1. INTRODUCTION

The term “Blue Economy” is relatively new as its concept was first discussed at the Rio+20 United Nations Conference on Sustainable Development in 2012. Due to its relative novelty, there is no agreed uniform definition of the term and various organizations use their own versions depending on the field of application (European Commission 2021a; United Nations 2022). According to the European Commission, the Blue Economy refers to “economic activities related to the ocean, seas and coasts and covers a wide range of interlinked established and emerging sectors, including coastal tourism, aquaculture, ocean energy, marine biotechnology, shipbuilding, maritime transport and fisheries.” (European Commission 2023). The World Bank defines it as “the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems” (World Bank 2023). The High Level Panel for a Sustainable Ocean Economy (The Ocean Panel) aims to advance a more prosperous and resilient future for people and the planet. Instead of the term “Blue Economy”, the Ocean Panel uses the term “Sustainable Ocean Economy”, which is defined as “The use of ocean resources for economic growth, improved livelihoods and jobs while preserving the health of ocean ecosystems and associated services” (The Ocean Panel 2024).

Blue Economy has become a subject of scientific research in the recent years and a part of many policies and governmental strategies worldwide, which strive to make sure that Blue Growth is also sustainable and does not happen at the expense of the ocean health. For example, in May 2021, the European Commission adopted the Communication regarding a new approach towards sustainable Blue Economy in the European Union. This approach provides coherence across the sectors of the Blue Economy, tries to facilitate their coexistence, and look for synergies to ensure that the environment is not damaged. It also highlights the importance of investment in innovation, research, and skills. There is a call for a shift from the “Blue Growth” focus to the “Sustainable Blue Economy” concept. It is underlined that the economy and the marine environment are very much connected, recognizing that a sustainable blue economy can create job and business opportunities related to the circular economy, mitigation strategies and innovation (European Commission 2021b).

The EU Blue Economy report by the European Commission (2022) divides Blue Economy sectors into two groups: established and emerging. The seven established sectors are:

1) Marine living resources (including primary production, processing and distribution of fish products). This sector generated GVA (Gross Value Added) of about €19.3 billion in 2019, which contributed to 10.5 % of the EU Blue Economy GVA (established sectors);
2) Marine non-living resources (extraction of crude petroleum and natural gas, operation of gravel and sand pits; mining of clays and kaolin; extraction of salt; support activities for petroleum and natural gas extraction, other mining and quarrying). In 2019, the GVA from this sector was almost €4.7 billion (about 2.6% of the EU Blue Economy GVA);

3) Marine renewable energy (offshore wind energy). In 2019, the GVA generated by the production and transmission of Offshore wind energy was more than €1.9 billion (about 1% of the EU Blue Economy GVA);
4) Port activities (cargo handling, warehousing, storage, construction of water projects and service activities incidental to water transportation). The GVA in 2019 reached €27.9 billion, or 15.2% of the EU Blue Economy GVA.
5) Shipbuilding and repair (as well as manufacture of various equipment and machinery). In 2019, the GVA was valued at almost €15.6 billion, or 8.5% of the EU Blue Economy GVA.
6) Maritime transport (including passenger and freight transport, as well as inland water transport, and transport services). This sector in 2019 had a GVA of €34.3 billion, or 18.7% of the EU Blue Economy GVA.
7) Coastal tourism (including transport, accommodation, and other expenditures). The GVA in this sector in 2019 was slightly more than €80 billion, or 43.5% of the EU Blue Economy GVA.

The emerging sectors include ocean energy (other than oil, gas, and offshore wind), blue biotechnology, desalination, maritime defense, security, and surveillance, research and innovation, and infrastructure (European Commission 2022). These are the marine domains which are not mature yet or for which there is not publicly available data, such as for example, in the area of maritime defense, security, and surveillance.

Afanasyev et al. (2022) have identified a significant gap in academic-corporate cooperation in the Blue Economy field in the Black Sea. Furthermore, they have shown that academic literature lacks studies on the Blue Economy as a scientific area of research in the Black Sea. The present paper aims to add knowledge to the pool of literature on the Blue Economy in the Black Sea with the specific emphasis on the Russian sector of the Black Sea basin, and discusses the potential and perspectives of the Blue Economy in this region. For the purpose of this paper, the authors examine the established sectors of the Blue Economy in the Russian sector of the Black Sea (according to the definition by the European Commission as above). The authors believe that this paper will be useful for any professionals with research interests in the Blue Economy and especially in its development in the Black Sea and its Russian sector.

2. BLUE ECONOMY IN THE BLACK SEA

The Black Sea is part of the Atlantic Ocean basin off the coast of Russia, Ukraine, Romania, Bulgaria, Turkey, and Georgia (Figure 1). It is connected by the Bosphorus Strait to the Sea of Marmara, and by the Kerch Strait to the Sea of Azov. The total area of the Black Sea is 422 thousand km^2, water volume – 555 thousand km^3, average depth – 1315 m, the largest depth is 2210 m, the smallest depth – 10 m (Grinevetskiy et al. 2015).

Fig. 1. Map of the Black Sea. Modified from https://maps-for-free.com/

The Black Sea has great economic importance for the countries surrounding the sea – Russia, Abkhazia, Georgia, Turkey, Bulgaria, Romania, and Ukraine. It is an important transport route, with the largest ports being: in Ukraine - Izmail, Odessa, Chernomorsk, Nikolaev, Kherson; in Russia - Sevastopol, Kerch, Novorossiysk, Tuapse, Sochi; in Georgia - Poti, Batumi; in Turkey - Trabzon, Samsun, Istanbul; in Bulgaria - Burgas, Varna; in Romania - Constanta. The Black Sea is a large harvesting area for fish, algae, and shellfish. The shelf and continental slope are promising for gas production. Its favorable climatic conditions allow for development of resorts and tourism (Grinevetskiy et al. 2015).

In the topography of the seabed, there are three main structures: the shelf, the continental slope, and the deep-sea basin. The shelf occupies up to 25% of the total bottom area and is on average limited to depths of 100-120 m. It reaches its greatest width (more than 200 km) in the northwestern part of the sea, which is all located within the shelf zone. Almost along the entire length of the mountainous eastern and southern coasts of the sea, the shelf is very narrow, only a few kilometers, and in the southwestern part of the sea it is wider (tens of kilometers). The continental slope, occupying up to 40% of the bottom area, descends to approximately 2000 m depth. The deep-sea basin (35%) is a flat accumulative plain, the depths of which gradually increase towards the center (Grinevetskiy et al. 2015).

