Defining and analyzing existing conditions in the maritime space, support for Maritime Spatial Planning

Cross Border Maritime Spatial Planning in the Black Sea
Bulgaria and Romania MARSPLAN–BS II Project

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Support the work of national competent authorities in charge of developing and implementing maritime spatial plans
WP1, Activity 1.1, Component 1.1.2.

June 2021

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DEFINING AND ANALYZING EXISTING CONDITIONS IN THE MARITIME SPACE, SUPPORT FOR MARITIME SPATIAL PLANNING

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SUMMARY

INTRODUCTION. DEFINING THE WORKING FRAMEWORK

This study is a continuity of the MARSPLAN BS I Project study (*Defining and analyzing existing conditions in the maritime space*) and Study 1.1.1 reported in the present MARSPLAN (*Synthesis report on maritime uses*)*;* it inventoried the previous MSP data and information, maritime activities and uses of Bulgaria and Romania, focusing on the analysis of existing conditions and human activities and their distribution and interrelations. Hence, the current study aims to identify and update information on recent changes, existing relations and possible conflicts and synergies between maritime uses (user-user), and maritime uses and environment (user-environment). The inventory of present data and mapping creates conditions for the planning process, both at national and transboundary levels

The Partnership is formed by: Ministry of Regional Development and Public Works (BG) - Lead Partner - P1, Ministry of Public Works, Development and Administration (RO) – P2, National Center for Regional Development (BG) – P3, National Institute for Marine Research and Development (RO) – P4, Centre for Coastal and Marine Studies (BG) – P5, National Institute for Marine Ecology and Geology (RO) – P6, "Ovidius" University Constanta (RO) – P7, Nikola Vapsarov Naval Academy (BG) – P8.

The study applies the MU and LSI concepts to elaborate thematical and integrated maps as a support for the national and transboundary maritime spatial plans.

The proposed steps and ways for the main objectives achieving stem from the MSP Methodology, are as following:

- collection and mapping the information on environmental, geological, cultural and marine characteristics, on a territorial sea scale;
- collecting and mapping information on maritime activities, on a territorial sea scale;
- identifying and analysing existing the possible conflicts and synergies between maritime uses and between maritime uses and environment.

For this study purpose, the current knowledge and experience on the Maritime Spatial Planning Directive and MSP Methodology, the Maritime Strategy Framework Directive and maritime rules, relevant policies related to maritime activities, marine environment and resources will be considered.

The study aims i) to consolidate the cross-border cooperation and to exchange information between Romania and Bulgaria, on the issues related to maritime areas; ii) to elaborate the MSP strategic goals for the Black Sea; iii) to elaborate the cross-border maritime spatial plan for the area Constanta-Varna; iv) to consult stakeholders, to elaborate national maritime spatial plans, contributing to a wider dialogue on MSP in the Black Sea.

The Study 1.1.2 provides a comprehensive description of current existing conditions of the maritime areas of both countries: physical, biological, natural preservation features and main maritime human uses and pressures (Sections 4,5 and 6). In the section 7 *Conflicts and synergies between maritime uses and maritime uses and environment* are presented. Chapters 7 and 8 support the key issues for transboundary MSP.

BOX 1

- **General overview** (1) contains the initial analysis of relevant characteristics of the area, including: the including: the marine environment; maritime activities and key sectoral and socio-economic trends; emerging pressures and conflicts in the use of maritime space; legal framework and related issues, governance structure.

- **Marine delimitations and jurisdictions** (1.1) are focused on definitions of boundaries aiming to provide a clear identification of uses of different zones, in order to help at reducing pressures and conflicts. The study started by defining the geographical scope of the planning and management area. It is a very

important topic because the sea border between Bulgaria and Romania has not been agreed yet. The experts from all partner institutions of the current consortium promote the cross-border cooperation and effective use of common resources. The delimitation and jurisdiction and the geographical scope of the maritime area are mainly based on the specific characteristics of the underwater geomorphology of the Black Sea.

- **Legal framework and governance structure** (2) support transposition of the MSP Directive in national Bulgarian and Romanian legislations and the process of developing maritime spatial plans. The **Legislative analysis** (2.1) in the MARSPLAN-BS is updated and brings clarity on the maritime border between both partner countries. The **Bulgaria and Romania Governance** (2.2) structure in the field of Maritime Spatial Planning is described in terms of their relations and cooperation, responsibilities and capacity to monitor and manage the implementation of the MSPs.

- **Cross border maritime spatial planning and maritime spatial plans delimitation**

- The main transboundary issues include all environmental aspects (most of them are similar) and maritime sectors like maritime transport, shipping, tourism, fishing activities, extraction of non-living resources, etc., and their possible impact on the environment; marine protected areas, ecosystem services.
  Identified planning and transboundary issues (2.2.1) related to planning and transboundary context of the maritime spatial planning.

- **Maritime spatial planning in the national Bulgarian and Romanian planning systems** (2.2.2) brings into attention the delimitations of the Maritime Spatial plans of countries on national level, their interactions and incorporation of the cross-border planning principles and zones.

- **Description of methodology used in collecting and mapping** (3) describes the data sources and providers, such as scientific or open data sources.

- **Present state of Marine Environment** Section (4) is focused on the results and information related with two main objectives established in the technical proposal (project): *Geographical and physical characteristics* and *Marine environmental status including gaps of knowledge/ information*

- **Geographical and physical characteristics** covers aspect related Marine Geology, Bathymetry and Hydrography/Oceanography**.**
- **Marine environmental status** updates the information and will analyses the sub-topics of (4.2.1) Environmental protection (Nationally designated marine protected areas and NATURA 2000); (4.2.2) Marine Habitats and biodiversity; (4.2.3) Marine mammals, (4.2.4) birds, (4.2.5) fish and (4.2.6) shellfish; (4.2.7) Spawning ground and nursery; (4.2.8) Algae and marine plants Section.

- **Present Maritime Activities and Uses of Bulgaria** involves a variety of sea uses and marine resources based on the maritime activities, developed in previous MARSPLAN-BS studies, and updated here: (5.1) Fishing and Aquaculture, (5.2) Extraction of non-living resources; (5.3) Maritime transport; (5.4) Submarine cables and pipelines; (5.5) Tourism (coastal and maritime); (5.6) Coastal defence/flood protection; (5.7) Dredging and dumping; (5.8) Underwater Cultural Heritage; (5.9) .Military trainings The identified gaps of knowledge and key issues and challenges are summarized.

- **Natural and anthropogenic pressures** are added to the study to identify and present the main vulnerabilities and risks of the both countries areas. They are **Natural hazards and climate change impacts and anthropogenic pressures.**

- Identifying existing and possible **Conflicts and Synergies between maritime uses and environment** took into account two situations, identifying the interaction between maritime uses and the interaction of maritime activities and uses with marine environment.

- **Conclusions** chapter summarized the main aspects resulted from each chapter. **References** are included in chapters. Official documents citation, articles in journals, books, internet sources are on page.

The study includes 166 pages, the data base list and presentation a number of 12 thematical integrated maps, 25 table, 84 figures, eight schemes and 54 boxes. Maps are a set of the principal maritime domains and processes, provided in colours in the same format.

The main purpose of maritime spatial planning is to promote sustainable development, to identify and encourage multiple uses, in accordance with relevant national legislation and policies. To achieve this goal, according to the provisions of Directive 2014/89/EU, Member States must ensure that the planning process or processes result in comprehensive planning

that identifies the different uses of the maritime space, taking into account the long-term climate changes.

This Study is based on available data in both countries. Therefore, differences between the reporting format and content can be registered, due to legislation, statistics and information.

All schemes and maps are produced in a common format and template agreed among partners and are connected with the GIS database created in the MARSPLAN I (the common project database). All the maps are provided in electronic format, using GIS system.

The common Data Base created and MSP practices resulted provide information support for the other Black Sea countries and a cooperation framework between them. The Black Sea Commission was identified as a possible observer partner.

The information presented in this study is planned to accompany and support the MSP authorities, research community (in reciprocal way), and the specialists of all maritime sciences and industrial fields, interested in Maritime Spatial Planning, and to insure the MSP stakeholders' consultancy and feedback.

The study aimed to consolidate the cross-border cooperation in exchange of information between Romania and Bulgaria on the issues related to maritime areas.

The study has a number of 166 pages, 54 boxes, 25 tables, 84 Figures and graphs +12+8 (respectively integrated maps and schemes).

1. GENERAL OVERVIEW: GEOGRAPHICAL SCOPE OF MARITIME AREA

Hristo Stanchev, Vesselina Troeva, Laura Alexandrov, Dan Vasiliu

According to the UNCLOS, as well as to the national legislations, it includes: the *Internal waters* (adding water bodies following the United Nations Convention on the Law of the Sea Nations Convention on the Law of the Sea, Water Act in Bulgaria and the Law 17/1990 in Romania, concerning juridical regime of waters); *Territorial waters* (12 nautical miles), the *Contiguous zone* (up to 24 nautical miles) from the territorial sea baseline; and the *Exclusive Economic zone* (EEZ), up to 200 nautical miles.

The geographical scope of the maritime area is based mainly on the specific characteristics of the underwater geomorphology of the Black Sea. The three main elements, are: **the continental shelf, the continental slope and the abyssal plain.** These geological features add one more dimension to the maritime cross-border spatial planning. As support to the maritime spatial plans of Bulgaria and Romania will be a coastal zone definition from physical and administrative perspective or landward limits of analysed area i.e., to consider LSI, appropriate in maritime spatial planning, according to the geographical characteristics, administrative structure, data collection, coastal and territorial planning legislation.

➢ Baseline/Shoreline

The normal baseline is the low-water line along the coast as marked on large-scale charts officially recognized by the coastal State (NOAA). Except where otherwise provided in the UN Convention on the Law of the Sea (UNCLOS)[1], the normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on large-scale charts officially recognized by the coastal State. Special rules for determining the baseline can be applied in different circumstances, such as in bays, harbours, estuaries, deeply indented coastlines and others. Baselines may be subject to change as the coastline is very dynamic and

[1] https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

subject to constant change due to the destructive action of the waves and sediment flows resulting in shoreline erode or grow with the accumulation of sedimentary material. Another reason to change the shape of the shoreline may be as result of building of different types of engineering facilities, harbours, breakwaters, coast walls, jetties, dams, etc.

Figure 1. Geographical area of study, Bulgarian and Romanian Black Sea maritime area *(MPWDA)*

The holders of reference data for the baseline in Bulgaria are:
- Ministry of Defence - Military Geographical Service. According to the Law of Geodesy and Cartography, the Minister of Defence shall ensure for: the creating, updating and publishing of the state topographic maps for the territory of the country in scale 1: 25 000 and in smaller scales.
- Ministry of Interior. According to Ministry of Interior Act, Law of Geodesy and Cartography and Ordinance № V-12-1720 of May 13, 2014.
- General Directorate Border Police, Ministry of Interior. In relation with Art. 30 (1) from the Ministry of Interior Act, Art. 45 (2) in Rules for the Structure and Activities of the Ministry. The Interior Act, Geodesy and Cartography Act and Ordinance № V-12-1720 of May 13, 2014.

1.1. MARINE DELIMITATIONS AND JURISDICTIONS

➢ Maritime boundaries

In BULGARIA

In Bulgaria, the Maritime Areas, Inland Waterways and Ports of the Republic of Bulgaria Act[2] regulates the legal regime of the sea areas, the inland waterways and the ports of the Republic of Bulgaria. Among other, this law aims to:

- coordination of the use of the Black Sea in the interest of cooperation with the Black Sea and other countries;
- facilitation of the sea connections;

[2] Promulgated SG No 12/11.02.2000, amended SG No 28/2018

- ensuring the safety of navigation, the protection of the marine environment during navigation and the maintenance of the ecological Bălance;
- providing equal access to the market of port services and increasing the efficiency in their implementation;
- the improvement of the quality of the services offered to the users of the ports;
- cost reduction and promotion of sea and river transport, including short-distance and combined transport;

The law stipulates the application of an ecosystem approach and promotion of coexistence of the various activities and ways of using the maritime spaces of the Republic of Bulgaria with a view to achieving sustainable development and growth of the maritime economy, including the marine energy sector, maritime transport, fisheries and aquaculture, tourism, extraction of raw materials, protection of underwater cultural heritage and protection, protection and improvement of the marine environment, including resilience to the effects of climate change. The maritime areas of the Republic of Bulgaria cover the internal sea waters, the territorial sea, the adjacent zone, the continental shelf and the exclusive economic zone (Figure 1,2,4).

In ROMANIA

The area of interest for the project is the entire coastline of Romania, located in the western part of the Black Sea; having a length of approximately 240 km. The geographical limits are Musura Bay, to the north, and Vama Veche, to the south. The coastline can be divided into two units or coastal areas: the Northern Unit, from Musura Bay to Midia Port, and the Southern Unit, from Midia Cape to Vama Veche.

1.1.1. Internal waters

Bulgaria	**BOX 2. Marine delimitations and jurisdictions**
Internal waters	The internal sea waters of the Republic of Bulgaria include: ○ the waters between the coastline and the exit lines, from which the width of the territorial sea is measured; ○ the waters of the ports, bounded on the sea side by the line connecting the most distant points in the sea of the anchorages, the hydraulic and other permanent port facilities; ○ the waters of: a) Varna Bay between the coastline and the straight line connecting Cape St. Constantine with Cape Ilandzhik; b) the Burgas Bay between the coastline and the straight line connecting Cape Emine with Cape Maslen nose; ○ the waters between the shoreline and the straight exit lines connecting Cape Kaliakra with Cape Tuzla, Cape Tuzla with Cape Ekrene and Cape Maslen nose with Cape Rohi.
Romania	**Marine delimitations and jurisdictions**
Internal waters	In Romania, the Law 17/1990 on the regime of internal waters, territorial sea, the contiguous zone and exclusive economic zone of Romania regulates the legal status of these waters and islands, in accordance with the United Nations Convention on the Law of the Sea, ratified by the Law 110/1996 (Figure 4). These are the waters between the shoreline and baselines. The baselines are the straight lines joining the furthermost points of the shoreline, including the islands, mooring places, hydraulic constructions or port facilities. The internal waters area (to the baseline) and territorial sea (12-nm zone from the baseline), cover in Romania approximately 4,084 km^2.

1.1.2. Territorial waters and the Contiguous zone

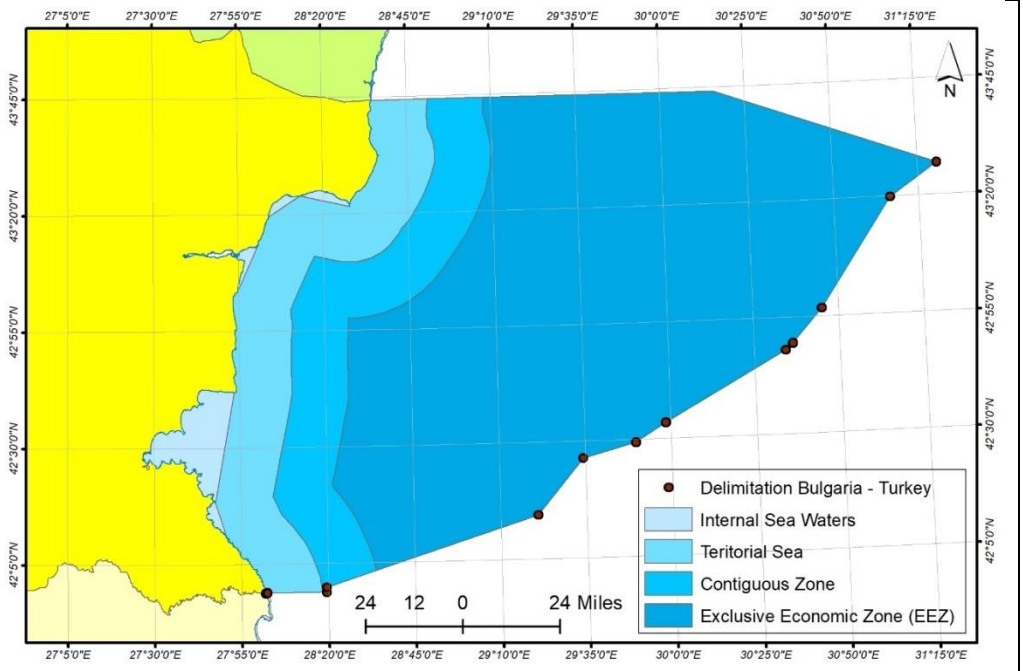
Bulgaria	**BOX 3. Marine delimitations and jurisdictions**
Territorial waters	The **Territorial Sea** of the Republic of Bulgaria includes the sea strip adjacent to the coast and the internal sea waters with a width of 12 nautical miles, measured from the baselines. The starting lines shall be the line of the largest outflow from the shore or the straight lines connecting the two end points of the bays and the spaces. The external and lateral borders of the territorial sea are the state border of the Republic of Bulgaria.
Contiguous zone	**The Contiguouss Zone** of the Republic of Bulgaria is the sea strip, which lies within the territorial sea and extends at a distance of 24 nautical miles from the baselines, from which the width of the territorial sea is measured. In the adjacent zone, the Republic of Bulgaria exercises control to prevent the violation of customs, financial, border and health requirements within the country, included in the territorial sea, and jurisdiction to punish violators of these provisions.
Romania	**Marine delimitations and jurisdictions**
Territorial waters	**The Romania territorial sea** includes the strip of sea adjacent to internal waters, having a width of 12 nautical miles (22 224 m), measured from the baselines (the outer limit of the territorial sea is the line that has each point at a distance of 12 nautical miles measured from the nearest point of the baselines); the sovereignty of the State extends to its territorial sea.
Contiguous zone	**The Romanian contiguous zone** is adjacent to the territorial sea strip of sea that stretches to the open sea up to 24 nautical miles, measured from established baselines.

1.1.3. Exclusive Economic Zones (EEZ)

The **Exclusive Economic Zone** (**EEZ**) extends beyond the borders of the territorial sea at a distance of up to 200 nautical miles from the baselines from which the breadth of the territorial sea is measured. The external borders of the exclusive economic zone shall be determined by agreement with the neighbouring and adjacent States in accordance with international law in order to reach a fair solution.

In BULGARIA

BOX 4.	**Marine delimitations and jurisdictions**
Exclusive economic zones	In the **EEZ** both the Republic of Bulgaria and Romania, carry out: - sovereign rights to explore, develop, use, conserve and manage the biological, mineral and energy resources located on the seabed, in its bowels and in the waters covering them, as well as to carry out other activities related to exploration and the use of the area; - exclusive rights and jurisdiction related to: (a) the creation and use of artificial islands, installations and facilities; (b) the conduct of marine scientific research; (c) the protection of the marine environment; - other rights arising from the international treaties to which the Republic of Bulgaria is a party and from the generally recognized principles and norms of the international law. Among the gaps in information, spatial data and knowledge, one should mention the limited data and specialized knowledge about the deep waters, the continental shelf and the most remote parts of the Exclusive Economic

	Zone. Due to these circumstances, as well as to the dynamics of the marine environment, there is a lot of data discrepancy in the information, provided by different official institutions. For this particular study the data uploaded on the EMODNet platform, based on the Black Sea River Basin Directorate studies and monitoring were used.(Figure 2)
Marine delimitations and jurisdictions of Bulgaria Figure 2. (*CCMS)*	
Southern Border with Turkey	The Agreement between the Republic of Bulgaria and Republic of Turkey for the demarcation of the border at the mouth of the river Rezovska/Mutludere and delimitation of maritime spaces between the two countries in the Black Sea was promulgated in the State Gazette No. 68 of 30.07.1999. Ratified by law, adopted by the 38th National Assembly on June 24, 1998 (SG No. 79/1998) and entered into force in 4th November,1998 (Promulgated, SG No. 68 of 30 July 1999). While the delimitation with the Republic of Turkey is a fact as signed by agreement, it has not yet reached and signed an agreement with Romania.
Northern Border	The border between **Bulgaria – Romania** is not yet delimited.

