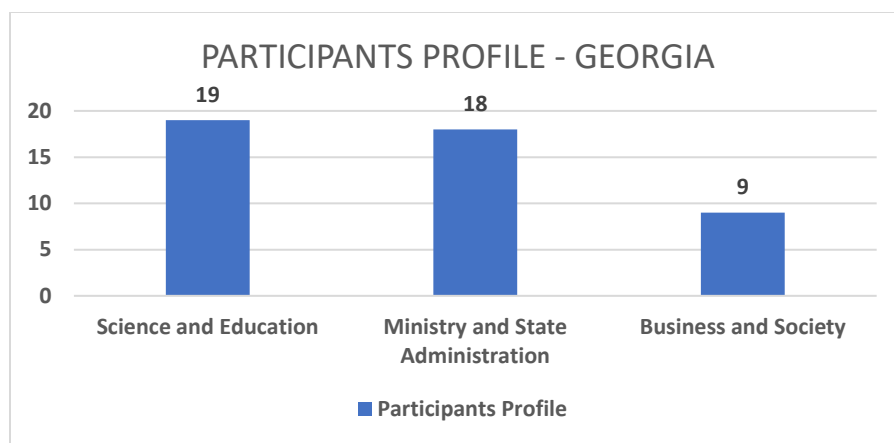
- I think that creation of 3D digital copies of the found cultural artifacts as well as natural landmarks, representatives of the flora and fauna, could be integrated into virtual reality, which recreates virtual routes, and to be accessible to tourists in museums or tourist information centers. The mapping and filming of the underwater cultural-historical and natural landmarks will enable their popularization among the general public integrating virtual reality with the technologies used in scientific research. This will allow building a cross-platform system that could be available online or could be downloaded on different devices. This will be a good approach for digitization and promotion of cultural heritage and natural resources.
- The proposal of Mr. Manasiev to develop virtual reality as a tourism product is very good. It could be separated as an separate action - implementation of a specific tourist product/service in this theme.
- Many of the actions refers to ecosystem services. I recommend using the correct term, namely including the term “ecosystem services” in the Implementation Plan. Ecosystem services have their value and they are in a complex relation between each other (in many cases negative).

#### **Theme 12: Blue Skills and Capacity Building on Marine Sciences**

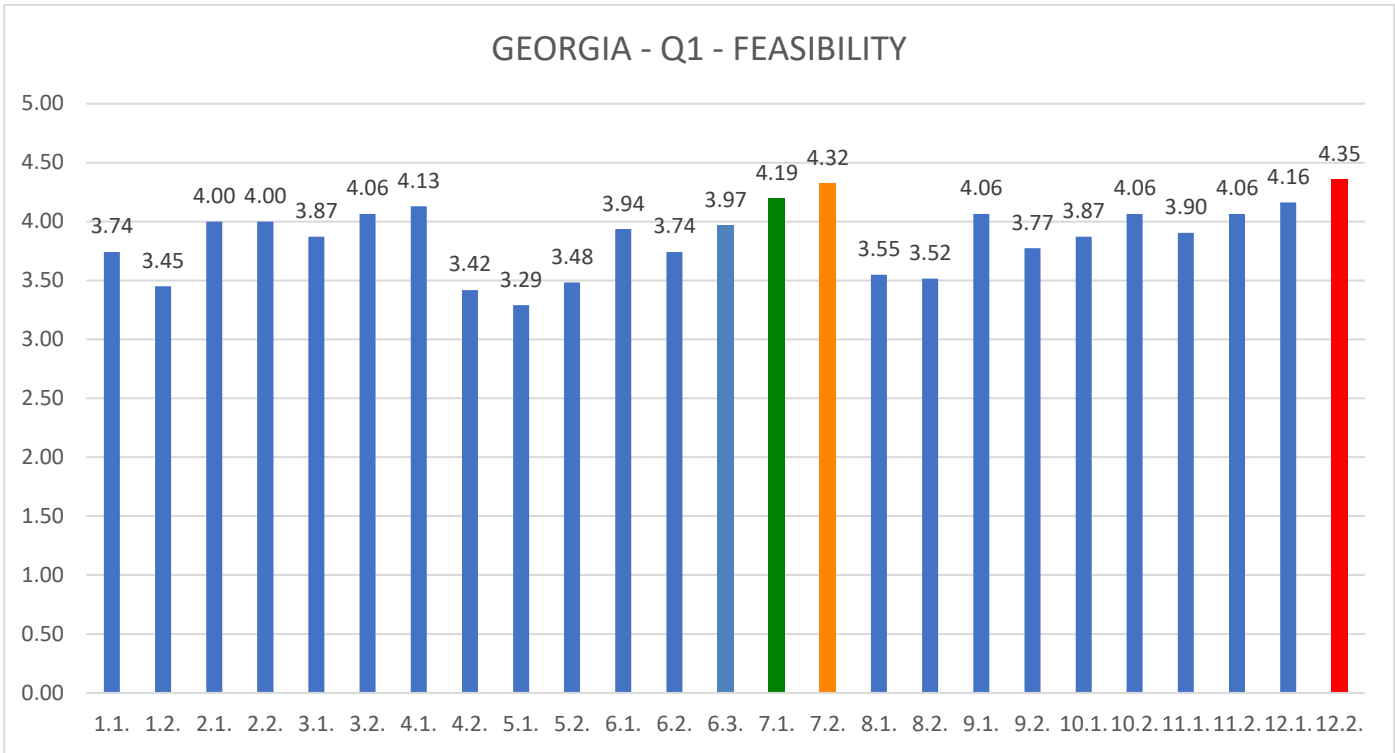
- There are already successful practices for the development of joint Master's programs between different universities - in the field of green and blue energies and technologies for design and production. Interdisciplinary programs are the way to successful training and education of young specialists.

## Georgia

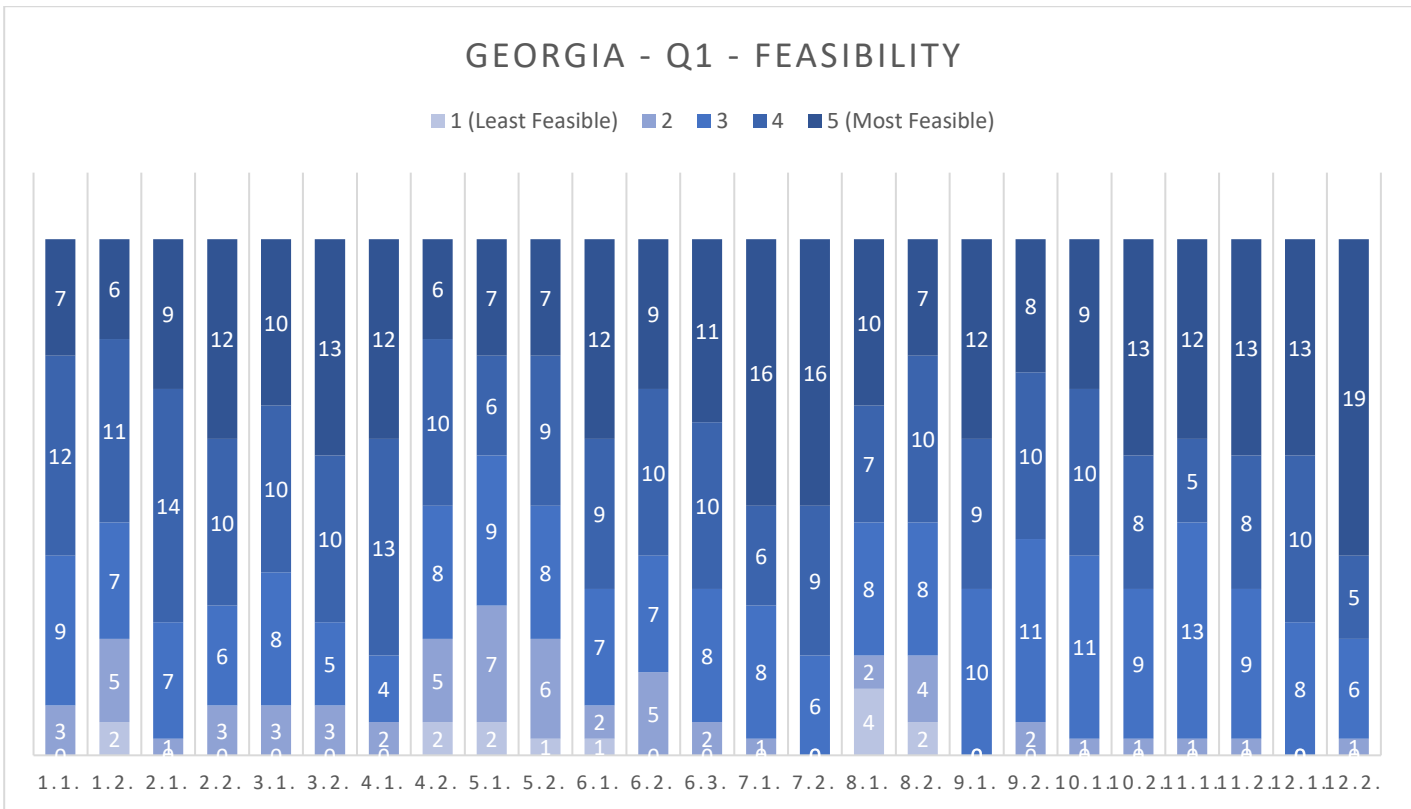
Consultations for SRIA IP in Georgia took place 02 February 2023 as a hybrid meeting hosted at Hotel Radisson Blu, Batumi, Georgia. Georgian stakeholders were invited in the period of January-February 2023 to complete the multilingual SRIA IP Survey questionnaire (in English, Georgian and the languages of all Black Sea partner countries), conveniently composed prior by TSU partner at the request of Project Coordinator. The survey was sent out to the invitees prior to the meeting but during the workshop stakeholders are provided with more information to help them filling the survey for those who have not done so before the meeting. Opportunity was then given to complete survey till the end of February 2023 and 31 stakeholders completed it successfully. Video and audio recording of the proceedings as well as participant screenshots are available in project files of TSU partner.



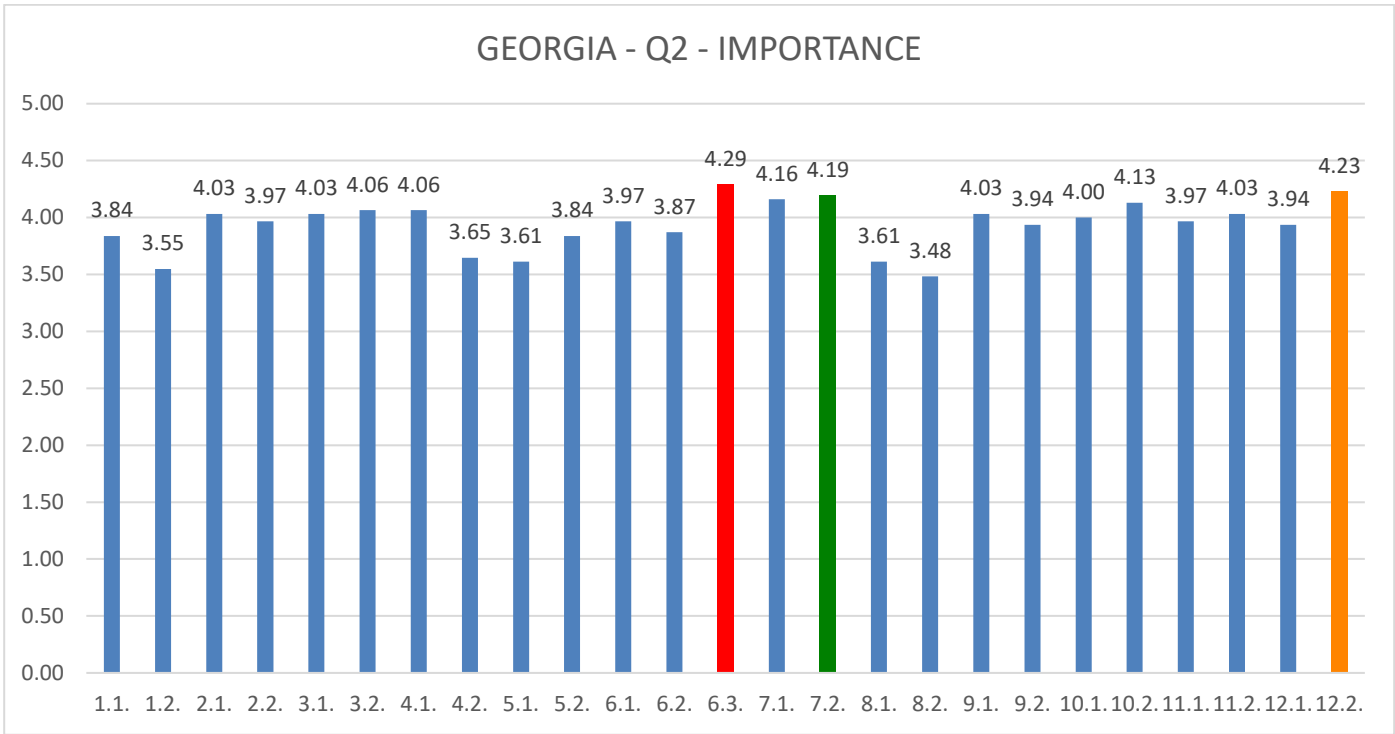
**Figure 6** Participants profile by stakeholder category in the Second National Consultation in Georgia



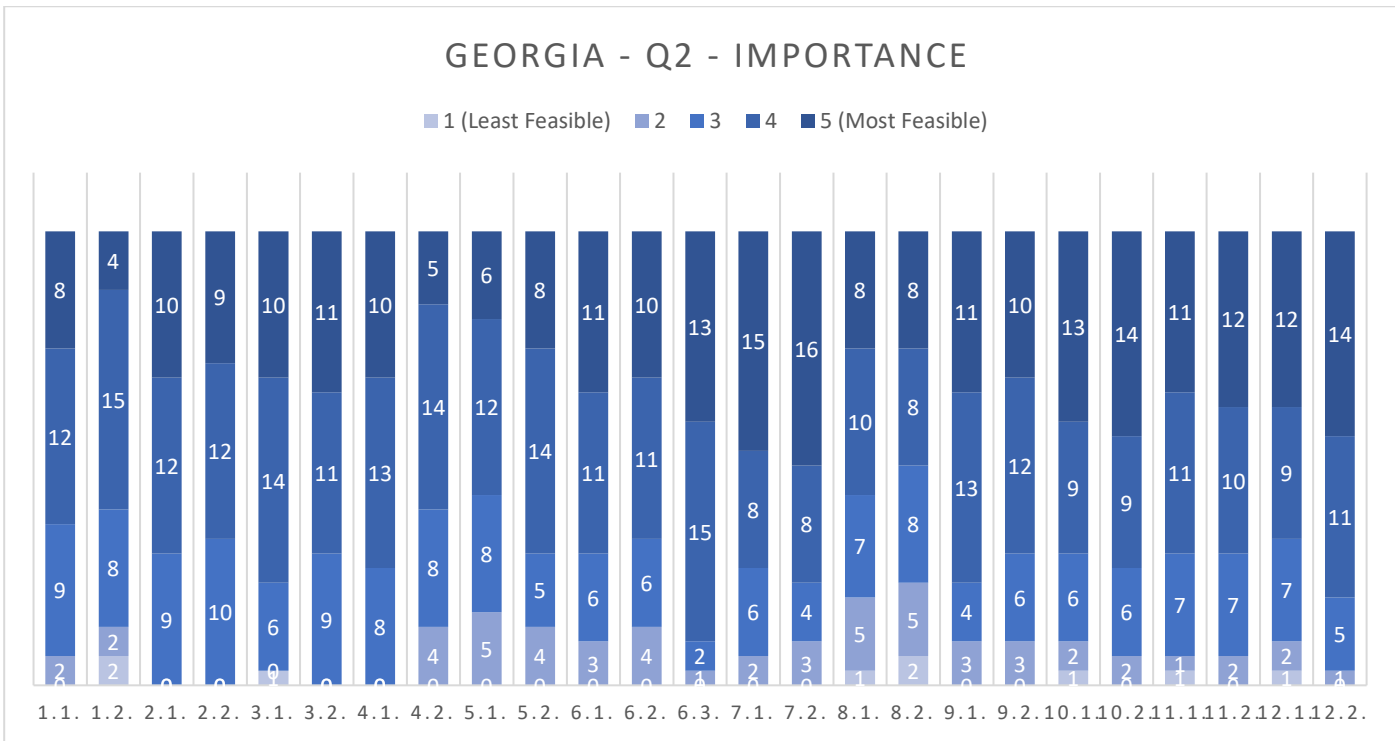
**Figure 7** Ranking of the SJAs by feasibility (Q1) by the Georgian Stakeholders based on the average scoring out of 5



**Figure 8** Number of votes per each SJA's feasibility (Q1) on the scale 1 to 5 provided by the Georgian Stakeholders



**Figure 9** Ranking of the SJAs by importance (Q2) by the Georgian Stakeholders based on the average scoring out of 5



**Figure 10** Number of votes per each SJA's importance (Q2) on the scale 1 to 5 provided by the Georgian Stakeholders



## Comments

In general, SRIA Implementation Plan was positively received and suggestions reported from Georgia in the 1<sup>st</sup> round of SRIA consultations remain relevant and actionable. Joint online questionnaire was found very helpful by responders and the organisers were commended for synchronised joint survey by all Black Sea states, including Ukraine.

The following issues suggested by Georgian stakeholder at 1<sup>st</sup> SRIA national consultations remained valid and were proposed for consideration under SRIA IP during the Regional Stakeholder Consultations in Bucharest on 30.03.15. Georgian stakeholders' suggestions are presented below structured per SRIA Implementation Plan Themes.

### General Comments

- Material, technical and intellectual resources are needed to implement actions.
- Black Sea and aquaculture research need lab upgrades and new methodologies.
- Development of scientific data bases is welcome.
- Research vessel capacity is required in Georgia.
- International cooperation is the key.
- Joint expeditions initiatives are supported and welcome.
- Regular marine surveys required to determine the effects of pollutants on the marine ecosystem.
- e-DNA studies are supported and considered required for various systematic groups.
- Population/conservation genetics studies support is needed to investigate the remaining sturgeon species in Rioni River in Eastern Black Sea.
- In country with tourism as priority important is to develop innovative tourism models.
- It is important to engage BSYAs and involve citizens in environmental issues.
- Regional and basin-scale mathematical models of the dynamics of the Black Sea with a resolution of 5 km and 1 km have been developed in the Sector of Modelling the Sea and Atmospheric dynamics of the Nodia Institute of Geophysics, respectively, on the basis of which it will be possible to create a digital twin of the Black Sea. This would allow simulation of a number of stressors and study their impact on the Black Sea ecosystem. Also, it is possible to determine the annual variation and trend of the surface temperature, heat content and other parameters of the Black Sea during the recent years, which is related to the regional climate change. In this respect TSU Institute of Geophysics capabilities of regional and basin-scale Black Sea modelling in 5km and 1km resolutions was proposed to tap.
- Proposed was to apply SRIA and its Implementation Plan to guide calls by National Science Foundations of the Black Sea countries.

### Theme 1: Digital Twin of the Black Sea

- Establish operational Black Sea Catchment Observation System to monitor and act on nutrient pollution loads (including introduction of economic and financial instruments for reduction of loads).
- Develop data cube, other big data solutions for integration of remote sensing as well as vector and other types of data characterising marine, coastal and catchment domains.

### Theme 2: Effect of Multiple Stressors on the Black Sea Ecosystem

- Cumulative impact mapping of multiple stressors in the Black Sea.

### Theme 3: Changing Black Sea biodiversity and climate change

- Promote considerable expansion of MPAs in the Black Sea and in Georgia's EEZ.
- Address planning and preparedness for sea level rise and marine heatwaves.
- Scale of invasive species distribution is extremely important point for the Black Sea ecosystem (SJA 3.2)

### Theme 4 - Ecosystem Based Fisheries, High-tech Aqua- and Mariculture

- Establish joint fisheries monitoring and assessment programme (e.g. Georgia-Turkey, Bulgaria-Romania) with public data sharing based on FAIR principles.
- Study of conflict of interest in zoning fisheries and other sectors of the economy for aquaculture development.
- Develop Global Fishing Watch compatible open access big data pilot scheme for the Black Sea (including vessel tracking data publishing).
- Eco-friendly integrated multitrophic aquaculture (EfIMA) development.
- Explore concept of EfIMA development in Allocated Zones for Aquaculture (AZA) and couple it with an integrative inclusion of stakeholders throughout the process.

#### **Theme 5: Blue Biotechnology**

- Implement Harmful Algal Bloom monitoring measures (in situ and remote sensing).
- Role of alga in marine ecosystem is extremely important; it would be appropriate to tap on experience of more advanced countries on that matter (e.g., trainings, study tours, projects). (SJA5.2)

#### **Theme 6: One Health Approach and Improved Safety for Black Sea Coasts**

- Inventory of coastal hazards around the Black Sea, create digital map of coastal hazards (such as sea level rise, coastal floods, coastal erosion).
- Establish system of coastal indicators for regional, national and sub-national reporting (e.g. Deduce or Pegaso).
- Bathing water pollutants such as faecal/microbiological as well as harmful algal blooms (HAB) need to be addressed.
- Bathing water pollution and litter monitoring for all public beaches proposed.
- National Blue Flag or equivalent beach and bathing water rating schemes required.
- Eutrophication is extremely important to be addressed on ecosystem and basin wide level (SJA 6.2)

#### **Theme 7: Marine Litter Pilot**

- Applying Black Sea Catchment Observation System for modelling streams of waste/litter from land based and riverine sources flowing into the Black Sea and to quantify marine/beach litter.
- Implement Fishing for Litter (FfL) scheme in the Black Sea countries e.g. Turkey-Georgia-Ukraine pilot.
- Develop local safe landfill management programs (collection, transfer, disposal).
- Develop waste management campaign covering Black Sea rivers and catchments.
- Develop beach clean-up campaigns and counts programme for all 6 countries, reporting to EU Marine Litter Watch Portal.
- It is suggested to organise Marine Litter Forum in cities around Black Sea (Batumi including), e.g., hosting them back-to-back with the International Black Sea Days of October 31st. (SJA 7.2)

#### **Theme 8: Marine Renewable Energy**

- Carbon capture as marine geoengineering solution might be implicated in risking or manipulating natural processes.
- Caution expressed with regard to inclusion of blue carbon (carbon capture underwater), as containing highly uncertain geoengineering risks. (SJA 8.2)

#### **Theme 9: Innovative Observing Systems**

- Establishment of stationary research stations and monitoring transects in the Black Sea waters within the borders of each Black Sea country, including Georgia's EEZ.
- Establish European marine services national competent node in each country. Initiate training activities as the first step.
- Join and promote use of relevant European marine infrastructures.
- Implement ferry-box equivalents on fishing vessels (joint pilot by Turkey & Georgia).
- Monitoring of bathing water quality (microbiological indicators) for the development of safe recreational tourism.

### **Theme 10: Black Sea Underwater and Coastal heritage**

- Underwater mapping of priority heritage areas of Georgia's Territorial Sea.

