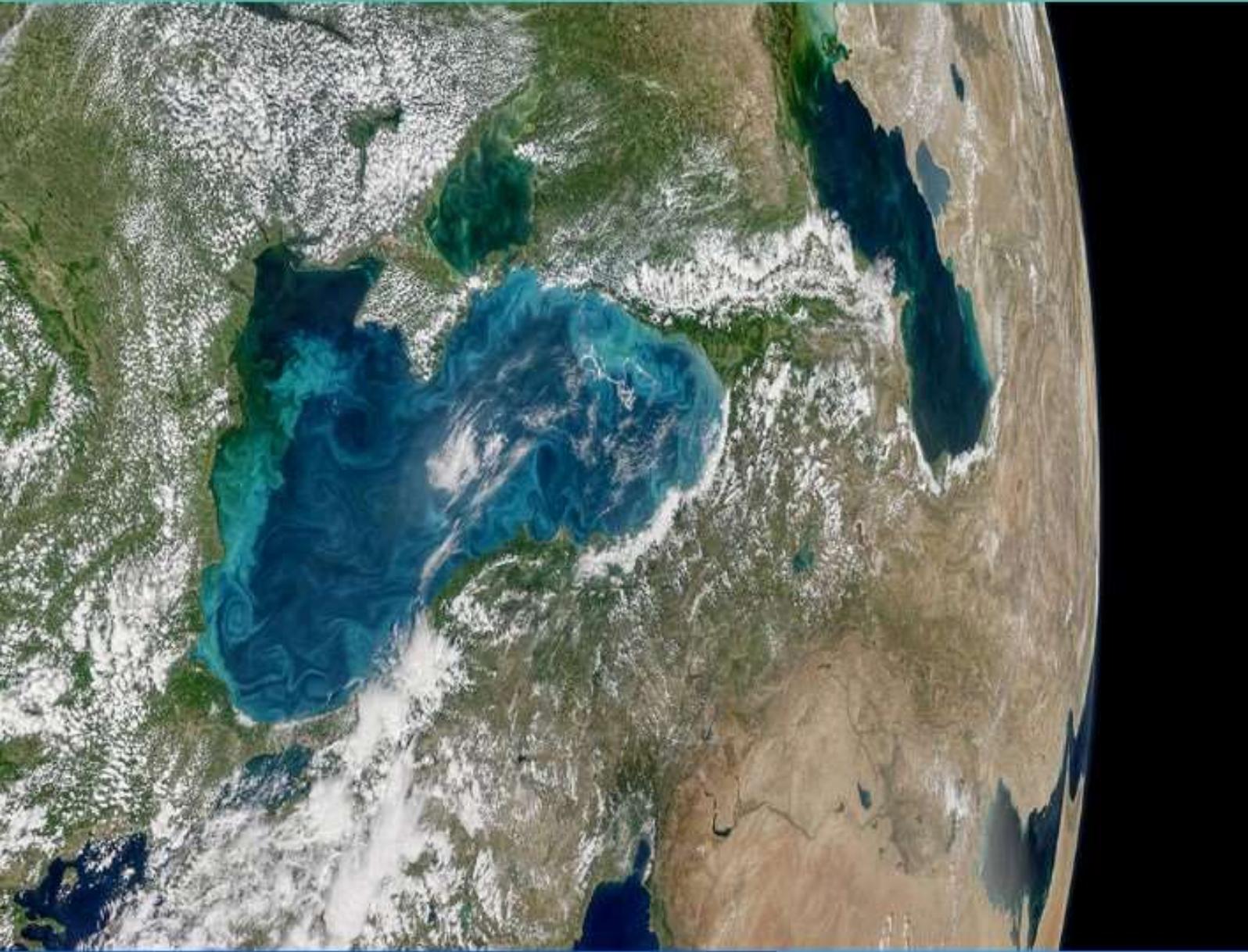


# Black Sea CONNECT

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



D2.4 Second, updated version of  
SRIA



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## Contents

Executive Summary.....	4
The Strategic Research and Innovation Agenda (Black Sea SRIA) .....	5
Black Sea SRIA and Pillars.....	7
Black Sea SRIA Goals and Actions .....	8
Pillar 1 - Addressing fundamental Black Sea research challenges.....	8
Pillar 2 - Developing innovation, solutions and clusters underpinning Black Sea Blue Economy .	10
Pillar 3 - Building of critical support systems and research infrastructures for the benefit of Black Sea communities.....	12
Pillar 4 - Education and capacity building .....	14
ANNEXES .....	17
ANNEX 1 - GLOSSARY .....	17
ANNEX 2 - DEVELOPMENT OF THE SRIA .....	19
ANNEX 3 – Public SRIA .....	24

## Executive Summary

The first version of the **Strategic Research and Innovation Agenda (SRIA)** was prepared through the process that started in 2017 with the expert working group consisted of experts from Black Sea coastal countries. They produced the Burgas Vision Paper<sup>1</sup> the key framework document for a shared vision of a productive, healthy, resilient, sustainable and better-valued Black Sea by 2030. The paper was launched during the European Maritime Day 2018 in Burgas, Bulgaria (May 2018). It addresses the key pillars on which a new Strategic Research and Innovation Agenda (SRIA) can be built on. This process was further supported by the Ministerial Declaration towards a Common Maritime Agenda (2018)<sup>2</sup> for the Black Sea, endorsed by the same Black Sea countries.

After the launch of the Burgas Vision paper in May 2018, the efforts of the Black Sea Blue Growth Initiative were focused on developing the SRIA goals and actions. The structure of the SRIA was set to pave the path for an effective and realistic implementation of the SRIA, which includes a clear definition of goals, challenges, targets and main actors. In 2019, Black Sea CONNECT Coordination and Support Action (CSA) was funded with the goal of consolidating the SRIA and develop its implementation Plan.

With these goals, the Black Sea CONNECT CSA aimed to take further the process that started with the Burgas Vision Paper to SRIA Implementation. For this purpose, under the Black Sea CONNECT CSA, the next steps were focused on gathering national-level feedback to define key framework conditions for the SRIA implementation with the contribution of the various stakeholder groups, including policy makers, regulatory agencies, researchers, and end users.

In this regard, Black Sea SRIA consultation workshops were organised. The first round was carried out in September – October 2020. More information on the first round of the consultation are gathered and submitted under Black Sea CONNECT “Updated SRIA D2.2. Based on the first round of consultations, 1<sup>st</sup> Draft of the Black Sea SRIA Implementation Plan was drafted and second round of consultations took place based on that. After the second round of consultations, the feedback received during the workshops are used not only to finalize the Black Sea SRIA Implementation Plan (D2.6) but also update the SRIA (D2.4).

The Final Black Sea SRIA defines the general framework for strategic research, development and innovation, whereas the related Implementation Plan translates the SRIA goals into concrete actions, targeting national research funders and key stakeholders, foreseeing specific periods for initiation of joint activities, and addressing scientific questions, identifying programmes, policies, funding opportunities and research infrastructures. Under the Black Sea CONNECT CSA, also an Operational Network of Funders (ONF) has been established consisting of the funding agencies (ministry representatives) of Black Sea countries (Bulgaria, Georgia, Romania, Moldova, Turkey, Ukraine) and EC officials from DG RTD, DG MARE and EEAS with the objective of streamlining funding for the implementation of the SRIA and its Implementation Plan.

For the purpose of this deliverable to be submitted to the EC, the original format of the Black Sea SRIA 2018 is used but revised with the up-to-date Black Sea CONNECT CSA achievements (Annex 2) as many project activities are used to feed into the updated version of the SRIA and its Implementation Plan. As a next step, this document will be presented to the ONF for their endorsement. However, a visually advanced version in line with the Implementation Plan is developed and added as an Annex to this document.

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<sup>1</sup> <https://black-sea-maritime-agenda.ec.europa.eu/key-documents>

<sup>2</sup> <https://black-sea-maritime-agenda.ec.europa.eu/key-documents>

## The Strategic Research and Innovation Agenda (Black Sea SRIA)

The first version of the **Strategic Research and Innovation Agenda (SRIA)** was prepared to guide stakeholders from academia, funding agencies, industry, policy and society to address together the fundamental Black Sea challenges, to promote blue economy and economic prosperity of the Black Sea region, to build critical support systems and innovative research infrastructure and to improve education and capacity building. The Blue Economy has great potential for the Black Sea countries and for Europe as a whole as it can be considered an instrument to promote cooperation, stability and empower the coastal communities in the region. While the Black Sea is a unique sea basin that is rich in biodiversity, heritage and natural resources, the basin is increasingly under pressure due mainly to the increasing impacts from human-induced factors, such as eutrophication and hypoxia, overfishing, and the introduction of alien species, in addition to the effects of climate change. The combination of these stressors is considered to be the main cause for the degradation of the Black Sea marine ecosystem, which has undergone dramatic changes since the early 1970s. Moreover, the deeper 90% of the Black Sea is the largest oxygen-free and hydrogen sulphide-rich volume of marine waters on Earth, just as the global ocean of the geological past was for a billion years between 1.8 and 0.8 billion years ago. Therefore, the Black Sea, with its marine basin and coastal socioeconomic systems combined, can be considered a natural laboratory of global significance, for fundamental science, sustainability policy and the Blue Economy.

The Black Sea SRIA builds on these premises and the common vision and challenges identified in the Burgas Vision Paper:

We, experts from the Black Sea coastal countries, namely the Republic of Bulgaria, Georgia, Romania, the Russian Federation, the Republic of Turkey and Ukraine, as well as the Republic of Moldova, in cooperation with marine experts from leading European marine institutes and organisations, and with the support of the European Commission, have developed the Black Sea Strategic Research and Innovation Agenda with the aim of advancing a shared vision for a productive, healthy, resilient, sustainable and better valued Black Sea by 2030.

Research and innovation are key to foster human and infrastructures capacity building in coastal, marine and maritime sectors in view of unlocking unique opportunities for sustainable and environmental friendly blue economy in the Black Sea. In this sense, the Strategic Research and Innovation Agenda will become a reference framework for marine and maritime strategies to be used as a programmatic tool for defining national, European, and sea-basin priorities.

As a first step, the Strategic Research and Innovation Agenda will guide researchers, academia, funding agencies, industry and policymakers to promote the social well-being, prosperity of Black Sea citizens and support economic growth and jobs of countries bordering it.

The approach of the SRIA is based on the following principles of the Burgas Vision Paper:

- We identify the Black Sea as a common resource, paleoclimate archive and natural laboratory, hosting unique forms of life in its diverse ecosystems, which need to be sustained with joint activities based on this vision and with the support of the Strategic Research and Innovation Agenda.
- The Black Sea is the largest oxygen-free hydrogen sulphide-rich marine basin on Earth. Any new local, national or transboundary policy measures should consider its special ecosystem characteristics, its biodiversity and its submerged cultural heritage sites.
- Attention needs to be drawn to emerging challenges, which are driven by a range of human-induced and natural drivers, such as pollution, maritime transport, eutrophication, climate change, and coastal hazards.

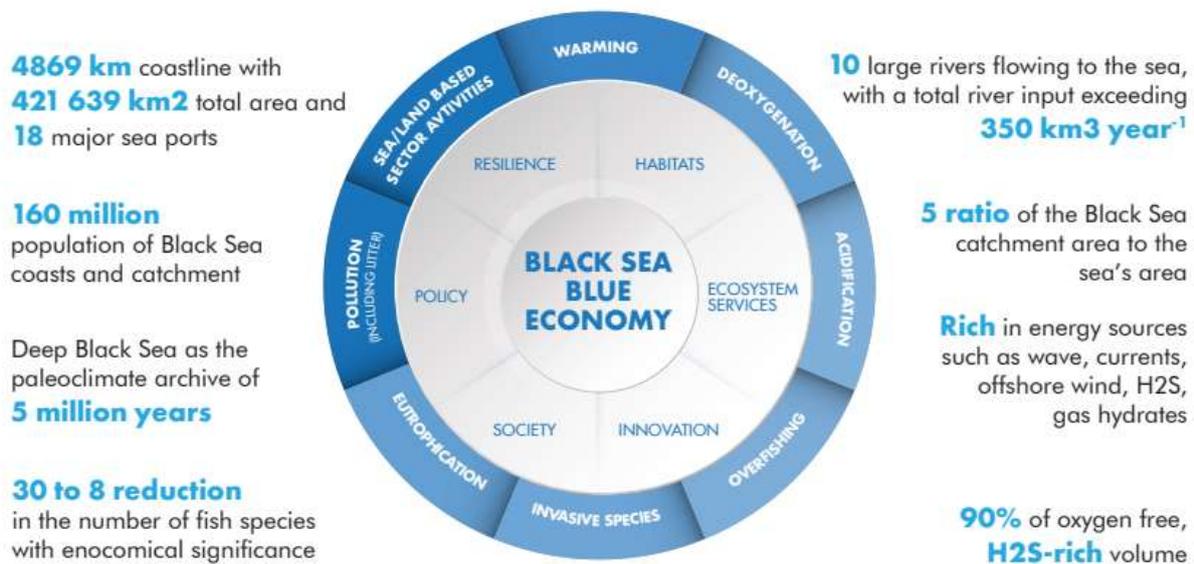
- The abundance of gas hydrates is a particular asset of the Black Sea that represents both opportunities and risks.
- Fish stocks and species diversity are under severe stress, common surveys and monitoring can provide a base for better assessment, management and prevention.
- Provide accurate predictive tools and capabilities to tackle the increasingly complex array of multi-stressors and their poorly understood interactions, including their connection with rivers flowing into the Black Sea.
- We see education, science and innovation as the most important tool that can fully unlock the potential for blue economy in living resources, offshore renewable energy, tourism, culture, transport and seafloor hydrocarbons that underpin the blue economy of the region.
- Science and innovation support the development and implementation of coastal and maritime policies and strategies in the Black Sea, including better ecosystem assessments, forecasts and management; understanding of vulnerability, risks and possible mitigation measures.
- Knowledge supports evidence-based and informed decision-making towards the sustainable growth of the Black Sea economies in response to societal and environmental or climate-related challenges.