In ROMANIA

Romania	**BOX 5 Marine delimitations and jurisdictions**
Exclusive Economic Zones	It is established in the marine space of Romanian Black Sea, located beyond the territorial sea waters and adjacent, in which Romania exercises sovereign rights and jurisdiction over the natural resources of the seabed, its subsoil and water column above, over activities related to the exploration, exploitation, protection, environment conservation, management. The delimitation of the continental shelf and the exclusive economic zone starts first from the state borders on the sea, up to the limit of territorial waters, situation solved only partially between the countries bordering the Black Sea. Romanian EEZ area (from 24 miles) is about 20075 km^2(Table1)
Coastal zones	It is calculated from the coast line above sea level at 50 m, stretching on~

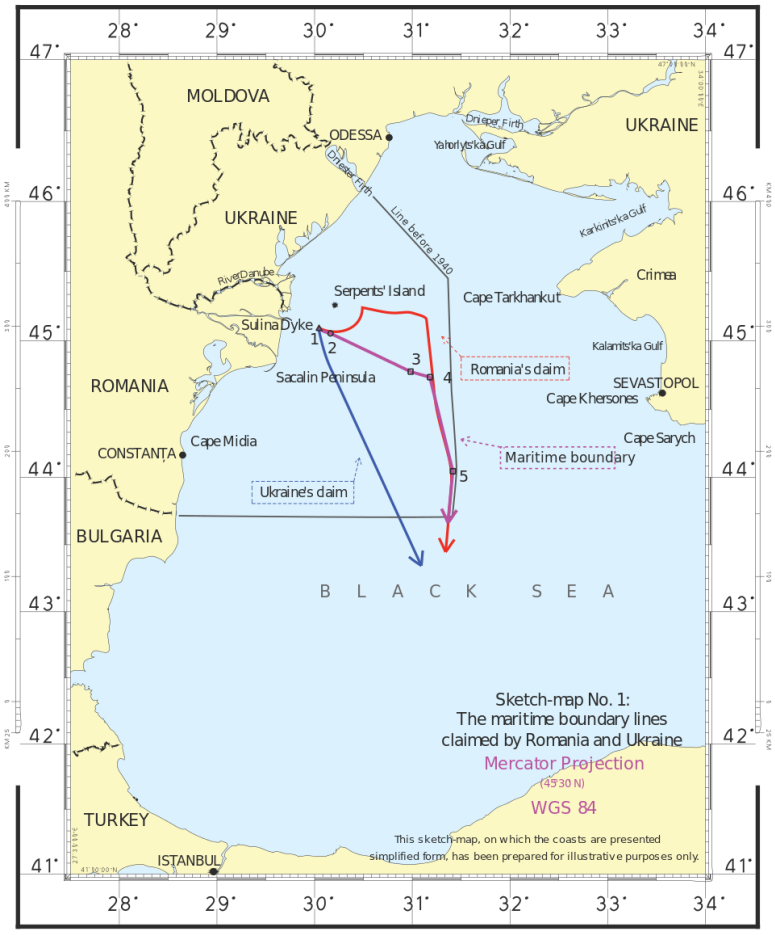
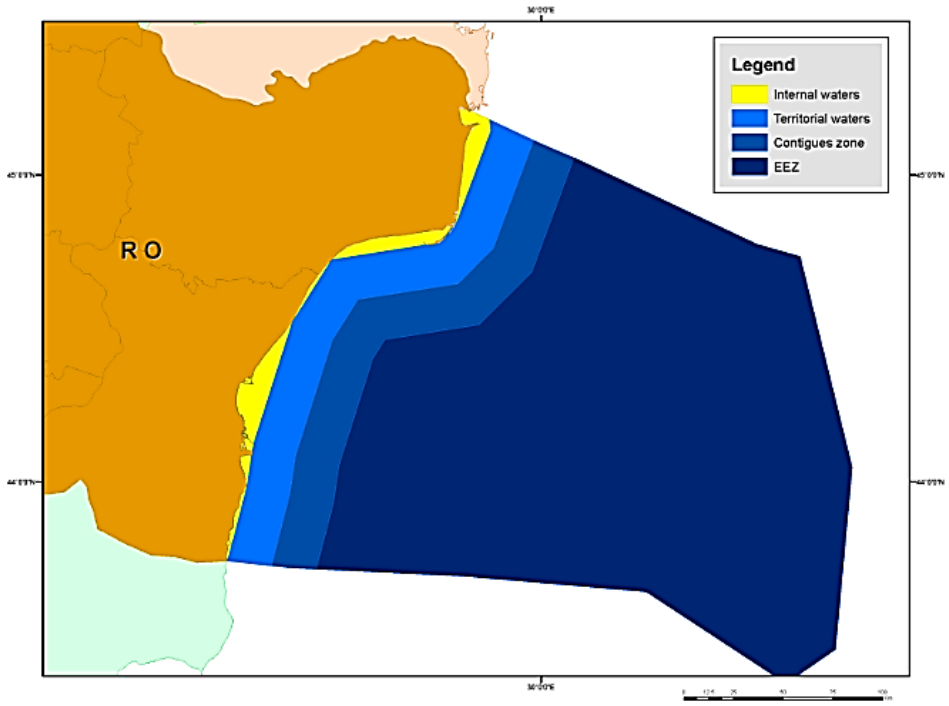
areas	6000 km^2 in Romania. It should be noted that in the areas of coastal zones are also included coastal lakes, lagoons and Danube Delta.
Figure 3. The Romanian continental platform of the Black Sea delimited by the ICJ decision of February 3, 2009 (*https://ro.wikipedia.org/wiki/Frontiera_%C3%AEntre_Rom%C3%A2nia_%C8%99i_Ucraina#/media/Fi%C8%99ier:ICJ_Romania_vs._Ukraine.svg*)	
Northern border Romania Ukraine	In accordance with international law the maritime boundary between Romania and Ukraine (exclusive economic zones) was established on 3 Feb. 2009 by the International Court of Justice (ICJ). It currently has a length of 649.4 km, of which 273.8 km is land border, 343.9 km river border and 31.7 km sea border. (Figure 3)

Table 1. Geographical extent of maritime space of Bulgaria and Romania

Geographical extent of maritime space	Area (km^2)	
	Bulgaria	Romania
Baseline/Shoreline km	414*	245*
Internal sea waters km	967	766
12 miles zone km^2	5 326	4084
Territorial waters km^2	6 358 **	5256
Contiguous zone km^2	5 200 **	3202
24 mile zone	5097	4275
EEZ (from 24 miles) km^2	29052**	22486
Total km^2	40610	

Sources: * Black Sea Basin Directorate (BSBD)

Figure 4. **Map of the Romanian marine waters: shoreline, Territorial waters and Exclusive Economic Zone-EEZ** (*NIMRD*)



Reference

1) Laura Alexandrov, Simion Nicolaev, Alina Daiana Spînu & altii, *Detailed Study for a Complete Analysis of the Romanian and Bulgarian Maritime Areas* - 2017, ISBN 978-606-642-166-9
2) *UN Convention on the Law of the Sea (UNCLOS)* *https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf*
3) *Maritime Areas, Inland Waterways and Ports of the Republic of Bulgaria Act*, promulgated SG No. 12/11.02.2000, amended SG No. 28/2018
4) **European MSP Platform https://www.msp-platform.eu/countries/bulgaria
5) xxx MARSPLAN Studies, *www.marsplan.ro/en*

2. LEGAL FRAMEWORK AND GOVERNANCE STRUCTURE

Legal framework and governance structure supports transposition of the MSP Directive in national Bulgarian and Romanian legislations and the process of developing maritime spatial plans. In this chapter it continues the theme of the legislation' analysis. It aims to develop a working framework for maritime spatial plans elaboration.

2.1. LEGAL FRAMEWORK

Plamen Tzenov, Vesselina Troeva, Detelina Apostolova, Bogdan Ghinea, Laura Alexandrov, Elena Vlăsceanu, Dragoș Vintila

The common legal framework for both countries is determined by the ratified documents of the international institutions and forums such as charters, conventions and protocols and the adopted EU regulations, directives and decisions. The latter were transposed in the national legislation of both countries and considering these procedures, one should not expect significant differences among the documents implementation in Bulgaria and Romania. Among these important international documents for the maritime spatial planning are:

BOX 6. Important international documents for the Maritime Spatial Planning

- United Nations Convention on the Law of the Sea (UNCLOS), entered into force in Nov.1992;

○ Convention on Biodiversity (UN, 1992);[3] ○ Convention on the Protection of the Underwater Cultural Heritage (UNESCO, 2001); ○ Convention on Environmental Impact Assessment in a Transboundary Context (Espoo (EIA) Convention, 1991); The Convention on the Protection of the Black Sea Against Pollution, signed in Bucharest, 1992;[4]	
The European directives, related to the maritime spatial planning	
○ Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning; ○ Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive);[5] ○ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (EU Framework Water Directive); ○ Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Birds Directive)[6]; ○ Directive 92/43/EEC of 21 May 1992 of the Council on the conservation of natural habitats and of wild fauna and flora (Habitats Directive, Consolidated version)	
Obs.	There are no recent changes in these conventions, annexes and accompanying protocols, after the completion of the MARSPLAN BS I project.
	There are also dozens of directives and regulations aimed at different sectors (ports and port activities, fisheries and aquaculture, maritime traffic, marine environment protection and many others) that must be applied in zoning of maritime spatial planning.

This specific analysis covered by the international conventions and protocols; the most important among them refer to:

BOX 7. International conventions	***Target, effect, impact***
UN Convention on the Law of the Sea – UNCLOS	- regulated different maritime spaces
Integrated Maritime Policy (IMP-2007), Blue Growth Strategy (2012), Marine Spatial Planning Directive (MSP-2014)	- established a framework for marine space and the marine environment according to MSFD
Marine Strategy Framework Directive (MSFD 2008)	- established a framework for community action in the field of marine environmental policy and the national acts, ordinances and regulations in this field
The most important among them, besides the ones for Climate change, Biodiversity, Waters. All additional European and national sector specific regulations, such as Fishery, Aquaculture, Underwater Heritage, Traffic Systems etc., are considered either in this section or in relation with their main thematic area.	

In accordance with the Directive 2014/89/EU (22 point of the preamble), through the maritime spatial plans, Member States can reduce the administrative burden and costs in support of their action to implement relevant Union legislation. The timelines for maritime spatial plans should therefore, where possible, be coherent with the timetables set out in other relevant legislation, especially: Directive 2009/28/EC, which requires the share of energy

[3] *https://www.cbd.int/convention/*
[4] *http://www.blacksea-commission.org/_convention.asp*
[5] *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056*
[6] *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147*

from renewable sources in gross final consumption of energy in 2020 to be at least 20% and identifies coordination of authorization, certification and planning procedures, including spatial planning, as important contribution to the achievement of the Union's targets for energy from renewable sources; Directive 2008/56/EC and point 6 of Part A of the Annex to Decision 2010/477/EU, which require Member States to take the necessary measures to achieve or maintain good environmental status in the marine environment by 2020 and identify maritime spatial planning as a tool to support the ecosystem-based approach to the management of human activities in order to achieve good environmental status; Decision No 884/2004/EC, requires the trans-European transport network establishing by 2020 as means of the integration of Europe's land, sea and air transport infrastructure networks.

Maritime Spatial Planning has contributed, to achieving the aims of the 2009/28/EC Directive of the European Parliament and of the Council (9), Council Regulation (EC) No 2371/2002 (10), Directive 2009/147/EC of the European Parliament and of the Council (11), Council Directive 92/43/EEC (12), Decision No 884/2004/EC of the European Parliament and of the Council (13), Directive 2000/60/EC of the European Parliament and of the Council (14), Directive 2008/56/EC, recalling the Commission communication (3 May 2011) '*Our life insurance, our natural capital: an EU biodiversity strategy to 2020'*, the Commission communication (20 September 2011) '*Roadmap to a Resource Efficient Europe*', the Commission communication (16 April 2013) '*An EU Strategy on Adaptation to Climate Change*' and the Commission communication (21 January 2009) entitled '*Strategic goals and recommendations for the EU's maritime transport policy until 2018*', where appropriate, the Union's Regional Policy, including the sea-basin and macro-regional strategies.

Marine and coastal activities are closely linked in order to promote the sustainable use of maritime space; Maritime Spatial Planning takes this into account: the interactions between land and sea. It play a very useful role in establishing guidelines for the sustainable and integrated management of marine human activities, the environment protection, the vulnerability of coastal ecosystems, erosion and social and economic factors. Maritime Spatial Planning integrates the maritime dimension of certain coastal uses or activities and their impact, and ultimately develops of an integrated and strategic vision.

The legislative analysis in the MARSPLAN-BS is updated and brings clarity on the maritime border between both partner countries.

In BULGARIA

The legal documents, linked to the maritime spatial planning in Bulgaria are presented.

BOX 8. Legislation support

- Maritime spaces, Inland Waterways and the ports of the Republic of Bulgaria, promulgated in SG No. 12/11.02.2000, amended SG No. 28/2018;
- Spatial Planning Act, promulgated in SG No. 01/02.01.2001, amended SG No. 21/2020;
- Black Sea Planning Act, promulgated in SG No. 48/15.06.2007, amended SG No. 21/2020;
- Regional Development Act, promulgated in SG No. 50/30.05.2008, amenneed SG No. 21/2020;
- Environmental Protection Act, promulgated in SG No. 91/25.09.2002, amended SG No. 54/2020;
- Biodiversity Act, promulgated in SG No. 77/09.08.2002, amended SG No. 98/2018;
- Waters Act, promulgated in SG No. 67/27.07.1999 г., amended SG No. 21/2020;
- Fishery and Aquaculture Act, promulgated in SG No. 41/24.04.2001, amended SG No. 52/2020;
- Culture Heritage Act, promulgated in SG No. 19/13.03.2009, amended SG No. 44/2020;
- Concessions Act, promulgated in SG No. 96/01.12.2017, amended 79/2019

Following art. 5 of the Maritime spaces, Inland Waterways and the Ports of the Republic of Bulgaria Act, the next six sections of the Act regulate the boundaries, the rights and obligations in the maritime spaces according to the UNCLOS. The section VI is devoted to

the maritime spatial planning and its jurisdictional, institutional, spatial, and temporal framework. The Minister of Regional Development and Public works is responsible for the maritime spatial planning, supported by the Consultative Council.

A significant part of the listed laws were supplemented recently aiming to link strategic documents from different sectors and hierarchical levels to the maritime spatial plan where appropriate. These laws, together with their respective by-laws, form the institutional and regulatory framework for maritime spatial planning and the regimes for the use of maritime space and resources within the Bulgarian national space.

One of the most important problems is the complicated legal framework of many laws and regulations with overlapping provisions and fields of application, which makes effective enforcement and control difficult.

In ROMANIA

Considering Romania's obligations as a member state of the European Union to harmonize the national legislation with the mandatory legislation of the European Union, the Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning, published in the Official Journal of the European Union, L series, no. 257 of August 28, 2014 was fully transposed by the Government Ordinance no. 18/2016 on the maritime spatial planning, approved by Law no. 88/2017.

BOX 9. Legislation support

- Law no. 98 on 16th September 1992 ratifying the Convention on the Protection of the Black Sea against Pollution, signed in Bucharest on 21st April 1992, published in the Official Gazette no. 242 on September 29th, 1992.
- Water Law, Law no. 107 on 25th September 1996, published in the Official Gazette no. 244 on 8th October 1996.
- GD. 856/2002 for approving the list of waste management and waste, including dangerous waste; abrogated the GD 155/1999.
- Decision no. 1364 on 27th December 2001 approving the Methodological Norms for the application of Government Ordinance no. 20/1994 concerning measures to mitigate the seismic risk on existing buildings, republished.
- Emergency Ordinance/ Decree no. 202 on 18th December 2002 concerning the integrated management of the coastal zone, published in the Official Gazette no. 965 on 28th December 2002.
- GD.788/2007 on establishing measures for the implementation of the European Parliament and of the Council Regulation (EC) No. 1013/2006 on shipments of waste;
- Emergency Ordinance/ Decree no. 142 on 28th October 2008 on the approval of the National Landscaping Plan - Section VIII - Areas with tourism resources, published in the Official Gazette no. 781 on 21st November 2008.
- GD.1061/2008 on the transport of hazardous and nonhazardous on Romanian territory.
- Law no. 6 on 1st March 2011 approving the Government Emergency Ordinance no. 71/2010 on establishing marine strategy, published in the Official Gazette no. 159 on 4th March 2011.
- Law no. 211 of 15 November 2011 on waste regime, published in the Official Gazette no. 837 of November 25, 2011;
- Regulation no.1205/2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata (INSPIRE - EEA relevance); with all followed amendments form 2010, 2012, 2013.
- Law no. 185 on October 20th 2016 regarding some measures necessary for the implementation of the projects of national importance in the natural gas field, published in the Official Gazette no. 848 on 25th October 2016.
- Law no. 165 on July 22th 2016 on the safety of offshore oil operations, published in the Official Gazette no. 572 on 28th July 2016.
- Law 235/2017 (amending and supplementing the Government Ordinance no. 22/1999) regarding the administration of ports and waterways, the use of public transport infrastructures belonging to the public domain, as well as the development of naval transport activities in ports and inland waterways
- Methodology for the Integrated Maritime Spatial Plan elaboration, 21.06.2018

Government Ordinance no. 18/2016 provides the objectives of the maritime spatial planning activity, the elaboration of the maritime spatial plan, the procedures for informing and consulting interested parties and the cooperation with Member States and non-EU states, as well as the designation of competent authorities for the elaboration and monitoring the implementation of the maritime spatial plan.

BOX 10. MSP Definition - Argument	
Maritime spatial planning is defined as the activity consisting in the process of analysis, planning and organizing of human activities in marine waters, in order to meet ecological, economic, social and safety objectives, representing a dimension of the integrated maritime policy of interest for Romania in the Black Sea Region. This cross-sectoral activity allows competent authorities and stakeholders to use a coordinated, integrated and cross-border approach in promoting sustainable development and growth of maritime and coastal economies	
The maritime spatial plan is the strategic planning document, with a directorial and regulatory character, which identifies the spatial and temporal distribution of current and future activities and uses in marine waters and which establishes the general framework for sustainable and integrated development of marine space between different sectors in marine waters.	
MSP Authority - Government Ordinance no. 18/2016	
➢ According to **Government Ordinance no. 18/2016** on maritime spatial planning, approved with amendments by Law no. 88/2017, the Secretariat of the Maritime Spatial Planning Committee is provided by the central public authority in the field of territorial development, respectively by the Ministry of Public Works, Development and Administration.	
Article 3	Paragraph. (2) of the Government Ordinance no. 18/2016: in the elaboration of the maritime spatial plan, the particularities of the marine regions, the relevant current and future activities and uses and the impact on the environment and natural resources, as well as the land - sea interactions are taken into account.
➢ According to **Government Ordinance no. 18/2016** on maritime spatial planning, approved with amendments by Law no. 88/2017, the Secretariat of the Maritime Spatial Planning Committee is provided by the central public authority in the field of territorial development, by the Ministry Public Works, Development and Administration.	
Article 3	The maritime spatial planning process aims to contribute to the fulfillment of the objectives provided by the ordinance. The development of the maritime spatial plan shall take into account the particularities of marine regions, relevant current and future activities and uses and their impact on the environment and natural resources, as well as on land-sea interaction. The maritime spatial plan will be approved by organic law is planned to enter into force no later than March 31, 2021and it will be reviewed at least once every 10 years.
Article 7	The maritime spatial plan identifies the spatial and temporal distribution of current and future activities and uses in marine waters, in order to contribute to the objectives provided by the ordinance. The maritime spatial plan has a guiding and regulatory character, integrating, without being limited, the following activities, uses and fields: aquaculture areas; fishing areas; facilities and infrastructure for the exploration of crude oil, gas and other energy sources, mineral resources, energy from renewable sources; shipping routes and traffic flows; military exercise and training areas; protected natural areas; raw material extraction areas; scientific research, including facilities and infrastructures for scientific research and monitoring of the marine environment; the routes of submarine cables and pipelines and their safety and protection areas; tourist activities; underwater cultural heritage; coastal protection measures against erosion; contingency plans in case of accidental pollution or in case of a marine natural hazard at risk for the coastal area; ports and hydrotechnical infrastructure areas.

