



BLACK SEA
STRATEGIC RESEARCH
AND
INNOVATION AGENDA



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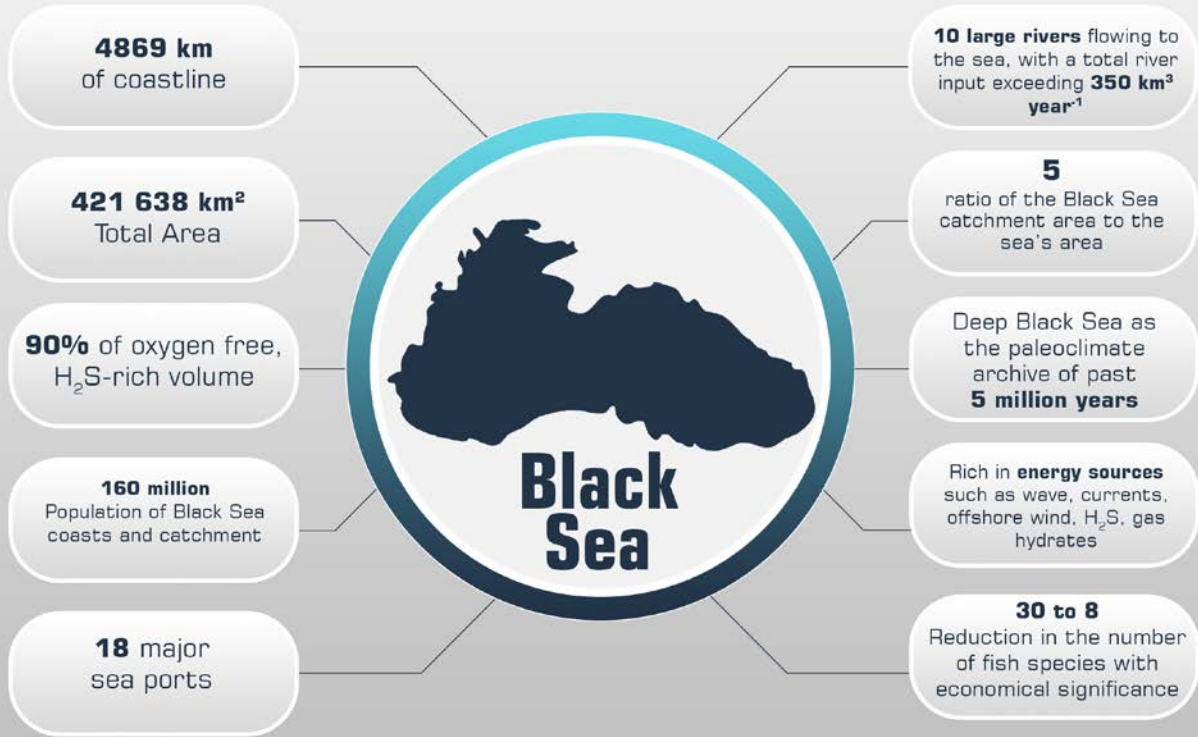
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The Black Sea

A unique sea basin, rich in biodiversity and heritage, but also where an exceptional combination of natural and human induced stressors co-occur



| A COMMON VISION FOR THE BLACK SEA¹

This first version of the **Strategic Research and Innovation Agenda (SRIA)** will guide stakeholders from academia, funding agencies, industry, policy and society to address together the fundamental Black Sea challenges, to promote blue growth 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 a 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 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 is key to foster human and infrastructures capacity building in coastal, marine and maritime sectors in view of unlocking unique opportunities for a sustainable and environmental friendly blue growth 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 policy makers 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.*

¹ Burgas Vision Paper : https://ec.europa.eu/maritimeaffairs/maritimeday/sites/mare-emd/files/burgas-vision-paper_en.pdf presented on the occasion of the European Maritime Day in May 2018.

- 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 growth in living resources, offshore renewable energy, tourism, culture, transport, 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 the societal and environmental or climate-related challenges.