In 2019, Black Sea CONNECT Coordination and Support Action was funded with the goal of consolidating the SRIA and developing its Implementation Plan (More information on the CSA work is provided under Annex 2). The present document is the second updated version of the SRIA based on outcome of the two national consultations and other activities of the Black Sea CONNECT CSA). Furthermore, with these input, Black Sea SRIA Implementation Plan has been also developed (D2.6).

The Black Sea SRIA defines the general framework for strategic research, development and innovation, whereas the related Implementation Plan translates the SRIA goals into concrete actions, targeting national research funders and key stakeholders, foreseeing specific periods for initiation of joint activities, and addressing scientific questions, identifying programmes, policies, funding opportunities and research infrastructures. Under the Black Sea CONNECT CSA, also an Operational Network of Funders (ONF) has been established consisting of the funding agencies (ministry representatives) of Black Sea countries (Bulgaria, Georgia, Romania, Moldova, Turkey, Ukraine) and EC officials from DG RTD, DG MARE and EEAS with the objective of streamlining funding for the implementation of the SRIA and its Implementation Plan. The ONF will continue beyond the CSA for the further uptake of the Black Sea SRIA and its Implementation Plan.

Considering the recent events related to the unjustified war to Ukraine – the effects to the Black Sea environment must be assessed and evaluated to get an objective information about the short-term and long-term impacts of war on marine ecosystems and ecosystem services. While developing the updated Black Sea SRIA and its Implementation Plan, this has been actively taken into consideration.

## Black Sea SRIA and Pillars



*Figure 1 Four main pillars of the Black Sea SRIA based on the Burgas Vision Paper.*

The SRIA has been developed on the already agreed goals as stated in the Burgas Vision Paper to address the related challenges. Final SRIA is also updated with the same vision under the Black Sea CONENCT CSA.

The Initiative has identified four main pillars on which a new set of research and innovation actions can be developed (*Figure 1*):

- Addressing fundamental Black Sea research challenges - Black Sea Knowledge Bridge,
- Developing innovations, solutions and clusters underpinning Black Sea Blue Economy,
- Building of critical support systems and innovative Infrastructures - Key Joint Infrastructure and Policy Enablers,
- Education and capacity building - Empowered Citizens and Enhanced Blue Skills.

There are three overarching considerations throughout the SRIA:

- First, the pillars support developing and adopting innovative, fit for purpose observation and data sharing systems (combining ecology and social data) building on existing networks.
- Second, the actions are designed to benefit primarily from co-funding and co-programing mechanisms and bodies at national, transnational and international levels.
- Third, the Black Sea SRIA was updated on a regular basis in dialogue and in close link with relevant national and research stakeholders and further clarifications and revisions will be made as needed.

A key output of the SRIA is to help identify national level priorities to contribute to the development of national Sustainable Blue Economy agendas. Furthermore, the actions proposed in the SRIA and their implementation generates scientific knowledge. Such new knowledge includes better ecosystem assessments, forecasts and management, as well as an understanding of the vulnerabilities of the ecosystem. Knowledge is the key element towards science-based and well-informed decision-making. Such policymaking paves the way to a sustainable blue economy<sup>3</sup>.

<sup>3</sup> This SRIA has been actively supporting the development of the Common Maritime Agenda for the Black Sea. For the purposes of this Common Maritime Agenda the participating countries have a common understanding of the blue or maritime economy as - all economic activities, including sustainable exploitation and preservation, related to oceans, seas

## Black Sea SRIA Goals and Actions

### Pillar 1 - Addressing fundamental Black Sea research challenges

Pillar 1 - Addressing fundamental Black Sea research challenges	
Main Goal 1 - Developing innovative multi-disciplinary research from coastal systems to the deep-basin including seafloor processes, building on existing initiatives, including data sharing mechanisms that will generate the knowledge needed to increase ecosystems resilience and assess ecosystem services	
Actions	Main Actor(s)-Initiatives <sup>4</sup>
<ul style="list-style-type: none"> <li>1.1-1 Address the main Black Sea challenges on eutrophication, deoxygenation, invasive species, emerging pollutants, effects of disruptive activities (i.e. military), and litter across the land-sea continuum all the way to the deep seafloor (<i>Medium/Long Term</i>)</li> </ul>	Academia, BSC, FAO, GFCM Ministries and Related Governmental Agencies, Private Sector, Research Institutions
<ul style="list-style-type: none"> <li>1.1-2 Enhance food systems research, including fisheries, recruitment, stock assessment and ecosystem-based management, fishing productivity zones and biotech (such as alternative protein and other nutrient sources) (<i>Medium/Long Term</i>)</li> </ul>	Academia, BSC, FAO, GFCM, Ministries and Related Governmental Agencies, Research Institutions
<ul style="list-style-type: none"> <li>1.1-3 Fill gaps in understanding the evolution of the Black Sea, ecosystem dynamics, biogeographic patterns, functional biodiversity, ecosystem resilience and functions and their effects on ecosystem services (<i>Short Term</i>)</li> </ul>	Academia, BSUN, FAO, GFCM, IOC-UNESCO, Ministries and Related Governmental Agencies, National Authorities, Navy Oceanographic Offices, Research Institutions, UNEP
<ul style="list-style-type: none"> <li>1.1-4 Initiate comprehensive socio-economic data collection and analyses on coastal communities interacting with the marine ecosystem to understand how drivers of the marine environment and human induced pressures impact the communities (systems approach) (<i>Short/Medium Term</i>)</li> </ul>	Academia, Black Sea NGO Forum, BSEC, CPMR, Maritime Clusters, National Statistical Institutes, Port Authorities, Research Institutions, Union of Black Sea Municipalities
<ul style="list-style-type: none"> <li>1.1-5 Increase knowledge on ecosystem resilience through an improved understanding of specific Black Sea features such as Rim current dynamics, mesoscale features i.e. fronts, eddies, vertical upwelling, suboxic-anoxic interface, deep basin including the seafloor and sediments underneath in the Black Sea and their roles in nutrient fluxes, productivity and food provisioning and climate regulating services (<i>Short/Medium Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Private Sector, Research Institutions, Space Agencies, UNDP
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 land-sea interface to the deep basin	
Actions	Main Actor(s)-Initiatives

and coasts, covering a wide range of interlinked established sectors with long term, proven contribution to the economy, such as shipping, shipbuilding, fisheries, traditional sun-sea tourism, and emerging new sectors that show high potential for future development, including blue bioeconomy/biotechnology, ocean energy, offshore wind energy, desalination, coastal and environmental protection as source of economic growth.

<sup>4</sup> Listed alphabetically. The list of existing actors and initiatives given for an action is not exclusive of other potential actors.

<ul style="list-style-type: none"> <li>1.2-1 Quantify sources of natural and anthropogenic inputs including from the river catchments, atmosphere, maritime activities, towards an understanding of the drivers and processes that influence the Black Sea at wider scale (covering river-to-sea interactions and atmosphere – hydrosphere interfaces) (<i>Short/Medium Term</i>)</li> </ul>	Academia, BSC, Coastal Communities, Maritime Agencies, Ministries and Governmental Agencies Municipalities, NGOs, Port Authorities, River Commissions, Research Institutions, Research Infrastructure Networks, Space Agencies
<ul style="list-style-type: none"> <li>1.2-2 Develop the Digital Twin of the Black Sea that includes innovative circulation and biogeochemical models integrated with socio-economic models and AI supported DSTs (<i>Short/Medium Term</i>)</li> </ul>	Academia, BSC, CPMR, Ministries and Government Agencies, MEDCOAST, Municipalities, NGOs, Research Institutions, European DTO
<ul style="list-style-type: none"> <li>1.2-3 Develop the 'One Health' Approach and improved safety for Black Sea coasts, via investigating climate-related impacts and geohazards: such as coastal erosion, submarine landslides, sea level rise, extreme events, emerging pollution fluxes and human borne pathogens and impacts on human and ecosystem health (<i>Short /Medium Term</i>)</li> </ul>	Academia, Copernicus, Ministries and Governmental Agencies, Municipalities, Research Institutions, WHO One Health Initiative
<ul style="list-style-type: none"> <li>1.2-4 Use state of the art geochemical proxy tools and advanced models to enhance the Black Sea paleoclimate archive to shed light on the recent geological and biogeochemical natural evolution of the Basin (<i>Short/Medium Term</i>)</li> </ul>	Academia, Infrastructures from IODP, IOC-UNESCO, International Marine Research Networks, Research Institutions
<ul style="list-style-type: none"> <li>1.2-5 Reveal the interactions between multiple stressors, biodiversity and marine ecosystem functioning as well as demonstrate how adaptation and evolution may change ecosystem response to changing stressors (<i>Short/Medium Term</i>)</li> </ul>	Academia, Copernicus, Global and Regional Observing Systems, IOC-UNESCO, Research Infrastructure Networks, Research Institutions
<ul style="list-style-type: none"> <li>1.2-6 Develop integrated, novel evolutionary end-to-end (microbes to fish) modelling and data analyses capacity (<i>Short/Medium Term</i>)</li> </ul>	Academia, Copernicus, Research Institutions
<ul style="list-style-type: none"> <li>1.2-7 Advance research for integrated coastal and marine management, including the interaction between land-based and sea-based activities and their impacts on coastal zones, both landward and seaward (<i>Short/MediumTerm</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Research Institutions

Pillar 2 - Developing innovation, solutions and clusters underpinning Black Sea Blue Economy

Pillar 2 - Developing innovation, solutions and clusters underpinning Black Sea Blue Economy	
Main Goal 1 - Supporting marine and maritime research and innovation domains of all the Black Sea countries to create synergy, develop ecosystem based, carbon neutral sustainable economy, mitigate hazard impacts for resilient Black Sea communities	
Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> <li>2.1-1 Promote and foster synergies, through social innovation, living labs and multi-actor forums, enhanced networks for innovation and capacity building to transfer knowledge between clusters in the blue economy and reinforce existing inter-sectorial interactions (<i>Short/Medium Term</i>)</li> </ul>	BSC, Black Sea NGO Forum, BSEC, CPMR, GFCM, Local Authorities, Local Communities, Maritime Clusters, Ministries and Related Governmental Agencies, Industries, Regional and National Networks
<ul style="list-style-type: none"> <li>2.1-2 Define geological features located near shore and offshore, including the deep seafloor, their evolution over time and support the business uptake of innovative technologies to avoid potential geo-hazards and their effect on cultural and recreational ecosystem services (<i>Medium Term</i>)</li> </ul>	Academia, Local Authorities, Ministries and Related Governmental Agencies, NGOs, Private Sector, Research Institutions
<ul style="list-style-type: none"> <li>2.1-3 Support the dialogue between researchers and business to promote and adopt circular economy principles as a booster for sustainable innovation for the blue economy (<i>Medium Term</i>)</li> </ul>	Academia, Maritime Clusters, NGOs, Private Sector, Research Institutions
<ul style="list-style-type: none"> <li>2.1-4 Develop methodologies for science-based policymaking, foresight and cost-benefit analyses and other financial instruments towards the assessment of the innovative and feasibility potential of the projects (<i>Short Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Research Institutions
<ul style="list-style-type: none"> <li>Development of a unified database at national/regional level with completed and on-going projects, in particular related to the blue economy in order to analyse and further use the results obtained (<i>Medium Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Research Institutions
Main Goal 2 - Developing innovation in existing and emerging blue economy sectors	
Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> <li>2.2-1 Develop renewable energy pilots and demonstrators such as wind, wave, solar, green hydrogen and carbon capture in marine and coastal areas; Investigate the potential of responsible exploration of gas hydrates (<i>Short/Medium Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Private Sector, Regional Authorities, Research Institutions
<ul style="list-style-type: none"> <li>2.2-2 Develop ecosystem-based fisheries and high-tech aquaculture including multi-use platforms (<i>Short/Medium Term</i>)</li> </ul>	Business Associations, FAO, Fisheries and Aquaculture Organisations, GFCM, Ministries and Related Governmental Agencies, Private Sector, Research Institutions, SMEs

<ul style="list-style-type: none"> <li>2.2-3 Foster biotechnology by exploring candidate species and potential habitats that support bioactive compounds, such as novel pharmaceuticals, biofuels, enzymes, fishmeal, and biopolymers, for sustainable development in the region (<i>Medium/Long Term</i>)</li> </ul>	Academia, Associations (such as European Aquaculture Association and European Society for Marine Biotechnology), FAO, GFCM, Ministries and Related Governmental Agencies, Private Sector, Research Institutions, EU Life sciences and biotechnology
<ul style="list-style-type: none"> <li>2.2-4 Further develop new and innovative cultural and recreational ecosystem services to promote synergies between sustainable coastal tourism and other activities (i.e. pesca-tourism, culture and underwater heritage, aquaculture, yachting) (<i>Short Term</i>)</li> </ul>	Academia, Business Associations (such as shipbuilders), Local and Regional Authorities, Ministries and Related Governmental Agencies, Private Sector, Research Institutions
<ul style="list-style-type: none"> <li>2.2-5 Innovative solutions for sustainable development of port infrastructure and operations towards net zero economy and environmentally friendly “Green ports” and “Smart ports” (<i>Medium/Long Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Port Authorities, Private Sector, Public Authorities, Research Institutions
<ul style="list-style-type: none"> <li>2.2-6 Promote low-emission, carbon-neutral ships and freight operations in line with the international safety standards and circular economy principles to achieve sustainable and green shipbuilding, repair and retrofit (<i>Medium Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Port Authorities, Private Sector, Public Authorities, Research Institutions
<ul style="list-style-type: none"> <li>2.2-7 Develop and promote innovative marine litter (including microplastics) management techniques both on land and sea in line with the principles of circular economy and maintaining regional marine litter forum on a permanent basis (<i>Short Term</i>)</li> </ul>	Academia, Black Sea NGO Forum, BSC, Citizens, GFCM, Local Communities, Ministries and Related Governmental Agencies, Municipalities, Private Sector, Research Institutions
<ul style="list-style-type: none"> <li>2.2-8 Identify the services provided by marine biotic and abiotic resources for enhanced coastal protection and resilience (<i>Short/Medium Term</i>)</li> </ul>	Academia, Local and Regional Authorities, Ministries and Related Governmental Agencies, Private Sector, Research Institutions

Pillar 3 - Building of critical support systems and research infrastructures for the benefit of Black Sea communities