### **Theme 11 - Innovative Approaches to Connect Scientists, Policymakers, Industry and Society**

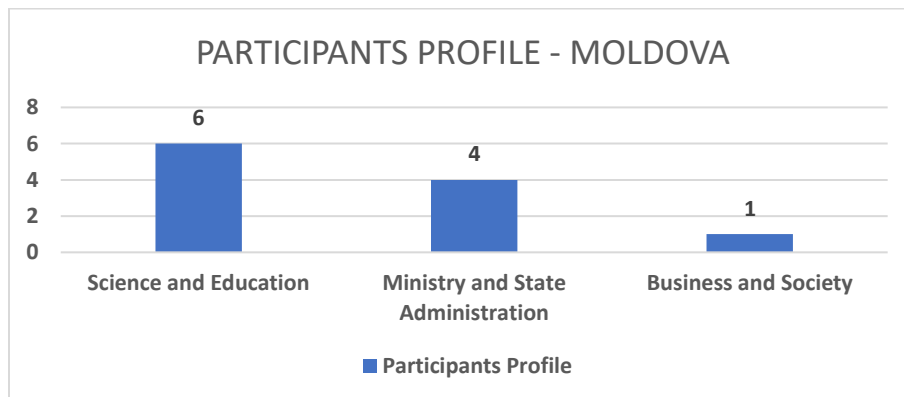
- Networking with European (Med, Baltic) & global sea basins (UNEP regional seas)
- Develop MSP and ICZM planning methodologies for marine basins and for coastal zones respectively.
- Preparation of a Guidelines for Strategic and Environmental Impact Assessments (SEA/EIA) of maritime and coastal plans and projects for Black Sea coastal countries (BSC to take lead).
- Develop and adopt coastal legislations and coastal strategies based on regionally agreed model.
- Reactivate integrated coastal and marine management legislation and strategy development process in Georgia by implementing relevant provisions of the EU Georgia Association Agreement in the field of environment and climate change by updating, consulting and adopting existing draft law and draft strategy.

### **Theme 12: Blue Skills and Capacity Building on Marine Sciences**

- Develop in unified format for all riparian countries lifelong training and vocational education (including elaboration of B.Sc. and Ph.D. programmes) of professionals in Blue Economy, MSP and ICZM at leading universities in each Black Sea country including Georgia (e.g., Tbilisi State University, Ilia State University, Batumi State University).
- Establish national program supporting international Black Sea Day activities.

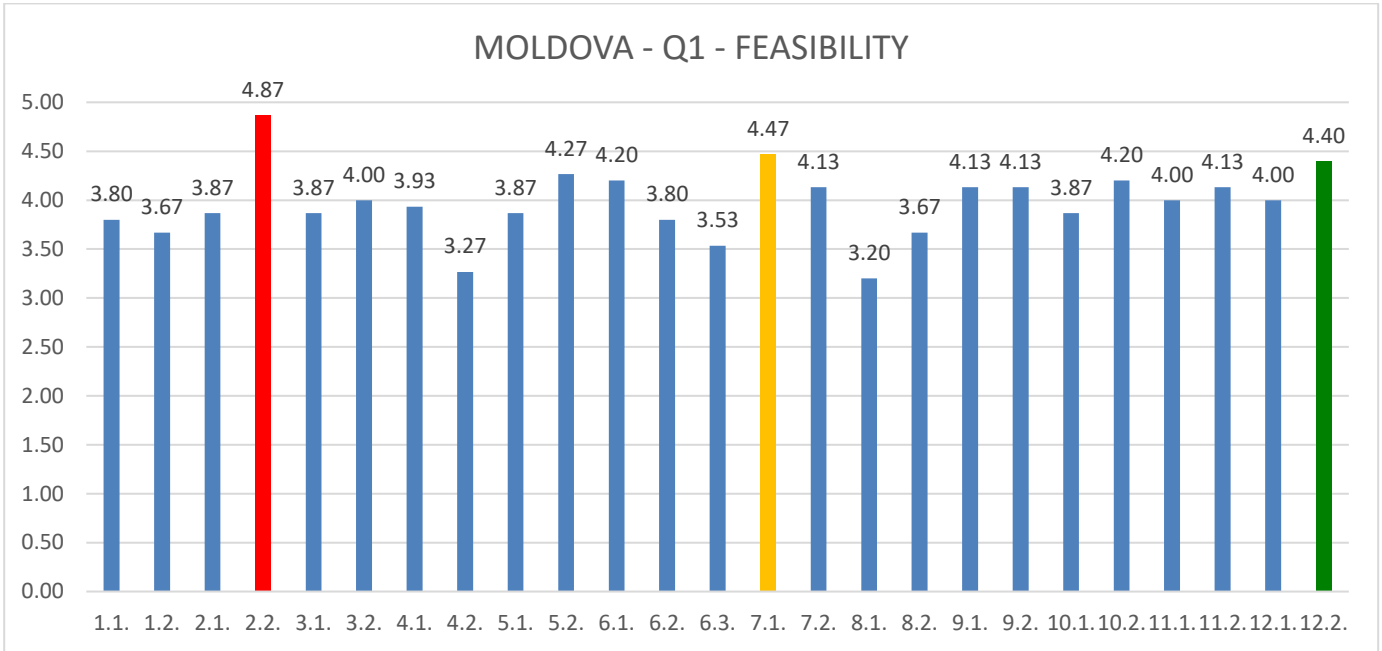
## Moldova

The Second National Consultation in Romania & Republic of Moldova took place on 08 February 2023 in Constanța, Romania (see Appendix 1 - Agenda). A number of 8 Moldovan stakeholders participated live in the workshop. The number of online participants is difficult to estimate, their total number being around 45, from both countries. The diverse stakeholders' audience included representatives of Universities and Research Institutes, key National Ministries and Agencies, and the Society.

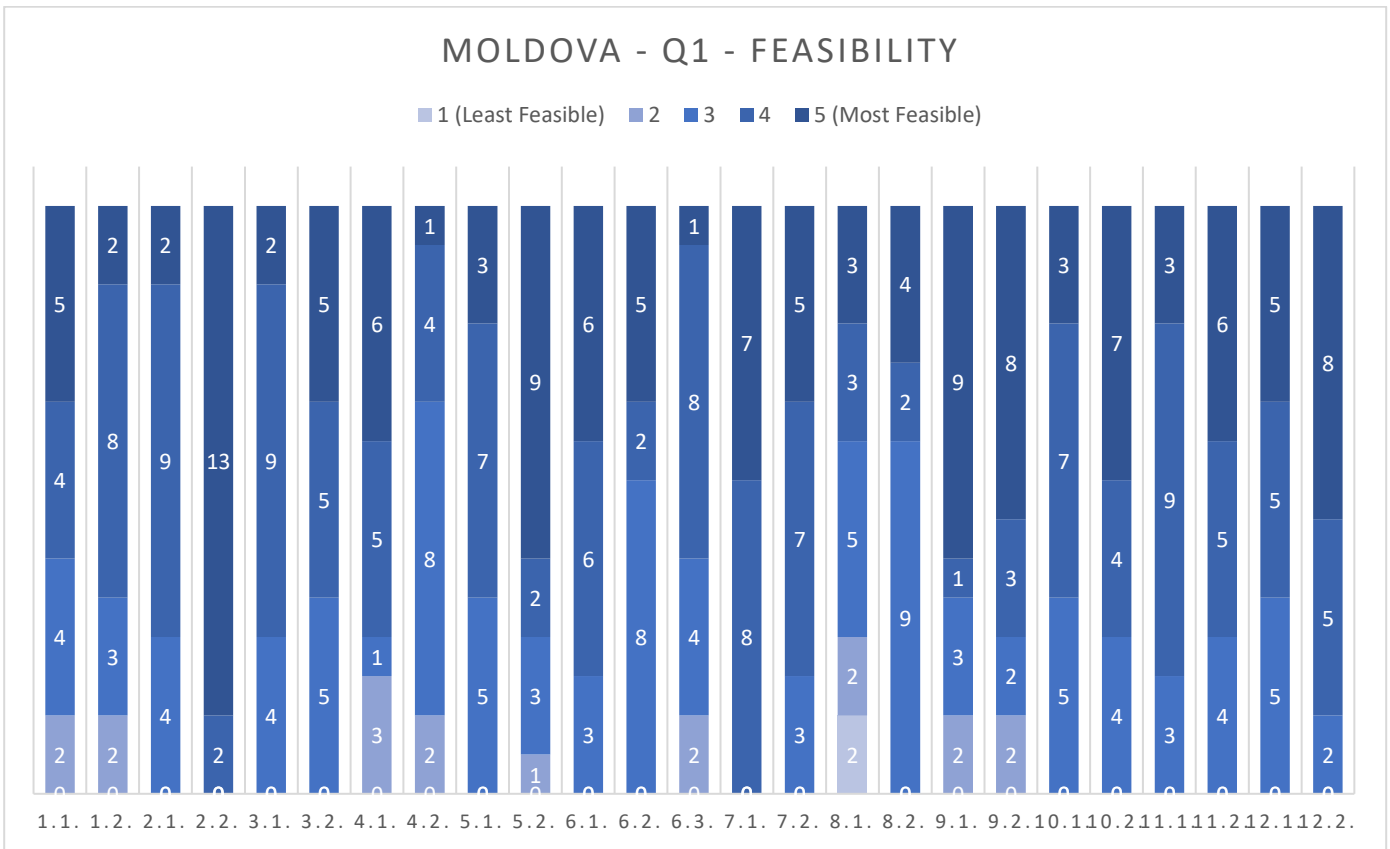


**Figure 11** Participants profile by stakeholder category in the Second National Consultation in Republic of Moldova

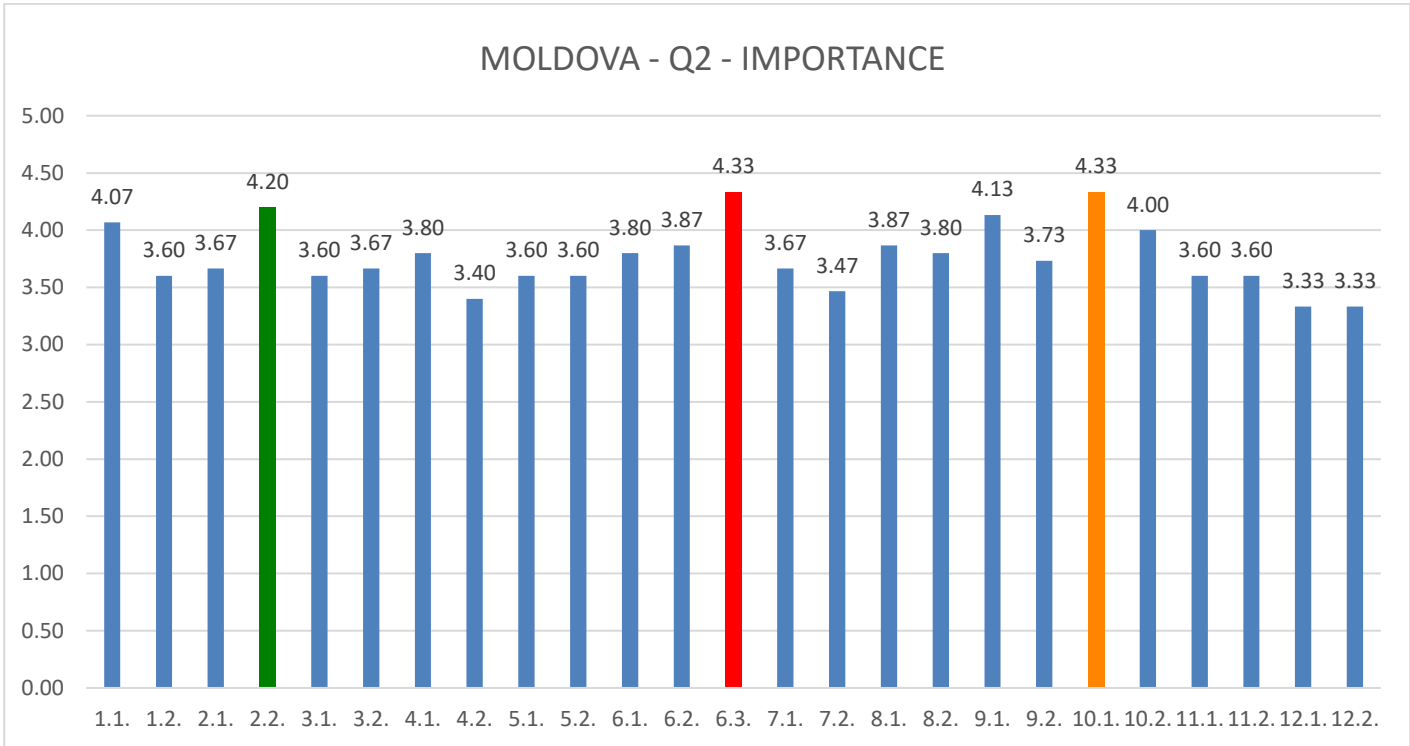
For Question 1, most stakeholders considered the actions feasible to implement. Most of the respondents answered with 3, 4 or 5 (25.5%, 36.0% and 34.2% of the answers, respectively). For Question 2, most stakeholders considered the actions necessary to implement. Most of the respondents answered with 3, 4 or 5 (10.5%, 9.5%, and 8.0% of the answers, respectively).



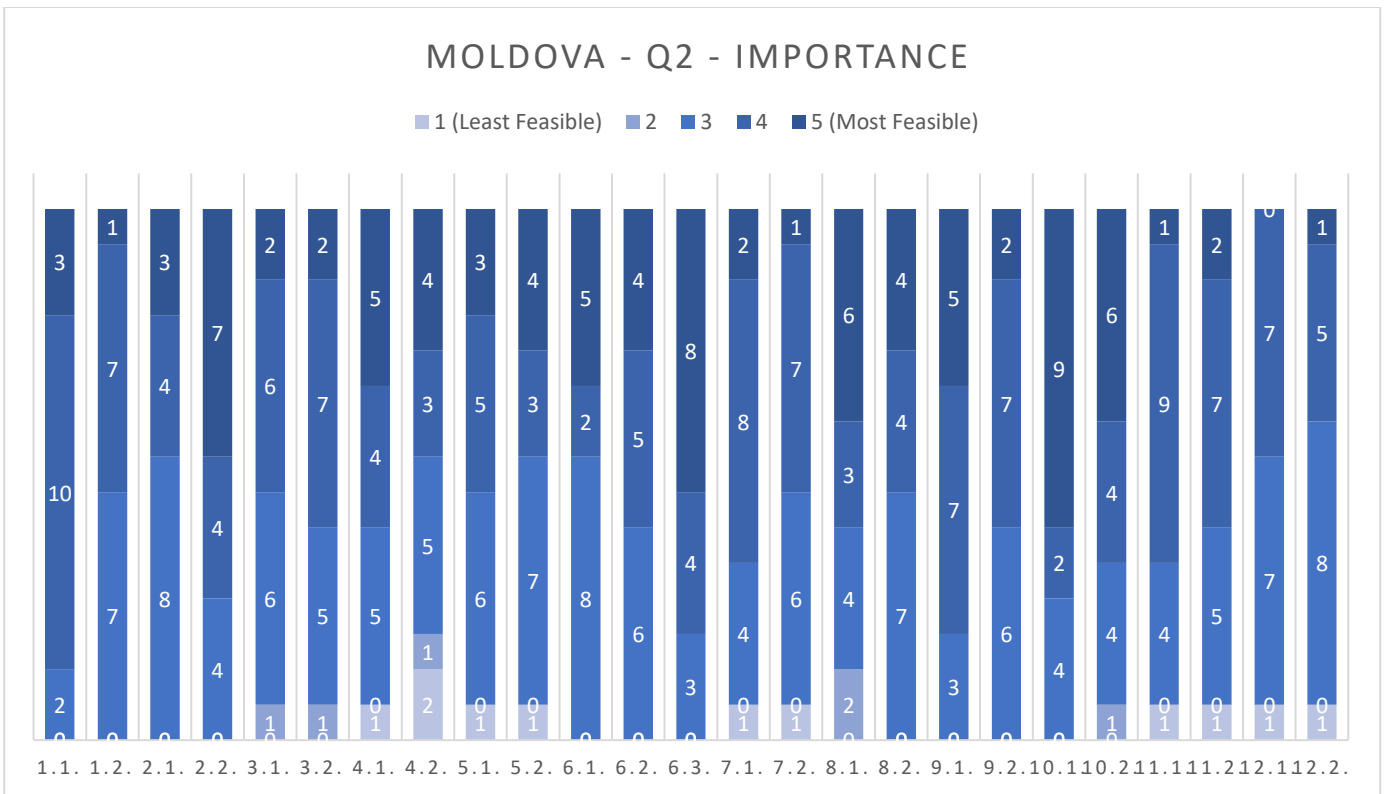
**Figure 12** Ranking of the SJAs by feasibility (Q1) by the Moldovan Stakeholders based on the average scoring out of 5



**Figure 13** Number of votes per each SJA's feasibility (Q1) on the scale 1 to 5 provided by the Moldovan Stakeholders



**Figure 14** Ranking of the SJAs by importance (Q2) by the Moldovan Stakeholders based on the average scoring out of 5

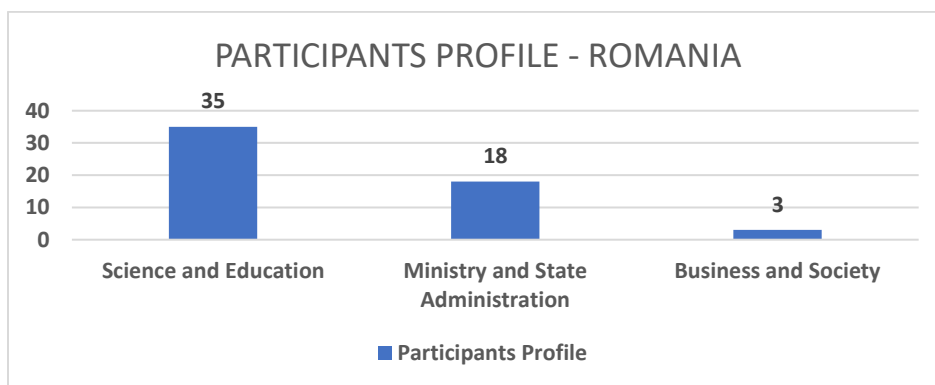


**Figure 15** Number of votes per each SJA's importance (Q2) on the scale 1 to 5 provided by the Moldovan Stakeholders

## Romania

The national consultation organized by the GeoEcoMar, NIMRD "Grigore Antipa" and "Ion Creanga" State Pedagogical University took place on February 8<sup>th</sup> 2023 in Constanța, at the National Institute for Marine Research and Development "Grigore Antipa" headquarters, starting 12:00 local time. The event was organized for stakeholders both from Romania and the Republic of Moldova, in hybrid format

The overall ZOOM participants were 34, with 48 persons being physically present in the conference hall (covering thus both Romania and Moldova).



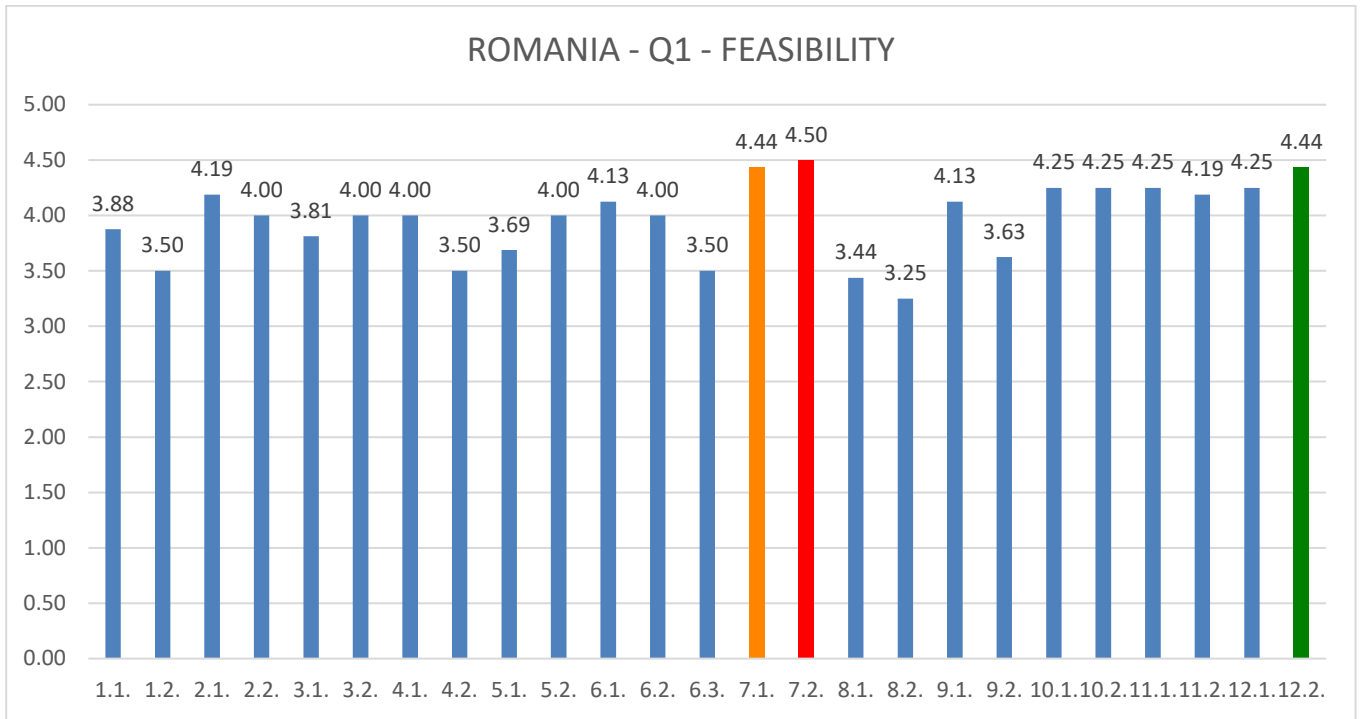
**Figure 16** Participants profile by stakeholder category in the Second National Consultation in Romania

Based on analytics of the National Workshop participation, respondents of the questionnaires: 40 participants at the venue and 16 participants online (most of the participants filled in the online questionnaires at a later date). (the statistics refer only to the Romanian participants)

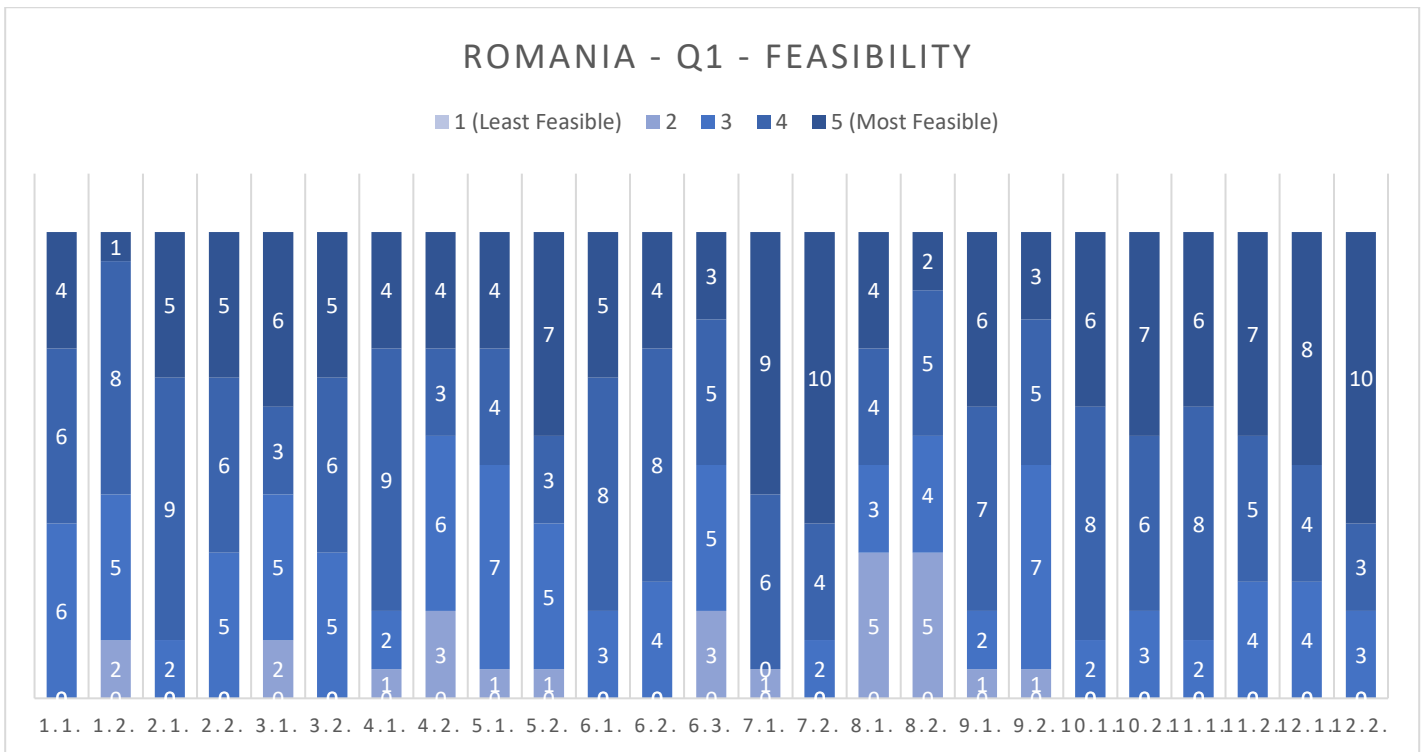
During the workshop the stakeholders scored the Strategic Joint Actions via two surveys. The first one focused on how feasible is each Strategic Joint Action by the year 2030. The second one tried to assess the relevance of the Actions which were considered less feasible by the time horizon of 2020. The third question regarded any potential suggestions from the participants.