With the growing enthusiasm towards the Blue Economy, it is understandable that there is also increasing scientific interest in the analysis of the current state and perspectives for the Blue Economy sectors in the Black Sea. For example, this was one of the tasks of the

DOORS Project, where both authors of this paper participated. DOORS stands for "Developing Optimal and Open Research Support for the Black Sea" and aims to make operational the Strategic Research and Innovation Agenda for the Black Sea (SRIA), support the successful implementation of Blue Growth, as well as overall contribute to a healthy, productive and resilient Black Sea (DOORS Black Sea 2023).

One of the deliverables of the DOORS Project, a report by Brils et al. (2022), discusses that for the Black Sea, the size of the Blue Economy is much smaller relative to the Blue Economy size in the European Union. In 2019, the Blue Economy in the Black Sea generated €2 billion GVA (Gross Value Added) and 0.16 million jobs, and its main sectors were Coastal tourism (0.09 million jobs and €1 billion GVA), followed by Shipbuilding and repair and Port activities. In contrast, the established sectors of the Blue Economy in the European Union in 2019 provided employment to almost 4.45 million people and generated €183.9 billion GVA (European Commission 2022).

Below the authors provide an overview of each of the established Blue Economy sectors in the Russian sector of the Black Sea. For the efficiency purposes, the sectors of port activities and maritime transport were merged into one section.

2.1. Marine Living Resources

The main share of commercial fish catch in the Azov and Black seas in the last few decades (since 1995) is accounted for Turkey (almost 80%). Its annual average catch, according to official statistics, amounts to 331 thousand tons. Russia accounts for about 10% of the total catch (about 40 thousand tons), Ukraine – about 5% (about 20 thousand tons), and Bulgaria, Romania, and Georgia - about 1% (about 4 thousand tons). Recently, these shares have changed significantly, because in 2020 in the Black Sea region, which includes the Black Sea, as well as the Azov and Marmara Seas, 692.2 thousand tons were caught by all countries, of which Turkey accounted for 42.8%, the Russian Federation (18.3%), followed by Romania (12.6%), Georgia (10.2%), Bulgaria (9.1%), and Ukraine (7.0%) (Seryogin and Sudakov 2022). Figure 2 shows interannual variability of fish catch in the Black Sea by Russia in 1992-2021 (tonnes of live weight) according to the FAO statistics (FAO 2024). Unfortunately, there are no data for 1990-1992.

In recent decades, Russia has seen an increase in aquaculture production, which grew by more than 4.6 times - from 77 thousand tons (2000) to 356.6 thousand tons (2021). The volume of commercial aquaculture production in 2021 increased by 8.5% compared to 2020 (Balykin et al. 2022). The main aquaculture species are: Mullet (Liza haematocheilus), Mediterranean Mussel (Mytilus galloprovincialis), European flat oyster (Ostrea edulis), Pacific oyster (Crassostrea gigas), Clam (Anadara kagoshimensis). The objects of artificial reproduction are: Black Sea salmon (Salmo trutta labrax), Flathead grey mullet (Mugil cephalus), Golden grey mullet (Liza aurata), Black Sea turbot (Scophthalmus maeoticus).

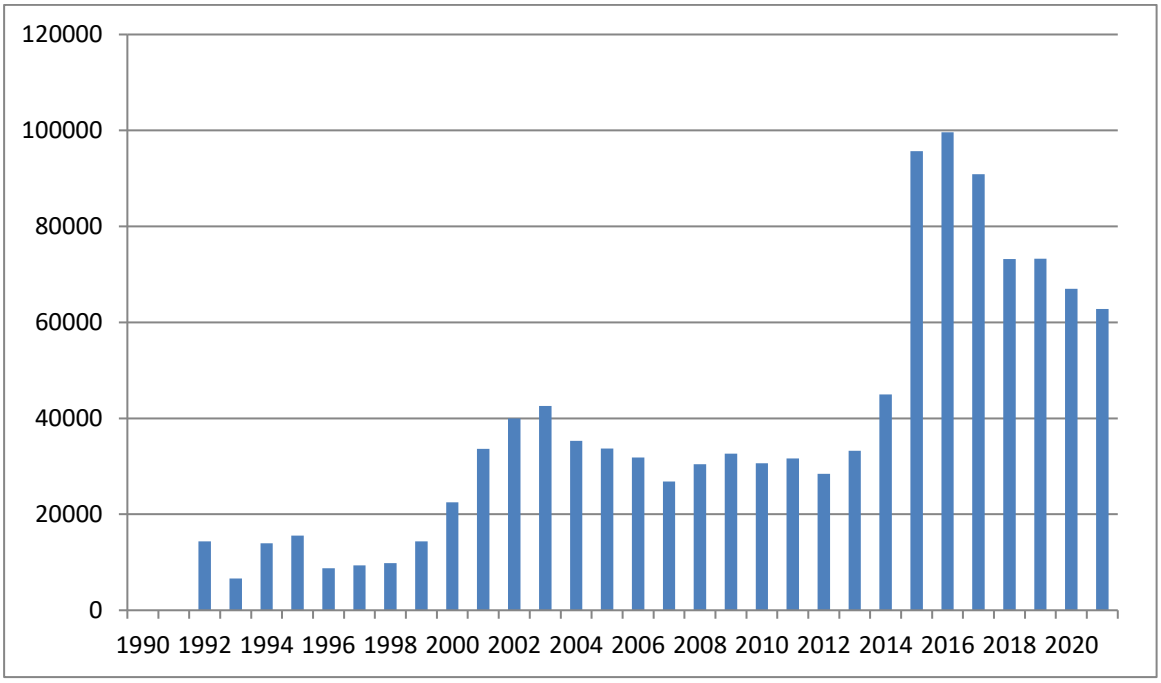

Fig. 2. Fish catch in the Black Sea by Russia in 1992-2021 (tons of live weight) (FAO 2024).

