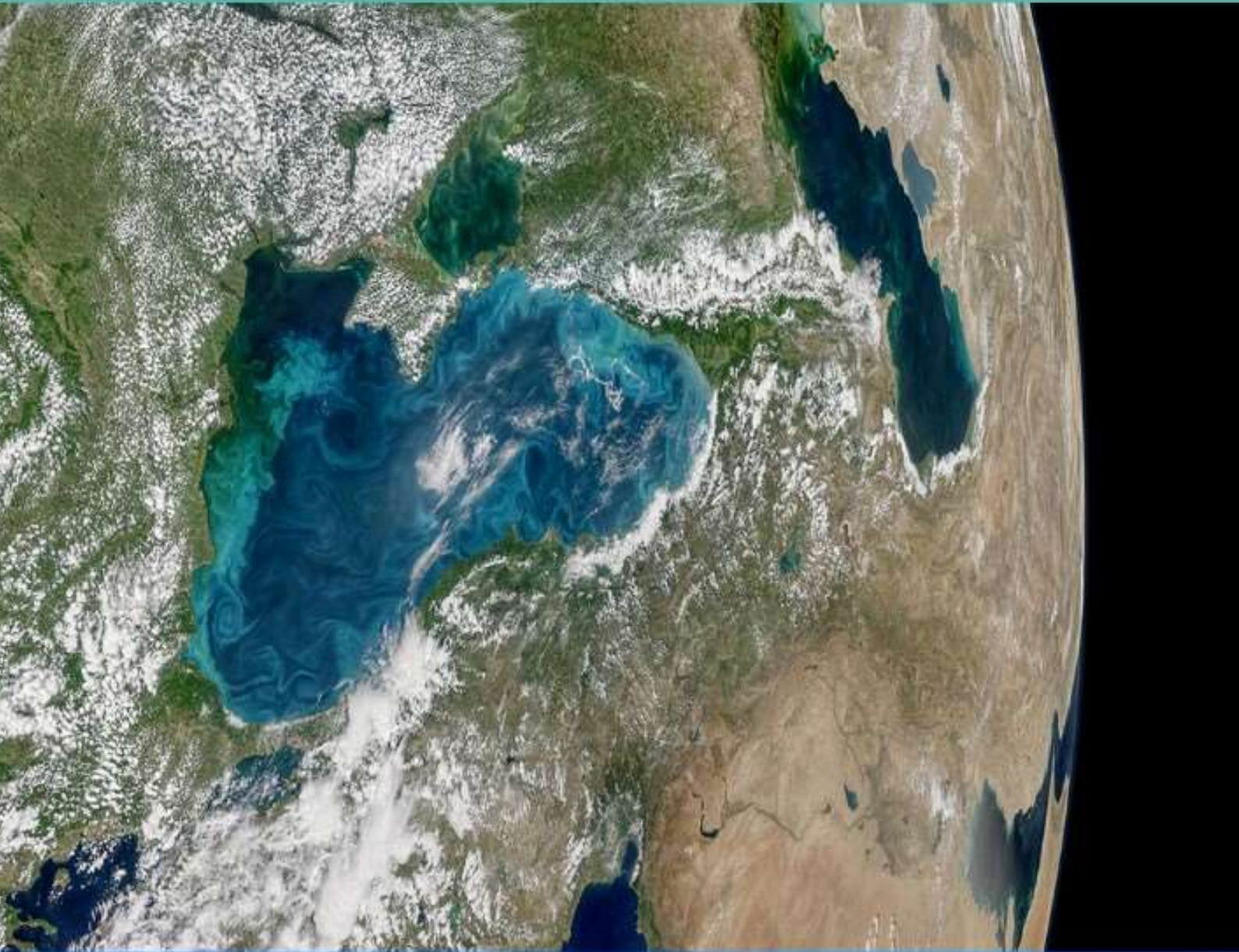


Coordination of Marine and Maritime Research and Innovation in the Black Sea



D3.4 Black Sea Marine Innovation Report



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1. Executive summary

The Black Sea Innovation report is the result of a long process where project partners and key stakeholders interacted to better analyze the current situation of marine research and innovation in the Black Sea. This analysis made it possible to identify a series of stakeholder needs and the main challenges which were addressed through a questionnaire and the organization of a dedicated workshop on innovation.

Gathering more than 245 participants, the workshop was designed as a time for exchanges and presentations of inspiring experiences from the Black Sea and other European sea basins. In addition to the "learning from other experiences" dimension of the event, the objective was also to discuss the next steps to be implemented to better organize the Black Sea.

Different challenges of importance for the development of marine research and innovation were discussed 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.

The main outputs are presented in this report as well as the next steps with the link made with two structuring projects active in the Black Sea (BRIDGE-BS and DOORS), the policies of the European Commission and the Black Sea SRIA Implementation Plan. Additionally, the Innovation Workshop run closely parallel with the Common Maritime Agenda (CMA) through active role and participation from the CMA national hubs which are working closely with the blue economy sectors. The outputs of the workshop have provided direct input to the CMA implementation, BRIDGE-BS High Tech Summit for the Black Sea and Accelerator Programme of both BRIDGE-BS and DOORS projects.

The main messages coming from this event are summarized below:

- There is a strong interest of the Black Sea stakeholders which was measured in terms of the number and quality of participants in the activities (questionnaire and workshop). New people and organizations have been involved in this work.
- Openness to experiences from other sea basins as the actors were testifying to their successful experiences from other sea basins and expressed their openness and availability to discuss in more detail with the actors of the Black Sea to replicate all or part of these actions.
- Raising awareness and increasing the understanding of the Black Sea challenges of policymakers, banks and civil society was key for the region.
- Use Digital technologies to increase innovation potential, modernise key maritime sectors and support emerging ones. Investors are often more inclined to invest in this type of technology
- Development of a maritime cluster dedicated to supporting R&I by creating the conditions for scientists, industrial players, policymakers and civil society to meet and define joint projects, to bridge the gap between scientific research and economic development.
- Enable the link with technological clusters, notably existing digital clusters active in the Black Sea region.
- Multi-use activities could be well-used as a solution to reduce the competition of space between marine activities as well as create financial savings
- The Fourth Revolution's key ambitions are totally in line with the development and enhancement of maritime sectors identified during the workshop In the Black Sea context



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2. Context

The Black Sea is a vital resource with vast potential to boost the societal value of the blue economy for its surrounding countries. 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 of human-induced factors, such as eutrophication and hypoxia, overfishing, and the introduction of alien species, in addition to the effects of climate change. (Oğuz, 2017)

With 430,400 square kilometres, the Black Sea has both great biological richness and significant fragility. Very evoked and bordered by many industrial installations, it is subject to sources of pollution such as river discharges (Danube, Dnieper, Don), oil spills, and the accumulation of plastics or mercury, which present particularly remarkable ecosystems, at the stage of the Danube delta, and found themselves trapped in this almost closed sea.

In recognition of the importance of these and the significant influence of multistressors on the Black Sea ecosystems and its services, the Burgas Vision

Paper (2018), the Common Maritime Agenda (CMA, 2019), and its Science Pillar the Black Sea Strategic Research and Innovation Agenda (SRIA, 2019) emphasized the urgent need to identify multiple synergistic stressors interactions impacting ecosystem resilience and prioritized a set of actions for 'a healthy, resilient and productive Black Sea by 2030'.

2.1 Geopolitical context & Black Sea Challenges

Shared between Bulgaria, Turkey, Georgia, Russia, Ukraine and Romania, the Black Sea is the biggest enclosed sea in the world. It has an area of over 430,000 square kilometres, which is significantly smaller than the hydrographic basins of rivers draining water into it (only the Danube basin is more than double the Black Sea area). It is the geographic gate between Europe and Asia and it has been also the crossing point between different civilizations, empires and social systems. Since the end of the Cold War, it is also the maritime space which concentrated the greatest number of military conflicts: the TransDniester War (1992), the Abkhazia War (1992-1993), the Georgian civil war (1991-1993), wars in Chechnya (1994-1996; 1999-2000), the Second South Ossetia War (2008), the Donbas - Crimea war, which began in 2014 and continues following the Russian invasion of the 24th February 2022.

In a world of "existential threats" linked in particular to climate change, where Europe is expected to take the lead in finding solutions for mitigation and adaptation, the Black Sea is an



Figure 1 - The Black Sea at a glance (source: Black Sea SRIA)



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industrial activity bottleneck. The Black Sea carries about 40% of the world's grain and a large proportion of mineral fertilizers and natural gas. For Europe, concerned about its economic prosperity, or for Africa so dependent on fertilizers to feed its growing population, the Black Sea seemed, until now, an unknown choke point. On the energy front, Romania and Turkey have recently started to exploit new subsea gas fields, which could help alleviate the shortage caused by Russia. But this will only produce tangible effects in a few years and the new resources may only have a regional impact.

The spectrum of interests and concerns around the Black Sea is very varied and complex. The Black Sea Economic Cooperation Organization, established in 1992, is bound to bring in and secure security and prosperity throughout the Black Sea in a complicated political landscape: three of the six bordering States are members of NATO (Bulgaria, Romania, Turkey) with Ukraine and Georgia part of the “NATO Partnership for Peace” agreement. Two are also Member States of the European Union (Bulgaria, and Romania), whilst three are EU candidate and associate countries (Georgia, Turkey and Ukraine). Black Sea bordering States are concerned about security, high-tech weapons, connectivity, transcontinental energy networks, quality of life, finance and industrial capabilities.

But they are above all worried about questions of identity and values because, like the confrontation of the 1920s and 1930s, between extremist doctrines (communism and fascism) on one side and democracy, one side feeds on the exploitation of the naivety of the other, is concerned with rewriting history and needs asymmetrical conditions of engagement in order to perpetuate its own existence. At the same time, others are concerned about development issues that are now integrating climate change into economic growth prospects.

The recent Russian invasion of Ukraine has a significant economic impact on the European economy, it will inevitably also impact the Blue Economy sectors as well. This crisis has affected the EU Blue Economy sectors in different ways, ranging from increases in oil prices, to trade restrictions and supply chain bottlenecks. The impact on the different sectors will depend on the extent and duration of the conflict and retaliation measures. Besides the recent war in Ukraine, the Black Sea has also been one of the critical regions from the route of refugees and emigrants to the European Union, either through its northern shores, through Russia, Ukraine, Moldova and Romania or taking the Southern route, from Turkey to Bulgaria or across the sea, to Romania. The humanitarian crisis due to the numbers and fate of these refugees has added significant strain mainly during the last decade.

At the end of the communist period, due to the abrupt change of social and political regime in 1989 for Bulgaria and Romania and in 1991 for the former ex-USSR, as well as to the birth of newly independent countries in Georgia, Ukraine and Russia, almost all the Black Sea communities – with the notable exception of Turkey – started their journey through the political transition towards democracy and – in places still sought for – prosperity. The years 1990 were years of legislative and political chaos, as time was needed to create new structures and legal systems, whilst the former centralized economies went bankrupt. Thus the last decade of the 20th Century was marked by an almost general lack of economic activities due to the closing down of entire industries in the hydrographic basins feeding their waters to the Black Sea. In the meanwhile, the drastic decrease in revenues made itself felt also on the level of funding of marine research in the former communist countries. With numerous research institutions and programmes being either suspended or closed down, the previously normal projects were put on hold. The Black Sea marine research community however was kept alive and made to continue its career thanks to the dedicated programmes funded by the United Nations (notably the Black Sea Environmental Programme, the GEF for the Black Sea, and the Black Sea Ecosystem Recovery Programme). All of them were aimed at the development (first) and then implementation of the Black Sea Strategic Agenda – which aimed at stopping and reversing the critical ecological degradation. The United Nations programmes supported a slow but sure



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return to cooperation and supported the build-up again of critical R&D capacities – mainly in the former communist countries. The Black Sea Commission for the Protection of the Environment, put in place by the Black Sea Riparian countries to implement the Bucharest Convention (1992), had a critical role in supporting and guiding national and international programmes for monitoring the state of the environment and for the improvement of the environmental state of the sea. Following the Chornobyl accident in 1986, a series of IAEA (International Agency for Atomic Energy) funded projects monitored the health of the specific Black Sea ecosystems. A series of projects nationally funded by countries outside the Black Sea (e.g. France- Germany- Romania-Ukraine, France- Romania – BLASON cruises, UK – US – Bulgaria, with Turkey continuing its cooperation with several other countries) supported the investigations of the Black Sea even towards its deeper parts.

The mid-1990s were also the years when the framework programmes of the EC – DG RTD had study areas or even entire projects dedicated to the Black Sea (FP IV EROS 21, FP V CRIMEA and METROL and EURODELTA). Starting FP VI, a new effort was funded by the EC at the basin level through the Black Sea Scene series of Integrated Action projects that also brought back together the relevant persons, capabilities and efforts. 2007, when Bulgaria and Romania joined the EU, was a new start for European-funded research of the Black Sea, either through the Framework Programmes of the DG RTD or through the newly established Cross Border Cooperation regional programmes.

These activities paved the way towards the current effort to put in place and implement a Black Sea Strategic Research and Innovation Agenda (SRIA), which kicked off in 2017, in Brussels.

The region raises environmental issues. The Black Sea has both great biological richness and significant fragility. Very busy and bordered by numerous industrial installations, it is subject to sources of pollution such as river discharges, oil spills, and the accumulation of plastics or mercury, which affect particularly remarkable ecosystems and find themselves trapped in this almost closed.

In the frame of the European Commission's Regional Strategies for Sea Basins, the Black Sea area is fully supported at the EU level. Europe ensures coherence and improves coordination between the main sectors of the blue economy, as the European Commission seeks to engage with stakeholders (public and private), build their capacities and support cooperation actions in the marine and maritime sectors. On 31 May 2018, during the European Maritime Day in Burgas, the European Commission presented a "Black Sea Vision Paper" defining the main lines of research identified by the bordering countries as priorities in the Black Sea and responding to the axes of Europe's integrated policy. This strategic document was followed by the creation and launch of the Black Sea Strategic Research and Innovation Agenda (SRIA) in Bucharest, on May 8th, 2019.

2.2 Research and innovation in the Black Sea

Blue Growth has great potential for the Black Sea countries and Europe as a whole as it can be considered an instrument to promote stability and empower the coastal communities in the region (SRIA, 2019)

According to the *European Blue Economy Report 2022*¹, the Blue Economy in the Black Sea generated in 2019 €2 billion Growth Value Added (GVA) and 0.16 million jobs. This wealth is

¹ https://oceans-and-fisheries.ec.europa.eu/system/files/2022-05/2022-blue-economy-report_en.pdf



mainly coming from Coastal Tourism (0.09 million jobs and €1 billion GVA), followed by Shipbuilding and repair and Port activities.