All strategic actions from **SRIA Implementation Plan** were considered to be either how feasible/implementable each joint strategic action is (1 = not at all, 5 = definitely). For the second question, the Actions scoring less than 3 were selected to be replied to (as those ranked with 4 and 5 are clearly feasible and priority). This is why the second question had less respondents, in this attempt to rank the relevance of the actions that seemed to be less feasible by 2030. The third question was: note any specific observations you have about common actions and indicate if any major actions/themes are missing. - for the first question, most of the participants that filled the questionnaire scored the proposed strategic joint actions with 3 to 5, considering them relatively feasible or feasible to be implemented by 2030 (ranging from 80.3 % and 100 %), while between 1.7 % and 7.1 % rated certain actions as not feasible. In accordance with these findings, the joint actions that have been considered to be feasible (score 4 or 5) have not been taken into account for the 2nd question.

The respondents were asked to rank the importance (necessity) of actions that had received marks between 1 and 3! Since the question was addressed to actions less feasible, those who were considered feasible (scoring 4 and 5) were not included in the questionnaire. According to the responses of the first question, a lower number of participants filled the second one, ranging from 3 to 27. The results showed that most of participants evaluated the actions proposed as necessary to be implemented by 2030. the most necessary actions to implement but not least feasible were represented by 1.1, 1.1 and 3.1 and 3.2.

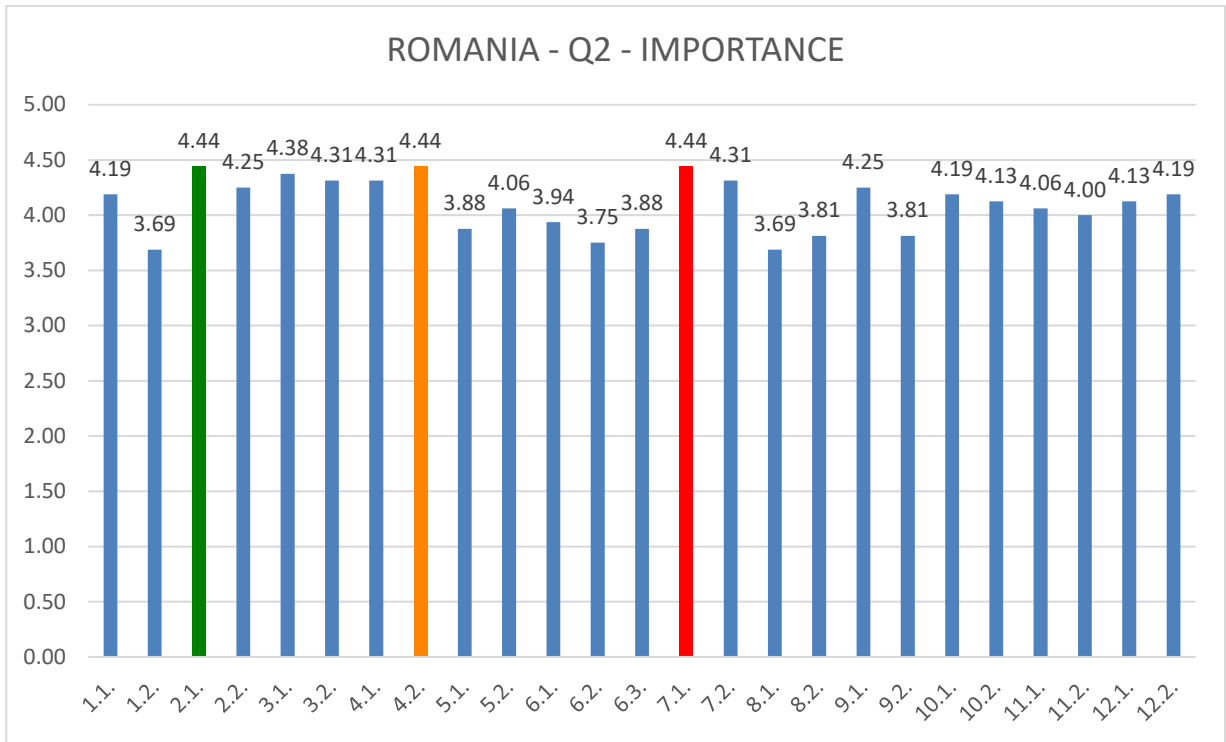


**Figure 17** Ranking of the SJAs by feasibility (Q1) by the Romanian Stakeholders based on the average scoring out of 5

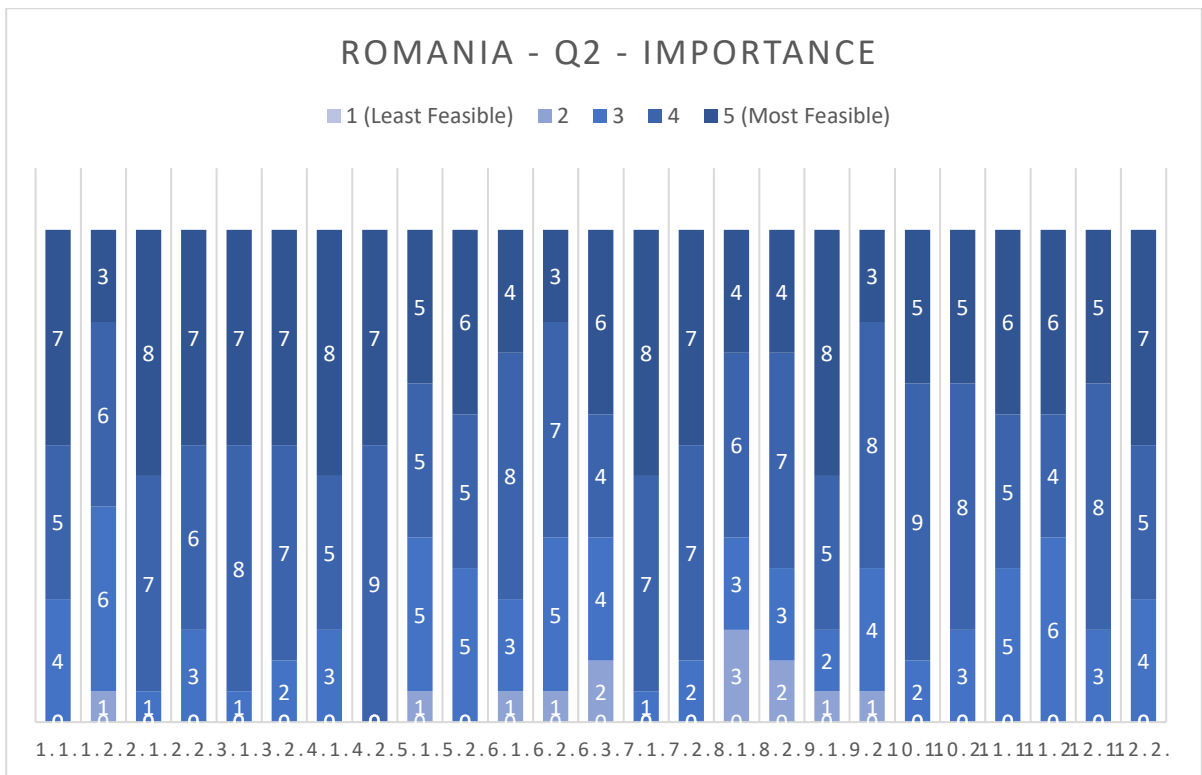


**Figure 18** Number of votes per each SJA's feasibility (Q1) on the scale 1 to 5 provided by the Romanian Stakeholders





**Figure 19** Ranking of the SJAs by importance (Q2) by the Romanian Stakeholders based on the average scoring out of 5



**Figure 20** Number of votes per each SJA's importance (Q2) on the scale 1 to 5 provided by the Romanian Stakeholders

**Comments/observations grouped per main categories – per themes:**

## **Theme 1: Digital Twin of the Black Sea**

### **Action 1.1.**

- integrating database initiatives in EU projects into a regional platform

### **Action 1.2.**

- Link with EWS (intelligent warning systems);
- link with MSP, ICZM, different national + EU strategies

## **Theme 2: Effect of Multiple Stressors on the Black Sea Ecosystem**

### **Action 2.1.**

- imperative for regional harmonisation of methodologies and effective collaboration;
- development of mobile platforms;  
promote remote-sensing technologies and biomarkers
- the availability of research vessels equipped according to the current requirements
- development of research infrastructure (acquisition of up-to-date equipment)

### **Action 2.2.**

- need for funding and specialists in different fields of marine science;

## **Theme 3: Changing Black Sea biodiversity and ecosystem resilience under climate change and multistressors**

### **Action 3.1.**

- need for funding to increase the accuracy of results, eDNA approach should be combined with traditional taxonomy; moreover, a regional database should be created;
- involving Romanian scientists in European networks;

### **Action 3.2.**

- assessment of positive/negative effects of invasive alien species is required;
- control and legislative measures for the introduction of invasive alien species are needed;
- the invasive species issue can't be solved by 2030;
- assessment of existing measures and development of new ones.

## **Theme 4 - Ecosystem-based fisheries and high-tech aqua and mariculture**

### **Action 4.1.**

- raising awareness campaigns among the general public;
- the protection/methods and actions to protect the MPAs;
- involving Romanian scientists in European networks.

### **Action 4.2.**

- development of high-tech aquaculture.

## **Theme 5: Blue biotechnology**

### **Action 5.1.**

- human and financial resources are need

#### **Action 5.2.**

- not all algae species are considered hazards.

### **Theme 6: One Health Approach and Improved Safety for Black Sea Coasts**

#### **Action 6.1.**

- the delimitation of coastal zones and their functional sub-zones must be established;
- warning systems are needed.

#### **Action 6.2.**

- warning systems are needed.

### **Theme 7: Marine Litter Pilot**

#### **Action 7.1.**

- development of curriculum dedicated to the marine litter issue.

### **Theme 8: Marine Renewable Energy**

#### **Action 8.1.**

- acquiring Gloria platform for research purposes;
- the need of SMEs and research clusters;

### **Theme 10: Black Sea Underwater and Coastal Heritage**

#### **Action 10.1.**

- legislative regulations concerning the scientific diving are needed;
- use of LIDAR and UAV systems is needed;
- Marine Spatial Planning is needed.

### **Theme 12: Blue Skills and Capacity Building on Marine Sciences**

#### **Action 12.2.**

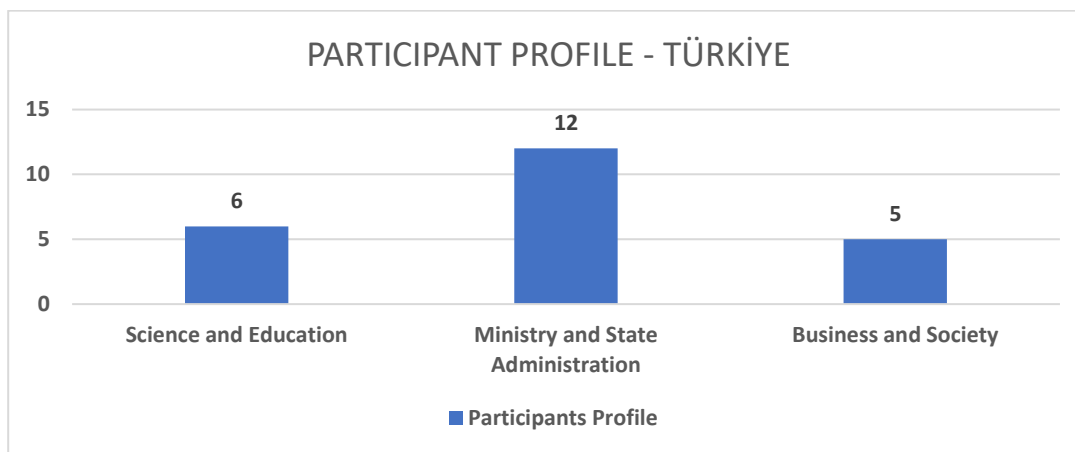
- training series also for mid-career professionals.
- Funding sources – all pointed towards the Mix between National and Local budget, EU and International Organizations funds, Private Investments – as the most suitable funding solutions

## Türkiye

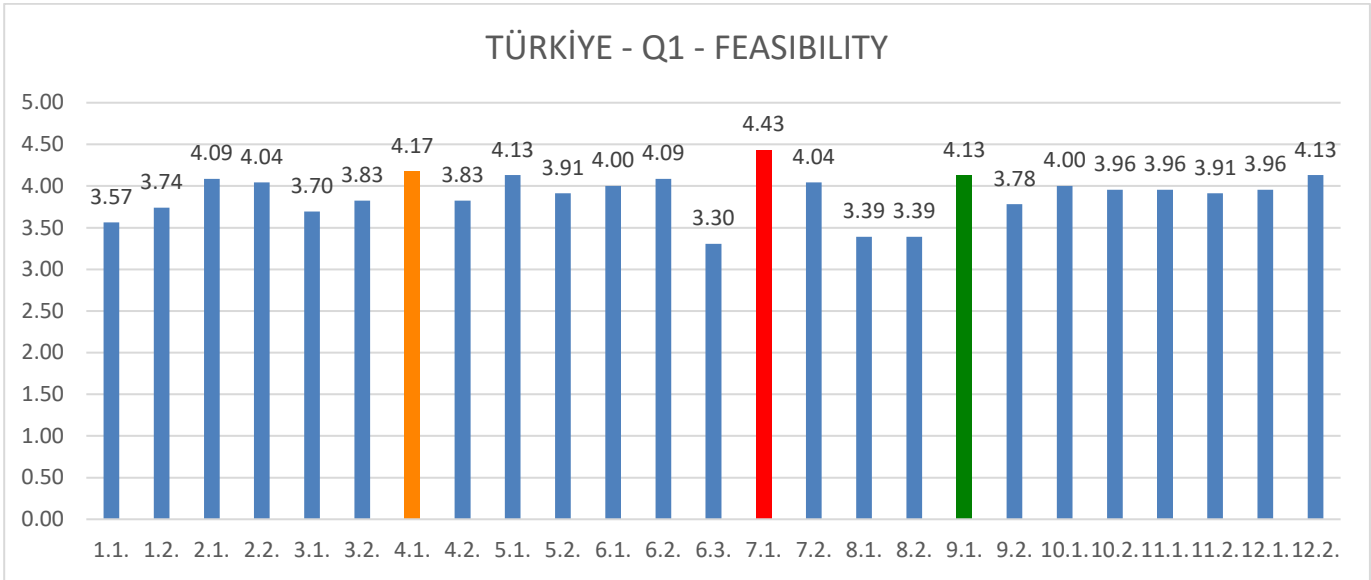
The second national consultation on the first draft of the Black Sea SRIA Implementation Plan was initially scheduled to take place on 8 February 2023 in Ankara at TUBITAK premises but it was cancelled due to the devastating earthquakes that took place in Türkiye on 6 February. Due to the earthquakes, the focus has been on the rescue and aid efforts by different ministries and general public.

On 23 February 2023, an online survey was launched to gather input to the SRIA IP remotely. The participants were provided with a concept note and general information on the SRIA IP as well as all the necessary links and documents. The questionnaire and what are expected from the participants were introduced in detail. In case of a question or further comment, the participants were encouraged to contact the relevant contact persons (TUBITAK and METU colleagues). As a result, **23** entries are received.

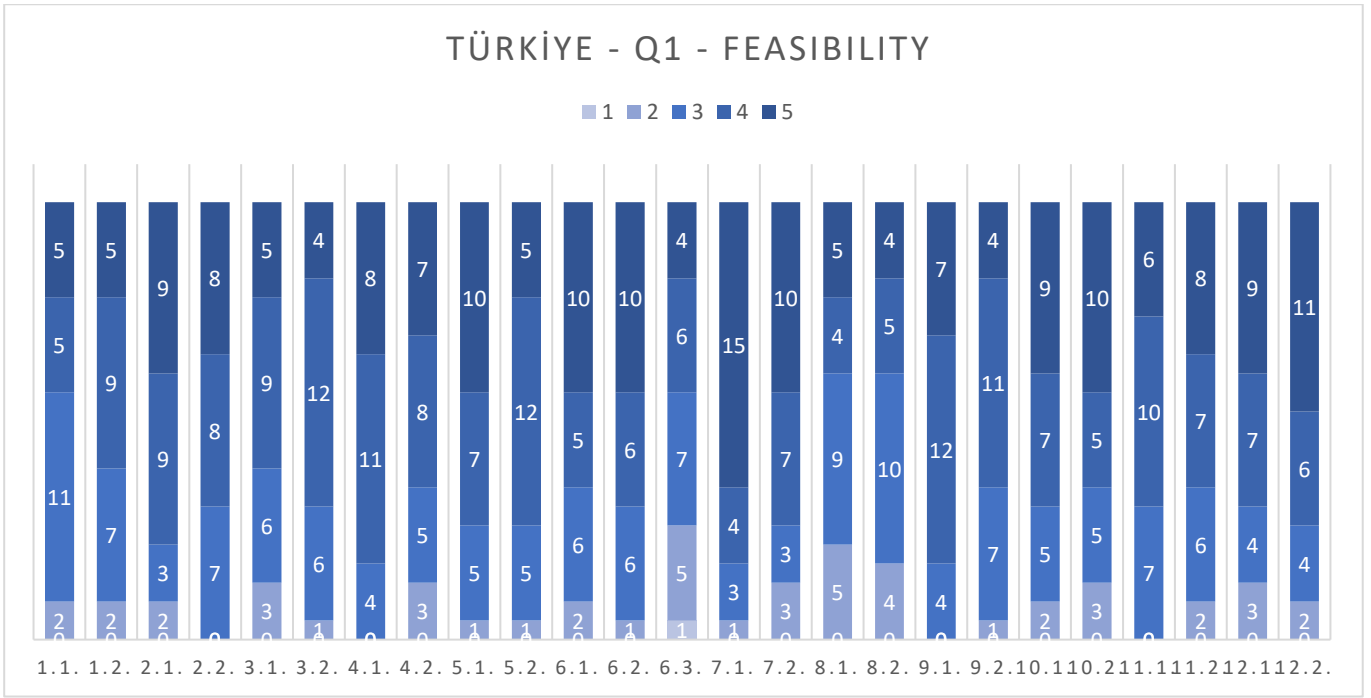
However, as a general note, the Black Sea SRIA IP is received positively by the stakeholders. It was observed that most actions ranked above 3 for feasibility and importance/necessity, pointing out that Black Sea IP themes and actions are relevant.



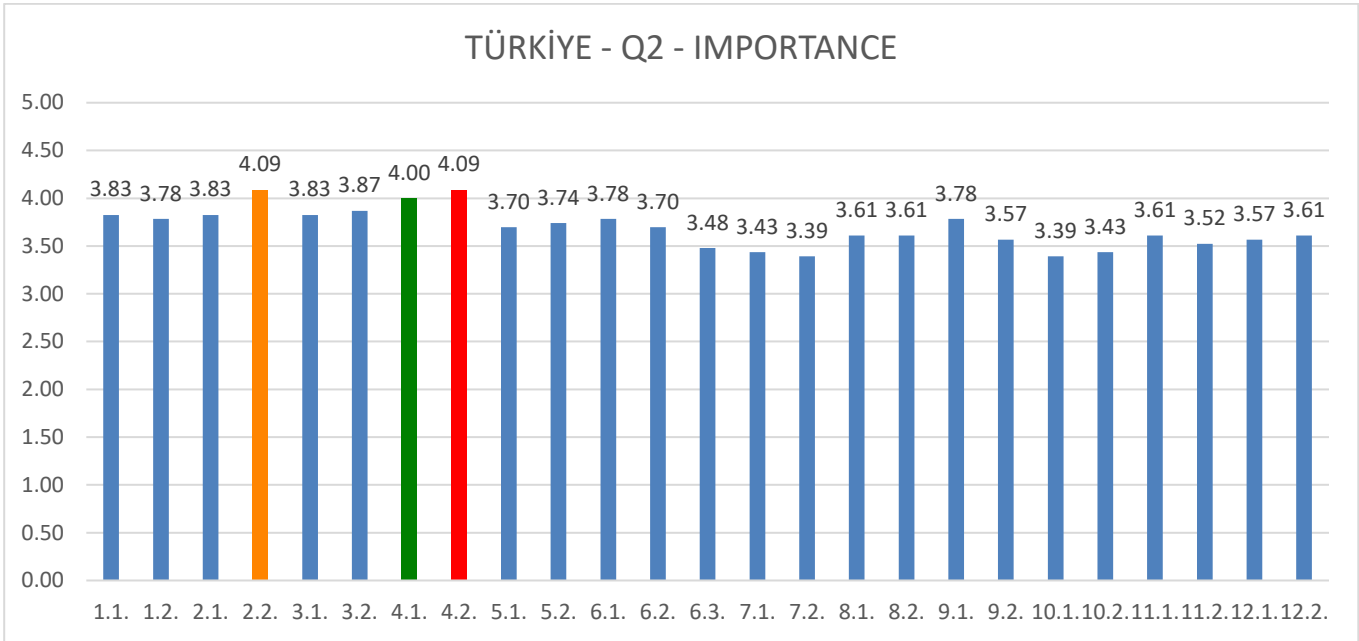
**Figure 21** Participants profile by stakeholder category in the Second National Consultation in Türkiye



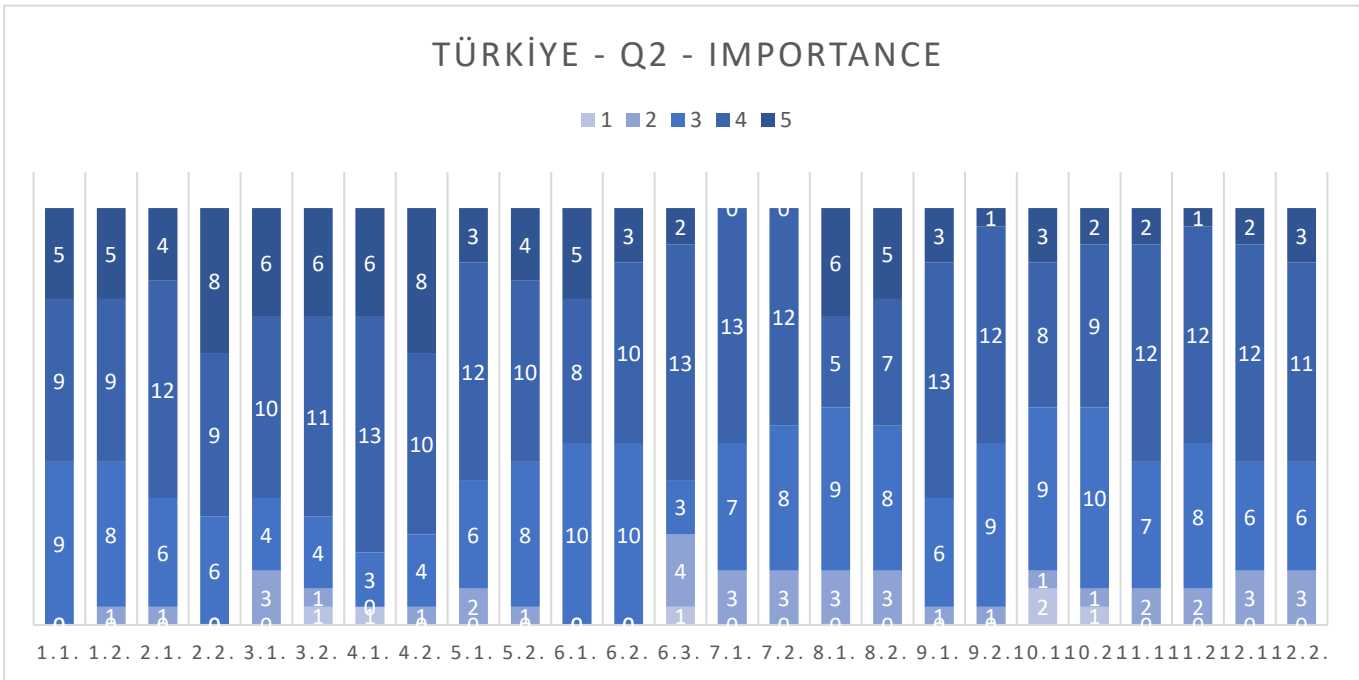
**Figure 22** Ranking of the SJAs by feasibility (Q1) by the Turkish Stakeholders based on the average scoring out of 5