References

1) Biodiversity Act, promulgated in SG No. 77/09.08.2002, amended SG No. 98/2018
2) Black Sea Planning Act, promulgated in SG No. 48/15.06.2007, amended SG No. 21/2020
3) Concessions Act, promulgated in SG No. 96/01.12.2017, amended 79/2019
4) Convention on Biodiversity (UN, 1992) https://www.cbd.int/convention/
5) Convention on the Protection of the Black Sea Against Pollution, Bucharest,1992 http://www.blacksea-commission.org/_convention.asp
6) Culture Heritage Act, promulgated in SG No. 19/13.03.2009, amended SG No. 44/2020

7) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (EU Framework Water Directive)
8) Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)
9) Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Birds Directive)
10) Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning
11) Directive 92/43/EEC of 21 May 1992 of the Council on the conservation of natural habitats and of wild fauna and flora (Habitats Directive, Consolidated version)
12) Environmental Protection Act, promulgated in SG No. 91/25.09.2002, amended SG No. 54/2020
13) Fishery and Aquaculture Act, promulgated in SG No. 41/24.04.2001, amended SG No. 52/2020
14) International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), IMO. http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the Prevention-of-Pollution-from-Ships-(MARPOL).aspx
15) Laura Alexandrov, Simion Nicolaev, Alina Daiana Spînu & altii, *Detailed Study for a Complete Analysis of the Romanian and Bulgarian Maritime Areas* - 2017, ISBN 978-606-642-166-9
16) xxx MARSPLAN Studies, *www.marsplan.ro/en*
17) Regional Development Act, promulgated in SG No. 50/30.05.2008, amended SG No. 21/2020
18) Spatial Planning Act, promulgated in SG No. 01/02.01.2001, amended SG No. 21/2020
19) Waters Act, promulgated in SG No. 67/27.07.1999 г., amended SG No. 21/2020

2.2. GOVERNANCE STRUCTURE FOR MARITIME SPATIAL PLANNING IN BULGARIA AND ROMANIA

Vesselina Troeva, Plamen Tzenov, Bogdan Ghinea

The **Bulgaria and Romania Governance** structure in the field of Maritime Spatial Planning are described in terms of their relations and cooperation, responsibilities and capacity to monitor and manage the implementation of the MSPs.

The multilevel governance structure for elaboration and implementation of the maritime spatial planning in most EU countries is a complicated one, integrating all sectors and hierarchical levels, involved in the implementation of the common European policies. This is due to several factors, among which: i) maritime spatial planning as a relatively new type of planning, inherited existing structures, involved in management and control of the use of maritime spaces; ii) the maritime spatial planning deals both with the maritime space and the adjacent coastal territory, facilitating Land-Sea Interaction and reducing the conflicts between land and sea, between sectors and between interested parties, involved; iii) maritime spatial planning is a multidisciplinary and multidimensional, it deals with more layers than the territorial planning and thus requires a different expertise and governance agents.

An important role for the communication of knowledge and support of the local governance structures in the field of marine environment protection, maritime traffic and control, human health, climate change, cultural heritage, tourism and other maritime sectors have the global organizations IOC, IMO, UN, UNESCO, WTO, WMO, WHO, ICOMOS[7].

The governance structure in Maritime Spatial Planning in Bulgaria and Romania has similar characteristics and has been developed recently after transposition of the Directive 2014/89 in the national legislation in 2018. There are three levels – Community level, regional and national levels. The first level corresponds to the EU Integrated maritime policy implementation structures, among which DG MARE, European Environmental Agency

[7] *http://ioc-unesco.org/; https://gisis.imo.org/Public/Default.aspx; https://whc.unesco.org/en/; https://www.unwto.org/resources-unwto; https://public.wmo.int/en/resources; https://www.euro.who.int/en/publications; http://icomos-bg.org/?p=8&l=2;*

(EEA), European Agency of Small and Medium Enterprises (EASME), as well as all other related structures within the EU, dealing with energy, transport, mobility, regional policy and social affairs. Bulgaria participates with its representatives in the working groups, transferring new regulations, information and knowledge in the national governance structure.

Black Sea region' institutions, such as the Commission on the Protection of the Black Sea Against Pollution (Black Sea Commission) with the local centers (The Centre of Environmental and Safety Aspects of Shipping, Varna, Bulgaria and the Environmental Aspects of Fisheries and Other Marine Living Resources, Constanta, Romania), adds value and regional specific knowledge to the governance structures in Bulgaria. They have a major role on the regional level, providing support for implementation of the macro regional type of documents among which the Danube Strategy, '*Towards a common maritime agenda for the Black Sea*' ministerial declaration (2018) and Black Sea Basin Programme 2014-2020, part of the EU Cross-Border Cooperation (CBC) under its European Neighborhood Instrument (ENI).

At the highest national level stands the Council of Ministers, which adopts the Maritime Spatial Plan of the Republic of Bulgaria and Romania and its amendments. There are a number of ministerial bodies, involved in the maritime spatial planning process with their subordinated structures – executive agencies and state consulting companies.

In BULGARIA

Institutions	BOX 11. Main attributes and responsibilities in MSP
The Ministry in Regional Development and Public Works (MRDPW)	MRDPW is the leading institution, according to the Maritime Space, Inland Waterways, and the ports of the Republic of Bulgaria Act. The minister is carrying out the general management and coordination of the maritime spatial planning activity and is responsible for the elaboration and maintenance of the Maritime Spatial Plan of the Republic of Bulgaria. (art. 51b, para 1 and 2). He is supported by a Consultative Council on Maritime Spatial Planning, established mainly for implementation of cooperation and coordination in the process of maritime spatial planning.
The Ministry of Environment and Waters	(MOEW) is the competent authority for the Strategic Environmental Assessment of the MSP and responsible for the elaboration and implementation of the Maritime Strategy of the Republic of Bulgaria. The Executive Environmental Agency (ExEA)[8] as an administration with the Minister of Environment and Water carries out management, coordination control and information functions, designs and manages the National System for Environmental Monitoring on the state of the environmental components and factors on the territory of the country, including the Black Sea environment.
The **Ministry of Transport, Information Technologies and Communications**	(MTITC) is providing the state transport policy, the Minister of transport, with the Minister of regional development and public works, is responsible for the development of the transport infrastructure and for safety in commercial shipping. He is supported in this field by the Executive Agency 'Maritime Administration'[9] and Port Infrastructure State Company[10] with its structures in Varna and Burgas. The former organizes and coordinates activities related to the safety of shipping in the sea spaces of the Republic of Bulgaria; ensures the liaison between the government and ships, flying the Bulgarian flag; exercises control on safety requirements implementation by Bulgarian and foreign ships and on the provision of services for traffic management and information of shipping maritime spaces, on the compliance with the quality requirements for marine fuels.
The **Ministry of Culture**	(MC) provides the state policy for protection of the monuments of culture, including underwater heritage. The Minister of culture is responsible for monuments declaration, registration, conservation and restoration, for commissioning and adoption of the Heritage Protection and Management Plans, in compliance with the Cultural Heritage

[8] http://eea.government.bg/en
[9] https://www.marad.bg/index.php/en/taxonomy/list/147
[10] https://www.mtitc.government.bg/en/category/15/port-infrastructure

	Act. He works with the support of the National Institute for the Immobile Monuments of Culture and the Centre for Underwater Archeology, Sozopol.[11]
The **Ministry of Tourism**	(MT) is providing the policy in the area of tourism, maintains a register of the accommodation, catering facilities and attractions, and is responsible for the management and concessions of the beaches along the Black Sea coast. It works with the regional structures for advertising and managing both Northern and Southern Black Sea tourism regions, with the established NGOs and professional tourism associations.
The **Ministry of Health**	(MH) with its regional structures in Varna, Dobrich and Burgas is responsible for protection of touristic and recreational resources, including the Black Sea waters to 20 meters depth. The three inspectorates take part in the adoption of the Master plans for the coastal municipalities. The Ministry of Health is one of the competent authorities for adoption of the SEA of the national Maritime Spatial Plan of the Republic of Bulgaria.
The **Ministry of Agriculture, Foods and Forestry**	(MAFF) together with its Executive Agency of Fishery and Aquaculture[12] is responsible for providing the policy in the area, implementation of the Programme for Maritime Affairs and Fishery 2014-2020, protection and sustainable management of the living resources. The Minister of Agriculture, Foods and Forestry recognizes by order the organizations of producers of fishery and/or aquaculture products and the interbranch organizations in the fisheries sector.
The **Ministry of Defense** jointly with the **Ministry of Interior** (MI) and its Border Police General Directorate and **Ministry of Foreign Affairs**	(MD) is responsible for the marine border protection, control for the observance of the border regime in the sea areas, search and rescue. The General Directorate Border Police is a national specialized three levels structure for carrying out activities (operational search; security; crime investigation; information; control; prevention; administrative penal and provision of administrative services) in the border areas, checkpoints, international ports, inland waters, the territorial sea, the contiguous zone, the continental shelf, according to the Maritime Spaces, Inland Waterways, and Ports of the Republic of Bulgaria Act and Ministry of the Interior Act.[13] The Navy supports these institutions to protect the interests of the Republic of Bulgaria in the maritime space, guarantees maritime sovereignty and prepares formations for participation in support of international peace and security operations and for assistance to the population in case of disasters and accidents.
The **Ministry of Energy**	(ME) has a major role to play in the Green Deal transformations, planned for all sectors, including the marine ones. The Minister coordinates and manages the overall process for geological and geo-ecological investigation of the national territory and the continental shelf including the Bulgarian Black Sea EEZ. He is responsible for collection and update of the information for the mineral resources and for concession contracts signed.

On regional level the main institutions, involved in the maritime spatial planning governance are Black Sea River basin Directorate in Varna, the Regional Inspectorates of the Environment and Waters in Varna and Bourgas, the Regional Health Inspectorates in Varna, Dobrich and Burgas, the local administrations of the State Company Port Infrastructure. The Regional Development Councils also will play a role in the coordination of the Integrated Territorial Strategies for Development of the two Black sea NUTS 2 planning regions – the Northeastern and the Southeastern with the Maritime Spatial Plan.
On district level (NUTS 3) the responsibilities of the governor is determined by the Administration Act[14], Regional Development Act and the Regulations for its application, and cover among others, the coordination of the work of the state institutions' regional structures, Territorial and Cross-Border Cooperation management.
Coastal municipalities and their Municipality Councils and Planning Expert Councils are responsible for commissioning of Master Plans, part of which are ports and ports' infrastructure. Bulgarian municipalities do not take part in the port's management, but their Expert and Municipality Councils consult and adopt the detailed plans of the ports, the projects for renovation and extension works.
Implementing the principles of public participation, communication and information within the process of MSP elaboration and implementation, active participants are all other important stakeholders – professionals of different fields and their associations, academic and scientific institutions, NGOs and local communities. In this respect they could also be considered as part of the multilevel governance, facilitating the bottom-up approach to maritime spatial planning and the communication of the important tacit knowledge.

[11] *https://www.cua-sozopol.com/bg/*
[12] *http://iara.government.bg/*
[13] Promulgated SG No. 53/27.06.2014, amended SG No. 58/2019
[14] Promulgated in SG No 130/05.11.1998, amended SG No. 21/2020

In ROMANIA

Based on art. 12 of Ordinance no. 18/2016, the Maritime Spatial Planning Committee were established, as an inter-ministerial body, without legal personality, which functions under the coordination of the Prime Minister, who also ensures the presidency. The maritime spatial planning committee is responsible for developing and monitoring the implementation of the maritime spatial plan. The organization, functioning and nominal composition of the members of the Maritime Spatial Planning Committee was established by the Government Decision no. 406/2017. The Secretariat of the Maritime Spatial Planning Committee is provided by the central public authority for territorial development, namely MPWDA.

The composition of the Maritime Spatial Planning Committee is ensured by one full member and one alternate member, appointed by the following institutions with responsibilities in the field of regulation of this ordinance, as follows: Ministry of Public Works, Development and Administration; Ministry of Economy, Energy and Business Environment; Ministry of Transport, Infrastructure and Communications; Ministry of Environment, Waters and Forests; Ministry of Agriculture and Rural Development; Ministry of Foreign Affairs; Ministry of Interior; Ministry of National Defense; Ministry of Culture; Ministry of Education and Research; National Agency for Mineral Resources; ”Danube Delta” Biosphere Reserve Administration.

At the same time, the composition of the Maritime Spatial Planning Committee includes a full member and a substitute member appointed by the competent authority established on the basis of Law no. 165/2016 on the safety of offshore oil operations.

Representatives of other public institutions with attributions in the regulatory fields of Ordinance no. 18/2016 may also participate in the meetings of the Maritime Spatial Planning Committee.

The Ordinance does not apply to town and country planning, as regulated by Law no. 350/2001 on spatial and urban planning, but the provisions of these normative acts are applied in conjunction, ensuring the achievement of the objectives established at European, national and local level.

✓ *Conclusions*

Like the legislative framework, the institutional framework for maritime planning is complex and multilevel one, with a great number of state, regional and local institutions and organizations. Some of the most urgent tasks are aimed at clarifying the horizontal and vertical links and interactions, distribution of powers and responsibilities in order to avoid overlapping and to achieve clearer accountability and control. The next are a consensus building among stakeholders on the priorities for future actions and provision and exchange of up-to-date information among institutional information systems in a more unified and compatible format.

References

1) Administration Act, promulgated in SG No. 130/05.11.1998, amended SG No 21/13.03.2020
2) Local Governance and Local Administration Act, promulgated in SG No. 77/17.09.1991, amended SG No. 44/13.05.2020
3) Maritime Spaces, Inland Waterways and Ports of the Republic of Bulgaria, promulgated SG No 12/11.02.2000, amended SG No. 28/29.03.2018

2.3. CROSSBORDER MARITIME SPATIAL PLANNING AND MARITIME SPATIAL PLANS DELIMITATION

Plamen Tzenov, Jozef Nasser, Bogdan Ghinea, Laura Alexandrov

There are general approaches for explaining the development and progress of cooperation between individuals and governance cooperation, explaining networks, actors and communication in a cross border context. Cross-border cooperation in spatial development is formulated, structuring empirical data collection and evaluation aiming spatial planning.

The main transboundary issues include all environmental aspects (most of them the similar) and maritime sectors like maritime transport, shipping, tourism, fishing activities, extraction of non-living resources, etc., and the possible impact of them on the environment; marine protected areas, ecosystem services.

At least, important is to define similarities (living in the same geographical areas, with common history, traditions and customs, including a big number of common words in the own language vocabulary) and differences between the both countries, resulted from the origin, languages, economic, social, demographic, mentality aspects, difference and changes.

BOX 12. Exogenous factors
• size of the cooperation area, experience in cooperation • need for cooperation in specific cities and regions, • processes of transition, differing administrative structures, relationship between politics and administration, • transnational organisations and legal framework, • Languages, prejudices and cultural differences.
Endogenous factors
• transaction costs, financial resources and funding, • objectives, expectations and issues, • actors, their competencies and resources, • design, management and moderation of cooperation processes and spatial planning.

Continuity and compatibility of spatial plans in cross border areas could make possible the establishment of the marine border between the Bulgaria and Romania.

2.3.1. Planning and transboundary issues identification

Plamen Tzenov, Jozef Nasser, Bogdan Ghinea, Liviu Băileșteanu, Alina Huzui, Laura Alexandrov

In compliance with the European law, maritime law and international conventions the EU Member States cooperate with each other and, where possible, with third countries to ensure coordination of actions in the affected sea regions.[15] The Republic of Bulgaria and Romania, as member states, cooperate with the countries of the Black Sea region, including within the Organization for Black Sea Economic Cooperation and the Commission for Protection of the Black Sea against Pollution[16] in the consultation process of the Maritime Spatial Plan of the country in Bulgaria (MSPRB) and MSP Authority of the Ministry of Public Works, Development and Administration (MPWDA) in Romania (MSPA-RO). The aim is to achieve coherence and coordination of the national maritime spatial plans on transnational issues. The defined maritime boundaries based on political negotiations and legal regulations differ from

[15] Directive 2014/89/EC of the European Parliament and the Council
[16] Maritime spaces, Inland Waterways and Ports of the Republic of Bulgaria Act

the boundaries of marine ecosystems and those in which marine activities take place.[17] In this context, cross-border cooperation in the process of maritime spatial planning (MSP) improves the effectiveness of planning and management of coastal and marine resources and activities. The simultaneous existence of the MSPRB, MSPA-RO and the MARSPLAN-BS II projects and the wide range of high level professional in the Advisory board of the latter, facilitate the knowledge communication and solves a number of problems in the cross-border cooperation between Bulgaria and Romania in the planning process.

The fact that the maritime planning process is implemented in both countries through the MARSPLAN-BS and MARSPLAN-BS II projects it makes possible to largely avoid the difficulties of differences in the two spatial planning systems and at the same time, allows the maritime spatial plans of Bulgaria and Romania to be prepared and implemented with a high degree of coherence.

In the process of developing joint document in the field of MSP, in case of MARSPLAN BS II, the emphasis is placed on the potential that give priority to both countries as partners and EU member states. In order to take full advantage of their strengths, countries need to develop strategic and planning documents, using local development potential in the most comprehensive way, giving them a competitive advantage over other partner countries in the Black Sea region. Central to cross-border cooperation in MSP is the precise scope of jurisdiction, communication and exchange. An obstacle for Bulgaria and Romania is the lack of a legitimate sea border between them (while the borders with Turkey[18] and Ukraine[19] are defined).

The issue of the maritime border, like that of the land border, is sensitive and must be treated carefully and with an understanding of opposing views, by the nominated and competent authorities. The institutions empowered to discuss and negotiate these issues are not directly involved in the project the aim of the MARSPLAN BS II project is not to solve this particular problem. The project could provide informational support for professional arguments in the diplomatic and political negotiations.

A number of EU Member States are making significant progress in the field of Maritime spatial planning. The experience of the Baltic States is available and the conclusions and recommendations are relevant to the MARSPLAN-BS II project.[20]

A challenge for cross-border integration and communication in the region is the different pace of development and adoption of maritime spatial plans. Communication and exchange of information are much more difficult when a neighboring country is either more advanced in the MSP process, with an adopted national plan, or is just at the beginning. Integration barriers arise in the search of direct communication among the different levels of government between countries. Transnational coordination between authorities in sectors located at different institutional levels is complex, especially when jurisdictions, maritime intentions and the legal status of plans in the countries are not similar. Relying on the direct discussion procedures specified in the Espoo Convention[21], stakeholders in the planning process expand their knowledge of maritime spatial planning and address arising issues. The need for

[17] Cross-border cooperation in maritime spatial planning (Final report - Study), *2017, EU publications*
[18] Agreement between the Republic of Turkey and the Republic of Bulgaria on determination of the boundary…*1997*
[19] Maritime Delimitation in the Black Sea (Romania v. Ukraine), Judgment, I.C.J. Reports *2009*
[20] New generation EU directives, sustainability, and the role of transnational coordination in Baltic sea maritime spatial planning, *2019*
[21] Convention on the Environmental Impact Assessment in a transbouday context (Espoo Convention, *1991*) https://www.unece.org/fileadmin/DAM/env/eia/documents/legaltexts/Espoo_Convention_authentic_ENG.pdf

integration between planning and sectoral bodies from different levels of administration and knowledge exchange is being emphasized. Neighboring public bodies have interests that require a cross-border view, and successful integration cannot be based only on the involvement of one level authorities, related to the maritime spatial planning.

The 2014/89/EU Directive requires Member States to involve the public in order to promote the high quality of plans, while the effective involvement of stakeholders expands the boundaries of knowledge and improves decision-making. The requirements for cross-border consultation in the Strategic Environmental Assessment procedures are a major incentive for the parties to consult each other. The types of communication in cross-border aspect of maritime spatial planning are formal consultations, broader formal and semi-formal interactions and informal interactions.[22] Integrated planning and management cannot be expected from formal MSP processes alone. Instead, a broader supportive and interactive environment and increased decision-making competence are sought.

Lack of coordination and coherence leads to loss of efficiency. Trust between politicians, public authorities, scientists, citizens and stakeholders nationally and internationally and informal prior consultation are important for the effective wider participation and achievement of good results. Cross-border integration is crucial for the success of MSP in areas where activities, together with their environmental, social and economic impacts, have overlapping spatial dimensions. Planners need to understand the driving forces of maritime uses in the neighboring country in order to be able to deal with emerging issues effectively and in perspective.