Pillar 3 - Building of critical support systems and research 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	
Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> <li>3.1-1 Develop and enhance a network of dedicated Marine Research Infrastructures at the Black Sea, building on existing European and international initiatives, ensuring interaction between the ongoing projects and research activities (<i>Short Term</i>)</li> </ul>	Academia, BSEC, Copernicus, GOOS, IOC-UNESCO, Ministries and Related Governmental Agencies, Research Infrastructures (such as EMSO-ERIC, DANUBIUS-RI, EURO ARGO-ERIC, JERICO, HYDRALAB, EuroFleets), Private Sector, Research Institutions
<ul style="list-style-type: none"> <li>3.1-2 Design and of joint innovative observing systems and redesign and enhance regular sea expeditions, deployment of mobile and fixed marine observation instruments. (<i>Short/Medium Term</i>)</li> </ul>	Academia, Copernicus, GOOS, Ministries and Related Governmental Agencies, Research Infrastructures (such as EMSO-ERIC, DANUBIUS-RI, EURO ARGO-ERIC, JERICO, HYDRALAB, EuroFleets), Private Sector, Research Institutions
<ul style="list-style-type: none"> <li>3.1-3 Produce, collect and make available compatible high-quality data sets (the FAIR principles and open data access) (<i>Short/Medium Term</i>)</li> </ul>	Academia, NCPs, National Data Centres and Organisations, Regional Data Infrastructures and European Projects (such as Copernicus, EMODNET, SeaDataNet, SeaDataCloud, DANUBIUS-RI, EURO ARGO ERIC, EMSO-ERIC), Research Institutions, Regional and National Authorities
<ul style="list-style-type: none"> <li>3.1-4 Integrate, strengthen and upgrade monitoring, modelling and forecasting capacities to support the Digital Twin of the Black Sea and marine spatial planning (<i>Short/Medium Term</i>)</li> </ul>	Academia, BSC, CMEMS, Copernicus, EuroGOOS, National Authorities, Regional and National Forecasting Centres, Regional Forecasters, Research Institutions, Risk Management Agencies, European DTO
Main Goal 2 - Advancing a harmonised set of working methodologies, standards and procedures on all aspects of coastal and marine research	
Actions	Main Actor(s)-Initiatives

<ul style="list-style-type: none"> <li>3.2-1 Develop common monitoring standards and research infrastructures for integrated coastal and marine management in support of policy- and decision makers (<i>Medium Term</i>)</li> </ul>	Academia, BSC, ICES, IMO, Maritime Clusters, MEDCOAST, Ministries and Related Governmental Agencies, Regional Authorities, Research Institutions
<ul style="list-style-type: none"> <li>3.2-2 Establish common methodology and transboundary pilot schemes for marine spatial planning at national and regional levels based on ecosystem approach (<i>Short Term</i>)</li> </ul>	Academia, BSC, Local and Regional Authorities, Ministries and Related Governmental Agencies, MSP Platforms, Research Institutions
Main Goal 3 - Developing new marine based technologies by benefiting from the latest innovations for the Black Sea to promote safe and sustainable economic growth of the marine and maritime sectors, the conservation and valorisation of marine cultural heritage	
<b>Actions</b>	<b>Main Actor(s)-Initiatives</b>
<ul style="list-style-type: none"> <li>3.3-1 Identify and promote key technologies and innovations required for the Black Sea monitoring and research in close interaction with solution providers and best practices (<i>Short/Medium Term</i>)</li> </ul>	Academia, BSEC, CPMR, EuroGOOS, Maritime Clusters, Ministries and Related Governmental Agencies, National Emergency Agencies, Port Authorities, Private Sector, Research Institutions, SMEs
<ul style="list-style-type: none"> <li>3.3-2 Support the development of basin-scale programmes for research and exploration, conservation and valorisation of marine cultural heritage (<i>Long Term</i>)</li> </ul>	IOC-UNESCO, Media, Ministries and Related Governmental Agencies, Museums, NGOs, Research Institutions
Main Goal 4 - Mechanisms to create, support and promote start-ups, entrepreneurs oriented towards the circular and blue economy in the Black Sea region	
<b>Actions</b>	<b>Main Actor(s)-Initiatives</b>
<ul style="list-style-type: none"> <li>3.4-1 Enable researchers, innovators and entrepreneurs open and easy access to research infrastructures and networks via the establishment of the Open Transnational Service and Access initiatives (i.e. transnational and virtual access) (<i>Short/Medium/Long Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, National Authorities and Organisations, Regional Organisations, Research Infrastructures, Research Institutions
<ul style="list-style-type: none"> <li>3.4-2 Create, integrate and support incubators and techno parks for promoting SMEs, start-ups and innovative businesses for the blue economy (<i>Short/Medium/Long Term</i>)</li> </ul>	Academia, Chambers of Commerce and Industry, International Organisations Ministries and Related Governmental Agencies, Private Sector, Regional Organisations, Research Institutions, Startup Europe, Venture Capital

## Pillar 4 - Education and capacity building

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	
Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> <li>4.1-1 Develop new formal and informal programmes and coordinate existing ones (syllabus and curricula) to support and implement priorities defined in SRIA. This entails the design and implementation of dedicated undergraduate, graduate and postdoctoral programmes for future researchers and professionals in all fields of the Blue economy (<i>Short/Medium Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, Higher Education Councils, Regional and National Authorities, Private Sector, Research Institutions, Training Organisations, EU Erasmus +, IOC OTGA, EMSEA, UN SDG4 Quality Education
<ul style="list-style-type: none"> <li>4.1-2 Develop programmes for life long and intergenerational training as well as vocational education of professionals in integrated coastal and marine management and blue economy (<i>Short/Medium Term</i>)</li> </ul>	Academia, BSC, MEDCOAST, Ministries and Related Governmental Agencies, Higher Education Councils Private Sector, Regional and National Authorities, Research Institutions, Training Organisations, Vocational Training Institutions, European Year of Skills 2023
<ul style="list-style-type: none"> <li>4.1-3 Promote digital literacy (i.e. e-learning environments) and prepare for the rapid change in use and implementation of virtual technologies as an essential component of life long education in all fields of blue economy (<i>Short/Medium Term</i>)</li> </ul>	Academia, Media, Ministries and Related Governmental Agencies, Higher Education Councils, National and Regional Authorities, NGOs, Research Institutions, Private Sector, Training Organisations, IOC OTGA
<ul style="list-style-type: none"> <li>4.1-4 Promote mentoring and training for new start-ups and coaching for scaling-up companies and investors in the blue economy at local/regional levels (<i>Short/Medium Term</i>)</li> </ul>	Academia, Business Community, Chambers of Commerce, Innovation Parks and Clusters, Ministries and Related Governmental Agencies, Higher Education Councils, National and Regional Authorities, CPMR, Research Institutions, NGOs, Technological Parks, Training Organisations
<ul style="list-style-type: none"> <li>4.1-5 Support undergraduate, graduate students and early career ocean professionals to gain blue skills (like staff exchanges, secondments, mobility programmes) and undergo work placement apprenticeships schemes in businesses and institutions active in the blue economy (<i>Short/Medium Term</i>)</li> </ul>	Academia, Chambers of Commerce, Innovation Parks and Clusters, Ministries and Related Governmental Agencies, Higher Education Councils, National and

	Regional Administrations, NGOs, Private Sector, Research Institutions, Technological Parks, Training Organisations, EU Erasmus+, European Youth, UN ECOPs, EU4Ocean
<b>Main Goal 2 - Empowering ocean-engaged citizens contributing to a climate resilient, clean, plastic free, healthy and productive Black Sea</b>	
<b>Actions</b>	<b>Main Actor(s)-Initiatives</b>
<ul style="list-style-type: none"> <li>4.2-1 Educate communities towards the unique value of the Black Sea and promote Ocean literacy in the region through integrated citizen science and outreach activities such as the European Researchers' Night', European Maritime Day, International Black Sea Day (<i>Short/Medium Term</i>)</li> </ul>	Academia, EMSEA, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, NGOs, Opinion Makers (influencers), Private Sector, Research Institutions, Training Organisations, Social Media and Communication Experts and Specialised Companies, EU4Ocean, IOC-UNESCO Ocean Literacy
<ul style="list-style-type: none"> <li>4.2-2 Nurture a Black Sea cultural/scientific identity, through dedicated formal and informal education as well as work-oriented programmes in all fields of research and Blue Economy (<i>Short Term</i>)</li> </ul>	Academia, Local Authorities, Ministries and Related Governmental Agencies, Higher Education Councils, NGOs, Parent and Consumer Associations, Opinion Makers (influencers), Private Sector, Research Institutions, Social Media and Communication Specialists, Sport Clubs, Training Organisations, EU4Ocean, IOC-UNESCO Ocean Literacy,
<ul style="list-style-type: none"> <li>4.2-3 Communicate the uniqueness and importance of the Black Sea basin, via sustaining the established Young Ambassadors Programme and extending this to new Black Sea Ambassadors of all ages including influencers and celebrities, at local, regional and global levels at special events and initiatives such as the International Black Sea Day (31<sup>st</sup> October) and the European Maritime Day (<i>Short Term</i>)</li> </ul>	Academia, BSC, International Organisations, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, Higher Education Councils, NGOs, Private Sector, Research Institutions, Social Media and Communication Specialists, European Youth, EU4Ocean
<b>Main Goal 3 - Contributing to enhanced science policy dialogue in formulating coastal and marine policies and programmes</b>	
<b>Actions</b>	<b>Main Actor(s)-Initiatives</b>

<ul style="list-style-type: none"> <li>4.3-1 Develop mechanisms to continue the identification of new SRIA priorities and emerging topics for implementation (<i>Short/Medium/Long Term</i>)</li> </ul>	Academia, International Organisations, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, NGOs, Private Sector, Research Institutions, Social Media and Communication Specialists
<ul style="list-style-type: none"> <li>4.3-2 Train policy and decision makers through dedicated activities for the efficient implementation of marine and coastal policies and management (<i>Short Term</i>)</li> </ul>	Academia, Ministries and Related Governmental Agencies, National, Regional and Local Authorities, NGOs, Research Institutions

## ANNEXES

### ANNEX 1 - GLOSSARY

<b>ACRONYM</b>	<b>TITLE</b>
<b>AI</b>	Artificial Intelligence
<b>BRIDGE-BS</b>	Advancing knowledge, delivering research, empowering citizens for sustainable and climate-neutral Black Sea (EU funded project)
<b>BSC</b>	Black Sea Commission
<b>BSEC</b>	Organization of the Black Sea Economic Cooperation
<b>BSUN</b>	Black Sea University Network
<b>CMEMS</b>	Copernicus Marine Environment Monitoring Service
<b>Copernicus</b>	The European Earth Observation Programme
<b>CPMR</b>	Conference of Peripheral Maritime Regions
<b>DANUBIUS-RI</b>	International Centre for Advanced Studies on River–Sea Systems
<b>DG MARE</b>	The Commission's Directorate-General for Maritime Affairs and Fisheries
<b>DG R&amp;I</b>	The Commission's Directorate-General for Research and Innovation
<b>DOORS</b>	'Developing Optimal and Open Research Support' for the Black Sea (EU funded project)
<b>DSTs</b>	Decision Support Tools
<b>EEAS</b>	European External Action Service (EEAS)
<b>EC</b>	European Commission
<b>ECOPs</b>	Early Career Ocean Professionals
<b>EMODNET</b>	The European Marine Observation and Data Network
<b>EMSEA</b>	European Marine Science Educators Association
<b>EMSO-ERIC</b>	European Multidisciplinary Seafloor and Water Column Observatory - European Research Infrastructure Consortium
<b>EU</b>	European Union
<b>EU Erasmus+</b>	EU's programme to support education, training, youth and sport in Europe
<b>EU4OCEAN</b>	European Ocean Coalition for Ocean Literacy
<b>EURO ARGO - ERIC RI</b>	European contribution to the Argo programme
<b>European DTO</b>	European Digital Twin Ocean
<b>EUROFLEETS</b>	New operational steps towards an alliance of European research fleets
<b>EuroGOOS</b>	European Global Ocean Observing System
<b>FAIR</b>	Findable, Accessible, Interoperable, and Reusable
<b>FAO</b>	Food and Agriculture Organization
<b>GFCM</b>	General Fisheries Commission for the Mediterranean
<b>GOOS</b>	Global Ocean Observing System
<b>Hydralab</b>	Network of environmental hydraulic institutes in Europe
<b>ICES</b>	International Council for the Exploration of the Sea
<b>IMO</b>	International Maritime Organization
<b>IOC OTGA</b>	Ocean Teacher Global Academy
<b>IOC-UNESCO</b>	Intergovernmental Oceanographic Commission of UNESCO
<b>IODP</b>	International Ocean Discovery Program
<b>IP</b>	Implementation Plan
<b>JERICO</b>	Joint European Research Infrastructure network for Coastal Observatories
<b>MEDCOAST</b>	Mediterranean Coastal Foundation

<b>MSc</b>	Master of Science
<b>MSP</b>	Maritime Spatial Planning
<b>NCPs</b>	National Contact Points
<b>NGOs</b>	Non-governmental Organizations
<b>ONF</b>	Operational Network of Funders
<b>SDG</b>	Sustainable Development Goal
<b>SeaDataCloud</b>	Further developing the pan-European infrastructure for marine and ocean data management (EU funded project)
<b>SeaDataNet</b>	Marine Data Infrastructure for the management of large and diverse sets of data deriving from in situ of the seas and oceans
<b>SMEs</b>	Small and Medium-sized Enterprises
<b>SRIA</b>	Strategic Research and Innovation Agenda
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme
<b>WHO</b>	World Health Organization

## ANNEX 2 - DEVELOPMENT OF THE SRIA

In 2017, an Initiative was launched and supported by the European Commission (EC) to develop a joint research and innovation agenda and guide national and EU-level policymakers named as ‘The Blue Growth Initiative for Research and Innovation in the Black Sea’. As highlighted in the Burgas Vision Paper, this expert working group consisted of *experts from Black Sea coastal countries, (Republic of Bulgaria, Georgia, Romania, the Russian Federation, the Republic of Turkey and Ukraine, as well as the Republic of Moldova), in cooperation with marine experts from leading European marine institutes and organisations, with the support of the European Commission<sup>1</sup>*. They produced the Burgas Vision Paper<sup>5</sup> the key framework document for a shared vision of a productive, healthy, resilient, sustainable and better-valued Black Sea by 2030. The paper was launched during the European Maritime Day 2018 in Burgas, Bulgaria (May 2018). It addresses the key pillars on which a new Strategic Research and Innovation Agenda (SRIA) can be built on. This process was further supported by the Ministerial Declaration towards a Common Maritime Agenda (2018)<sup>6</sup> for the Black Sea, endorsed by the same Black Sea countries.