THE STRATEGIC RESEARCH AND INNOVATION AGENDA

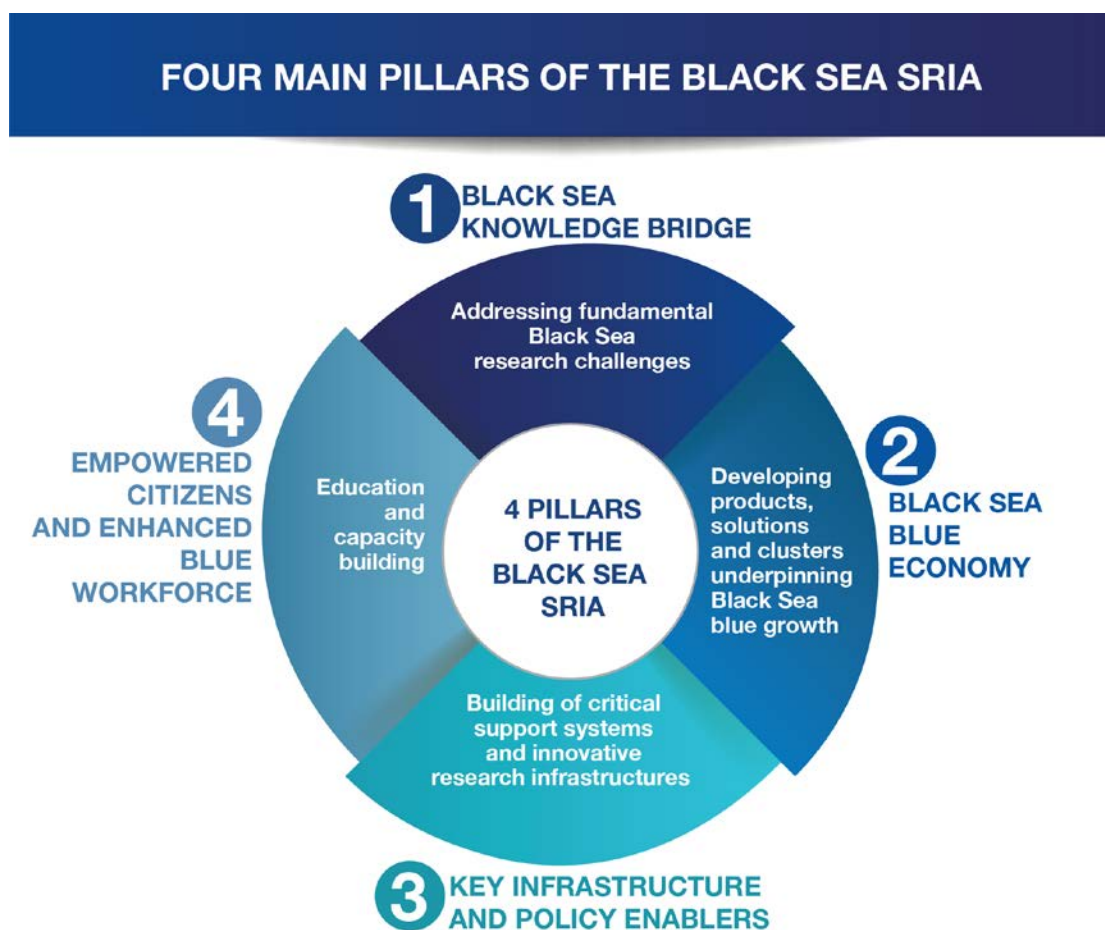


Figure 1 Four main pillars of the Black Sea SRIA based on the Burgas Vision Paper.

The SRIA has been developed on the already agreed goals as stated in the Burgas Vision Paper to address the related challenges.

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 products, solutions and clusters underpinning Black Sea Blue Growth - 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 Workforce.

There will be 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 level.
- Third, the Black Sea SRIA will be 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 Blue Growth agendas. Furthermore, the actions proposed in the SRIA and their implementation will be generating scientific knowledge. Such new knowledge includes better ecosystem assessments, forecasts and management, as well as 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 economy².

² This SRIA is also 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.

Pillar 1 - Addressing fundamental Black Sea research challenges	
Main Goal 1 - Developing innovative multi-disciplinary research, building on existing initiatives, including data sharing mechanisms that will generate the knowledge needed to increase ecosystems resilience.	
Actions	Main Actor(s)-Initiatives³
<ul style="list-style-type: none"> Address the main Black Sea challenges on eutrophication, deoxygenation, invasive species, emerging pollutants, litter (<i>Medium /Long Term</i>) 	Academia, BSC, FAO, GFCM Ministries and Related Governmental Agencies, Private Sector, Research Institutions
<ul style="list-style-type: none"> Enhance food systems research including fisheries, recruitment, stock assessment and sustainability, MPAs, biotech (such as alternative protein sources) (<i>Medium/Long Term</i>) 	Academia, BSC, FAO, GFCM, Ministries and Related Governmental Agencies, Research Institutions
<ul style="list-style-type: none"> Fill gaps in understanding the evolution of the Black Sea, ecosystem dynamics, biogeographic patterns, biodiversity, and ecosystem functions (including living resources) and potential impacts of aquaculture. (<i>Short Term</i>) 	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"> Promote socio-economic research focusing on coastal communities interacting with the marine ecosystem to understand how drivers of marine environment and human induced pressures impact the communities (systems approach) (<i>Short/Medium Term</i>) 	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"> Increase knowledge on ecosystem resilience through an improved understanding of specific Black Sea features such as Rim current dynamics, mesoscale features (such as fronts, eddies, vertical upwelling), suboxic-anoxic interface, deep part (including the sea bottom) in the Black Sea and their roles in nutrient fluxes, productivity and fisheries (<i>Short/Medium Term</i>) 	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
<ul style="list-style-type: none"> 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>) 	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"> Develop research on integrated coastal and marine management including the interaction between land-based and sea-based activities and their impacts on coastal zones, 	Academia, BSC, CPMR, Ministries and Government Agencies, MEDCOAST,