Central to the process are additional attention to the management of cross-sectoral conflicts and the promotion of synergies. In the event that stakeholders are excluded from wider and informal interactions, it is possible to enhance the perception of the Maritime Spatial Plan as a narrow, limited and restrictive tool for experts, applying a top-down approach without regard to the opinions and needs of the less empowered parties. A forum that brings together decision-makers, institutions, experts, industry and all stakeholders is very suitable for creating an informal discussion platform and expanding the knowledge base.

The specific conditions on the countries due to the Covid'19 require new communication methods and approaches in the current project and appropriate environment for discussions on the common issues in the crossborder areas with the participation of the local communities. Video conferences and exchange of materials and comments, as well as a feedback, are useful if are properly organised and moderated and if the main stakeholders have their representatives involved. A key factor of success in the crossborder maritime spatial planning is also the mutual trust among partners and their professional culture, particularly for exchange of information and ideas and for experts' support.

Identified planning and transboundary issues are related to planning and transboundary context of the maritime spatial planning. Based on the results obtained from the analysis of existing and possible user-user and user-environment conflicts the main planning and transboundary issues identified. The goal of this review is to support the identification of conflicts and synergies, both in space and time, between uses and environment, highlighting issues which particularly require a transboundary approach. (Figure 5)

[22] Imbalances in interaction for transboundary marine spatial planning: insights from the Baltic sea region, *2018*

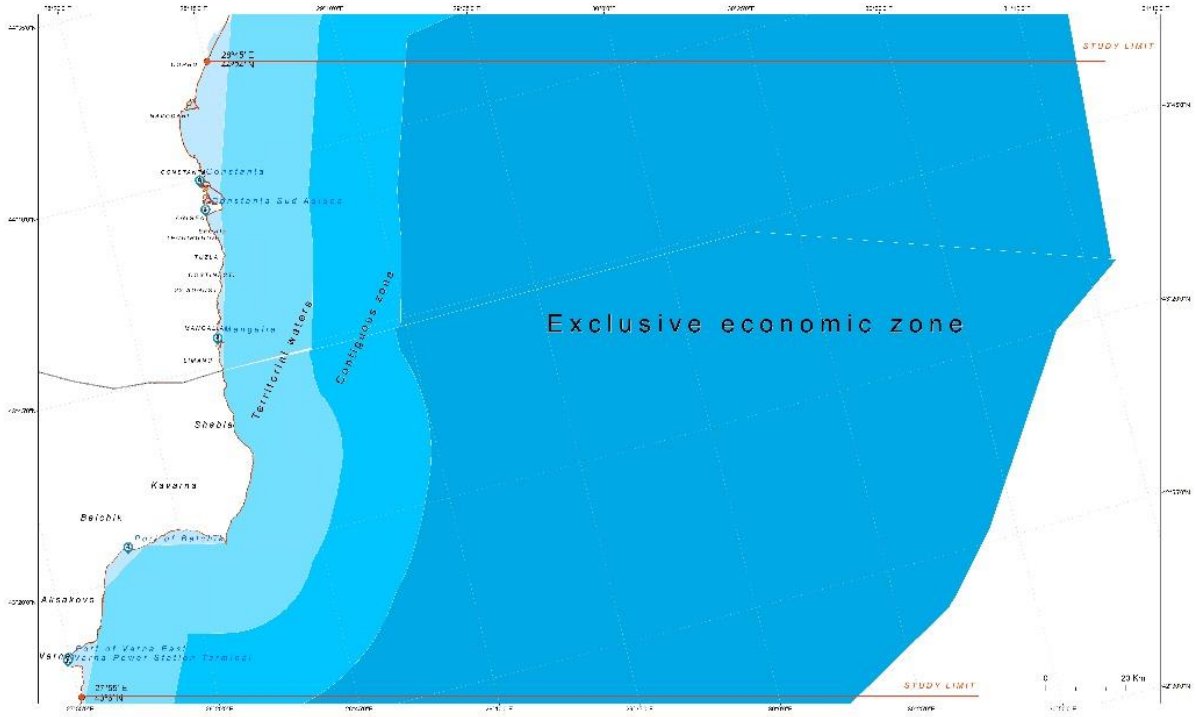


Figure 5. Cross border maritime spatial transboundary area nominated to be case study for common maritime spatial planning between Bulgaria and Romania *(MPWDA)*

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3) Cross-border cooperation in maritime spatial planning (Final report - Study) 2017, EU publications https://op.europa.eu/en/publication-detail/-/publication/985c28bb-45ab-11e7-aea8-01aa75ed71a1Directive 2014/89/EC of the European Parliament and the Council of 23rd July 2014 for establishing a framework for maritime spatial planning https://eur-lex.europa.eu/legal-content/BG/TXT/?uri=CELEX%3A32014L0089
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2.3.2. Maritime spatial planning under the national Bulgarian and Romanian planning systems

Vesselina Troeva, Bogdan Ghinea, Liviu Băileșteanu, Alina Huzui, Laura Alexandrov

✓ *Present Conditions*

Maritime spatial planning in the national Bulgarian and Romanian planning systems takes into attention the delimitations of the Maritime Spatial plans of both countries on

national level, the interaction of both and incorporation of the cross-border planning principles and zones.

It examines the place and role of the maritime spatial planning in the national planning systems of both countries. The registered results contribute to the MARSPLAN-BS II project's next Work Package (WP 2) of the – "*Connecting cross-border to national MSP*". Links and delimitations between cross border maritime spatial planning and the national maritime spatial plans are established (Chapter 10). The place and role of the MSPs within the planning systems of both EU countries is clarified. The links and relations of the MSPs with the national concepts for spatial development and with the overall process of the Integrated Maritime Policy implementation.

As members of the EU, Bulgaria and Romania should not have major differences in their planning systems. The differences in the documents are rather found in their priorities, based on the specific characteristic of the country, in the quality, as a result of the capacity in the field and process of maritime spatial planning and in the system for assignment, development and approval of various strategies, plans and programs.

In BULGARIA

➢ Maritime spatial planning in the Bulgarian planning systems

Bulgaria Planning system has long term traditions and has always being developed on 4 levels – National, Regional (NUTS 2), District (NUTS 3) and Local levels (LAU 1 and LAU 2). The documents developed are related to the Regional Development Act, Spatial Planning Acts, Environmental Protection Act and Biodiversity Act. A total number of these documents, without sectoral strategies and plans were 678, reduced recently as a result of the regional policy reform to 548, including the MSP and 265 Master plans of the municipalities. For the area, included in the MARSPLAN BS II the total number of these plans, only in the area of regional and spatial planning, are 2 on national level, 2 on regional (NUTS 2) level, 14 on municipality (LAU 1) level or 18; 2 plans for the Black Sea River Basin; 1 for Protection and Management of the old town of Nesseber; and total 13 adopted plans for protected areas and protected sites management[23]. The statutory Planning System of Bulgaria suffer from similar problems and shortcomings as the multilevel governance structure, among which overlapping areas for implementation, treatment of the same matter in several laws and overlapping planning documents in scope and content, with accumulating restrictions.
The analysis of the legal framework, the responsible institutions and the statutory documents, which are developed at different hierarchical levels, shows the horizontal and vertical connections between the programme and strategic documents.

BOX 13. Maritime Spatial Plan of the Republic of Bulgaria (2021-2035)

The most important national level document will be the **Maritime Spatial Plan of the Republic of Bulgaria (2021-2035)** after the consultations and adoption by the end of the year 2020 and approved by the EC after the end of March 2021. It follows the requirements of the Directive 2014/89, the Maritime Spaces, Inland Waterways and Ports of the Republic of Bulgaria Act, applies the lessons learned from the MARSPLAN BS project and the good practice experience and recommendations from other EU countries. The Bulgarian MSP covers the maritime transport infrastructure with ports and ports' infrastructure, shipping and ship building, shipyards and all conceded road and railway transport infrastructure, logistic and multimodal centres; fishery and aquaculture with the supportive infrastructure and facilities; the extraction of non-living resources (oil and gas, incl. infrastructure, salt, water,

[23] https://www.moew.government.bg/bg/priroda/zastiteni-teritorii/planove-za-upravlenie-na-zastiteni-teritorii-vlezli-v-sila/zastiteni-mestnosti-i-prirodni-zabelejitelnosti/

mineral resources etc.) the submarine cables and pipelines and their links with the coastal technical infrastructure; tourism; coastal defence/floods protection, dredging and dumping; underwater cultural heritage; the sites for military training. The main aim of the MSP is to offer a model for sustainable use of marine resources, to reduce the conflicts between land and sea and to enhance the synergy between the marine sectors.

The Maritime Spatial Plan is closely linked to the **Marine Strategy of the Republic of Bulgaria**,[24] developed according the Marine Strategy Framework Directive (2008/56/EC) and aiming at maintaining or achieveing a Good Environmental Status (GES) in the marine environment by 2020. The proposed Program of Measures applies to the territorial marine waters (in their entirety from the shoreline to the border of the Exclusive Economic Zone (EEZ)) and the Exclusive Economic Zone of Republic of Bulgaria. The period of the implementation of the Program of measures (PoMs) is running from 2016 to 2021. The art 11 of the Directive provides legally-binding requirements for Member States to establish and implement coordinated monitoring programmes. This monitoring is organized by the Black Sea Basin Directorate and is carried out by the Institute of Oceanology (IO) at Bulgarian Academy of Science. The analysis and the assessment of the current status of the marine environment in the MSP used the same 11 descriptors and ecosystem-based approach in order to identify better pressures and risks.

The other important link of the MSP on the national level are with the **National Strategy for Regional Development of the Republic of Bulgaria** (2012-2022) and the **National Concept for Spatial Development for the period 2013-2025** (Update 2019). The NCSD is a new type of document, implemented after last changes of the regional development policy and integrates in its latest version the goals of the NSRD. The NCSD's role as a spatial coordinator of the territorial processes and sectoral policies is maintained and, at the same time, updated within the context of the common European spatial polycentric development, focusing on the complex, integrated planning and an increased strategic orientation.

The NCSD update helps establish the requisite informational and planning support for the Operational Programme for Regional Development for the 2021–2027 periods. The upcoming period is expected to improve the implementation of the NCSD, turn the monocentric development trends and proceed to a gradual transition towards a polycentric development. This is both a precondition to achieve a Balanced, effective and environmentally friendly utilization of the territorial resources and potentials, and a prerequisite to mitigate the climate change risks. The updated NCSD gives a stronger focus on the NUTS 2 regions and a higher degree of manageability of their development through targeted integrated territorial investments, responding to the trend for a more pronounced regional and territorial dimension of the European policies. The Maritime Spatial Plan has a similar role to play, coordinating and integrating sectoral policies, their goals and priorities, and planned programmes of measures.

Although outside the scope of the **Spatial Planning System of Bulgaria**, the MSP takes into account the spatial dimensions of important sectoral national documents, including the National Development Programme: Bulgaria 2030,[25] the Integrated Transport Strategy for the period until 2030;[26] The Energy Strategy of the Republic of Bulgaria till 2020,[27] the National Strategy for Small and Medium-sized Enterprises 2014-2020 - Small Business Act,[28] the National Strategy for Sustainable Development of Tourism in the Republic of Bulgaria 2014-2030[29] and the updated Innovation Strategy for Smart Specialization of the Republic of Bulgaria 2014-2020.[30] These documents have thematic and spatial links with the important sectors of the Blue economy, with protection of the marine environment and with the strategic goals for innovative and smart growth.

On the regional level the NCSD (Update 2019) sets out the guidelines for the development of NUTS 2 planning regions and justifies the axes and functional zones for the integration of territorial investments. Both NUTS 2 regions, Northeast and Southeast, in their Integrated Territorial Strategies for Development address the Blue economy sectors.

The art. 8 para 4 issue 6 of the Regional Development Act provides requirements for the national, regional and local levels documents to serve the coordination role for the development of the national territory and aquatory in accordance with the Maritime Spatial Plan of the Republic of Bulgaria. Such coordination could be established only by professional communications, exchange of ideas and disaggregation of the strategic goals to

[24] *http://cdr.eionet.europa.eu/bg/eu/msfd_mp/msfd4text/envvibp8w/*
[25] *https://www.minfin.bg/bg/1394*
[26] *https://www.mtitc.government.bg/en/category/42/integrated-transport-strategy-period-until-2030*
[27] *https://www.me.government.bg/en/themes-c233.html*
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[30] *https://www.mi.government.bg/en/themes/inovacionna-strategiya-za-inteligentna-specializaciya-na-republika-balgariya-2014-2020-g-1806-287.html*

the lower levels.
There are 2 types of documents at the municipality level – the plan for integrated development and the Master plan. The first one is among the new instruments for conducting the state policy for regional development at the municipal level, and the second - for finding the most suitable territorial addresses for the realization of these ideals. Both types of documents are connected with the maritime spatial planning, through the projects for different maritime sectors and through the detailed zoning of the adjacent marine water.

The main advantages of the new system of regional and spatial planning in Bulgaria are the reduced number of more focused documents and the reduced administrative and financial burden for their implementation. In the well-established hierarchical system of interrelated strategic documents, what are needed are the improved programming and timing and further capacity building for development and implementation of these documents.

The main challenge facing the national spatial planning system is to incorporate the maritime spatial planning in it, establishing, exploring and operating the most important links between strategic documents at national and sectoral level.

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In ROMANIA

➢ Maritime spatial planning in the Romanian planning systems

In Romania, the Ministry of Public Works, Development and Administration elaborated long term nnational territorial plan; regional plans (14 provinces / counties); municipal plans (275) - including sectoral and financial plans, action plans, local plans which regulate land uses, construction regime and architectural features; mandatory for certain categories of projects in which public consultation is also obligatory.

BOX 14. Maritime spatial planning in the national Romanian planning systems
Various coastal management plans, such as the Urban planning for the Black Sea Coastal Zone (2010-2011), the Master Plan for Protected Areas (2007) and the Strategic Action Plan for the Rehabilitation of the Black Sea (updated in 2009) were also developed. Other spatial plans are related to the Danube Delta Master Plan, Danube Strategy (including Danube, Danube Delta and the Black Sea). A focus on the sustainable development is also taken by the Master Plan elaborated by Romanian National Tourism Development in 2007-2026.
Romania is the only Black Sea country having an ICZM national law (Law 280/2003, amending the 202/2002 GU) and an ICZM authority, under the Ministry of Environment, Waters and Forests (NCCZ), including 40 authorities, institutions and stakeholders (NGOs). In 2004 the National Committee of Coastal Zone (NCCZ) has been set up in order to ensure an integrated coastal zone management responsibilities in: • *Endorsing the plans regarding integrated coastal zone management and local and regional spatial planning;* • *Endorsing the studies regarding environment impact of activities having an important impact in the coastal zone, as well as the environment audit for the existing ones;* • *Endorsing the projects regarding establishing of natural parks and reserves. Through its Permanent Technical Secretariat (PTS) is empowered to inform the competent organizations about critical coastal situations which need rehabilitation actions, initiating of specific projects.*
10 years before MARSPLAN Project, some research project started to introduce MSP field (under ICZM umbrella in the first stages) in the Black Sea area transferring experience from Baltic and Mediterranean Sea (PLANCOAST, PEGASO Projects). After, developing independent MSP cases studies in national programs, till 2016, when the EU-MSP legislation was harmonized at the national conditions and the 2014/89/EU Directive started to be implemented, thematic and integrated maps were elaborated.

Based on the Decision no. 436/2018, the *Methodology for elaborating the maritime spatial plan* was approved. The normative act establishes the stages of the process of elaboration and implementation of the maritime spatial plan, as well as the content framework of the maritime spatial plan.

In this sense, the stages of the process of elaboration and implementation of the maritime spatial plan are the following: establishing and delimiting the responsibilities of the competent authorities, according to the specific attributions in their area of competence; context assessment and definition of the general framework; organizing stakeholder participation and consultation; defining and analysing existing conditions; defining and analysing future conditions; elaboration and approval of the maritime spatial plan; implementation of the maritime spatial plan; monitoring and evaluation of the maritime spatial plan; adapting the maritime planning process.

The Regulation for the organization, functioning and nominal composition of the members of the Maritime Planning Committee, approved by Government Decision no. 406/2017, establishes the attributions of the Maritime Spatial Planning Committee, the attributions of the chairman of the Maritime Spatial Planning Committee, the attributions of the secretariat of the Maritime Spatial Planning Committee, the members of the Maritime Spatial Planning Committee and designated members, the meetings of the Maritime Spatial Planning Committee and the decision-making procedure.

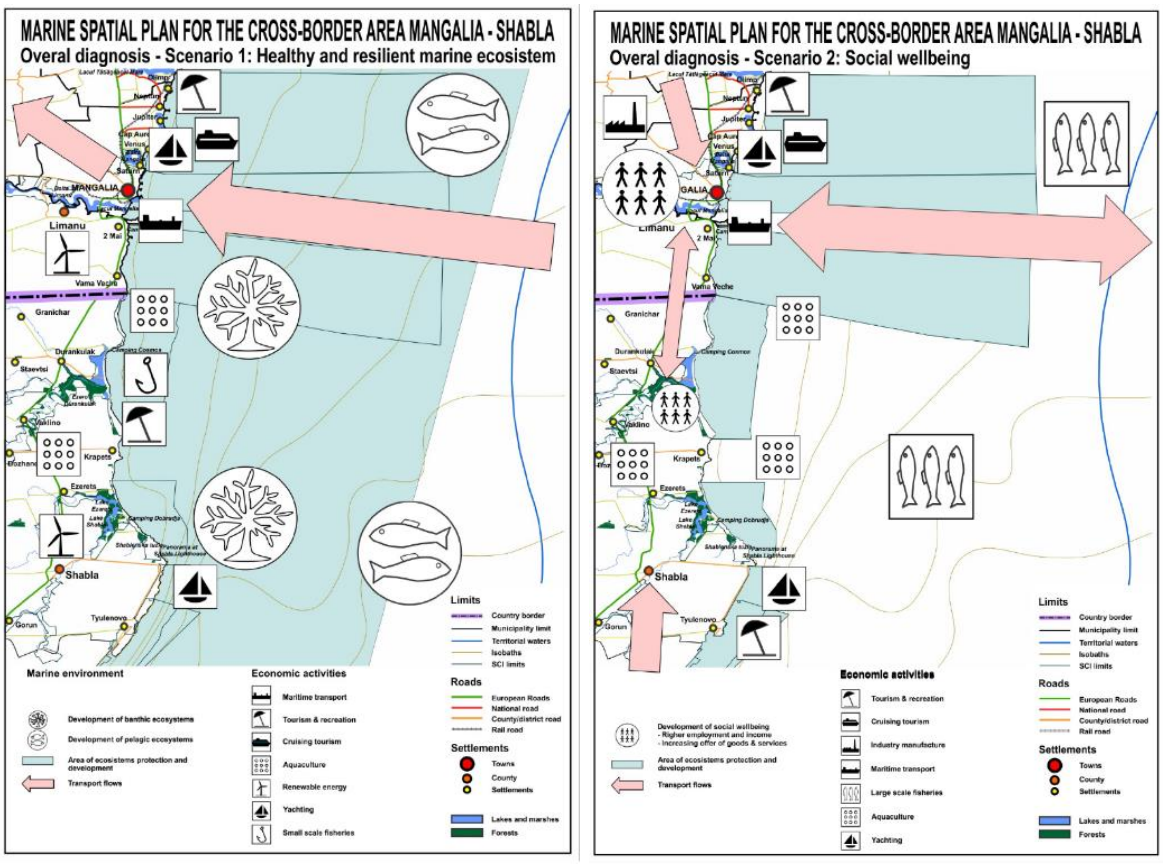

Figure 6. Shabla – Mangalia Spatial scenarios (1,2) between Bulgaria and Romania (http://www.marsplan.ro/en/, *URBAN-INCERC*)

BOX 15. Concerning **Transboundary planning aspects between Bulgaria and Romania** have been taken into account and proposed, by MARSPLAN Project, three important phases/steps.