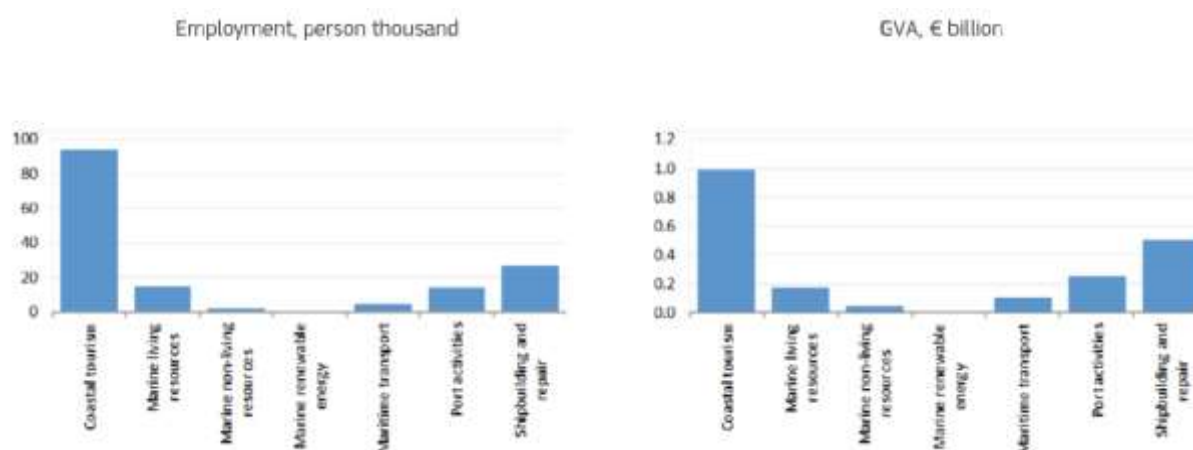


Figure 2 Black Sea Basin Blue Economy by sector, 2019 (Source: EU BLUE Economy Report 2022)

Research and innovation play an essential role in fully realizing the potential of marine and maritime sectors in the Black Sea and in unlocking unique opportunities for sustainable and environmentally friendly blue growth in the region.

For this reason, experts from the Black Sea coastal countries have developed the Black Sea Strategic Research and Innovation Agenda to advance a shared vision for a productive, healthy, resilient, sustainable and better-valued Black Sea by 2030 (SRIA, 2019)

- **The Black Sea Strategic Research and Innovation Agenda (SRIA)**

Improved knowledge and enhanced infrastructure together with better coordination and alignment of research and innovation efforts could both help to restore and maintain the resilience of the Black Sea ecosystem and enable sustainable exploitation of its natural resources. To this end, an Initiative has been supported by the EU to develop a joint research and innovation roadmap and guide national and EU-level policymakers. In this context, The Burgas Vision Paper was produced by the Initiative and published by the EC as the key framework document for a shared vision of a productive, healthy, resilient, sustainable and better-valued Black Sea by 2030. It was prepared by experts from Black Sea coastal countries, in cooperation with marine experts from leading European marine institutes and organisations, with the support of the European Commission and 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) and its Implementation Plan are built on, a direction which was further supported by the Ministerial Declaration towards a Common Maritime Agenda (2018) for the Black Sea, endorsed by all the Black Sea countries.

SRIA guides 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.



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The SRIA is organised around four main pillars on which a new set of research and innovation actions can be developed

- 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.



Figure 3 - 4 Pillars of the Black Sea SRIA

With specific actions under these Pillars, Black Sea SRIA puts science and innovation to the forefront as the most important tools 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. With better ecosystem assessments, predictions, and management, as well as an understanding of vulnerability, dangers, and potential mitigating measures, science and innovation enable the creation and implementation of coastal and marine policies and strategies in the Black Sea.



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3. The “Innovation for sustainability and economic growth in the Black Sea” workshop

One of the objectives of WP3 Synergistic Activities towards SRIA Implementation of the Black Sea CONNECT project is to exchange best practices between European advanced marine innovation clusters and nascent Black Sea clusters and innovation actors to achieve innovation for the blue economy. A specific task, led by IFREMER, is dedicated to Innovation for Blue Economy under Task 3.4 to identify the innovation needs and opportunities for healthy and sustainable use of the Black Sea while achieving economic growth by adopting emerging technologies offered especially by the Fourth Industrial Revolution.

To that aim, the Black Sea CONNECT Innovation Workshop entitled “*Innovation for sustainability and economic growth in the Black Sea*”, took place virtually on February 2, 2022, due to the COVID pandemic to showcase the best practices of marine clusters initiatives, bringing together stakeholders from science and research, policy-making, industry, and business to enhance communication and collaboration for sustainable economic growth in the Black Sea.

3.1 Objectives

The objectives of this workshop were to address two key issues:

- What can we learn from the “others” to organize in the Black Sea region?
- What steps can we initiate to start organizing the Black Sea?

Based on the analysis of the local context and the Black Sea SRIA priorities, the workshop raised awareness and built capacities on:

- The clustering approach: Enhance communication and collaboration between stakeholders from science and research, policymakers, industry, business and investment to generate innovative products and services;
- Share good practices to support innovation adaptable to the Black Sea context.

The approach has consisted of presenting successful stories and best practices from different blue economy sectors, allowing the meeting of nascent maritime and innovation, clusters in the Black Sea with more developed European counterparts and driving their collaborative development of blue innovations for the region.

The workshop focused on maritime sectors of high interest for the Black Sea region, as defined in the SRIA:

- **Fisheries and aquaculture:** the situation is critical, with 87% of the assessed stocks overfished and a significant lack of knowledge about fishing pressure and reproductive capacity.²
- **Marine Renewable Energy** with the development of ocean energies (to a lesser extent) and Floating offshore wind applications is becoming a viable option for EU countries and regions lacking shallower waters that could open new markets and opportunities in the Black Sea.
- **Coastal and marine common cultural heritage**

² EU Blue Economy report 2022



3.2 Methodological approach

The workshop has been designed following a participatory approach involving the project partners and key actors from the Black Sea.

It was based on a comprehensive analysis of innovation needs and opportunities for healthy and sustainable use of the Black Sea while achieving economic growth by adopting emerging technologies offered especially by the Fourth Industrial Revolution³.

In addition, the workshop also tried to identify which are the potential gaps and barriers of all sorts (legal, financial, etc.) in the successful development of Blue Growth in the Black Sea countries and will try to find best practice examples that could help smoothen the path forward.

A questionnaire (Annex 6.2) was designed and spread to the Black Sea CONNECT consortium and their national network of business. It has been translated into the national languages of riparian countries to make it more accessible to the national stakeholders. It has been also widely disseminated in the Black Sea CONNECT online channels such as the [websites](#) and social media accounts.

The goal of the questionnaire was to map innovation needs and opportunities in the Black Sea. The inputs gathered are briefly presented below:

Questionnaire highlights

- 38 experienced respondents mostly operating in the Fisheries or Tourism Sector considered (themselves) successful organisations
- Main difficulties impacting their development: Lack of funding and Bureaucracy/ Legal framework
- Actors willing to collaborate with scientists (and their importance) and get information through events/ newsletters/ scientific publications
- Actors are open to emerging technologies notably digital for their development
- The most important tool to support collaboration with research is by far the funding of collaborative projects. Funding in general appears as the most important issue in Black Sea. The creation of a funding programme dedicated to the Black Sea is seen as a key priority. At a lower level, we can underline training activities as tool mentioned by the respondents. We can point out there specific training to access EU and international funding
- An interest to learn from success stories from other sea basins
- Lack of knowledge about clusters and a willingness to learn more about them

The following graphics reflect the main information which was used to build the Innovation workshop programme.

The main difficulties impacting the development of the activity in the Black Sea are the lack of funding available to finance Research and Innovation, the weight of the bureaucracy and legal framework where improvements are expected and the lack of qualified human resources available.

³ http://www3.weforum.org/docs/WEF_Harnessing_4IR_Oceans.pdf



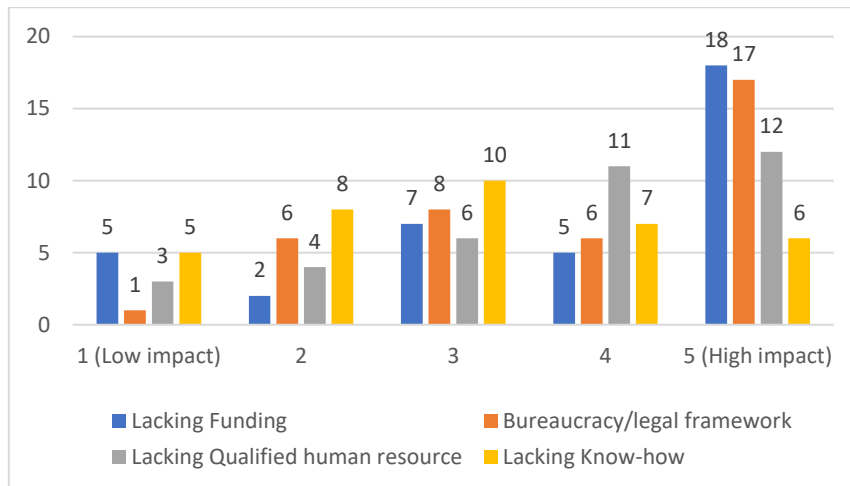


Figure 4 - Main difficulties for the development of your activity/ business (Values on the horizontal axis show how participants scored the impact on a scale of 1 to 5, 5 being the high impact. Values on the vertical axis show how many participants scored that category)

The sectors of interest mentioned by the respondents were Tourism and Fisheries.

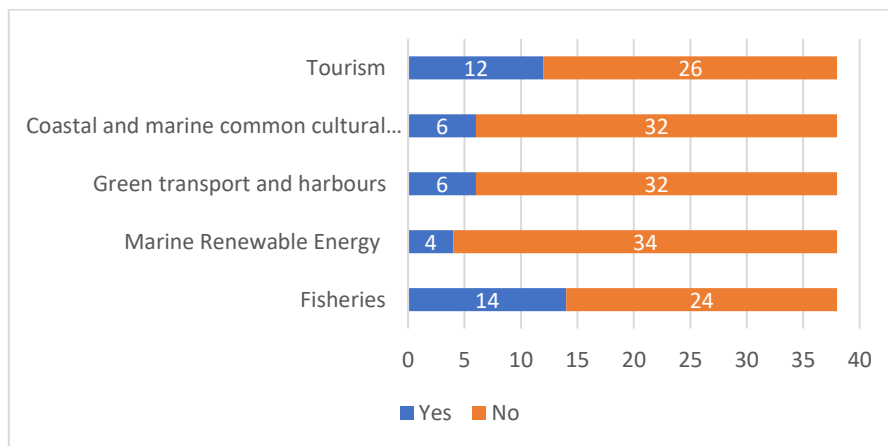


Figure 5 - Sectors of interest (“Yes” implies an interest in the sectors provided)

According to the respondents, **the most important tools needed from technology to improve the business** is by far the funding for collaborative projects, Training activities to have qualified human resources.



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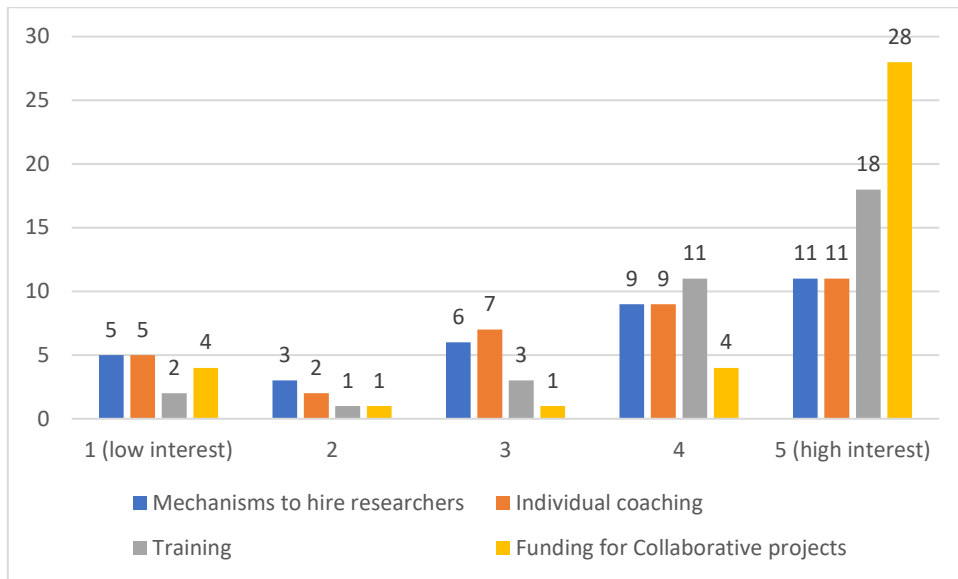


Figure 6 - Tools expected from Technology to boost business

The activities of highest interest for the Black Sea are related to the creation of a specific fund to support the development of innovative projects in the Black Sea and the need for training sessions to access European funding.

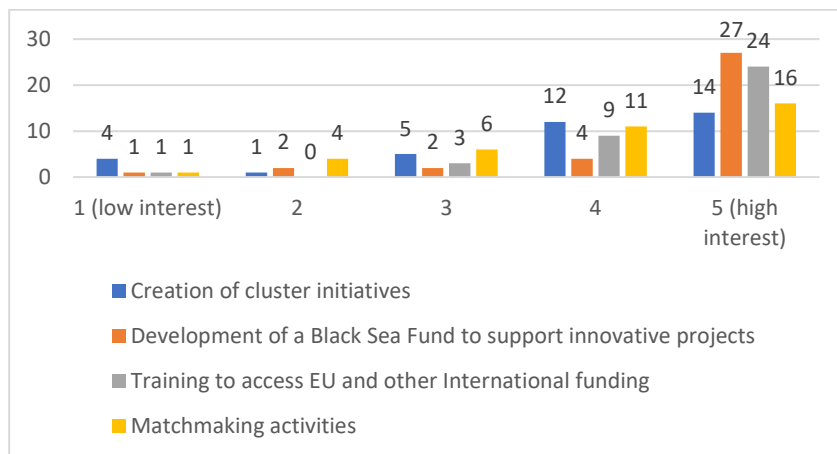


Figure 7 - Activities expected

3.3 Innovation Workshop at a glance

Despite the original plans of a hybrid meeting, the workshop was organised virtually. 323 registered persons from 26 countries of which have participated in the workshop.