Eight workshops were held by the experts joining the Blue Growth Initiative for Research and Innovation in the Black Sea with the support of the European Commission (EC). Initially information on both national and international marine research projects were collected and analysed. Secondly, gaps and research and innovation opportunities together with the necessary justification and drivers from each Black Sea country were collated. Thirdly, regional and national boundary and framework conditions for the Research and Innovation needs and opportunities for successful implementation of a SRIA were identified. Based on the data generated and outcomes of these workshops, the experts of the Initiative drafted: i) common vision, ii) challenges, iii) goals of the SRIA. These results were presented in the Burgas Vision Paper.

The matrixes and past project information were analysed and collated into summary graphs to identify needs and gaps. For this, sets of pre-defined area keywords were delivered to the expert group and they were asked to map national/international projects. As a result, different focuses of national-funded and EU-funded projects were highlighted. For instance, while the national projects were mostly focused on biodiversity, pollution, observing and management projects, EU- funded projects targeting the Black Sea prioritised more crosscutting frontier areas such as socioeconomics, training, climate change and multiple stressors.

After the launch of the Burgas Vision paper in May 2018, the efforts of the Black Sea Blue Growth Initiative were focused on developing the SRIA goals and actions. The structure of the SRIA was set to pave the path for an effective and realistic implementation of the SRIA, which includes a clear definition of goals, challenges, targets and main actors.

In 2019, Black Sea CONNECT Coordination and Support Action (CSA) was funded with the goal of consolidating the SRIA and develop its implementation Plan. The specific goals of the CSA are as below

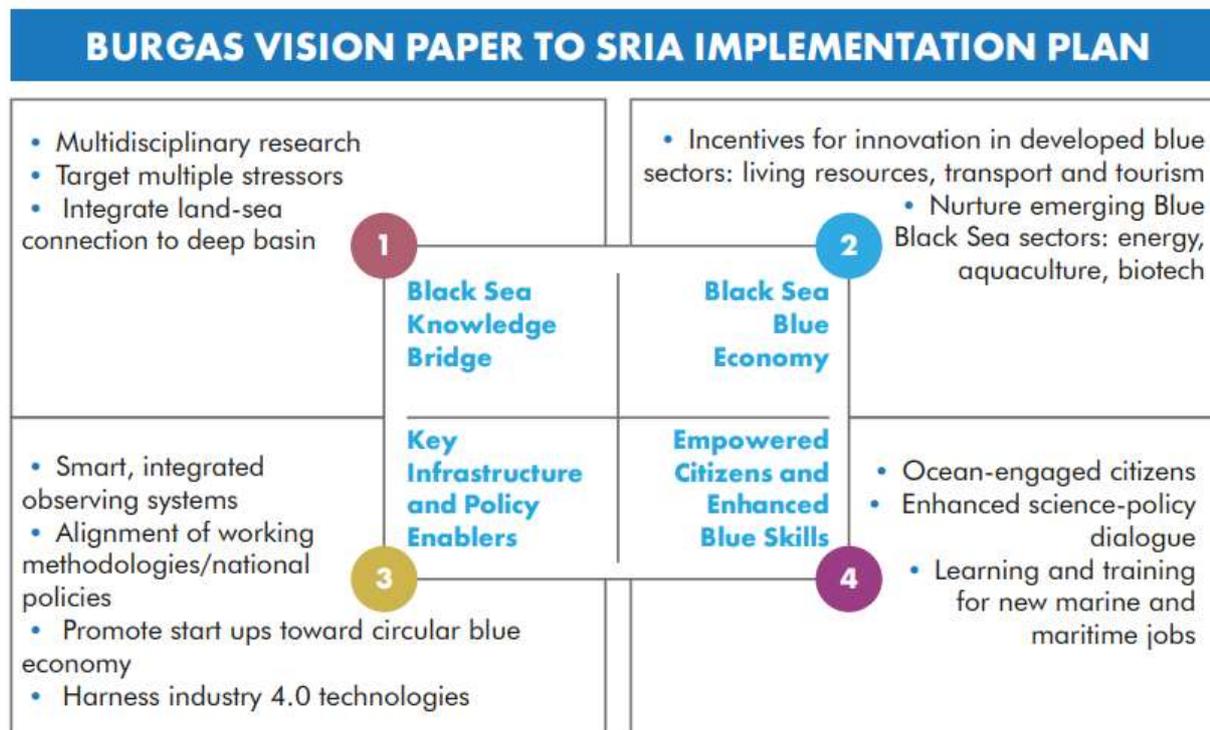
1. Support the Black Sea Blue Growth Initiative to consolidate and update the SRIA
2. Develop the SRIA Implementation Plan
3. The establishment of an operational network for the Black Sea Region
4. Support the design and implementation of new transnational joint activities
5. Making the Black Sea visible through empowered Black Sea societies

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<sup>5</sup> <https://black-sea-maritime-agenda.ec.europa.eu/key-documents>

<sup>6</sup> <https://black-sea-maritime-agenda.ec.europa.eu/key-documents>

With these goals, the Black Sea CONNECT CSA aimed to take further the process that started with the Burgas Vision Paper to SRIA Implementation (*Figure 2*). For this purpose, under the Black Sea CONNECT CSA, the next steps were focused on gathering national-level feedback to define key framework conditions for the SRIA implementation with the contribution of the various stakeholder groups, including policy makers, regulatory agencies, researchers, and end users.



*Figure 2 Goals of the SRIA based on the Burgas Vision Paper*

In this regard, two national Black Sea SRIA consultation workshops were organised. The first round was carried out in September – October 2020, covering more than 600 attendees in the 7 Black Sea countries. The results from the national platforms included identified gaps, barriers and bottlenecks on innovation and new technologies, scientific knowledge, and sustainable development of marine and maritime economic sectors. It was also observed that the SRIA actions and goals are still relevant based on the ranking activities conducted during the consultations. More information on the first round of the consultation are gathered and submitted under Black Sea CONNECT “Updated SRIA D2.2 and D2.4).

Additionally, Black Sea CONNECT CSA conducted other activities that provided input to the development of the Implementation Plan. Firstly, the CSA continued to update the matrixes and past project information to identify needs and gaps in the research and innovation areas. These reports have shown that in all funding streams, there was a gap in terms of support to emerging R&I areas. Most of the Black Sea countries are lacking underlying infrastructure (such as observing and monitoring systems), relevant marine-related policies and implementation instruments. More funding is needed both at the national and EU level for projects and programmes tackling areas such as Marine Ecosystem Services, Human Health and Seas, Interconnections of the basins among many others National projects mostly focused on Living Marine Resources, Marine Pollution and Litter, Biodiversity and Operational Oceanography/Observing Systems and Monitoring projects; Multinational EU funded projects targeted Operational Oceanography/Observing Systems and Monitoring, Training & Technology Transfer, Tourism and Surrounding Economy, Socioeconomic & Policy Research and Biodiversity. Climate change was addressed as a secondary area; Emerging challenges are little addressed in monitoring programs: Bioinvasions, Deep Sea Ecosystems, Seas

and Human Health (Reports on State of the art of Black Sea projects mapping and framework conditions - D2.1 and D2.7).

Secondly, the CSA continually identified the relevant projects to engage in the SRIA development and Implementation. Project reports (Handbook of relevant Black Sea projects, initiatives and entities and its updated version- D3.1 and D3.6) are developed a database of past and on-going projects that are relevant to Black Sea CONNECT, with also including the discussion of the modes of engagement. It covers not only activities that involve the Black Sea directly, but also those on other European seas and rivers from which Black Sea CONNECT can gain experience and expertise.

Thirdly, Black Sea CONNECT CSA organized an Innovation Workshop showcase the best practices of marine clusters initiatives to the eventual formation of a marine and maritime cluster of the Black Sea. The outputs of this workshop (Black Sea Marine Innovation Report - D3.4) showed that different challenges of importance for the development of marine research and innovation exist including the digital transition, the ecological transition, the circular economy, the transition from research to the market, the formation of a maritime cluster for the Black Sea and the key issue of public and private funding. These inputs also used in the updated SRIA and its Implementation Plan.

Moreover, Black Sea CONNECT CSA has piloted three joint actions which are also integrated first into the draft and then in the final Implementation Plan. Marine Litter Action Forum organized, focusing on the innovative solutions to combat the marine litter pollution in the Black Sea. Also, Black Sea Young Ambassadors Programme has been launched being a flagship activity of the project. Finally, third joint action focused on the assessment of the impact of pandemic type risks on the Black Sea ecosystem, sea level rise, extreme weather, harmful algal blooms – impacts and adaptations, one health approach, that considers both the human health and the ecosystem health and resilience with specific strategic joint actions underneath. It has been integrated as a separate theme to the Implementation Plan. Impact of military activities are also added as part of this joint action, especially after the unjustified war on Ukraine this impact is expected to increase. Available monitoring activities need to be upgraded to better understand these impacts. Inputs received through these actions and activities are also integrated into the Implementation Plan draft (Report on joint actions and their implementation status - D3.3).

Black Sea CONNECT project has also been involved in synergistic activities with the relevant policies and initiatives. Close cooperation has been ensured with the Common Maritime Agenda for the Black Sea and its Steering Group and national hubs throughout the life-time of the project. Black Sea SRIA is represented in the business focused events and activities of the CMA. Additionally, through Black Sea CONNECT, SRIA is integrated into the Sustainable Blue Economy Partnership as the sea-basin strategy for the Black Sea. Lastly, alignment with the Mission Ocean and Water priorities are also enabled. This way, many more stakeholders are engaged beyond the CSA-organized activities, and input are gathered to be integrated into the final SRIA and its Implementation Plan.

Under the Black Sea CONNECT CSA, the Operational Network of Funders (ONF) that has been built on the Group of Senior Officials of the Black Sea SRIA was also established. Consisting of funding agencies (ministry representatives) of Black Sea countries (Bulgaria, Georgia, Romania, Moldova, Turkey, Ukraine) and EC officials from DG R&I, DG MARE, and EEAS, the objective of the Operational Network of Funders is to streamline funding for the implementation of the SRIA Implementation Plan joint actions. Through online and onsite/hybrid meetings organized in the last year under the Black Sea CONNECT CSA, the Operational Network of Funders contributed greatly to the development of the Implementation Plan (Report on agreed measures on medium and long term articulation beyond the CSA lifetime D2.5 and Report on the activities on the operational network, its sustainability beyond the CSA and recommendations D3.5).

Based on the first round of the consultations, and all other CSA activities (mentioned above) draft Implementation Plan was developed with the Steering Committee team of the CSA which included themes and strategic joint actions. Based on the draft Implementation Plan, the second round of national consultations was organized in February – March 2023, focusing on identifying feasible and necessary actions to be addressed by the SRIA Implementation plan (SRIA Implementation Plan – D2.3, D2.6). A total of 203 Black Sea various national stakeholders responded to joint online questionnaire before, during or after the consultations. In addition, a consultation with linked projects and initiatives on the Implementation Plan was organised in Bucharest on 15 March 2023, gathering further input on the Implementation Plan of the Black Sea SRIA from linked projects and initiatives, including BRIDGE-BS and DOORS Projects. The generalised output was processed accordingly and transferred to the final update of the SRIA and the IP.



Photos from SRIA Development



Photos from the various national consultation meetings held by the partners



Consultation with linked projects and initiatives  
for the Black Sea SRIA Implementation Plan  
15 March 2023 Bucharest, Romania



Photos from consultation with Operational Network of Funders  
16 March 2023 Bucharest, Romania

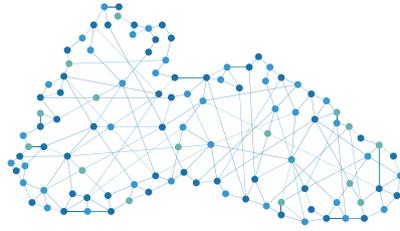


Photos from consultation with Operational Network of Funders  
4 May 2023 Brussels, Belgium

ANNEX 3 – FORMATTED SRIA

Please see the document below for SRIA 2023.

SRIA 2019 is available via this [link](#).