- **Sectoral current situation analysis** has been updated in the last ten years, including the cross-border area, Mangalia – Shabla. It consists in the following stages. (Figure 6)
  - **Introduction to specific problems:** General description, terrestrial, coastal and marine context, Spatial planning documents and relevant strategies/directives;
  - **Current situation analysis:** Environment features (physical, biological and natural conservation, Built environment (settlements and infrastructures), Current socio-demographic processes, Coastal and marine economic activities, Analysis of the supra-territorial context (county, district, regional);
  - **Assessment of the previous evolutions:** Identifying current and future conflicts and compatibilities among uses, and uses and environment; Key issues for transboundary MSP in the pilot area and recommendations; Stakeholder consultation;
- **Analysis of the future evolutions:** Prospective analysis of the relevant domains, Development of strategic scenarios

Strategy formulation: Formulation of the spatial vision and goals, Formulation of the strategic objectives and action plan, Stakeholder consultation and approval of the pilot MSP; Focus on cross-border issues, interaction of human activities, opportunities and bottleneck for cross-border MSP

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2) xxx MARSPLAN Studies, *www.marsplan.ro/en*

1. DESCRIPTION OF METHODOLOGY USED IN DATA COLLECTION AND MAPPING

Hristo Stanchev, Margarita Stancheva, Maria Novakova, Laura Alexandrov

This study has collected present information from the Romanian and Bulgarian marine space concerning ecological, economical aspects, according to the European MSP Directive 2014/89/EU obligations and terms, national Maritime Spatial Planning (MSP) laws and Methodologies of the both countries.

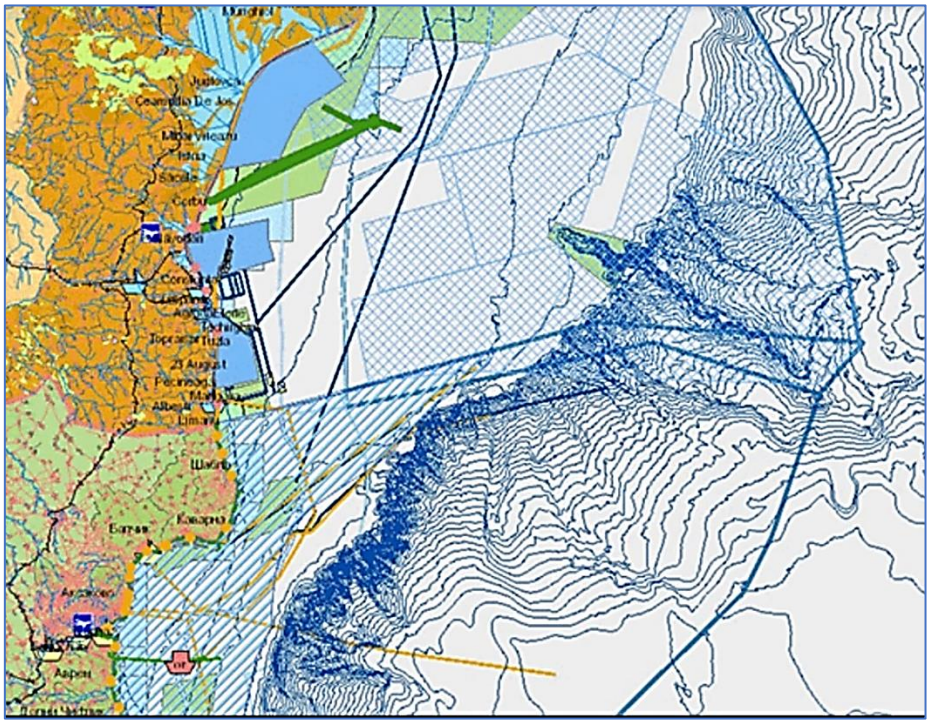

Figure 7. Integrated map of transboundary marine space and maritime activities (*https://we.tl/t-0vxzcRwKIn*, *www.marsplan.ro*)

The main purpose of data collection and inventory is to present the information foundations for the MSP in the Black Sea basin and for MSP transboundary and national Maritime Spatial Plans of Bulgaria and Romania.

Data collection, inventory and analysis of existing conditions, existing maps, identified economic sectors/uses and natural valuable areas overlapping on all mapped fields and their spatial representation (including existing conflicts among uses, and among uses and environment conditions identified by project partners) have been considered on a common base of analysis, thus being selected, integrated and mapped for both countries. (Figure 7)

BULGARIA

Marine spatial planning (MSP) is increasingly, being recognized as an important tool in the sustainable management of marine ecosystems [1]. Several definitions exist for MSP, UNESCO defines it as *'a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process'* [2].

This definition suggests the need to apply a variety of approaches, methods and tools in the maritime spatial planning process in order to analyze a huge amount of information and data. One of the very important and key action is related to the information and data collecting for project area - for both countries' land and maritime spaces, included into the project. These are various geospatial and statistical data on the environment and the state of all its components, assessment of the cummulative impacts, the resource security, potential and employment in the development of maritime economy' sectors, monitoring demographic trends and forecasts, important factors for ideas implementation.

BOX 16. Geographic Information System (GIS)

Geographic Information System (GIS) is recognized as a computer tool, suitable to acquire process, analyze and interpret data in support to marine and coastal studies and applications. Marine GIS technology permits to better understand the marine environment and to increase ability for measuring changes in oceans [3]. GIS is a powerful tool for Marine Spatial Planning (MSP), a process that aims at minimizing the conflicts among different sea uses as well as their negative effects by allocating space and applying zoning for different activities [4].

The methodology approach to data collecting, processing and application for mapping is based on traditional and proved practices, used in many similar projects. It includes several well-known steps:

(1) Research on possible, trusted sources of information and structured data on national level. Such a sources could be national institutions, as government ones (Ministries, agencies and others, which are responsible for collecting and maintaining information, important and related to the project)
(2) Research on possible, trusted sources of information and structured data on European level. Such sources could be branches, agencies etc. collecting and maintaining data for/in specific area (s) of interests for countries in the EU.
(3) Research for a data and information from related specific thematic areas and territorial scope.

Information on the spatial extent of marine uses and activities was initially gathered during the first MARSPLAN-BS project. Data sources included Environmental Statements Government agencies, published reports and books, Eurostat[31], EMODnet[32], etc. Whilst some data was available in the GIS format (predominantly government data), many data sets had to be digitized and converted to a GIS format.

During the MARSPLAN-BS II project, a desk survey for new published GIS layers or statistical data was implemented. New GIS layers were created, using non-spatial data formats. The collecting and mapping work includes next steps:

- **Inventory of GIS layers and preparation of maps**

Building a project common GIS database with data for the territory and marine spaces of both countries was

[31] https://ec.europa.eu/eurostat
[32] https://www.emodnet.eu/

gone in the following steps:

(1) Inventory of spatial data (GIS) from project MARSPLAN-BS

(2) Preparation of common for the MARSPLAN-BS II project database structure – as GIS and database structure, synchronised with the one of the MARSPLAN-BS projects

(3) Inventory of available data (for both countries) for specific themes – as a category, spatial references etc. Inventory of available data in all kind of formats.

- **Data inventory, checking.**

Inventory of data and checking their accuracy – as spatial accuracy, coordinate systems, coding etc. Formal inquiries have been sent to ministries and other official institutions in Bulgaria.

This task includes also desk inventory of new published data, related to maritime area of Bulgaria, as project reports/studies, scientific papers and books, which not be published or available during the first MARSPLAN-BS project. A detailed desk research was done in portals as: Google Scholar[33], Science Direct[34], Research Gate[35], EEA website[36], research project websites, BSBD-Varna[37] website, Eurostat and National Statistical Institute[38], etc. An appropriated and free available scientific articles and reports were downloads for further use in analysis. Additional documentary analysis methods were applied for studying the latest research in the area of maritime spatial planning.

- **Searching, downloading and processing free GIS data**

This task includes desk research for new GIS layers (shape and raster formats) in open and free available platforms providing GIS data such: EMODnet, Copernicus[39], GEBCO[40], Eurostat (GISCO)[41], EUNIS[42], Ministry of Environment and Water (MOEW)[43]. As an example, a new data for dredging activities in Bulgarian port were downloaded from the EMODnet portal. Data for bathing water in Bulgaria, density map of shipping activities, cables in Black Sea waters, etc. As some data is in tabular format, they were proceeded in GIS environment in order to be used for visualisation, mapping and spatial geospatial analysis.

- **Work on GIS database update**

This task includes producing new GIS layers, using new available data from National Statistical Institute (NSI), paper maps (Nautical maps), reports, etc., in order to visualize and easily and precisely analyse environmental conditions and current maritime uses/human activities. For example, the data for tourist activities of Bulgaria, which should be proceeded in appropriate GIS formats for better analysis.

- **GIS database update and GIS model design. Work on a list and characteristics of data, provided and available**

All open source data available created news GIS layers and were added to established GIS database. This is continued process, as spatial data are needed for LSI study, focused on coastal erosion in cross-border area.

In addition to the methods used for data collection and processing, all appropriate analytical and statistical methods for comparative analysis, ideas generation and development prognosis have been applied jointly with the specific methods for different thematic areas and economic sectors.

Among the problems and gaps in data collection and processing, many discrepancies were found in the data on maritime spaces, maritime traffic, tourist visits and stays. The Covid'19 pandemic made the situation more unstable and unpredictable. The many institutions that maintain a database, related to the Black Sea Basin and its uses, find it difficult to communicate with each other, to exchange information and data. Different networks and data formats, the reluctance of institutions to provide information and data or the insufficient capacity to keep the data up-to-date are among the main reasons for the difficult and slow analyses, the uncertainty in the accuracy of the data, the lag in the adequate implementation of maritime spatial planning. This affect the monitoring and control process of the national

[33] https://scholar.google.com/
[34] https://www.sciencedirect.com/
[35] https://www.researchgate.net/
[36] https://www.eea.europa.eu/data-and-maps
[37] https://www.bsbd.org/
[38] https://www.nsi.bg/
[39] https://www.copernicus.eu/bg
[40] https://www.gebco.net/
[41] https://ec.europa.eu/eurostat/web/gisco
[42] https://eunis.eea.europa.eu/
[43] https://www.moew.government.bg/en/ministry/

maritime spatial plans implementation, being also necessary to up-to-date the information of the provided and resulted indicators for the assessment of the MSP implementation.

ROMANIA

The work done by the Romanian partners for the database production consisted in identifying available data for the maritime and the coastal areas, with a focus on indicators that are easily obtainable and collected on a regular basis. Official data requests were sent by the Ministry of Public Works, Development and Administration to public institutions and to relevant stakeholders outside of the public administration sector.

The datasets collected for this project reflect the current situation of the maritime space in Romania, focusing on yearly datasets that cover 2017, 2018 or 2019, with the purpose of integrating in the GIS database, to be used for maps and plans elaboration, as an essential part of the analyses. In some domains, a medium value of these last three years was used, excepting the coastal and marine information concerning threats on geo-morphological data which need around ten years period for detecting trends, not changed since the last reporting.

Regarding the data sources, most of the data have been compiled by the project partners from their own sources (data processed for the mentioned period) including from different scientific projects that were approved by the Romanian ministries which coordinated the research projects. In addition, the most recent public datasets from open sources were used, as well as data from different annual reports.

Other data were provided by research institutions outside the MARSPLAN Project, different companies, including ancillary documents, articles, as well as statistics. The chapters of legislative and governmental information are the contribution of the MPWDA. This Study was conducted based on the latest available data. Upcoming information that was requested from relevant institutions will be integrated in the final database to fill existing data gaps and to address the issue of themes that are not covered yet in the database.

Because of this, there can be several differences between the kind of reporting for the two countries, each one having a specific legislation and different statistics systems. Most of environmental data are from NIMRD and GeoEcoMar own measurements.

The study remains in progress because data are continually updated with the latest information on several themes, thus it is important to have comprehensive datasets for the maritime space that can contribute to elaborate the Maritime Spatial Plan.

BOX 17. Marine environmental status - updated information referring to the following sub-topics for both Romania and Bulgaria:	
Environmental protection (*Nationally designated marine protected areas and NATURA 2000*)	Is based on the information from the EEA or the GIS database https://ec.europa.eu/environment/nature/natura2000/db_gis/index_en.htm and the national environmental bodies such as ExEA and NATURA 2000 network and open database in Bulgaria and Ministry of the Environment and NATURA 2000 network in Romania. The focus is to underline the marine protected areas and sites in the MARSPLAN-BS II for at least 12 nautical mile zones length.
Marine Habitats and Biodiversity	It comes from the new data and research projects and publications for the Black Sea region with a focus on those species and habitats, important for biodiversity protection.
Main living organisms and resources	Marine mammals, birds, fish and shellfish sub-chapters are presenting species distribution, population, trends, abundance – based on changes between the data which correspond to the previous assessment and the current one. The information and data set are updated for 2012, 2014, 2015 or 2016

• **Marine mammals**	- To assess the condition of dolphin populations, in 2019, monitoring activities were carried out in the marine space on ships board, boats, on oil platforms, also near shore and dams. This shown a kind of distribution.
• **Birds**	- The central Black Sea is particularly important for Yelkouan Shearwater (Red List, Vulnerable) during its non-breeding period, and the Romanian coast sees large numbers of birds passing through its marine area. Romania is also important for various gull and tern species, and overwintering seabirds and sea ducks, such as grebes, eiders, scoters, mergansers and the Common Goldeneye
• **Fish**	- Fish chapter is dedicated to the Black Sea stocks of the most important species taking into account the available data and information from research and monitoring. It is linked with the marine environment, biodiversity, regulations and restrictions
• **Spawning ground and nursery**	- Spawning ground and nursery result from the information gained during environmental status monitoring made in the Black Sea, according to the Marine Strategy Framework Directive; the analysis will further evaluate the achieved goals for a better status.
• **Algae and marine plants**	- Algae and marine plants chapter considered the available data after the period of 2012-2014, in order to identify their distribution areas and the potential impacts of pollution, eutrophication that led to reduction and disappearance of valuable species, as result of human activities effect
The invasive species possible to be described as natural resource are also included, but presented in the chapter the hazards and pressures (6.2.3), some species being also object of shells chapter, or maritime activities: fishing and aquaculture.	

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4. PRESENT STATE OF MARINE ENVIRONMENT

4.1. GEOGRAPHICAL AND PHYSICAL CHARACTERISTICS

4.1.1. Marine Geology

Dan Vasiliu, Glicherie Caraivan, Alina Spînu, Emanuela Mihailov, Dragoș Niculescu, Emil Nikitov

✓ *Existing Conditions*

Geographical and physical characteristics covers aspect related Marine Geology, Bathymetry and Hydrography / Oceanography**.** Taking into consideration the existing dynamics and slow changes in submarine geology and geomorphology the main topics for cross-border maritime spatial planning in this area have remained unchanged. The identification of suitable zones for the different sea uses and the maritime risks/conflict zones has remained a priority.

In BULGARIA

There are no changes in the marine geology for such a short period after the end of the MARSPLAN-BS project.

The Bulgarian Black Sea coast and the adjacent sea area are made up of the easternmost parts of three main morphotectonic units - the Moesian Plate, the Balkanids and the Srednogorska Zone. These structures form the coastal parts and gradually sink eastwards towards the seabed. The coastal and sea part is divided between four main geological structures, which are separated from each other by deep fractures.

The coastal and sea parts are divided between four main geological structures, which are separated from each other by deep faults. These are the Varna Depression, the Dolnokamchi Depression, the Stara Planina Zone and the Burgas Depression. The Bulgarian Black Sea coast with the shelf, the continental slope and the continental are part of the Black Sea deep-water depression. This large negative morphostructure was formed during the Paleogene and Neogene - Quaternary.

BOX 18. The Bulgarian Coastal Zones

The coastal zone of the border with Romania (Sivriburun) and Galata belongs to the Moesian plate. The length of the waterline is 158.79 km. The base of the plate is made of folded pre-Paleozoic and Paleozoic rocks, which are largely fault-block differentiated. Above the platform are established three horizontal sedimentary complexes: Caledonian - Hercynian (lower: Ordovician - Lower Carboniferous and upper: Carboniferous - Permian); Cimmerian (Triassic) and Alpine (lower: Jurassic - Paleogene and upper: Neogene - Quaternary). To the east, the Moesian plate continues on the shelf and reaches the continental slope.

South of the Varna Depression is the Lower Kamchia Depression. The area is located between Cape Galata and Black Cape to the south. Its length is 29.20 km. The Varna Depression occupies a transitional position between the Moesian Plate and the Stara Planina zone. The basis of the negative structure is made up of sharply sinking to the east (up to 7 km) Wallachian and Upper Cretaceous sediments, on which Middle and Upper Eocene sediments rest. The Lower Kamchia Depression is considered to be a fragment of an ancient, wider Black Sea basin and represents a continental slope from the Paleogene. To the east, it expands funnel-shaped, reaching the continental slope.

The East Balkan zone covers the eastern parts of the Stara Planina coast, between Black Cape and Cape Emine. It has a very heterogeneous, structural-block structure, which includes: Belene anticline; Dyulin decline; Heraclius anticline; Bane Depression and Emon Block. The main reason for this is the fault-fault processes in the past. A southeastern bend of the structures of the Eastern Stara Planina in the Black Sea, 10 km east of the coastline, is established.

The Sredna Gora zone is a linear mesoalpine, imposed island-arc orogenic zone, laid down through the Upper Cretaceous south of the Balkanids. Its characteristic feature is the wide spread of Senonian effusive and intrusive magmatism and flysch sedimentation. The main geological structures in the Srednogorska zone are the Burgas depression and the Mednoridsko-Strandzha region. The Burgas depression is located between Cape Emine and the town of Sozopol. In the northern and southern part of the Burgas syncline are located the Prosenech asymmetric graben and Burgas graben depression representing imposed-Quaternary depressions with pronounced manifestation of Quaternary and modern negative tectonic deformations, which determine the low relief and estuarine character of the coastal zone. The Mednoridsko-Strandzha region is dominated by the abrasion type of coast with a deep abrasion-structural underwater profile and a slightly sloping accumulative slope. They are formed on banks with strong fracture tectonics and block-tectonic structure, built of abrasion-resistant volcanogenic complexes. The Srednogorska area turns southeast towards the Western Pontides.

In ROMANIA

The Black Sea is located in an old basin, subject of tectonic activity that has generated over time an accentuated subsidence and the periodic isolation of the Black Sea from other seas. Currently, the coastal area around the Danube Delta is considered to be subsidence, which is about 1.5-1.8 mm per year (Panin, 1998).

An essential feature of the Black Sea is that it is the largest meromictic basin in the world, which means that the upper oxic layers do not mix with deeper water. This phenomenon is the result of the modern topography of the Black Sea basin and the significant rivers contribution. The rivers flow into the sea is colder, less salty ones and, less dense than the currents coming from the Mediterranean inflow. These waters float above the saltiest and densest entering from the Mediterranean. Due to the strong stratified vertical structure, a Cold Intermediate Layer (SIR) is maintained below the surface layer. The anoxic environment and the frequency of blooms could be influenced by changing water flows as a result of building of large dams and industrial capacities in all rivers catchment areas.

The area off the Romanian coast is characterized by a shallow continental shelf, which is the largest continental shelf in this sea, but the coastline is also exposed to a wide fetch input for storm waves in the northeast and east. The general orientation on the north-south direction of the coast, relative to the main direction of winds and storm waves from the northeast, also means that, the coastal area is directly exposed to the harshest conditions, on a large scale. The energy varies due to the differences in the orientation of the shoreline and the bathymetric regime near the shore, as well as the protection determined by the different coastal structures. It is mentioned that the terrestrial part of the Romanian coast is soft and almost flat, Bulgarian one is strong.

4.1.2. Bathymetry

Dragoș Niculescu, Dan Vasiliu, Glicherie Caraivan, Laura Alexandrov, Emil Nikitov

✓ ***Existing Conditions***

In BULGARIA

There are no changes in the bathymetry of the Bulgarian marine spaces for such a short period after the end of the MARSPLAN-BS project.

In the period 2017-2019, a new geomorphological map of the Bulgarian continental shelf in M 1: 100 000 was prepared by the IO-BAS within the framework of work package 4, "*Quaternary geology and geomorphology*", of the European Monitoring Network project. Data on the marine environment - Lot 2 Geology (EMODnet Geology).