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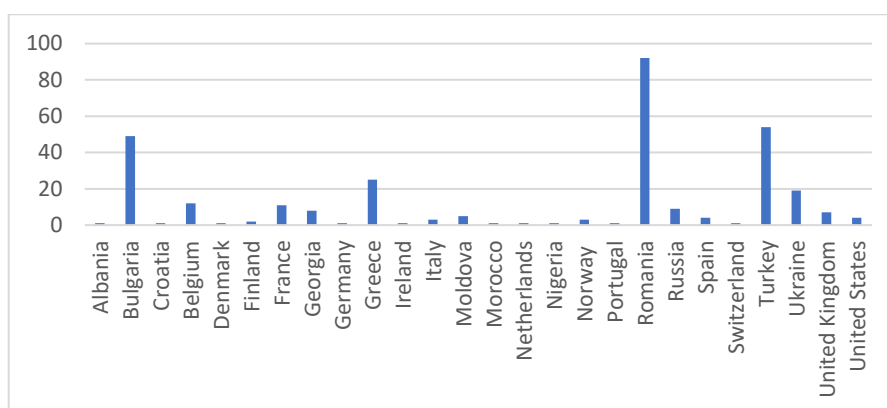


Figure 8 - Registered participants per country

The workshop was organised in 5 main sessions:

- **Opening remarks** where Barış Salihoğlu, Black Sea Connect coordinator, Wendy Bonne, Directorate-General for Research and Innovation and Patrizia Busolini, Directorate-General for Maritime Affairs and Fisheries provided to the audience an overall context of the project and the actions and strategies supported by the European Commission in the Black Sea;
- **Testimonies of maritime clusters** where Guy Herrouin, Pôle Mer Méditerranée (France) and Ilze Atanasova, Marine Cluster Bulgaria and BG CMA national Hub presented their respective experiences regarding cluster development and operations.
- **Best practices showcase session** moderated by Emina Mamaca, IFREMER with various concrete examples from the Black Sea and outside, in the maritime sectors of interest:
 - Sylvie Giraud - Starfish 4.0 Project - Safety and Tracking 4.0 Digital Technologies for Artisanal Fishermen
 - Thanasis Koukounaris, University of Patras, BLUEfasma and circular economy principles applied to aquaculture and fisheries
 - Colin Ruel, Pôle Mer Méditerranée, GALATEA project and the cross-sectoral approach to support innovation the blue economy
 - Angelos Mallios, PLOATECH (scientific and customized engineering services for marine and maritime solutions) on the transition from researcher to entrepreneur
 - Sorin Constantin, TerraSigna on the use of Earth observation data to the blue economy
 - Franck Zal, "The story of a sea worm, from the lab bench to the patient's bed. How *Arenicola marina* hemoglobin saves lifes?" Hemarina, a French spinoff of IFREMER
 - Rune Klausen, GCE Node from Norway on how a cluster can organise and support the emergence of the Marine renewable sectors
- **An interactive session** moderated by Adrian Stanica, Romanian National Institute of Marine Geology and Geoecology to exchange the different examples presented and discuss funding with:
 - Panayotis Gavras, Black Sea Trade and Investment Bank
 - Rieko Kubota, "Eco-innovation challenge for the Black Sea region under the BBSEA project" World Bank
 - Frédéric Herpers, Black Sea Assistance Mechanism of the Common Maritime Agenda



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- **A session dedicated to DOORS and BRIDGE BS projects** on how these projects will tackle innovation
 - Eleni Manousiadi, H2020 DOORS R&I Action
 - Patrizio Mariani, H2020 BRIDGE-BS R&I Action



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4. Main findings and recommendations to support innovation development in the Black Sea

4.1 Digital transition

Digitalisation transforms the maritime sector and provides many new opportunities to enhance the productivity, competitiveness, efficiency and sustainability of the blue economy. The development of modern information technologies makes it easier for stakeholders to work together to promote the efficiency of the overall ecosystem. Digital transition includes the use of cloud-based services, mobile devices and apps, sensors and other IoT technologies, AR, 5G network, digital twins, autonomous transportation, artificial intelligence, cyber security, block chain technology and big data-driven innovation, robotics.

The examples presented during the workshop focused on sustainable fisheries and earth observation data applications:

Starfish 4.0 project led by the French CLS SYSTEMS, a 2-year project (2020-2021), funded by the European Commission's European Maritime and Fisheries Fund as part of its Sustainable Blue Economy grant. The project proposes new technologies for the safety of small-scale fishermen and sustainable marine resource management. The overall objective is to refine the product and services through user feedback and improve stakeholder engagement and the adoption of 4.0 technologies in a data-poor sector. Small-scale fisheries are not currently monitored as large, contrary to industrial fishing vessels are. It creates significant challenges for sustainable resource management. To address this issue, STARFISH 4.0 developed digital tools and technology designed for these fishermen. It includes an innovative, solar-powered VMS transponder with an IoT/ satellite/ GSM communications system, a Big Data software platform, and dedicated mobile applications.

TerraSigna, a Romanian company specialised in the development of services based on earth observation data has presented different initiatives conducted in the Black Sea and has conducted various projects in the Black Sea from science dealing with marine observation and the collection of data to concrete various applications such as fisheries and aquaculture services, coastal area management, coastal infrastructure stability, Floating vegetation detection and monitoring.

4.2 Ecological transition

The European 2020 Strategy for smart, sustainable and inclusive growth focuses on climate change and energy sustainability by describing the 20/20/20 goals: greenhouse gas emissions 20% lower than 1990 levels, 20% of energy coming from renewable, and 20% increase in energy efficiency⁴.

Regarding these targets, the maritime sector concentrates its efforts on preserving biodiversity and reducing its ecological footprint, notably for ports through the implementation of environmental monitoring and for maritime transport, through the development of alternative energies and the use of new materials.

The challenge is to mobilize all stakeholders, citizens, companies, and territories, to place the economy on a trajectory investment (particularly in research and innovation) making it possible to achieve the objective of neutrality carbon. This mobilization concerns all maritime sectors to

⁴ European Commission, Europe 2020 strategy.



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design products for lower ecological impact, but also to design efficient energy production systems renewables, particularly marine energies.

GCE NODE, a cluster dedicated to ocean technologies located in Norway gathers around 100 companies, most of which constitute a world-leading value chain of suppliers to the oil & gas, offshore, energy and maritime industries.

They presented their regional collaborative project named “Fremtidens Havvind” which aims to contribute to their regional industrial players’ success in offshore wind sector development through collaboration between local companies, public authorities and academia. This project has implemented different kinds of activities to reach this objective; from regular networking activities to :

- connect companies and facilitate new partners/businesses;
- facilitate for local businesses to meet with developers (B2B, meetings etc);
- map opportunities in the region's coastline; to have a political influence through the involvement of local policymakers.

4.3 Circular approach

The circular economy addresses challenges and is a concrete opportunity for the development of the maritime economy in port areas, maritime transport, fisheries and aquaculture, marine energy resources and coastal development.

- The eco-design of products and services: Increase in the lifespan of products, their recyclability and their share of bio-sourced raw materials
- The Optimization of production processes: Improving the performance and energy efficiency of production processes and reducing their environmental impact
- Waste recovery: Reuse of resources and materials. For instance, maximizing the reusability of products and raw materials and avoiding destroying valuable materials is necessary for seaports, places of active trade and exchanges with many companies operating in close proximity to each other. Plenty of opportunities exist for using a company’s by-products and waste as raw materials in other companies. Ships account for about 20% of global discharges into the sea⁵.

The **BlueFasma project** successfully achieved a change towards Circular Economy in the key blue growth sector of fishing and aquaculture, The project offered useful tools to private and public entities through an online platform:

- Circular Economy knowledge base, systematizing innovative best practices
- Circularity self-assessment tool measuring business position for circularity, acting as a unified measure of SMEs readiness & willingness to invest in a circular economy. A decision support tool for SMEs, highly transferable to other areas.
- Unified Mediterranean CE data in the sector. e-network facilitating experience exchange & networking amongst the 195 registered users.

4.4 Transfer research knowledge to the market

Converting scientific knowledge into socio-economic benefits needs great efforts and support to improve it. Research organisations need to disseminate and exploit more effectively research results to translate them into new products and services. To achieve this goal, several approaches can be highlighted such as academia-industry collaborations through the support

⁵ European Parliament (2018) Port reception facilities for ship waste – Collecting waste from ships in ports.



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of clusters; collaborative or contract research conducted or funded jointly with the private sector and the creation of spinoffs.

The intervention from **PLOATECH company**, created by a scientist illustrated the path between research and industry and the personal transition from researcher to entrepreneur.

The presentation of **HEMARINA company** was very interesting as it is a success story and a nice example in the blue economy sector. This is a biopharmaceutical company specialising in the development of health products via its proprietary technology platform (M101) based on the properties of Lugworm (*Arenicola marina*) hemoglobin. The first publication and the idea was in 2000. A spin-off of the CNRS and Sorbonne University (Paris VI), Hemarina was created in 2007 in Northern Finistère.

Convinced that this natural biopolymer had the potential as an innovative therapeutic option to address diseases for which there are significant unmet medical needs. Now this company is based on fifteen years of fundamental research with 50 people staff, two growing Lugworm (*Arenicola marina*) farms in France and in the Netherlands and 3 subsidiary companies that will grow at the international level.

4.5 Formation of a Black Sea Maritime Cluster

Clusters foster *linkages* among firms, knowledge-producing institutions (universities, research institutes, technology-providing firms), bridging institutions (e.g. technology extension services) and customers of a value-adding production chain, which cooperate in developing and using *sector-specific* goods based on common physical and knowledge *infrastructures*. The prevalence of clusters reveals important insights about the microeconomics of competition, competitive advantage and innovation. More specifically, *from a firm perspective*, evidence explains the benefits of the cluster including among others:

- Increased and sustainable competitiveness to those firms that are based in clusters instead of similar not belonging in the cluster by integrating core competencies and capacities;
- Utilization of complementarities in the input of resources, which may create scale economies in production and chances to reach a critical mass of demand necessary for the production of particular goods or services;
- Better access to skilled labour;
- Sharing of knowledge and information, and learning through networking, interaction and collaboration;
- Development of leader firms;
- Reduction of transaction costs;
- Deal with common problems and opportunities that cannot be addressed individually.

Thus, the concept of clusters and networks acquires central importance in modern economic and business development.

As defined by Michael E. Porter, a Cluster⁶ is a geographically proximate group of *interconnected* companies and associated institutions, in a particular field, linked by *commonalities* and *complementarities*. They are suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standard agencies, and trade associations), in particular fields, that *compete* and also *cooperate*.

⁶ PORTER, M. 1998. Clusters and competition: new agenda for companies, governments and institutions. On Competition, Harvard Business Review Book, Boston, USA: Harvard Business School Press



Clusters offer a favourable ecosystem, which encourages both competition and cooperation among firms with different industrial backgrounds, and technological and business expertise⁶. Evidence shows that companies in clusters are more innovative, conduct more market research and register more international trademarks and patents than businesses operating outside clusters.

The Vision of the Black Sea Maritime Cluster would be:

- Encourage and facilitate collaborative projects/ joint activities between its members
- Creating a favourable environment for open innovation in SMEs facilitating cross-country and cross-sectoral connection, collaboration and acceleration of Blue Innovation
- Supporting SMEs and startups in the maritime value chains through an integrated innovation support system and impact financing to build their innovation potential and scale up their growth potential by linking up to knowledge, technologies, market and expertise; facilitating the uptake of new technologies and use of new business models.
- Development and capitalization of the emerging industry by fostering interactions and linkages between value chains and other industries; bridging enterprises, start-ups and SMEs with other industries' players, researchers, and public authorities to generate, improve, co-create and put forward innovative concepts and ideas
- To help the Black Sea companies select the innovative axes, based on their true expertise to cope with the main challenges highlighted in the SRIA.

For the implementation of the Black Sea Cluster, several key success factors have to be taken into account:

- **SMEs are an important factor** for renewal within the industry as they often end up in smaller niche markets where they can assess new ideas and product concepts. SMEs play an important role as suppliers to large companies and need to be at the core of the Cluster activities
- **Support a positive environment for all players:** Clusters provide a positive environment for new firms, enabling access to customers, supply chains, skilled labour and information. Large firms benefit from specialist suppliers enabling them to focus on their core competencies and benefit from SMEs that are experimenting at the cluster's periphery. Clusters enable SMEs to tackle issues that would be difficult to address in isolation. Large firms act as important partners and customers for SMEs.
- **Foster co-opetition:** The geographic and social proximity facilitates collaboration alongside competition a culture of co-opetition. Strong clusters do not have clumps of isolated firms but networks of interlinked firms with well-developed communications. As isolated solo players become more integrated into a system, a co-opetition culture is developed with firms' better understanding of where collaboration can be a win-win.
- **Foster innovation:** Within a strong cluster there is rivalry and intense competition. This is central to fostering innovation. Close interaction and exchanges amongst co-located firms underpin competition and stimulate innovation. Moreover, cooperation and linkages among competitive core firms and new firms, often exploring new markets, new processes, new technologies, support firms and service providers, government departments and others foster innovation.



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Lessons learnt from Clusters invited to share their experiences



Pôle Mer Méditerranée, French maritime cluster

Clusters were created in France in 2005 following a call for tenders from the French government. They were seen as key tools for economic development through innovation.

The central idea was: *"Between public research and companies, creativity comes from the frequent and repeated circulation of people who disseminate tacit knowledge: the new product will come from the meeting between a PhD student and an industrialist, between a venture capitalist and a researcher, between a laboratory and a market".*

The operation of the clusters is financed 50% by the State and the territories (regions where the cluster operates). The other 50% comes from private funding (membership fees, services, and expertise)

The innovation projects are supported by the clusters (through support and a process of the label) but are not financed by these clusters but by the State, the territories, funding agencies and Europe, through calls for projects. At the beginning of the policy, the government created a specific fund to finance innovation projects to launch the dynamics of clusters.

From this experience, the main recommendations for the development of clusters and innovation in the Black Sea are:

- Organizing a network of clusters in the Black Sea countries on the priority areas for the sustainable economic development of the Black Sea actors, identified in the SRIA (Strategic Research and Innovation Agenda);
- Organize calls for innovative collaborative projects;
- Select the best projects that would be financed by pooling the different funding streams capable of supporting the objectives and common actions of the SRIA;
- Build on existing cluster initiatives from the Black Sea region.