Balykin et al. (2022) come to the conclusion that the Russian fisheries industry is now experiencing a pronounced crisis, not only in the Black Sea, but also in the Azov and Caspian Seas. The reasons for this crisis are considered to be poaching and shortcomings in fisheries management (Kumantsov et al. 2012; Makoedov 2015; Balykin et al. 2022; Seryogin and Sudakov 2022).

These problems can be potentially overcome with the development of fisheries clusters. In March 2020, the Government of Russia approved the State Program of the Russian Federation "Development of the Fisheries Complex". The main objective of the Program is to create conditions for increasing efficiency of catch of aquatic biological resources, moving away from raw material exports by stimulating production with a high share of added value and creating favorable conditions for business and investment in the industry. One of the main mechanisms for achieving these goals should be an effective policy for the development of clusters, which are designed to remove barriers among business participants and create conditions for investment for the entire fishery complex. The concept of cluster in Russia became widespread relatively recently – about 15 years ago. A cluster is considered as an organizational mechanism, created by business entities for implementation of joint projects, which include, in addition to enterprises, educational and scientific organizations, financial institutions and other business supporting structures (Kolonchin et al. 2021).

Currently, the fishing industry in Russia still operates with the infrastructure and logistics built during the time of the planned economy in the USSR (before 1991), when large storage and production facilities were located not around catch sites, but in large cities

with the highest number of consumers. These conditions often do not meet the requirements of the contemporary market, which necessitates the creation of fisheries clusters. A good example of such cluster initiatives can be taken from other coastal countries, where a competitive environment is created with small and medium-sized businesses, and various forms of trade are widely used: from the sale of fresh produce directly at the piers to the creation of large wholesale distribution logistics centers and exchange wholesale trade (Kolonchin et al. 2021).

Cooperation between sectors of the coastal region's industries allows creating entrepreneurial opportunities, increasing income and growth. Above all, ocean and marine clusters can evolve towards sustainable development through improvements in existing extractive, manufacturing and commercial practices. In addition, clusters also contribute to the development of promising, fast-growing maritime activities that meet the principles of sustainable development, for example, environmentally friendly technologies. Ocean/maritime clusters coordinate activities between organizations, develop intellectual capital, and ensure the institutionalization of standards and best practices. One of the best examples is the Iceland Ocean Cluster consisting of a group of experts, engineers and entrepreneurs in the fish and seafood industry. The Icelandic Ocean Cluster applies blue technologies to fisheries management and uses the collected raw materials to the maximum extent possible in the economic chain. By maximizing the use of white cod, the cluster has created large value additions to the fishing industry. The Icelandic Ocean Cluster's efforts to use 100% raw materials help keep fish stocks at biologically sustainable levels. Utilizing all the fish benefits both consumers and the fisheries themselves. Since the benefit of 100% utilization occurs when the supplier or fishermen are registered and become interconnected in the cluster's production chain, this 100% utilization concept helps reduce illegal fishing and overfishing as well (Hansen et al. 2018; Kostianaia et al. 2018).

Development of fisheries clusters requires training of highly qualified personnel, significant financial and time costs from the preparation phase to implementation. In addition, at the initial stage, there is often unpreparedness for coordinated teamwork and elements of mutual distrust among cluster participants. This necessitates an adaptation period, which certainly affects the results (Kolonchin et al. 2021).

2.2. Marine Non-Living Resources

Exploration for oil and gas on the shelf area of the Black Sea began in the Soviet Union in the 1970s. In 1981, commercial natural gas production started in the Sea of Azov and from 1983 on the northwestern shelf of the Black Sea near the Crimean coast. In 2002, Russian company “Chernomorneftegaz” started exploration for oil and gas in the Sea of Azov and on the shelves of the Black Sea. In 2003, Russian company “Rosneft” and French company “Total” agreed on joint exploration and development of the fields in the Tuapse offshore area. In 2004, seismic surveys were done, and in 2007, preparation works for drilling started. In 2009, “Rosneft” and Ministry of Economy of the Republic of Abkhazia signed an agreement for five years for geological survey, evaluation, and exploration of hydrocarbon deposits in the Gudauta offshore area (3850 km^2). In 2011, “Rosneft” and ExxonMobile signed an agreement on joint hydrocarbon development in the Tuapse

offshore area. It was planned that in 2014 the first drilling works should start, and this could be the first developed field in the Russian part of the Black Sea (Zonn and Zhiltsov 2016; Zhiltsov et al. 2016).

In 2012, “Rosneft” and Italian “Eni” signed a comprehensive cooperation agreement, which provided for the joint development of areas of the Black and Barents Seas in Russia, the exchange of technologies and personnel, as well as “Rosneft” participation in Eni’s international projects. One of three objects for joint development in the Black Sea was Shatsky Ridge, which is located along the Russian coastline. The area of the site for joint development was 8600 km^2 at a water depth from 600 to 2250 m. “Rosneft” thoroughly studied the area using seismic sounding and identified 6 promising structures with total recoverable resources of about 10 billion barrels of oil. In accordance with licensing obligations in 2015-2016, it was planned that two prospecting and appraisal wells were to be drilled on the site (Rosneft 2012). In March 2018, “Eni” and ExxonMobil froze projects with “Rosneft” on the Black Sea shelf in relation to economic sanctions against Russia (RBC 2018).

Currently, there are no activities related to hydrocarbon exploration, extraction, and production in the Russian sector of the Black Sea. Nevertheless, construction of offshore gas pipelines has always received great administrative and financial support (Gazprom 2023).

Such discussions first started in 1990. One of the key projects was an offshore gas pipeline “Blue Stream” to connect Russia and Turkey. The project was launched in December 1997 by signing the Russian-Turkish Intergovernmental Treaty. Russian company “Gazprom” committed to deliver to Turkey 365 bcm of natural gas for 25 years. In February 1999, “Gazprom” and Italian “Eni” signed a Memorandum on mutual understanding on joint implementation of the Blue Stream Project. Industrial gas supplies via the pipeline began in February 2003. The Blue Stream Project became the largest project for gas export from Russia to Turkey via offshore gas pipeline. The total length of the gas pipeline is 1213 km, of which: the offshore section from Arkhipo-Osipovka (southeast of Gelendzhik) to the Durusu terminal, located 60 km from the city of Samsun (Turkey), is of 396 km long (Zonn 2016). In 2021, the gas pipeline capacity amounted to 47.355 million m^3/day, which is equivalent to approximately 17 billion m^3/year (Gazprom 2023).