As a basis for making the geomorphological map, a bathymetric model was developed using the composite digital models of the bottom relief (CDM).

The most important features of the morphology of the Bulgarian continental shelf based on the new geomorphological map in M 1: 100 000 (Figure 8-9) are the following:

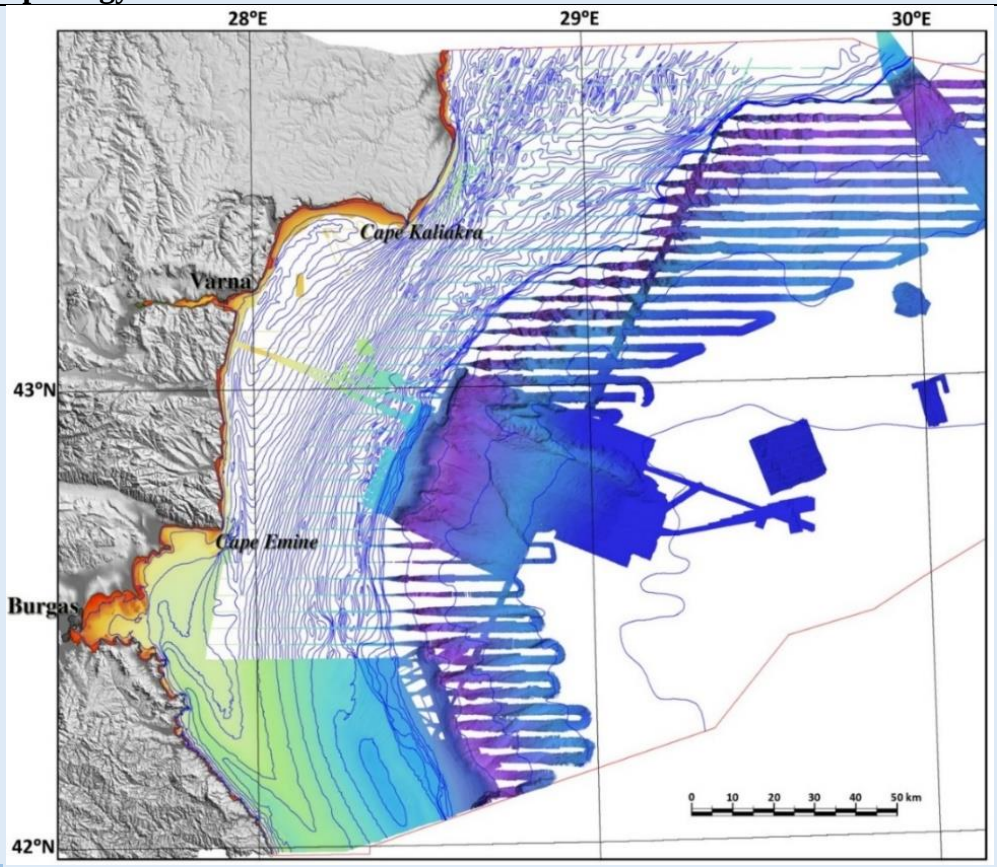
BOX 19. The Bulgarian continental shelf

The Bulgarian continental shelf (BCS) is characterized as a relatively shallow (average depth of about 130 m, with a maximum - up to 200 m) part of the bottom, slightly dissected, abrasion-accumulative plane, located between the coastline and the border with the continental slope. The BCS is a gradually narrowing from north to south water area with latitudes along the parallel of 90-100 km to the north along the water border with the Republic of Romania, 60-70 km in its central parts on the parallel of the city of Varna, to 45-50 km against the mouth of the Rezovska River to the south.

The end of the shelf and the beginning of the slope is expressed either by a clear knee-shaped refraction of the relief of the bottom, or by its obliquely convex shape, but always by a definite change of the slope of the bottom - by the relatively small regional slope of the shelf plane (of 0.1-0.3°) to 3-5° and even tens of degrees of inclination of the continental slope. The boundary between these geomorphological elements is traced along the front edge of the peripheral shelf terrace at depths of 130-170 m, although at greater depths

sharper bends can be found in the relief of the bottom. To the east of this border, the continental slope is arched.

Geomorphology



Sources: IO-BAS, 2019

Figure 8. Bathymetric model of the EEZ, Bulgaria

Geomorphologically, in the continental shelf there are three separate zones: coastal, central and peripheral. The main distinguishing feature between the zones is the different hydrodynamic regime and as a consequence, different manifestation of abrasions and accumulative processes, ie. the specific morphology and geological manifestation of the seabed is in the most direct dependence on the modern sedimentation and mass transfer processes taking place in the different zones of the shelf.

The meridional zonning of the shelf is determined by the hydrological regime along the coast, distinguishing the northern shelf from the border with the Romania in the north to the parallel of Varna to the south) with dominant abrasion processes and the southern shelf (to the border with Turkey) with predominant accumulative forms of the bottom relief.

Coastal area

The inner, coastal area is located along the modern coastline. The 23-25 meter isobaths are considered to be the marine boundary of this zone. The most important feature is that it is subjected to active wave action, thus the processes of abrasion and accumulation are present at the same time. Its appearance is largely influenced by the geological and geomorphological features of the adjacent land and extensive areas of intense abrasion with a cliff shore, adding landslides in many places, interrupted by small bays with increased accumulation and vice versa, long beaches alternate with insulated abrasive noses.

Geomorphological units

Geomorphological units (towards the coast): 1. Flattened sloping plane at the beginning of the continental slope with landslides; 2. Shelf border - continental slope; 3. Peripheral shelf

terrace; 4. Submerged paleo coastal zone; 5. Area with relict dunes and separate dunes; 6. Peripheral uplift with marked axes of ridges, valley and dunes; 7. Peripheral shelf depression; 8. Uneven sloping shelf plane; 9. Flattened inclined shelf plane; 10. Different morphological units of the Northern shelf; 11. Active faults (designed on the seabed). The common finding for both topics is the accumulated knowledge for the marine spaces close to the coast, but limited information and knowledge for the remora areas in the Black Sea.

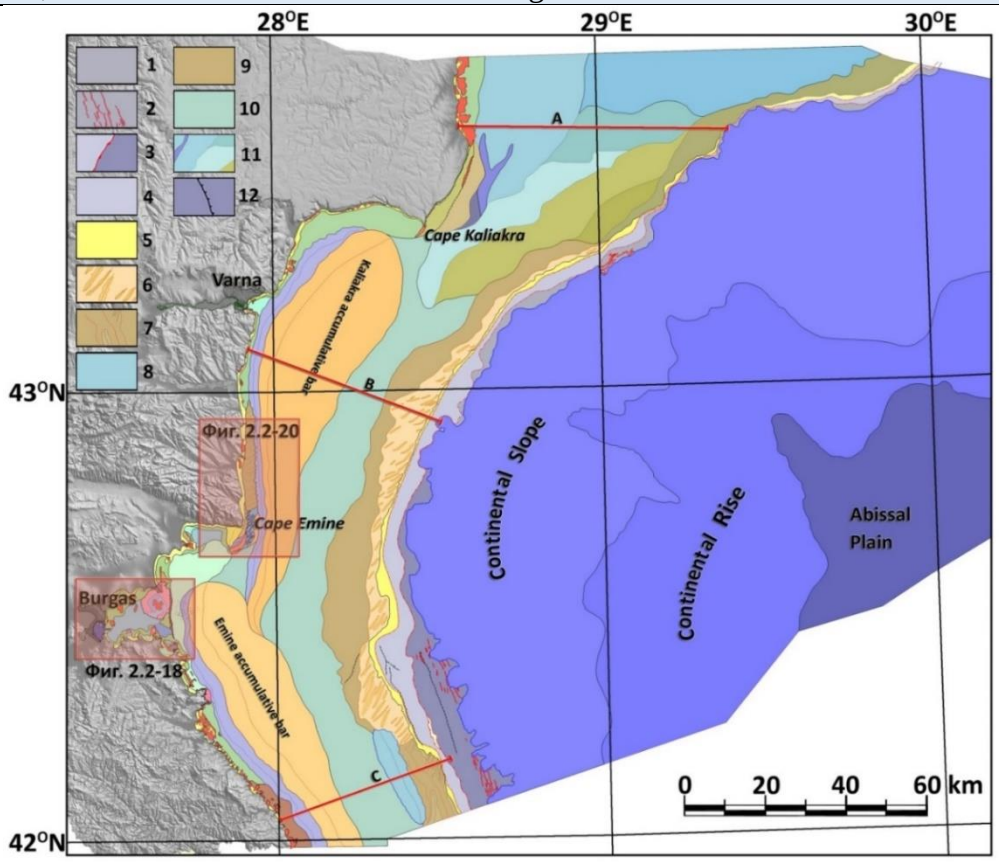


Figure 9. The morphology of the Bulgarian continental *(Sources: IO-BAS, 2019).*

The diverse and complicated relief of the terrace complex in the active coastal zone is associated with the differences in the genesis of the abrasion and abrasion-accumulative forms as a result of the selective abrasion of the rock formations of different degrees of wave resistance**.** The colorful picture of morphological forms has coastal slope, followed by accumulative slope; leveled terraces; sloping plane at their foot; the steep slopes of the main cliffs along the south coast and around the islands; numerous rock reefs and banks. To the north (Cape Shabla-Cape Kaliakra) has a more specific morphological appearance due to the nature of the land's geological-geomorphological structure of the. Its geomorphology is two-fragment of coastal and accumulative slopes, which have a greater slope than other areas along the coast and pass directly into the uneven abrasion plane of the shelf.

In ROMANIA

BOX 20.	**MARINE GEOLOGY**
Coastal Geomorphology,	The Romanian coast (lenght of 243 km.) is divided into two main units:***Northern unit*** (part of the Danube Delta Biosphere Reserve) with ca.160 km lenght, consisting of fine sands brought by the Danube and redistributed in the sea by waves and currents. There are three main coastal sedimentary cells in front of the Danube Delta, from north to south: a.Kilia sedimentary cell corresponds to the front of the Kilia secondary delta. The southern boundary of this cell is represented by the jetties of the Sulina Canal The

	jetties, extended offshore, block the sediments transported by the longshore currents from the north; thus representing an impermeable boundary between Kilia and Sulina–Sf. Gheorghe cells; b. Sulina–Sf. Gheorghe sedimentary cell. Most of the sediments from this cell are Danube – born alluvia, less than 10% being represented by the calcareous fraction resulted from shell fragments; c. Zatoane–Midia Harbor sedimentary cell is mainly represented by the barrier beaches that separate the Razelm–Sinoe Lagoon system from the Black Sea. Most of the sediments from this cell are Danube–born alluvia;– most of them being remobilized by erosion of fossil littoral bars. The southernmost few kilometers of this cell are represented by the first outcropping of cliffs at Cape Midia – the headlands being separated by long pocket beaches. Sediments in the southern limit of this cell is represented by the northern jetty of Midia Harbor.
	Southern Unit (ca. 80 km length) is located between Cape Midia and Vama Veche. This unit consists of cliffs, separated by low sandy shores (Mamaia, Eforie, Costinesti, Olimp - Mangalia). The coastal sedimentary cells included in this unit are: a. Midia – Constanta. The northern and southern boundaries of this cell are represented by long impermeable jetties built for Midia and Constanta harbours protection. Three coastal cells are also separated here. b. Eforie – Cape Tuzla c. Cape Tuzla – Mangalia. d. 2 Mai – Vama Veche, extending also in Bulgaria.
Shelf Geomorphology	***Inner shelf*** **-** The Romanian Black Sea inner shelf is very well defined, having a width of 10–15 km in the northern area and about 1–5 km south of Constanţa. Modern sediments locally mask the relict geomorphologic structures. In north, the bottom slope varies within 1.1–4.0 ‰, while south of Constanţa, the relict structures are better preserved, especially the submarine terraces, where the slope is steeper (1.6–60 ‰). Eastwards, the inner shelf boundary is marked by the 27–30 m isobaths.
	Outer shelf **-** develops a very gentle slope (below 1, 0 ‰) extending eastwards from 27-30 m isobaths to the edge of shelf (isobath of ca. 200m). (Figure 10) The Romanian inner shelf stands out as the shallow area, which receiving clayey and silty sediments supplied by the Danube River. Moving as suspended load, the sediment flux goes beyond the area in front of the Danube Delta, but it does not reach the eastern boundary of the shelf. Under the influence of the dominant currents the clayey sediment flux moves southward toward the Bulgarian shelf, keeping closer to the shoreline. Located outside the area covered by the Danube fed sediment flux the Romanian outer shelf represents an area practically deprived of clastic material. Within this sediment-starved shelf area the condensed sediment accumulation is of biogenic origin, consisting of organic pellets on relict sediments or shell concentrations.
Coastal sediments	***Northern unit (Danube Delta Front)*** Three distinct populations can be identified on a grain size cumulative curve, having different rates of participation in the sediments composition. - clay and silt fraction - sandy fraction – the most important participation (98 – 99% in northern areas and 50 – 60% in southern areas); - calcareous fraction (shells, large shells fragments).
	Southern unit (Cape Midia - Vama Veche) Grain size characteristics in beach deposits depend on several factors, such as the materials` source area, the prevailing hydrodynamic regime, coastal morphology, etc. For both the northern beaches (Cape Midia–Mamaia Bay) and the southern ones (Eforie–Vama Veche) a trend can be observed: an accumulation of poorly sorted sediments in the backshore area and well sorted in the submerged beaches.
Geochemical characterization	Marine sediments may be regarded as a system with three components: terrigenous material, originating from the continental weathering of rocks; calcium carbonate; and organic matter. The mixing proportions of these three components determine the chemical composition of the sediments. The chemical composition corresponds to sediments varying from purely terrigenous (<10% $CaCO_3$ in the near-shore coarse sediments and 10-30% $CaCO_3$ in terrigenous muds from the area under the Danube influence) to carbonated ones (up to 80% $CaCO_3$). The TOC contents, reflecting the

	participation of organic matter in sediment constitution, vary from <0.5% in coarser, well oxygenated sediments, to 2-3% in finer shelf sediments and 3-5% in the abyssal ones (coccolithic ooze), with maximal values (5-15%) in the sapropelic mud.

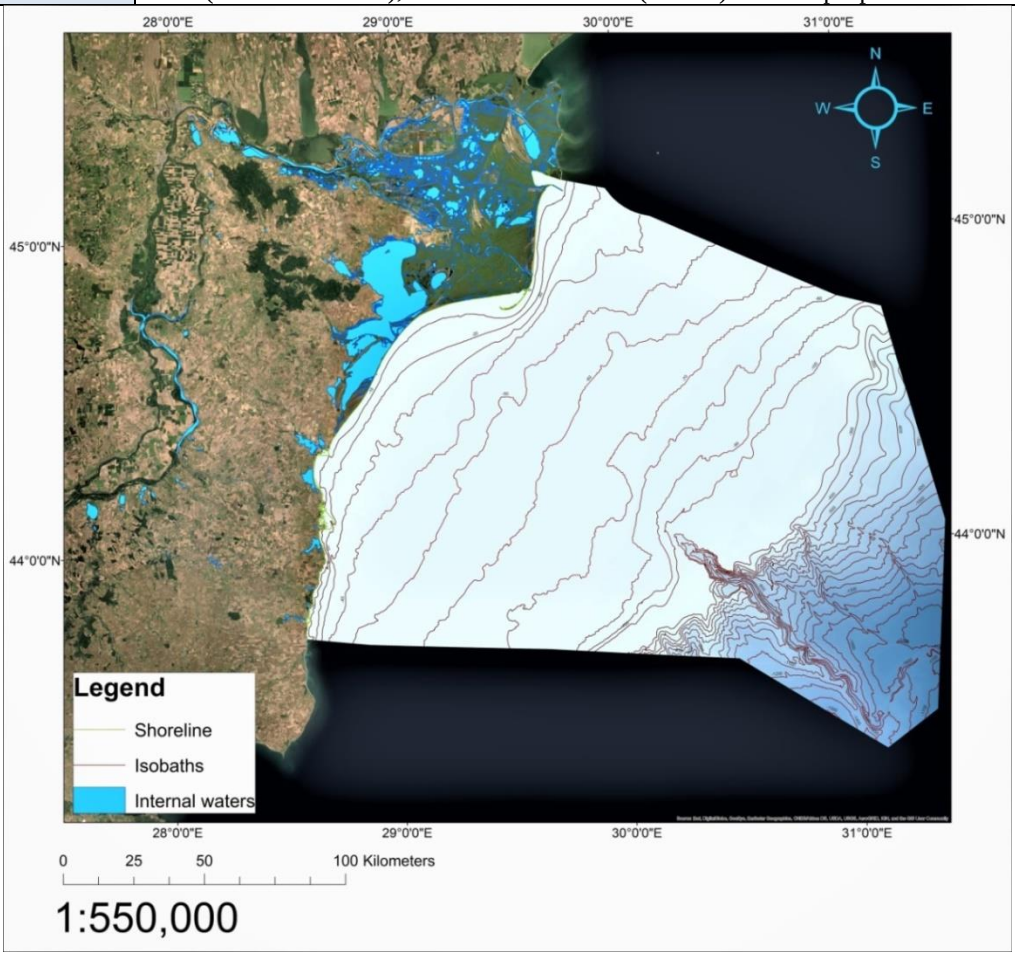


Figure 10. Bathymetry and hydrographical map Romanian Black Sea coast (*NIMRD*)

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4.1.3. Hydrography/Oceanography

Emil Nikitov, Hristo Stanchev, Emanuela Mihailov, Dragoș Niculescu, Dan Vasiliu

✓ *Existing Conditions*

The Black Sea is the biggest inner sea on the planet with a surface of 423 000 km^2, volume of the sea masses 555 000 km^2, average depth 1315 m and deepest point 2 258 m. It is semi closed and through the Kerchen Strait is connected to the Sea of Azov, through the Strait of Bosphorus - with the Marmara Sea. Its coastline has a total length of about 3 400 km. The Black Sea is a remnant of the ancient Tethys Ocean, which during the Mesozoic era connected the Atlantic to the Indian Ocean. In the central part of the pool, the sedimentary complex sits directly on a basal layer - that is, the granite layer is absent.

The catchment area of the Black Sea Basin has an asymmetric shape and covers large parts of Central and Eastern Europe and is 4.4 times the area of the sea. The large (353.3 km^3/year)

and smaller (72 million t/year) run-offs of rivers also cause a large cross-border transport of biogenic substances and pollutants into the Black Sea. As a result of the significant amount of river water entering the Northwestern Part of the Black Sea, its level has a slope in the south direction and is 53 cm higher than the level of the Marmara Sea.

Other specific characteristic of the Black Sea basin is the unique two-layer thermo-haline water stratification. The acute halo-pycnocline formed, located at a depth of 50 - 100 m, separates the surface and deep waters layers. The abrupt density stratification, accompanied by poor vertical circulation and mixing, prevents the ventilation of the water under the permanent pycnocline. The organic matter, which is constantly sedimenting and decomposing, has led to the development of persistent anoxia and high concentrations of hydrogen sulfide below a depth of 120-150 m over the last 7,000 years. Another distinctive feature of the Black Sea is the presence of a permanent halocline - a layer with high salinity gradients, located between 120 and 200 m depth, reflecting with its depth the Balance between the surface dispersed and the deep-water relatively salty layers.

These are only some of the factors that determine the lower exchange rate of seawater and its slower and more difficult treatment, the relatively higher sensitivity of ecosystems and the poorer biodiversity in the Black Sea. Some of the identified problems can be solved only with the joint efforts of specialists from other countries in the region.

In BULGARIA

➢ Coastal Hydrographic network of Bulgarian

BOX 21. The river network in the Bulgarian Black Sea coastal area

The river network in the Bulgarian Black Sea coastal area is formed by rivers with small catchment, short length and minor amount of river water discharge (Figure 11). There is only one exception: the longest Bulgarian Black Sea River - Kamchia. Some of the rivers flow directly into the Black Sea, while other flows into numerous coastal lakes and marshes. Another important feature of the Bulgarian Black Sea Rivers is their low altitude of watersheds. Bulgarian Black Sea coastal area is characterised by weak (15-60 mm) and very weak aquiferous (less than 15 mm), as the rivers at the northern part of the coast has smallest aquiferous (Ivanov et al., 1961; Galabov, 1982).