³ Listed alphabetically. The list of existing actors and initiatives given for an action is not exclusive of other potential actors.

both landward and seaward (<i>Short/Medium Term</i>)	Municipalities, NGOs, Research Institutions
<ul style="list-style-type: none"> Establish research on coastal hazards: erosion, submarine landslides, sea level rise, extreme events, flooding, and connections with climate change (<i>Short/Medium Term</i>) 	Academia, Copernicus, Ministries and Governmental Agencies, Municipalities, Research Institutions
<ul style="list-style-type: none"> Use state of the art geochemical proxy tools and advanced models to enhance Black Sea paleoclimate archive to shed light on the recent geological and biogeochemical natural evolution of the Basin (<i>Short/Medium Term</i>) 	Academia, Infrastructures from IODP, IOC-UNESCO, International Marine Research Networks, Research Institutions
<ul style="list-style-type: none"> 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>) 	Academia, Copernicus, Global and Regional Observing Systems, IOC-UNESCO, Research Infrastructure Networks, Research Institutions
<ul style="list-style-type: none"> Develop integrated, novel evolutionary end-to-end (microbes to fish) modelling and data analyses capacity 	Academia, Copernicus, Research Institutions

Pillar 2 - Developing products, solutions and clusters underpinning Black Sea Blue Growth

Main Goal 1 - Supporting marine and maritime research and innovation domains of all the Black Sea countries to create synergy, increase economic benefits, reduce hazards in service of prospering, resilient and empowered communities deriving interest from the Black Sea basin

Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> Promote and foster synergies, through networking events and meetings towards capacity building to transfer knowledge between clusters in the blue economy and reinforce existing inter-sectorial arrangements (<i>Short/Medium Term</i>) 	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"> Define geological features located near shore and offshore, their evolution through time and support the business uptake of innovative technologies to boost growth by avoiding potential geo-hazards (<i>Medium Term</i>) 	Academia, Local Authorities, Ministries and Related Governmental Agencies, NGOs, Private Sector, Research Institutions
<ul style="list-style-type: none"> Support the dialogue between researchers and business in order to promote and uptake of the circular economy principles as booster for sustainable innovation for blue growth (<i>Medium Term</i>) 	Academia, Maritime Clusters, NGOs, Private Sector, Research Institutions
<ul style="list-style-type: none"> Support and promote 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>) 	Academia, Ministries and Related Governmental Agencies, Research Institutions

Main Goal 2 - Creating incentives for maritime innovation in existing and new, emerging blue economy sectors

Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> Identify renewable energy sectors such as offshore wind and wave energy while investigating the potential of responsible exploration of gas hydrates (<i>Short/Medium term</i>) 	Academia, Ministries and Related Governmental Agencies, Private Sector, Regional Authorities, Research

	Institutions
<ul style="list-style-type: none"> Develop sustainable fisheries and high-tech aquaculture including multi-use platforms (<i>Short/Medium Term</i>) 	Business Associations, FAO, Fisheries and Aquaculture Organisations, GFCM, Ministries and Related Governmental Agencies, Private Sector, Research Institutions, SMEs
<ul style="list-style-type: none"> Foster biotechnology by exploring the potential of high-value, novel products from unique organisms inhabiting the Black Sea, along the whole value chain (<i>Medium/Long Term</i>) 	Academia, Associations (such as European Aquaculture Association and European Society for Marine Biotechnology), FAO, GFCM, Ministries and Related Governmental Agencies, Private Sector, Research Institutions
<ul style="list-style-type: none"> Further develop new and innovative tourism offers and services to promote synergies between coastal tourism and other activities (e.g. pesca-tourism, culture and underwater heritage, aquaculture, yachting) (<i>Short Term</i>) 	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"> 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>) 	Academia, Ministries and Related Governmental Agencies, Port Authorities, Private Sector, Public Authorities, Research Institutions
<ul style="list-style-type: none"> Develop and promote innovative marine litter (including microplastics) management techniques both on land and sea in line with the principles of circular economy (<i>Short Term</i>) 	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"> Identify the services provided by marine biotic and abiotic resources for enhanced coastal protection and resilience (<i>Short/Medium Term</i>) 	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