Turkey was interested to expand the Blue Stream Project and to construct a second line “Blue Stream 2” in parallel to the first one. In later plans, this expansion was replaced by the “South Stream” Project (“South-European Gas Corridor”). Initially it was planned that the Project would be implemented by extending the existing “Blue Stream 1” over land from Samsun to Istanbul, and then via Greece to the countries of Southern Europe. Then, the plan was changed again in favor of construction of an offshore gas pipeline directly from Russia (compressor station “Beregovaya” near Dzhubga in Krasnodar Krai) to Bulgaria near Varna. Then, the plan was changed again in favor of a line coming to Turkey with a new name “TurkStream”. It starts from Russkaya compressor station near Anapa in Krasnodar Krai, crossing the Black Sea to the receiving terminal at Kıyıköy, westward of Istanbul. On 1 January 2020, “Gazprom” began shipping gas to Turkey via “TurkStream”,

including to Bulgaria and North Macedonia. The pipeline is 930 km long, has two lines with a total capacity of 31.5 billion m^3/year, and lies at the depth up to 2200 m (Gazprom 2023).

In 2009, construction of the offshore gas pipeline "Dzhubga-Lazarevskoye-Sochi" began along the Russian coast of the Black Sea. The aim of this project was to increase gas supply to the facilities constructed for the Winter Olympic Games 2014 in Sochi. The choice for the offshore route was done with the objective to minimize the impact of construction on the coastal environment with the dense urban and tourist infrastructure. Its total length is 175 km, and its capacity is 3.8 bln m^3/year. The pipeline was put into operation on 6 June 2011 (Kostianoy et al. 2016).

There are no plans for future offshore gas pipeline construction in the Russian sector of the Black Sea.

2.3. Marine Renewable Energy

Wind climate in the west part of the Black Sea basin is characterized by a higher wind speed (the average wind speed is about 7 m/s) compared to the eastern part (the average wind speed does not exceed 5.5 m/s). The windiest locations, which would be suitable for an offshore wind farm, are found near the Ukrainian and Romanian coasts, so in the northwestern part of the Black Sea (Onea et al. 2015; Khodochenko 2020). Rusu (2023) has found that the Black Sea is expected to see a considerable enhancement of the maximum wind speed due to regional climate change. It was also suggested that the highest storms can be of the hurricane type, both in terms of the cyclonic form of the storm and the wind speed intensity.

Taking into consideration the results of the research above, it would be safe to conclude that there is not much potential for offshore wind farms in the Russian sector of the Black Sea. The authors produced a map (Figure 2, below) with the monthly average wind speed in the Black Sea region from January 2000 to December 2022, calculated based on MERRA-2 atmospheric reanalysis (GMAO 2015). Analyses and visualizations used in this figure were produced with the Giovanni online data system, developed, and maintained by the NASA GES DISC (Acker and Leptoukh 2007). This map confirms the research results above; however it also displays higher wind speed in the Sea of Azov, which could lead to an interesting discussion about the possibility to set up offshore wind farms in this area. The average wind speed is the same or even higher than in the north-western and western parts of the Black Sea, and the average depth here is 7 m, so this is more suitable for constructing offshore wind farms rather than the coastline of the Russian sector of the Black Sea, which has a steep slope starting from very near from the shore. Such shallow depths allow for construction even further away from the shore to make sure that wind farms do not negatively impact the view from the shore and beaches.

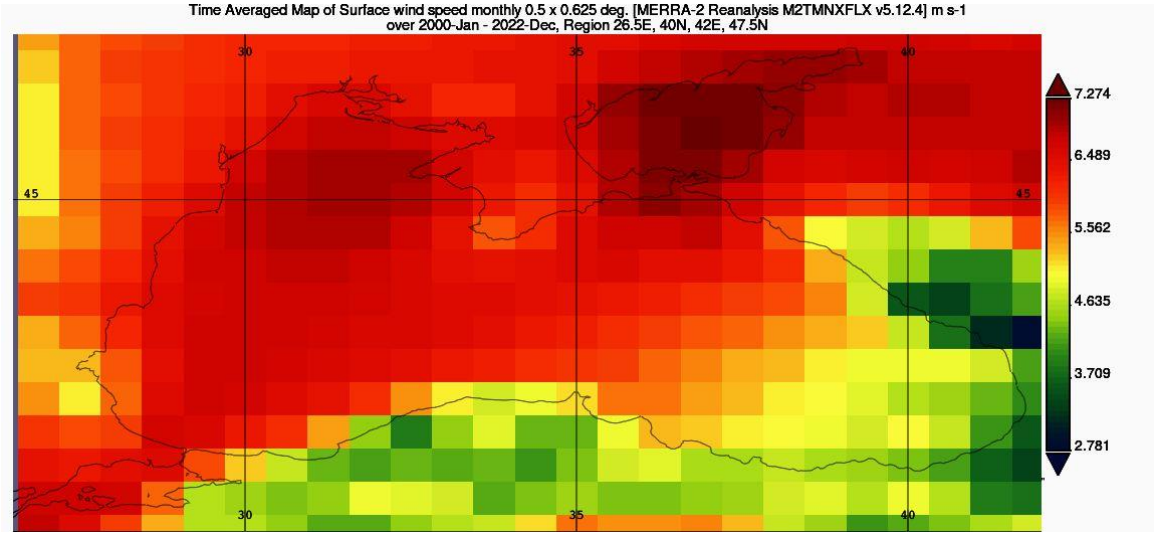

Fig. 2. Average wind speed in the Black Sea Region from January 2000 to December 2022 derived from MERRA-2 reanalysis.