Marine Cluster Bulgaria

The cluster is already in operation and has been established with a clear vision to promote result-oriented business relationships. Marine Cluster Bulgaria is already active in the Black Sea with the objectives in Bulgaria to gather enterprises, academic, scientific and business organizations and local authorities to achieve sustainable economic growth, support the development of innovation potential, optimise resource efficiency for a competitive Bulgarian maritime economy and promote the integration of Bulgarian maritime industry in International Maritime Economic Area.



The GALATEA Blue Growth Accelerator, a cross-sectorial experience

The Blue Growth Accelerator designed and implemented under the Horizon 2020 project is a relevant example on how to support R&I projects led by SMEs through the development of new cross-sectorial and cross-border industrial value-chains,



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integrating technologies and know-how from aerospace and ICT communities to key Blue Growth domains: ports, ships, shipyards and maritime surveillance.

The development of the blue economy in the Black Sea must be based on the integration of technologies, in particular digital. In the meantime, digital technology developers are not aware of the blue economy challenges and potential. GALATEA demonstrated the need to gather these communities of actors to imagine and develop new solutions for the blue economy. We can point out the existence of IT clusters in the Black Sea that are already operational (i.e. Cluj IT in Romania).

The GALATEA approach presented below can be adapted to the Black Sea context. It proposes a three-step methodology for supporting SMEs' innovation projects and development.

Two main principles guide the action, to ensure the well-redistribution of money and the sufficient impact of the GALATEA systemic approach.

4.6 Funding organizations

The dedicated session of the workshop gathered a representative panel made of private and public banks and financial experts.

There are currently large investments made in various sectors of the Black Sea area but not too much in the blue economy. There are several factors explaining the reluctance of investors:

- Lack of knowledge about maritime domains and challenges;
- Lack of a comprehensive governance and legal framework.
- Difficulty in creating the dialogue between the Black Sea countries with fragmentation between the countries (EU members, non-EU, candidates which is complicated);
- Lack of understanding about the importance of investments in the established and emerging sectors

The complementarity between public and private funding is pivotal

Public investments have to pave the way for private investors to be more confident in innovators. There is a clear complementarity between public and private investments, but the difficulty is finding a good balance and timing to shift from low TRL to the market.

High-risk investment does not necessarily mean high gain. There is a strong interest from private investors to learn from the experiences of other sea basins. Certain areas such as port infrastructures which are linked to many other maritime activities such as maritime transport for instance did not have so many investments yet. It is identified as an area where investment could be focused in the Black Sea.

The World Bank has designed and implemented a mechanism in the Black Sea which is an Eco-business competition and grants to innovators to reduce pollution and improve water



Figure 9 - GALATEA Methodology



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quality in Georgia, Moldavia, Turkey and Ukraine with eligible innovators from any Black Sea countries. The main objective was to build trust to support public authorities (Municipalities, port authorities) to introduce innovation. Awareness-raising activities were planned on the issue of pollution targeting commercial banks from the area because they have difficulties assessing the project related to the pollution agenda.

Concrete advancements regarding the framework

Despite the fragmentation of the Black Sea countries, key progresses were made with the Common Maritime Agenda for the Black Sea. This unique framework of regional cooperation on the Blue Economy was endorsed on 21 May 2019 at the Ministerial level. It is complemented by its scientific pillar, the Strategic Research and Innovation Agenda (SRIA) for the Black Sea, supported by the Directorate General for Research and Innovation of the European Commission. There is now a strong alignment between the overall policy will and the public funding opportunities (INTERREG NEXT, Horizon Europe, EMFAF for instance). Private investors can capitalize on that for their future investment in blue innovative projects.

Main findings:

- Gains from any kind of investments are not only financial but are also social and environmental;
- The use of digital technologies for maritime applications is key for the development of innovations and will contribute to attracting investors;
- The legal framework issue is central regarding investment to allow the development of maritime activities. Investors consider it at the same level of importance as the business model of a company. An adapted legal environment will create adequate conditions for the innovations;
- Multi-use activities have to be considered as they reduce the competition of space between marine activities as well as create financial savings. It allows mixing established and emerging maritime activities and also non-economic ones such as maritime surveillance
- Sharing success stories is pivotal to raising awareness in the Black Sea for all stakeholders notably for the promotion to public and private investors.

4.7 Final Conclusions

The main conclusions of this participatory process, which began more than a year ago, are of different kinds:

The strong interest of the Black Sea stakeholders: This interest is measured in terms of the number and quality of participants in the activities (questionnaire and workshop). New people and organizations have been involved in this work.

Openness to experiences from other sea basins: The actors testifying to their successful experience from other sea basins expressed their openness and availability to discuss in more detail with the actors of the Black Sea to replicate all or part of these actions.

Raising awareness and increasing the understanding of the Black Sea challenges of policymakers, banks and civil society is key for the region.

Use Digital technologies to increase innovation potential and modernise key maritime sectors and support emerging ones. Investors are often more inclined to invest in this type of technology



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Development of a maritime cluster dedicated to supporting R&I by creating the conditions for scientists, industrial players, policymakers and civil society to meet and define joint projects, to bridge the gap between scientific research and economic development.

Enable the link with technological clusters, notably existing digital clusters active in the Black Sea region.

Multi-use activities are a solution to reduce the competition of space between marine activities as well as creating financial savings.

4.8 The Black Sea Ecosystem and the Fourth industrial revolution

The Fourth Industrial Revolution for the planet is an initiative led by the World Economic Forum.⁷

The potential to harness the Fourth Industrial Revolution to help transform how humanity manages its environmental footprint and, more fundamentally, to re-imagine how human and economic systems might interact with the natural world. It concerns specifically:

- The transport and the reduction of its environmental impacts
- The product traceability
- The use of connected products and services
- The blockchain technologies
- The value of biodiversity
- The monitoring of greenhouse gas emissions.

In the Black Sea context, key ambitions of the Fourth Revolution are totally in line with the development and enhancement of maritime sectors:

The green ship: There is a real need for eco-friendly technologies to be applied to ships: from reducing consumption of engines by optimising hulls and architectures of machinery, use of lighter and cleaner materials, to reducing pollution by cleaning exhaust gases, treating ballast waters and generating less waste. Alternative fuels and engine technologies will bring part of the solution to those issues: liquid natural gas is cleaner than today's oil and existing ships can be retrofitted for its use; batteries and hybrid propulsion are making ships more silent and limiting direct impacts on the ecosystems; hydrogen offers a huge potential to cut pollution and greenhouse gases – if it is produced by clean electricity.

Product traceability in Fishing and Aquaculture sectors: Develop product traceability, particularly through digital solutions to facilitate the implementation of regulations. The development of these digital monitoring tools has to be financially accessible by aquaculture professionals and fishermen.

Distributed Ledger Technologies (DLT), of which blockchain, are expected to secure and optimize different maritime sectors for instance provide secure information: for traceability in Fisheries and Aquaculture; for financial transactions and the management of supply chain procedures in ports to the benefit of the container shipping industry.

Understanding and measuring the value of biodiversity and measurement of carbon capture capacity: The ongoing loss of coastal ecosystems, and the resulting loss of biodiversity, is recognized as a serious concern across the Black Sea and in many other waters

⁷ <https://www.weforum.org/focus/fourth-industrial-revolution>



internationally. Quantitative evaluation of ecosystem services is an important enabler of restoration and enhanced management, but it is a relatively new field of study. Some methodologies have been piloted and deployed: for example, in valuing the multi-sectoral financial value of ecosystem services provided by specific ecosystem types (e.g. macro-algae and seagrass); and more specifically in analysing the economic benefit of carbon sequestration in various marine ecosystem types (e.g. seagrass, mangrove and salt marsh).

Blue Biotechnologies development is concerned with the exploration and exploitation of the resulting diverse marine organisms to develop new products.⁸ Best practices exchanges targeting the different markets mentioned in the table below are expected to support the emergence of the domain in the Black Sea:

Markets		Product	Consumer
Healthcare and pharmaceuticals	Pharmaceutical	Medicines	Humans
	Cosmetic	Cosmetic products	
	Nutraceutical	Food supplements	
Agriculture & Livestock	Animal Feed	Nourishments, food supplements	Animals
	Veterinary products	Antibiotics, antiseptics, vaccines	
	Agriculture	Fertilizers	Soil & plants
Industrial processes		Enzymes, catalyzers	Industry
Energy Productions		Biomass, Biofuels	Industry
Bio-remediation		Biomass	Industry

Table 1 - Blue Biotechnologies Markets

Circular approaches for marine litter: 400 million tons of plastics are produced each year at the global level. The expectation is that this production will further increase to about 600 million tons in 2025⁹. About 12 million tons of plastic debris annually enter the global seas (Jambeck et al., 2015), in such proportions that they impact the carbon cycle and pose threats to aquatic life (seas and rivers), ecosystems, and human health (Wilcox et al., 2015; Gall et al., 2015; Stubbins et al., 2021; Justino et al., 2022). There is not yet a generalized waste collection system that allows an optimization of the sorting, and the treatment as recycling or destruction.

⁸ https://ec.europa.eu/maritimeaffairs/policy/biotechnology_en

⁹ <https://www.boell.de/en/plasticatlas>



5. Next steps and perspectives

5.1 Horizon Europe Partnership 2021-2024

European Partnerships are initiatives in which the EU and private and/or public partners, commit to jointly support the development and implementation of a programme of research and innovation activities, including market, regulatory or policy uptake. European Partnerships are defined in Article 2 of the Horizon Europe regulation. They are set up based on Article 10 and are selected, implemented, monitored and phased out according to the criteria in Annex III of Horizon Europe Regulation.

European Partnerships under Horizon Europe set up a strategic, coherent and impact-oriented approach by focusing partnerships on the delivery of EU priorities and putting increased emphasis on synergies between partnerships, as well as with other initiatives at the EU, national or local level.

The majority of European Partnerships are established under the following thematic clusters of the “Global Challenges and European Industrial Competitiveness” pillar II of Horizon Europe”:

- Cluster 1 – Health;
- Cluster 4 – Digital, industry and space;
- Cluster 5 – Climate, energy and mobility;
- Cluster 6 – Food, bioeconomy, natural resources, agriculture and environment.

At the same time, other partnerships are also found in pillars I (partnerships within research infrastructures) and II (partnerships on innovation ecosystems).

The core activity of partnerships is to enable the Commission and relevant actors in a priority area to develop a common vision, build a critical mass of investments and implement them through a programme of joint activities.

These are initiatives where the EU engages with private and/or public partners to support jointly the development and implementation of R&I activities program. With this partnership, Horizon Europe introduces a more strategic, coherent and impact-oriented:

Expected oriented impacts	Partnership planned
Climate neutrality and adaptation to climatic change	Water4all: Water Safety for the Planet
Preservation and restoration of biodiversity and Ecosystems	Saving biodiversity to save life on Earth
Sustainable and circular management of natural resources, pollution control, bioeconomy	A bio-sourced circular Europe: solutions sustainable, inclusive and circular bio-sourced
Food and nutrition security for all through sustainable food systems, farm to plate	- Accelerating the transition of agricultural systems: agro-ecological living labs and infrastructure research - Animal health and welfare - Healthy and sustainable food systems for people, the planet and the climate
Innovative governance models enabling sustainability, Environmental	- Agriculture of data - A neutral blue economy



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observation	climate, sustainable and productive
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There are three different partnerships categories:

1) **Co-programmed partnerships:** Memoranda of Understanding (MoU) or contractual agreements between the Commission, Member States and partners Implemented through traditional Horizon Europe calls

2) **Co-financed partnerships:** through a grant agreement. Funding from national actors and EU co-financing. Beneficiaries in the selected projects are funded at the national level up to 30% (or even 50% in some cases).

3) **Institutionalized partnerships:** Implemented through specific structures created on the basis of a Regulation of the Council of the EU (Art. 187), a decision of the Parliament and the Council of the EU (Article 185) or a specific Regulation (e.g., EIT Regulation) in the case of Knowledge and Innovation Communities (KIC).

The common principles to all partnerships are:

- Implementation of partners common strategic vision (SRIA, roadmap);
- Translation of the strategic vision into annual work programmes;
- Clear life cycle with time-limited partnerships;
- Union added value;
- Systemic approach: portfolio of activities going beyond collaborative R&I projects.

In total, there is 49 European Partnerships covering 5 areas:

1. Health
2. Digital, space and industry
3. Climate, energy and mobility
4. Food, bioeconomy, natural resources, agriculture and environment
5. Cross-cutting partnerships: EIT, KIC, Innovative SMEs, European Open Science Cloud Partnership

EU Mission: Restore our Ocean and Waters

The European Commission launched five new EU Missions – including the Mission “Restore our Ocean and Waters by 2030” with 0.5 billion Eur. This is the world's largest research and development programme and European Missions are a new broad mobilisation initiatives programme. Rooted in the Horizon Europe research and innovation to face the greatest challenges of our time, Missions go beyond R&I and the existing instruments, cutting across policies, programmes and solutions, technological, social, business and governance. They will develop and demonstrate innovative different levels of governance and promote new forms of cooperation, allowing everyone to play an active role.

EU Missions are a new way to bring concrete solutions to some of our greatest challenges. They have ambitious goals and will deliver concrete results by 2030.

They will deliver impact by putting research and innovation into a new role, combined with new forms of governance and collaboration, as well as by engaging citizens.

EU Missions are a novelty of the Horizon Europe research and innovation programme for the years 2021-2027.

EU Missions are a coordinated effort by the Commission to pool the necessary resources in terms of funding programmes, policies and regulations, as well as other activities. They also aim to mobilise and activate public and private actors, such as EU Member States, regional



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and local authorities, research institutes, farmers and land managers, entrepreneurs and investors to create real and lasting impact. Missions will engage with citizens to boost societal uptake of new solutions and approaches.

EU Missions will support Europe's transformation into a greener, healthier, more inclusive and resilient continent. They aim to bring tangible benefits to people in Europe and engage Europeans in their design, implementation, and monitoring.

The Mission Restore our Ocean and Waters will help achieve the marine and freshwater targets of the European Green Deal, such as protecting 30% of the EU's sea area and restoring marine ecosystems and 25 000 km of free-flowing rivers.