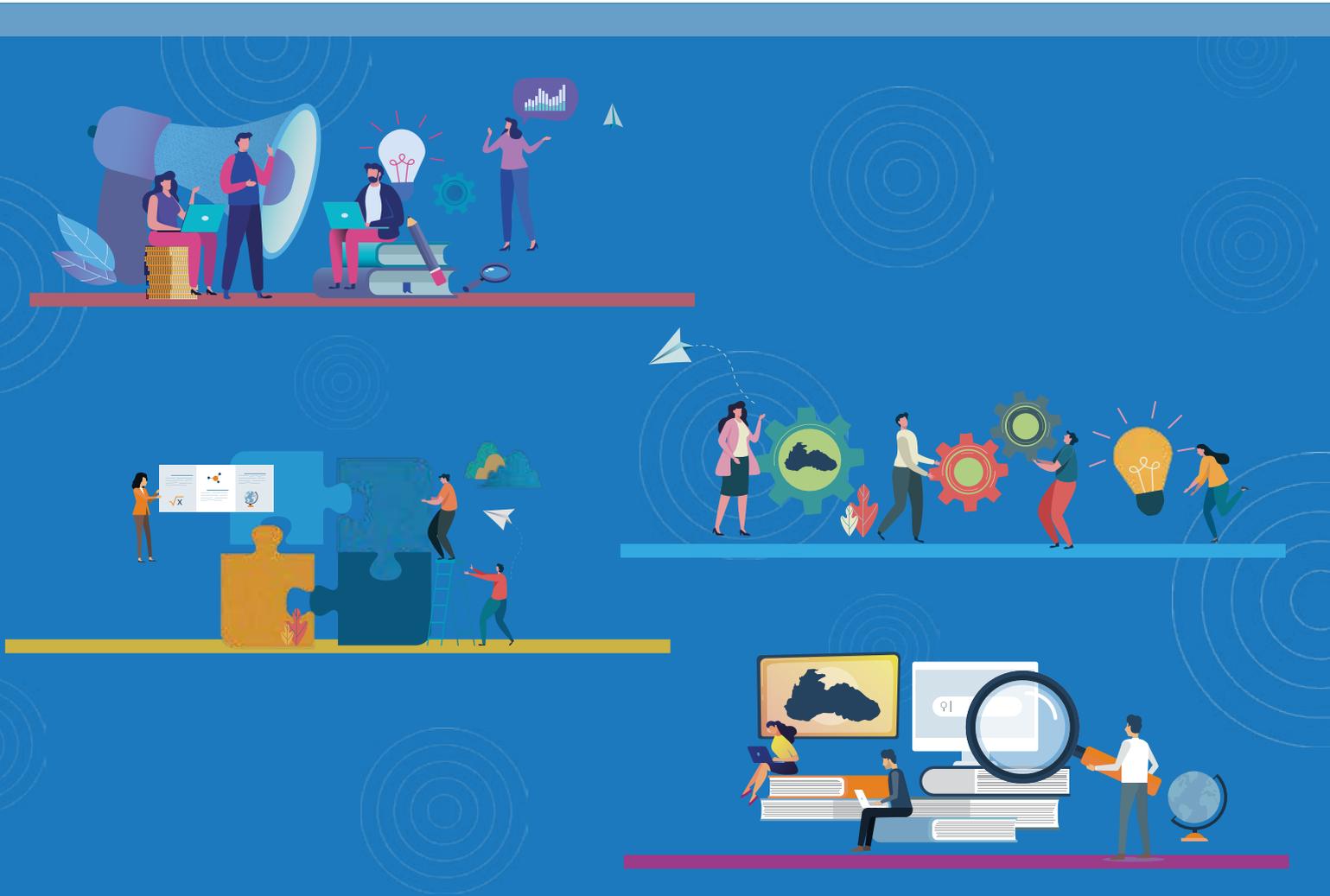


CONNECT  BLACK SEA

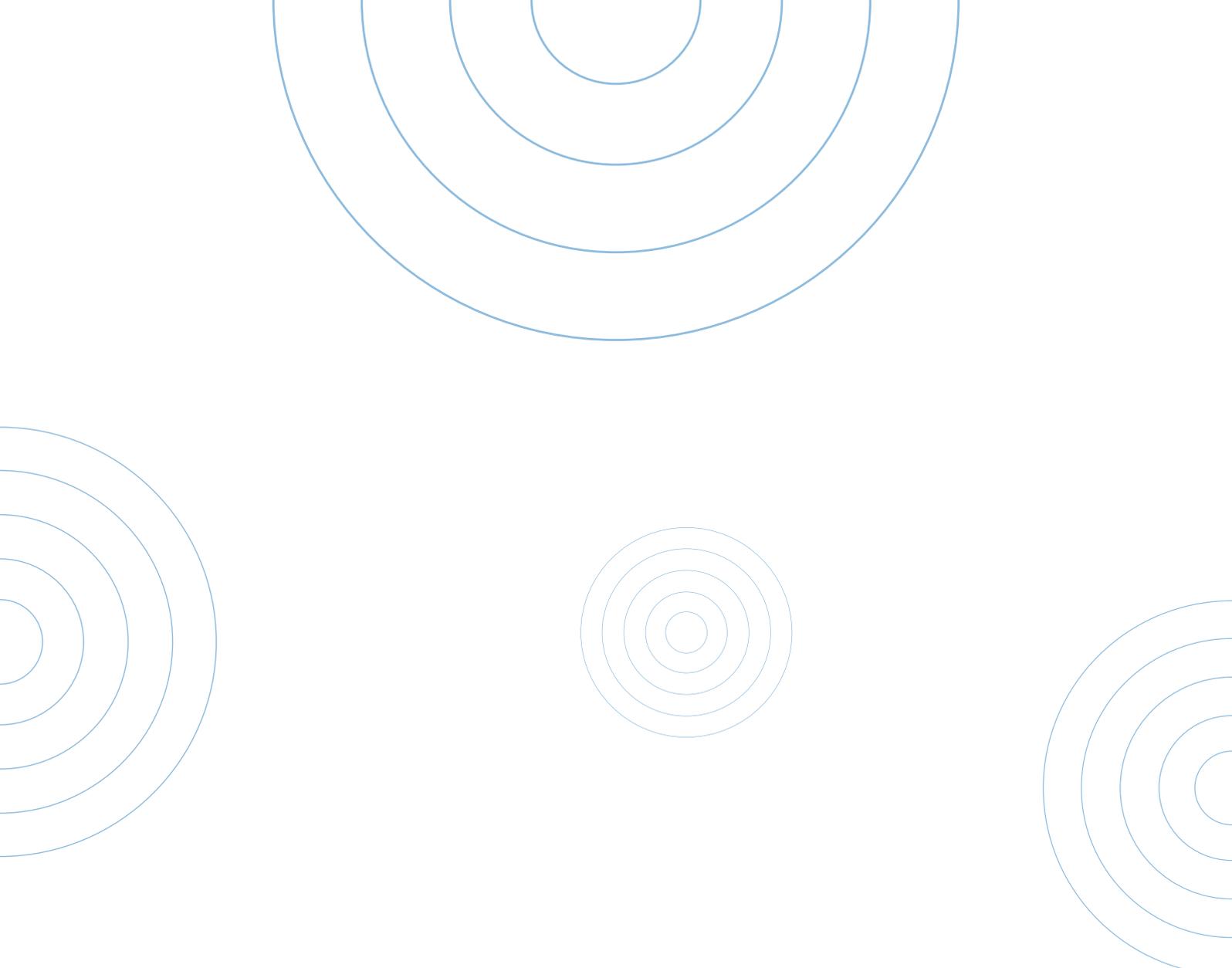
Coordination of Marine and Maritime Research and Innovation in the Black Sea

# BLACK SEA STRATEGIC RESEARCH AND INNOVATION AGENDA

FINAL EDITION



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



**30 JUNE 2023**

## **AUTHORS**

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## CONTENT

4

**THE UNIQUENESS AND CHALLENGES  
OF THE BLACK SEA**

5

**THE STRATEGIC RESEARCH AND INNOVATION  
AGENDA (BLACK SEA SRIA)**

7

**BLACK SEA SRIA AND PILLARS**

9

**SRIA PILLAR 1 MAIN GOALS**

11

**SRIA PILLAR 2 MAIN GOALS**

13

**SRIA PILLAR 3 MAIN GOALS**

15

**SRIA PILLAR 4 MAIN GOALS**

17

**ANNEX 1 - GLOSSARY**

18

**ANNEX 2 - DEVELOPMENT OF THE SRIA**

# THE UNIQUENESS AND CHALLENGES OF THE BLACK SEA

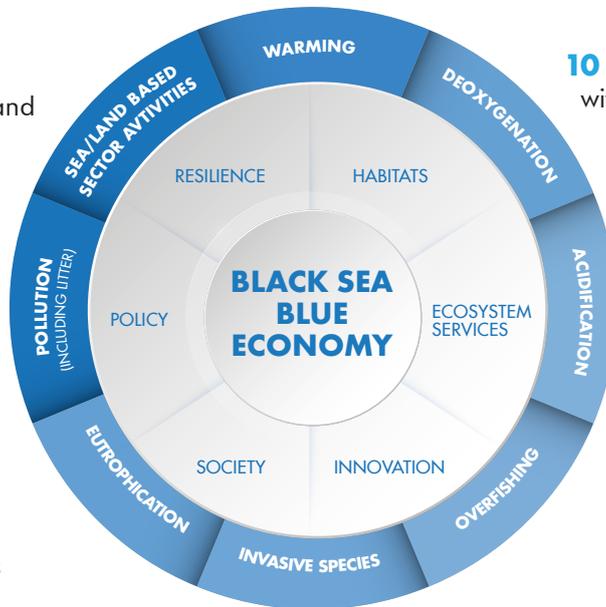
The Black Sea is a unique sea basin, rich in biodiversity and heritage, but also it includes an exceptional combination of natural and human-induced stressors that can co-occur.

**4869 km** coastline with  
**421 639 km<sup>2</sup>** total area and  
**18** major sea ports

**160 million**  
 population of Black Sea  
 coasts and catchment

Deep Black Sea as the  
 paleoclimate archive of  
**5 million years**

**30 to 8 reduction**  
 in the number of fish species  
 with enocomical significance



**10** large rivers flowing to the sea,  
 with a total river input exceeding  
**350 km<sup>3</sup> year<sup>-1</sup>**

**5 ratio** of the Black Sea  
 catchment area to the  
 sea's area

**Rich** in energy sources  
 such as wave, currents,  
 offshore wind, H<sub>2</sub>S,  
 gas hydrates

**90%** of oxygen free,  
**H<sub>2</sub>S-rich** volume

Figure 1: The uniqueness and challenges of the Black Sea

## THE STRATEGIC RESEARCH AND INNOVATION AGENDA (BLACK SEA SRIA)

The first version of the Strategic Research and Innovation Agenda (SRIA) was prepared to guide stakeholders from academia, funding agencies, industry, policy and society to address together the fundamental Black Sea challenges, to promote blue economy and economic prosperity of the Black Sea region, to build critical support systems and innovative research infrastructure and to improve education and capacity building. The Blue Economy has great potential for the Black Sea countries and for Europe as a whole as it can be considered an instrument to promote cooperation, stability and empower the coastal communities in the region. While the Black Sea is a unique sea basin that is rich in biodiversity, heritage and natural resources, the basin is increasingly under pressure due mainly to the increasing impacts from human-induced factors, such as eutrophication and hypoxia, overfishing, and the introduction of alien species, in addition to the effects of climate change. The combination of these stressors is considered to be the main cause for the degradation of the Black Sea marine ecosystem, which has undergone dramatic changes since the early 1970s. Moreover, the deeper 90% of the Black Sea is the largest oxygen-free and hydrogen sulphide-rich volume of marine waters on Earth, just as the global ocean of the geological past was for a billion years between 1.8 and 0.8 billion years ago. Therefore, the Black Sea, with its marine basin and coastal socioeconomic systems combined, can be considered a natural laboratory of global significance, for fundamental science, sustainability policy and the Blue Economy.

The Black Sea SRIA builds on these premises and the common vision and challenges identified in the Burgas Vision Paper:

*We, experts from the Black Sea coastal countries, namely the Republic of Bulgaria, Georgia, Romania, the Russian Federation, the Republic of Türkiye and Ukraine, as well as the Republic of Moldova, in cooperation with marine experts from leading European marine institutes and organisations, and with the support of the European Commission, have developed the Black Sea Strategic Research and Innovation Agenda with the aim of advancing a shared vision for a productive, healthy, resilient, sustainable and better valued Black Sea by 2030.*

Research and innovation are key to foster human and infrastructures capacity building in coastal, marine and maritime sectors in view of unlocking unique opportunities for sustainable and environmentally friendly blue economy in the Black Sea. In this sense, the Strategic Research and Innovation Agenda will become a reference framework for marine and maritime strategies to be used as a programmatic tool for defining national, European, and sea-basin priorities.

As a first step, the Strategic Research and Innovation Agenda will guide researchers, academia, funding agencies, industry and policymakers to promote the social well-being, prosperity of Black Sea citizens and support economic growth and jobs of countries bordering it.

The approach of the SRIA is based on the following principles of the Burgas Vision Paper:

- *We identify the Black Sea as a common resource, paleoclimate archive and natural laboratory, hosting unique forms of life in its diverse ecosystems, which need to be sustained with joint activities based on this vision and with the support of the Strategic Research and Innovation Agenda.*

- *The Black Sea is the largest oxygen-free hydrogen sulphide-rich marine basin on Earth. Any new local, national or transboundary policy measures should consider its special ecosystem characteristics, its biodiversity and its submerged cultural heritage sites.*
- *Attention needs to be drawn to emerging challenges, which are driven by a range of human-induced and natural drivers, such as pollution, maritime transport, eutrophication, climate change, and coastal hazards.*
- *The abundance of gas hydrates is a particular asset of the Black Sea that represents both opportunities and risks.*
- *Fish stocks and species diversity are under severe stress, common surveys and monitoring can provide a base for better assessment, management and prevention.*
- *Provide accurate predictive tools and capabilities to tackle the increasingly complex array of multi-stressors and their poorly understood interactions, including their connection with rivers flowing into the Black Sea.*
- *We see education, science and innovation as the most important tool that can fully unlock the potential for blue economy in living resources, offshore renewable energy, tourism, culture, transport and seafloor hydrocarbons that underpin the blue economy of the region.*
- *Science and innovation support the development and implementation of coastal and maritime policies and strategies in the Black Sea, including better ecosystem assessments, forecasts and management; understanding of vulnerability, risks and possible mitigation measures.*
- *Knowledge supports evidence-based and informed decision-making towards the sustainable growth of the Black Sea economies in response to societal and environmental or climate-related challenges.*

In 2019, Black Sea CONNECT Coordination and Support Action was funded with the goal of consolidating the SRIA and developing its Implementation Plan (More information on the CSA work is provided under Annex 2). The present document is the second updated version of the SRIA based on outcome of the two national consultations and other activities of the Black Sea CONNECT CSA). Furthermore, with these input, Black Sea SRIA Implementation Plan has been also developed (D2.6).

The Black Sea SRIA defines the general framework for strategic research, development and innovation, whereas the related Implementation Plan translates the SRIA goals into concrete actions, targeting national research funders and key stakeholders, foreseeing specific periods for initiation of joint activities, and addressing scientific questions, identifying programmes, policies, funding opportunities and research infrastructures. Under the Black Sea CONNECT CSA, also an Operational Network of Funders (ONF) has been established consisting of the funding agencies (ministry representatives) of Black Sea countries (Bulgaria, Georgia, Romania, Moldova, Türkiye, Ukraine) and EC officials from DG RTD, DG MARE and EEAS with the objective of streamlining funding for the implementation of the SRIA and its Implementation Plan. The ONF will continue beyond the CSA for the further uptake of the Black Sea SRIA and its Implementation Plan.