The river systems and the river runoff module

The river systems and the river runoff module are directly linked to and depending on the climate and bedrock geology, therefore the runoff of Bulgarian Black Sea Rivers varies a lot. In the northern coastal part, there is a high proportion of subsurface water component (about 70 %). Batova, Devnya and Provadiyska Rivers are characterized with typical karst aquifers regime. In the middle and southern coastal parts, the rivers are prevailing rainy runoff regimes (80 %). The runoff module increases from north to south. In the northern part of the coast it is less than 1/l/sec/km^2 and in the southern parts of the coast reaches up to 15/l/sec/km^2. The lowest river module flow in the northern coast is due to the small amount of precipitation (here is measured the lowest rainfall in Bulgaria), flat terrain and the presence of water-permeable ground surface of loess and limestone (Cheshitev et al., 1992). The maximum river flow also varies. In the northern part of Bulgarian coast it is in the spring, while in the middle and southern parts - it is in the winter, and this corresponds to the maximum rainfall in this part of the coast.

BOX 22. Generally, Bulgarian Black Sea rivers can be subdivided as follows

Dobrudzha rivers	The largest rivers are Batova, Shabla and Izvorska. From all Dobrudzha rivers that flow directly into the Black Sea, the largest is Batova River (39 km long and 339 km² catchment area).
Watershed of Provadiyska River	The largest rivers are Provadiyska, Devnya, Kriva and Glavnitsa. The catchment area of Provadiyska River is 2,132 km² and it is 119 km long. The river originates from the hilly elevation 426 m, flows in a south-eastern direction into the Beloslav Lake.

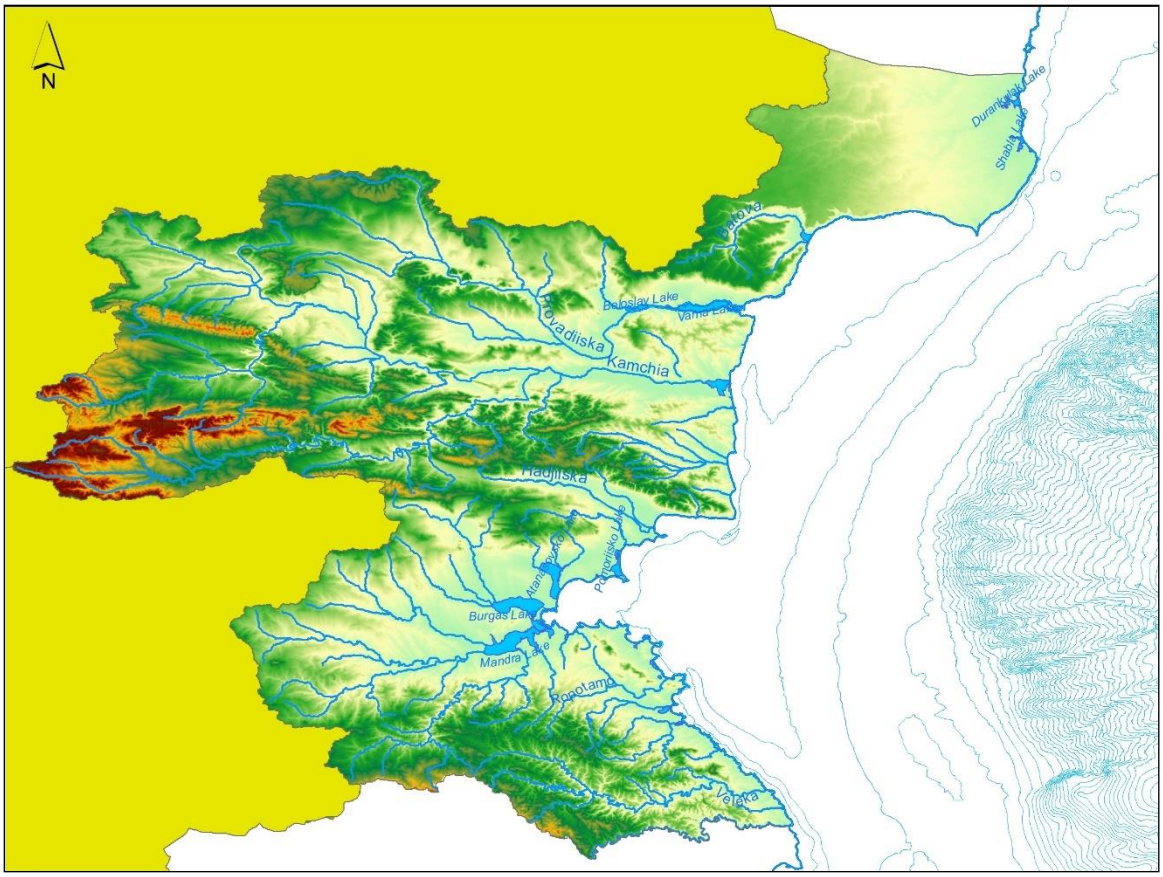

Figure 11. Hydrographic network in Bulgarian Black Sea area (*CCMS)*

Kamchia River	It flows eastwards in a wide valley between the Avren plateau on the north and Stara Planina Mountain to the south. In the valley, it is passed the border between the Danube Plain and Fore-Balkan. The low part of river stream is swampy and overgrown with dense forests (named Longoz). It flows into the Black Sea close to the Sea Resort "Kamchia". The catchment area of the Kamchia River is 5,358 km². Near the river mouth the longest Bulgarian Black Sea beach (12 km) named Kamchia-Shkorpilovtsi is located.
South Kamchia River	It has several smaller rivers flow directly into the Black Sea: Fandakliyska, Dvoinitsa and Vaya.
Rivers in Burgas Valley	They are Hadzhiyska, Aheloy and Aytoska, flowing directly into the sea and others in the Burgas Lake. These rivers are relatively short, with small catchment areas, with high density of the river network. In the southern part of the Burgas Valley there are few rivers, such as Rusokastrenska, Sredetska, Fakiyska, Izvorska, Marinka, which flow into the Black Sea through the Lake Mandra.
South of Burgas Valley	The main rivers are Ropotamo, Dyavolska, Karaagach, Veleka; and Rezovska River on Turkish border. Ropotamo River is 48.5 km total length and 249 km² catchment area is. Veleka River rises in Turkish territory: with 147 km length and 995 km² catchment area. The border river Rezovo has 112 km total length and 738 km² catchment area (183 km² on Bulgarian territory). The January-April water high formed 64% of annual runoff, during summer being extremely shallow, due to the specific local climate, under the influence of the Black, Aegean and Marmara Seas.
• **Coastal lakes wetlands**	Coastal lakes in Bulgaria, depending on their origin are divided into two types: estuaries and lagoons (Ivanov et al., 1964).
• **Lagoons**	They are coastal stretches of shallow salt water, virtually cut off from the open sea by barrier sand beach or sand spit, mostly characterised with shallow depth. Such lagoon type lakes in Bulgaria are Pomoriysko and Atanasovsko Lakes, located in the Burgas Bay (Georgiev, 1991). Their depth reaches 1 to 3 m and are surrounded by low coast. In very dry summers its salinity reaches 250‰, these lakes are, from centuries, subject of salt production through evaporation. In origin, the swamps of Alepu, Arcutino and

	Stomoplo can be classified as lagoons. Dobrudzha lagoons - Balchishka Tuzla, Nanevska Tuzla, Shabla Tuzla have special features; they are small, shallow and salty lagoons. Their surface is below the sea level, especially in the summer; the bottom is covered by thick layer of mud. Balchishka and Nanevska Tuzlas are formed in areas of landslides and can therefore be considered as lakes.
• **Firth Lakes**	Durankulak, Ezerets and Shabla Lakes are located in the northern part of Bulgarian coast. West from the Bay of Varna two artificially interconnected by navigation canal lakes, Varna and Beloslav are located (Stanchev et al., 2010) and Burgas with Mandra Lakes (Uzungeren) are located westward of Burgas Bay. Varna Lake has the largest volume (about 170 million m^3) and it is the deepest coastal lake in Bulgaria – up to 19 m. It is narrow and elongated in a west-east direction, with 15 km length and 1.3 km width average. Burgas Lake has the largest area of 27.6 km^2, but the shallowest (1 m depth), separated from the Sea by a narrow sandy strip and low and swampy shores.
• **Marshes**	Typical marshes occur in Kamchia and Ropotamo rivers, as type of wetland, where water covers ground for long periods of time, at some spills on rivers in their lower courses. They are treeless, being dominated by grasses and other herbaceous plants. During some summers, they could reduce the water level and even dry up.

- Most coastal lakes, lagoons and marshes in Bulgaria are also important wetlands and Ramsar sites. Bulgaria is among the first countries, joined the Ramsar Convention - the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (adopted by participating parties in Ramsar, Iran on February 2, 1971). This is the first international treaty for the conservation of biological diversity with the aim of conservation and wise use of wetlands as waterfowl habitats, recognizing them as an international resource (environmental conditions and the relative species of animals and plants). In List of Wetlands of International Importance, Bulgaria is represented with 11 wetlands, covered surface area of 35 488 hectares – "Atanasovsko Lake", "Belene Islands Complex", "Durankulak Lake", "Ibisha Island", "Lake Shabla", "Poda", "Pomorie Wetland Complex", "Ropotamo Complex", "Srebarna", "Vaya Lake" and "Dragoman Swamp Complex" (Black Sea Wet Initiative).
- Varna and Beloslav lakes are the most polluted mainly due to the industrial development and insufficient protection measures in the recent past. Combined initiatives for cleaning the lakes and underwater heritage exploration will joint measures for improving its state.

BOX 23. Varna-Beloslav lake complex

The larger lakes at the Bulgarian Black Sea coastline, each distinguishes with a specific hydrological regime and parameters. Varna Lake is the deepest and the largest, a firth formation at the river valley under a rising sea level during the Holocene, when it was divided from the sea by a large sandy spit. Varna Port has a navigation canal (since 1900s) between Varna Lake and the sea, while in 1920s it was artificially connected to the inland Beloslav Lake by other navigation channel. Since the beginning the two lakes have been subject of many direct human impacts: digging of three navigation channels; situating a number of ports with different functions; constantly performed dredging activities, etc. Significant alterations have been caused by increased anthropogenic impacts. As a result, the lakes were irreversibly altered in areas, water volumes, hydrological parameters and ecology

The Varna-Beloslav Lake complex has a 5450 m long navigation canal (Canal-2) and a Varna Lake - Black Sea with a 3000 m long navigation canal (Canal-1). The lakes of Varna and Beloslav are related to the Black Sea catchment basin, with a watershed area of 2 611 km^2. A few rivers and smaller streams disgorge into the Varna Lake, among which the largest are rivers of Devnya and Provadiyska that discharges near the western shores of Beloslav Lake. From hydrological point of view the watershed of both lakes belongs to the area with continental climatic influence on the regime of the river water runoff and it is a sub-area with a prevalence of rainfall nourishment. The northern coast of Varna Lake and catchment area of Devnya River are related to the region with prevailing influence of underground nourishment. The module of annual runoff is in the range between 0.5 and 1-2 $l/s/km^2$, with exception of Devnya River with a module of annual runoff up to 4 $l/s/km^2$. This increase could be associated with additional inputs from the Devnya karsts springs. Varna Lake is divided from the sea by a 2 km wide sandy spit. (Figure 12)

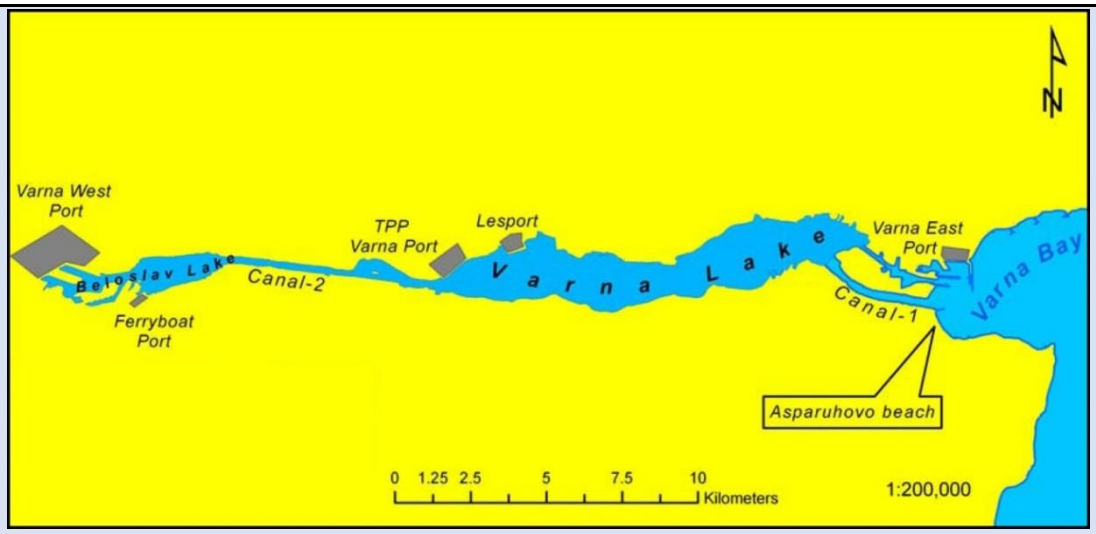

Figure 12. Varna-Beloslav lake complex *(CCMS)*

Source: Stanchev, H., Peychev, V., Palazov, A., & Stancheva, M. (2010**).** *Long-term alterations to the Varna-Beloslav Lake complex due to human activities* (Bulgarian Black Sea coast). In Conference on Water Observation and Information System for Decision Support. Balwois (Vol. 4, pp. 1-7).

In ROMANIA

➢ Coastal Hydrographic network of Romania

The Romanian coast representing 6% of the total length of the Black Sea coast. The Romanian coast has approx. 80% low altitude beaches-beaches and approx. 20% high shores – cliffs; the northern sector represents 68%, and the southern, 32%.

The surface of the Dobrogea-Littoral basin is 11,809 km². It consists of a counties waters network of Constanta, Tulcea and the big island of Braila. It has of 0.1-0.3 km / km2 density (excluding the Danube Delta). It is the lowest in the country, due to short rivers, tributary to the Danube or to the coastal lakes.

The state of coastal waters at the Romanian coast is under Danube River impact, with cumulative pressures from the entire Danube basin (Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Romania, Bulgaria, Moldova, Ukraine), combining the contribution of pollutants from NS sea currents (Ukraine) and of other processes taking place at the Black Sea level.

Danube
• is the second largest river in Europe, after the Volga of the Russian Federation with 2,840 km length and 817,000 km2 catchment area • has 267 km out of 1075 km on the Romanian territory • has an average flow of 6,350 m3 / sec. at the entrance to the Delta • with a flow of 5,000-9,000 mc./sec., it transports annually, 50 million tons of alluvium on average, (approximately 8 times more than the Tiber and 20 times more than the Rhine). • Its flow is distributed on the 3 arms: Chilia 58%, Sulina 19%, Sf. Gheorghe 23%.
Danube Delta
The hydrographic network of the Danube Delta is complex from a geographical, economic and tourist point of view. It ensures the water supply of the lakes, as well as the navigability. This hydrographic network includes: the branches of the Danube, the lakes, the ponds, the swamps, the garlands, the canals. • 4 Branches of the Danube, Chilia (120 km), Sulina (63 km) and Sfantu Gheorghe (69.7) km have mouths in the sea; the 4th, the Tulcea arm, is delimited between Chilia and Sfantu Gheorghe.
It is 2.5% of Romania's surface, 22nd place in the world and has the 3rd place in Europe (after Volga and Kuban). It is one of the largest wetlands in the world, as a habitat for waterfowl. It has 8th place in the over 600 wetlands of the Ramsar Convention and it is the largest compact area of reeds on the planet

(1,560 km2), having 30 types of ecosystems in total, and can be called a real museum of biodiversity.

The lakes constitute an important morphohydrographic category in the whole Danube Delta: 668 lakes totaling 31,262 ha in 1960 (9.28% of the surface of the Danube Delta). Following the drainage action for agriculture, the total number decreased in present, to 479 lakes larger than 1 ha; their total area reached 25,666 ha (7.82%). The fluvial, deltaic and coastal lakes (as Razim, Dranov, Goloviţa, Zmeica, Ceamurlia, Babadag) are natural water resources with importance for fishing-fisheries, communication means (through numerous channels) and leisure or water supply for the population. The main lakes, are: Razim (41.5 thousand ha), Sinoe (17.2 thousand ha), Smeica (5.46 thousand ha), and Dranov 2.17 (thousand ha).

The hydrography of the Danube Delta also includes the maritime area which corresponds to the coastal belt located along the coast, at 10-15 km lengh from the coasts, with a depth of less than 25 m, influenced by freshwater flows.

- The Danube Delta includes areas with full protection regime (18), buffer zones (13), economic zones and ecological reconstruction zones.
- Physical-geographical units, are: *Maritime Danube* between Galati - Sulina sector; *Floodplain* between Isaccea - Tulcea sector; Murighol Saltings; Razim-Sinoe lagoons complex.

➢ Hydrography / Oceanography in Romania

BOX 24.

Sea level

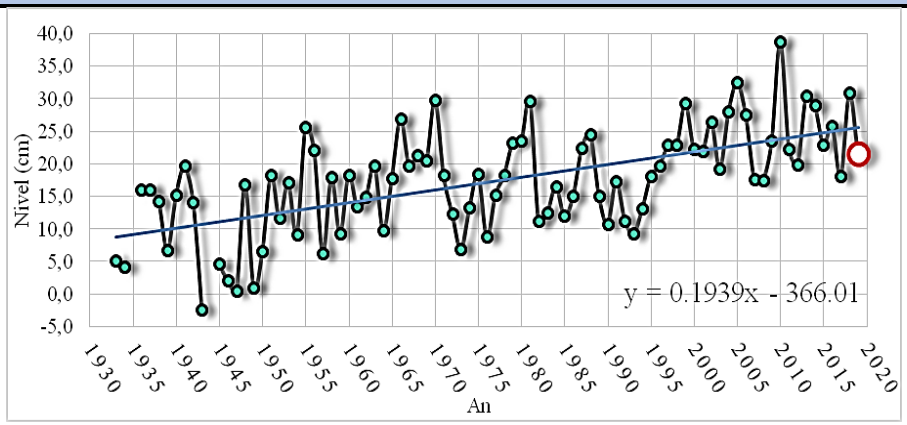

Figure 13. Sea level fluctuations,1933–2019 yearly means *(NIMRD)*

Sea level variation at the Romanian Black Sea coast is strongly influenced by the meteorological and hydrological factors; the tide is too low to be considered. The Figure 13 shows the sea level observations at the Constanta port gauge (OTT type). In 2019, the sea level has a yearly mean of 21.55 cm that means an increase as compared to multiannual mean of 17.41 cm (for the period 1933-2019). The maximal value of 44 cm was recorded in June, while the minimum (3.4 cm) was observed in November, which is in accordance with the Danube's flow data for 2019, measured at Isaccea (Figure 14). The long term variation of the sea level at the Constanta port is similar to the global variation with an annual increasing rate of 1.9 mm/year.

