|  |
| --- |
| Pillar 1 - Addressing fundamental Black Sea research challenges |
| Main Goal | **Action** | **Main Actor(s)-Initiatives** | **Milestones** |
| Developing innovative multi-disciplinary research, building on existing initiatives, including data sharing mechanisms that will generate the knowledge needed to increase ecosystems resilience | Addressing the main Black Sea challenges on eutrophication, invasive species, emerging pollutants, litter with further and international research efforts | Universities, Academic and Research Institutes, public, private, academia, FAO, BSC | Medium /Long-term  |
| Food systems research -fisheries, recruitment, stock assessment and sustainability, MPAs, biotech (alternative protein sources, this should be aligned with Pillar 2 & 3) | Universities, Academic and Research Institutes, FAO | Medium-/Long-term |
| Fill gaps in understanding the Black Sea ecosystem dynamics, biogeographic patterns, biodiversity, and ecosystem functions (including fishing resources) and potential impacts of aquaculture. This should build on innovative observation and data sharing research, integrated data sharing/observing systems methodologies, (combining ecology and social data) using/building on existing networks | Universities, Institutes, Black Sea Network, Ministries, Navy Oceanographic Offices, UNEP, National authorities, funding agencies, Black Sea Commission and its subsidiary bodies, FAO, EU, GFCM | Short Term |
| Promote socio-economic research focusing on coastal communities interacting with the marine ecosystem to understand how drivers of marine environment and human induced pressures transform to communities (systems approach) | BSEC, CPMR, Research Institutes, Port authorities, municipalities, Union of Black Sea Municipalities, CPMR, Black Sea Network of NGOs, Maritime Clusters, National Statistical Institutes | Short/Medium Term |
| Increase ecosystem resilience knowledge, via an improved understanding of specific Black Sea features such as Rim current dynamics, mesoscale (fronts, eddies, vertical upwelling), suboxic zone anoxic layer, deep part (including the sea bottom) in the Black Sea and its roles in nutrient fluxes, productivity and fisheries  . | Universities, Marine Institutes, Funding agencies, Space Agencies, Ministries, Research Institutes, Offshore Industry, EU Research Institutions, Ministry Of Energy, Environment, Foreign Affairs, European Bank Reconstruction and Development, UNDP, European Research Centers that has capacity for deep-sea research | Short/Medium Term |
| 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. | Improved quantification of sources of natural and anthropogenic inputs including the catchment, rivers, atmosphere, maritime activities (across different Black Sea interfaces) | All actors, EU, Ports, Maritime Agencies, Space Agencies, EU Safety Security at Sea,Research Infrastructures | Short/Medium Term |
| Develop research on 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. | Black Sea Commission, Universities, Municipalities, NGOs, CPMR | Short/Medium Term |
| Establish research on coastal hazards erosion, submarine landslides, sea level rise, extreme events, flooding, and connections with climate change | Scientific Institutes, European Intuitions, Funding Agencies, municipalities, Ministries | Short/Medium Term |
| 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  | Institutes, Global Institutes, IODP, IOC, Funding Agencies | Short/Medium term |
| Reveal the interactions between multiple stressors, biodiversity and marine ecosystem functioning by developing novel evolutionary modelling and data analyses tools and demonstrate how adaptation and evolution may change ecosystem response to changing stressors  | National Institutes, European Research Centers, research infrastructures, global and regional observing systems | Short/Medium Term |

|  |
| --- |
| Pillar 2 - Developing products, solutions and clusters underpinning Black Sea Blue Growth |
| Main Goal | **Action** | **Actor(s)** | **Milestones** |
| 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 | Promote & foster synergies, through conferences, workshops, capacity building to transfer knowledge between clusters in the blue economy and reinforce existing inter-sectorial arrangements, e.g. between EC, BSEC and BSC. | *Regional*: BSEC, BSC, GFCM, CPMR, clusters etc.*National*: line-ministries: -environment, transport/ communication, energy, education/science, fisheries, economy/sustainable development, tourism, industries, local authorities, NGOs, financial agencies, clusters. | Short/medium term |
| Define geological features located near shore and offshore, their evolution through time and supporting business uptake of innovative technologies to boost growth by avoiding potentially generating geo-hazards.  | *National*: line-ministries: -environment, transport, energy, education/science, economy/sustainable development; industries, local authorities, NGOs, financial agencies. | Medium term  |
