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Deliverable D.1. – NEEDS ASSESSMENT REPORT

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1. INTRODUCTION

The current analysis is carried out within the framework of the EMFAF-2021-PIA-FLAGSHIP project “DBAN - Digital Blue economy and innovation Acceleration Network”.

The project is implemented by a cross – border partnership led by the Burgas Municipality and composed of DIGIHUB, an NGO joint initiative of organizations from the public, private, non-governmental and the educational sectors in Burgas, IBEDC, an NGO established in Tbilisi as an innovative Business Support Organization and the Odessa State Agrarian University, a multidisciplinary institution of higher education.

According to the executive summary, the project idea was designed around the concept of establishing a regional blue growth acceleration network – based ecosystem which supports existing and emerging businesses and initiatives in the Blue economy sectors, building upon their potential for innovation, circular and bio-based solutions, as well as their capacity to contribute to the local/regional sustainable development performance indicators.

The proposal aims to bring together blue economy stakeholders in the Black Sea Basin region and to analyze together and identify local potential for blue growth and innovation suggesting specific actions in addressing capacity building needs with the ultimate objective to boost innovation, digitalization and investment in the Black Sea blue economy.

The Needs Analysis which led to the project idea identified a series of gaps between research and entrepreneurship, between entrepreneurship and demand for innovation, between the needs of the sectors and the unexplored potential for partnership as well as between the potential of the blue economy sectors and the overall performance of the region in achieving environmental and sustainable development goals.

The activities of the project were designed to cover for needs such as:

- a need to develop capacity of blue economy SMEs and start-ups to identify and access investment opportunities, for innovative and digital solutions
- a need to foster and improve regional coordination and networking between the maritime economic sectors, the research and education communities, maritime clusters and financing bodies, including private investors
- a need to provide information, build capacity and involve blue economy SMEs/start-ups, clusters and R&D organizations in regional partnerships.

- a need to stimulate transfer of best practices among maritime economic sectors and stakeholders on access to funding and investment opportunities.

While the general objective of the project is to establish a blue growth acceleration network at a regional level, several specific objectives were defined:

- SO1 – Identification and improved visibility and participation of potential actors and value chains to advance digital and environmentally sustainable blue economy models at Black Sea level within 24 months
- SO2 – Development of digital tools for enhanced capacity of Blue Economy actors within 20 months
- SO3 – Development of stakeholder capacity to establish/enhance concrete cooperation and networking approaches within 24 months

A special work package (WP2) was dedicated to the elaboration of a Regional Blue growth strategy with smart specialization local action plans. The present Gap Assessment is the first step in sketching the Smart Specialization Local Action Plans. The target of the assessment is to identify specific needs related to digitalization and use of innovative tools in order to improve the business environment and strengthen value chains.

2. CORE CONCEPTS

2.1. BLUE ECONOMY

The term **Blue economy** refers to the sustainable use of ocean and maritime resources for economic growth, improved livelihoods and jobs, and the lasting health of ocean and maritime ecosystems.

It is recognized as a pivotal component of global economies. There is international consensus that the blue economy boosts employment and innovation, and offers significant opportunities for economic development and investment, including to local communities.

The blue economy contributes 2.5% of global GDP and provides employment to an estimated 1.5% of the global workforce. Furthermore, its current output of €1.32 trillion is expected to double by 2030¹.

Europe's blue economy provides 4.5 million direct jobs, many in regions where there are few alternatives.

¹<https://cinea.ec.europa.eu/system/files/2021/05/Sustainability%20criteria%20for%20the%20blue%20economy%200.pdf>

Blue economy is a concept covering all economic activities related to oceans, seas, and coasts. Blue economy covers a wide range of interlinked *established sectors* such as fisheries and aquaculture, coastal and maritime tourism, maritime transport with related fields of ports and shipbuilding and repair as well as conventional resources extraction (oil, gas, salt) and *emerging sectors* such as blue bio-technology, marine renewable energy, desalinization, coastal and environmental protection or ocean-related infrastructure and robotics projects.

Fisheries and aquaculture belong to the so-called marine living resources sector which includes three subsectors:

- primary sector: capture fisheries (small-scale coastal, large-scale and industrial fleets) and aquaculture (marine, freshwater and shellfish);
- processing of fish products: processing and preservation of fish, crustaceans, and mollusks; meal preparation, manufacture of oils and fats and other food products;
- distribution of fish products: retail sale of fish, crustaceans and mollusks in specialized stores and wholesale outlets.

Coastal tourism includes beach-based tourism and recreational activities (such as swimming and sunbathing) and other activities that benefit from being near the sea, (such as coastal hikes and animal watching), while **maritime tourism** refers to water-based activities and nautical sports such as sailing, scuba diving, and cruising.

Maritime transport is essential to global trade and economy and despite the pressure it exerts on the environment, it is an important pillar of the Blue Economy. Still, shipping is the most environmentally friendly means of transportation, emitting the least amount of carbon dioxide (CO₂) per unit of distance and weight transported. It produces fewer exhaust gas emissions - such as nitrogen oxides, hydrocarbons, carbon monoxide, and sulfur dioxide - per ton transported per kilometer than air or road transport. International maritime transportation emits less than 3% of global CO₂ annually. Conventional sub-sectors of maritime transport include: passenger transport, freight transport and services for transport such as renting and leasing of water transport equipment.

Maritime transport is linked to port activities and shipbuilding and repair. **Ports** are crucial for trade, economic development, and job generation facilitating the free movement of goods and services as departure, entry, and transfer points. **Shipbuilding** is a dynamic and essential competitive industry, both commercially and socially. The sector is responsible for the construction of bigger (mostly seagoing) vessels for use by the merchant fleet (cargo or passenger transport), the offshore energy industry and the military. It also comprises the goods and services involved in the construction, conversion, and upkeep of these ships. Other sectors such as transportation, security, energy, research, and the environment are all involved in the shipbuilding sector.

The **extraction of oil and gas and other minerals**, (including gravel, sandpits, clays, kaolin, and salt), and their support activities, are all part of the so-called marine non-living resources industry.

The **maritime defense, security, and surveillance sectors**, although belonging to the established sectors, are gaining relevance and expanding with many technological innovations and applications for military and civilian uses.

Marine Renewable Energy (MRE) is the generation of energy from both offshore wind farms and other ocean energy technologies. In the context of the EU Green Deal Objectives and the pressure put on energy resources by the global context and the nearby war situation in the Black Sea basin the sectors gain utter importance. There is great potential for the MRE sector to sustainably generate economic growth and jobs, enhance energy security and boost industry competitiveness through technological innovation. The MRE market includes a variety of technologies, with offshore wind (bottom-fixed foundation in the seabed or anchored floating devices) being the most advanced. Other technologies such as ocean energy (tidal and wave power, ocean thermal energy conversion, salinity gradient), floating solar photovoltaic (FPV), and offshore renewable hydrogen production are all in the early stages of development.

The **Blue Biotechnology and non-traditional living resources** is a sector that continues to grow within Europe's Blue Economy sector. They include the non-traditionally commercially exploited groups of marine organisms and their biomass application. Macro and micro-algae, bacteria, fungi and invertebrates are among the main marine resources used as raw materials/feedstock in the Blue Bioeconomy.

Even though **desalination** is a rapidly growing sector of the Blue Economy, with over 2 300 seawater desalination units in the EU (out of over 18 000 worldwide) at the level of 2022, the sector is mainly developed in the Mediterranean Sea basin and there is ecological concern upon the environmental impact of the planned desalination plants in Crimea.

At a European level **research and Innovation (R&I)** is regarded as a central driver for fostering a sustainable Blue Economy, fulfilling the goals laid out in the European Green Deal and recovering after the COVID-19 crisis.

Innovative technologies such as big data, artificial intelligence, advanced modelling, sophisticated sensors, and autonomous systems are likely to transform the blue economy in the immediate future. New technologies can enable traditional sectors such as shipping, fisheries, and tourism to improve their sustainability and circularity while emerging sectors rest on innovation for their very existence.

Through innovation, coastal communities can rebuild or reshape their economies and become local drivers of sustainability. Community-led local development is a powerful tool to drive this process.

The scope of the DBAN project is to explore ways of incorporating innovative approaches and technologies in the traditional sea – related sectors of fisheries and aquaculture, coastal and marine tourism, and maritime transport.

2.2. SMART SPECIALIZATION

The **Smart specialization** concept was first developed in the context of the high-level expert group on ‘Knowledge for Growth’² created by the European Commission. S3 is an example of fruitful interaction between science and policy.