**Figure 23** Number of votes per each SJA's feasibility (Q1) on the scale 1 to 5 provided by the Turkish Stakeholders



**Figure 24** Ranking of the SJAs by importance (Q2) by the Ukrainian Stakeholders based on the average scoring out of 5



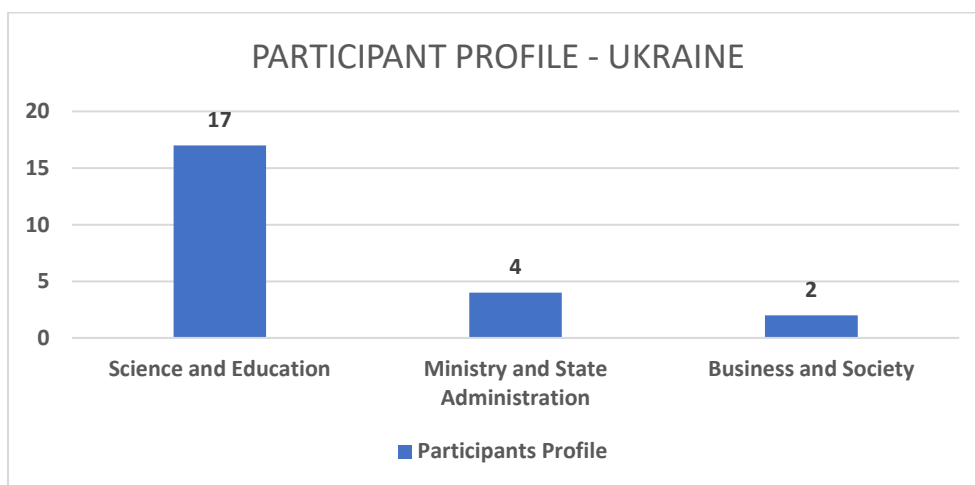
**Figure 25** Number of votes per each SJA's importance (Q2) on the scale 1 to 5 provided by the Turkish Stakeholders

## Comments

- The main problems in renewable energy sources in our country are our dependence on Far East Countries and Europe in terms of energy production and storage of produced energy. In order to solve this problem, it is necessary to establish thematic, especially marine-themed techno parks and R&D Centers, to increase state-supported calls, to allocate more budget to these areas, and to encourage researchers to work in these areas.
- Development of legislation and infrastructure studies related to Deep Sea Mining is necessary
- Theme 9: In order to design an observation system that will be integrated with the criteria of the European Union Maritime Strategy Framework Directive (MSFD) within the framework of Strategic Joint Action 9.1 under the title of Innovative Observation Systems, a comparative legislative study should be carried out among the states bordering the Black Sea. However, in line with the data to be obtained after this legislative work, an applicable observation system can be designed for all coastal states
- Although it is possible to achieve targets 10.1 and 10.2; The effect of the work outputs on the expected result is highly dependent on the budget to be transferred and the planned time. eg. There are many methods that can be used for mapping underwater cultural heritage. Radar scanning can be done in order to detect the depth and spread area of the remains on the seabed in the Black Sea line. Or satellite observation tools (bathymetry etc.) may be useful in some cases. While the first of these two applications has the potential to produce much more precise results, its cost will be higher and the application time will be longer. On the other hand, the use of satellite instruments will reduce the sensitivity and precision of the findings, while reducing the cost and research time.
- Determining the effects of natural disasters (such as flood, fire, earthquake) on the ecosystem can be added in Strategic Joint Action 6.3.

## Ukraine

Due to the full-scale war on Ukraine by Russia, the consultation could not take place. However, the online questionnaire is remotely conducted by the Ukrainian stakeholders. Participants included universities, research centres, and other organisations from cities like Kyiv, Berdiansk, Odesa, Ivano-Frankivsk, Vinnytsia, Mykolaiv Kherson and more. The areas of specialisation ranged from marine ecology and geological sciences to information technology and agrarian studies, offering a diverse perspective in the survey.



**Figure 26** Participants profile by stakeholder category in the Second National Consultation in Ukraine

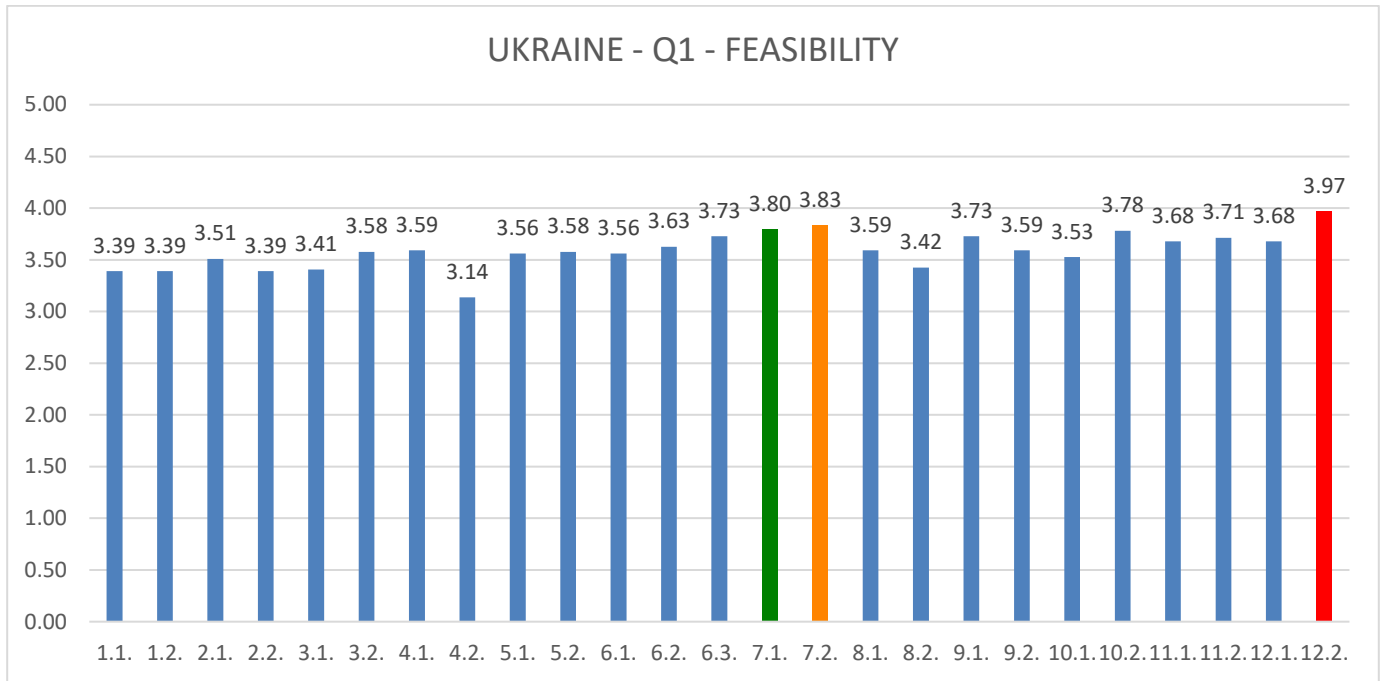
The implementation plan was received with unexpected enthusiasm and positivity in Ukraine. The participation in the process was significantly higher than anticipated, demonstrating a strong level of commitment and eagerness among the participants.

This enthusiastic response indicates a high level of trust and confidence in the potential victory in the ongoing war with the Russian Federation. There is an apparent consensus and shared desire among the participants to rebuild Ukraine and make significant progress forward.

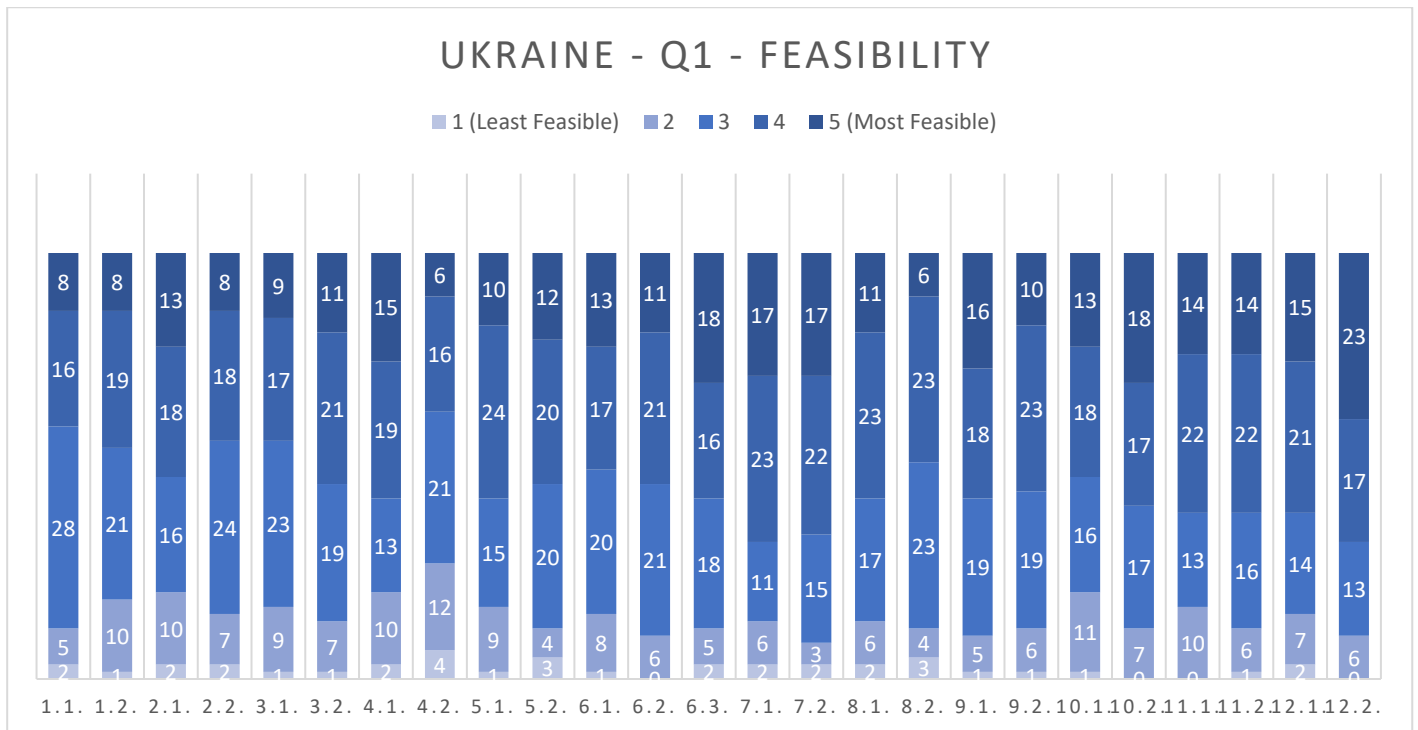
The optimism and proactive involvement of the participants suggest a wide acceptance and eagerness to implement the plan, signifying a constructive outlook for its success. The plan's reception reflects the strong resilience and determination of the Ukrainian people in the face of adversity and their collective aspiration for a prosperous and stable future.

It was recognized however that there aren't a lot of possibilities to implement the Plan of actions in Ukraine for now and near future.

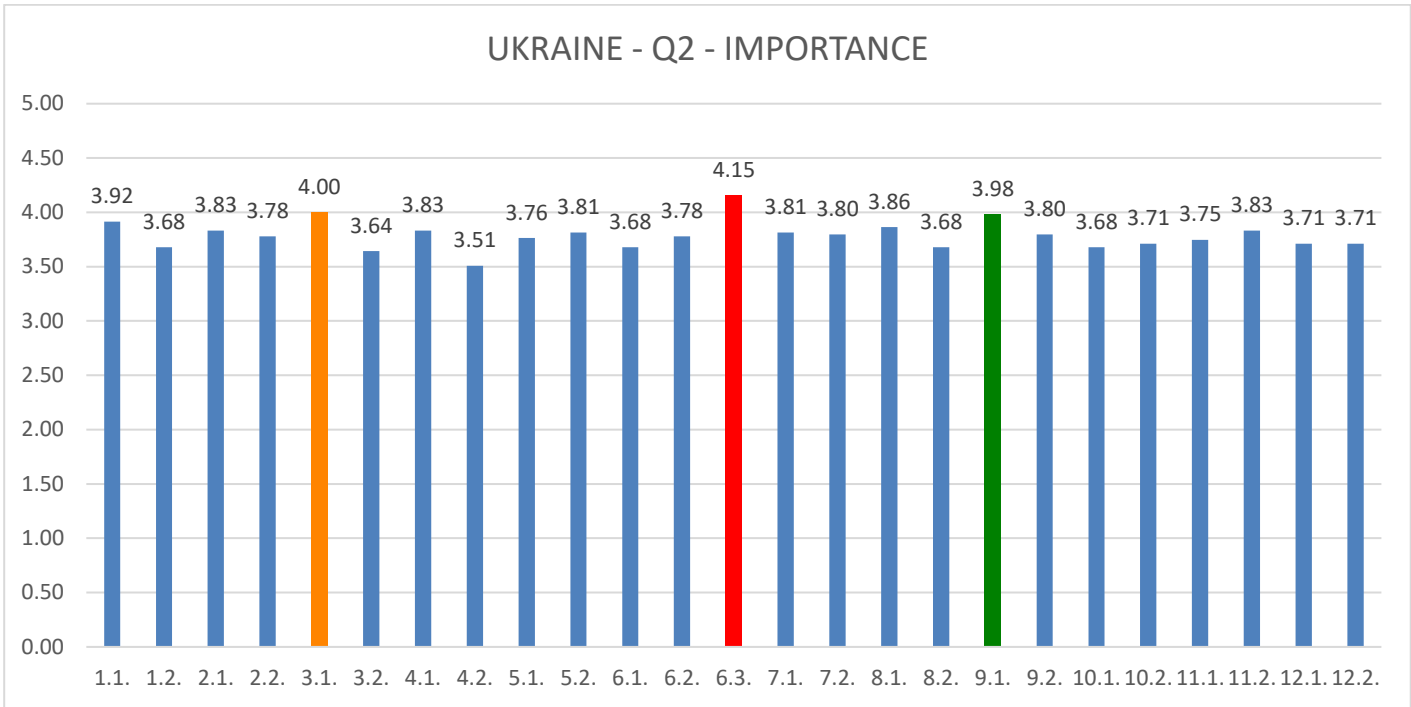




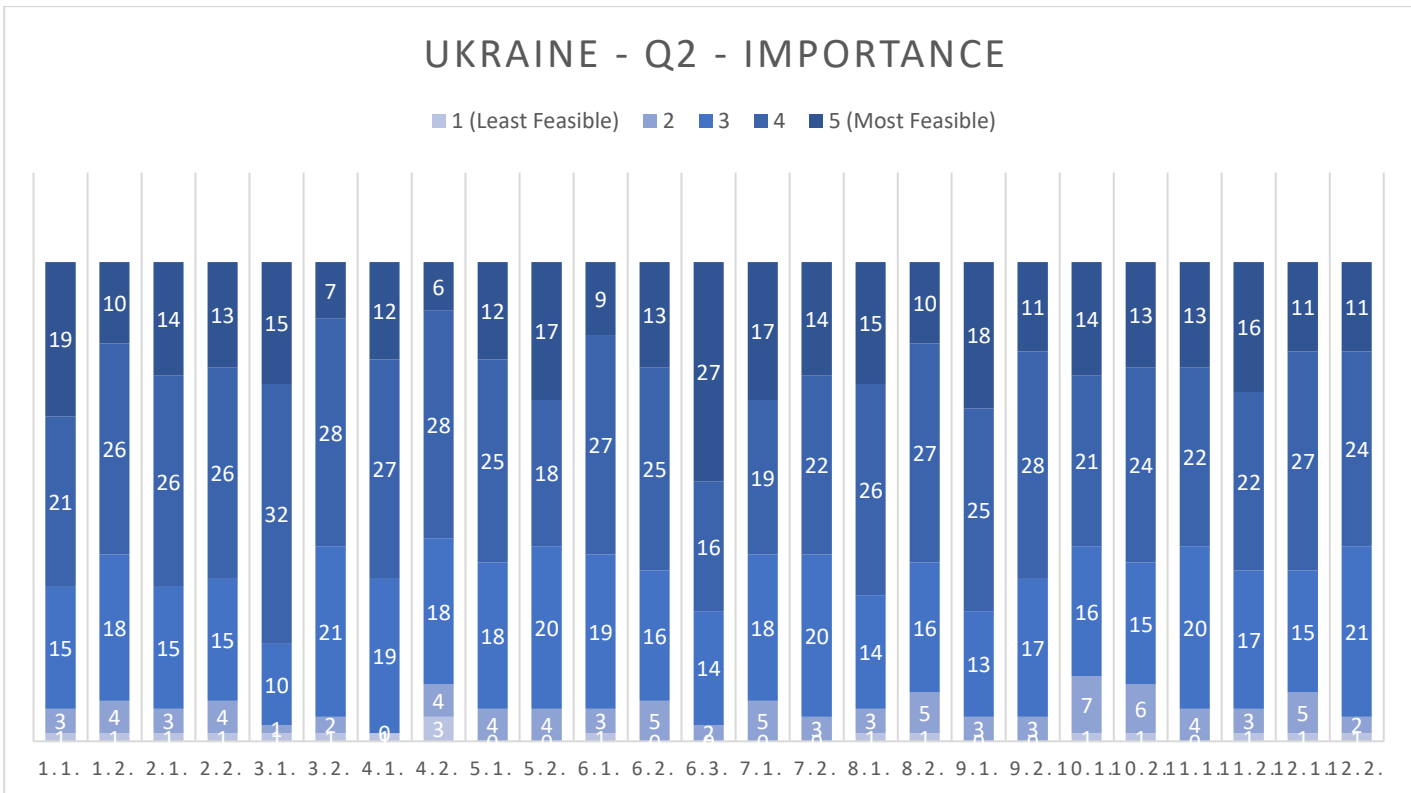
**Figure 27** Ranking of the SJAs by feasibility (Q1) by the Ukrainians Stakeholders based on the average scoring out of 5



**Figure 28** Number of votes per each SJA's feasibility (Q1) on the scale 1 to 5 provided by the Ukrainian Stakeholders



**Figure 29** Ranking of the SJAs by importance (Q2) by the Ukrainian Stakeholders based on the average scoring out of 5



**Figure 30** Number of votes per each SJA's importance (Q2) on the scale 1 to 5 provided by the Ukrainian Stakeholders

## Comments

- The main goal for Ukraine is to win the war and build the country after the victory
- We are going to review the implementation plan for Ukraine after the end of the war
- Whatever we can do, we are doing for now: first of all, scientific, education and capacity building part, as example, the elaboration of the methodological part and revision of the experience of other countries
- Expedition tasks and maritime using of the sea cannot be accomplished until the war was over
- For now the most necessity for Ukraine: 6.3 “Identification of the ecosystem impact of civil and military disruptive activities affecting the resilience of coastal communities, integrating coastal scientific, socioeconomic and psychological angles”; 3.1 “Cost-effective mapping of the Black sea biodiversityea...”; 9.1 “Designing of an integrated joint observing system...”; 1.1 “Developing the Digital Twin of the Black Sea...”

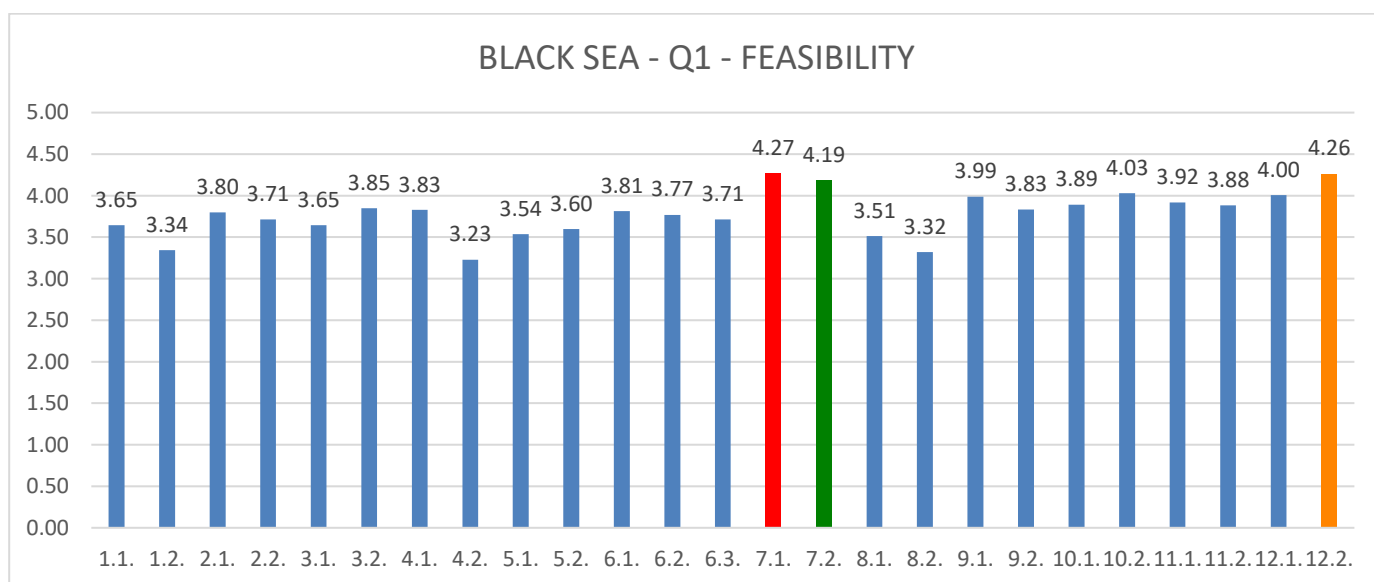
## Black Sea Basin wide

Total 203 Black Sea national stakeholders responded to joint online questionnaire before, during or after the consultations in the period of February - March 2023.

Central authorities of littoral countries BG, GE, RO, TR, UA and MD, regional and local authorities; Black Sea Commissioners, national focal points and advisory group members; maritime, fisheries and environment agencies; maritime academies, universities and marine research institutes from national capitals and coastal cities; European H2020 projects (Connect, Bridge, Doors); international, regional and national NGOs; BSYAs; blue economy sector companies, SMEs, startups; general and specialised innovation agencies; etc.