Considering the recent events related to the unjustified war to Ukraine – the effects to the Black Sea environment must be assessed and evaluated to get an objective information about the short-term and long-term impacts of war on marine ecosystems and ecosystem services. While developing the updated Black Sea SRIA and its Implementation Plan, this has been actively taken into consideration.

## BLACK SEA SRIA AND PILLARS

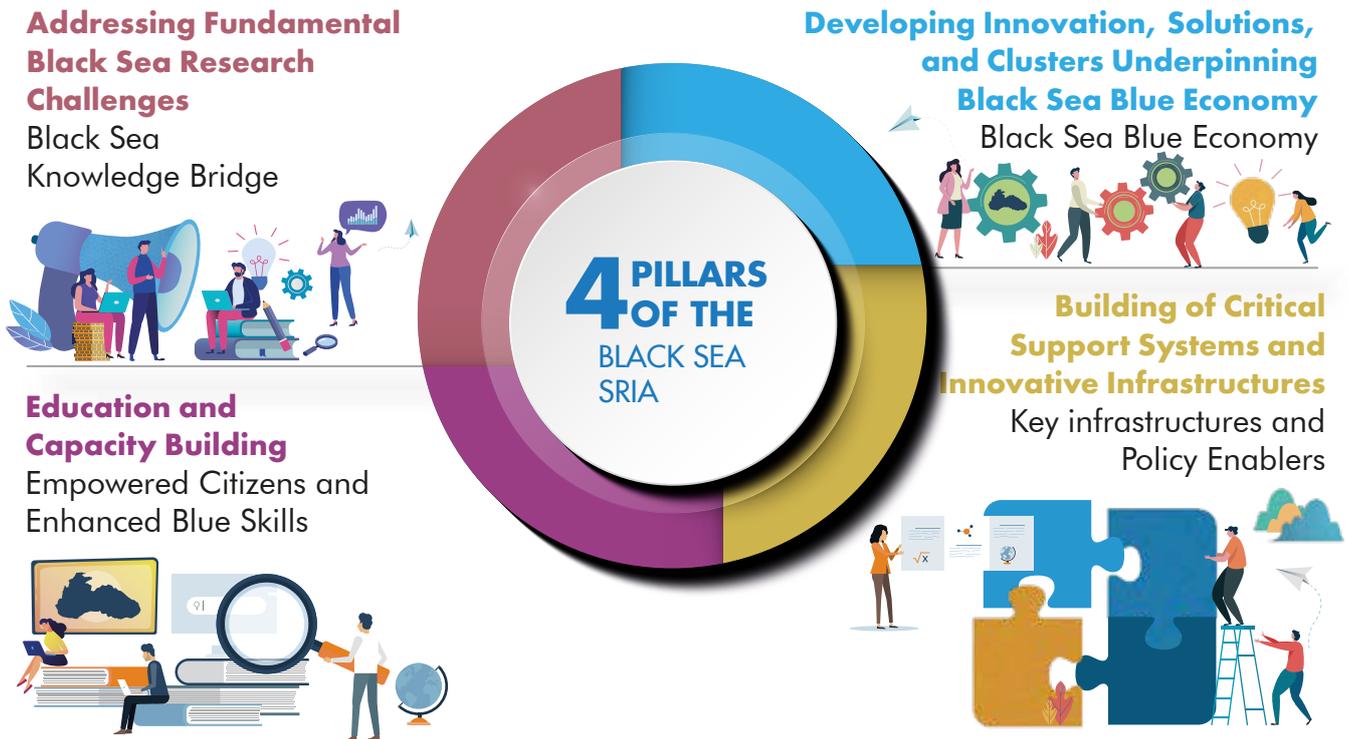


Figure 2: Four main pillars of the Black Sea SRIA based on the Burgas Vision Paper

The SRIA has been developed on the already agreed goals as stated in the Burgas Vision Paper to address the related challenges. Final SRIA is also updated with the same vision under the Black Sea CONNECT CSA.

The Initiative has identified four main pillars on which a new set of research and innovation actions can be developed (Figure 2):

- *Addressing Fundamental Black Sea Research Challenges - Black Sea Knowledge Bridge*
- *Developing Innovations, Solutions and Clusters Underpinning Black Sea Blue Economy*
- *Building of Critical Support Systems and Innovative Infrastructures - Key Joint Infrastructure and Policy Enablers*
- *Education and Capacity Building - Empowered Citizens and Enhanced Blue Skills*

There are three overarching considerations throughout the SRIA:

- *First, the pillars support developing and adopting innovative, fit for purpose observation and data sharing systems (combining ecology and social data) building on existing networks.*
  - *Second, the actions are designed to benefit primarily from co-funding and co-programming mechanisms and bodies at national, transnational and international levels.*
  - *Third, the Black Sea SRIA was updated on a regular basis in dialogue and in close link with relevant national and research stakeholders and further clarifications and revisions will be made as needed.*

A key output of the SRIA is to help identify national level priorities to contribute to the development of national Sustainable Blue Economy agendas. Furthermore, the actions proposed in the SRIA and their implementation generates scientific knowledge. Such new knowledge includes better ecosystem assessments, forecasts and management, as well as an understanding of the vulnerabilities of the ecosystem. Knowledge is the key element towards science-based and well-informed decision-making. Such policymaking paves the way to a sustainable blue economy<sup>1</sup>.

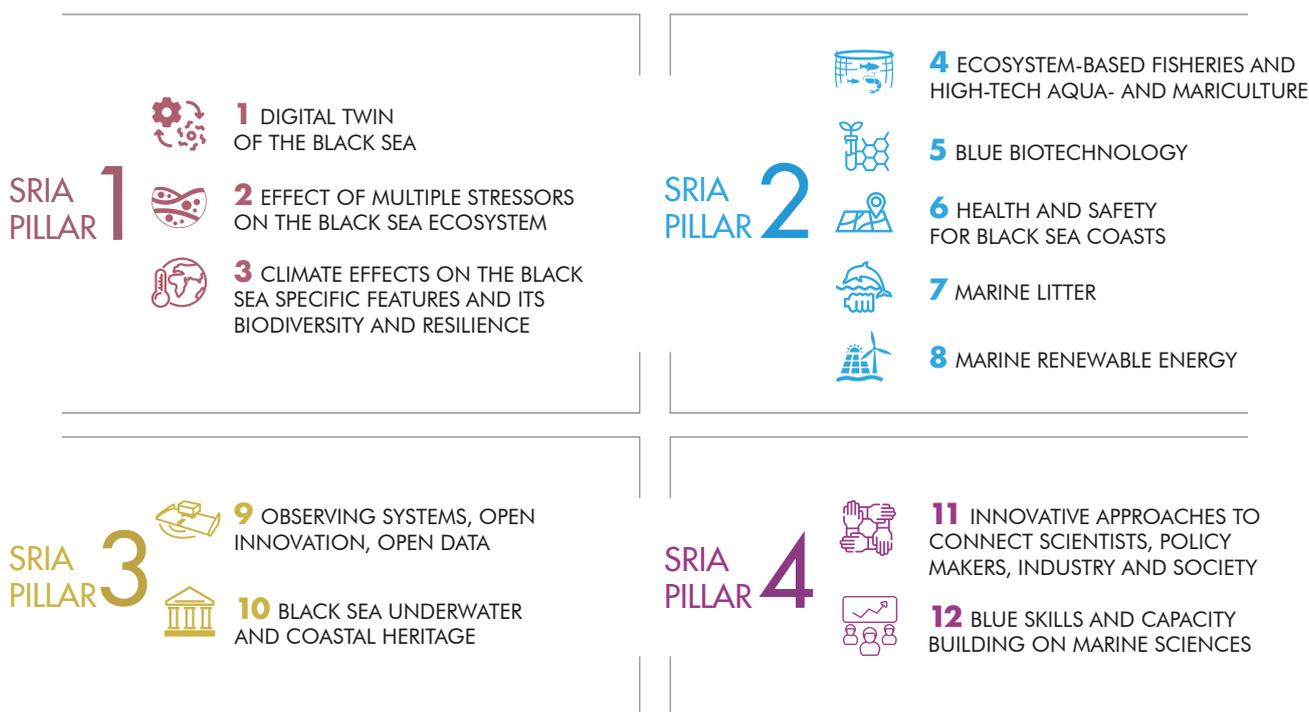


Figure 3: Black Sea SRIA Implementation Plan Themes

<sup>1</sup> This SRIA has been actively supporting the development of the Common Maritime Agenda for the Black Sea. For the purposes of this Common Maritime Agenda the participating countries have a common understanding of the blue or maritime economy as - all economic activities, including sustainable exploitation and preservation, related to oceans, seas and coasts, covering a wide range of interlinked established sectors with long term, proven contribution to the economy, such as shipping, shipbuilding, fisheries, traditional sun-sea tourism, and emerging new sectors that show high potential for future development, including blue bioeconomy/biotechnology, ocean energy, offshore wind energy, desalination, coastal and environmental protection as source of economic growth.

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

**MAIN GOAL 1** - Developing innovative multi-disciplinary research from coastal systems to the deep-basin including seafloor processes, building on existing initiatives, including data sharing mechanisms that will generate the knowledge needed to increase ecosystems resilience and assess ecosystem services

ACTIONS	TERM	MAIN ACTOR(S)-INITIATIVES
<b>1.1-1</b> Address the main Black Sea challenges on eutrophication, deoxygenation, invasive species, emerging pollutants, effects of disruptive activities (i.e. military), and litter across the land-sea continuum all the way to the deep seafloor	Medium - Long Term	Academia, BSC, FAO, GFCM Ministries and Related Governmental Agencies, Private Sector, Research Institutions
<b>1.1-2</b> Enhance food systems research including fisheries, recruitment, stock assessment and ecosystem-based management, fishing productivity zones and biotech (such as alternative protein and other nutrient sources)	Medium - Long Term	Academia, BSC, FAO, GFCM, Ministries and Related Governmental Agencies, Research Institutions
<b>1.1-3</b> Fill gaps in understanding the evolution of the Black Sea, ecosystem dynamics, biogeographic patterns, functional biodiversity, ecosystem resilience and functions and their effects on ecosystem services	Short Term	Academia, Black Sea NGO Forum, BSEC, CPMR, Maritime Clusters, National Statistical Institutes, Port Authorities, Research Institutions, Union of Black Sea Municipalities
<b>1.1-4</b> Initiate comprehensive socio-economic data collection and analyses on coastal communities interacting with the marine ecosystem to understand how drivers of the marine environment and human induced pressures impact the communities (systems approach)	Short - Medium Term	Academia, BSUN, FAO, GFCM, IOC-UNESCO, Ministries and Related Governmental Agencies, National Authorities, Navy Oceanographic Offices, Research Institutions, UNEP
<b>1.1-5</b> Increase knowledge on ecosystem resilience through an improved understanding of specific Black Sea features such as Rim current dynamics, mesoscale features i.e. fronts, eddies, vertical upwelling, suboxic-anoxic interface, deep basin including the seafloor and sediments underneath in the Black Sea and their roles in nutrient fluxes, productivity and food provisioning and climate regulating services.	Short - Medium Term	Academia, Ministries and Related Governmental Agencies, Private Sector, Research Institutions, Space Agencies, UNDP

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

**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 land-sea interface to the deep basin

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>1.2-1</b>	Quantify sources of natural and anthropogenic inputs including from the river catchments, atmosphere, maritime activities, towards an understanding of the drivers and processes that influence the Black Sea at wider scale (covering river-to-sea interactions and atmosphere – hydrosphere interfaces)	Short - Medium Term	Academia, BSC, NGOs, Coastal Communities, Maritime Agencies, Ministries and Governmental Agencies Municipalities, Port Authorities, River Commissions, Research Institutions, Space Agencies, Research Infrastructure Networks
<b>1.2-2</b>	Develop the Digital Twin of the Black Sea that includes innovative circulation and biogeochemical models integrated with socio-economic models and AI supported DSTs.	Short - Medium Term	Academia, BSC, CPMR, Ministries and Government Agencies, MEDCOAST, Municipalities, NGOs, Research Institutions, European DTO
<b>1.2-3</b>	Develop the 'One Health' Approach and improved safety for Black Sea coasts, via investigating climate-related impacts and geohazards: such as coastal erosion, submarine landslides, sea level rise, extreme events, emerging pollution fluxes and human borne pathogens and impacts on human and ecosystem health	Short - Medium Term	Academia, Copernicus, Ministries and Governmental Agencies, Municipalities, WHO One Health Initiative, Research Institutions
<b>1.2-4</b>	Use state of the art geochemical proxy tools and advanced models to enhance the Black Sea paleoclimate archive to shed light on the recent geological and biogeochemical natural evolution of the Basin	Short - Medium Term	Academia, Infrastructures from IODP, IOC-UNESCO, International Marine Research Networks, Research Institutions
<b>1.2-5</b>	Reveal the interactions between multiple stressors, biodiversity and marine ecosystem functioning as well as demonstrate how adaptation and evolution may change ecosystem response to changing stressors	Short - Medium Term	Academia, Copernicus, Global and Regional Observing Systems, IOC-UNESCO, Research Infrastructure Networks, Research Institutions
<b>1.2-6</b>	Develop integrated, novel evolutionary end-to-end (microbes to fish) modelling and data analyses capacity	Short - Medium Term	Academia, Copernicus, Research Institutions
<b>1.2-7</b>	Advance research for integrated coastal and marine management, including the interaction between land-based and sea-based activities and their impacts on coastal zones, both landward and seaward	Short - Medium Term	Academia, Research Institutions Ministries and Related Governmental Agencies

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

**MAIN GOAL 1** - Supporting marine and maritime research and innovation domains of all the Black Sea countries to create synergy, develop ecosystem based, carbon neutral sustainable economy, mitigate hazard impacts for resilient Black Sea communities.