Conceived within the reformed Cohesion policy of the European Commission, Smart Specialization is a place - based approach characterized by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement. It is outward-looking and refers to a broad view of innovation including but not limited to technology-driven approaches, supported by effective monitoring mechanisms.

The approach states that setting priorities should not be a top-down process. It should be an inclusive process of stakeholders’ involvement centered on “entrepreneurial discovery” that is an interactive process in which market forces and the private sector are discovering and producing information about new activities, and the government assesses the outcomes and empowers those actors most capable of realizing this potential.

While developing the concept, four challenges have been identified and need to be addressed:

- Further reform of research and innovation systems within regions
- Increasing cooperation in innovation investment across regions
- Leveraging research and innovation in less developed and industrial transition regions
- Harnessing synergies and complementarities between EU policies and instruments.

Smart specialization strategies are about enabling regions to turn their needs, strengths and competitive advantages into marketable goods and services. They aim is to prioritize public research and innovation investments through a bottom-up approach for the economic transformation of regions, building on regional competitive advantages and facilitating market opportunities in new inter-regional and European

² <https://knowledgeforgrowth.be/>

value chains. They help regions to anticipate, plan and accompany their process of economic modernization³.

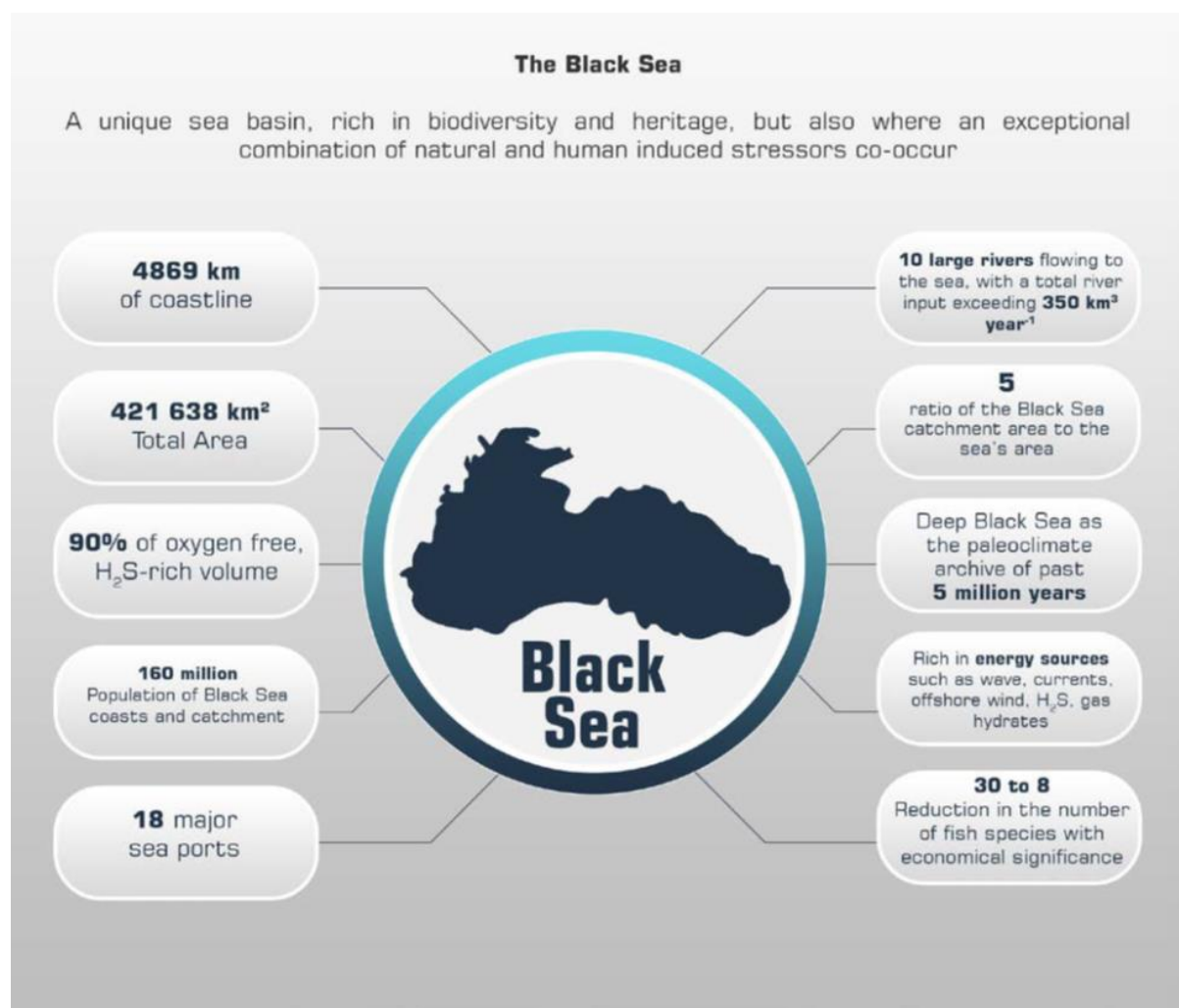
From the point of view of the DBAN project, the issue of Smart specialization approach is important because of the way such strategies can be used to drive a more effective innovation policy and **push interregional cooperation in new value chains across borders**. Linking research and innovation actors with industrial stakeholders helps to exploit complementarities in the development of products and process design. This can help build and reshape cross – border value-chains by encouraging the synergy of investment between the private and public sector.

Stronger strategic inter-regional cooperation and sustainable linkages between regional ecosystems along smart specialization priority areas can increase competitiveness and resilience.

3. BLACK SEA BASIN Blue Economy

The *Burgas Vision Paper* qualified the Black Sea as a maritime basin with some very peculiar characteristics.

³ https://s3platform.jrc.ec.europa.eu/documents/portlet_file_entry/20125/com_2017_376_2_en.pdf/3e58fbca-d9f9-04ba-bf94-dd431ef27537



Source: SRIA – Black Sea Strategic research and Innovation Agenda⁴

3.1. EU Blue Economy context

According to the 2022 EU Blue Economy Report, based on 2019 Euro Stat (SBS) and DCF data, the established sectors of the EU Blue Economy directly employed close to 4.45 million people and generated around €667.2 billion in turnover and €183 billion in GVA⁵.

The two established sectors that have seen the largest growing trends in terms of EU Blue Economy's Gross Value Added (GVA) over the last decade were Living resources (+31 %) and Shipbuilding and repair (+39 %).

Among the emerging sectors, the marine renewable energy sector, mainly offshore wind, has experienced growing trends, with employment increasing by 17 % in 2019 (compared to 2018) and is considered a key sector for the implementation of the EGD objectives by 2050. The most notable sub-sector in Blue bio-economy is the algae sector. According to

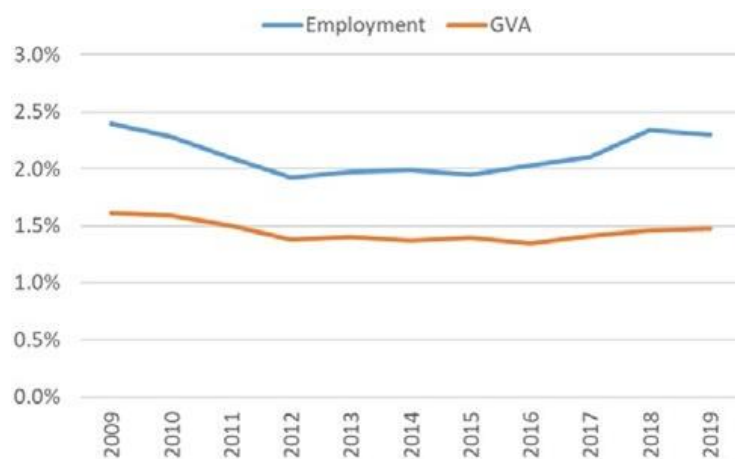
⁴ http://connect2blacksea.org/wp-content/uploads/2019/12/Black_Sea_SRIA_Final.pdf

⁵ https://oceans-and-fisheries.ec.europa.eu/system/files/2022-05/2022-blue-economy-report_en.pdf

the 2022 Report, available socio-economic estimate that that algae production in Europe generates an annual turnover well above €10 million in the MSs with the largest number of production facilities, i.e. France, Spain and Portugal. Blue-tech innovation and robotics are considered key enablers for the sustainability transition and the ambitious European DTO project.⁶

The Gross Domestic Product (GDP) of the EU-27 was estimated at €14,015 billion and employment at 193.6 million people in 2019. The contribution of the Blue Economy established sectors to the EU-27 economy in 2019 was 1.5 % in terms of GVA and 2.3 % in terms of employment as shown in the figure below based on Euro Stat (SBS) and DCF data.