For question 1 (Feasibility) most important 3 actions at the Black Sea level: (**Figure 31**)

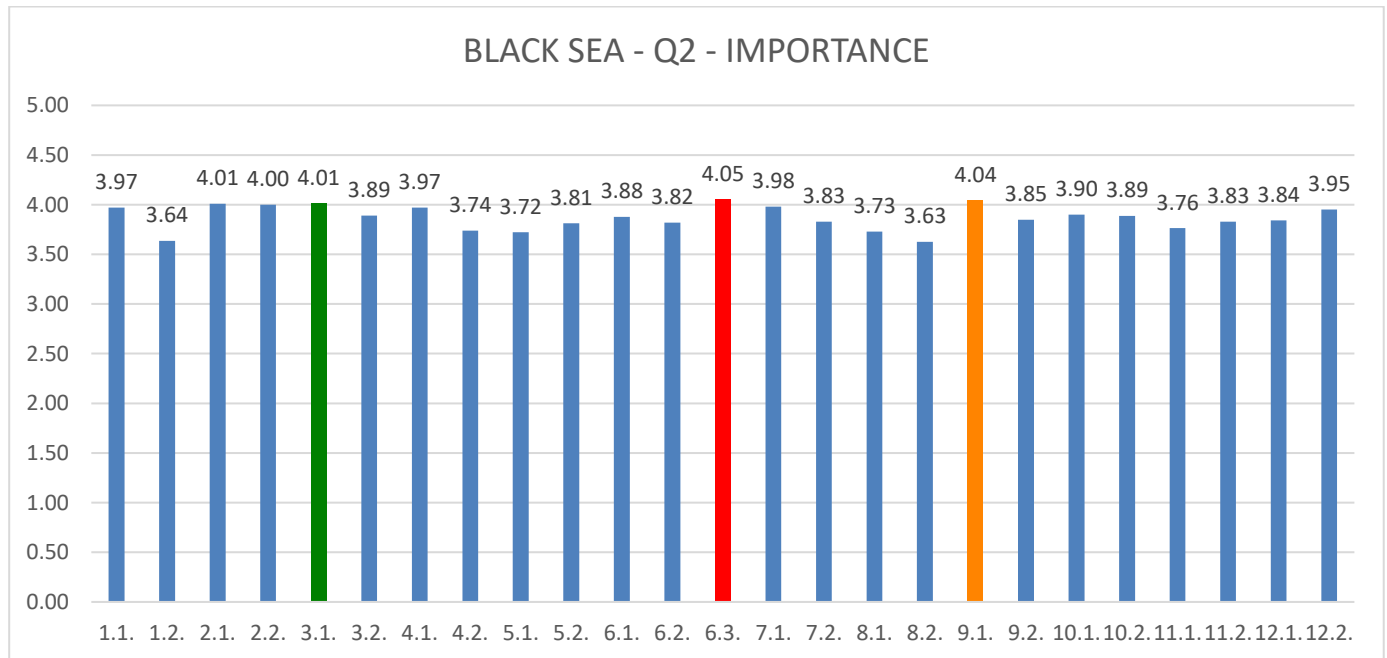
1. 7.1 Raise awareness on the marine litter pollution and solutions in the Black Sea targeting the broader public by linking with already existing initiatives and creating novel activities (such as activities of Black Sea Young Ambassadors and other Early Career Ocean Professionals (ECOPs)) (4.27)
2. 12.2 Develop a training series (including summer school-type activities) for ECOPs and LATE COPS (peer training, involving late careers as mentors). Adopt a "Train the Trainer" Programme Approach (through staff exchanges, secondments, mobility programmes etc.) in order to increase the capacity of mentors/researchers who can act as mentors to younger researchers. (4.26)
3. 7.2 Enable the Black Sea CONNECT Marine Litter Action Forum as a recurring platform/forum to tackle the pollution crisis in close links to Mission Restore our Ocean and Waters (4.19)



**Figure 31** Ranking of the SJAs by feasibility (Q1) by the Black Sea Stakeholders based on the average scoring out of 5

For question 2 (Importance) most important 3 actions at the Black Sea level: **(Figure 32)**

1. 6.3 Identification of the ecosystem impact of civil and military disruptive activities (hazardous pollution, unexploded ordnance etc.) affecting the resilience of coastal communities, integrating coastal scientific, socioeconomic and psychological angles **(4.05)**
2. 9.1 Designing of an integrated joint observing system, including regular sea expeditions, standardized fixed observing systems supported by mobile platform. **(4.04)**
3. 3.1 Cost-effective mapping of the Black sea biodiversity via emerging tools (such as the e-DNA) at genetic, species and ecosystem levels. **(4.01)**



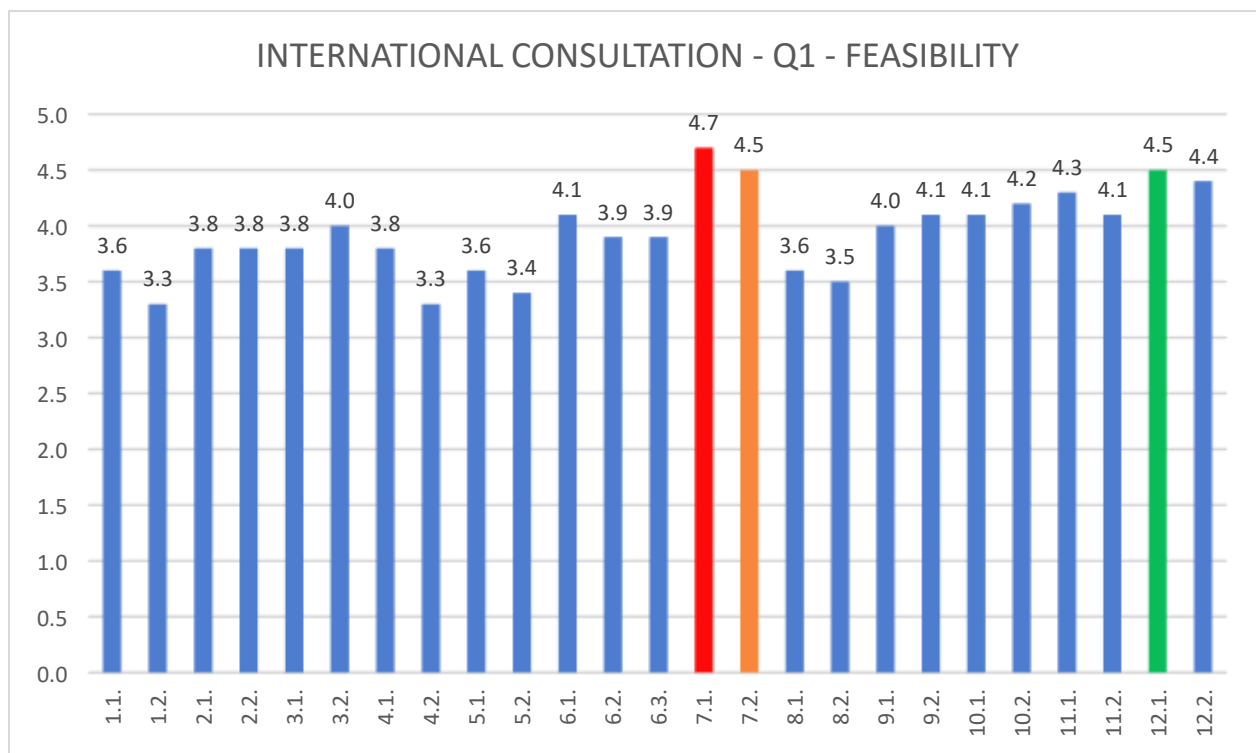
**Figure 32** Ranking of the SJAs by importance (Q2) by the Black Sea Stakeholders based on the average scoring out of 5

## International Consultations

Consultation with Linked Projects and Initiatives on the Implementation Plan event was organized by Black Sea CONNECT partner GEOECOMAR on 15 March 2023 in Bucharest 2023. The event was aimed to get further input on the Implementation Plan of the Black Sea Strategic Research and Innovation Agenda (SRIA).

The stakeholders are carefully selected and targeted invitations are sent out to those that are conducting international projects, initiatives, and/or from relevant organizations. D3.1 is benefitted when identifying these stakeholders. Additionally, BRIDGE-BS and DOORS Work package leaders are invited to provide their feedback to the IP not only their mandate based on these projects but also as experts experienced in similar projects in the Black Sea or different sea-basins.

To get input from the stakeholders, the same methodology as the national consultations is followed. The survey with the three questions (the first one focused on how feasible is each Strategic Joint Action by the year 2030, the second one tried to assess their relevance, while the third question regarded any potential suggestions from the participants) was sent out to the invitee's ahead of the meeting. During the meeting, they are first introduced to the SRIA process and the IP. A roundtable for receiving feedback took place. In the meantime, the hybrid meeting gathered input via online participants. They are also given 1 day to complete the online survey.

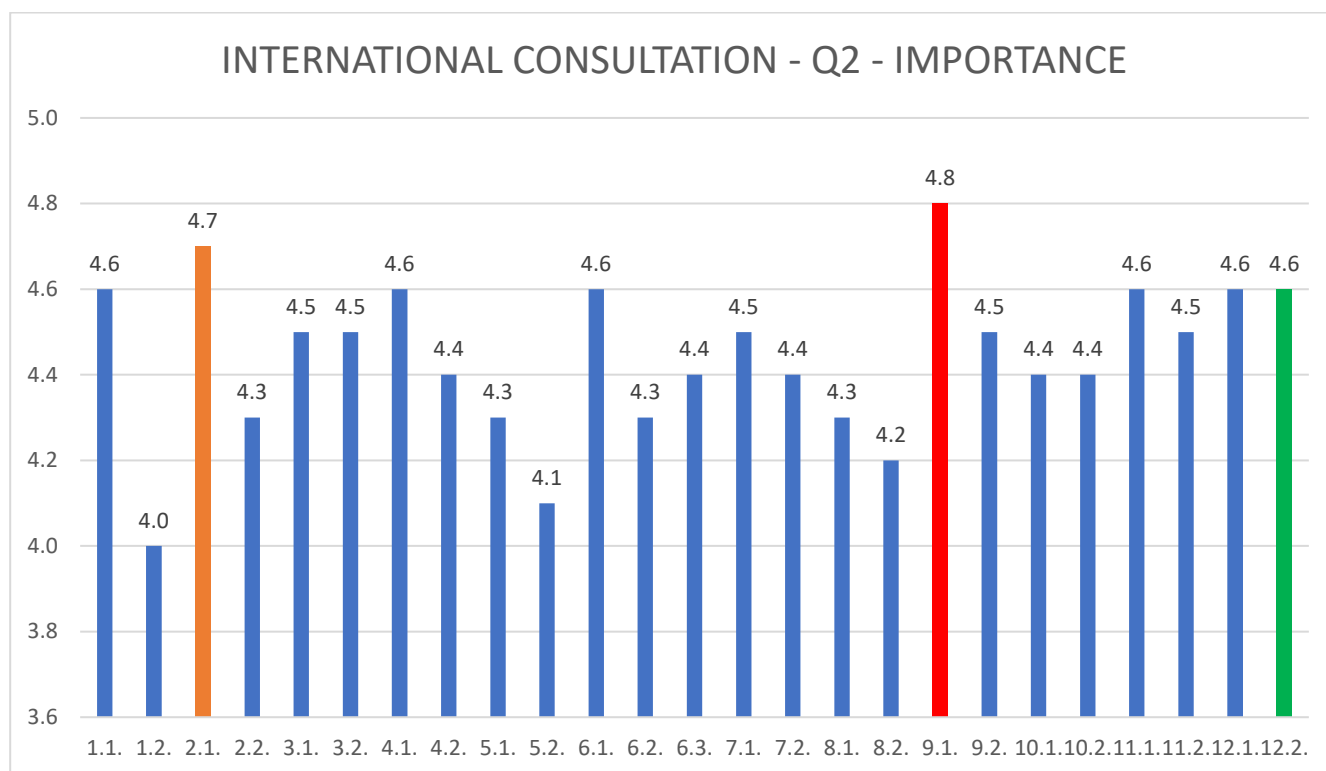


**Figure 33** Ranking of the SJAs by feasibility (Q1) by the International Stakeholders based on the average scoring out of 5

For question 1 (Feasibility) most important 3 actions at International level: (**Figure 33**)

1. 7.1 Raise awareness on the marine litter pollution and solutions in the Black Sea targeting the broader public by linking with already existing initiatives and creating novel activities (such as activities of Black Sea Young Ambassadors and other Early Career Ocean Professionals (ECOPs)) (4.70)
2. 7.2 Enable the Black Sea CONNECT Marine Litter Action Forum as a recurring platform/forum to tackle the pollution crisis in close links to Mission Restore our Ocean and Waters) (4.50)
3. 12.1. Building on momentum of existing Black Sea Young Ambassadors Programme, new approaches for all ECOPS will be developed in order to engage general public such as the Citizen Science initiatives –

actively involve citizens in science-related processes using innovative tools for learning by doing (water quality, biodiversity monitoring). (4.50)



**Figure 34** Ranking of the SJAs by importance (Q2) by the International Stakeholders based on the average scoring out of 5

For question 2 (Importance) most important 3 actions at the Black Sea level: **(Figure 34)**

1. 9.1. Designing of an integrated joint observing system, including regular sea expeditions, standardized fixed observing systems supported by mobile platforms (4.80)
2. 2.1. Organizing synoptic/joint oceanographic expeditions to identify synergistic and individual effects of each stressor (such as deoxygenation, acidification, sulfide build-up). (4.70)
3. 12.2. Develop a Training series (including summer school-type activities) for ECOPs and LATE COPS (peer training, involving late careers as mentors) Adopt a "Train the Trainer" Programme Approach (through staff exchanges, secondments, mobility programmes etc.) in order to increase the capacity of mentors/researchers who can act as mentors to younger researchers (4.60)

## Comments

### Strategic Joint Action 1.1.

- Use bottom-up approaches, starting from real needs/demands.
- Developing theory to interlink ecological processes to socioeconomic trends should be prioritized.
- to be confirmed on the work done and expected by Doors and Bridges BS
- Historical data could create some problems due to lack of continuity in collection and availability and different methods used for obtaining

- Digital platforms have demonstrated already their use. Moreover, digital instruments could simulate any other parts beyond of socioeconomic, blue economy etc.
- A reference to the EU DTO core infrastructure as an enabler to develop a BS-specific DT can be added. The EU DTO webpage has been updated with the latest information on projects and calls. European Digital Twin of the Ocean (European DTO) ([europa.eu](http://europa.eu)). Link does not work here probably, but you will get our EC comments also through e-mail with track changes in your document, that may be easier to process. Smart specialisation can be added as programme, and EMFAF and I3 Instrument as funding opportunities.
- Points to focus: increase of real time transfer of measured data for inclusion as model inputs; importance of lateral fluxes and capability to have scenarios that consider the changing land use (catchment models that can include all major catchments of the BS). Results from DOORS project will give outcomes both for lateral fluxes and climate change scenarios connected. Need to increase the integration between EO, in-situ, modelled data + capability to include citizen science in this flow.
- Conceptual developments may be feasible but basin-scale developments with sufficient data may be challenging
- Data collection and sharing across the region will be a challenge to overcome - DOORS system of systems will certainly help this action
- Be sure to align priorities/roadmap with the upcoming call from the Sustainable Blue Economy Partnership, focused on developing DTOs at sea-basin levels.
- The Black Sea Ocean Observing System should be a fundamental part of a DTO. Algorithms are only as good as the data that feeds into them, and high-quality ground-truthing data sets are essential to train algorithms.
- Effective DTOs will require transdisciplinary collaboration and trust in order to develop the needed computational solutions. This includes bringing together expertise from computer scientists, social scientists, ethicists, industry etc.
- Effective data sharing, handling and management is a pre-requisite to AI solutions and DTOs.
- See EMB Future Science Brief on Big Data in Marine Science and 7th Forum proceedings for more information.
- Establish operational Black Sea Catchment Observation System to monitor and act on nutrient pollution loads (including introduction of economic and financial instruments for reduction of loads).
- Develop data cube and other big data solutions for the integration of remote sensing as well as vector and other types of data characterising marine, coastal and catchment domains.
- The development and application of this tool (Digital Twin) is extremely important, including for assessing damage to the marine environment as the result of Russian war aggression against Ukraine.
- There are already a lot of databases for the Black Sea. It's important not to create too many databases.
- Digital Twin will improve efficiency and quality of science outputs, give base for businesses development, better understanding of processes, leading to minimize false in the business.
- QA/QC procedures should be common at Black Sea scale. Harmonized data should be used in developing regional and basin-scale models, scenarios on which Digital Twin is building.
- The action is needed for the Black Sea region, but the time-frame proposed for its implementation is quite short even though there are already some initiatives through a number of EU-funded projects. The process will take longer and needs to be continuous to be successful.
- Digital Twin focus on data and models, but need to include socio-economic models. Developing digital twin should be supported by capacity-building activities.



- The action is very relevant. I feel that the impact of climate change on individuals, populations and ... on biodiversity ... and ecosystem function and services is underestimated and only partially addressed. The impact of ecological ... in climate change is likely to impact both ... and global development in the Black Sea basin.
- It's a long-term process, starting from assessment of available information + ... with SBEP funded projects. Including building on achievements of winning projects (BRIDGE / DOORS).
- General comment: It is recommended to follow the principles cooperation-coordination-integration with a co-constructive and co-designed approach. First of all, I strongly recommend not to manage each pillar and each task as a separate issue, but to make a strong effort to connect the different activities to get benefits of sharing and put in common results.

### **Strategic Joint Action 1.2.**

- Focus the research on adaptive management under multiple stressors
- in particular for cumulative impact assessment in a prospective approach
- Decision makers and R&I are very interconnected sides (if I correctly understood the Action)
- Capacity may depend a lot on progress around digitalisation of monitoring/observation but also on the human activities
- Be sure to align priorities/roadmap with the upcoming call from the Sustainable Blue Economy Partnership, focused on developing DTOs at sea-basin levels.
- The Black Sea Ocean Observing System should be a fundamental part of a DTO. Algorithms are only as good as the data that feeds into them, and high-quality ground-truthing data sets are essential to train algorithms.
- Effective DTOs will require transdisciplinary collaboration and trust in order to develop the needed computational solutions. This includes bringing together expertise from computer scientists, social scientists, ethicists, industry etc.
- Effective data sharing, handling and management is a pre-requisite to AI solutions and DTOs.
- See EMB Future Science Brief on Big Data in Marine Science and 7th Forum proceedings for more information.
- AI still needs lot of expert knowledge in terms of ecosystem management.
- Data harmonization is a must
- Ecosystems are changing sometimes in non-linear ways - I would like to see evidence AI can capture these.
- Considering the present geopolitical situation in the Black Sea area, building of this support tool for marine ecosystem management will probably develop differently within the riparian countries.
- I would suggest to have "Biodiversity and ecosystem response to climate change as a third Strategic Joint Action on Pillar 1. LifeWatch ERIC would be happy to support this.
- The AI is important, but it is worth to consider the results and the achievements of other initiatives, projects, ERICs, not repeating ways already followed and the strategy to progress.
- Another important issue is to connect regional-national-European efforts to enhance the results among them.

### **Strategic Joint Action 2.1.**

- Activities should feed into common infrastructures for both data collection (e.g., ships and observing technologies) and data sharing (e.g., FAIR principles)
- to be confirmed with on-going conditions in the Black Sea

- The riverine countries need modern and well-equipped Research Vessels
- it will allow to know the future developments of the state
- Quite unfeasible now for war conditions. But this aspect is substantial also to have same methods for observation applied everywhere (common approaches for measuring at sea - best practices)
- Even with partial involvement this should yield important progress
- It is important to research the behaviour of recovering ecosystems, potential time-lags, regime shifts, non-linearities, where tipping points occur and the consequences of crossing them.
- Understanding the impacts of coastal pressures on social-economics and human-ocean interactions is important, which is critical for developing mitigation and adaptation measures and understanding their costs and risks.
- Model prediction capacities of cumulative pressures in a future world will be important to advance (magnitude, timing, location).
- Recommend to keep an eye out for the EMB Position Paper on Coastal Resilience that will be published in October 2023: <https://www.marineboard.eu/coastal-resilience> which includes recommendations for research on understanding single and multiple stressors in coastal areas.
- Tensions in Black Sea area
- These activities are extremely necessary and important, but they cannot be carried out while war invasion is ongoing in Ukraine.
- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea.
- BRIDGE BS has a very good idea to carry out oceanographic cruises simultaneously to identify multistressors impact but also to present whole picture of the Black Sea ecosystem state.
- Quite low Feasibility due to the war condition in the Western Black Sea. Also lack of funds, heterogeneity of available funds will lead to low Feasibility of organising synoptic/joint cruises across the Black Sea basin.
- These research cruises are usually extremely important and relevant when more detailed study is needed in a particular stressor. However, they are often not sufficient to understand completely the stressors mentioned.
- Very relevant, but most probably not feasible, at least in the near future. For sure it will not include all the Black Sea countries.
- Links with climate change need always to be taken into account. Not considering the ... .. of climate change could reduce ... of ...
- It is important to bridge other activities and programmes (like ERICs) to share initiatives, results, data and planning.

### **Strategic Joint Action 2.2.**

- Specific supporting programmes are necessary
- To study the impact of contaminants is a very important component
- Not only MSFD but also WFD is relevant.
- Central aspect. The capability to study the full continuum and quantify the observative and investigation capability at the land-sea interface is addressed also in other regional seas. Need for a full use of model tools able to address this (not only hydro but coupled biogeochemical, lagrangian, catchment models). Possibility to rely on DOORS project results and DANUBIUS-RI facilities
- Not sure if the type of contaminants mentioned are the most important at the moment...

- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea.
- Low Feasibility due to the high funds needed for studying the fluxes, transformation and impact of emerging contaminants, as well as the risks the emerging contaminants pose to ecosystem and human health. In terms of relevance, the hazards arising from multiple biotic impacts on the ecosystem are quite less-known in the moment. So, after the studies will intensify, we can take a conclusion on the relevance.
- This Action can address many of the pilot studies/activities listed in this Implementation Plan.
- The idea that the Black Sea is the most polluted European sea emerged in the last years. It is considered that this sea is full of plastic and all kind of marine litter and all kind of contaminants. With this respect it is very important to assess all kind of stressors that affect the Black Sea ecosystem. Identifying additional stressors is also relevant.
- Critical studies of emerging pollutants are needed.
- It is relevant, but what about the geo-hazards (crucial for the area) that are completely missing and ignored. These processes are strictly connected with the main goals of this joint action.

### **Strategic Joint Action 3.1.**

- I would expand the focus to other (more cost effective) technologies based on acoustic, optical and chemical sensing in combination with AI
- Such methods are still under development and present several disadvantages
- Economic argumentation must be present
- Also, WFD and EU Bird and Habitat Directives relevant. You mean European Sustainable Blue Economy approach in the EU in policy box?
- Potential difficulties to cover to north region of the basin
- For eDNA, molecular data must still be based on reliable identification of phenotypes, requiring taxonomic expertise to avoid the introduction of bias. Hyperspectral imaging is also an important emerging technique for biological mapping allowing to distinguish between otherwise indistinguishable objects. Autonomous platforms, low-cost sensors, 3D imaging systems, in-situ photogrammetry, and further integration of AI and ML into mapping methodology will allow improved biological mapping. Improve modelling capacity to be able to move from predicting single species occurrences to whole ecosystems based on mapping data.
- Improved resilience indicators are needed to identify where threats to resilience and deviations from preferred resilient pathways are occurring. Improved knowledge of resilience properties, including integrated ecological and social tipping points that take into account time and robustness, will help to interpret the values of resilience indicators.
- Research on the resilience of social-ecological systems is needed.
- Recommend to keep an eye out for the EMB Position Paper on Coastal Resilience that will be published in October 2023: <https://www.marineboard.eu/coastal-resilience> and Future Science Brief on Marine Habitat Mapping that will be published at the end of 2023: <https://www.marineboard.eu/marine-habitat-mapping#:~:text=Marine%20habitat%20mapping%20aims%20to,%2C%20status%2C%20and%20physical%20conditions>.
- the available data sets for e-DNA for Black Sea could be still at the beginning.
- In our opinion, the key obstacle to the formation of database using the e-DNA is its high cost.
- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea.