2.4. Maritime Transport and Ports

Novorossiysk Commercial Sea Port is the largest Russian port on the Black Sea, which includes the Novorossiysk Grain Terminal, the KSK grain terminal, the NUTEP container terminal, the Novoroslesexport timber port, the Sheskharis oil harbor, the Novorossiysk oil transshipment complex, a complex for reloading oil products, a fuel oil terminal, a ship repair plant, as well as an oil terminal of the Caspian Pipeline Consortium (CPC), which is the end point of the Tengiz-Novorossiysk oil pipeline. The port of Novorossiysk annually receives about 4-5 thousand ships. Currently, a large volume of cargo transshipment in the Novorossiysk Sea Port is accounted for by the Caspian Pipeline Consortium, which operates the CPC-R terminal in Yuzhnaya Ozereevka, which is equipped with three offshore mooring units that allow loading tankers at a distance from the coast. In 2018, 61.1 million tons of oil were shipped through the terminal (Knyazev et al. 2021).

In 2018, the total cargo turnover of the port of Novorossiysk amounted to 154.9 million tons, in 2019 - 156.8 million tons, in 2020 - 141.8 million tons. The main types of cargo are oil and oil products, containers, grain, coal, mineral fertilizers, timber, food, and chemical products. According to the results of the cargo turnover of Russian companies in 2020, the CPC-R terminal ranked first in Russia with 59.03 million tons (Knyazev et al. 2021).

Figure 3 shows interannual variability in turnover of the Ports of Novorossiysk (blue), Taman (red), and Tuapse (green) in 2003-2022 (mln tons). Unfortunately, we couldn’t find data before 2017 for the Port of Tuapse and data before 2019 for the Port of Taman.

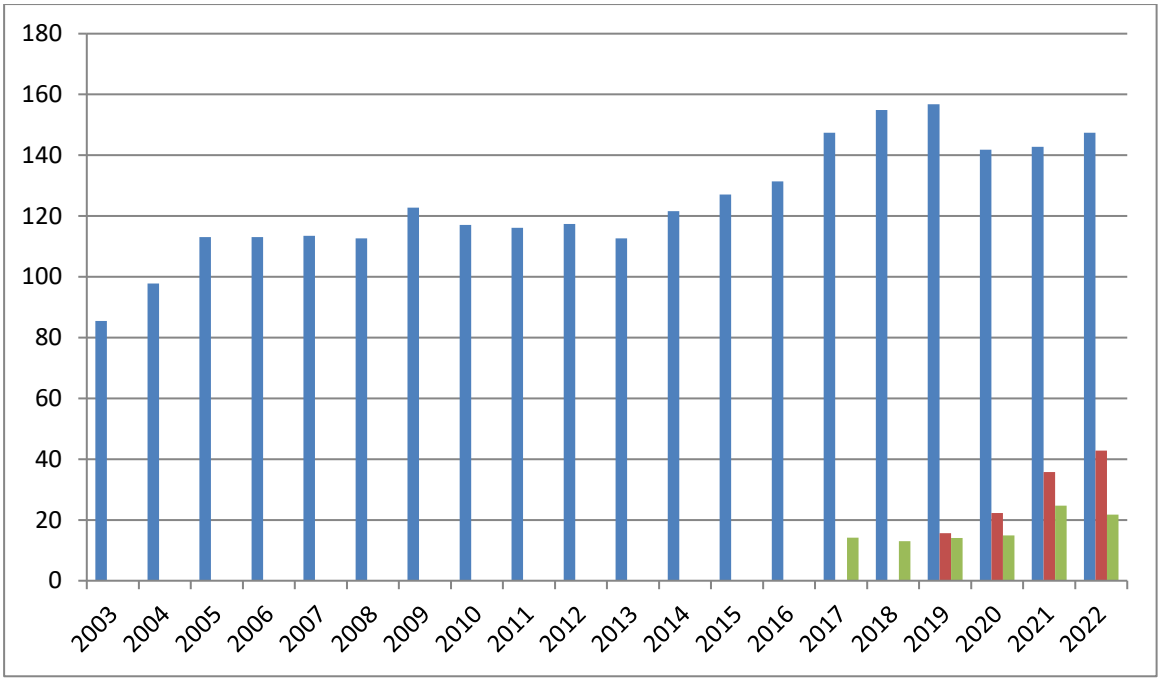

Fig. 3. Turnover of the Ports of Novorossiysk (blue), Taman (red), and Tuapse (green) in 2003-2022 (mln tons) (Association of marine commercial ports 2024).

Figure 4 shows a density map of marine traffic in the Black Sea, averaged for 2022. It clearly shows that the Russian part of the Black Sea and its ports have a very intense maritime transport flow. In January – July 2023, the cargo turnover of the sea ports of the Azov-Black Sea basin amounted to 174.9 million tons (+18.4% in comparison to the same period of 2022), of which the volume of dry cargo transshipment amounted to 83.4 million tons (+29.5%), liquid cargo - 91.5 million tons (+9.9%). Cargo turnover of the ports of Novorossiysk amounted to 96.3 million tons (+11.4%), Taman - 25.2 million tons (-0.7%), Tuapse - 14.9 million tons (+31.7%), Port Kavkaz - 13.0 million tons (1.8 times increase), Rostov-on-Don – 9.5 million tons (+28.4%) (Association of marine commercial ports 2023).