Fig. 1 - Contribution of the Blue Economy to the overall EU economy



Source: European Commission (2022). The EU Blue Economy Report. 2022

As far as sectors as concerned, coastal tourism is the main Blue Economy sector in the EU. It accounted for 63 % of the jobs and 44 % of the GVA in the overall EU Blue Economy in 2019.

The main fishing grounds for the EU fishing fleet are in FAO fishing areas 27 (Northeast Atlantic, Baltic and North seas) and FAO 37 (Mediterranean and Black seas). Aquaculture is concentrated mainly in four countries: Spain (27 %), France (18 %), Italy (12 %), and Greece (11 %), making up 69 % of the sales weight and 62 % of the turnover in the EU-27. As the EU self-sufficiency in seafood products is around 30 %, EU depends heavily on global fish markets.

More than 80 % of the current European oil and gas production takes place offshore, mainly in the North Sea and to a lesser extent in the Mediterranean and Black Seas.

⁶ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters/european-digital-twin-ocean-european-dto_en

The European Shipbuilding industry is currently composed of approximately 300 shipyards specialized in building and repairing the most complex and technologically advanced civilian and naval ships and platforms and other hardware for maritime applications.

Offshore wind energy is currently the only commercial deployment of a marine renewable energy with wide-scale adoption. The main EU producers of marine green energy are Germany, the Netherlands, Belgium, and Denmark. Other offshore renewable technologies need constant support to move from pilot and demonstration phases to a utility scale. Floating offshore wind is one of the EU's R&I priorities. Tidal technologies can be considered at a pre-commercial stage, while wave energy projects are developed at a national or cross-border scale. Floating solar photovoltaic (FPV) is at predominantly R&D and demonstration phase, but the sector has witnessed increased interest during the last years. The 2020 Hydrogen Strategy states the ambition to build by 2030 40 GW of green hydrogen electrolyzers⁷.

Maritime transport is an essential element of global trade and the economy and is therefore highly globalized. In the EU, it carries 77 % of external trade and 35 % of intra-EU trade. The sector generated a GVA of €34.3 billion in 2019, which is 27 % higher compared to 2009 while overall employment increased 13 % in 2019 as compared to 2009.

3.2. Black Sea Blue Economy in the EU context

While Blue Economy contributes to about 1.5 % of the total GVA in the 2019 EU economy, the contribution by sea basins shows a lot of disparities **with Black Sea basin contributing only to 1.1 %**.

Fig. 2 - The EU Blue Economy by sea basin, GVA, € billion

Total Blue Economy		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	European Union	154	157	153	141	145	144	152	151	164	176	184
Northern Waters	Atlantic Ocean	17.2 %	17.6 %	19.2 %	18.5 %	19.0 %	19.2 %	18.6 %	19.2 %	19.2 %	19.7 %	18.9 %
	North Sea	24.9 %	25.2 %	25.7 %	27.9 %	27.5 %	27.2 %	27.5 %	26.0 %	26.2 %	25.1 %	25.9 %
	Baltic Sea	19.2 %	20.9 %	21.9 %	22.7 %	22.9 %	22.6 %	22.7 %	20.6 %	20.8 %	19.7 %	21.2 %
Mediterranean	Mediterranean	40.6 %	38.9 %	36.4 %	34.0 %	33.7 %	34.2 %	34.4 %	36.5 %	36.2 %	37.4 %	36.4 %
	West Mediterranean	15.2 %	14.8 %	15.5 %	14.9 %	15.0 %	14.9 %	14.9 %	15.5 %	15.3 %	16.1 %	15.4 %
	Adriatic-Ionian Sea	17.9 %	16.5 %	13.8 %	12.1 %	12.1 %	12.6 %	12.6 %	13.5 %	13.8 %	13.8 %	13.7 %
	East Mediterranean	9.2 %	7.1 %	5.5 %	4.1 %	4.4 %	4.8 %	4.4 %	4.9 %	5.3 %	5.2 %	5.1 %
	Black Sea	1.6 %	1.3 %	1.4 %	1.0 %	1.0 %	0.9 %	1.0 %	1.2 %	1.0 %	1.2 %	1.1 %

⁷ https://energy.ec.europa.eu/topics/energy-systems-integration/hydrogen_en

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Source: European Commission (2022). The EU Blue Economy Report. 2022

The situation is similar in terms of jobs within the blue economy sectors, **the Black Sea basin contribution to employment in 2019 was of only 4%** as shown in the table below.

Fig.3 – The EU Blue Economy by sea basin, employment, person thousand

Total Blue Economy		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	European Union	4428	4158	3812	3488	3563	3619	3580	3800	3993	4481	4449
Northern Waters	Atlantic Ocean	18 %	18 %	19 %	20 %	21 %	20 %	20 %	20 %	20 %	20 %	20 %
	North Sea	13 %	14 %	15 %	16 %	16 %	16 %	17 %	16 %	16 %	16 %	16 %
	Baltic Sea	15 %	16 %	17 %	18 %	18 %	18 %	19 %	18 %	18 %	16 %	16 %
Mediterranean	Mediterranean	47 %	46 %	43 %	43 %	42 %	43 %	42 %	43 %	44 %	46 %	46 %
	West Mediterranean	16 %	15 %	16 %	16 %	16 %	16 %	16 %	16 %	16 %	16 %	16 %
	Adriatic-Ionian Sea	24 %	24 %	20 %	19 %	19 %	21 %	19 %	20 %	21 %	23 %	23 %
	East Mediterranean	13 %	12 %	10 %	8 %	9 %	11 %	10 %	11 %	12 %	14 %	14 %
	Black Sea	8 %	7 %	7 %	4 %	4 %	4 %	4 %	4 %	3 %	4 %	4 %

Source: European Commission (2022). The EU Blue Economy Report. 2022

The blue economy in the sea basin is strongly dependent on the established maritime sectors, such as transport, shipbuilding, fisheries, and sun-sea tourism. These sectors continue to grow but still need to be modernized. In particular the environmental sustainability, resilience and competitiveness of those sectors on the global market could be improved.

The coastal tourism sector is the main sector of Blue economy in the Black Sea basin with 0.09 million jobs and €1 billion GVA (out of 0.16 million jobs and €2 billion GVA in 2019) followed by Shipbuilding and repair and Port activities.

The Black Sea region covers FAO fishing area 37.4. Bulgaria and Romania are involved in the Black Sea fisheries. All landings by the Bulgarian and Romanian fishing fleets originate only from the Black Sea. Revenue was estimated at €10.5 million and GVA at €7.4 million in 2019.

According to 2021 data, the top 15 EU ports in terms of cargo capacity are: this order: Rotterdam (NL), Antwerp (BE), Hamburg (DE), Valencia (ES), Piraeus (EL), Bremerhaven (DE), Algeciras (ES), Barcelona (ES), Gioia Tauro (IT), Le Havre/Rouen (FR), Marsaxlokk (MT), Genoa (IT), Gdansk (PL), Zeebrugge (BE), Sines (PT). None of them is in the Black Sea region.

Romania and Bulgaria are hydrocarbon (oil and gas) producers in the Black Sea but most of European production takes place in the Northern Sea.

3.3. Blue Economy profiles of Bulgaria, Georgia, and Ukraine

The partners of the DBAN project are from three of the countries that encompass the Black Sea basin: Bulgaria, Georgia, and Ukraine.

3.3.1. Bulgaria

The country blue economy profile is based on the Annexes to the 2021 Blue Economy Report as the corresponding annexes of the 2022 Report are not available.

The Bulgarian Blue Economy (established sectors) employs 98,148 people (2018 data) and generates around € 979 million in GVA. The contribution of the Blue Economy to the national economy in terms of jobs is 3.2% and in GVA 2%, a significant decrease compared to 2009 (9% and 4.7% respectively).

Overall, Blue Economy GVA decreased by 35.8%, compared to 2009, underperforming compared to the +49.7% of the national economy. In terms of jobs, the Blue Economy's share, at 3.2% in 2018, declined 64.6% compared to 2009.

Coastal tourism is by far the largest contributor to Bulgaria's Blue Economy. In 2018, the sector represented 79.6% of Blue Economy jobs and 68.2% of GVA.

Marine living resources and Shipbuilding and repair are also important generators of GVA, at 9.1% and 9.8% respectively, both of which have been growing in recent years.

Bulgaria has a maritime cluster for the sustainable development of the Bulgarian maritime economy⁸ through partnerships and joint actions of all stakeholders and members. Members of the cluster include SMEs, NGOs, educational institutions, and research and development organisations. The association acts towards the creation of favourable conditions for development and enhancement of the competitiveness of the Blue Economy by introducing new organisational, product, market and technological solutions, training, implementation of best practices, as well as for its promotion at a national and an international level. Marine cluster Bulgaria is a full member of the European Network of Maritime Clusters⁹ and of the Association of Business Clusters in Bulgaria.