- Even if we refer to cost-effective mapping, the costs for implementing this action are still quite high. Infrastructure and capacity-building are required.
- This is important, since the Black Sea often has very unique species. However, e-DNA methods at this point are not widespread or cost-effective and proper representative sampling can be difficult.
- A crucial role is the regional cooperation.
- Biodiversity research via emerging tools should be supported by research on community functionality.
- Absolutely relevant and to be expanded to video and sound mapping of biodiversity.

### **Strategic Joint Action 3.2.**

- Linking research to socio economic trends is important
- It's important to maintain the balance of species (if could be said like this)
- Also WFD
- 3.1 and 3.2 could progress in parallel
- high complexity
- In the condition of different stressors impact, the focus needs to be on sustainable development of the ecosystem of the Black Sea. This could happen with control of human activities that lead to deterioration of ecosystem and biodiversity decrease, also non-native species introduction. Prevention is another way for minimizing species invasion and impact.
- Develop tools not only to forecast the NIS impact, but also for early alarming of the authorities. The Black Sea is an enclosed basin, where this type of Action should be easy to implement especially through collaboration with partners. Possibly - to be carried out in collaboration with fishing boats?
- Also taking on consideration long term effects of IAS, in order to optimize activities / costs of controlling IAS dynamics

### **Strategic Joint Action 4.1.**

- to be linked in an extensive approach with MSP
- It will allow good management of fishing to maintain the balance of fish in the Sea
- Also, WFD, EU Habitat and Bird Directives and CMA relevant as policy/programmes + Sustainable Blue Economy Partnership as funding opportunity.
- Overfishing and illegal fishing practices, lack of law enforcement are key challenges the sectors are facing, innovations (e.g., in environmental monitoring, sustainable fishing practices) can help tackling this challenge. Also, funds expected other than from Bulgaria, Romania and EU?
- Establish joint fisheries monitoring and assessment programme (e.g., Georgia-Turkey, Bulgaria-Romania) with public data sharing based on FAIR principles.
- Develop Global Fishing Watch compatible open access big data pilot scheme for the Black Sea (including vessel tracking data publishing).
- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea, due to large amount of the sea mines.
- Determination of fish productive zones for all Black Sea and expand protected areas with an aim to recover fish populations state.
- Pesca-tourism

- This requires very good collaboration between partner countries - this is not very feasible. For example, studying the sturgeon populations, which travel in coast and rivers - requires collaboration from all countries where those species reside. Also, fish travel in regions beyond the protected regions.

#### **Strategic Joint Action 4.2.**

- A proper assessment of present and future ecosystem state is important to define the safe operating space for mariculture to develop
- yes, to meet 2050 carbon neutrality
- Storms and hydro-meteorological conditions could be a barrier
- protein is a very important for food strategies
- Smart specialization platform on the sustainable blue economy in policy/programmes. I3 Instrument in funding opportunity.
- need for shared policy roundtable to set common rules on mariculture.
- The expansion of low- and integrated multi-trophic aquaculture is required to shift to sustainable food production from the sea will be important.
- Eco-friendly integrated multitrophic aquaculture (EfIMA) development.
- Explore the concept of EfIMA development in Allocated Zones for Aquaculture (AZA) and couple it with an integrative inclusion of stakeholders throughout the process.
- Develop mariculture (not only mussels) as alternative.
- Financial support (in different ways) for private companies developing mussels farms.
- Requires long-time investment, but this is an important action.
- Legislation changing to accommodate the proper development of the marine aquaculture, at least in Romania. The process must speed-up.

#### **Strategic Joint Action 5.1.**

- need good knowledge but also to make a link with industry to identify how it can meet the business needs. to be considered under WP7 for Bridges BS for instance
- important for medicine and food
- Smart specialization platform on the sustainable blue economy, CMA, EU Algae Communication "Towards a strong and sustainable EU algae sector" can be added in policy/programmes. I3 Instrument in funding opportunity.
- Better fundamental understanding the chemical ecology and ecosystem physiology will help to identify candidate species most suitable for novel biotechnological products. Existing knowledge on this can be used as a basis.
- Research on overcoming challenges relating to the sustainable biomass supply of target species is also important.
- Recommend to consult the Strategic Research Agenda for Oceans and Human Health in Europe: <https://sophie2020.eu/strategic-research-agenda/>
- Conservation of the Black Sea coastal habitats.
- In our opinion, this Strategic Joint Action is determined by the high cost of conducting relevant analyses to determine the candidate species and habitats, that support bioactive compounds.

- Less developed but with huge importance
- More research is needed thus more funds. The expertise in the field is not so high, thus funds are also needed for capacity-building, dedicated infrastructure, etc.
- The bottleneck would be the necessity to use research cruises.
- Depending on the involvement of the countries in the region.
- An interdisciplinary approach should be more effective, connecting results from different points of view (oceanographic, geochemical, physical, environmental).

### **Strategic Joint Action 5.2.**

- good to make a link with industry to identify how it can meet the business needs. to be considered under WP7 for Bridges BS for instance
- Algae bloom events are sporadic and not extensive as frequency and intensity
- Smart specialization platform on the sustainable blue economy, EU Algae Communication "Towards a strong and sustainable EU algae sector" can be added in policy/programmes. I3 Instrument in funding opportunity.
- Implement Harmful Algal Blume (HAB) monitoring measures (in situ and remote sensing).
- To prioritise - due to lack of knowledge.
- Attempts to obtain biofuels for algae were carried out but without significant success. But performing a Feasibility study is feasible, but not very relevant.
- Requires long-time investments.

### **Strategic Joint Action 6.1.**

- but also the impacts on the blue economy activities (tourism, fisheries, aquaculture)
- Mission Adaptation (you cited it for other SJAs before), also a funding opportunity. As policy you can also cite the EU Climate Adaptation Strategy (2021) [https://climate.ec.europa.eu/eu-action/adaptation-climate-change/eu-adaptation-strategy\\_en](https://climate.ec.europa.eu/eu-action/adaptation-climate-change/eu-adaptation-strategy_en), and also mention Smart specialization platform on the sustainable blue economy. I3 could be again a funding opportunity.
- need for available modelling tools on this, establishing SoS (System of System) for data sharing with decision makers in charge with management and adaptation plans (see DOORS outcomes)
- There may be relevant data gaps
- It will be important for research to be transdisciplinary and focus on the full social-ecological system and site-specific feasibility of nature-based solutions.
- Regarding the adaptation of coastal communities, Cinner et al. (2018) identify 5 factors that contribute to building adaptive capacity of coastal communities. These are highlighted as key to adaptation in the EMB coastal resilience Position Paper that will be published in October 2023 <https://www.marineboard.eu/coastal-resilience>.
- Inventory of coastal hazards around the Black Sea., create digital map of coastal hazards.
- Establish system of coastal indicators, regional and national reporting.
- Use of sea level gauging stations & stationary & underway FerryBox systems between all countries. Models will help for this as well very much.

### **Strategic Joint Action 6.2.**

- Smart specialization platform on the sustainable blue economy, can be added. I3 again in funding opportunity.
- further improve the use of available EO products to support this action.
- Including the term viable biotechnological applications would be of interest
- The focus on this text is only on the risks posed by the Ocean to humans but in other oceans and human health work, we also look at the risk posed by humans to the Ocean, as well as the positive influences (ecotourism, blue gym effect etc) that they can both have on each other – would be useful to also complete the loop and include these aspects. Recommend to consult the Strategic Research Agenda for Oceans and Human Health in Europe: <https://sophie2020.eu/strategic-research-agenda/>
- The action is very feasible, actually this kind of studies have been carried out. The relevance is directly linked with the outputs of studies.
- When at the surface, these blooms may be best observed from space, but this may be difficult with EELS, and also, some of them take place underwater (jelly blooms), which requires research cruises. Also, in-situ cameras can help, but are very expensive.
- The problem is of highest importance, especially considering the global climate changes. This is still a huge gap of knowledge for the Black Sea.

### **Strategic Joint Action 6.3.**

- Spreading of pathogens directly and indirectly mediated by marine life
- Very important in the context of the actual war
- WFD is also relevant here, and CMA
- Even partial approaches would help
- Currently, only distance research methods and sampling in coastal waters are possible for Ukrainian part, and for comprehensive assessment requires research cruises, which will be possible only after the end of war invasion.
- This is the most important topic for Ukraine, which suffers from the war with Russian Federation.
- Less feasible at Black Sea scale due to war conditions.
- Please also include bottom trawling activities and their impact of biota. These may not be so well regulated, but should have a significant effect on the ecosystem. Also, important to look at ship traffic impacts on the Black Sea ecosystems (ballast waters, gray water discharge).
- The process will be longer than the proposed time-frame, and needs to be carefully considered by the Ministry of Environment in close cooperation with the Ministry of Defence.
- Common comment 6.1-6.3: also, these are strictly connected. I suggest to take into consideration other processes affecting these ones. Again, the geo-hazards that can affect the coasts are important to be considered.

### **Strategic Joint Action 7.1.**

- in the follow up of the on-going actions
- The number of such initiatives is increasing
- Some ENI CBC Black Sea Basin Projects are dealing with monitoring of marine litter. It could be an option to refer to them as well in Theme 7. INTERREG NEXT BS funding opportunity for 7.1.

- It may be better to give this sort of action a broader approach, increasing awareness on other marine relevant topics and yes, not only looking at problems but also spreading knowledge on possible solutions
- Raising awareness to the general public is very important but far from sufficient to tackle the marine litter issue. It is crucial to target the industry, raise awareness and train the business community on Circular Economy. Demonstrate and replicate existing innovations targeting the fishery and tourism sectors.
- Could connect with EMBracing the Ocean artist Lera Litvinova who is working on raising awareness of black sea pollution to the general public through her art projects, also looking at the impacts of war <https://www.marineboard.eu/lera-litvinova>
- Applying Black Sea Catchment Observation System for modelling streams of waste/litter from land based and riverine sources flowing into the Black Sea and to quantify marine/beach litter.
- Implement Fishing for Litter scheme in the Black Sea countries e.g., Turkey-Georgia-Ukraine pilot.
- Develop waste management campaign covering rivers and catchments in the Black Sea.
- Develop beach clean-up campaigns and counts programme for all 6 countries, reporting to EU Marine Litter Watch Portal.
- Implement bathing water pollution monitoring for all public beaches.
- Establish national Blue Flag or equivalent beach and bathing water rating schemes.
- BSEC can support in this regard
- Most active experts, including young people, are involved in the fight against Russian aggression - as a volunteer or as a military...
- To increase the relevance, the targeted public should be expanded to maritime transport, port operations, tourism, energy operators.
- Possible with SJA 1.2 as feedback

### **Strategic Joint Action 7.2.**

- link with Mediterranean Sea, but also with Danube lighthouse
- Involve the business community, and representative of the general public
- We suggest to connect Artur Palacz (IOCCP), also in EuroSea, as they have developed a lot of things on this regard at international level, and they are developing a proposal for this to become an EO.V.
- BSEC can support in this regard
- Very relevant action, feasible, but most important this Action Forum to be kept active and promoted to all countries in the region.
- Possible with SJA 1.2 as feedback

### **Strategic Joint Action 8.1.**

- interest to be confirmed regarding the Black Sea specificities to be demonstrated before launching a pilot. there are already existing solutions which could be ready for the Black Sea energy market. to be included in any MSP actions.
- Include the EU Offshore renewable energy strategy (2020) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0741> MSP Directive is also an important policy element, Smart



specialization platform on the sustainable blue economy. BlueInvest, I3 Instrument as funding opportunities.

- Establishing pilot areas at sea may be "easily" feasible and low cost. It would be considered to encompass this effort with the promotion of local developments and skills development
- Is offshore solar is also of relevance for the Black Sea? Also, a combined device is only as advanced as the least advanced part – and wind is far more advanced than wave – perhaps an initial demonstrator should be wind only before they complicate it by combining with wave.
- Hydrogen generation from biofuels is mentioned but you could also use the renewable energy generated offshore to generate hydrogen as this could be a way to have less demand for infrastructure to bring power back to shore and get it into the grid. Also need to consider not just social acceptability, but wider social impacts of ensuring a suitable supply chain of goods and services to enable renewable energy to be deployed and used in the region.
- Recommend to keep an eye out for the EMB Future Science Brief on Offshore Renewable Energy to be published on 4 April 2023 <https://www.marineboard.eu/marine-renewable-energy-WG>
- In this way an EIA-like study could be included.
- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea - hazard to any scientific & economic activity.
- This is VERY important action, to provide energy independence for the Black Sea countries and for pushing technological advancement. Studies need to be done on the impact of such infrastructures on the ecosystems (ex. mixing of waters).

### **Strategic Joint Action 8.2.**

- Focus on identifying real drivers and expected added values of MU Platforms in the area. And then identify and work on barriers and enablers.
- interest to be confirmed regarding the Black Sea specificities to be demonstrated before launching a pilot. there are already existing solutions and pilots which could be relevant for the Black Sea (cf UNITED Project). to be included in any MSP actions
- Offshore Renewable Energy Strategy, Smart specialization platform on the sustainable blue economy, Communication on the Energy Transition of the EU Fisheries and Aquaculture sector in policy/programmes. BlueInvest, I3 instrument in funding opportunity.
- Not too confident about the multi-purpose approach
- Carbon capture as marine geoengineering solution might be implicated in manipulating natural processes.
- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea.
- The action is not defined very clearly. Basically, the idea is good, but should be adjusted.
- This could disturb protected regions.
- I like the multi-use offshore platforms to enhance results and sharing the benefits. Why solutions about geothermal issues (such as energy and minerals sources) are not considered at all?

### **Strategic Joint Action 9.1.**

- Need focus on cost effective solutions and distributed systems using autonomous devices and link with data validation and access

- pivotal with its integrative component - good to see how Russian waters will be monitored to have the full scope.
- Recommend to consult the EMB Policy Brief on 'Sustaining in situ Ocean observations in the age of the digital ocean' for an overview of the investments needed for transformation and sustainability of observing systems.
- Establishment of stationary research stations in the Black Sea waters within the borders of each Black Sea country.
- Monitoring of bathing water quality (microbiological indicators) for the development of safe recreational tourism.
- Establish European marine services national competent node in each country. Initiate training activities as the first step.
- Our organization and its experts can join the development of the integrated joint observing system", and can take part in the regular sea expeditions (but not on the Ukrainian territory).
- Priority for Ukraine
- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea.
- Ship opportunity for monitoring/observations and unused offshore platforms as possible fixed observing platforms.
- This will answer other Action Plans and is definitely beneficial for all partners. Please consider including FerryBox technology.
- Observing System is definitely both relevant and feasible, but regular expeditions most probably will be sparse and fragmented.
- This action is in close correlation with A1.1 and A2.2
- Collaboration with EMSO ERIC and EMODNET should be included.
- The fixed and mobile platforms are complementary tools to enhance the knowledge of the oceans. EMSO ERIC is missing. EMSO is already present in Romanian waters (Romania is one of the EMSO members) and thru an Interreg project in some extent Bulgaria. Other countries around Black Sea can join, breaking barriers and extending the monitoring systems.

### **Strategic Joint Action 9.2.**

- I suppose observatories will operate with observing systems closely
- Interreg NEXT Black Sea Basin cannot support infrastructure projects as such, rather soft measures.
- Add European marine infrastructure.
- Implement ferry-box equivalents on fishing vessels (joint pilot by Turkey and Georgia).
- Easy to implement
- FerryBox mobile component could contribute to the Joint Action.
- I am not sure that glider deployment can add knowledge on the Black Sea potential to support Blue Growth.
- Fixed- platforms are not only buoys but also seafloor observatories, looking at the ocean as a 4D dimension from the surface along with the water column to seafloor and sub-seafloor (the variability in time is fundamental).

### **Strategic Joint Action 10.1.**

- fully in line with the CMA and its SG decision
- It depends on the available funding support, because the added value is not so evident (my subjective point))
- Potential Black Sea CMA Underwater Heritage Working Group, as this is not yet established, proposal to relaunch work for its activation at CMA later. In funding opportunities: add as well EMFAF, Creative Europe 2021-2027 European cooperation projects (Cultural heritage)
- It may be costly. A step wise approach could help encompassed with valorising strategies
- Recommend to consult the EMB Position Paper on 'Land beneath the waves: submerged landscapes and sea level change' which provides recommendations for the scientific field termed 'European Continental Shelf Prehistoric Research'.
- It is recommended also for increase of the attractivity of Black Sea for tourists.
- Difficult or even impossible during Russian aggression in Ukraine and the Black Sea.
- This action should be done in coordination / cooperation with Ministries of Culture. The combination of UCH with tourism should be promoted, but in a sustainable way.
- Depends also on the involvement of Ministry of Culture.

### **Strategic Joint Action 10.2.**

- good to keep in mind the protection when opening to public - link with marine protected areas
- In this theme I think will be needed to connect respective entities, (heritage) (Directorate/Unit of EC)
- Potential Black Sea CMA Underwater Heritage Working Group. Delete INTERREG NEXT BSB 2021-2027, as not really fitting in the new programme's objectives. Add EMFAF, Creative Europe 2021-2027 European cooperation projects (Cultural heritage)
- Sustainable tourism models are essential but challenging to manage under real sustainability criteria
- Establishing means of control and supervision
- First the Ukrainian shore should be free from mines, and the sea - from Russian underwater marine mines.
- Sounds like a good (business?) model, looking ahead.

### **Strategic Joint Action 11.1.**

- Including monitoring and evaluation of actions, through narratives and KPIs
- Engage other regional and basin scale initiatives to harmonise strategic actions
- link with ongoing actions Bridges BS and DOORS for instance but also beyond the Black Sea to ensure the liaison with other sea basins to develop synergies and share practices
- Outcomes from implementation of nowadays strategy must serve an input material for the next ones
- Replace DG MARE Sea Basin Assistance Mechanism with CMA. Put EMFAF calls instead of DG MARE calls
- refer to KTT (Knowledge Transfer and Training) work programme of DOORS Project to plan joint actions to be further developed
- Coordinate efforts, keep track on what is going on, assess impact and readdress priorities could go first than setting new ones
- Networking with other European (Med, Baltic) and global sea basins (UNEP regional seas)
- BSEC can support in this regard
- Good forward thinking for sustained SRIA.
- Role of SBEP contact nodes to support the legacy.

- It's a bit vague - what kind of mechanism? How will these mechanisms ensure stakeholder engagement and interest? At least it needs to be rephrased to be clearer as to know who/why/how these mechanisms will work and who will be involved.
- To work together with other stakeholder categories (such as industry).

### **Strategic Joint Action 11.2.**

- The challenge here not that much in building communities of practice, but to make them concrete, effective, influential in policy-making and decision-making processes at different scales. Through well designed and continuous mechanisms.
- good to keep the link with decision makers at national and sea-basin levels (link with CMA)
- It will be important to maintain and develop dialog for collaboration of researchers
- Replace DG MARE Sea Basin Assistance Mechanism with CMA.
- make use of MAF (Multi Actor Forum) developed in DOORS
- Long term engagement is difficult also. Suggestion: establish incentives... organise the process to avoid SHs fatigue and share progress and achievements with all. Increase the involvement of social sciences and arts in the process
- There are so many projects happening in the Black Sea at the moment, and there should be somehow a way to ensure that stakeholder engagement for multiple projects do not cause stakeholder fatigue.
- Develop MSP and ICZM planning methodologies for marine basins for coastal zones respectively.
- Preparation of a Guideline for Environmental Impact Assessments (EIA) of maritime and coastal projects for the Black Sea coastal countries.
- Preparation of a Guideline for Strategic Environmental Assessment (SEA) of maritime and coastal plans for the Black Sea coastal countries.
- Develop and adopt coastal legislation and coastal strategies based on regionally agreed model.
- BSEC can support in this regard
- Action is crucial; full involvement of stakeholders' is not easy if they do not see a clear award from their involvement. ERICs are surely more than happy to give support.
- The difficult part is keeping the stakeholders engaged in the long term. So, we need to highlight "what's in it for them" somehow, what's the benefit in their involvement? It's feasible as long as it's carefully planned and managed.
- To enhance and implement the stakeholder engagement is crucial to raise the awareness of people and therefore the pushing of policymakers to continue to support and fund the different initiatives.
- This activity is fundamental and difficult, it needs a continue, dedicated and professional efforts.

### **Strategic Joint Action 12.1.**

- the argumentation is in the use of implemented actions for the society
- Please note and cite that 2023 will be the EU year of skills. Add 2023 European Year of Skills, CMA in policy/programmes. Add INTERREG NEXT BS in funding opportunity and put EMFAF calls instead of DG MARE calls.
- Partnership with schools
- Suggest to look into art-science collaboration projects for citizen engagement.
- Establish national program supporting Black Sea Day activities.

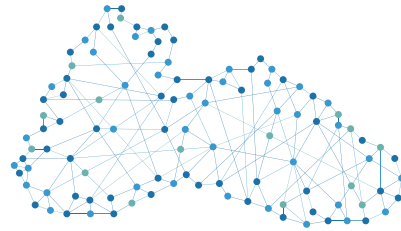
- Establish lifelong training and vocational education of professionals in ICZM, MSP and blue economy at leading universities in each Black Sea country.
- Absolutely relevant and probably ... support of it is developed in a full ... context.
- Synergy with SBEP
- The big problem/question is how to engage those who will not participate in the "learning by doing" activities? Maybe virtual reality games/platforms? or some sort of educational platform available to the general public that is both fun and educational. Think about the youth: mobile phone users, apps, virtual reality games, etc. & new technologies.
- Very important, strictly connected at least with the previous one. Citizen science is a good way to involve people and increase their awareness of the importance and the added value of the marine research activities.

### **Strategic Joint Action 12.2.**

- I see it as very indicated action, especial - mobility for young researchers, students and teachers from the prospective of development of curricula and study programs in education system. I find all actions very important, so, I scored all with „5”.
- Add 2023 European Year of Skills, CMA in policy/programmes. Add INTERREG NEXT BS in funding opportunity.
- As well as considering blue skills and ocean literacy to enhance public support for the black sea, you will also need a lot of especially skilled people to enable them to develop the different blue economy areas identified in the plan – so some attention should also be given to looking into what skills are needed in the other themes and finding ways to train people in these.
- BSEC can support this activity
- Continuous training and networking for the Black Sea research community is very important.
- Could be even more ambitious with achievement of progress into "Twinning"(?) network - also digital skills should be addressed.
- The training is also an essential tool to increase the awareness and the beauty to dedicate working efforts to these activities. In some extend, to build up young generation open-mind researchers-technologists-technicians.

## ANNEX 2 FINAL BLACK SEA SRIA IMPLEMENTATION PLAN

See the document below.



CONNECT  BLACK SEA

Coordination of Marine and Maritime Research and Innovation in the Black Sea

# BLACK SEA STRATEGIC RESEARCH AND INNOVATION AGENDA IMPLEMENTATION PLAN



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 860055.

# ACKNOWLEDGEMENT

## AUTHORS

Inputs were collected by the Black Sea CONNECT Coordination and Support Action partners and the members of the SRIA Operational Network of Funders. The final collation, integration and editing of the expert group inputs at all stages of the Black Sea SRIA Implementation Plan were performed by Prof. Dr. Barış Salihoğlu, Prof. Dr. Mustafa Yücel, and Zehra Pınar Uygurer.

## LAYOUT DESIGN AND GRAPHICS

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## BLACK SEA STRATEGIC RESEARCH AND INNOVATION AGENDA AND ITS IMPLEMENTATION PLAN

With the support of the European Commission, a working group of experts from countries bordering the Black Sea gathered in 2017 to develop a shared agenda for research and innovation for the Black Sea and provide guidance to national and EU policymakers. The group collaborated with marine experts from top European marine institutes and organizations and produced the Burgas Vision Paper, the key framework document for a shared vision of a productive, healthy, resilient, sustainable, and better valued Black Sea by 2030. The publication was introduced at the 2018 European Maritime Day in Burgas, Bulgaria (May 2018). It addresses the key pillars on which the Black Sea Strategic Research and Innovation Agenda (SRIA) is built on. The Ministerial Declaration towards a Common Maritime Agenda for the Black Sea (2019), endorsed by the same Black Sea countries, provided more backing for this approach and the context for its implementation. The Horizon 2020 Programme provided funding for the “Coordination of Marine and Maritime Research and Innovation in the Black Sea - Black Sea CONNECT” Coordination and Support Action (CSA) in 2019.