| 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 | National: Scientists, economists, business and clusters, NGOs | Medium term |
| Creating incentives for maritime innovation in existing and new, emerging blue economy sectors | Energy – establishing of renewable energy sectors such as offshore wind and tapping the potential of sustainable gas hydrates exploration | National level: Sectorial and financial agencies; Regional authorities;Science and industry | Short term (Offshore wind)Medium term (Mapping/State-of-play and Sustainable gas hydrates) |
| Aquatic food – developing sustainable fisheries and high-tech aquaculture including multi-platform use (or multi-use platform) | Science & fisheries (& aquaculture) bodies; Business & SMEsNational: Policy makers | Short/ Medium term |
| Fostering biotechnology by exploring the potential of high-value, novel products from unique organisms inhabiting the Black Sea, along whole value chain on aquaculture, dimension and biofuels  | Regional level: GFCMNational level: Science & industry | Medium/Long term |
| Further develop innovative tourism offers and services (e.g. small-scale cruise, big data analytics and tourism 4.0, coastal 'waze') and promote synergies between coastal tourism and other activities (e.g. pesca-tourism, culture and underwater heritage, aquaculture, yachting). | National level: Local and regional authorities, business (e.g. shipbuilders), policy planners, scientists | Short term  |
| Achieve sustainable and green shipbuilding and repair by promoting carbon efficient ships in line with the international safety standards and circular economy principles | Marine and maritime industry, energy industry, port authorities, public authorities (ministry of transport) scientists | Medium term |
| Promoting innovative marine litter treatment techniques | Regional : EC, BSC, GFCMNational : Ministries, industry, and scientists | Short term |
| Mapping and understanding the value of abiotic marine resources in order to avoid major negative impact on the coast (e.g. coastal resilience, material for beach artificial nourishment, etc.) | Scientists, local & regional authorities, engineers, industry  | Short/ Medium term |

|  |
| --- |
| Pillar 3: Building of critical support systems and innovative Infrastructures |
| Main Goal | **Action** | **Actor(s)** | **Milestones** |
| Development of smart 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 | Develop and enhance a network of dedicated Marine Research Infrastructures at the Black Sea, building on existing European and international initiatives  | EMSO, ESFRI (DANUBIUS-RI, EURO ARGO-RI), GOOS, IOC, EuroFleet, etc, Universities and Maritime Institutes  | Short term |
| Produce and make available compatible high-quality data sets (the FAIR principles and open data access) | National research Institutes, National Data centres and organizations, Authorities, COPERNICUS , EMODNET, SeadataNET, SeaData Could, DANUBIUS-RI, ARGO\_RI | Short to Medium |
| Integrate and strengthen an updated monitoring and forecasting capabilities | National Forecasting Centres, Copernicus, CMEMS, Regional forecasters, Risk management agencies, National Authorities, EuroGOOS  | Short to Medium |
| Advancing a harmonized set of working methodologies, standards and procedures on all aspects of coastal and marine research  | Use common monitoring standards and research infrastructures to support existing policy frameworks such as ICZM, MSP or national frameworks in support of decision- and policy makers | Research Institutes, Black Sea commission, Maritime stake holdersMinistries , Local national and regional authorities, Marine Institutes, ICES, IMO | Medium term |
| Establish common methodology and transboundary pilot schemes for marine spatial planning at national and regional levels  | Black Sea Commission, Maritime StakeholdersMinistries , Local, national and regional authorities, Marine Institutes | Short term |
| Developing new marine based technologies by harnessing 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 | Identify and promote of key technologies and innovations required for the Black Sea monitoring and research | Research Institutions, CPMR,Industry, SMEs, EuroGOOS, University and councils, Innovative clusters,National Emergency Agencies | Short to Medium |
| Identify and support solution providers and best practices for development and use of key and tailor-made marine technologies and ICT | BSEC, Industry, Research Institutions, National authorities , Ports,   | Medium to Long term |
| Support the development of coherent basin-scale programmes by harnessing 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  | Black Sea Trade and Development Bank, funding agencies, UNEP,BSEC Related Bodies, Cultural bodies, Museums  | Long Term |