5.2 Vision in BRIDGE BS and DOORS

In 2021, two Horizon 2020-funded Research and Innovation Actions commenced with the vision to implement the Black Sea SRIA. While "BRIDGE-BS: Advancing Black Sea Research and Innovation to Co-Develop Blue Growth within Resilient Ecosystems" focuses on ecosystem resilience, services, and development of the blue economy; "DOORS: Developing Optimal and Open Research Support for the Black Sea" project aims to develop integrated observing systems, land-sea interactions, and the deep sea. With close links to Black Sea CONNECT (the Coordinator of Black Sea CONNECT also coordinates BRIDGE-BS and the Coordinator of DOORS is a WP leader in the Black Sea CONNECT), both projects adhere to implement the Black Sea SRIA.

The overall objective of BRIDGE-BS is to advance the Black Sea's marine research and innovation to co-develop Blue Growth pathways under multistressors for the sustainable utilization of ecosystem services. To do so it will develop an ecosystem-based management framework to enable policy uptake and foster citizen engagement. Clustering around three main nodes including Service Dynamics, Blue Growth Incubators, and Empowered Citizens; BRIDGE-BS will use pilot study sites at the regional level, with findings contributing to interconnected work packages addressing the four pillars of the Black Sea Strategic Research and Innovation Agenda (Black Sea SRIA).

Blue Growth Incubators Node develops an incubator platform supporting the transition needed to secure a sustainable future for the Black Sea's empowered citizens within a preserved marine environment. This future will be generated by stakeholders themselves in a co-design process of sustainable scenarios and transition pathways for the Black Sea. Under this Node, there is a dedicated work package for demonstrating an accelerator platform to boost ocean digitalization and innovative industry 4.0 business models towards sustainable Blue Growth in the Black Sea. (WP7: Accelerating 'Industry 4.0' business models).

WP7 of BRIDGE-BS will demonstrate an accelerator platform to boost ocean digitalization and innovative industry 4.0 business models towards sustainable Blue Growth in the Black Sea. It will accelerate the uptake of innovative 4.0 services and technologies, as developed and identified in the project, by promoting greater dialogue between innovative businesses, private investors and the broader research community in the Black Sea and deliver a roadmap to identify present opportunities for technology and knowledge transfer pathways towards ocean industry 4.0. More specifically, BRIDGE-BS will identify and short-list a number of innovative, sustainable and science-informed 'disruptive' business models that enable financial returns (bankable models) while ensuring societal and ecosystem sustainable development and will provide services to emerging start-ups, and develop and demonstrate novel technology and service solutions (TRL3 to TRL6) aligned with topics discussed with industrial sectors, policymakers and ecosystem managers. Accelerator services will include support and advice for the pitching of ideas, business model preparation, training on tools and data available



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through the consortium, liaising with investors, web material and preparation. Two High-Tech Summits and Black Sea CONNECT network, a large research-based Black Sea forum on ocean digitalization and Industry 4.0 across academia, research organizations, investors, industry and society at large will be established in which actors of the Blue Sector value chain and companies, start-ups, organisations and universities can meet.

From the moment of its inception as the proposal, H2020 DOORS has also intended to promote synergies and collaboration between researchers, businesses and policymakers. This is why one of the 3 main work programmes of DOORS is the delivery of its Blue Growth Accelerator (BGA), which is bound to highlight and promote opportunities for sustainable business development in blue economy sectors. Thus, the BGA will bring together key partners, promote synergies, organise training and mentoring schemes and facilitate access to investors to practically support growth and job creation.

H2020 DOORS has planned to set all this set this up by building upon the current Blue Economy sectors including fisheries and maritime transport, whilst realising the potential of new and emerging sectors such as aquaculture, marine renewables and blue biotechnologies, in the region.

As a key starting point, it was decided from the beginning of the project that DOORS would build on the results and the support of Black Sea CONNECT and develop BGA activities to meet the needs of the local/national Black Sea communities. The selection of Blue Growth opportunities will be part of the DOORS process, based on the Black Sea system understanding, and will promote an ecosystems approach. The sectors linked to the research results, which are of interest to (potential) entrepreneurs, will be prioritised as a bottom-up approach. Priority will be given to new marine-based technologies by harnessing Industry 4.0 for the Black Sea to promote the safe and sustainable economic growth of the marine and maritime sectors and the conservation and valorisation of marine cultural heritage (maritime sectors contained in the Black Sea SRIA (offshore renewable energy, tourism, culture, fisheries). Moreover, highlighting recent and future discoveries concerning the marine cultural heritage (wrecks and submarine settlements) as opportunities for cultural tourism, transport, and seafloor exploration, will provide the pathway for increased exploitation and uptake by users.

These above-mentioned points are crucial when stating that all the outcomes of the Black Sea CONNECT Innovation activities have already been considered – as DOORS representatives have participated in the Innovation Workshop, engaged further with the actors invited to bring in the “blue perspective” to the Black Sea business community and started already discussing with identified local investors in various fields of Blue Economy.

Besides these directions of work, already in progress in H2020 DOORS, another significant key direction was set up by Black Sea CONNECT in regards to the presentation of funding opportunities – on which both BRIDGE-BS and DOORS partners will build when engaging further with the local actors. The outcomes from this report are crucial, together with the collaboration with the BRIDGE-BS and with the coordination team of the CMA in covering as many directions as possible, in preparing as many ~champions~ into preparing a critical mass of successful entrepreneurs in the field of Blue Growth. The activities described in the present report represent the foundation of these activities. As mentioned in Section 3.3, BRIDGE-BS and DOORS also played an important role in the Innovation Workshop.

Following that, BRIDGE-BS organized the 1st High Tech Summit for The Black Sea to provide a welcoming environment for businesses, start-ups, organizations, and universities from the Black Sea basin and beyond to exchange, present, and discuss their most recent technological developments, debate the most recent discoveries on 27-28 September 2022, in Varna



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Bulgaria. In this activity, synergy with DOORS BGA activities is ensured with the participation of the DOORS Coordinator and BGA leaders. Further plans for joint actions such as finding bankable Black Sea 4.0 projects and streamlining various funding mechanisms are in place.

5.3 Black Sea SRIA Implementation Plan

The Black Sea CONNECT project is tasked with the consolidation of the SRIA and the development of its Implementation Plan through a range of national and international activities. As of April 2023, the final Black Sea SRIA Implementation is being finalized, which translates Black Sea SRIA goals into concrete actions with the input of Black Sea CONNECT activities such as Innovation Workshop, rounds of national and international consultations as well as input from the activities of BRIDGE-BS and DOORS.

The Implementation Plan consists of 12 Themes and 25 Strategic Joint Actions and outputs of the Innovation Workshop provided direct input to the plan such as; the digital twin, sustainable resource management of fish and high-tech aquaculture, marine renewable energy, innovative observation systems, and innovative approaches to connect scientists and industry.



Figure 10 Black Sea SRIA Implementation Plan Themes

The Implementation Plan aims to contribute to the national Blue Economy Strategies and better structuring of the relevant funding mechanisms for solution-oriented implementation and contribute to the international and regional strategies and their implementation, and therefore, support the co-funding mechanisms.

Overall, the Black Sea SRIA Implementation Plan will foster marine innovation by providing a framework for collaboration, innovation, and investment in the region's blue economy services and sectors. By focusing on key research and innovation priorities, promoting collaboration, and encouraging the adoption of new technologies and practices, the plan will help to create a more sustainable and prosperous future for the Black Sea region.



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6. Annexes

6.1 References

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6.2 Questionnaire

1	Identification
	First name: Name: Position: Organisation: Country: Contact details:
	Description of your organization (Maximum 250 words):
2	In which Blue sector(s) you operate? Tick as many boxes as you wish
	Fisheries and aquaculture
	Marine Renewable Energy (e.g. offshore wind)
	Green transport and harbours
	Coastal and marine common cultural heritage
	Tourism
	Other Please specify:
3	For how long have you been operating in a Black Sea country?
A	Less than a year
B	From one to five years
C	More than five years
4	Can you consider your business/ activity developed so far as a success?
A	Yes
B	No
5	Please rate from 1(low impact) to 5 (high impact), the main difficulties you have impacting the development of your business/ activity?
a	Lacking Funding 1 2 3 4 5
b	Navigating around the Bureaucracy /legal framework 1 2 3 4 5



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c	Lacking Qualified human resource 1 2 3 4 5
d	Lacking Know-how 1 2 3 4 5
6	If you consider other difficulties, please list them below Open-ended question
	(maximum 100 words)
7	What has kept you going in the business? Why do you continue?
	(maximum 100 words)
8	What would you like to change for a successful Blue Business?
	(maximum 100 words)
9	Do you think the legal framework in your country allows innovation and economic development?
a	Yes
b	No
10	Do you think you need advice from the R&I community to improve your activity?
a	Yes
b	No
11	Do you consider that science can be useful to improve your daily business?
a	Yes
b	No
12	What do you think it could be of importance for you from the marine research activities? Multiple choice or Open-ended?
13	Would you be interested to get in contact with researchers?
a	Yes
b	No
14	Which are your main difficulties in communicating with scientists?
	(maximum 100 words)
15	Would you use the results of science if you are properly introduced to them?
a	Yes
b	No
16	If yes, what would be the best ways to be introduced to the results of science? Please rate the following items from 1 (low interest) to 5 (high interest)
a	Events 1 2 3 4 5
b	Scientific publications 1 2 3 4 5
c	Newsletters 1 2 3 4 5
d	Other please specify
17	Would you accept to collaborate with scientists to help them understand how they can learn better which are your needs?



a	Yes
b	No
18	Do you think your business could benefit more from the emerging technologies (for example, AI, block chain, IoT, etc.)?
a	Yes
b	No
19	Which are the most important tools you need from technology to improve your business? Multiple choice or Open-ended?
20	Are you interested to benefit from training activities to improve your skills to use the technology?
a	Yes
b	No
21	Which of the following activities do you think of highest interest for the Black Sea in these days? Multiple choice or Open-ended?
22	Could you tell us an example(s) of successful companies in the Blue Business in your country?
	(maximum 250 words)
23	why do you think they are successful?
	(maximum 100 words)
24	Could you tell us one examples of failure in the Blue Business in your country?
	(maximum 100 words)
25	Why do you think this happened?
	(maximum 100 words)
26	Are you interested to find out about success stories from other Black Sea Countries?
a	Yes
b	No
27	Are you interested to find out about success stories from other marine basins?
a	Yes
b	No
28	Do you know what a cluster is?
a	Yes
b	No
29	If yes, would you be interested to be involved in one?
a	Yes
b	No
30	Would you want to know more about clusters?
a	Yes
b	No



31	Are you interested to participate in the innovation workshop to discuss and share experiences for the development of R&I in the Black Sea
a	Yes
b	No
32	Would you like to remain in contact with us?
a	Yes
b	No
33	Would you like to sign up for Black Sea CONNECT newsletter for hearing Black Sea related news?
a	Yes
b	No

- By submitting this form, I accept that the information entered will be used exclusively within the framework of the European project Black Sea Connect, co-funded by the Horizon 2020 program. Your contact information will be used to contact you in the abovementioned topics. Your personal data provided in this questionnaire will be stored and used within the context of the Black Sea CONNECT CSA and Black Sea Blue Growth Initiative. If you would like to learn more about data processing and withdrawing your data, please contact Pinar Uygurer via pinaruygurur@ims.metu.edu.tr



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6.3 Innovation workshop agenda



BLACK SEA CONNECT INNOVATION

**WORKSHOP
2 FEBRUARY 2022
ONLINE**

Draft Agenda
Registration Link:

https://zoom.us/meeting/register/tJlrdeuprDgpHtOxvVMQXjN4GPS7_aEpPCGb

CET

08:50 Connecting to the event and netiquette

09:00 Opening Remarks

Bariş Salihoğlu and Mustafa Yücel, Black Sea CONNECT
Wendy Bonne, Directorate-General for Research and Innovation
Patrizia Busolini, Directorate-General for Maritime Affairs and Fisheries

09:30 Innovation workshop objectives and Presentation of the questionnaire key findings

Emina Mamaca, IFREMER

Testimony of maritime clusters

Guy Herrouin, Pôle Mer Méditerranée
Ilze Atanasova, Marine Cluster Bulgaria and BG CMA national Hub
Q&A session

10:15 Best practices showcase session

Moderated by Emina Mamaca, IFREMER

Sylvie Giraud - Starfish 4.0 Project - Safety and Tracking 4.0 Digital Technologies for Artisanal Fishermen

Thanasis Koukounaris, University of Patras, BLUEfasma

Colin Ruel, Pôle Mer Méditerranée, GALATEA

Angelos Mallios, PLOATECH (scientific and customized engineering services for marine and maritime solutions)

Sorin Constantin, TerraSigna (Earth Observation SME)

Franck Zal, "The story of a sea worm, from the lab bench to the patient's bed. How Arenicola marina hemoglobin saves lives?" Hemarina

Rune Klausen, GCE Node (Energy Cluster)



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Q&A session

11:30 Break

11:45 **Interactive session**

Moderated by Adrian Stanica, Romanian National Institute of Marine Geology and Geoecology - GeoEcoMar

Panayotis Gavras, Black Sea Trade and Investment Bank

Rieko Kubota, "Eco-innovation challenge for the Black Sea region under the BBSEA project" World Bank

Frédéric Herpers, Black Sea Assistance Mechanism of the Common Maritime Agenda

12:30 **How will innovation be tackled in DOORS and BRIDGE-BS?**

Eleni Manousiadi, H2020 DOORS R&I Action

Patrizio Mariani, H2020 BRIDGE-BS R&I Action

Closing Remarks

13:00 **End of the workshop**



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6.4 Innovation workshop attendance list