Creating a responsible and effective SRIA Implementation Plan based on the essential framework requirements to translate SRIA outputs into actions in collaboration with national research funders and key stakeholders is one of the goals of the Black Sea CONNECT CSA. To do so, national level SRIA consultations were held in the Black Sea countries in the second half of 2020. These consultations provided direct input to the SRIA and its Implementation Plan with regard to country level goals and priorities. In order to ensure the involvement of funding agencies and ministries from Black Sea countries, a network called the Operational Network of Funders has also been established.

Its goal is to strengthen regional cooperation among public research funders and facilitate the alignment of national priorities (such as research and innovation strategies) and prepare the ground for the focused funding of strategic joint actions to address the key challenges and goals of the SRIA. The Operational Network of Funders will provide easy contact for strategic joint actions with other relevant EU, national or regional initiatives.

The 1st Draft of the Implementation Plan was developed using input from the Operational Network of Funders in addition to national-level input gathered through the consultations. This was further complemented by input from European and regional level priorities and policies like the European Green Deal, EU Mission: Mission Restore our Ocean and Waters, Sustainable Blue Economy Partnership, and UN Decade of Ocean Science. Based on this initial draft, the second round of national and international SRIA consultations was held, and the results are incorporated into the Final SRIA and its Implementation Plan.

The Final SRIA and the Implementation Plan aim to set the foundational work for protecting the unique habitats of the Black Sea while supporting the development of sea-based sectors, which will then boost the blue economy and help create more jobs. The SRIA and its Implementation Plan will direct participants from academia, funding organizations, industry, policy, and society to address the fundamental challenges of the Black Sea, to promote the blue economy, build vital support systems and innovative research infrastructure, enhance education, and build capacity. The Implementation Plan will be a long-lasting guide to catalyse new ideas and innovations towards and with the Black Sea community and beyond with adjacent regions, actors and instruments.



# BLACK SEA SRIA MAIN GOALS

## **SRIA PILLAR 1: ADDRESSING FUNDAMENTAL BLACK SEA RESEARCH CHALLENGES**

### **MAIN GOAL 1**

Developing innovative multi-disciplinary research, building on existing initiatives, including data-sharing mechanisms that will generate the knowledge needed to increase ecosystem resilience.

### **MAIN GOAL 2**

Providing new knowledge to mitigate the impacts of global climate change and the multiple environmental and anthropogenic stressors in the Black Sea from the land-sea interface to the deep basin.

## **SRIA PILLAR 2: DEVELOPING INNOVATION, SOLUTIONS, AND CLUSTERS UNDERPINNING A SUSTAINABLE BLACK SEA BLUE ECONOMY**

### **MAIN GOAL 1**

Supporting marine and maritime research and innovation domains of all the Black Sea countries to create synergy, increase economic benefits, and reduce hazards in service of prospering, resilient and empowered communities deriving interest from the Black Sea basin.

### **MAIN GOAL 2**

Creating incentives for maritime innovation in existing and new, emerging blue economy sectors.

## **SRIA PILLAR 3: BUILDING OF CRITICAL SUPPORT SYSTEMS AND INFRASTRUCTURES FOR THE BENEFIT OF BLACK SEA COMMUNITIES**

### **MAIN GOAL 1**

Developing smart, integrated observing and monitoring systems in support of addressing scientific and socioeconomic challenges of the Black Sea, towards governance for a sustainable ecosystem, mitigation of climate change impacts, and accurate forecasting for adaptive management.

### **MAIN GOAL 2**

Advancing a harmonised set of working methodologies, standards and procedures on all aspects of coastal and marine research.

### **MAIN GOAL 3**

Developing new marine-based technologies by benefiting from the fourth industrial revolution for the Black Sea to promote the safe and sustainable economic growth of the marine and maritime sectors and the conservation and valorisation of marine cultural heritage.

### **MAIN GOAL 4**

Mechanisms to create, support and promote start-ups oriented towards the circular and blue economy in the Black Sea region.

## **SRIA PILLAR 4: EDUCATION AND CAPACITY BUILDING**

### **MAIN GOAL 1**

Supporting formal and informal learning, education, training and use of knowledge and technologies for established and emerging marine and maritime jobs.

### **MAIN GOAL 2**

Empowering ocean-engaged citizens contributing to a clean, plastic-free, healthy and productive Black Sea.

### **MAIN GOAL 3**

Contributing to enhanced science policy dialogue in formulating coastal and marine policies and programmes.

# BLACK SEA SRIA IMPLEMENTATION PLAN



**THEME 1: DIGITAL TWIN OF THE BLACK SEA**



**THEME 2: EFFECT OF MULTIPLE STRESSORS ON THE BLACK SEA ECOSYSTEM**



**THEME 3: CHANGING BLACK SEA BIODIVERSITY AND ECOSYSTEM RESILIENCE UNDER CLIMATE CHANGE AND MULTISTRESSORS**



**THEME 4: ECOSYSTEM BASED FISHERIES, HIGH-TECH AQUA- AND MARICULTURE**



**THEME 5: BLUE BIOTECHNOLOGY**



**THEME 6: ONE HEALTH APPROACH AND IMPROVED SAFETY FOR BLACK SEA COASTS**



**THEME 7: MARINE LITTER**



**THEME 8: MARINE RENEWABLE ENERGY**



**THEME 9: INNOVATIVE OBSERVING SYSTEMS**



**THEME 10: BLACK SEA UNDERWATER AND COASTAL HERITAGE**




**THEME 11: INNOVATIVE APPROACHES TO CONNECT SCIENTISTS, POLICYMAKERS, INDUSTRY AND SOCIETY**



**THEME 12: BLUE SKILLS AND CAPACITY BUILDING ON MARINE SCIENCES**

CORRESPONDING PILLAR:

 SRIA PILLAR 1: ADDRESSING FUNDAMENTAL BLACK SEA RESEARCH CHALLENGES

 SRIA PILLAR 2: DEVELOPING INNOVATION, SOLUTIONS, AND CLUSTERS UNDERPINNING A SUSTAINABLE BLACK SEA BLUE ECONOMY

 SRIA PILLAR 3: BUILDING OF CRITICAL SUPPORT SYSTEMS AND INFRASTRUCTURES FOR THE BENEFIT OF BLACK SEA COMMUNITIES

 SRIA PILLAR 4: EDUCATION AND CAPACITY BUILDING

# BLACK SEA SRIA IMPLEMENTATION PLAN



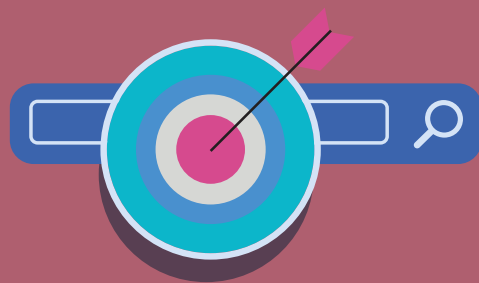
**THEME 1: DIGITAL TWIN OF THE BLACK SEA**



**THEME 2: EFFECT OF MULTIPLE STRESSORS ON THE BLACK SEA ECOSYSTEM**



**THEME 3: CHANGING BLACK SEA BIODIVERSITY AND ECOSYSTEM RESILIENCE UNDER CLIMATE CHANGE AND MULTISTRESSORS**






**LINKED TO SRIA PILLAR 1:  
ADDRESSING FUNDAMENTAL  
BLACK SEA RESEARCH CHALLENGES**



## THEME 1: DIGITAL TWIN OF THE BLACK SEA

LINKED TO SRIA PILLAR 1

The Digital Twin of the Black Sea will consist of real-time information from available database systems, high-resolution models of the sea and the Black Sea watershed supported by artificial intelligence tools and socio-economic models. The Digital Twin will further our understanding of the Black Sea ecosystem, help predict its state under changing climate and environmental stressors, test alternative socio-economic scenarios, and support decision-making. A Black Sea-specific ocean observing system should fundamentally support data sharing among participants and further contribute to the handling and management of Digital Twin of the Black Sea.

STRATEGIC JOINT ACTION				
<b>1.1</b>	<b>Develop the Digital Twin of the Black Sea, building on innovative models at regional and basin-scale that simulate climate change and multiple stressors and integrating them with socioeconomic trends, blue economy scenarios and system of systems approaches</b>	3-5 Years	EU Mission: Mission Restore our Ocean and Waters, EU Mission: Adaptation to Climate Change, Space Strategy for Europe, UN SDG13 Climate Action, Smart Specialisation Strategies, Common Maritime Agenda for the Black Sea (CMA), Türkiye's Climate Council Decisions, Romanian National Plan for Research and Innovation IV	EU Mission: Mission Restore our Ocean and Waters, Horizon Europe Sustainable Blue Economy Partnership, Horizon Europe Cluster 6, INTERREG NEXT BSB 2021-2027, Marine Ecosystem and Climate Research Center - DEKOSIM (Türkiye), European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Interregional Innovation Investments (I3) Instrument, European Digital Twin of the Ocean (European DTO), Copernicus Marine Environment Monitoring Service (CMEMS), Relevant Ministries and Agencies from the Black Sea Countries, DANUBIUS-RI, H2020 DOORS
<b>1.2</b>	<b>Advance AI-powered decision support tools (DSTs) for ecosystem based management in the Black Sea</b>	3-5 Years	EU Mission: Mission Restore our Ocean and Waters, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, UN SDG14 Life Below Water	EU Mission: Mission Restore our Ocean and Waters, Horizon Europe Sustainable Blue Economy Partnership, Relevant Ministries and Agencies from the Black Sea Countries



## THEME 2: EFFECT OF MULTIPLE STRESSORS ON THE BLACK SEA ECOSYSTEM

LINKED TO SRIA PILLAR 1

Forecasting how changes will affect the Black Sea environment and its services is only possible by understanding the impact of various stressors on the ecosystem. Studies tend to concentrate on understanding the individual effects of various stressors, such as climate change, fisheries, invasive species, and pollution, despite the fact that these stressors often interact with one another (such as fisheries and invasive species) or have difficult-to-distinguish and complicated dynamics (such as climate change and deoxygenation) in the wider context of the special Black Sea unique genesis, evolution and characteristics. The H2020-funded BRIDGE-BS project's efforts to understand the effects of various stressors present difficulties and knowledge gaps regarding the synergistic and isolated effects of the stressors, highlighting the need for additional research on developing new tools and investigations to close the knowledge gaps.

### STRATEGIC JOINT ACTION



**2.1 Organize synoptic/joint oceanographic expeditions to identify synergistic and individual effects of each stressor (such as climate change, deoxygenation, acidification, sulphide build-up) on the entire ecosystem, from coasts to the deep parts, covering also sea floor processes.**

1-3 Years

EU Marine Strategy Framework Directive (MSFD), EU Mission: Mission Restore our Ocean and Waters, UN SDG13 Climate Action, UN SDG14 Life Below Water

Horizon Europe, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Joint cruise H2020 BRIDGE-BS & H2020 DOORS is a first step, EUROLLEETS, other R/Vs of countries, Marine Ecosystem and Climate Research Center - DEKOSIM (Türkiye), Relevant Ministries and Agencies from the Black Sea Countries

**2.2 Develop a source-to-sink (and river-to-sea) pilot study to identify the fluxes, transformation and impact of emerging contaminants (such as pharmaceuticals, antibiotics, anthropogenic nanoparticles) and identify hazards arising from their multiple biotic impacts on the marine ecosystem**

3-5 Years

EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), EU Mission: Mission Restore our Ocean and Waters, UN SDG14 Life Below Water, The European Green Deal, EU Action Plan: "Towards Zero Pollution for Air, Water and Soil", EU One Health Action Plan

National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, DANUBIUS RI, Relevant Ministries and Agencies from the Black Sea Countries



## THEME 3: CHANGING BLACK SEA BIODIVERSITY AND ECOSYSTEM RESILIENCE UNDER CLIMATE CHANGE AND MULTISTRESSORS

LINKED TO SRIA PILLAR 1

Studying an ecosystem's biodiversity is important, however, how changing environmental conditions affect an ecosystem's resilience also needs to be understood. To understand how biodiversity influences an ecosystem's health, production, and resistance to stresses, there is a need for novel, thorough, faster, and less expensive methods of mapping biodiversity. One of the subjects covered by recent research (such as BRIDGE-BS project) is understanding the Black Sea ecosystem's adaptability in the past and future. However, there are still important gaps in assessing the resilience of the ecosystems. New methods such as e-DNA, acoustic, optical and chemical sensing and data are required to understand the resilience of the ecosystems better, as well as how biodiversity is affected by changes. Efforts should be integrated for mapping biodiversity with those for ecosystem dependency assessment.

### STRATEGIC JOINT ACTION

**3.1 Cost-effective mapping of the Black Sea biodiversity via emerging tools (such as e-DNA) at genetic, species and ecosystem levels**



3-5 Years



EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), EU Birds and Habitats Directives (EU Nature Directives), EU Biodiversity Strategy, Global Environment Facility (GEF)/United Nations Development Programme (UNDP)/UNESCO Black Sea Ecosystem Based Management (EBM) projects/initiatives, FAO Climate Change Programmes, The new Sustainable Blue Economy approach in the EU, The European Green Deal, UN SDG14 Life Below Water



National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Relevant Ministries and Agencies from the Black Sea Countries

**3.2 Uncover the extent of invasive species in the Black Sea and developing tools to forecast their impact in the context of the Black Sea multiple stressors as a basis for prevention, mitigation and adaptation policies**

5-7 Years

EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), EU Biodiversity Strategy, Global Environment Facility (GEF)/United Nations Development Programme (UNDP)/UNESCO Black Sea Ecosystem-Based Management (EBM) projects/initiatives, FAO Climate Change programmes, The new Sustainable Blue Economy approach in the EU, The European Green Deal

National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Relevant Ministries and Agencies from the Black Sea Countries



# BLACK SEA SRIA IMPLEMENTATION PLAN



**THEME 4: ECOSYSTEM BASED FISHERIES, HIGH-TECH AQUA- AND MARICULTURE**



**THEME 5: BLUE BIOTECHNOLOGY**



**THEME 6: ONE HEALTH APPROACH AND IMPROVED SAFETY FOR BLACK SEA COASTS**



**THEME 7: MARINE LITTER**



**THEME 8: MARINE RENEWABLE ENERGY**

**LINKED TO SRIA PILLAR 2:  
DEVELOPING INNOVATION, SOLUTIONS,  
AND CLUSTERS UNDERPINNING A  
SUSTAINABLE BLACK SEA BLUE ECONOMY**








## THEME 4: ECOSYSTEM BASED FISHERIES, HIGH-TECH AQUA- AND MARICULTURE

LINKED TO SRIA PILLAR 2

The study of fish stocks has dominated Black Sea fisheries science, but a more comprehensive understanding of the environment, in which fish populations play a key role, is needed. It is crucial to have a better understanding of the fish biomass and how fisheries interact across the different fish populations. Research focuses on how fisheries affect the target species. However, there is a need to understand the effect of fisheries on the overall ecosystem and the primary production of the Black Sea. Focusing on understanding fish production zones and expanding the Black Sea's extremely small protected areas is important since attaining sustainable fisheries is a hotly debated topic. These will be the first steps toward ecosystem-based fisheries, which is a poorly understood and unaddressed notion. Alternative methods of utilizing proteins and other nutritional products from the sea need to be researched while Europe aims towards zero carbon practices.

### STRATEGIC JOINT ACTION




			
<b>4.1 Determine and validate of fish productivity zones and protected areas in the Black Sea using ecosystem-based approaches involving multi-actor platforms including artisanal (traditional) fisheries towards a basin wide network of complementary traditional fisheries and mariculture</b>	3-5 Years	EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), EU Birds and Habitats Directives (EU Nature Directives), EU Maritime Spatial Planning Directive, The European Green Deal, Smart Specialization Strategies, GEF/UNDP/FAO/GFCM Black Sea Fisheries projects/initiatives, UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Common Maritime Agenda for the Black Sea (CMA), Fisheries and Oceans Package (Action Plan: Protecting and Restoring Marine Ecosystems for Sustainable and Resilient Fisheries)	National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, ANPA (National Agency for Fisheries and Aquaculture, Romania), European Sustainable Blue Economy Partnership, Relevant Ministries and Agencies from the Black Sea Countries
<b>4.2 Develop carbon-neutral sustainable mariculture in the Black Sea, including supporting related research in alternative carbon-neutral protein sources</b>	5-7 Years	GEF/UNDP/FAO/GFCM Black Sea Fisheries projects/initiatives, The European Green Deal, EU Marine Strategy Framework Directive (MSFD), Smart Specialization Strategies, The European Sustainable Blue Economy, UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Common Maritime Agenda for the Black Sea (CMA), The EU Algae Initiative, Fisheries and Oceans Package (Action Plan: Protecting and Restoring Marine Ecosystems for Sustainable and Resilient Fisheries)	National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, ANPA (National Agency for Fisheries and Aquaculture, Romania), Romanian National Plan for Research and Innovation IV, Interregional Innovation Investments (I3) Instrument, Relevant Ministries and Agencies from the Black Sea Countries



## THEME 5: BLUE BIOTECHNOLOGY

LINKED TO SRIA PILLAR 2

Marine waters include rich multicellular but also microbial biodiversity much of which is under-documented. This situation is further amplified in the Black Sea. Much of the basin has a unique biogeochemical structure, rendering this system as a habitat for anaerobic microorganisms and extreme eukaryotes. These organisms represent a large potential for new bio-inspired products and solutions. Besides, the productive surface waters of the Black Sea result in seasonal algal blooms which can further be cultivated for potential fuel and protein products. The strategic joint actions in this theme will emphasize the documentation and sustainable use of this potential. They will be implemented with an interdisciplinary approach, connecting results from different points of view (oceanographic, geochemical, physical, and environmental processes).

			
STRATEGIC JOINT ACTION			
<p><b>5.1 Establish a knowledge system of candidate species and habitats that support bioactive compounds, such as novel pharmaceuticals, biofuels, enzymes, fishmeal, and biopolymers, for sustainable development and food security in the region</b></p>	<p>1-3 Years</p>	<p>The European Green Deal, EU Bioeconomy Strategy, UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Smart Specialization Strategies, Common Maritime Agenda for the Black Sea (CMA), The EU Algae Initiative</p>	<p>National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, European Marine Biology Resource Centre (EMBRC), LifeWatch ERIC, Interregional Innovation Investments (I3) Instrument, Scientific and Technological Research Council of Türkiye (TÜBİTAK), Relevant Ministries and Agencies from the Black Sea Countries, Shota Rustaveli National Science Foundation of Georgia (SRNSFG)</p>
<p><b>5.2 Transform hazards into resources: performing a feasibility study on the role of algae as biofuels, alternative protein sources and other natural products of the second generation</b></p>	<p>3-5 Years</p>	<p>EU Mission: Mission Restore our Ocean and Waters, The European Green Deal, Common Maritime Agenda for the Black Sea (CMA), The European Circular Economy Action Plan, Türkiye's Climate Council Decisions, EU Bioeconomy Strategy, UN SDG2 Zero Hunger and SDG12 Responsible Consumption and Production, Smart Specialization Strategies, The EU Algae Initiative</p>	<p>Horizon Europe, Romanian National Plan for Research and Innovation IV, National Science Fund - Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Interregional Innovation Investments (I3) Instrument, Scientific and Technological Research Council of Türkiye (TÜBİTAK), Relevant Ministries and Agencies from the Black Sea Countries</p>






## THEME 6: ONE HEALTH APPROACH AND IMPROVED SAFETY FOR BLACK SEA COASTS

LINKED TO SRIA PILLAR 2

Adopting the One Health Approach to marine systems, this implementation theme will emphasize that the health and well-being of coastal populations cannot be separated from the resilience and health of the marine and coastal ecosystems. This theme will link the broad range of science and innovation included in the Implementation Plan with the health and well-being of communities and citizens living around the Black Sea. In this approach, the increasing frequency of climate-driven extreme events and the potential risk of marine geohazards (submarine landslides, earthquakes) will be considered along with disruptive activities affecting the resilience of coastal communities - including socioeconomic and psychological angles. The COVID-19 Pandemic was a sharp demonstration of the need for such an approach. The assessment of the impact of COVID-19 on the Black Sea ecosystem, long term and episodic (storm-related) sea level rise and coastal floods, estimation of geohazard-related coastal risks, impact of pollution accidents, impact of armed conflict related activities (effects of ammunition, noise and episodic pollution events - unexploded ordnance), development of remote detection of shipwrecks with leaking chemicals, estimation of free-floating hazards such as mines are all current disruptive events in the Black Sea. Available monitoring, research and innovation tools need to be mobilized to better understand and predict these disruptive hazards for the well-being of citizens.

### STRATEGIC JOINT ACTION

			
<b>6.1 Investigate the long term and episodic (extreme weather event and geohazard-related) changes related to marine heatwaves, sea level rise and coastal floods with associated impacts and adaptations including social aspects and nature-based solutions</b>	3-5 Years	EU One Health Action Plan, EU Marine Strategy Framework Directive (MSFD), The European Green Deal, EU Mission: Mission Restore our Ocean and Waters, IOC's International Harmful Algal Bloom (HAB) Programme, UN SDG3 Good Health and Well-being and SDG14 Life Below Water, European Rural Development Policy, Smart Specialization Strategies, EU Climate Adaptation Strategy (2021), WHO One Health Joint Plan of Action	National Science Fund – Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Interregional Innovation Investments (I3) Instrument, EU Climate Adaptation Strategy (2021), Relevant Ministries and Agencies from the Black Sea Countries, EMSO ERIC, DANUBIUS-RI
<b>6.2 Risk assessment of harmful algal bloom (HAB), jelly blooms and mucilage events at the regional level and their impact on ecosystem services, food safety and evaluation of their potential biotechnological applications</b>	1-3 Years	EU One Health Action Plan, EU Marine Strategy Framework Directive (MSFD), The European Green Deal, EU Mission: Mission Restore our Ocean and Waters, IOC's International Harmful Algal Bloom (HAB) Programme, UN SDG3 Good Health and Well-being and SDG14 Life Below Water, Smart Specialization Strategies	National Science Fund – Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, The Scientific and Technological Research Institution of Türkiye, Interregional Innovation Investments (I3) Instrument, Copernicus Marine Environment Monitoring Service (CMEMS), Relevant Ministries and Agencies from the Black Sea Countries
<b>6.3 Identify the ecosystem impact of civil and military disruptive activities (such as hazardous pollution and unexploded ordnance) affecting the resilience of coastal communities, integrating coastal scientific, socioeconomic and psychological angles</b>	3-5 Years	EU Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), The European Green Deal, EU Mission: Mission Restore our Ocean and Waters, Cluster 6 in Horizon Europe UN SDG14 Life Below Water, JPI Ocean Munitions in the Sea, JPI Oceans Underwater Noise in the Marine Environment, Common Maritime Agenda for the Black Sea (CMA), Joint Communication on an Enhanced EU Maritime Security Strategy and its Action Plan	National Science Fund – Ministry of Education and Science Bulgaria, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Horizon Europe, INTERREG NEXT BSB 2021-2027, Romanian National Plan for Research and Innovation IV, Relevant Ministries and Agencies from the Black Sea Countries, EURO ARGO, EMSO ERIC



## THEME 7: MARINE LITTER

LINKED TO SRIA PILLAR 2

Marine litter is a common global challenge that is needed to be tackled with cutting-edge actions and as well as forming a platform of circular economy solutions. Following the mandate of the Marine Litter Action Forum organised under the EU H2020 Black Sea CONNECT in November 2022, the need to address marine litter at the source is of high importance. In addition, information on the distribution and the concentration of marine litter, and especially plastics, in the water column and sediments in the Black Sea is missing.