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"> Develop and enhance a network of dedicated Marine Research Infrastructures at the Black Sea, building on existing European and international initiatives, ensuring 	Academia, BSEC, Copernicus, GOOS, IOC-UNESCO, Ministries and Related

interaction between the ongoing projects and research activities (<i>Short Term</i>)	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"> Produce, collect and make available compatible high-quality data sets (the FAIR principles and open data access) (<i>Short/Medium Term</i>) 	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"> Integrate, strengthen and upgrade monitoring, modelling and forecasting capacities to address societal challenges (<i>Short/Medium Term</i>) 	Academia, BSC, CMEMS, Copernicus, EuroGOOS, National Authorities, Regional and National Forecasting Centres, Regional Forecasters, Research Institutions, Risk Management Agencies
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"> Develop common monitoring standards and research infrastructures for integrated coastal and marine management in support of policy- and decision makers (<i>Medium Term</i>) 	Academia, BSC, ICES, IMO, Maritime Clusters, MEDCOAST, Ministries and Related Governmental Agencies, Regional Authorities, Research Institutions
<ul style="list-style-type: none"> Establish common methodology and transboundary pilot schemes for marine spatial planning at national and regional levels based on ecosystem approach (<i>Short Term</i>) 	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 fourth industrial revolution 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	
Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> 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>) 	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"> Support the development of coherent basin-scale programmes for the conservation and valorisation of marine cultural heritage (<i>Long Term</i>) 	IOC-UNESCO, Media, Ministries and Related Governmental Agencies, Museums, NGOs, Research Institutions
Main Goal 4 - Mechanisms to create, support and promote start-ups oriented towards the circular and blue economy in the Black Sea region	
Actions	Main Actor(s)-Initiatives
<ul style="list-style-type: none"> 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 (e.g. transnational and virtual access)) (<i>Short/Medium/Long Term</i>) 	Academia, Ministries and Related Governmental Agencies, National Authorities and Organisations, Regional Organisations, Research Infrastructures, Research Institutions
<ul style="list-style-type: none"> Create, integrate and support incubators and techno parks for promoting SMEs, start-ups and innovative businesses for blue economy (<i>Short/Medium/Long Term</i>) 	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	
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"> Develop new 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, MSc, PhD and postdoctoral programmes for future researchers and professionals in all fields of Blue Growth (<i>Short/Medium Term</i>) 	Academia, Ministries and Related Governmental Agencies, Regional and National Authorities, Private Sector, Research Institutions, Training Organisations
<ul style="list-style-type: none"> Develop programmes for life long training and vocational education of professionals in integrated coastal and marine management and blue economy (<i>Short Medium Term</i>) 	Academia, BSC, MEDCOAST, Ministries and Related Governmental Agencies, Private Sector, Regional and National Authorities, Research Institutions, Training Organisations, Vocational Training Institutions
<ul style="list-style-type: none"> Promote digital literacy (e.g. 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>) 	Academia, Media, Ministries and Related Governmental Agencies, National and Regional Authorities, NGOs, Research Institutions, Private Sector, Training Organisations
<ul style="list-style-type: none"> Promote mentoring and training for new start-ups and 	Academia, Business

<p>coaching for scaling-up companies in blue economy and blue growth at local/regional levels. <i>(Short/Medium Term)</i></p>	<p>Community, Chambers of Commerce, Innovation Parks and Clusters, Ministries and Related Governmental Agencies, National and Regional Authorities, CPMR, Research Institutions, NGOs, Technological Parks, Training Organisations</p>
<ul style="list-style-type: none"> Support students, graduates and early career researchers to gain practices and undergo work placement apprenticeships schemes in businesses and institutions active in blue economy <i>(Short/Medium Term)</i> 	<p>Academia, Chambers of Commerce, Innovation Parks and Clusters, Ministries and Related Governmental Agencies, National and Regional Administrations, NGOs, Private Sector, Research Institutions, Technological Parks, Training Organisations</p>
<p>Main Goal 2 - Empowering ocean-engaged citizens contributing to a clean, plastic free, healthy and productive Black Sea</p>	
<p>Actions</p>	<p>Main Actor(s)-Initiatives</p>
<ul style="list-style-type: none"> Educate the communities in the region towards the unique value of the Black Sea and promote Citizen Science in the region <i>(Short/Medium Term)</i> 	<p>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</p>
<ul style="list-style-type: none"> Nurture a Black Sea cultural/scientific identity, through dedicated education and work stage programmes in all fields of research and Blue Economy <i>(Short Term)</i> 	<p>Academia, Local Authorities, Ministries and Related Governmental Agencies, NGOs, Parent and Consumer Associations, Opinion Makers (influencers), Private Sector, Research Institutions, Social Media and Communication Specialists, Sport Clubs, Training Organisations</p>
<p>Main Goal 3 - Contributing to enhanced science policy dialogue in formulating coastal and marine policies and programmes</p>	
<p>Actions</p>	<p>Main Actor(s)-Initiatives</p>
<ul style="list-style-type: none"> Conduct integrated outreach on the annual 'European Researchers Night', at multiple Black Sea locations, targeting public, students and children <i>(Short Term)</i> 	<p>Academia, International Organisations, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, NGOs, Private Sector,</p>