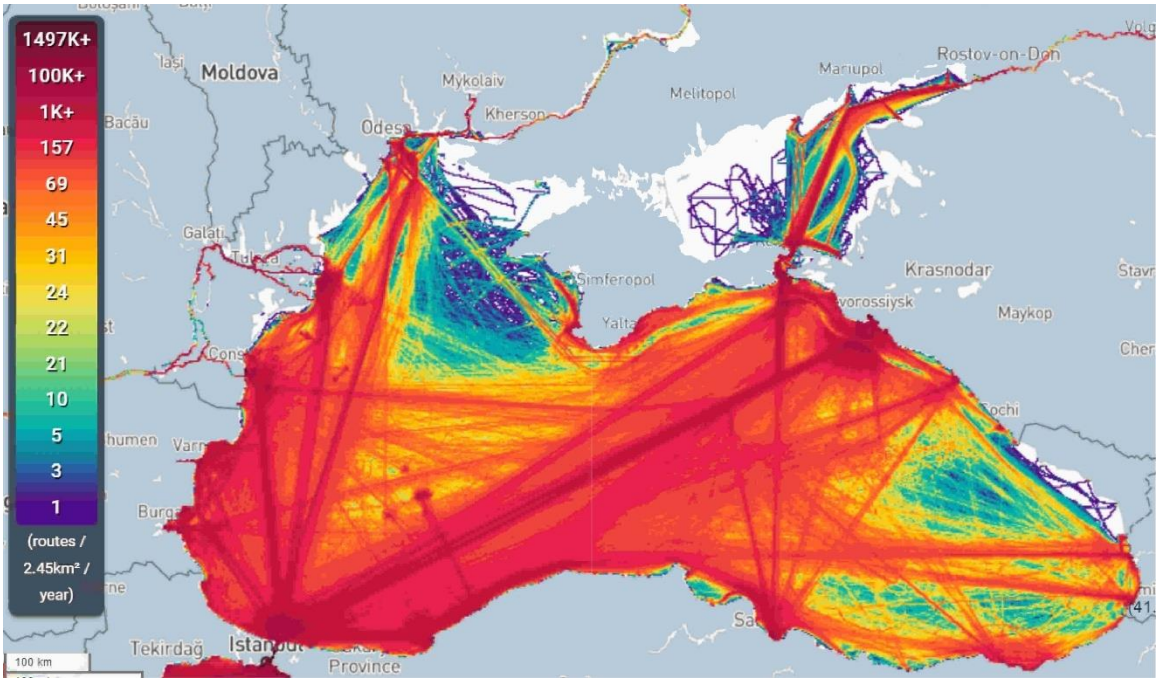

Fig. 4. Density map of marine traffic in the Black Sea in 2022. https://www.marinetraffic.com/en/ais/home/centerx:35.0/centery:44.7/zoom:6

In January-July 2023, the main number of passengers was served at specialized passenger terminals in the seaports of Sevastopol - 1837.4 thousand people (+3.3%), Yalta - 196.8 thousand people (-20.9%), Sochi - 135.0 thousand people (+38.1%) (Association of marine commercial ports 2023).

Overall, Russia sees comprehensive development of seaports and railway access to them within the framework of the national project "Modernization of Transport Infrastructure". Such work allows not only to improve the connectivity of economic growth centers, but also to increase the export capacity of the entire country. For example, today the total carrying capacity of sections leading to the seaports of the Azov-Black Sea basin grew up to 125.1 million tons (National projects of Russia 2023).

2.5. Shipbuilding and Repair

For this Blue Economy sector of the Russian segment of the Black Sea, it is necessary to distinguish military and commercial shipbuilding. Military shipbuilding is sufficiently supported due to the essential geopolitical role that the Black Sea plays for the security of the Russian Federation. At the same time, civilian commercial shipbuilding lags behind. For the economic development of enterprises in this industry, governmental support does not suffice. One of the first steps is to restore the industry's attractiveness to young specialists, expand the portfolio of customers in the domestic market of the Russian Federation, as well as to form a stable client base among domestic ship owners, who would need ship repair services (Vetrova et al. 2022).

In Krasnodar Krai and Rostov region (adjacent to Krasnodar Krai), there are several ship repair yards: in Novorossiysk, Tuapse, Azov, Temryuk, Aksai, Rostov-on-Don,

Taganrog (see Figure 1). The largest of these is the one in Novorossiysk, which does repair and maintenance of boats, ships, diesel engines and their components; steam turbines and their components; gas turbines and their components; radio navigation equipment; power electrical machines and electrical equipment. It has a floating dock with a capacity of up to 60,000 tons (Morvesti 2014).

Currently, there are discussions to create a shipbuilding cluster in Crimea, which should include both large and small enterprises.

2.6. Coastal Tourism

Of all the tourist places in the Russian Federation, the Russian Black Sea coast, namely Krasnodar Krai (Krasnodar region), is the main summer holiday destination. Krasnodar Krai includes such resorts as Anapa, Gelendzhik, Tuapse, and Sochi, as well as many other small villages and resorts of regional significance, which are situated along the coastline between Anapa and Adler towards the border with Abkhazia. The climate of the Krasnodar Krai is very favorable as a tourist destination: along the coastline from Anapa to Tuapse the climate is semi-dry Mediterranean, south of Tuapse it is humid subtropical. This region in general has mild winters and hot summers. For example, the average January temperature along the Black Sea coast is from 0 - +6 C, in Sochi +6 C. The average July temperature is +22 - +24 C. In 2022, Krasnodar Krai was visited by more than 17 million tourists, which shows a 5% increase in comparison to 2019 before the COVID-19 period (Kostianoy and Kosarev 2008; Kostianaia and Kostianoy 2021; Volkova et al. 2022).

The main type of recreation in the region is beach tourism; however, health resorts are also very popular. This sphere contains over 200 organizations with total capacity of about 100 thousand places, which amounts to approximately 21% of the total bed capacity in health resorts in Russia. On average, every year about 1.5 million people stay in health resorts (Kostianaia and Kostianoy 2021).

With recreational tourism being one of the main employers and the largest contributor to the economy of Krasnodar Krai, the region has a further high potential for development of its beach resorts (Damianova et al. 2020). However, there are some problems that need to be addressed to fully explore the opportunities for this sector of the Blue Economy, such as: shortage of staff, poorly organized marketing, insufficiently developed tourist and basic beach infrastructure (Kasyanov et al. 2018).

Sea cruise tourism is a significant component of coastal tourism worldwide; however, it is in its early stages of development in Russia, despite many ports and an extensive coastline in the country. Russia is not considered as one of the world leaders in sea cruise tourism (see, for example, KVI Travel 2024), and until 2017 there were no sea cruise companies in Russia at all. Currently, there are only two cruise ships operating in the Black Sea from the Russian side: “Knyaz Vladimir” with the route Sochi-Novorossiysk-Yalta-Sevastopol-Sochi, and “Astoria Grande” with several cruises in the Black and Mediterranean Seas going from Sochi to several destinations in Turkey, as well as Egypt and Israel. Interestingly, river cruises have become much more developed in Russia: in 2021, 18 companies offered cruises on the country's inland waterways (Smirnov 2022).