The Black Sea Marine Litter Action Forum has been established as one Forum to present the actions in place for existing and new initiatives and projects and to best coordinate all efforts for future cutting-edge interactions at different stakeholder groups (such as policy, science, industry and NGOs) on marine litter pollution in the Black Sea. The establishment of the Marine Litter Action Forum as a recurring event will not only facilitate the discussion for decisions needed at the basin level but will leave a legacy in the region, in supporting the proper actions for the reduction, legal obligations and management of marine litter. Recycling, prevention of marine plastic and mitigation options to increase the blue circular economy and fulfil the goals of the European Green Deal will also be explored.

### STRATEGIC JOINT ACTION

**7.1 Raise awareness on the marine litter pollution and solutions in the Black Sea targeting the broader public by linking with already existing initiatives and creating novel activities (such as activities of Black Sea Young Ambassadors and other Early Career Ocean Professionals (ECOPs))**



1-3 Years



EU Mission: Mission Restore our Ocean and Waters, Danube and Mediterranean Lighthouses, The European Green Deal, Common Maritime Agenda for the Black Sea (CMA), EU Strategy for Plastics in a Circular Economy, UN SDG14 Life Below Water, EU Zero Pollution Action Plan, EU Initiative Plastic Pirates Europe, The Convention on the Protection of the Black Sea Against Pollution



Horizon Europe, Romanian National Plan for Research and Innovation IV, INTERREG NEXT BS, Relevant Ministries and Agencies from the Black Sea Countries, Black Sea Economic Cooperation (BSEC), European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, World Bank, Shota Rustaveli National Science Foundation of Georgia (SRNSFG)

**7.2 Enable the Black Sea CONNECT Marine Litter Action Forum as a recurring platform/forum to tackle the pollution crisis with close links to EU Mission: Mission Restore our Ocean and Waters**

3-5 Years

EU Mission: Mission Restore our Ocean and Waters, EU Danube and Mediterranean Lighthouses, The European Strategy for Plastics in a Circular Economy, UN SDG14 Life Below Water, The Convention on the Protection of the Black Sea Against Pollution, The European Green Deal, EU Action Plan: "Towards Zero Pollution for Air, Water and Soil"




Horizon Europe as well as the Sustainable Blue Economy Partnership, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Plastic Producer Associations, Black Sea Economic Cooperation (BSEC), Relevant Ministries and Agencies from the Black Sea Countries



## THEME 8: MARINE RENEWABLE ENERGY

LINKED TO SRIA PILLAR 2

With the European Green Deal, the seas and oceans will have an elevated role in providing grounds for the development of carbon-zero, climate neutral blue and green industries. The seascape, with its abundance of wave and wind energy, will have a large role in the transition to a climate neutral economy. The Black Sea, in previous EU and nationally funded projects, has been shown as of a high potential for offshore wind and wave energy. Now a more robust roadmap and detailed feasibility studies will be needed, but the community will also need to start testing prototype renewable energy solutions that potentially integrate other blue carbon solutions such as macroalgal cultivation and hydrogen generation from biofuels. This theme and the associated Strategic Joint Actions suggest two implementable actions to start tapping the Black Sea's high renewable energy potential.

			
<p><b>8.1</b> <b>Develop an experimental renewable wind and wave energy demonstrator for identifying energy outputs, impact on the ecosystem and economic feasibility and social acceptability</b></p>	<p>3-5 Years</p>	<p>The European Green Deal, The European Circular Economy Action Plan, European Marine Spatial Planning Directive, Türkiye's Climate Council Decisions, Energy Union and the Strategic Energy Technology Plan (SET-Plan), UN SDG7 Affordable and Clean Energy, Offshore Renewable Energy Strategy, Smart Specialization Strategies</p>	<p>Horizon Europe as well as the Horizon Europe Sustainable Blue Economy Partnership, Romanian National Plan for Research and Innovation IV, Horizon Europe European Clean Energy Transition Partnership, BlueInvest, Interregional Innovation Investments (I3) Instrument, Relevant Ministries and Agencies from the Black Sea Countries, Fisheries and Oceans package (Communication from the Commission: On the Energy Transition of the EU Fisheries and Aquaculture sector)</p>
<p><b>8.2</b> <b>Advance the concept, design and feasibility of future multi-use offshore platforms allocating zones for piloting solutions integrating solar energy, green hydrogen production, carbon capture underwater</b></p>	<p>5-7 Years</p>	<p>The European Green Deal, The European Circular Economy Action Plan, Türkiye's Climate Council Decisions, MARINERG-i - ESFRI, UN SDG7 Affordable and Clean Energy, Offshore Renewable Energy Strategy, Smart Specialization Strategies, Fisheries and Oceans package (Communication from the Commission: On the Energy Transition of the EU Fisheries and Aquaculture sector), European Marine Spatial Planning Directive, EU Mission: Mission Restore our Ocean and Waters, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls</p>	<p>Horizon Europe Sustainable Blue Economy Partnership, Romanian National Plan for Research and Innovation IV, Horizon Europe European Clean Energy Transition Partnership, BlueInvest, Interregional Innovation Investments (I3) Instrument, Relevant Ministries and Agencies from the Black Sea Countries, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls</p>

# BLACK SEA SRIA IMPLEMENTATION PLAN



**THEME 9: INNOVATIVE OBSERVING SYSTEMS**



**THEME 10: BLACK SEA UNDERWATER AND COASTAL HERITAGE**






**LINKED TO SRIA PILLAR 3:  
BUILDING OF CRITICAL SUPPORT SYSTEMS  
AND INFRASTRUCTURES FOR THE BENEFIT  
OF BLACK SEA COMMUNITIES**



## THEME 9: INNOVATIVE OBSERVING SYSTEMS

LINKED TO SRIA PILLAR 3

The observation of key oceanographic features, essential ocean variables, and critical parameters that underpin MSFD (EU Marine Strategy Framework Directive) criteria are of great essence to addressing any issue related to marine health and a sustainable blue economy. These observations include those made through research-vessel-based seagoing expeditions, fixed platforms such as buoys, mobile platforms such as gliders, ROVs, AUVs and ARGOS, and also by remote sensing through satellites or via acoustic observations. These approaches generate a wealth of observations on the state of marine physical and ecosystem processes and they are increasingly logged in standardized, harmonized databases at least at the metadata level. There is a great need for all these observation actions to be realized in a coordinated, targeted way tailored to the need of the policymakers and scientific knowledge gaps. The concept of, cost-effective instrumentation, Open Data and Open Innovation are underlying and cross-cutting principles underpinning these Strategic Joint Actions.

			
STRATEGIC JOINT ACTION			
<p><b>9.1 Design of an integrated joint observing system, including regular sea expeditions, standardized fixed observing systems supported by mobile platforms</b></p>	1-3 Years	Marine Ecosystem and Climate Research Center - DEKOSIM (Türkiye), BulArgo, European Data Strategy, EU4OceanObs	Activities started in H2020 DOORS (System of Systems) with the integration of data from Danube Delta Supersite of DANUBIUS-RI, Romanian National Plan for Research and Innovation IV, Infrastructure for sustainable development in the field of marine research and participation in the European infrastructure EURO ARGO (MASRI), Relevant Ministries and Agencies from the Black Sea Countries, EMSO ERIC
<p><b>9.2 Advance the mobile component of the Black Sea observatory by expanding the ARGO and glider deployment in a coordinated way</b></p>	3-5 Years	Marine Ecosystem and Climate Research Center - DEKOSIM (Türkiye), BulArgo, Copernicus, EU4OceanObs	Horizon Europe, Infrastructure for sustainable development in the field of marine research and participation in the European infrastructure EURO-ARGO (MASRI), DANUBIUS-RI, EURO ARGO, Relevant Ministries and Agencies from the Black Sea Countries, EMSO ERIC, EMODNET, SeaDataNet








## THEME 10: BLACK SEA UNDERWATER AND COASTAL HERITAGE

LINKED TO SRIA PILLAR 3

Since the dawn of history, the Black Sea has been at the crossroads of civilizations. Via shipwrecks, submerged ancient settlements and buried artefacts; the sea keeps unprecedented clues to ancient maritime trade routes, diplomatic relations or wars, and economic developments. The coastal zone of the Black Sea countries is especially rich in this respect, but the deeper water of the Black Sea safeguards uniquely preserved wooden shipwrecks that pave the way for new discoveries. These and many other coastal and deep-water heritage elements constitute not only exciting opportunities for international scientific cooperation, but they also provide pathways for inclusive, sustainable blue growth for the coastal cities and communities. The Strategic Joint Actions of this theme will emphasize both aspects and serve as a fruitful platform for cooperation and innovation in the region.

STRATEGIC JOINT ACTION				
10.1	<b>Continue to map and select (for further promotion) the underwater heritage of the Black Sea and assess the sensitivity of heritage sites to climate change and multistressors</b>	3-5 Years	Potential Common Maritime Agenda for the Black Sea Underwater Heritage Technical Group, the UNESCO Convention on the Protection of the Underwater Cultural Heritage, Council of Europe	National Science Fund - Ministry of Education and Science Bulgaria, Horizon Europe, INTERREG NEXT BSB 2021-2027, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Creative Europe 2021-2027 European cooperation projects (Cultural heritage), Black Sea Economic Cooperation (BSEC), Relevant Ministries and Agencies from the Black Sea Countries
10.2	<b>Open the Common Cultural Heritage of the Black Sea coast to the wider public through the development of sustainable and innovative tourism models</b>	3-5 Years	Potential Common Maritime Agenda for the Black Sea Underwater Heritage Technical Group, Horizon Europe Sustainable Blue Economy Partnership, Joint Operational Programme Black Sea, the UNESCO Convention on the Protection of the Underwater Cultural Heritage, Council of Europe	National Science Fund - Ministry of Education and Science Bulgaria, Horizon Europe, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, Creative Europe 2021-2027 European cooperation projects (Cultural heritage), Relevant Ministries and Agencies from the Black Sea Countries, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR)

# BLACK SEA SRIA IMPLEMENTATION PLAN



**THEME 11: INNOVATIVE APPROACHES TO CONNECT SCIENTISTS,  
POLICYMAKERS, INDUSTRY AND SOCIETY**



**THEME 12: BLUE SKILLS AND CAPACITY BUILDING ON MARINE SCIENCES**



**LINKED TO SRIA PILLAR 4:  
EDUCATION AND  
CAPACITY BUILDING**



## THEME 11: INNOVATIVE APPROACHES TO CONNECT SCIENTISTS, POLICYMAKERS, INDUSTRY AND SOCIETY




LINKED TO SRIA PILLAR 4

Identifying synergies, co-creating activities and designing new approaches that will actively engage and sustain an interest and commitment from stakeholders in the Black Sea is of utmost importance for the implementation of the SRIA. An engaging and participatory approach for all stakeholders is proposed, through appropriately chosen platforms that can promote and allow an ongoing dialogue at all societal levels, incorporating all current subjects of interest and facilitating exchanges among participants in a timely, efficient and engaging manner. The information flow among all stakeholders needs to work in synergy for all parties involved and must provide clear benefits to all parties from the start in order to initiate interest.

Research and Innovation stakeholders can be engaged through sustainable platforms such as Living Labs, World Cafes. So that a participatory, interactive approach can be adopted, based on improved dialogue, and all parties can be fully aware of the issues discussed. The way to be accomplished can be adapted accordingly, depending on the audience.

Adopting and maintaining a coordinated approach, regularly connecting and projecting future scenarios on environmental change, impacts on ecosystems goods and services, blue growth scenarios as well as the impact on jobs and well-being of local communities can be crucial in addressing these stakeholders and achieving a continuous and fruitful interaction with them and preventing stakeholder fatigue.

### STRATEGIC JOINT ACTION

			
<b>11.1 Develop mechanisms to continue the identification of new SRIA priorities and emerging topics of implementation</b>	1-3 Years	EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, Common Maritime Agenda for the Black Sea (CMA)	Joint Operational Programme for the Black Sea, New EU Mission calls, emerging EU calls (such as Erasmus+, EMFAF calls), European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries, Shota Rustaveli National Science Foundation of Georgia (SRNSFG)
<b>11.2 Engage research and innovation stakeholders through sustainable stakeholder platforms such as Living Labs, Multi Actor Forum (MAF), World Cafes</b>	1-3 Years	EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls	DANUBIUS RI, European Green Deal projects such as ARSINOE, Horizon Europe and also related Horizon Europe Partnerships, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries



## THEME 12: BLUE SKILLS AND CAPACITY BUILDING ON MARINE SCIENCES

LINKED TO SRIA PILLAR 4

Raising awareness among the general public, through ocean literacy activities, and thus contributing to a more ocean-literate and empowered society is crucial for the sustainability of the region. To develop ocean education and, therefore, change the thinking of the public towards the merits that the Black Sea can lead to a more ocean-literate society and enhance marine citizenship. Participation in environmental education has been identified as the most important predictor of environmental behaviour. This can be accomplished through citizen-science initiatives, engaging the public in activities in which they will actively participate in local/regional activities, and using innovative tools for learning by doing (water quality, biodiversity monitoring).

Ensuring youth involvement in ocean literacy activities has great importance to raise awareness of seas and oceans. The Black Sea Young Ambassadors Programme, which is going to continue through the BRIDGE-BS Project, could co-create activities with Young Ambassadors/Youth Initiatives from other sea basins with and on UN Ocean Literacy and UN SDGs. The Programme itself will help to bring the general public closer to the Black Sea Early Career Ocean Professionals (ECOPs), especially through their activities in BRIDGE-BS Project. For the implementation of these joint actions, opportunities such as the EU year of skills (2023) will be exploited.

Additionally, while it is evident that skills are a pathway to employability in the marine and maritime sectors, there is still a great divide between industry requirements and skills gained through formal education and training systems. To contribute to a more resilient labour market, increase capacity and the attractiveness of blue careers, there is a need to tailor both formal and informal training courses for a wide spectrum of stakeholders, ranging from the experienced to early career researchers and policymakers.

### STRATEGIC JOINT ACTION



**12.1 Build on the momentum of the existing Black Sea Young Ambassadors Programme, new approaches for all ECOPS will be developed to engage the general public to create ocean literate societies such as the Citizen Science initiatives - actively involve citizens in science-related processes using innovative tools for learning by doing (water quality, biodiversity monitoring)**

1-3 Years

EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, Other sea and ocean basin Young Ambassadors/Youth Initiatives, European Marine Science Educators Association (EMSEA), UN Decade of Ocean Science and UN SDG4 Quality Education, UN ECOPs, 2023 European Year of Skills, Common Maritime Agenda for the Black Sea (CMA), EU4Ocean

Existing projects (BRIDGE-BS, Black Sea CONNECT CSA), European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, EU Erasmus+ Calls, INTERREG NEXT BS 2021-2027, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries

**12.2 Develop an Intergenerational Training series (including summer school-type activities) for ECOPs and LATE COPS (peer training, involving late-career professionals as mentors)**

3-5 Years

EU Mission: Mission Restore our Ocean and Waters and its Danube and Black Sea Lighthouse, European Marine Science Educators Association (EMSEA), Black Sea Universities Network (BSUN), UN SDG4 Quality Education, UN ECOPs, 2023 European Year of Skills, Common Maritime Agenda for the Black Sea (CMA), Relevant Ministries and Agencies from the Black Sea Countries

Existing projects (BRIDGE-BS, Black Sea CONNECT CSA), DANUBIUS-RI, European Maritime, Fisheries and Aquaculture Fund (EMFAF) Calls, INTERREG NEXT BS 2021-2027, European Commission Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR), European Commission Directorate-General for Regional and Urban Policy (DG REGIO), Relevant Ministries and Agencies from the Black Sea Countries

**Adopt a "Train the Trainer" Programme Approach (through staff exchanges, secondments, mobility programmes etc.) to increase the capacity of mentors/researchers who can act as mentors to younger researchers**

# **SRIA PILLAR 1**

## **ADDRESSING FUNDAMENTAL BLACK SEA RESEARCH CHALLENGES**

### **THEME 1: DIGITAL TWIN OF THE BLACK SEA**

#### **Strategic Joint Action 1.1**

Develop the Digital Twin of the Black Sea, building on innovative models at regional and basin-scale that simulate climate change and multiple stressors and integrating them with socioeconomic trends, blue economy scenarios and system of systems approaches

#### **Strategic Joint Action 1.2**

Advance AI-powered decision support tools (DSTs) for ecosystembased management in the Black Sea

### **THEME 2: EFFECT OF MULTIPLE STRESSORS ON THE BLACK SEA ECOSYSTEM**

#### **Strategic Joint Action 2.1**

Organize synoptic/joint oceanographic expeditions to identify synergistic and individual effects of each stressor (such as climate change, deoxygenation, acidification, sulphide build-up) on the entire ecosystem, from coasts to the deep parts, covering also sea floor processes.

#### **Strategic Joint Action 2.2**

Develop a source-to-sink (and river-to-sea) pilot study to identify the fluxes, transformation and impact of emerging contaminants (such as pharmaceuticals, antibiotics, anthropogenic nanoparticles) and identify hazards arising from their multiple biotic impacts on the marine ecosystem

### **THEME 3: CHANGING BLACK SEA BIODIVERSITY AND ECOSYSTEM RESILIENCE UNDER CLIMATE CHANGE AND MULTISTRESSORS**

#### **Strategic Joint Action 3.1**

Cost-effective mapping of the Black Sea biodiversity via emerging tools (such as e-DNA) at genetic, species and ecosystem levels

#### **Strategic Joint Action 3.2**

Uncover the extent of invasive species in the Black Sea and developing tools to forecast their impact in the context of the Black Sea multiple stressors as a basis for prevention, mitigation and adaptation policies

# **SRIA PILLAR 2**

## **DEVELOPING INNOVATION, SOLUTIONS AND CLUSTERS UNDERPINNING A SUSTAINABLE BLACK SEA BLUE ECONOMY**

### **THEME 4: ECOSYSTEM BASED FISHERIES, HIGH-TECH AQUA- AND MARICULTURE**

#### **Strategic Joint Action 4.1**

Determine and validate of fish productivity zones and protected areas in the Black Sea using ecosystem-based approaches involving multi-actor platforms including artisanal (traditional) fisheries towards a basin wide network of complementary traditional fisheries and mariculture

#### **Strategic Joint Action 4.2**

Develop carbon-neutral sustainable mariculture in the Black Sea, including supporting related research in alternative carbon-neutral protein sources

### **THEME 5: BLUE BIOTECHNOLOGY**

#### **Strategic Joint Action 5.1**

Establish a knowledge system of candidate species and habitats that support bioactive compounds, such as novel pharmaceuticals, biofuels, enzymes, fishmeal, and biopolymers, for sustainable development and food security in the region

#### **Strategic Joint Action 5.2**

Transform hazards into resources: performing a feasibility study on the role of algae as biofuels, alternative protein sources and other natural products of the second generation

### **THEME 6: ONE HEALTH APPROACH AND IMPROVED SAFETY FOR BLACK SEA COASTS**

#### **Strategic Joint Action 6.1**

Investigate the long term and episodic (extreme weather event and geohazard-related) changes related to marine heatwaves, sea level rise and coastal floods with associated impacts and adaptations including social aspects and nature-based solutions

#### **Strategic Joint Action 6.2**

Risk assessment of harmful algal bloom (HAB), jelly blooms and mucilage events at the regional level and their impact on ecosystem services, food safety and evaluation of their potential biotechnological applications

#### **Strategic Joint Action 6.3**

Identify of the ecosystem impact of civil and military disruptive activities (such as hazardous pollution and unexploded ordnance) affecting the resilience of coastal communities, integrating coastal scientific, socioeconomic and psychological angles

### **THEME 7: MARINE LITTER**

#### **Strategic Joint Action 7.1**

Raise awareness on the marine litter pollution and solutions in the Black Sea targeting the broader public by linking with already existing initiatives and creating novel activities (such as activities of Black Sea Young Ambassadors and other Early Career Ocean Professionals (ECOPs))

#### **Strategic Joint Action 7.2**

Enable the Black Sea CONNECT Marine Litter Action Forum as a recurring platform/forum to tackle the pollution crisis with close links to EU Mission: Mission Restore our Ocean and Waters

### **THEME 8: MARINE RENEWABLE ENERGY**

#### **Strategic Joint Action 8.1**

Develop an experimental renewable wind and wave energy demonstrator for identifying energy outputs, impact on the ecosystem and economic feasibility and social acceptability

#### **Strategic Joint Action 8.2**

Advance the concept, design and feasibility of future multi-use offshore platforms allocating zones for piloting solutions integrating solar energy, green hydrogen production, carbon capture underwater

## **SRIA PILLAR 3 BUILDING OF CRITICAL SUPPORT SYSTEMS AND INFRASTRUCTURES FOR THE BENEFIT OF BLACK SEA COMMUNITIES**

### **THEME 9: INNOVATIVE OBSERVING SYSTEMS**

#### **Strategic Joint Action 9.1**

Design an integrated joint observing system, including regular sea expeditions, standardized fixed observing systems supported by mobile platforms

#### **Strategic Joint Action 9.2**

Advance the mobile component of the Black Sea observatory by expanding the ARGO and glider deployment in a coordinated way

### **THEME 10: BLACK SEA UNDERWATER AND COASTAL HERITAGE**

#### **Strategic Joint Action 10.1**

Continue to map and select (for further promotion) the underwater heritage of the Black Sea and assess the sensitivity of heritage sites to climate change and multistressors

#### **Strategic Joint Action 10.2**

Open the Common Cultural Heritage of the Black Sea coast to the wider public through the development of sustainable and innovative tourism models

## **SRIA PILLAR 4 EDUCATION AND CAPACITY BUILDING**

### **THEME 11: INNOVATIVE APPROACHES TO CONNECT SCIENTISTS, POLICYMAKERS, INDUSTRY AND SOCIETY**

#### **Strategic Joint Action 11.1**

Develop mechanisms to continue the identification of new SRIA priorities and emerging topics of implementation

#### **Strategic Joint Action 11.2**

Engage research and innovation stakeholders through sustainable stakeholder platforms such as Living Labs, Multi Actor Forum (MAF), World Cafes

### **THEME 12: BLUE SKILLS AND CAPACITY BUILDING ON MARINE SCIENCES**

#### **Strategic Joint Action 12.1**

Build on the momentum of the existing Black Sea Young Ambassadors Programme, new approaches for all ECOPS will be developed to engage the general public to create ocean literate societies such as the Citizen Science initiatives – actively involve citizens in science-related processes using innovative tools for learning by doing (water quality, biodiversity monitoring)

#### **Strategic Joint Action 12.2**

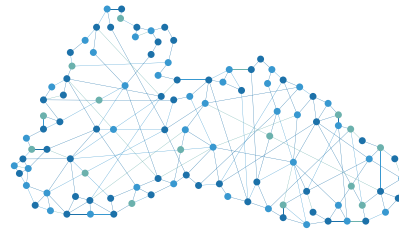
Develop an Intergenerational Training series (including summer school-type activities) for ECOPs and LATE COPS (peer training, involving late-career professionals as mentors).

Adopt a "Train the Trainer" Programme Approach (through staff exchanges, secondments, mobility programmes etc.) to increase the capacity of mentors/researchers who can act as mentors to younger researchers.



*Scan QR code for the Black Sea  
SRIA Implementation Plan*





CONNECT  BLACK SEA

### Coordination of Marine and Maritime Research and Innovation in the Black Sea



**Coordinator**  
Middle East Technical University  
METU-IMS, Türkiye



Organization of the Black Sea  
Economic Cooperation | BSEC, Türkiye



Institute of Oceanology, Bulgarian  
Academy of Sciences | IO-BAS, Bulgaria



Ukrainian scientific Centre  
of Ecology of Sea | UkrSCES, Ukraine



**TÜBİTAK**  
Scientific and Technological Research  
Council of Türkiye | TÜBİTAK, Türkiye



National Institute for Research and  
Development of Marine Geology  
and Geoecology | GeoEcoMar, Romania



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