ACTIONS	TERM	MAIN ACTOR(S)-INITIATIVES
<b>2.1-1</b> Promote and foster synergies, through social innovation, living labs and multi-actor forums , enhanced networks for innovation and capacity building to transfer knowledge between clusters in the blue economy and reinforce existing inter-sectorial interactions	Short - Medium Term	BSC, Black Sea NGO Forum, BSEC, CPMR, GFCM, Local Authorities, Local Communities, Maritime Clusters, Ministries and Related Governmental Agencies, Industries, Regional and National Networks
<b>2.1-2</b> Define geological features located near shore and offshore, including the deep seafloor, their evolution over time and support the business uptake of innovative technologies to avoid potential geo-hazards and their effect on cultural and recreational ecosystem services	Medium Term	Academia, Local Authorities, Ministries and Related Governmental Agencies, NGOs, Private Sector, Research Institutions
<b>2.1-3</b> Support the dialogue between researchers and business to promote and adopt circular economy principles as a booster for sustainable innovation for the blue economy	Medium Term	Academia, Maritime Clusters, NGOs, Private Sector, Research Institutions
<b>2.1-4</b> Develop methodologies for science-based policymaking, foresight and cost-benefit analyses and other financial instruments towards the assessment of the innovative and feasibility potential of the projects	Short Term	Academia, Ministries and Related Governmental Agencies, Research Institutions
<b>2.1-5</b> Development of a unified database at national/regional level with completed and on-going projects, in particular related to the blue economy in order to analyse and further use the results obtained	Medium Term	Academia, Ministries and Related Governmental Agencies, Research Institutions

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

### MAIN GOAL 2 - Developing innovation in existing and emerging blue economy sectors

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>2.2-1</b>	Develop renewable energy pilots and demonstrators such as wind, wave, solar, green hydrogen and carbon capture in marine and coastal areas. Investigate the potential of responsible exploration of gas hydrates	Short-Medium Term	Academia, Ministries and Related Governmental Agencies, Private Sector, Regional Authorities, Research Institutions
<b>2.2-2</b>	Develop ecosystem based fisheries and high-tech aquaculture including multi-use platforms	Short-Medium Term	Business Associations, SMEs, FAO, GFCM, Research Institutions, Fisheries and Aquaculture Organisations, Ministries and Related Governmental Agencies, Private Sector
<b>2.2-3</b>	Foster biotechnology by exploring candidate species and potential habitats that support bioactive compounds, such as novel pharmaceuticals, biofuels, enzymes, fishmeal, and biopolymers, for sustainable development in the region	Medium-Long Term	Academia, Associations (such as European Aquaculture Association and European Society for Marine Biotechnology), FAO, GFCM, Ministries and Related Governmental Agencies, Private Sector, Research Institutions, EU Life Sciences and Biotechnology
<b>2.2-4</b>	Further develop new and innovative cultural and recreational ecosystem services to promote synergies between sustainable coastal tourism and other activities (i.e. pesca-tourism, culture and underwater heritage, aquaculture, yachting)	Short Term	Academia, Business Associations (such as shipbuilders), Local and Regional Authorities, Ministries and Related Governmental Agencies, Private Sector, Research Institutions
<b>2.2-5</b>	Innovative solutions for sustainable development of port infrastructure and operations towards net zero economy and environmentally friendly "Green ports" and "Smart ports"	Medium-Long Term	Academia, Ministries and Related Governmental Agencies, Port Authorities, Private Sector, Public Authorities, Research Institutions
<b>2.2-6</b>	Promote low-emission, carbon-neutral ships and freight operations in line with the international safety standards and circular economy principles to achieve sustainable and green shipbuilding, repair and retrofit	Medium Term	Academia, Ministries and Related Governmental Agencies, Port Authorities, Private Sector, Public Authorities, Research Institutions
<b>2.2-7</b>	Develop and promote innovative marine litter (including microplastics) management techniques both on land and sea in line with the principles of circular economy and maintaining regional marine litter forum on a permanent basis	Short Term	Academia, Black Sea NGO Forum, BSC, Citizens, GFCM, Local Communities, Ministries and Related Governmental Agencies, Municipalities, Private Sector, Research Institutions
<b>2.2-8</b>	Identify the services provided by marine biotic and abiotic resources for enhanced coastal protection and resilience	Short-Medium Term	Academia, Local and Regional Authorities, Ministries and Related Governmental Agencies, Private Sector, Research Institutions

## SRIA PILLAR 3: BUILDING OF CRITICAL SUPPORT SYSTEMS AND RESEARCH 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

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>3.1-1</b>	Develop and enhance a network of dedicated Marine Research Infrastructures at the Black Sea, building on existing European and international initiatives, ensuring interaction between the ongoing projects and research activities	Short Term	Academia, BSEC, Copernicus, GOOS, IOC-UNESCO, Ministries and Related Governmental Agencies, Research Infrastructures (such as EMSO-ERIC, DANUBIUS-RI, EURO ARGO-ERIC, JERICO, HYDRALAB, EuroFleets), Private Sector, Research Institutions
<b>3.1-2</b>	Design and of joint innovative observing systems and redesign and enhance regular sea expeditions, deployment of mobile and fixed marine observation instruments	Short-Medium Term	Academia, Copernicus, GOOS, Ministries and Related Governmental Agencies, Research Infrastructures (such as EMSO-ERIC, DANUBIUS-RI, EURO ARGO-ERIC, JERICO, HYDRALAB, EuroFleets), Private Sector, Research Institutions
<b>3.1-3</b>	Produce, collect and make available compatible high-quality data sets (the FAIR principles and open data access)	Short-Medium Term	Academia, NCPs, National Data Centres and Organisations, Regional Data Infrastructures and European Projects (such as Copernicus, EMODNET, SeaDataNet, SeaDataCloud, DANUBIUS-RI, EURO ARGO ERIC, EMSO-ERIC), Research Institutions, Regional and National Authorities
<b>3.1-4</b>	Integrate, strengthen and upgrade monitoring, modelling and forecasting capacities to support the Digital Twin of the Black Sea and marine spatial planning	Short-Medium Term	Academia, BSC, CMEMS, Copernicus, EuroGOOS, National Authorities, Regional and National Forecasting Centres, Regional Forecasters, Research Institutions, Risk Management Agencies, European DTO

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

**MAIN GOAL 2** - Advancing a harmonised set of working methodologies, standards and procedures on all aspects of coastal and marine research

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>3.2-1</b>	Develop common monitoring standards and research infrastructures for integrated coastal and marine management in support of policy- and decision makers	Medium Term	Academia, BSC, ICES, IMO, Maritime Clusters, MEDCOAST, Ministries and Related Governmental Agencies, Regional Authorities, Research Institutions
<b>3.2-2</b>	Establish common methodology and transboundary pilot schemes for marine spatial planning at national and regional levels based on ecosystem approach	Short Term	Academia, BSC, Local and Regional Authorities, Ministries and Related Governmental Agencies, MSP Platforms, Research Institutions

**MAIN GOAL 3** - Developing new marine based technologies by benefiting from the latest innovations for the Black Sea to promote safe and sustainable economic growth of the marine and maritime sectors, the conservation and valorisation of marine cultural heritage

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>3.3-1</b>	Identify and promote key technologies and innovations required for the Black Sea monitoring and research in close interaction with solution providers and best practices	Short-Medium Term	Academia, BSEC, CPMR, EuroGOOS, Maritime Clusters, Ministries and Related Governmental Agencies, National Emergency Agencies, Port Authorities, Private Sector, Research Institutions, SMEs
<b>3.3-2</b>	Support the development of basin-scale programmes for research and exploration, conservation and valorisation of marine cultural heritage	Long Term	IOC-UNESCO, Media, Ministries and Related Governmental Agencies, Museums, NGOs, Research Institutions

**MAIN GOAL 4** - Mechanisms to create, support and promote start-ups, entrepreneurs oriented towards the circular and blue economy in the Black Sea region

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>3.4-1</b>	Enable researchers, innovators and entrepreneurs open and easy access to research infrastructures and networks via the establishment of the Open Transnational Service and Access initiatives (i.e. transnational and virtual access)	Short Medium Long Term	Academia, Ministries and Related Governmental Agencies, National Authorities and Organisations, Regional Organisations, Research Infrastructures, Research Institutions
<b>3.4-2</b>	Create, integrate and support incubators and techno parks for promoting SMEs, start-ups and innovative businesses for the blue economy	Short Medium Long Term	Academia, Chambers of Commerce and Industry, International Organisations Ministries and Related Governmental Agencies, Private Sector, Regional Organisations, Research Institutions, Startup Europe, Venture Capital

## 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.

ACTIONS	TERM	MAIN ACTOR(S)-INITIATIVES
<p><b>4.1-1</b> Develop new formal and informal programmes and coordinate existing ones (syllabus and curricula) to support and implement priorities defined in SRIA. This entails the design and implementation of dedicated undergraduate, graduate and postdoctoral programmes for future researchers and professionals in all fields of the Blue economy</p>	Short - Medium Term	Academia, Ministries and Related Governmental Agencies, Higher Education Councils, Regional and National Authorities, Private Sector, Research Institutions, Training Organisations, EU Erasmus+, IOC OTGA, EMSEA, UN SDG4 Quality Education
<p><b>4.1-2</b> Develop programmes for life long and intergenerational training as well as vocational education of professionals in integrated coastal and marine management and blue economy</p>	Short - Medium Term	Academia, BSC, MEDCOAST, Ministries and Related Governmental Agencies, Higher Education Councils Private Sector, Regional and National Authorities, Research Institutions, Training Organisations, Vocational Training Institutions, European Year of Skills 2023
<p><b>4.1-3</b> Promote digital literacy (i.e. e-learning environments) and prepare for the rapid change in use and implementation of virtual technologies as an essential component of life long education in all fields of blue economy</p>	Short - Medium Term	Academia, Media, Ministries and Related Governmental Agencies, Higher Education Councils, National and Regional Authorities, NGOs, Research Institutions, Private Sector, Training Organisations, IOC OTGA
<p><b>4.1-4</b> Promote mentoring and training for new start-ups and coaching for scaling-up companies and investors in the blue economy at local/regional levels</p>	Short - Medium Term	Academia, Business Community, Chambers of Commerce, Innovation Parks and Clusters, Ministries and Related Governmental Agencies, Higher Education Councils, National and Regional Authorities, CPMR, Research Institutions, NGOs, Technological Parks, Training Organisations
<p><b>4.1-5</b> Support undergraduate, graduate students and early career ocean professionals to gain blue skills (like staff exchanges, secondments, mobility programmes) and undergo work placement apprenticeships schemes in businesses and institutions active in the blue economy</p>	Short - Medium Term	Academia, Chambers of Commerce, Innovation Parks and Clusters, Ministries and Related Governmental Agencies, Higher Education Councils, National and Regional Administrations, NGOs, Private Sector, Research Institutions, Technological Parks, Training Organisations, EU Erasmus+, European Youth, UN ECOPs, EU4Ocean

## SRIA PILLAR 4: EDUCATION AND CAPACITY BUILDING

**MAIN GOAL 2** - Empowering ocean-engaged citizens contributing to a climate resilient, clean, plastic free, healthy and productive Black Sea.

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>4.2-1</b>	Educate communities towards the unique value of the Black Sea and promote Ocean literacy in the region through integrated citizen science and outreach activities such as the European Researchers' Night, European Maritime Day, International Black Sea Day	Short - Medium Term	Academia, EMSEA, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, NGOs, Opinion Makers (influencers), Private Sector, Research Institutions, Training Organisations, Social Media and Communication Experts and Specialised Companies, EU4Ocean, IOC-UNESCO Ocean Literacy
<b>4.2-2</b>	Nurture a Black Sea cultural/scientific identity, through dedicated formal and informal education as well as work-oriented programmes in all fields of research and Blue Economy	Short Term	Academia, Local Authorities, Ministries and Related Governmental Agencies, Higher Education Councils, NGOs, Parent and Consumer Associations, Opinion Makers (influencers), Private Sector, Research Institutions, Social Media and Communication Specialists, Sport Clubs, Training Organisations, EU4Ocean, IOC-UNESCO Ocean Literacy
<b>4.2-3</b>	Communicate the uniqueness and importance of the Black Sea basin, via sustaining the established Young Ambassadors Programme and extending this to new Black Sea Ambassadors of all ages including influencers and celebrities, at local, regional and global levels at special events and initiatives such as the International Black Sea Day (31st October) and the European Maritime Day	Short Term	Academia, BSC, International Organisations, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, Higher Education Councils, NGOs, Private Sector, Research Institutions, Social Media and Communication Specialists, European Youth, EU4Ocean

**MAIN GOAL 3** - Contributing to enhanced science policy dialogue in formulating coastal and marine policies and programmes.