Fig.4 – Evolution of the Blue economy established sectors in Bulgaria (2009 – 2018)

Persons employed (thousands)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Living resources	7.7	8.1	7.9	7.7	7.9	7.8	8.1	8.6	10.0	9.0
Non – living resources	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Ocean Energy	-	-	-	-	-	-	-	-	-	-
Port activities	7.2	5.9	5.0	4.8	4.0	5.5	5.8	4.7	4.3	3.9
Shipbuilding and repair	6.9	6.2	5.7	5.1	4.9	4.9	5.1	5.5	4.9	5.3
Maritime transport	2.1	2.1	2.0	1.9	1.5	1.8	1.7	1.8	1.8	1.8
Coastal tourism	265.5	183.9	191.6	63.9	62.5	46.9	47.8	74.1	53.3	78.1

⁸ <https://www.marinecluster.com/en/>

⁹ <https://www.enmc.eu/>

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Blue economy jobs	289.5	206.2	212.1	83.5	81.0	67.0	68.7	94.8	74.4	98.1
National employment	3,205	3,037	2,928	2,895	2,889	2,927	2,974	2,954	3,073	3,069
Blue economy (% of national jobs)	9.0%	6.8%	7.2%	2.9%	2.8%	2.3%	2.3%	3.2%	2.4%	3.2%
GVA (€ million)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Living resources	43	45	49	63	62	60	67	78	87	89
Non – living resources	3	6	43	48	29	22	9	12	11	14
Ocean Energy										
Port activities	120	109	81	72	67	86	102	68	78	78
Shipbuilding and repair	63	46	38	48	62	66	52	76	91	96
Maritime transport	37	36	39	40	39	27	30	35	36	34
Coastal tourism	1,258	890	997	387	416	288	335	614	442	668
Blue economy GVA	1,525	1,133	1,245	656	675	548	595	883	747	979
National GVA	32,478	33,060	36,071	36,383	36,059	37,239	39,434	41,869	45,183	48,634
Blue economy (% of national GVA)	4.7%	3.4%	3.5%	1.8%	1.9%	1.5%	1.5%	2.1%	1.7%	2.0%

Source: Annex 1 2021 Blue Economy Report

3.3.2. Georgia

A presentation of the blue economy sectors in Romania, Bulgaria, Türkiye, Georgia and Ukraine was made within the 4BIZ – Boosting the Blue Economy in the Black Sea Region by Initiating a Business Collaborative Framework in the fields of Fisheries and Aquaculture, Coastal and Maritime Tourism and Maritime Transport¹⁰ EU funded project coordinated by BSUN.

The Report presents information on fishing and aquaculture, nautical tourism, maritime transport and crewing services, shipbuilding, and ship repair as well as on maritime education.

While fishing is an important activity, the fishing fleet is rather small and in a precarious technical state. New regulations were adopted regarding aquaculture, but there a strategy for the development of the sector is not in place.

It is assumed to be great potential for nautical tourism, but the political situation in the Black Sea region starting with 2014 and the withdrawal of the Batumi Port from the Association of Mediterranean Cruise Ports seems to have significantly hindered cruise ship tourism. More than that, coastal and maritime tourism in the Black Sea region has historically been hampered by the geomorphologic and structural characteristics of the sea basin: limits in depth, if compared with the Mediterranean, and rules governing the passage through the Bosphorus Strait have provided traditional barriers to the upraise of the typical “large-scale cruising” in the region.

Cargo transport is related to the Batumi and Poti ports, both linked to the Georgian railways. Shipbuilding and ship repair needs cannot be covered by existing local infrastructure.

The research paper *Georgia Blue Economy in the marine sector*¹¹, the authors acknowledge the importance of a true blue economy for Georgia, while identifying the

¹⁰ <https://icbss.org/4biz-project/>

¹¹ <http://www.rieas.gr/images/publications/rieas176.pdf>

fragmented nature of governance in the Georgia and the general lacking of data related to its water resources including seas as a barrier to development of blue economy policies.

3.3.3. Ukraine

The above mentioned 4Biz Report presents data concerning the fishing and fish processing, aquaculture, coastal and maritime tourism, and maritime transportation, including shipbuilding and repair, highlighting the disruptive effect of the Russian aggression on all these sectors.

In 2018, Odessa and Mykolaiv regions accounted for 15 % and 22 %, respectively, of aquatic living resources produced by domestic fishermen. The depletion of natural resources, common in the Black Sea region, urge Ukraine to take into account aquaculture projects development as well as programs to preserve biological diversity in natural reservoirs of inland, territorial sea waters and the exclusive economic zone. The coastal sea waters provide proper ecosystems for the cultivation of mollusks such as mussels, oysters, and rapana. On the other hand, due to the war, more than 80% of the fishing and aquaculture businesses stopped their activity starting with 2022.

The most important maritime and coastal tourism facilities are in the Odesa and Mykolaiv oblasts. The combined accommodation capacity of the two regions is almost 70,000 places. Tourism's importance is recognized by law which declares it as a priority area.

In terms of transport, since the beginning of war, the Danube shipping route became an alternative to sea commercial transportation. Presented data show that about 39% of Ukraine's foreign trade (by volume) passes through ports, with a huge quota for of the agricultural products (90%). Between 2015 and 2019, the volume of cargo processing in seaports has constantly increased from 144.7 million tons in 2015 to 160.0 million tons in 2019. In 2019, container terminals handled more than 1,003.5 thousand TEU, and the volume of container transportation increased by 18.6%.

A particular aspect regarding shipbuilding and repair is the significant number of ship repair and ship conversion as compared to shipbuilding. Shipbuilding was already affected by the Russian aggression in Crimea. In 2014, production volumes fell by 33.3% compared to 2010.

4. SMART SPECIALIZATION institutional aspects and processes in the target countries of the DBAN project

The new European policies and priorities require a complete transformation of production ecosystems in two directions - environmentalism and digitization. This means not only an innovative reconfiguration of production processes in enterprises, but also the creation of incentives for public-private cooperation between scientific research organizations and businesses, enabling both a transition to green energy and transport fuels, and a digital transformation of industry with the help of technology of Industry 4.0. On a national level,

EU Member States will not only have to implement the above policies, but also deal with the economic consequences of the global COVID 19 pandemic, as well as the changing international and socio-economic environment, the military conflict in Ukraine and the emerging challenges facing the EU and Black sea region countries, which affect security, inflation, supply chains, etc.

In this regard, the Smart Specialization Strategies focus on strengthening research and innovation capacity, digitalisation, the growth of small and medium-sized enterprises (SMEs) and the development of skills needed to implement smart specialisation. Research and innovation will be crucial for increasing the competitiveness of regional economic systems, developing new competences, promoting sustainable production models, as well as international and interregional cooperation in innovation.

4.1. Bulgaria

According to <https://s3platform.jrc.ec.europa.eu/bulgaria>, Bulgaria is a Modest Innovator as per the European Innovation Scoreboard, ranking 27th in the EU in terms of innovation performance. Its GERD (expenditure on R&D as a % of GDP) was 0.75% in 2017. The public sector's R&D spending is among the lowest in the EU amounting to only 0.21 % of GDP in 2017, far from the EU average of 0.69 %. Business R&D expenditure is 0.53% of GDP, with the private sector the main actor within the national innovation system. Nevertheless, Bulgarian enterprises show low levels of innovation, competitiveness and collaboration with academia even though the country has a large number of universities and research institutes.

Bulgaria has a new released National Innovation strategy for Smart Specialisation 2021-2027 that builds upon the achieved so far by National Innovation Strategy for Smart Specialisation 2014–2020¹² as well as some regional / local S3s (Severen – Tsentralen Region, Sofia, Plovdiv, Varna and Ruse).

Innovation Strategy for Smart Specialization (ISIS) 2021-2027 defines five thematic areas in which Bulgaria has a competitive advantage and capacity for smart specialization and should direct its efforts to their accelerated development. In this way, the scope of the strategy is broadened by strengthening the focus on the existing ISIS priority thematic areas 2014-2020.

The five thematic priority areas: Mechatronics and clean technologies, Informatics and information and communication technologies; Biotechnology, Nanotechnology, Creative Industries, including cultural, Pharmacy and Food industry.