	Research Institutions, Social Media and Communication Specialists
<ul style="list-style-type: none"> • Train policy and decision makers through dedicated activities for the efficient implementation of marine and coastal policies and management (<i>Short Term</i>) 	Academia, Ministries and Related Governmental Agencies, National, Regional and Local Authorities, NGOs, Research Institutions
<ul style="list-style-type: none"> • Communicate the uniqueness and importance of the Black Sea basin, via the establishment of Black Sea Ambassadors, 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 (<i>Short Term</i>) 	Academia, BSC, International Organisations, Local Authorities, Mass Media, Ministries and Related Governmental Agencies, NGOs, Private Sector, Research Institutions, Social Media and Communication Specialists

ANNEXES

ANNEX 1 - GLOSSARY

ACRONYM	TITLE
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
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
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EURO ARGO - ERIC RI	European contribution to the Argo programme
EUROFLEETS	New operational steps towards an alliance of European research fleets
EuroGOOS	European Global Ocean Observing System
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
ICT	Information and Communication Technologies
ICZM	Integrated Coastal Zone Management
IMO	International Maritime Organization
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO
IODP	International Ocean Discovery Program
JERICO	Joint European Research Infrastructure network for Coastal Observatories
JPI	Joint Programming Initiatives
MEDCOAST	Mediterranean Coastal Foundation
MPAs	Marine Protected Areas
MSP	Maritime Spatial Planning
NGOs	Non-governmental Organizations
SeaDataCloud	EU Funded Project - Further developing the pan-European infrastructure for marine and ocean data management
SeaDataNet	EU Funded Project - Pan-European infrastructure for ocean & marine data management
SMEs	Small and Medium-sized Enterprises
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

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*⁴. They produced the Burgas Vision Paper⁴ 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)⁵ 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) (Figure 2). 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.

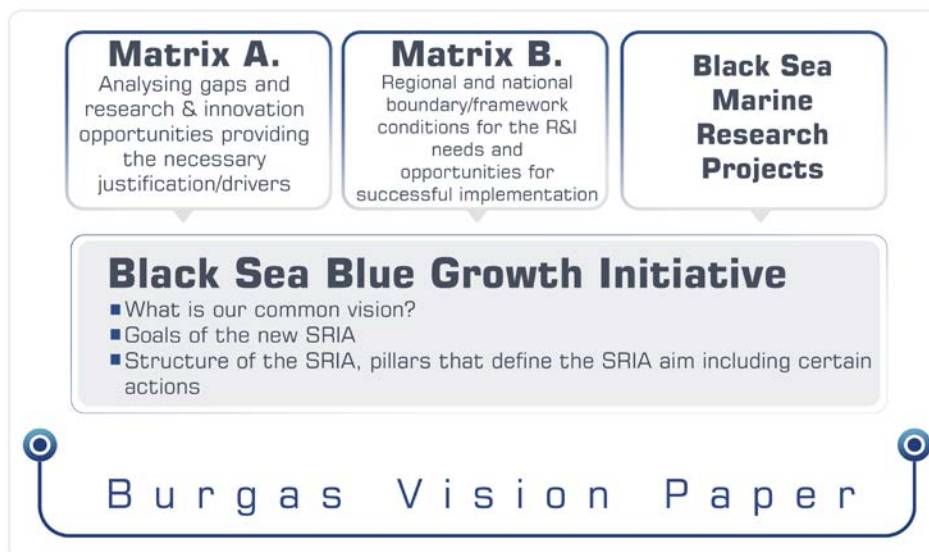


Figure 2 Steps taken to develop the Burgas Vision paper

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 of this exercise, the different focus of national-funded and EU-funded projects were revealed, as shown in the figures below (Figure 3). For instance, while the national projects mostly focused on biodiversity,

⁴ https://ec.europa.eu/maritimeaffairs/maritimeday/sites/mare-emd/files/burgas-vision-paper_en.pdf

⁵ https://ec.europa.eu/maritimeaffairs/maritimeday/sites/mare-emd/files/burgas-ministerial-declaration_en.pdf

pollution, observing and management projects, EU- funded projects targeting Black Sea prioritised more crosscutting frontier areas such as socioeconomics, training, climate change and multiple stressors.