In January 2022, the Government of the Russian Federation approved the Concept for the development of cruise tourism in the Russian Federation for the period until 2024. Implementation of this concept requires serious investment in the infrastructure of cruise routes and, above all, in the renewal of the cruise fleet, which is far behind the world level: for example, in 2022, in the whole country there were only 8 sea cruise ships. It is also essential to renew the port infrastructure and the land transport infrastructure linked to cruise tourism, which all requires additional investment. Now regional and federal authorities are trying to create favorable conditions for the development of cruise tourism. For example, the Deputy Chairman of the Russian Government approved the Program for the Development of Cruise Tourism in the Azov-Black Sea Region on the terms of a public-private partnership. In June 2021, Krasnodar Krai approved the Concept for the development of the yacht tourism infrastructure on the Azov-Black Sea coast of Krasnodar Krai. Its implementation is planned for the period until 2030 and involves creation of a network of marinas, which will ensure comprehensive development of the recreational potential of the coastal areas of the region (Smirnov 2022).

Smirnov (2022) identifies three groups of challenges for the development of cruise tourism: technogenic, natural and economic. The first group includes slow renewal of the mostly outdated cruise fleet. Natural problems mainly concern shallowing waterways in winters with less snow, significant water removal, and algae growth, but these issues are mostly linked to river cruise tourism. The third group of challenges is linked to the unfavorable dynamics of incomes of the Russian population. The price factor limits the demand for cruises, the costs of which are not a priority for household expenses. Sea and river cruises in Russia, as well as yachting activities, are available only to a small part of the population, and therefore development of these types of coastal tourism is not considered a priority for the authorities at both the federal and regional levels.

At the same time, there is a lack of sea passenger transportation, including ferries, among coastal cities and resorts. Currently, there are only two ships going from Novorossiysk to Sochi. According to the Ministry of Transport and Road Facilities of Krasnodar Krai, during the 2021 navigation season, these two ships carried 14,321 passengers, in 2022 - 40,868 passengers, and in 2023 - 52,022 passengers. In August 2023, another sea passenger transportation line was added between Anapa and Gelendzhik (Kommersant 2023). The development of sea passenger transportation in the region is hampered by several factors, including weather, the lack of ships, ferries, and the necessary port infrastructure.

3. CONCLUSIONS

The Russian sector of the Black Sea has a high potential for the Blue Economy development due to the significant economical, social, and political role that the Black Sea plays for the country. At the moment, the most developed established sectors here are maritime transport, port activities, and coastal tourism. Based on the overview above, the authors provide the following conclusions regarding the potential of the development of these sectors, as well as recommendations for policy-makers:

1) Marine living resources

According to the stats discussed in the corresponding section above, there is a high potential for the development of the aquaculture segment. However, the development of the fisheries industry (first of all, catch) is hampered at the moment due to the lack of modern fish fleet and general investment in the infrastructure (fish processing farms, refrigerators etc).

Apart from economic aspects, natural factors, that can affect fish stock and thus the development of the fisheries industry, should also be taken into account. The introduction of the *Mnemiopsis leidyi* jellyfish in 1988 in the Black Sea caused decline in the stock of many fish species. For instance, anchovy catch in the Turkish waters of the Black Sea decreased from 300,000 tons/year to about 60,000 tons/year within two years (by 1990). A similar decline for the total fish catch has occurred also in Russia and the other Black Sea countries (Fig. 5).

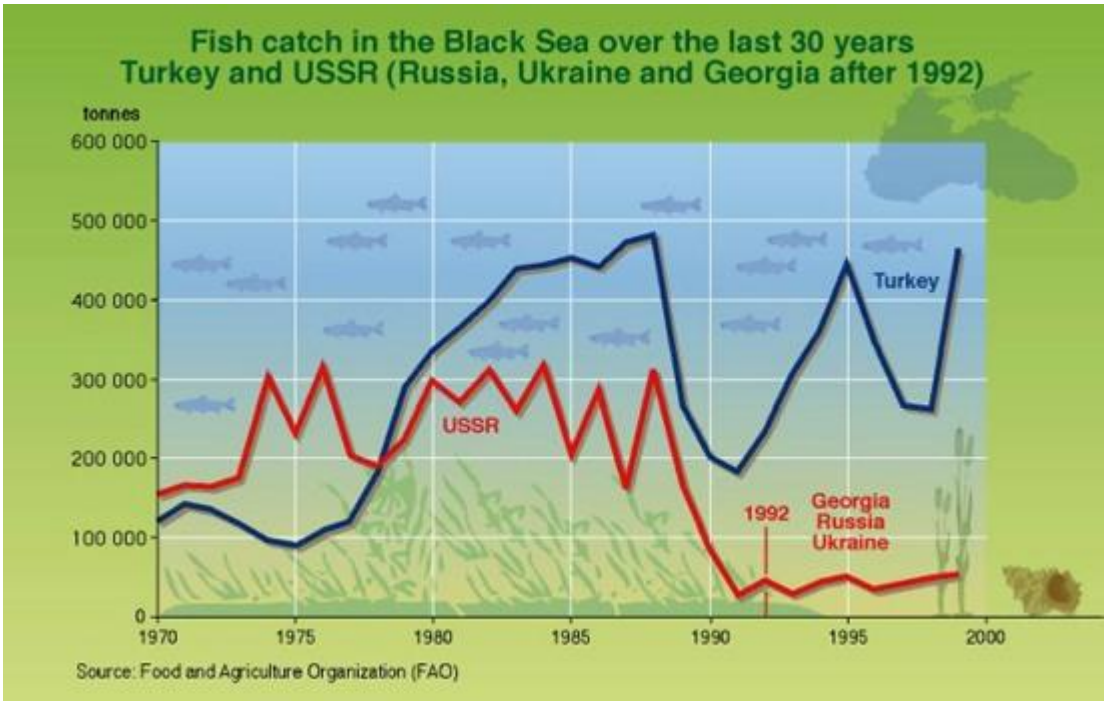

Fig. 5. Fish catch in the Black Sea in 1970-2000 (UNEP/GRID-Arendal 2024).

2) Marine non-living resources

Currently, there are no plans for hydrocarbon exploration and extraction in the Russian sector of the Black Sea because of the fact that cooperation with international companies has been frozen due to sanctions against Russia (Gazprom 2024; Rosneft 2024). At the moment, there is no discussion of the additional development of offshore gas pipelines as seemingly the current volume of transported gas is sufficient for recipient countries. On the other hand, if there is a need for a higher volume of gas supply to Europe, it can be done by repairing the Nord Stream 1 and Nord Stream 2 pipelines in the Baltic Sea.