The vision, objectives, principles and thematic areas of ISIS 2021-2027 are:

Vision: Turning Bulgaria into an innovative, smart, green, digital and connected country through a new common policy for interaction between scientific research, innovation and technology, as well as increasing international and cross-sectoral cooperation and

¹² https://www.mi.government.bg/files/useruploads/files/innovations/ris3_26.10.2015_en.pdf

intensive use of data for accelerated specialization in products and services with high technological and scientific intensity and significant economic impacts for sustainable competitiveness, technological transformation of the economy, increasing resource efficiency and digitization.

Strategic goals: To develop and position Bulgaria as a center of medium- and high-tech innovations in strategic areas in which the country has established capacity and market positions, as well as recognized competences to compete on the world market, increasing the country's national and regional innovation performance; To support the deployment and establishment of a sustainable, modern, dynamic, inclusive, data-driven and globally connected research, innovation and entrepreneurship ecosystem in Bulgaria.

Operational objectives

Operational objective No. 1: Improvement of the scientific research system and innovation performance of enterprises. With the realization of this goal, the ambition is to reach levels of 70% compared to the EU average, which will strengthen Bulgaria's position in the group of moderate innovators by 2027.

Operational objective No. 2: Increasing the technological capacity of enterprises, increasing the environmental friendliness and internationalization of Bulgarian products and services.

Operational objective No. 3: Improving human resource capacity in the field of new technologies and innovations.

Principles

The implementation of the current updated Innovation Strategy for Smart Specialization is guided by the following principles:

Applying a new paradigm for innovation policy addressing global challenges in order to transform the economy and society to achieve socially meaningful results

Shared responsibility of stakeholders

Sustainability and social inclusion

Implementation of effective management and implementation mechanisms

Ongoing monitoring and adaptability to the rapidly changing needs of the economy.

The Bulgarian S3 is managed at the central level by the strategic body. This is supported by an Interinstitutional Working Group and an Administrative Partnership Network. A central technical body ensures overall coordination of S3 governance in the country and the bottom-up body consists of the centrally appointed Regional Partnership Network and other stakeholders.

4.2. Eastern Partnership countries

The JRC Smart Specialization Framework for EU Enlargement and Neighbourhood Region is adopted on a voluntary basis by the countries interested in applying this EU-made innovation policy concept. JRC provides methodological support and guidance via its Enlargement and Integration Action, which so far has helped 13 EU Neighbours. Additional support is provided by DG REGIO and DG NEAR.

The Smart Specialization implementation framework for the EU Enlargement and Neighbourhood Region¹³ is a Science-for-policy report by the Joint Research Centre (JRC) that aims at providing a structured implementation framework for Smart Specialization in accession countries and countries in the neighborhoods regions, thus including both Georgia and Ukraine.

4.2.1. Georgia

Georgia is among the five Eastern Partnership countries that have expressed interest in applying the smart specialization approach to research and innovation policy. To date, Georgia has carried out a number of preparatory actions including the mobilisation of its smart specialization team and exploring opportunities for smart specialization in one of the regions. The region of Imereti has been proposed as the first pilot for mapping economic and innovative potential. and the EDP started in the summer of 2022.

Smart specialization strategy development is still in an early phase in Georgia. First contacts between the EC and Georgia on S3 started already in 2017 and 2018. But the practical process in the country was planned to be launched only in March 2020 with trainings to be held in Tbilisi and Imereti region for the national S3 team, policy makers and local stakeholders. The COVID-19 pandemic delayed the planned activities and online trainings replaced the face-to-face meetings. The EDP started in the Imereti region in the summer of 2022.

Georgia chose a regional approach to Smart Specialisation. It plans to focus first on Imereti as a pilot region, and then expanding to a total of 4 regions (including Imereti). This approach is due to its current Pilot Integrated Regional Development Programme (PIRDP), which is also focused on Imereti and three more regions and follows the EU regional policy approach.

In terms of S3 governance, the Ministry of Regional Development and Infrastructure (MRDI) is in charge of S3 policy and of strategy development. Its Department of European Integration drives the process. A broad national S3 team has been formed, involving representatives of other main ministries: the Ministry of Education, Science, Culture and Sport (MES), the Ministry of Economy and Sustainable Development (MESD), Ministry of Environment Protection and Agriculture (MEPA), and the Ministry of Foreign Affairs (MFA). The main agencies for R&I and business support are represented, including the Shota Rustaveli National Science Foundation of Georgia (SRNSFG), the Georgian

¹³ <https://s3platform.jrc.ec.europa.eu/w/smart-specialisation-implementation-framework-for-the-eu-enlargement-and-neighbourhood-region>

Innovation and Technology Agency (GITA), the Rural and Agricultural Development Agency ARDA, the Intellectual Property Rights (IPR) office Sakpatenti, the statistical office Geostat, the business support agency Enterprise Georgia, and Chamber of Commerce and Trade. Beyond the team, international donor organisations are also involved, e.g. United Nations Development Programme (UNDP), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

According to the 2022 study Smart Specialisation in the Eastern Partnership countries¹⁴, the economic and innovation (E&I) specialization domains for Georgia are: Food and beverages (NACE 10, 11), Publishing, printing and recorded media (NACE 18), Fabricated metal products, except machinery and equipment (NACE 25), Tourism and travel (NACE 55, 56), and Financial service activities (NACE 62, 64).

The science and technology specialization (S&T) domains for Georgia are: Environmental sciences and industries, Agrifood, Health and Wellbeing, and ICT and computer science with relevant specialization in patents as well as highly cited publications participation in EC projects for all S&T domains.

4.2.2. Ukraine

The 2015 H2020 association highlighted that Ukraine considers research and innovation crucial for its economic growth and the creation of jobs even though the country was confronting a difficult social and economic situation, wide-spread institutional problems and armed conflict at part of its Eastern regions bordering with Russia which further on evolved into open warfare in February 2022.

Ukraine decided to introduce the regional approach into its policymaking and to embed smart specialization in regional development strategies. Ukraine included smart specialization in the secondary national legislation, as an obligatory part of regional development strategies from 2021. Before that, some of the Ukrainian regions started developing Smart Specialization strategies on voluntary basis. With the formal introduction of S3 elements to the Ukrainian Regional development strategies for the period 2021-2027, the process benefits from paving the way for an easier and more efficient connection between regional economic development and Smart Specialization initiatives. At the level of 2021, there were 12 regions progressing with Smart Specialization strategies who joined the S3Platform.

According to the 2022 study Smart Specialisation in the Eastern Partnership countries¹⁵, the E&I specialization domains in Ukraine are: Food products (NACE 10), Wood and products of wood and cork (NACE 16), Basic metals & fabricated metal products (NACE 25, 26), Machinery and equipment (NACE 28), Manufacture of motor vehicles (NACE 29), and Wholesale and retail trade (NACE 46).

¹⁴ <https://s3platform.jrc.ec.europa.eu/w/smart-specialisation-in-the-eastern-partnership-countries-potential-for-knowledge-based-economic-cooperation>

¹⁵ Idem

The S&T domains in Ukraine were identified as: Health and wellbeing, Energy, Biotechnology, Nanotechnology and materials, Transportation, and Mechanical engineering.

Upon documentary analysis, the first clear transversal E&I domain of potential collaboration occurs in the Food Processing and Manufacturing industry, while the common S&T specialization domains is that of Health and Wellbeing.

It is worth highlighting that none of the relevant documents, either EU or national, tackles aspects of E&I and / or S&T related to blue economy sectors in particular.

5. METHODOLOGICAL APPROACH

Technically a gap assessment implies identifying of the current situation and analyzing the gap between the current situation and the aimed one followed by the development of a plan to close the existing gap. This final stage will be addressed within sub-activity T.2.2. Identification of priority sectors and development of local action plans.

In order to identify the current situation, the approach consisted in a documentary phase reflected in the above chapters followed by field research carried out by each partner based on answers provided by the stakeholders to a set of questionnaires (see Annex 3).

As the DBAN project is focused on **digital blue economy**, the questions aimed to identify specific needs related to digitalization and use of innovative tools in order to identify the priority sectors and training needs, with the goal to improve the business environment and strengthen value chains in the field of maritime sectors, digital and green transition and sustainable solutions.

The questionnaire has been developed on the basis of the standard methodology outlined in the RIS3 Guide "Regional research and innovation strategies for smart specializations"¹⁶ (Annex III).

It was adjusted from the viewpoint of the project goals and with account of three perspectives:

- Addressing specific needs related to digitalization and use of innovative tools;
- Addressing the specifics of Blue Economy
- Addressing the specifics of the Black Sea Basin and in particular the countries of the project.

¹⁶ <https://s3platform.jrc.ec.europa.eu/en/w/guide-on-research-and-innovation-strategies-for-smart-specialisation-ris3-guide->

The stakeholders belong to different categories of organizations, such as: blue economy businesses, business and research organizations, chambers of commerce, clusters, business hubs/accelerators and financing bodies within representative established sectors of blue economy, i.e. coastal and maritime tourism, fisheries and aquaculture and maritime transport.