	First Name	Last Name	Email	Country/Region	Organization	Job Title	Country/Region Name
1	irine	Baramidze	i.baramidze@bama.edu.ge	GE	Batumi State Maritime Academy	Association Professor	Georgia
2	yeşim	Ak Örek	yeso35@yahoo.com	TR	Institute of Marine Sciences - METU	Researcher	Turkey
3	Diana	Trifonova	d.trifonova@mi.government.bg	BG	Ministry of economy	Expert	Bulgaria
4	İLAYDA DESTAN	ÖZTÜRK	destanozturk@istanbul.edu.tr	TR	IU_IMSM	Research Assistant	Turkey
5	Luigi	Mistodie	luigi.mistodie@ugal.ro	RO	Dunarea de Jos University	assis. prof.	Romania
6	Meltem	OK	meltemok@ims.metu.edu.tr	TR	METU Institute of Marine Sciences	Lecturer	Turkey
7	Burçin	Erlevent	berlevent@gmail.com	TR	İstanbul Technical University	Ph.D. Candidate	Turkey
8	Liliana	Gherghe	liliana.gherghe@inflpr.ro	RO	NATIONAL R&D INSTITUTE FOR LASERS, PLASMA AND RADIATION PHYSICS	Marketing Responsible	Romania
9	Michael	Rea	michael@michaelrea.co.uk	GB	DOORS	Communications Coordinator	United Kingdom
10	Oana	Marin	omarin@alpha.rmri.ro	RO	National Institute for Marine Research and Development , , Grigore Antipa"	Researcher	Romania
11	Chris	Walton	chriswaltonmedia@gmail.com	GB	BSTDB	Media Consultant	United Kingdom
12	Natalia	Mamariina	natalia.mamariina@maritimeukraine.com	UA	Public Union "Ukrainian Maritime Cluster"	Communication Manager	Ukraine
13	George	Mega	gcmega@constanta-port.ro	RO	NC Maritime Ports Administration of Constanta	Marketing Specialist	Romania
14	Daniela	Istrati	daniela.istrati@ugal.ro	RO	Dunarea de Jos University of Galati, Romania	Associate professor	Romania
15	Oktay	Tanrisever	oktay@metu.edu.tr	TR	METU	Prof. Dr. /Chair of Center for Black Sea and Central Asia	Turkey
16	Petar	Georgiev	petar.ge@tuvarna.bg	BG	Technical University of Varna	Lecturer	Bulgaria
17	Mustafa	Yucel	myucel@ims.metu.edu.tr	TR	METU	Assoc. Prof.	Turkey
18	Colin	RUEL	ruel@polemermediterranee.com	FR	Pôle Mer Méditerranée	Director European Project Department	France
19	Nikolaos	Chalkias	nc@exelixis.net.gr	GR	EXELIXIS - Development consultants LP	Environmental Engineer	Greece



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20	Kemal Can	Bizsel	kcbizsel@gmail.com	TR	DEU, Institute of Marine Sciences and Technology	Assoc. Prof. Dr. (Senior Researcher/Lecturer)	Turkey
21	Adrian	Stanica	astanica@geocomar.ro	RO	GeoEcoMar	Director General	Romania
22	George	Cozmencio	marinekompass@gmail.com	RO	Marine Kompass Srl	General Manager	Romania
23	Irina	Florea-Saghin	irinasaghin@gmail.com	RO	Ovidius University of Constanta	Lecturer	Romania
24	Andreea	Presura	apresura@bsun.org	RO	BSUN IPS	Expert	Romania
25	Daria	Ezgeta Balic	ezgeta@izor.hr	HR	Institute of Oceanography and Fisheries	Researcher	Croatia
26	PhD. Pizentsali	Serhiy	Mr.Sergei.Pizentali@ukr.net	MD	International Ukrainian NGO Ics Paletcom Srl Letter Invitation please kindly send on Juridical Address : 65001, Central Moldova,	PhD.Serhiy Pizentsali Business Ambassador Ombudsman CUCC Canada for Local Administration Government Clerks www.anenii-noi.md Qu	Moldova
27	Юрий	Харитонов	kharytonov888@gmail.com	UA	Национальный университет кораблестроения имени адмирала Макарова	руководитель учебно-научного центра "Морская инфраструктура"	Ukraine
28	Sylvie	giraud	sgiraud@groupcls.com	FR	CLS, Sustainable Management of Fisheries	Marketing/User Experience Specialist	France
29	Nelko	Yordanov	flag.shabla@gmail.com	BG	Fisheries Local Action Group Shabla - Kavarna - Balchik	Manager	Bulgaria
30	Mirela	Dinicoiu	mirela.dinicoiu@gmail.com	RO	GeoEcoMar	ECONOMIST	Romania
31	Tamara	Kukovska	t.kukovska@icloud.com	UA	MariGeoEcoCenter NASU	Deputy director for science	Ukraine
32	Florin	Dutu	florin.dutu@geocomar.ro	RO	GeoEcoMar	Researcher	Romania
33	Andris	Andrusaitis	andris.andrusaitis@bonuseeig.fi	FI	BONUS EEIG	Acting ED	Finland
34	Vladi	Kurshumov	vl_kurshumov@ue-varna.bg	BG	University of Economics - Varna	Chief Assist. Prof.	Bulgaria
35	Destan	Öztürk	destanozturk@gmail.com	TR	IU-IMSM	Research Assit.	Turkey
36	Asena	Topçubaşı Yavaş	asenatopcubasi@yahoo.com	TR	metu	expert	Turkey
37	Ростіслав	Медведський	rostislavmedvedskij@gmail.com	UA	SSI MARIGEOECOCENTER NAS UKRAINE	аспірант	Ukraine
38	Laura	Boicenco	laura_boicenco@yahoo.com	RO	National Institute for Marine Research and Development "Grigore Antipa" (NIMRD)	Sceintific Director	Romania



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39	Mariam	Avakova	mariamavakova@gmail.com	US	black sea ambassador	young ambassador	United States
40	Valentina	Tartiu	valentina.tartiu@niva.no	NO	Norwegian Institute for Water Research (NIVA)	Research Scientist Ph.D	Norway
41	Velina	Yordanova	v.yordanova@ue-varna.bg	BG	University of Economics-Varna	Assistant professor	Bulgaria
42	Bogdan	Druga	bogdan.druga@icbcluj.ro	RO	Institute of Biological Research Cluj	Research Scientist	Romania
43	Dominika	Fröhlichová	dominika.frohlichova@aets-consultants.com	BE	AETS Consultants; BSAM	Project manager	Belgium
44	ZAHİT	UYSAI	uysal@ims.metu.edu.tr	TR	IMS-METU	Prof. Dr.	Turkey
45	Catalin	Cretu	Catalin.cretu@boskalis.com	RO	Boskalis	Area Manager	Romania
46	Nikolai	Berlinsky	nberlinsky@ukr.net	UA	Odessa State Environmental University	Head of Oceanology and Marine Management Department	Ukraine
47	BERYL	BOUITEILLE	bouteilleb@afd.fr	FR	AFD/IDFC	Head of IDFC Secretariat	France
48	Cristian	Banciu	cristi.banciu@i-biol.ro	RO	Institutul de Biologie al Academiei Române	Researcher	Romania
49	Docan	Angelica	adocan@ugal.ro	RO	Dunărea de Jos University of Galați	Assoc. Professor	Romania
50	Christina	Leucuta	christina.leucuta@clustero.eu	RO	CLUSTERO-Romanian Cluster Association	Senior Advisor	Romania
51	Larisa	Danilova	lorhend@mail.ru	RU	Institute of Maritime Spatial Planning Ermak NorthWest	General Director	Russia
52	Rune	Klausen	rune@gcenode.no	NO	GCE NODE	Head of "Fremtidens Havvind" - Regional Collaboration Project, GCE NODE	Norway
53	Paolo	Favali	paolo.favali@emso-eu.org	IT	EMSO ERIC	strategy and funding advisor	Italy
54	Florin	Constantinoiu	florin.constantinoiu@mgeometoccoe.org	PT	NATO MGEOMETOCOE	STAFF OFFICER	Portugal
55	Iryna	Makarenko	iryna.makarenko79@gmail.com	TR	BSC PS	PMA Officer	Turkey
56	Siyan	Angelova	office@marinecluster.com	BG	Marine Cluster Bulgaria	coordinator	Bulgaria
57	Vazha	Trapaidze	vazha.trapaidze@tsu.ge	GE	Iv. Javakhishvili Tbilisi State University, Georgia	Associate Professor	Georgia
58	Genka	Rafailova	genka.rafailova@gmail.com	BG	College of Tourism - Varna, University of Economics - Varna	Director	Bulgaria
59	Ana	Serafia	aserafia@alpha.rmri.ro	RO	NIMRD	Research Assistant	Romania
60	Galina	Baturova	bagalina@bk.ru	US	MIREA — RUSSIAN TECHNOLOGICAL UNIVERSITY	Head of Center in Institute for	United States



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61	Ilze	Atanasova	chairman@marinecluster.com	BG	Marine Cluster Bulgaria	Chair of the MB	Bulgaria
62	irina	cozma	irinaco@gmail.com	RO	PA3-EUSDR	coordination team	Romania
63	Raluca	Bumbac	raluca.bumbac@itideltadunarii.com	RO	ADI ITI DD	Expert	Romania
64	Jos	Brils	jos.brils@deltares.nl	NL	Deltares	Exper adviser	Netherlands
65	Dan Nicolae	Tivilichi	dan.tivilichi@apdmgalati.ro	RO	APDM Galati	Mr	Romania
66	Mare Nostrum	Paiu	marian_paiu@marenostrom.ro	RO	Mare Nostrum NGO	Executive director	Romania
67	Nataliya	Shepel	Remignac@gmail.com				
68	Youssef	El hadri	magribinets@ukr.net	UA	Odessa State Environmental University	Senior Researcher	Ukraine
69	Galina	ILIEVA	galinaili@yahoo.com	BG	Technical University of Varna	Researcher	Bulgaria
70	Selma	Menabit	selma.menabit@geoecomar.ro	RO	GeoEcoMar	Scientific Researcher	Romania
71	Evgeniia	Kostianai	evgeniia.kostianai@gmail.com	RU	Institute of Oceanology	Researcher	Russia
72	Yoana	Georgieva	georgieva.ioana@gmail.com	BG	IBER-BAS	Researcher	Bulgaria
73	Petya	Ivanova	pavl_petya@yahoo.com	BG	Institute of Oceanology, BAS	Assoc.prof.Dr.	Bulgaria
74	Olena	ZHUKOVA	olena.zhukova@maritimeukraine.com				
75	Ekaterina	Batchvarova	ekbatch@gmail.com	BG	CAWRI-BAS	Director	Bulgaria
76	Natalia	Tsami	ntsami@dynamicvision.gr	GR	Dynamic Vision	Project Manager	Greece
77	Anca-Maria	Gheorghe	anca_gheorghe@marenostrom.ro	RO	Mare Nostrum NGO	Project Coordinator	Romania
78	Alina	Ragalie	alina.ragalie@abadl-rowater.ro	RO	ABA Dobrogea Litoral	SIG/IT	Romania
79	Corina	Urmosi	corina.urmosi@ccina.ro	RO	EEN-CCINA Constanta	senior expert	Romania
80	Ciprian	Nanu	ciprian.nanu@bdgroup.ro	RO	Business Development Group SRL	Partner	Romania
81	Miltiadis	Makrygiannis	miltiadis@pabssec.org	TR	PABSEC	Deputy Secretary General	Turkey
82	Marian	Paiu	romulus.marian@gmail.com	RO	Mare Nostrum NGO	Executive Director	Romania
83	Guy	HERROUIN	herrouin@polemermediterranee.com	FR	Pole de compétitivité Mer Méditerranée	Strategy officer	France
84	Natalia	Shepel	ns1u21@soton.ac.uk	GB	University of Southampton	Postgraduate Student	United Kingdom
85	Emilie	Riclet	emilie.riclet@strategies-marines.fr	FR	Stratégies Mer et Littoral	Chargée d'études	France



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86	Olena	Boika	olena.boika.ua@gmail.com	UA	Zaporizhzhia National University	vice-deab of International Affairs of Faculty of Biology	Ukraine
87	Tahsin	Gormus	tgormus@gtu.edu.tr	TR	Gebze Technical University	Res. Asst.	Turkey
88	Tociu	Carmen	tociucarmen@yahoo.com	RO	National Administration "Romanian Waters"	PhD	Romania
89	Ivaylo	Tonchev	tonchev@ue-varna.bg	BG	University of economics Varna	as	Bulgaria
90	Iulia	Iatco	iuliatco@gmail.com	MD	Institute of Microbiology and Biotechnology	Project manager	Moldova
91	Cem	Serimozu	cem.serimozu@metu.edu.tr				
92	Aygün	Karlı	karliaygun@gmail.com	TR	Atilim University	Research Assistant	Turkey
93	Costică	Voicu	asociatiasmurdgalati@gmail.com	RO	Clusterul Inovativ pentru Sanatate Dunarea de Jos	President	Romania
94	Cristian	Iliescu	cmiliescu@constanza-port.ro	RO	Maritime Ports Administration Constanta	PR Organizer	Romania
95	Rositsa	Stoeva	rstoeva@bsec-organization.org	TR	BSEC	Executive Manager	Turkey
96	Mirela	Paraschiv	mirela.paraschiv@univ-ovidius.ro	RO	Ovidius University of Constanta	PhD Lecturer	Romania
97	Oleksandra	Mytrofanova	mitrof_ol@ukr.net	UA	SSI "MariGeoEcoCenter NAS of Ukraine"	Postgraduate	Ukraine
98	Dumitrascu Doina	Maria	doinamaria07@yahoo.com	RO	Colegiul Tehnic Gheorghe Cartianu Piatra Neamt	Profesor	Romania
99	GREGOR Y	YOVANOF	yovanof@gmail.com	GR	Strategis - Maritime ICT Cluster	Managing Director	Greece
100	Baris	Salihoglu	baris@ims.metu.edu.tr	TR	METU	Prof	Turkey
101	Borys	Babin	babinb@ukr.net	UA	Association of Reintegration of Crimea	expert	Ukraine
102	mustafa	mantikci	mmantikci@gmail.com	TR	metu	researcher	Turkey
103	Kremena	Stefanova	stefanova@io-bas.bg	BG	Institute of Oceanology - Bulgarian Academy of Sciences	Deputy Director	Bulgaria
104	Isabelle-Louise	Aabel	isabelle@gcenode.no	NO	GCE NODE	EU Advisor	Norway
105	Luc	Vandenbulcke	luc@seamod.ro	RO	Jailoo SRL	Researcher	Romania
106	Patrizio	Mariani	pat@aqua.dtu.dk	DK	Technical University of Denmark	Senior Researcher	Denmark
107	Plamen	Prodanov	prodanov@cosmostd.com	BG	Cosmos Shipping	Director	Bulgaria
108	Radul	Kovachev	radulkovachev@gmail.com	BG	Marine Cluster Bulgaria	Board Member	Bulgaria