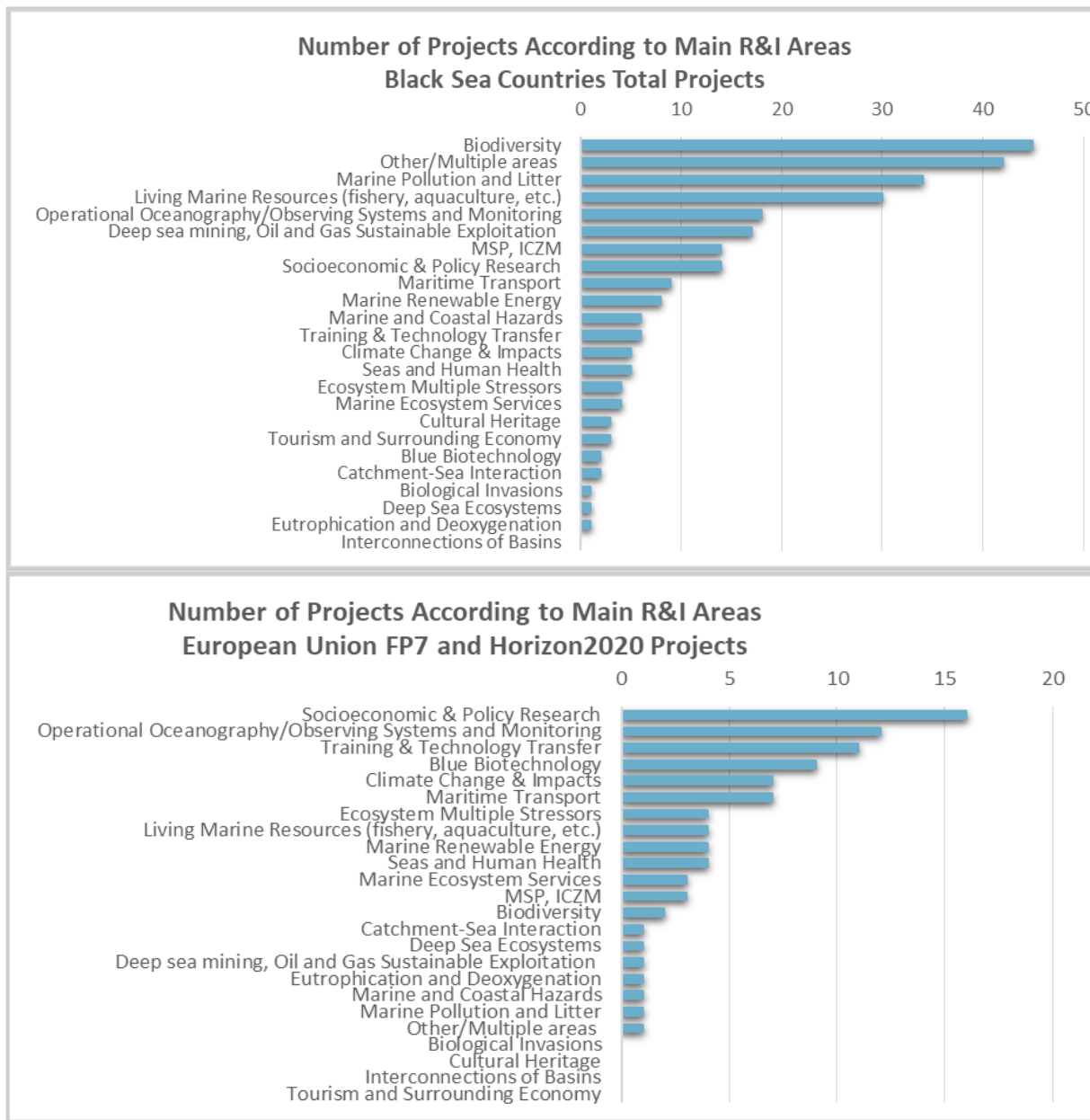


Figure 3 Marine research projects targeting the Black Sea

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 (Figure 4).



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

As the next steps, work will continue with 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.

This will also support the establishment of an operational stakeholder network based on the four pillars defined in this version of SRIA. The inputs provided by each pillar of the SRIA on needs, gaps and priorities will continue to be analysed, considering the research and innovation priorities for the Black Sea identified by recent and on-going relevant initiatives and projects. Such a dynamic process will allow for regular updates of the SRIA.



ANNEX 3 – SELECTED PROJECTS SUPPORTING THE BLACK SEA SRIA

COCONET (Towards COast to COast NETworks of marine protected areas (from the shore to the high and deep sea), coupled with sea-based wind energy potential) – EU Framework Programme for Research and Development (FP7)

CoCoNet focused on the Mediterranean and the Black Seas and its objectives were the production of: 1- Guidelines for the institution of networks of Marine Protected Areas (MPAs); 2 - Smart Wind Chart evaluating the feasibility of Offshore Wind Farms (OWFs). Both objectives call for the identification of spatially explicit marine units where the management of human activities (both in terms of protection and in clean energy production) is based on the features of natural systems, as both the ecosystem approach and marine spatial planning require. This novel concept is based on connectivity and proved useful for any planning of the use of marine space. MPA networks fulfil the strategic conservation objective of assuring, through the preservation of large-scale ecosystem functioning, the persistence of a good state for biodiversity. Offshore Wind Farms have not been installed neither in the Mediterranean nor in the Black Sea. This is due to unstable wind regimes and to resistance of coastal communities to large infrastructures near the coast. Since in most cases the continental shelf is narrow, the installations would be too near to the coast, being perceived as a disturbance to maritime landscapes. The necessity of clean energy production, however, is gaining momentum. Many Wind Farms are already present on land, and it is now acceptable to place them offshore, if properly placed so as not to disturb touristic activities. The inclusion of OWF in a project focusing also on MPA networks gave the opportunity to evaluate the opportunities given by wind energy and the limitations to such enterprises due to the necessity of environmental protection. COCONET consortium gathered 39 institutes and small and medium-sized enterprises from 22 EU and non-EU countries.