Prior to applying the questionnaires, the partners identified the most relevant stakeholders in each category. The lists of stakeholders as provided by the project partners are attached (see Annex 2).

The set of questionnaires included three types, with slight variations, according to the target group:

BUSINESS ACTORS – questions addressed to blue economy businesses including manufacturing and services, primary sectors, financial sector, creative industries, social sector, large firms, established SMEs, young entrepreneurs, e.g. in incubators, possibly students with business ideas, possibly cluster and business organizations, possibly multinationals that have expressed interest in investing in a region or country.

PUBLIC SECTOR ACTORS AND NGOs – questions targeting administrations at different government levels (if relevant), agencies such as for regional development, business advice, public procurement offices, incubators, etc. as well as NGOs and citizens' initiatives related to societal challenges for which innovative solutions would be helpful, consumers associations, etc.

RESEARCH, EDUCATION AND INNOVATION ACTORS - questions addressed to public and private research bodies, universities, science and technology parks, digital competence centers, innovation support actors etc.

The most complex set of questions was directed towards the business sector representatives and concerned:

- Section 1. Priority products/services
- Section 2. Sources of competitive advantage
- Section 3. Future trends in the sector
- Section 4. Innovation activity
- Section 5. Sources of innovation and training
- Section 6. Supply chain
- Section 7. Digital transformation
- Section 8. Policy and governmental support.

The questionnaires for Public sector & NGOs and the R&D had a similar structure regarding:

- Section 1. Capacities of R&D infrastructure
- Section 2. R&D supporting business
- Section 4. Public-private collaboration,

while section 3 addressed to public sector & NGOs asked about public support to business innovation and the correspondent section for R&D enquired about components of innovation impact, such as co-operation with other entities for skills development / innovative projects, budgetary allocation for mastering and development of research issues and future technologies, graduates follow up, support to collaborate with industries etc.

Most of the questions were rating scale options with answer options ranging from 0 to 5 where 0 was “none” or “I don’t know”, while 5 expressed the highest intensity / degree or open – ended questions.

For the scope of the DBAN project, two additional questions were inserted:

- Providing there would be an opportunity, would you like to go through an intensive program, such as an acceleration program in order to know how to start working on a new, innovative idea and eventually turn it into a business as well as how to use digital technologies to improve the efficiency of your organization and transform the way its business processes are organized and the way how it is creating value / making profit?
- There will be trainings in Digital skills arranged there will be trainings in Digital skills arranged under our project. Please let us know which topics in Digitalization you will be interested to be addressed during trainings?

The answers were centralized providing the basis for the description of the current situation in the blue economy in the Black Sea region in Bulgaria, Ukraine, and Georgia from the point of view of digitalization and smart specialization related needs.

Based on the analysis, priority products and services were identified for each studied sector as well as the gaps between the existing situation and the expectations. Further on, based on the SWOT analyses, Local action plans will be developed meant to close on a medium-term basis the identified gaps.

6. FINDINGS

The partners distributed the questionnaires mainly online and provided a synthesis of the answers using the sum - up templates.

6.1. Quantitative aspects

6.1.1. Bulgaria

According to the sum up templates, a number of 31 questionnaires were received from the following structure of respondents:

- Per blue economy sector:
 - o 18 % - fishing

D.2.1. Needs Assessment Report – version 01. / April 2023

- 14 % - aquaculture
- 7 % - maritime tourism
- 11 % - maritime transport
- 50 % - cross – sector respondents
- Per type of respondent:
 - 21 % - business sector
 - 68 % - public sector & NGOs
 - 11 % - R&D.

As a general observation, the proportion of respondents from the marine tourism sector is rather low even though the sector is rather outstanding.

6.1.2. Georgia

According to the sum up templates, a number of 34 questionnaires were received from the following structure of respondents:

- Per blue economy sector:
 - 6 % - fishing
 - 6 % - aquaculture
 - 53 % - maritime tourism
 - 21 % - maritime transport
 - 15 % - cross – sector respondents
- Per type of respondent:
 - 68 % - business sector
 - 26 % - public sector & NGOs
 - 3 % - R&D.

As a general observation, the biggest number of answers came from the business sector, with an outstanding reaction of maritime transport.

Besides the applied questionnaires, in Georgia were conducted also 2 focus groups. One reunited mainly representatives of tourism and IT companies, including the manager of the Techno Park in Batumi. The Batumi Techno Park expressed a special interest in supporting blue economy start-ups and delivered information on the concept of hackathon / ideathon to the participants.

The other focus – group brought together a wider range of stakeholders, such as representatives of port industry, aquaculture (mussels farming), oil transport companies, and representatives of public bodies such as the Maritime Transport Agency and the Maritime Employment Agency.

Security issues were recurrent during both meetings. It was either security of data, such as personal data and implementation of GDPR requirements, confidential character of contracts clauses, or security systems for property surveillance and effective break in alerts (for off shore mussel farms, for example).

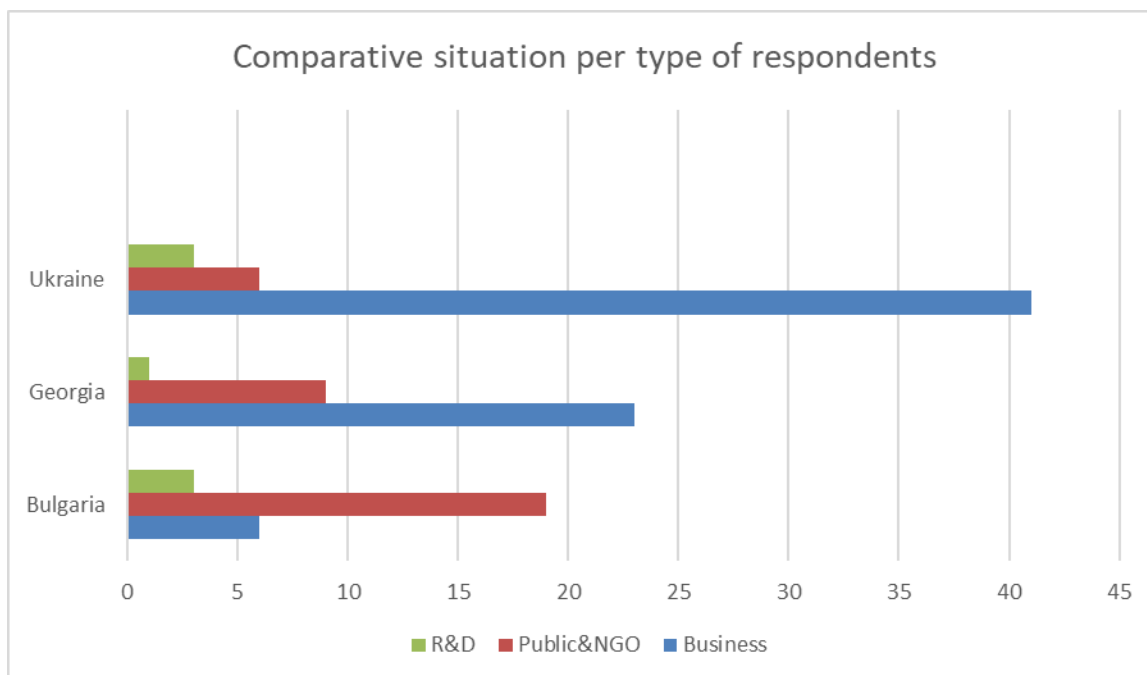
6.1.3. Ukraine

According to the sum up templates, a number of 53 questionnaires were received from the following structure of respondents:

- Per blue economy sector:
 - o 45 % - fishing
 - o 17 % - aquaculture
 - o 21 % - maritime tourism
 - o 2 % - maritime transport
 - o 15 % - cross – sector respondents
- Per type of respondent:
 - o 78 % - business sector
 - o 11 % - public sector & NGOs
 - o 11 % - R&D.