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109	Natalia	Fedoronchuk	fedoronch@gmail.com	UA	MorGoeEcoCentr	Senior researcher	Ukraine
110	Florentina	Caloianu	florentina.caloianu@abadrwater.ro	RO	Administratia Bazinala de Apa Dobrogea-Litoral	Biologist	Romania
111	Doina	Cioaca	doina.cioaca@anap.gov.ro	RO	Agentia Nationala pentru Aarii Naturale Protejate	Consilier	Romania
112	Elena	Culighin	culighin.elena@gmail.com	MD	Institute of Chemistry	Researcher	Moldova
113	Dilek	Ustaoglu	dilek.ustaoglu@asah.com.tr	TR	Karadeniz Technical University	Research Asistant	Turkey
114	Alexandru Cristian	Ionescu	aci@tpf.ro	RO	TPF Inginerie	Civil Engineer	Romania
115	Tetiana	Kulaha	tanya_2_7@ukr.net	UA	SSI MariGeoEcoCenter NAS Ukraine	PhD student	Ukraine
116	Simona	Pinzaru	simona.pinzaru@ubbcluj.ro	RO	Babes-Bolyai University	University professor	Romania
117	STANCOVICIANU	OANA	oana.stancovicibianu@apmct.anpm.ro	RO	EPA CONSTANTA	COUNSELOR	Romania
118	Ayça	Ergun	ayer@metu.edu.tr	TR	Metu	Professor	Turkey
119	Christos	Tsabarisis	tsabarisis@hcmr.gr	GR	Hellenic Center for Marine Research	Research Director	Greece
120	Beyza	Alabay	beyza.alabay.13@gmail.com	BE	Universite Libre de Bruxelles	Master Student (security studies)	Belgium
121	Kamen	Seymenliyski	kdimitrov@bfu.bg	BG	Burgas Free University	Vice - Dean	Bulgaria
122	Florentina-Natalia	Budescu-Salceanu	natalia.budescu@gmail.com	RO	Romanian River Transport Cluster	Director	Romania
123	Iustina	Boaja	iustinapopescu@yahoo.com	RO	Geological Institute of Romania	Senior Researcher	Romania
124	KONSTANTINOS	OIKONOMOU	oikonomouko@piraeusbank.gr	GR	PIRAEUS BANK SA	Director, Shipping Finance /C.I.B.	Greece
125	Salahuddeen mohammed	Shitu	salahusm@gmail.com	NG	Salaknight Ltd	Co-Founder	Nigeria
126	Brittany	Alexander	balexander@marineboard.eu	BE	European Marine Board	Science Officer	Belgium
127	Dina	Eparkhina	dina.eparkhina@eurogoos.eu				
128	Angelos	Mallios	amallios@ploatech.com	ES	Ploatech	Co-Founder and Technical Director	Spain
129	Мая Руменова	Георгиева	maioli@abv.bg	BG	Икономически университет Варна	Инспектор учебна дейност-каедра	Bulgaria



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						"Счетоводна отчетност"	
130	Husne	Altiok	altiokh@istanbul.edu.tr	TR	Istanbul University IMSM	Researcher	Turkey
131	Cem	Serimozu	cem@ims.metu.edu.tr	TR	METU IMS	PhD Student	Turkey
132	Esra	ERMIS	esra@ims.metu.edu.tr	TR	METU IMS	PhD Candidate	Turkey
133	Kristel	Jurado	Kristel.jurado@ec.europa.eu	BE	CINEA	Project Adviser	Belgium
134	Gizem	Akkuş	gizemakkuss@gmail.com	TR	METU IMS	BSYA	Turkey
135	Rosam	Fernández Otero	rfernandez@cetmar.org	ES	CETMAR	HEAD OF KNOWLEDGE TRANSFER DEPT.	Spain
136	Pinar	Uygurer	pinaruygurer@hotmail.com	TR	Middle East Technical University Institute of Marine Sciences	PM	Turkey
137	Dan	Lear	dble@mba.ac.uk	GB	MBA/EMODnet Biology	Head of Data, Information & Technology	United Kingdom
138	Sigi	Gruber	Sieglinde.gruber@ext.ex.europa.eu	BE	European Commission	Active Senior Advisor	Belgium
139	Martha	Papathanassiou	martha@indigo-med.com	GR	INDIGO MED	Communications & Ocean Literacy Expert	Greece
140	Pavel	Petrov	petrov@ue-varna.bg	BG	University of Economics - Varna	Assoc. Prof. Dr.	Bulgaria
141	DACIANA	SAVA	daciana.sava@gmail.com	RO	Ovidius University Constanta	Associate professor	Romania
142	Josan	Liudmila	josanliudmila40@gmail.com	RO	Omnipesca	Administrator	Romania
143	Mamuka	Gvilava	mgvilava@geographic.ge	GE	GSI and RS Consulting Center GeoGraphic	H2020 DOORS Team Leader	Georgia
144	Oana	Poiana	pnoana@yahoo.com	RO	Babeş-Bolyai University	Researcher PhD	Romania
145	Olena	Ivanik	om.ivanik@gmail.com	UA	MGEC	Investigator	Ukraine
146	Bilal	Akbulut	bakbulut61@gmail.com	TR	Central Fisheries Research Institute-Trabzon	Head of Aquaculture Department	Turkey
147	Mihai	Dragomir	mihai.dragomir@marine-research.com	RO	Marine Research Ltd.	Hydrographic surveyor & GIS Specialist	Romania
148	Dimitar	Berov	dimitar.berov@gmail.com	BG	IBER-BAS	senior research assistant	Bulgaria
149	ELPIDA	BESI	ebes@icbss.org	GR	International Centre for Black Sea Studies	Junior Project Manager	Greece
150	Volodymyr	Iemelianov	volodyasea1990@gmail.com	UA	SSI MariGeoEcoCenter (MGEC)	Director	Ukraine
151	Gheorghe	Luminita	abadl.pmb@gmail.com	RO	ABA Dobrogea Litoral	Biolog	Romania
152	Diana	Danilov	ddanilov@alpha.rmri.ro	RO	NIMRD	research assistant	Romania
153	Murat	Tepeyurt	murattan999@gmail.com	TR	Mavi	Marine biologist	Turkey



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154	Roxana	Iacob	roxana.iacob@itideltadunarii.com	RO	ADI ITI Delta Dunarii	Expert	Romania
155	Coatu	Valentina	vcoatu@alpha.rMRI.ro	RO	NIMRD"Grigore Antipa"	scientist	Romania
156	Sabka	pashova	spashova@ue-varna.bg	BG	University of Economics-Varna	Head of Commodity Science Department	Bulgaria
157	Andrei	Lappo	a.lappo@mail.ru	RU	institute Ermak NorthWest	Executive Director	Russia
158	Lucia	Capatina	capatina.lucia@gmail.com				
159	Luninita	Buga	lbuga@web.de	RO	National Institute for Marine Research and Development "Grigore Antipa"	Senior Scientist	Romania
160	Cristian-Emilian	Pop	contact@ngobiologic.com	RO	Biologic	Researcher	Romania
161	Sheila	Heymans	sheymans@marineboard.eu	BE	European Marine Board	Executive Director	Belgium
162	Ivo	Yotsov	ivo.yotsov@nvna.eu	BG	Nikola Vaptsarov Naval Academy	Dep Dean of Navigational Faculty	Bulgaria
163	Diana	Persa	persa.diana@yahoo.ro	RO	Geological Institute of Romania	Researcher	Romania
164	Panteleimon	Angelidis	Panteleimon.angelidis@gmail.com	GR	University of Macedonia	B.Sc. Student	Greece
165	Franck	ZAL	franck.zal@hemarina.com	FR	HEMARINA	CEO/CSO	France
166	Zagan	Remus	zagan.remus@cmu-edu.eu	RO	Constanta Maritime University	Professor	Romania
167	Faidra	Bazigou	fmpazigou@gmail.com	GR	Indigo MED	Project Manager / Marine Scientist	Greece
168	hasan	örek	orek@ims.metu.edu.tr	TR	METU-IMS	Dr.	Turkey
169	Mariana	Kancheva	marianaubbsla@gmail.com	BG	BLACK SEA ENERGY CLUSTER	CEO	Bulgaria
170	Mujdat	Aydin	aydinmujdat@gmail.com	TR	Dokuz eylul	Ogrenci	Turkey
171	Alexandra	Pătrașcu	alexandraa.patrascu@gmail.com	RO	C.N.Alexandru Odobescu, Pitelti	profesor	Romania
172	Stavros	Kalognos	stavros.kalognos@crpm.org	BE	Conference of Peripheral Maritime Regions (CPMR)	Executive Secretary of the Balkan and Black Sea Commission (BBSC)	Belgium
173	Снежана	Мончева	snejanam@abv.bg	BG	Institute of oceanology-BAS	prof.	Bulgaria
174	Lyuba	Hristova	lyuba.angelova@marad.bg	BG	Bulgarian Maritime Administration	Head of International Department	Bulgaria
175	Arzu	Karahan	arzukarahan@ims.metu.edu.tr	TR	METU-IMS	Molecular biology and genetics	Turkey



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176	idris	koraltan	koraltanidris@gmail.com	TR	Akdeniz Üniversitesi	PhD Student	Turkey
177	Antonaru	Otilia	otilia.antonaru@abadi-rowater.ro	RO	Dobrogea - Littoral Water Basin Administration	Technical manager	Romania
178	BEGÜM	UZUN	begum.uzun@gmail.com	TR	İstanbul Üniversitesi	Deniz Biyoloğu	Turkey
179	Emilia	Ivanova	e.d.ivanova@abv.bg	BG	Unuversity "Prof. d-r Asen Zlatarov" - Burgas	PhD	Bulgaria
180	Valentina	Bineva	Valentina.bineva@ue-varna.bg	BG	UE Varna, Bulgaria	Accountant	Bulgaria
181	Vangelis	Papathanassiou	vpapath@icloud.com	US	METU	Expert	United States
182	Rhonda	Smith	rhonda@minervacomms.net	GB	Minerva Communications UK	Director	United Kingdom
183	Simionov	Alexandru	alexandru.simionov@anpa.ro	RO	ANPA	consilier	Romania
184	Tülay	Çokacar	tulay.cokacar@istanbul.edu.tr	TR	İstanbul University	Assistant Profressor	Turkey
185	Cristina	Dragomir	cristinadragomir.umc@gmail.com	RO	Constanta Maritime University	Associate Professor	Romania
186	Dimitra	Frysali	frysalid@civil.auth.gr	GR	Aristotle university of Thessaloniki	Civil engineer	Greece
187	Carmen Catalina	Rusu	carmen.rusu@ugal.ro	RO	"Dunarea de Jos" University of Galati	Vice-Dean	Romania
188	Eleni	Manousiadi	e.v.manousiadi@kantorgroup.eu	GR	Kantor Management Consultants	Senior Analyst	Greece
189	Omar	Kadkoy	omar.kadkoy@tepa.gov.tr	TR	The Economic Policy Research Foundation of Turkey (TEPAV)	Policy Analyst	Turkey
190	Christina	Pavloudi	cpavloud@hcmr.gr	GR	HCMR	Post Doc Researcher	Greece
191	Javier	Martin Membiela	Javier.martin-membiela@ec.europa.eu	BE	REA	R.P.A.	Belgium
192	Nebi	Kehaya	kehayanebi@gmail.com	BG	FLAG Burgas-Kameno	Executive director	Bulgaria
193	Philip	Penchev	f.penchev@ifvarena.com	BG	Institute of Fish Resources - Varna	Senior Hydrologist	Bulgaria
194	Molly	Burchell	molly@minervacomms.net	GB	Minerva Communications	Account Executive	United Kingdom
195	Elisabeth	De Maio	elisabeth.demaio@ve.ismar.cnr.it	IT	Institute of Marine Science - Italian National Research Council (ISMAR - CNR)	Research Assistant	Italy
196	Kakhaber	Bilashvili	wocean@consultant.com	GE	Iv.Javakhishvili Tbilisi State University (TSU)	Prof.	Georgia
197	Dediu	Lorena	lorena.dediu@ugal.ro	RO	Dunarea de Jos University Galati	Profesor	Romania
198	Maria	Pogojeva	pogojeva_maria@mail.ru	RU	Zubov State Oceanographic Institute	senior scientist	Russia
199	Gonzalo	de Arboleya	Gonzalo.GARCIA-DE-ARBOLEYA@ec.europa.eu	ES	EUROPEAN COMMISSION (REA)	Project Officer	Spain



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200	Said	JAMAL	sayd.jamal@gmail.com	FR	None	Project Manager	France
201	Adriana	Filimon	afilimon@alpha.rmri.ro	RO	NIMRD	Researcher	Romania
202	Amuliu	Proca	amuliuproca@gmail.com	RO	Univers Ingineresc AGIR	Redactor	Romania
203	Marine	Desoche	marine.desoche@crowdhelix.com	IE	Crowdhelix	Project lead	Ireland
204	Sergey	Kovalev	sergeykovalev@inbox.ru	RU	NWIM RANEPА	Programms Director	Russia
205	Frédéric	Herpers	frederick.herpers@strategies-marines.fr	FR	BSAM	Team leader	France
206	Emina	Mamaca	emina.mamaca@ifremer.fr	FR	Ifremer	scientifique officer	France
207	Thanasis	Koukounaris	akoukounaris@g.upatras.gr	GR	University of Patras	Project Manager	Greece
208	Albena	Vatralova	albenav@mail.bg	BG	Climate, Atmosphere and Water Research Institute - Bulgarian Academy of Sciences (CAWRI-BAS)	Acting Scientific Secretary	Bulgaria
209	Vangelis	Papathanassiou	vpapath@hcmr.gr	GR	HCMR	Cosnultant	Greece
210	Sebastian Costin	Blicher	sebastian.blicher@yahoo.com	RO	Black Sea Connect	YA/ Deck Officer	Romania
211	Andrei	Diduh	andreididuh96@gmail.com	MD	Universitatea de Stat din Tiraspol	Student	Moldova
212	Florin	Tatui	florin.tatui@geo.unibuc.ro	RO	University of Bucharest	Assistant Professor / Researcher	Romania
213	Adriana	Constantinescu	adriana.c@geocomar.ro	RO	Romanian NIRD GeoEcoMar	Scientist	Romania
214	kalliropi	pappa	k.k.pappa@kantor-europe.eu	GR	Kantor Management Consultant	Communications Expert	Greece
215	Mariana	Golumbeanu	golumbeanu@gmail.com	RO	INCDM "Grigore Antipa"	senior researcher	Romania
216	Umar	KHAN	ukhan.tr@gmail.com	TR	Karadeniz Technical University	Assistant Professor	Turkey
217	Gabriela	Ploscutanu	Gabriela.Ploscutanu@ugal.ro	RO	Dunarea de Jos University of Galati	lecturer	Romania
218	Nikola	Bobchev	bobchev93@gmail.com	BG	IBER - BAS	Researcher	Bulgaria
219	Turgay	Öksüzöglü	turgay.oksuzoglu@csb.gov.tr	TR	Freelancer Researcher	Mühendis	Turkey
220	Serge	Gomes da Silva	serge@eellogic.com	FR	eellogic	Communications expert	France
221	Natasa	Vaidianu	natasa.vaidianu@geo.unibuc.ro	RO	Ovidius University of Constanta	Associate Prof	Romania
222	Turgay	Öksüzöglü	toksuzoglu@ogr.iu.edu.tr	TR	Freelancer Researcher	Mühendis	Turkey
223	Laura	Dutu	laura.dutu@geocomar.ro	RO	GeoEcoMar	Researcher	Romania
224	Catalin	Salceanu	agpgalati@gmail.com	RO	Association Global Project	Vicepresident	Romania
225	Bettina	Fach	bfach@ims.metu.edu.tr	TR	IMS	researcher	Turkey