	<b>ACTIONS</b>	<b>TERM</b>	<b>MAIN ACTOR(S)-INITIATIVES</b>
<b>4.3-1</b>	Develop mechanisms to continue the identification of new SRIA priorities and emerging topics for implementation	Short Medium Long Term	Academia, International Organisations, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, NGOs, Private Sector, Research Institutions, Social Media and Communication Specialists
<b>4.3-2</b>	Train policy and decision makers through dedicated activities for the efficient implementation of marine and coastal policies and management	Short Term	Academia, Ministries and Related Governmental Agencies, National, Regional and Local Authorities, NGOs, Research Institutions

## ANNEX 1 - GLOSSARY

ACRONYM	TITLE
AI	Artificial Intelligence
BRIDGE-BS	Advancing knowledge, delivering research, empowering citizens for sustainable and climate-neutral Black Sea (EU funded project)
BSC	Black Sea Commission
BSEC	Organization of the Black Sea Economic Cooperation
BSUN	Black Sea University Network
CMEMS	Copernicus Marine Environment Monitoring Service
Copernicus	The European Earth Observation Programme
CPMR	Conference of Peripheral Maritime Regions
DANUBIUS-RI	International Centre for Advanced Studies on River–Sea Systems
DG MARE	The Commission's Directorate-General for Maritime Affairs and Fisheries
DG R&I	The Commission's Directorate-General for Research and Innovation
DOORS	'Developing Optimal and Open Research Support' for the Black Sea (EU funded project)
DSTs	Decision Support Tools
EEAS	European External Action Service (EEAS)
EC	European Commission
EMODNET	The European Marine Observation and Data Network
EMSEA	European Marine Science Educators Association
EMSO-ERIC	European Multidisciplinary Seafloor and Water Column Observatory - European Research Infrastructure Consortium
EU	European Union
EU Erasmus+	EU's programme to support education, training, youth and sport in Europe
EU4OCEAN	European Ocean Coalition for Ocean Literacy
EURO ARGO-ERIC RI	European contribution to the Argo programme
European DTO	European Digital Twin Ocean
EUROFLEETS	New operational steps towards an alliance of European research fleets
EuroGOOS	European Global Ocean Observing System
FAIR	Findable, Accessible, Interoperable, and Reusable
FAO	Food and Agriculture Organization
GFCM	General Fisheries Commission for the Mediterranean
GOOS	Global Ocean Observing System
Hydralab	Network of environmental hydraulic institutes in Europe
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organization
IOC OTGA	Ocean Teacher Global Academy
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO

IODP	International Ocean Discovery Program
IP	Implementation Plan
JERICO	Joint European Research Infrastructure network for Coastal Observatories
MEDCOAST	Mediterranean Coastal Foundation
MSc	Master of Science
MSP	Maritime Spatial Planning
NCPs	National Contact Points
NGOs	Non-governmental Organizations
ONF	Operational Network of Funders
SDG	Sustainable Development Goal
SeaDataCloud	Further developing the pan-European infrastructure for marine and ocean data management (EU funded project)
SeaDataNet	Marine Data Infrastructure for the management of large and diverse sets of data deriving from in situ of the seas and oceans
SMEs	Small and Medium-sized Enterprises
SRIA	Strategic Research and Innovation Agenda
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WHO	World Health Organization

## ANNEX 2 - DEVELOPMENT OF THE SRIA

In 2017, an Initiative was launched and supported by the European Commission (EC) to develop a joint research and innovation agenda and guide national and EU-level policymakers named as 'The Blue Growth Initiative for Research and Innovation in the Black Sea'. As highlighted in the Burgas Vision Paper, this expert working group consisted of experts from Black Sea coastal countries, (*Republic of Bulgaria, Georgia, Romania, the Russian Federation, the Republic of Türkiye and Ukraine, as well as the Republic of Moldova*), in cooperation with marine experts from leading European marine institutes and organisations, with the support of the European Commission<sup>1</sup>. They 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 paper was launched during the European Maritime Day 2018 in Burgas, Bulgaria (May 2018). It addresses the key pillars on which a new Strategic Research and Innovation Agenda (SRIA) can be built on. This process was further supported by the Ministerial Declaration towards a Common Maritime Agenda (2018) for the Black Sea, endorsed by the same Black Sea countries.

Eight workshops were held by the experts joining the Blue Growth Initiative for Research and Innovation in the Black Sea with the support of the European Commission (EC). Initially information on both national and international marine research projects were collected and analysed. Secondly, gaps and research and innovation opportunities together with the necessary justification and drivers from each Black Sea country were collated. Thirdly, regional and national boundary and framework conditions for the Research and Innovation needs and opportunities for successful implementation of a SRIA were identified. Based on the data generated and outcomes of these workshops, the experts of the Initiative drafted: i) common vision, ii) challenges, iii) goals of the SRIA. These results were presented in the Burgas Vision Paper.

The matrixes and past project information were analysed and collated into summary graphs to identify needs and gaps. For this, sets of pre-defined area keywords were delivered to the expert group and they were asked to map national/international projects. As a result, different focuses of national-funded and EU-funded projects were highlighted. For instance, while the national projects were mostly focused on biodiversity, pollution, observing and management projects, EU- funded projects targeting the Black Sea prioritised more crosscutting frontier areas such as socioeconomics, training, climate change and multiple stressors.

After the launch of the Burgas Vision paper in May 2018, the efforts of the Black Sea Blue Growth Initiative were focused on developing the SRIA goals and actions. The structure of the SRIA was set to pave the path for an effective and realistic implementation of the SRIA, which includes a clear definition of goals, challenges, targets and main actors.

In 2019, Black Sea CONNECT Coordination and Support Action (CSA) was funded with the goal of consolidating the SRIA and develop its implementation Plan. The specific goals of the CSA are as below:

1. Support the Black Sea Blue Growth Initiative to consolidate and update the SRIA
2. Develop the SRIA Implementation Plan
3. The establishment of an operational network for the Black Sea Region
4. Support the design and implementation of new transnational joint activities
5. Making the Black Sea visible through empowered Black Sea societies

With these goals, the Black Sea CONNECT CSA aimed to take further the process that started with the Burgas Vision Paper to SRIA Implementation (Figure 4). For this purpose, under the Black Sea CONNECT CSA, the next steps were focused on gathering national-level feedback to define key framework conditions for the SRIA implementation with the contribution of the various stakeholder groups, including policy makers, regulatory agencies, researchers, and end users.

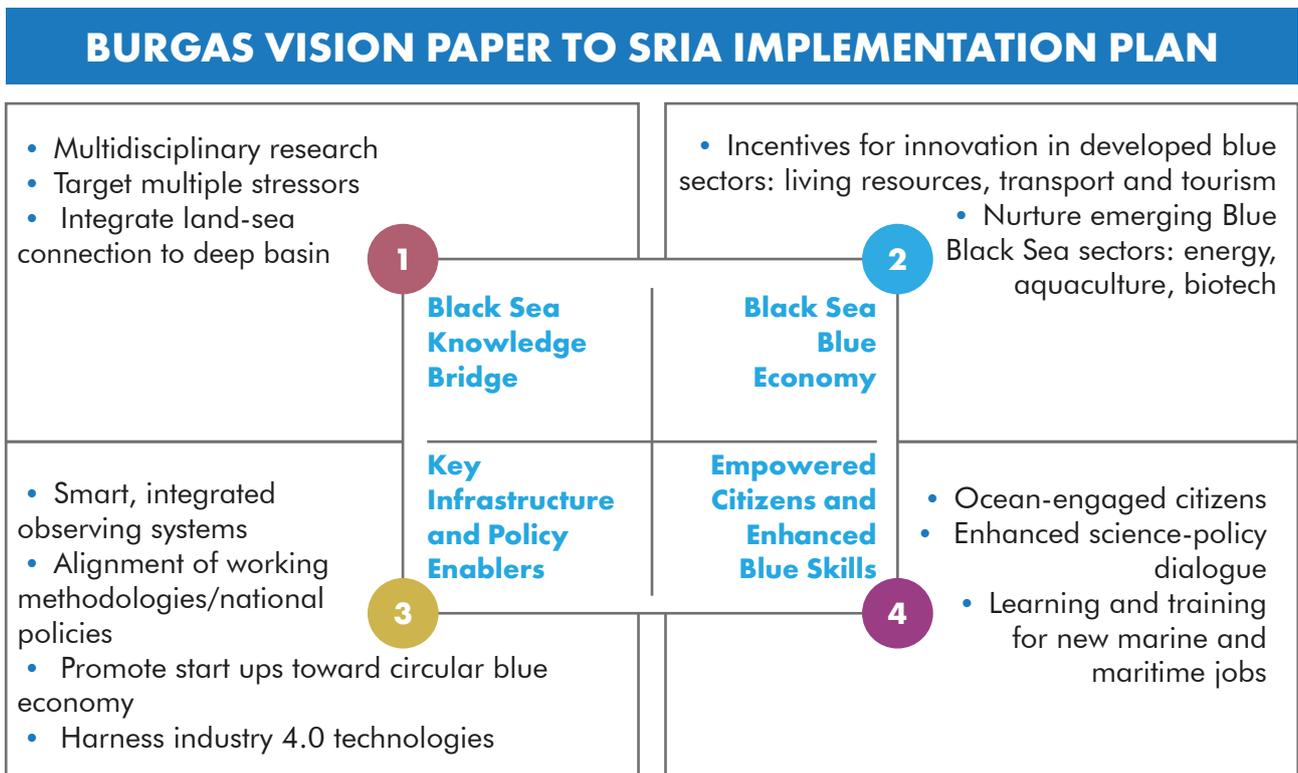


Figure 4: Goals of the SRIA based on the Burgas Vision Paper

In this regard, two national Black Sea SRIA consultation workshops were organised. The first round was carried out in September – October 2020, covering more than 600 attendees in the 7 Black Sea countries. The results from the national platforms included identified gaps, barriers and bottlenecks on innovation and new technologies, scientific knowledge, and sustainable development of marine and maritime economic sectors. It was also observed that the SRIA actions and goals are still relevant based on the ranking activities conducted during the consultations. More information on the first round of the consultation are gathered and submitted under Black Sea CONNECT (Updated SRIA D2.2 and D2.4).

Additionally, Black Sea CONNECT CSA conducted other activities that provided input to the development of the Implementation Plan. Firstly, the CSA continued to update the matrixes and past project information to identify needs and gaps in the research and innovation areas. These reports have shown that in all funding streams, there was a gap in terms of support to emerging R&I areas. Most of the Black Sea countries are lacking underlying infrastructure (such as observing and monitoring systems), relevant marine-related policies and implementation instruments. More funding is needed both at the national and EU level for projects and programmes tackling areas such as Marine Ecosystem Services, Human Health and Seas, Interconnections of the basins among many others National projects mostly focused on Living Marine Resources, Marine Pollution and Litter, Biodiversity and Operational Oceanography/Observing Systems and Monitoring projects; Multinational EU funded projects targeted Operational Oceanography/Observing Systems and Monitoring, Training & Technology Transfer, Tourism and Surrounding Economy, Socioeconomic & Policy Research and Biodiversity. Climate change was addressed as a secondary area; Emerging challenges are little addressed in monitoring programs: Bioinvasions, Deep Sea Ecosystems, Seas and Human Health (Reports on State of the art of Black Sea projects mapping and framework conditions - D2.1 and D2.7).

Secondly, the CSA continually identified the relevant projects to engage in the SRIA development and Implementation. Project reports (Handbook of relevant Black Sea projects, initiatives and entities and its updated version- D3.1 and D3.6) are developed a database of past and on-going projects that are relevant to Black Sea CONNECT, with also including the discussion of the modes of engagement. It covers not only activities that involve the Black Sea directly, but also those on other European seas and rivers from which Black Sea CONNECT can gain experience and expertise.

Thirdly, Black Sea CONNECT CSA organized an Innovation Workshop showcase the best practices of marine clusters initiatives to the eventual formation of a marine and maritime cluster of the Black Sea. The outputs of this workshop (Black Sea Marine Innovation Report - D3.4) showed that different challenges of importance for the development of marine research and innovation exist including the digital transition, the ecological transition, the circular economy, the transition from research to the market, the formation of a maritime cluster for the Black Sea and the key issue of public and private funding. These inputs also used in the updated SRIA and its Implementation Plan.

Moreover, Black Sea CONNECT CSA has piloted three joint actions which are also integrated first into the draft and then in the final Implementation Plan. Marine Litter Action Forum organized, focusing on the innovative solutions to combat the marine litter pollution in the Black Sea.

Also, Black Sea Young Ambassadors Programme has been launched being a flagship activity of the project. Finally, third joint action focused on the assessment of the impact of pandemic type risks on the Black Sea ecosystem, sea level rise, extreme weather, harmful algal blooms – impacts and adaptations, one health approach, that considers both the human health and the ecosystem health and resilience with specific strategic joint actions underneath. It has been integrated as a separate theme to the Implementation Plan. Impact of military activities are also added as part of this joint action, especially after the unjustified war on Ukraine this impact is expected to increase. Available monitoring activities need to be upgraded to better understand these impacts. Inputs received through these actions and activities are also integrated into the Implementation Plan draft (Report on joint actions and their implementation status - D3.3).

Black Sea CONNECT project has also been involved in synergistic activities with the relevant policies and initiatives. Close cooperation has been ensured with the Common Maritime Agenda for the Black Sea and its Steering Group and national hubs throughout the life-time of the project. Black Sea SRIA is represented in the business focused events and activities of the CMA. Additionally, through Black Sea CONNECT, SRIA is integrated into the Sustainable Blue Economy Partnership as the sea-basin strategy for the Black Sea. Lastly, alignment with the Mission Ocean and Water priorities are also enabled. This way, many more stakeholders are engaged beyond the CSA-organized activities, and input are gathered to be integrated into the final SRIA and its Implementation Plan.

Under the Black Sea CONNECT CSA, the Operational Network of Funders (ONF) that has been built on the Group of Senior Officials of the Black Sea SRIA was also established. Consisting of funding agencies (ministry representatives) of Black Sea countries (Bulgaria, Georgia, Romania, Moldova, Türkiye, Ukraine) and EC officials from DG R&I, DG MARE, and EEAS, the objective of the Operational Network of Funders is to streamline funding for the implementation of the SRIA Implementation Plan joint actions. Through online and onsite/hybrid meetings organized in the last year under the Black Sea CONNECT CSA, the Operational Network of Funders contributed greatly to the development of the Implementation Plan (Report on agreed measures on medium and long term articulation beyond the CSA lifetime D2.5 and Report on the activities on the operational network, its sustainability beyond the CSA and recommendations D3.5).

Based on the first round of the consultations, and all other CSA activities (mentioned above) draft Implementation Plan was developed with the Steering Committee team of the CSA which included themes and strategic joint actions. Based on the draft Implementation Plan, the second round of national consultations was organized in February – March 2023, focusing on identifying feasible and necessary actions to be addressed by the SRIA Implementation plan (SRIA Implementation Plan – D2.3, D2.6). A total of 203 Black Sea various national stakeholders responded to joint online questionnaire before, during or after the consultations. In addition, a consultation with linked projects and initiatives on the Implementation Plan was organised in Bucharest on 15 March 2023, gathering further input on the Implementation Plan of the Black Sea SRIA from linked projects and initiatives, including BRIDGE-BS and DOORS Projects. The generalised output was processed accordingly and transferred to the final update of the SRIA and the IP.



Photos from SRIA Development



Photos from the various national consultation meetings held by the partners



Consultation with linked projects and initiatives  
for the Black Sea SRIA Implementation Plan  
15 March 2023 Bucharest, Romania



Photos from consultation with Operational Network of Funders  
16 March 2023 Bucharest, Romania



Photos from consultation with Operational Network of Funders  
4 May 2023 Brussels, Belgium