Website: <https://cordis.europa.eu/project/rcn/101654/factsheet/en>

DANUBIUS-RI: The International Centre for Advanced Studies on River Sea Systems – EU Framework Programme for Research and Development (HORIZON 2020)

DANUBIUS-RI is a new pan-European, distributed Research Infrastructure, in the final year of its Preparatory Phase with funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement No 739562. DANUBIUS-RI, which has been on the ESFRI (European Strategy Forum on Research Infrastructures) Roadmap since 2016 and is a Flagship Project of EUSDR (EU Strategy for the Danube Region) is planned to become operational in 2023. Led by the Romanian National Institute for Marine Geology and Geoecology (GeoEcoMar) the Preparatory Phase consortium has 30 partners in 17 European Countries including *Republic of Bulgaria, Romania, Ukraine and Republic of Moldova*.

Rivers, deltas, and coastal zones are experiencing ever-increasing pressures in recent years with drastic changes in land use, over-exploitation of natural resources, and hydraulic re-engineering. The resulting degradation has serious implications for human communities and environmental health. DANUBIUS-RI, dedicated to overcoming disciplinary boundaries, will take a fundamentally new approach to support research addressing the conflicts between society's demands, environmental change and environmental protection in river–sea systems worldwide.

DANUBIUS-RI will have a Hub and Data Centre in Romania, four Nodes led from the UK (Observation), Germany (Analysis), Italy (Modelling) and Netherlands (Impact) and a Technology Transfer Office in Ireland. In addition, there will be Supersites across Europe, providing natural laboratories for observation, research, modelling and innovation at locations of high scientific importance and opportunity, covering river-sea systems from river source to transitional waters and coastal seas. Ranging from the near pristine (e.g. Danube Delta Supersite) to the heavily impacted (e.g. Thames Estuary Supersite), they will also provide excellent opportunities to undertake social and economic investigations in contrasting settings.

Website: <http://danubius-pp.eu/>

DEKOSIM: National Excellence Centre in Marine Ecosystem and Climate Research

The Centre for Marine Ecosystems and Climate Research (DEKOSIM) is the leading oceanographic research centre in Turkey and builds upon 40 years experience of METU Institute of Marine Sciences. Established in 2012, DEKOSIM is currently able to conduct regional comprehensive oceanographic research, including the Eastern Mediterranean and the Black Sea. Although DEKOSIM has reached a certain level of research excellence, the region is still under-researched with a limited capacity and infrastructure to explore integrated atmosphere- land-marine interactions and processes. These limitations significantly hamper the regional, European and global scale exploitation of Blue Growth potential. Therefore DEKOSIM focuses on three main objectives: (i) Upgrading the monitoring capacity to a unique, integrated system for the region, (ii) upgrading modelling and forecasting capacity to address emerging challenges, (iii) developing knowledge-based products to accelerate Blue Growth and address societal challenges. It will address challenges at societal level by providing innovative products and services to public and private sectors as well as instigating underdeveloped sectors suffering lack of essential knowledge that will be provided by the centre. Knowledge based services and products for national decision makers and private sectors will be the main value propositions. By supporting efficient implementation of EU Blue Growth Strategy, knowledge produced by DEKOSIM will act as springboard for regional economic growth.

Website: <http://dekosim.ims.metu.edu.tr/>

EMBLAS-PLUS: Improving Environmental Monitoring in the Black Sea– Selected Measures – EU / UNDP

The project will be implemented in the context of the ENI Regional East Strategy Paper (2014-2020)6; Regional East Multiannual Indicative Programme (2017-2020) and the Joint Operational Programme for the Black Sea Basin 2014-20208. The project is part of the ENI East Regional Action Programme 2017, Part 2: Support to the Implementation of the Eastern Partnership Multilateral Dimension and the Implementation of the Northern Dimension and the Black Sea Synergy. The present project is built on the results and conclusions of previous and current projects in the Black Sea and will ensure complementarities and synergy with activities under relevant actions in the region, in particular those funded by the European Union. The key programmes and projects are presented below. The overall objective of the project is to help improve protection of the Black Sea environment. This objective will be pursued through further technical assistance focused on marine data collection and local small-scale actions targeted at public awareness raising and education. The key involved actors are research / scientific and educational institutions and civil society organisations community.

2.1.2 Specific Objectives

The specific objectives are as follows: i) Improve availability and sharing of marine environmental data from the national and joint regional monitoring programmes aligned with the MSFD and WFD principles and the Black Sea Integrated Monitoring and Assessment Programme (BSIMAP); ii) Support joint actions to reduce river and marine litter in the Black Sea basin; iii) Raise awareness on the key environmental issues and increase public involvement in the protection of the Black Sea.