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226	Daniela	Popescu	daniela.popescu@abadi-rowater.ro	RO	A.B.A.-DL	engineer	Romania
227	Nina	Dzhembekova	sonata_bg@yahoo.com	BG	Institute of oceanology - BAS	researcher	Bulgaria
228	Clément	Dupont	clement.dupont@strategies-marines.fr	FR	Stratégies Mer et Littoral	Consultant	France
229	Orestis	Anagnopoulos	oanagnopoulos@apc.gr	GR	APC SA	Consultant	Greece
230	Luka	Ezerskii	l.ezerskiy@rfma.ru	RU	Ministry of Foreign Affairs	First Secretary	Russia
231	Wendy	Bonne	Wendy.BONNE@ec.europa.eu	BE	European Commission DG Research & Innovation	Policy Officer	Belgium
232	Gheorghe Viorel	Ungureanu	gigi_ungureanu@geoecomar.ro	RO	GeoEcoMar	Director of Department DANUBIUS-RI	Romania
233	Sorin	Constantin	sorin.constantin@terrasigna.com	RO	Terrasigna	Earth Observation Scientist	Romania
234	Damyán	Barantiev	barantiev@gmail.com	BG	Climate, Atmosphere and Water Research Institute at Bulgarian Academy of Sciences (CAWRI-BAS)	Research Associate	Bulgaria
235	Naima	EI HAJLI	naimaelhajli65@gmail.com	MA	Fstt	Student	Morocco
236	Gabriela	Mitova	gmitova@mtitc.government.bg	BG	Ministry of Transport Information Technology and Communications	Expert	Bulgaria
237	Genta	Mantikci	genta@ims.metu.edu.tr	TR	METU IMS	Administration	Turkey
238	Deborah	Bellafiore	deborah.bellafiore@ismar.cnr.it	IT	CNR	Researcher	Italy
239	Ruxandra	Croitoru	ruxandra.croitoru@rowater.ro	RO	National Administration "Romanian Waters"	Geographer	Romania
240	Damir	Nicoleta	ndamir@alpha.rmri.ro	RO	NIMRD	Research assistant	Romania
241	Panayotis	Gavras	pgavras@bstdb.org	Other	Black Sea Trade and Development Bank	Head, Policy and Strategy	null
242	Veneta	Slavova	veneta.slavova@marad.bg	BG	Bulgarian Maritime Administration	Environmental Inspector	Bulgaria
243	Ipek	Korlu	ipekkorlu@gmail.com	TR	Antalya Büyükşehir Belediyesi	Su Ürünleri Yüksek Mühendisi	Turkey
244	Andreea	Ionascu	romania-nh@blackseablueconomy.eu	RO	Romania National Hub for CMA	Representative	Romania
245	Berkay	Basdurak	berkay@ims.metu.edu.tr	TR	METU	Asst. Prof.	Turkey
246	Andra	Oros	aoros@alpha.rmri.ro	RO	National Institute for Marine Research and Development "Grigore Antipa"	scientist	Romania
247	Dorina	Seitaj	dorina.seitaj@iucn.org	CH	IUCN	Marine Programme Officer	Switzerland
248	Thanos	Smanis	tsmanis@gmail.com	GR	CLIMAZUL	Blue economy expert	Greece



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249	Antoaneta	Kirova	a.kirova@bdca.bg.org	BG	BDCA	environmental engineer	Bulgaria
250	Emma	Gileva	bsnn@bsnn.org	BG	Black Sea NGO Network	board member and official representative	Bulgaria
251	Marusya	Lyubcheva	milyubcheff@gmail.com	BG	Black Sea Institute Association	Expert	Bulgaria
252	Joseph	Nasser	nasser@ncrdh.p.bg	BG	National Centre for Regional Development NCRD	Regional and Urban planning expert	Bulgaria
253	Tamar	Beruchashvili	tberuch@gmail.com	GE	MFA	Ambassador at Large on Black Sea Affairs	Georgia
254	Veniamin	Todorov	vntodorov@ue-varna.bg	BG	University of Economics - Varna	assistant professor	Bulgaria
255	Arij	Zaatouri	arijzaatouri@gmail.com	TR	Akdeniz Üniversitesi	Student	Turkey
256	Goga	Kvaratskhelia	gmtholdingllc@gmail.com	GE	GMT Holding llc	Founder / CEO	Georgia
257	Stela	Naydenova	steltion@gmail.com	BG	University "Prof. d-r Assen Zlatarov"	Assistant prof	Bulgaria
258	Stergios	Alexandridis	alexandridis.stergiosgr@gmail.com	GR	Finance Club UoM	President	Greece
259	Angelica	Paiu	angelica_iosif@marenostrom.ro	RO	Mare Nostrum NGO	Project manager	Romania
260	Евгений	Костючик	jenyakostyuchik@ukr.net	UA	ГНУ "Центр проблем морской геологии, геоэкологии и осадочного рудообразования НАН	Аспирант	Ukraine
261	Joanna	Staneva	joanna.staneva@hereon.de	DE	Helmholtz Zentrum Hereon	Head of Department	Germany
262	Marina	Sarluceanu	marina.sarluceanu@rowater.ro	RO	ANAR	ENGINEER	Romania
263	Mihaila	Aluas	mihaluas@yahoo.co.uk	RO	Babes Bolyai University	Researcher	Romania
264	Sigi	Gruber	sieglinde.gruber@ext.ec.europa.eu	BE	European Commission	Active Senior Advisor	Belgium
265	Erald	Kullau	eraldkullauing@gmail.com	AL	Private	Civil Engineer	Albania
266	Nikolay	Valchev	valchev@io-bas.bg	BG	Institute of oceanology - BAS	Director	Bulgaria
267	Mamuka	Berdzenishvili	mamukabe@gmail.com	GE	Tourism Institute	BSAM NH GEO	Georgia
268	Larisa	Manastirli	manastlar@gmail.com	GR	BSTDB	Director	Greece
269	Rieko	Kubota	rkubota@worldbank.org	US	The World Bank	Senior Environmental Engineer	United States
270	Elvira	Marchidan	elvira.marchidan@rowater.ro	RO	National Administration Romanian Waters	Head of unit	Romania
271	Nicolas	Theodosiou	niktheod@civil.auth.gr	GR	Aristotle University of Thessaloniki - SDSN Black Sea	professor - Network Chair	Greece
272	Devrim	Tezcan	devrim@ims.metu.edu.tr	TR	METU-IMS	Dr.	Turkey



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273	Mykola	Pavlenko	mykola.y.pavlenko@gmail.com	UA	UkrSCES	Head of the Scientific Fundamentals of Marine Environmental Management, ГлґыСУЫ	Ukraine
274	guzel	yucel-gier	yucel.gier@deu.edu.tr	TR	University of Dokuz Eylul	researcher	Turkey
275	Dilek	Ediger	dilek.ediger@istanbul.edu.tr	TR	Istanbul university	Prof dr	Turkey
276	Igor	Kapyrin	igorkapyrin@mail.ru	RU	Ministry of Foreign Affairs	Deputy Director of European Cooperation	Russia
277	Athina	Korovesi	akorovesi@icbss.org	GR	ICBSS	Communications and Public Relations Manager	Greece
278	Liudmya	Berozkin	lkurazyeyeva@gmail.com	UA	SSI "MariGeoEcoCenter NAS of Ukraine"	leading engineer	Ukraine
279	Bukem	Belen	bukembelen@ims.metu.edu.tr	TR	METU Institute of Marine Sciences	PhD Researcher	Turkey
280	Stela	Barova	s.barova@bsbd.org	BG	Black sea Basin Directorate	chief expert	Bulgaria
281	Tamara	Shiganova	shiganov@ocean.ru	RU	Shirshov Institute of Oceanology RAS	Chief Scientist	Russia
282	Valeri	Penchev	v.penchev@coresbg.eu	BG	CORES @ BDCA	Manager	Bulgaria
283	Mihaela	Mirea	mmirea@lomartov.com	ES	Lomartov SL	EU Project Manager	Spain
284	Ivan	Dobrev	ivandobrev_vn@abv.bg	BG	HIDRO MAP LTD	Shef	Bulgaria
285	Billur	Ergin	biergin@ku.edu.tr	TR	Koc University	Lecturer	Turkey
286	Dilyana	Gradinarska-Ivanova	gradinarska_d@abv.bg	BG	University of Food Technologies-Plovdiv, Bulgaria	assistant professor	Bulgaria
287	Patrizia	Busolini	patrizia.busolini@ec.europa.eu	BE	EU COMMISSION, DG MARE	Policy Officer	Belgium
288	mohammed	latif	latif.us@gmail.com	TR	ims-metu	professor (retired)	Turkey
289	Lăcătuş	Anastasi	nastilacatus5@yahoo.com	RO	Comitetul Național Român pentru Drepturile Copilului Constanta	Student	Romania
290	Catherine	Meulders	catherine.meulders@uliege.be	BE	University of Liege	PhD student	Belgium
291	Eugenia	Beciu	eugenia.beciu@rowater.ro	RO	NARW	engineer	Romania
292	Elitsa	Stefanova	stefanova_es@abv.bg	BG	Institute of oceanology-BAS	Chief assistant	Bulgaria
293	valerian	melikidze	valerianmelikidze@gmail.com	GE	Ivane Javakishvili Tbilisi State University	Professor	Georgia
294	Lavinia	Voiculescu	lavinia_voiculescu@marenostrom.ro	RO	ONG MARE NOSTRUM	Assistant manager	Romania
295	Philipp	Schwartz	philipp.schwartz@interact-eu.net	FI	Interact / Knowledge of the seas network	Project Manager	Finland



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296	Oleksandr	Shcherbatyuk	oleksandr.shcherbatyuk@hydrogensystems.engineering	UA	UKRAINIAN MARITIME CLUSTER	Leader of projects	Ukraine
297	Ezgi	Sahin	ezgisahin@ims.metu.edu.tr	TR	METU Institute of Marine Sciences	Researcher	Turkey
298	Georgia	Chantzi	gchantzi@icbss.org	GR	ICBSS	Research and Policy Development Manager	Greece
299	Costin	Timofte	costin_timofte@marenostrom.ro	RO	Mare Nostrum NGO	Research assistant	Romania
300	Kosta	Donev	ts-east@port-varna.bg	BG	Port Varna EAD	Port of Varna EAD	Bulgaria
301	Cristina	Vrinceanu	cristina.vrinceanu@nottingham.ac.uk	GB	University of Nottingham	PGR student	United Kingdom
302	Tatiana	Elnikova	welcomecenter@investkr.ru	RU	Krasnodar region Development Corporation	International account manager	Russia
303	SANDITA	PACURARU	SORINA.PACURARU@UGAL.RO	RO	Dunarea de Jos University of Galati, Faculty of Naval Architecture	Associate profesor	Romania
304	Tudor	Castravet	tudor.castravet@ust.md	MD	Tiraspol State University	Assoc. Prof. Dr.	Moldova
305	Plamena	Nedyalkova	plnedyalkova@ue-varna.bg	BG	University of economics - Varna	accounting	Bulgaria
306	Vitalina	Kytsun	vitalina.kytsun@mfa.gov.ua	UA	UA Mission to the EU	First Secretary	Ukraine
307	Alice	Guittard	aguittard@aueb.gr	GR	Aueb	Research scientist	Greece
308	Elena	Stoica	estoica@alpha.rmri.ro	RO	National Institute for Marine Research and Development "Grigore Antipa" (NIMRD)	Researcher	Romania
309	Olgaç	Güven	olgac@akdeniz.edu.tr	TR	Akdeniz Üniversitesi	Assistant Professor	Turkey
310	Özgül Evrim	Sayılkan	ozgunevrimsayilkan@gmail.com	TR	METU	Communications Officer	Turkey
311	Fatih	AL	fatih.al@odtuteknokent.com.tr	TR	ODTU Teknokent Yönetim A.Ş.	Senior Expert	Turkey
312	Irina	Stanciu	irina.stanciu@geoecomar.ro	RO	GeoEcoMar	Researcher	Romania
313	Marius	Skolka	mokolka@gmail.com	RO	Ovidius University of Constanta	Associate professor	Romania
314	Ovidiu	ACOMI	office@team4excellence.ro	RO	Asociatia TEAM 4 Excellence	Legal Rep	Romania
315	Marioara	Musteata-Pavel	pavel_mioara@yahoo.com	RO	INCDT	Senior researcher	Romania
316	EBUN	AKINSET E	ebun.akinsete@icre8.eu	GR	ATHENA RC	Senior Researcher	Greece
317	Evrım	Kalkan Tezcan	evrimkalkan@ims.metu.edu.tr	TR	METU Institute of Marine Sciences	Researcher	Turkey
318	Sofia	ZHEREB CHUK	zerebcuksofia@gmail.com	UA	Black sea assistant mechanism	Ukrainian national hub	Ukraine
319	Cristina	Lixandroi	curea@incdt.ro	RO	INCDT	senior researcher	Romania
320	Iulia	Mihail	iulia.mihail@research.gov.ro	RO	ROST	Director	Romania



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321	Murat	Dağtekin	muratdagtekin998@gmail.com	TR	SUMAE	Researcher	Turkey
322	Sabri	Mutlu	sabri.mutlu@tubitak.gov.tr	TR	TUBITAK MAM	Researcher	Turkey
323	Charis	Stavridis	cstavrid@outlook.com	GR	SDSN Black Sea	Co-Manager, PhD candidate at AUTH	Greece



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