| Mechanisms to create, support and promote start-ups oriented towards the circular and blue economy in the Black Sea region | Enable researchers, innovators and entrepreneurs open and easy access of existing and developed infrastructures via the establishment of the Open Transnational Service and Access initiatives to research infrastructures and networks (e.g. TNA, VA, SA) | National Authorities and Organizations, Infrastructure owners, Research institutes and universities, Regional organizations | Short Term/ Medium Term/Long term  |
| Create co-funding and co-programing mechanisms and bodies at trans-national and international level  | JPI, Funding Agencies,Ministries, Expert bodies BELMONT Forum, Regional organizations, EU, International organizations | Short, Medium and Long Term  |

|  |
| --- |
| Pillar 4: Education and capacity building |
| Main Goal | **Action** | **Actor(s)** | **Milestones** |
| Supporting formal and informal learning, education, training and use of knowledge and technologies for established and creation of new marine and maritime jobs | To develop new programs and coordinate existing ones (syllabus and curricula) to support and implement priorities defined in SRIA. This includes the design and implementation of dedicated undergraduate, MSc, PhD and postdoctoral programmes for future researchers and professionals in all fields of Blue Growth. | Ministries of Education/ Research, Universities, research institutions, Training Organizations, regional and national authorities/government, private sector | Short Term |
| Develop programmes for life long training and vocational education of professionals in Integrated Coastal & Marine Management and Blue Economy | Ministries of Education/ Research, Universities, research institutions, Training Organizations, regional and national authorities/government, vocational training institutions, private sector | Short Term |
| Promoting digital literacy (e.g. e-learning environments) and preparing for the very fast change in use and implementation of virtual technologies as an essential components of life long education in all fields of Blue Growth. | Ministries of Education/Research, Universities, Research Institutions, NGOs, Training Organizations/Private sector, mass media, vocational training institutions, national and regional authorities | Short Term |
| Promote mentoring and training for new start-ups (e.g. entrepreneurship, etc.) in blue economy at local/regional levels. | Universities, Training Organizations/Business Community, national and regional administrations, CPMR, research institutions, NGOs, Chambers of Commerce, Technological Parks, Innovation Parks and Clusters | Short Term |
| Supporting students, graduates and early career researchers to gain practices and undergo apprenticeships at businesses and institutions active in blue economy | Universities, Training Organizations/Business Community, national and regional administrations, research institutions, NGOs, Chambers of Commerce, Technological Parks, Innovation Parks and Clusters | Short Term  |
| Empowering ocean-engaged citizens contributing to a clean, plastic free, healthy and productive Black Sea | Educate the coastal communities towards the unique value of the Black Sea and promote Citizen Science in the Blue Growth of the Black Sea  | Universities, Research Institutions, Training Organizations, Business Community, Local Authorities, NGOs, Mass Media, Social Media and Communication experts and specialised companies, opinion makers (influencers) | Short Term |
| Nurture a Black Sea cultural / scientific identity, through dedicated education and work stage programmes in all fields of research and Blue Economy | Universities, Research Institutions, Training Organizations, Business Community, Local Authorities, NGOs, Social Media and communication specialists, Parent and consumer associations, sport clubs, opinion makers (influencers) | Short Term |
| Contributing to enhanced science policy dialogue in formulating coastal and marine policies and programs | Conduct outreach on the annual 'European Researchers Night', at multiple Black Sea locations at the same day, targeting public, students and children  | Universities, Research Institutions, Training Organizations, Business Community, Local Authorities, NGOs, mass media, social media and communication specialists, various International Organisations | Short Term |
| Train policy and decision makers through dedicated activities as regards efficient implementation of marine and coastal zone policies and management | Ministries of Education, Universities, Training Organizations, Research Institutions, NGOs, national, regional and local authorities  | Short Term |
| Communicate the uniqueness and importance of the Black Sea basin, via the establishment of Black Sea Ambassadors, at local, regional and global levels in special events and initiatives such as the Black Sea International Day, and the European Maritime Day | Universities, Research Institutions, Training Organizations, Business Community, Local Authorities, NGOs, mass media, social media and communication specialists, various International Organisations |  Short Term |