Website: <http://emblasproject.org/>

ERANet SEAS-ERA Towards Integrated Marine Research Strategy and Programmes – EU Framework Programme for Research and Development (FP7) ERA-NET

SEAS-ERA was a partnership of the leading Marine R&D Funding Organisations in 18 countries, including Black Sea EU and non-EU countries. In brief, SEAS-ERA aimed to constitute a platform for developing a European integrated policy oriented structure to promote knowledge and expertise in any sea related area; the overarching element of SEAS-ERA, was its ambition to embrace the whole spectrum of marine and maritime research, making it an open forum for knowledge sharing, a real arena where all the sea related knowledge can meet. SEAS-ERA included a whole package dedicated to the Black Sea with the aim to increase joint activities among the main marine research

funding organisations thus providing a basis for the sharing of knowledge expertise and resources to address issues that are beyond the capabilities of individual states in the region and enhancing synergy at pan-European level. This WP developed a regional Science Plan, build up a common programme, record the existing marine research infrastructures, and assess and improve the existing instruments in human capacity building in the region.

Website: <http://www.seas-era.eu/>

MASRI (Infrastructure for sustainable development of marine research linked to the membership of Bulgaria in Euro-Argo EU infrastructure)

MASRI is a Project of the national roadmap for scientific infrastructure (2017-2023), as a component of the Operational Program "Science and education for smart growth" coordinated by the Institute of Oceanology- BAS. It is aimed at integration of national marine research capacity of all 8 partners into a distributed large-scale, interdisciplinary multifunctional (physics, chemistry, biology, geology, aquacultures, medicine, energy, underwater and offshore technologies) marine research infrastructure that will provide unique facilities (including databases and computer network) widely accessible at national, regional and international level for multidisciplinary research. The research infrastructure consists of four main modules: Research Fleet; National Operational Marine Observing System; Data and information center and Research Laboratory Complex. The mission of MASRI is to build and utilise a modern research infrastructure which will provide the basis for highly efficient responsible marine and maritime research to expand our knowledge of the marine environment and capacity for sustainable management of the Black Sea resources and services in support of implementation of marine policy, maritime spatial planning and Blue growth

Website: <http://masri.io-bas.bg/>

PEGASO – People for Ecosystem-based Governance in Assessing Sustainable development of Ocean and coast – EU Framework Programme for Research and Development (FP7)

This project was cross-basin effort for further developing Integrated Coastal Zone Management (ICZM) in the Mediterranean and the Black Sea. The main objective of PEGASO was to build on existing capacities and apply common novel approaches to support integrated policies for the coastal, marine and maritime realms of the Mediterranean and Black Sea Basins in ways, that are consistent with and relevant to the implementation of the ICZM Protocol in the Mediterranean, and for adjusting and applying the same model to the needs of the Black Sea. The Black Sea Commission Permanent Secretariat – a key project partner, representing countries of the region, successfully developed 'Guideline on ICZM in the Black Sea',⁶ endorsed by Black Sea Commission at its 32nd Meeting in October, 2016. This effort was indeed supported by IASON project (<http://iason-fp7.eu>), uptaking results of PEGASO and enviroGRIDS FP7 projects, latter developing Black Sea Catchment Observation System for BSC (<http://portal.envirogrids.net>).

Website: <http://pegasoproject.eu>

PERSEUS (Policy-oriented marine Environmental Research in the Southern European Seas) – EU Framework Programme for Research and Development (FP7)

The PERSEUS project studied the dual impact of human activity and natural pressures on the Mediterranean and Black Seas. The project combined natural and socio-economic sciences to predict the long-term effects of these pressures on marine ecosystems. The key to solving environmental problems on seas and coasts lies with a research governance framework that engages scientists, policymakers and the public. The PERSEUS project developed such a scheme, which resulted in a shared understanding and science-based decisions in line with tools like the EU Marine Strategy Framework Directive (MSFD). Specifically, the project advanced new tools to

⁶ http://www.blacksea-commission.org/Downloads/Black_Sea_ICZM_Guideline/Black_Sea_ICZM_Guideline.pdf

evaluate current environmental status, and upgraded and extended existing observational systems. An innovative, small research vessel that served as a scientific survey tool was also developed. PERSEUS brought together leading researchers from 21 EU and non-EU countries. The consortium had a high level of knowledge on marine research and socioeconomics, further increasing its added value by working closely together. This facilitated knowledge exchange, design of common approaches/ protocols, and development of a common vision, increase in scientific capacity and training opportunities for young scientists and stakeholders across the EU and beyond. This approach was critical, as the research activities and the large number of participants raise the profile and impact of such an international project creating a leverage effect, enabling PERSEUS to build new links beyond country borders and regions.

Website: <http://www.perseus-net.eu/>