3) Marine renewable energy

The most prospective areas for the development of wind energy farms are in the western and north-western parts of the Black Sea. However, as Figure 2 shows, the Sea of Azov could be a better option for the development of this sector in Russia. This is due to high levels of wind energy and shallow waters, which allow construction of wind farms at a considerable distance from the shore. Everywhere along the Russian coastline in the Black Sea this is not possible due to a sharp decline of depths at a small distance from the shore. Additionally, the whole Black Sea coastline from Anapa to Adler (Fig. 1) is a continuous line of large and small tourist resorts and villages, therefore wind farms right in front of beaches will likely be undesirable.

Still, we foresee that one of the problems linked to construction of wind farms in the Sea of Azov can be ice cover, which is periodically established and can cover the whole sea basin (Kostianoy et al. 2023).

4) Maritime transport and Port activities

Maritime transport and Port activities are the most developed established sectors of the Blue Economy in the Russian sector of the Black Sea. However, there is a further potential for their development, which is supported by the existing port and oil terminal infrastructure. At the same time, this potential is limited due to the following reasons: first, in many ports there is not much physical space for expansion of port facilities. For example, the port of Novorossiysk is located in the center of the city, surrounded by mountains; on both sides of the city there are either tourist resorts or areas with high and steep shores which are not suitable for port expansion. Furthermore, expansion of the port is limited by road and railway transport capacity. Already now, the city significantly suffers from traffic jams caused by cargo trucks. The Novorossiysk cargo and passenger railway station is a dead end with no physical space for its expansion.

Secondly, construction of ports in new places is severely restricted because of the existing tourism infrastructure from Anapa to Adler. Thirdly, further expansion of existing ports or construction of new ones and increase of shipping activities can have a negative impact on the marine ecosystem and marine environment. The Black Sea coastline is the primary tourist destination for Russian citizens and thorough strategic impact assessment and research on sustainability of such proposals should be made before any decisions are taken.

5) Shipbuilding and repair

There is a high potential for further development of ship repairing yards both in the Crimea and in Krasnodar Krai. There is already an existing significant number of facilities which are underused due to a lack of orders. There is an apparent connection with other Blue Economy sectors, such as Maritime transport and Coastal tourism (for example, building of yachts and catamarans). In this context, it is necessary to support the development of clusters as for many ports ship building and ship repair are one of the core-forming industries. This initiative can also help attract investors with the needed funding for any upgrade of the shipbuilding or ship repair facilities. Such clusters should not only foster cooperation between public and private companies, but

should also involve, where possible, scientific and educational institutions to stimulate attractiveness of the sector among the youth. This will not only contribute to economic growth, but also to the creation of an effective platform to exchange views and find optimal solutions for creating new practices, technologies, and activities (Kostianaia et al. 2018).

6) Coastal tourism

The Coastal tourism sector will most probably further develop, especially with the significant investment that is currently discussed. This sector is one of the priority tasks in Russia, and implementation of existing ambitious initiatives will help create an attractive tourist infrastructure and create jobs and contribute to the economic growth in the region.

Despite the potential for the development of coastal tourism and its significant economic role for the region, it is also essential to note the negative consequences that this might cause. Often, the local population are not very happy with high tourist flows over summer as restaurants, places of interest, roads become overcrowded. Accommodation and flat rental become more expensive over summer and tenants can even be asked to move out from flats for the months in the high season period.

Another challenge is that the whole coastline has a lot of small tourist resorts and villages, and the road connecting them passes right across these places, which leads to considerable traffic jams, especially in the summertime. For example, the direct geographical distance between Novorossiysk and Adler (see Figure 1) is only 225 km. Travel by car between these places in summer takes about 8 hours. This is a very long time for such a short distance, which negatively impacts local tourist visits and sightseeing in the area. There are current plans to build a highway which will pass inland further from the shore and the villages. Additionally, there are also plans for construction of a railway further inland as the current line between Tuapse and Adler goes right along the sea in the immediate proximity from the beaches and gets very often destroyed by flooding. This transportation problem for both road and railway access and connections in the region is of high importance. One of the immediate solutions for now could be organization of small passenger boat transportation between the towns and resorts of the region. This system existed in the Soviet Union and was very popular among the population and tourists as it was a fast and cheap way to travel locally. Now, there are only two boats (one catamaran ship and one hydrofoil) that go from Sochi to Novorossiysk only calling at Gelendzhik and operate only in summertime. This connection is not very popular as tickets are quite expensive and not affordable for most of the local population; moreover, trips get often cancelled due to weather conditions.

In general, coastal tourism in Krasnodar Krai can be significantly affected by the regional climate change in various ways, such as air and sea temperature rise, heavy rains, sea level rise, invasive species, algal bloom, extreme weather events, coastal upwelling, as well as shifting of the summer season to a later time in autumn. With regional climate change the frequency and intensity of extreme weather events is already rising and such occurrences can negatively impact the decision-making when choosing a tourist destination in Krasnodar Krai (Kostianaia and Kostianoy 2021).

In addition to the conclusions and analysis above, the authors would also like to make the following overarching concluding remarks:

Interregional cooperation is crucial for the successful development of the Blue Economy sectors in the Russian Black Sea basin. The current geopolitical situation in the region negatively affects opportunities for scientific and business cooperation, interregional tourism, and complicates the development of any sectors of the Blue Economy in general. Most interregional communication and cooperation are severely hampered.

This paper was focused on the established sectors of the Blue Economy and did not discuss emerging sectors, such as ocean energy (other than oil, gas, and offshore wind), blue biotechnology, desalination, maritime defense, security, and surveillance, research and innovation, and infrastructure. This topic is equally important for the discussion of the Blue Economy in the Russian sector of the Black Sea, but it should be targeted in a separate paper.

In summary, there are many positive factors that can contribute to the further Blue Economy development in the Russian sector of the Black Sea. Unfortunately, despite any thorough analysis, the latest years have shown that political and economic issues including sanctions and change of priorities in trade markets, as well as COVID-19 related restrictions, can considerably impact any analytical forecast.

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