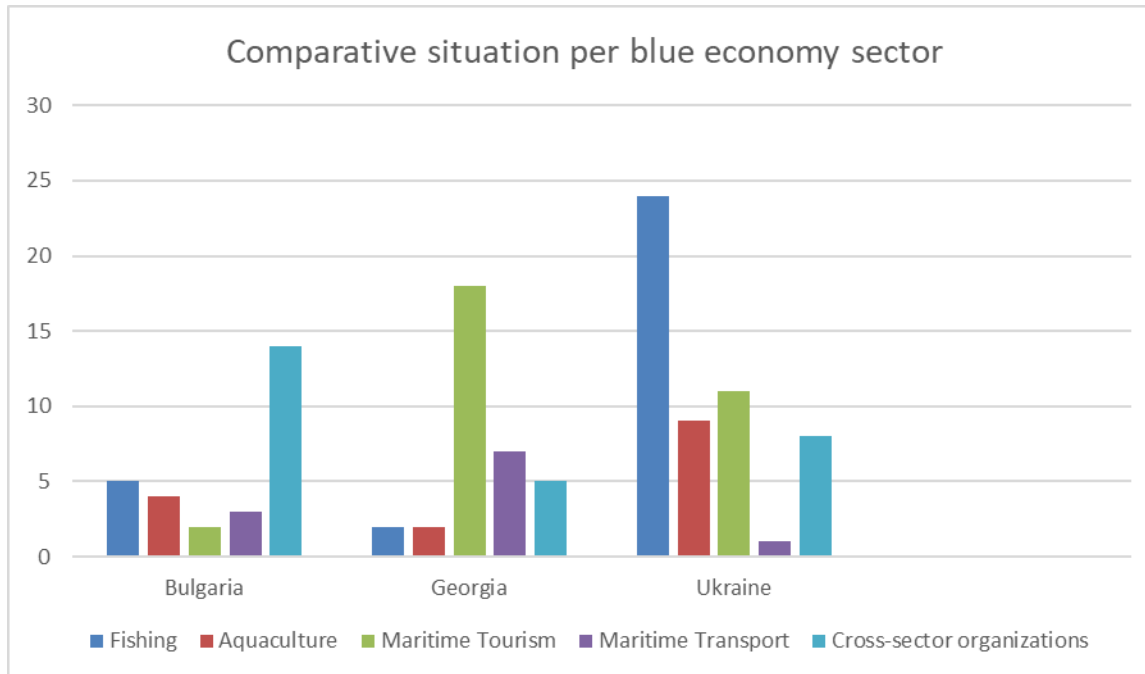
As a general observation, the number of respondents is quite big although it is completely understandable under the circumstances the desire of most of them not to make public the identity of the companies / organizations. In Ukraine also a significant number of answers came from the business sector, as compared to respondents from the public/NGO and R&D sector.

Fig.6 – Comparative situation per type of respondents



Source: Data provided by project partners

Fig. 7 – Comparative situation per blue economy sector



Source: Data provided by project partners

6.2. Qualitative aspects

The findings within this sub-chapter begin with the results of analyzing the answers provided by business respondents from all four sectors: aquaculture, fishing, maritime transport and tourism.

The respondents are involved in producing / catching and processing fish and shellfish, distribution of seafood products, salt production, maritime transport, and port administration as well as in maritime tourism.

Due to similarities in profile, the main findings by sectors are the following:

6.2.1. Aquaculture / Fishing / Seafood processing and distribution

All respondents agree that technology is the key to getting more profitable. While food processing and transport is interested mainly in processing equipment, freezing systems and special packaging (such as modified atmosphere packaging), aquaculture companies need improvement of security systems for the protection and poaching prevention at off shore farms.

Poaching is a phenomenon acknowledged in all three countries and there is a clear need for better regulations and efficient enforcement from the authorities.

There is an interest for new species or sub-sectors of blue economy, such as crab and algae farming.

Considering the scope of the DBAN project, need for new technologies in the field of fish farming including security systems and remote surveillance, use of AI and digitalization in aquaculture, blockchain-based systems to control the origin of goods, as well as improved technology for processing and packaging seafood are the most relevant.

In the meantime, increased use of machines poses threats on jobs in industries that are still labour intensive, so **there is a clear need for support services for reconversion in order to avoid unemployment and social problems as side effects.**

6.2.2. Maritime transport

There were respondents from maritime transport companies, intermodal transport, container and passenger handling and port administration.

Creating a logistics chain and compatible information flows are considered crucial. Offering customers, a unified logistics plan for the entire route is seen as an important competitive advantage.

In some cases, spatial and depth limitations are seen as an impediment for development especially as far as ports are concerned.

There is an obvious need for:

- **new operational equipment and digital cargo handling solutions**
- **reducing the administrative burden and digitalization exchange of information and documents between state and private operators**

6.2.3. Maritime tourism

While green tourism and cruises were identified as potentially productive products in the industry all respondents highlighted the threat pose by the geo-political situation in the area.

There is consensus that **Digital / IT technologies for tourism provide better promotion opportunities and that there is a trend of online booking platforms to take the place of personal contacts when services are searched or booked.** In the meantime, feedback concerning quality of services is basically obtained thorough the same means.

Cross – border co-operation and design of regional/traditional routes / activities was identified as means of differentiation.

Although an increased number of tourists is desirable in economic terms, a proper balance between tourism influx and protection of natural habitats should be observed. As such a balance depends on decision – making bodies, communication with authorities

was identified as a difficult process, especially under the circumstances of a weak representation through professional associations.

6.2.4. Cross – sector aspects

Answers to questions in Section 4 – Innovation activity produced the less specific answers. Even though some respondents assessed their companies' efforts for innovation (funding, rewards for innovative staff initiatives, interest and access to innovative support services or outsourcing) as good and that the average score is around 3, there were given few examples of innovations that are considered important to ensure the sustainable management of Blue Economy in the region. Most refer to **efficient energy use and protection of maritime resources with some interest in efficient waste management and circular economy solutions.**

Aspects mentioned in Sections 5 - Sources of innovation and training, 6 - Supply, 7 - Digital transformation and 8 - Policy and Government Support are dealt with in a similar way by representatives of all blue economy sectors under analysis.

Although there is a fair level of knowledge about R&D organizations at a local level, **access to consultancy services and advanced technological solutions is limited. Finding highly qualified staff is a recurrent problem in each sector and region.**

Non – compatible information systems were identified as a major challenge in terms of supply chains. In the meantime, new technologies and improved skills are seen as crucial for efficient co-operation with suppliers, logistics, cooperation partners, and customers.

In tourism sector, there is a clear need for **stronger professional organizations** while improved capacity is considered vital for all kind of associations representing different blue economy sectors.

A common digitalization's definition is the use of digital technologies to change a business model and processes to provide new revenue and value-producing opportunities. Most of the respondents declared to be either familiar with the concept but not using it into the company or just starting to use it. Even though the level of digitalization of both respondents and their competitors is scored with an average 2.5 points on the 0 to 5 scale, the use of online resources for business activities seems to be quite wide spread, but reduced mainly to administrative tasks.

Almost all respondents agreed upon great need for improvement in the fields of:

- **cybersecurity within the organization**
- **ICT tools to be used in relationship with members / represented organizations**
- **Electronic services and tools for interaction with the governmental organizations (taxation, customs services, statistics, employment etc)**

- **Digital skills of the personnel.**

Main hindrances for improved digital status are lack of financial resources as well as lack of appropriate ICT tools for the industries of blue economy.

A major threat, present all over the answers provided by the Ukrainian respondents but highlighted also by Bulgarians and Georgians is the lack of political and regional stability under circumstances of the war and limitations of access in and out of the Black Sea.

While implementation of regulations aligned with the EU policies was identified as among the constraints by some respondents in Bulgaria, it is worth keeping in mind that the EU accession perspectives of both Ukraine and Georgia must be considered while shaping local policies, awareness campaigns and training programmes. Compatibility of systems (not only technological) is crucial to regional development.

On the other hand, respondents from Georgia belonging to different sectors underlined the entrance of multinational companies as a threat and the lack of protective legislation for Georgian companies while foreign companies are free to enter the Georgian market. Even though a protective legislation might generate benefits on a short term, the free circulation of goods and services is a pillar of EU and thus it is by far better to enhance the competitiveness of local companies than to rise barriers for foreign trade.

6.2.5. Input from public sector and NGO respondents

The profile of public sector and NGO respondents included agencies for fisheries and aquaculture, maritime transport agencies, cross – sector organizations such as agencies for employment or environment and natural resources, administration of different ports such as Burgas and Batumi, business organizations for different sectors: fisheries, farming, tourism.

Most respondents identified the key education, research and innovation actors in their regions / countries related to the sectors of Blue Economy, and the key fields of competence, such as: fisheries and aquaculture, port activities, research and monitoring of the ecological status of local ecosystems and Black Sea waters, training for marine personnel, tourism management and development, greening of processes and energy production, implementation of IT in business activities.

In terms of research issues of interest for future development for the established sectors the accent is on sustainability for fisheries and aquaculture, transport, and tourism, digitalization and use of AI and security of marine transport and port activities. There is also interest in emerging sectors such as marine renewable energy, and biotechnology.

As factors for improving productivity and profitability of domestic industries were mentioned development of infrastructure, IT technologies, process automation in all sectors, and with significant recurrence education. Even awareness among civil servants and training regarding blue economy sectors as a distinct part of national / regional economy was mentioned.

Marine spatial planning and digitalization were the main types of innovations that are considered important for sustainable management of coastal tourism, preservation of natural habitats, maritime safety and sustainable shipbuilding, promotion of intermodality in maritime/inland water transportation, innovative ways for waste management, circular economy applications, energy efficiency and management of touristic flows in the Black Sea region.

Unfortunately, there seems to be consensus that there is a gap between science, enterprises and governance in terms of ability to jointly address the major stressors such as maritime litter, traffic pollution, “air” transporting containers, renewable energy needs or biodiversity devastation. Insufficient international exposure, lack of awareness, lack of financing and the fact the information is not properly shared among the stakeholders are the most common reasons for this situation. Exchange of information, joint thematic events, joint initiatives and campaigns are mentioned as soft mitigation measures, while digitalization of process and information flows are seen as effective for linking together administration, business and R&D organizations.

The private sector is considered by far more innovative than the public sector, even though the level of incentives provided by the national / regional authorities to facilitate the start-ups and spin-off companies or the development of innovative business clusters is perceived insufficient.

The reduction of the administrative burden appeared as a recurrent theme in the answers.

The level and result of consultation between decision – makers and representatives of civil society, business and academy milieu is considered as unsatisfactory as there is a lack of follow -up and poor strategic approach. It is expected to improve the private – public collaboration.

6.2.6. Input from the R&D

The respondents from all countries are educational entities (vocational and / or higher education organizations). Training is provided mainly in technology and engineering related to blue economy, but also healthcare and law were mentioned, as well as entrepreneurship training.

The self-assessment for competitiveness has an average score of 2.

Information technology, robotics and artificial intelligence, biodiversity conservation, marine litter reduction, wetland research, coastal tourism, biotransformation, climate change, renewable energy sources, tourism, but also language skills are among the recurrent research issues and future technologies considered as most necessary and perspective to support the growth and development of blue economy businesses in the area.

The relationship between science, enterprises, and governance with respect to address major societal and environment-related challenges has an average score of 3 in Georgia and Ukraine, while it was scored with 4 by Bulgarian respondents. The score is somehow

contradicted by the fact that everybody considered that the actors do have proper knowledge, resources, and incentives (mostly score 4).

On the other hand, lack of action is due to shortages in terms of human resources, communication, financing and even the fact that some actors do not understand the importance and the extent of the problems.

Regarding fostering of other actors to address the challenges, in Bulgaria was mentioned the lack of an institutional structure, such as the former Agency for Research and Innovation or the later Ministry of Innovation and Growth. Questions about effectiveness of joint initiatives were raised.

Support for research at national level is appreciated as rather low (average score below 3).

Existence of knowledge and research institutions (universities, R&D institutes, competence centers) is acknowledge in all three regions, the respondents belonging to this category. Most of the business support services seems to be provided, besides some rather specialized such as testing and experimentation services or modification and upgrade of existing equipment.

On the other hand, lack of equipment and qualified staff as well as lack of communication is considered as an obstacle that R&D organizations face in order to provide services to the business milieu.

Insufficient budget is another cause and there seem to be little financing from the private sector towards the R&D organizations. The degree of mobility between the public science and education and the private sector is rather low (average score 2).

Graduates of the higher education bodies seem to be able to find jobs on the market, while there is request for training and developing skills of companies' personnel. In Bulgaria were mentioned common training programmes with software companies.

To some extent, entrepreneurial education is provided to students from other faculties than the ones with economic profiles.

Career progress of alumni does not seem to be the standard although there is some input from former students that contributes to syllabus and curricula adjustments.

Few details were provided regarding fablabs, business incubators or technology transfer and commercialization center although their existence was acknowledged (for example, a dedicated space "Learning company", robotics and electronics laboratories, computer laboratories in high school, three specialized laboratories for Ecosystem services, Aquaculture and biotechnologies, Monitoring of pollution with macro and micro particles at "Prof. Dr. Asen Zlatarov" University – Burgas and center for cutting-edge technologies in the field of ICT, one center for competence in ICT and one in the field of clean technologies at Assen Zlatarov university).

Spin – offs and start – ups deriving from R&D organizations seem to be rare and only in Bulgaria the availability of grants for this purpose was acknowledged.

While all respondents seem to be involved in a certain degree in co-operation within international projects, local / regional financial support for research and experimentation seems to be insufficient.

Last but not least, involvement of private companies and R&D organizations in consultation process regarding digitalization policies, legislative changes or policy changes regarding Black Sea challenges is rather limited in terms of practical results.

7. CONCLUSIONS AND RECOMMENDATIONS

The findings are congruent with the conclusions of the above- mentioned macro - regional smart specialization studies in terms of S&T and E&I domains at a regional level.

7.1. Aquaculture and Fisheries

Sea farming (both traditional: fish and mussels and innovative: crab and algae) is considered a priority especially due to depletion of natural resources in the Black Sea and legal problems such as fishing quotas. Modern seafood processing and distribution are seen as profitable businesses.

Related services to be developed: security services and remote surveillance for off shore farming facilities, block -chain systems to control the origin of goods, digital and AI tools for aquaculture.

7.2. Marine transport

Priorities: Improvement of operational equipment for both transport and handling and creation of logistic chains.

Related services to be developed: digital cargo handling solutions, digital flows of information both for business and in the private sector relationship with administration (customs, tax, port authorities).

7.3. Marine Tourism

Priorities: Creation of new products able to provide differentiation factors in a globalized tourism market.

Related services: development of IT tools and training for using existing and new digital tools.

7.4. Cross – sector issues

Priorities:

- Increased energy efficiency and new energy sources
- Marine and coastal natural resources protection
- Marine spatial planning
- Waste reduction and circular economy

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- Efficient waste management

Support products and services:

- ICT tools to be used in both in B2C and B2B
- E-services and e-tools for interaction with the governmental organizations

Capacity building:

- Increased capacity of professional associations
- Coherent actions
- Development of digital skills of the personnel
- cybersecurity within the organizations

Based on the analysis of the received answers, the main identified gaps are:

- between the existing and the required capacity about smart business specialization
- the existing support services for enterprises and the actual needs of different blue economy sectors doubled but distorted or insufficient communication
- between the skills of graduates and the actual requirements on the labour market
- between the actual skills of employees and the new requirements generated by technological improvements and innovative processes
- between current managerial skills and the need of strategic thinking in a more and more competitive environment
- between the financing needs of both R&D and private sector in order to have access to state of the art equipment and technologies
- between the regulatory framework and the actual possibility of the private sector to comply with legal requirements especially when they involve sudden digitalization of processes.

The scope of the Local Action Plans will be to propose adequate measures to enable the target regions to turn their needs as well as the strengths and competitive advantages that will be identified in the SWOT analyses into marketable goods and services.

The Local Action Plans will be developed taking into account the goals of CMA and in accordance with the 2nd pillar of the of the Black Sea Strategic Research and Innovation Agenda (SRIA) and in synergy with exiting local strategic documents of municipalities in the target regions.

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ANNEXES

ANNEX 1 - ABBREVIATIONS

AI -	Artificial Intelligence
BESF -	Blue Economy Framework
BSUN -	Black Sea Universities Network
CAM -	Common Maritime Agenda
DBAN -	Digital Blue economy and innovation Acceleration Network
DCF -	Data Collection Framework
DTO -	Digital Twin Ocean
EC -	European Commission
EDP -	Entrepreneurial Discovery Process
EGD -	European Green Deal

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EIST -	Economic and Innovation, Scientific and Technological (specialization domain)
E&I -	Economic and Innovation (specialization domain)
ENMC -	European Network of Maritime Clusters
EU -	European Union
FAO -	Food and Agriculture Organization of the United Nations
FPV -	Floating solar photovoltaic
GDP -	Gross Domestic Product
GERD -	Gross Domestic Expenditure on R&D
GVA -	Gross Value Added
H2020 -	EU Programme Horizon 2020
JRC -	Joint Research Center. The JRC provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society.
MSs -	Member States
NACE -	Statistical classification of economic activities in the EU
OECD -	Organization for Economic Co – operation and Development
SMEs -	Small and Medium - sized Enterprises
S&T -	Scientific and Technological (specialization domain)
STEM -	Science, Technology, Engineering and Mathematics
TEU -	Twenty – Foot Equivalent Unit
UN -	United Nations
VCA -	Value Chain Analysis

ANNEX 2 – STAKEHOLDERS LISTS

ANNEX 3 – SET OF QUESTIONNAIRES