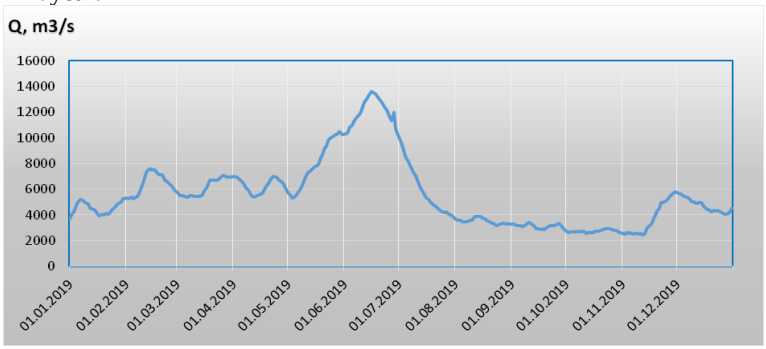

Figure 14. The Danube's flow seasonal fluctuation in 2019 *(NIMRD)*
(*http://www.inhga.ro/web/guest/diagnoza_si_prognoza_dunare***)**

The Danube's runoff, together with physical processes (upwelling) and meteo-hydrological

regime strongly influence the oceanographic features in the Romanian Black Sea shelf waters. Sea surface temperature and salinity are shown in the Fig.14

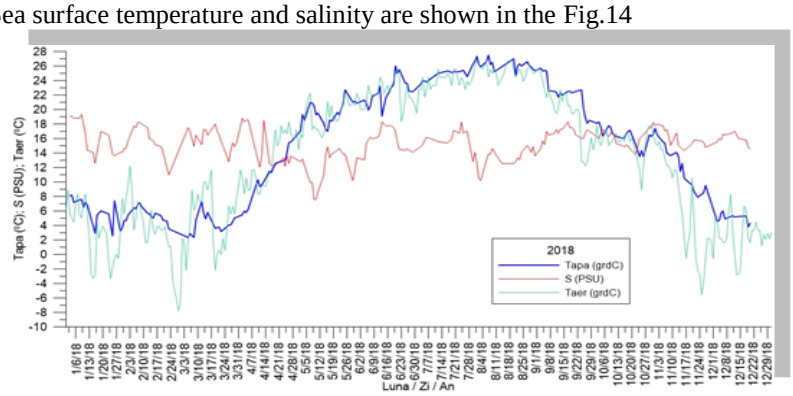

Figure 15. Daily values of air temperature sea surface temperature and salinity at Constanta in 2018 (*https://giovanni.gsfc.nasa.gov/giovanni/*),

The sea surface temperature measured in 2018, at Constanța, showed a yearly mean of 15.1° C), with 2.8°C higher than the reference period (1959 - 2017). The maximum daily value (27.5 °C) was measured in August, in accordance with the highest air temperature recorded during that period. Sea surface temperature (1959 – 2018) shows a slight increase (ca. 0.024 ° C / year). (Figure 15)

Currents

Recent data (2018 – 2019) collected by NIRD GeoEcoMar from its Black Sea Euxinus System, which consists of three oceanographic buoys moored at ca. 120 km offshore the Romanian Black Sea coast are presented in the table below (Table 2).

Table 2. Water current amplitude [cm/s] and dominant direction (from July 2018 through June 2019) - EuxRo03 (south of the Romanian shelf)

Year	Month	Mean	Min	Max	Dominant Direction (True North)
2018	July	11.2	0.5	29.8	110° SEE
2018	Aug	12.9	0.7	41.5	172° SSE
2018	Sept	13.1	0.2	65.5	148° SSE
2018	Oct	12.7	0.3	38	170° SSE
2018	Nov	15.3	0.4	54	190° SSW
2018	Dec	9.1	0.1	39.5	157° SSE
	2018	12.2	0.1	65.5	170° SSE
2019	Jan	11.5	0.6	50.1	167° SSE
2019	Feb	12.8	0.7	41.7	197° SSW
2019	March	10	0.5	28	119° SEE
2019	April	9.9	1.3	25.6	213° SSW
2019	May	17	0.7	43.2	150° SSE
2019	June	20.6	1.1	77	165° SSE
	2019	13.9	0.5	77	169° SSE

Waves

Wind and swell waves occur along the Romanian littoral coast. At the Romanian Black Sea shore, a calm sea state is encountered on average about 1.9% every year, more than 50.7% of the time the wind waves occupy the surface of the sea, swell waves make up for 20,1% and combined waves (wind and swell) 27.3%.

The wave directions can be divided into three main groups:

- Northerly directions: from N to ENE. This situation is encountered 102 days/year, mostly in wintertime. From these directions the largest wind speeds (34 and 40 m/s) blow from the north, and consequently, contributes to the largest average wave heights.
- Easterly directions: from E to SE. These conditions occur 27.8 days/year. Wind blowing from this direction produces the smallest average wave heights.
- Southerly directions: from SSE to WSW.

These conditions are covering 90.8 days/year. In good agreement with the seasonal changes in the wind regime, in the cold period (October - March), the waves with heights greater than 0.2m occur for more than 50% of the time, while in June they are less than 30%. Accordingly, the average height exceeds 1.0m in the cold period and is only 0.7m in June.

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4.2. MARINE ENVIRONMENTAL STATUS INCLUDING GAPS OF KNOWLEDGE / INFORMATION

In relation with the Marine Strategy Framework Directive (MSFD) (2008/56/EC) (amended by Commission Directive (EU) 2017/845) a set of Qualitative descriptors are used for the determination of good environmental status. They have been also taken into account for the spatial evaluation.

4.2.1. Environmental protection

(Nationally designated Marine Protected Areas and NATURA 2000)

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✓ ***Existing Conditions***

Marine protected areas are a key element of strategies dedicated to protection of coastal and offshore ecosystems in many parts of the world. In this context, Maritime spatial planning instruments may play an important role as spatial protection measures. These measures taken within the MPA networks shall give due consideration to sustainable development including social and economic impacts.

According to the international and European Union legislative guidelines, the network of marine protected areas must have an appropriate surface area to fulfill the assigned protection role and consist of protected areas connected by "ecological corridors" that ensure natural conditions for movement, reproduction and refuge of marine flora and fauna species.

Part of the NEN is the Marine Protected Areas (MPA), a key element of the strategies to protect coastal and shelf sea ecosystems in many parts of the world. They have been set up to maintain biodiversity, restore damaged ecosystems, and ensure sustainable development and to protect a representative range of species and habitats (OSPAR Commission, 2013). As well as protecting biodiversity, MPAs can help to ensure the long-term sustainability of fisheries (Weigel et al., 2014) and preserve coastal and marine sites of socio-cultural value (Börger et al., 2014).

Maritime spatial planning instruments may play an important role as spatial protection measures. MPA networks must contribute to Good Environmental Status taking into account the ecosystem approach, and the spatial protection measures taken shall give due consideration to sustainable development, including social and economic impacts. These requirements for the network necessitate the integration of measures, which go beyond Natura 2000 in several respects.

In BULGARIA

The National Ecological Network of Bulgaria includes “protected areas” (PAs) regulated by the Protected Areas Act and “protected sites” (PSs) under the Biodiversity Act. The protected sites are part of the NATURA 2000 European Ecological Network, designated according to Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds and the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

Within the coastal area and the maritime spaces there are several protected areas, under the Protection Areas Act among which 3 Natural Reserves (Kamchia, Kaliakra and Ropotamo), 4 Maintained Reserves (Atanasovsko Lake, Baltata, Veliov vir and Sand Lilly), 2 Nature Parks (Golden Sands and Strandja), 30 Protected Areas and 13 Natural landmarks (Table 3).

Being among the first countries that acceded to the Convention on Wetlands of International Importance as Waterfowl Habitats, Bulgaria has 11 Ramsar sites with a total area of 35 273 ha, 7 of which are located on the Black Sea coast. Two of them are within the cross-border maritime planning area - Durankulak Lake, designated in 1984 with an area of 350 ha and Shabla Lake, designated in 1996 with a total area of 404 ha.

Data source: EEA, 2019[44]

Tabel 3. The Network of Protected Areas, currently includes:
• 120 protected areas for the conservation of wild birds, covering 23.1% of the territory of Bulgaria;
• 234 protected areas for the protection of natural habitats, covering 30.3% of the territory of Bulgaria

Seven of the Ramsar sites are also designated as Important Birds areas (IBA)[1]. The Black Sea wetlands are also protected by the BlackSeaWet Regional Initiative.

Figure 16. Natura 2000 zones in coastal areas and sea waters in Bulgaria (*CCMS)*

The network of the Important Birds Areas in Bulgaria includes 114 IBAs, 87 with global importance, 112 with European, with a total area of 26 021 km^2, or 23% of the national territory and 542.72 km^2 sea areas. IBAs for flocking birds, during migration and especially during the winter season, located along the Black Sea coast, are extremely important for the conservation of the world's avifauna. They are important resting places on migration routes and especially on the second largest migratory bird route in Europe - *Via Pontica*, passing Romania, too.

Meanwhile, the Intergovernmental Coordination Council of UNESCO Man & Bioshpere programme (MAB - ICC) excluded old type Biosphere Reserve Kamchia from the world network of biosphere reserves, due to the fact that the authorities failed to agree with the municipalities Avren and Dolni Chiflik and local population the protected sites to be declared on their territory.

In Bulgaria, from 2002 to 2006, through the implementation of a number of projects, a national list of potential sites for inclusion in Natura 2000 network was drawn up. Initially, the proposed list contains 114 wild bird conservation areas (Natura 2000 sites under the Birds Directive), covering approximately 23.6% of the country's territory, and 225 protected areas for the conservation of natural habitats and of wild fauna and flora (Natura 2000 Habitats Directive sites), covering approximately 30% of the country's territory[45].

[44] https://www.eea.europa.eu/data-and-maps/data/natura-11
[45] www.moew.government.bg

In 2007, after decisions No122/02.03.2007, No 661/16.10.2007 and No 802/04.12.2007 of the Council of Ministers of the Republic of Bulgaria, Bulgaria presented to the European Commission a national list of potential Natura 2000 places, which contains:

- 114 wild bird conservation areas covering 20.4% of the territory of Bulgaria;
- 228 protected areas for the protection of natural habitats, covering 29.5% of Bulgaria.

Figure 17. CDDA network in Bulgaria (*CCMS)*

Data source: EEA, 2020

In the period 2008-2019, the national list of protected areas for the conservation of wild birds and for the protection of natural habitats was supplemented and expanded by Council of Ministers Decisions: No 811 of 16 November 2010, No 335 of 26 May 2011, No 660 of 01 November 2013, No. 678 of November 7, 2013, No. 223 of April 24, 2014, No. 598 of July 22, 2016.

The full contents of the Decisions of the Council of Ministers can be found in the section "*Register of Protected Areas*" under the section "*Decided by the Council of Ministers*".

The Bulgarian Black Sea spans a coast length of 414 km or 8,5% of the total Black Sea coast (Stanchev et al, 2011), with a shelf area of 36 160 km^2 (8,6% of the Black Sea area). The Bulgarian MPA network consists of 26 Natura 2000 zones.

Some of these zones are mostly landward located, with narrow strip (up to one nm) in the sea water. Eleven zones are protected under Bird Directive, 13 zones are Habitat Directive and two zones are under both Directives (Figure 16, 17). By the end of 2019 not even a single Management plan for Natura 2000 sites in marine space has been implemented.

From the EEA database (2020) there are 1042 protected areas in Bulgaria under national legislation. Of these, 30 are located along the coast, covering partly the coastline: Nature Reserves of Kaliakra, Kamchia, Ropotamo. Only one protected area is located entirely in the sea: Koketrays Protected site and Kaliakra reserve partly has a sea area.

✓ *Conclusions*

In Bulgaria there is a good coverage of both the coast and the adjacent Black Sea water areas by the National ecological network. The MPAs play an important role in this network.

There is also some opposition from the local population to the strict regimes in some of the protection categories that restrict the rights of local communities in the area of traditional practices and lifestyles. There are also a lot of recommendations for revision of the Natura 2000 sites, including the ones in the Black Sea in order to tune better their boundaries with the existing land and marine uses.

In ROMANIA

The Romanian MPA network consists of 10 sites (9 SCIs and 1 SPA) and has a total area of 7,457.66 km^2 of the Romanian shelf zone, while the marine part of the Danube Delta Biosphere Reserve (ROSCI0066 - Danube Delta - marine part) represents 45% of the whole network's area. Only 37% (5 SCIs within old limits and 1 SPA) from the Romanian Black Sea Natura 2000 network have management plans and the conservation measures are largely not adapted to the requirements. In Romania, the conservation objectives were not achieved by public consensus, and the strategies that should involve the stakeholders as the first step towards understanding the ecological, cultural and social benefits, have not been elaborated yet, which led to hard-to-resolve conflicts.

The Natura 2000 marine network still has major gaps: by far not enough effective management (conservation measures, species protection, deterioration preventing, restoration, monitoring, financing); many marine Natura 2000 sites remain paper protected areas.

➢ Natural protected areas of national importance

In Romania (Constanta County), there are 14 natural protected areas of national interest: five natural reserves (IUCN category IV), three monuments of nature (IUCN category III), and five scientific reserves (IUCN category I). In the Tulcea County, Danube Delta Biosphere Reserve occupies the entire northern coastal area, both of national and international importance.

BOX 25. *Danube Delta Biosphere Reserve (also SCI, SPA, Ramsar site)*

At the end of a course of over 2,860 km, collecting the water from a vast hydrological basin that exceeds 8% of the area of Europe, the Danube (the second largest river of the Continent) has during the last 16,000 years built at its mouth with the Black Sea. The Danube Delta is famous as one of the greatest wetlands of the earth. Among these, reeds form one of the largest single expanses in the world, and Letea and Caraorman forests represent the northern limit for two rare species of oak that are more frequently met in the south of the Italian and Balkan peninsulas. Together with the great number of aquatic and terrestrial plants, there are also many important colonies of pelicans and cormorants, which are characteristic of the Danube Delta, as well as a variety of other water birds which reside in or visit the delta for breeding or wintering. The large number of fish is also notable, with species of both high economic and ecological value.

From September 1990, the DDBR was listed as a wetland of international importance especially as waterfowl habitat under the Ramsar Convention, and is among the largest of the 600 or so wetlands so recognized. The universal natural heritage value of the reserve was recognized in December 1990 by the inclusion of the strictly protected areas in the World Heritage List under the World Heritage Convention.

➢ Marine Protected Areas designated under the Habitats Directive

In Romania, MPAs designation was made based on the data stored in the National Informatics System (NIS), created specifically for the purpose to extend the European ecological network

in Romania. The NIS was created and supplied with available data/information by the national scientific community.

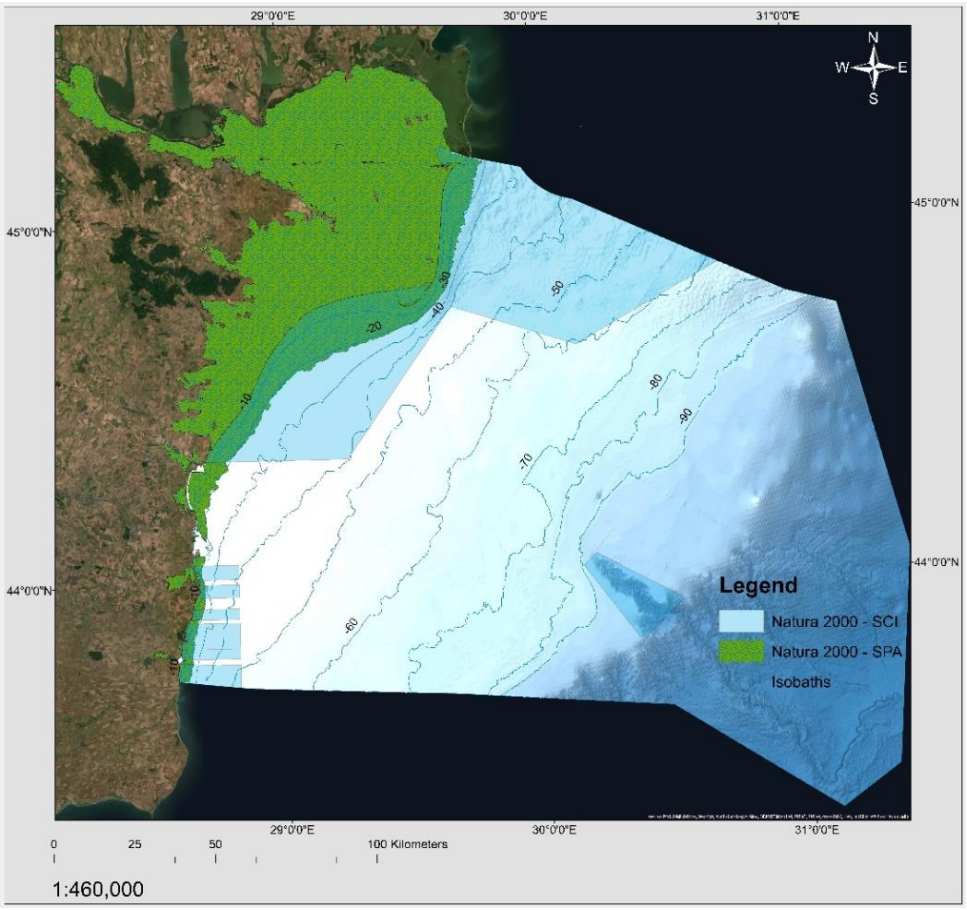

Figure 18. MPA's network from the Romanian Black Sea *(NIMRD)*

Besides the Danube Delta Biosphere Reserve (DDBR), for which there is a special protection and administration law concerning the economic and social development and water infrastructure, the Dobrogea region in Romania holds another 39 protected areas.

In Romania, the national network of marine protected areas comprises two Marine Reserves at present: the 2 Mai - Vama Veche Marine Reserve and the marine part of the Danube Delta Biosphere. in accordance with the stipulations of the Government Ordinance No. 57 from June 20, 2007, regarding the regime of protected areas, the preservation of natural habitats, of the wild flora and fauna (Official Gazzette No. 442 from June 29, 2007), as well as with the 79/409/EEC and 92/43/EEC European Directives, there are **9 sites designated** and **1** is **under the Birds Directive.** (Figure 18)

Starting with 2016, the surface of designated SCIs in marine Romanian waters is of 605,719 ha (20.46% - reference surface of the EEZ = 2,960,000 ha), shown in the Table 4:

Table 4. Evolution of the areas covered by SCIs at the Romanian Black Sea coast

MPA	Area in 2007 (ha)	Area in 2011 (ha)	Area in 2016 (ha)
ROSCI0066 Marine area of Danube Delta	121,697	123,374	336,200
ROSCI0094 Underwater sulphide seeps from Mangalia	382	382	5,784
ROSCI0197 Submerged beach Eforie North - Eforie South	140	140	5,716
ROSCI0237 Sf. Gheorghe	6,122	6,122	---
ROSCI0269 2 Mai - Vama Veche Marine Reserve	5,272	7,196	12,311

ROSCI0273 Cape Tuzla	1,738	1,738	4,946
ROSCI0281 Cape Aurora	---	13,071	13,592
ROSCI0293 Costineşti	---	4,878	4,883
ROSCI0311 Viteaz Canyon	---	---	35,376
ROSCI0413 Southern lobe of Zernov's *Phyllophora* field	---	---	186,815
TOTAL	135,351	156,901	605,719

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4.2.2. Marine Habitats and Biodiversity

Tatiana Begun, Mihaela Mureşan, Victor Niţă, Valeria Abaza, Laura Alexandrov, Hristo Stanchev, Margarita Stancheva, Milena Manova, Emil Nikitov

✓ *Existing Conditions*

➢ Pelagic habitats

In the pelagic of the Bulgarian and Romanian sectors of the Black Sea, three well-distinguished zones have been identified: coastal - from 0-30 m depth, shelf - 30-200 m depth and open sea -> 200 m (Figure 19).

The only official classification system of the pelagic habitats at the Romanian coast was done in the framework of the Directives 2000/60/EC and 2008/56/EC. The first addressed to the coastal and transitional waters, establishing the main water bodies, while a completion has been brought with the adoption of the latter Directive, which extended the classification and delineation of marine region to the offshore waters.

BLK_RO_RG_TT03 – **Transitional Waters**
Covers the northern part of the Romanian shelf under the Danube influence bounded by Sulina, in north, Portita in south, and 30 m isobaths in east. The waters are characterised by a high heterogeneity of salinity, which showed seasonal and an annual averages of 8.0 PSU and 14.5 PSU respectively
BLK_RO_RG_CT - **Coastal Waters**
Lay between Portita and Vama Veche, from the shoreline up to 30 m depth. The waters are characterised by a seasonal and annual range salinity of 8 - 16 PSU
BLK_RO_RG_MT01 – **Marine Waters**
Lay between 30 and 200 m isobaths; the inner and outer shelf waters showed higher salinities, ranging between 16 and 17.5 PSU

According to the MSFD (2008/56/EC), in the Romanian waters, 3 main pelagic habitats are.

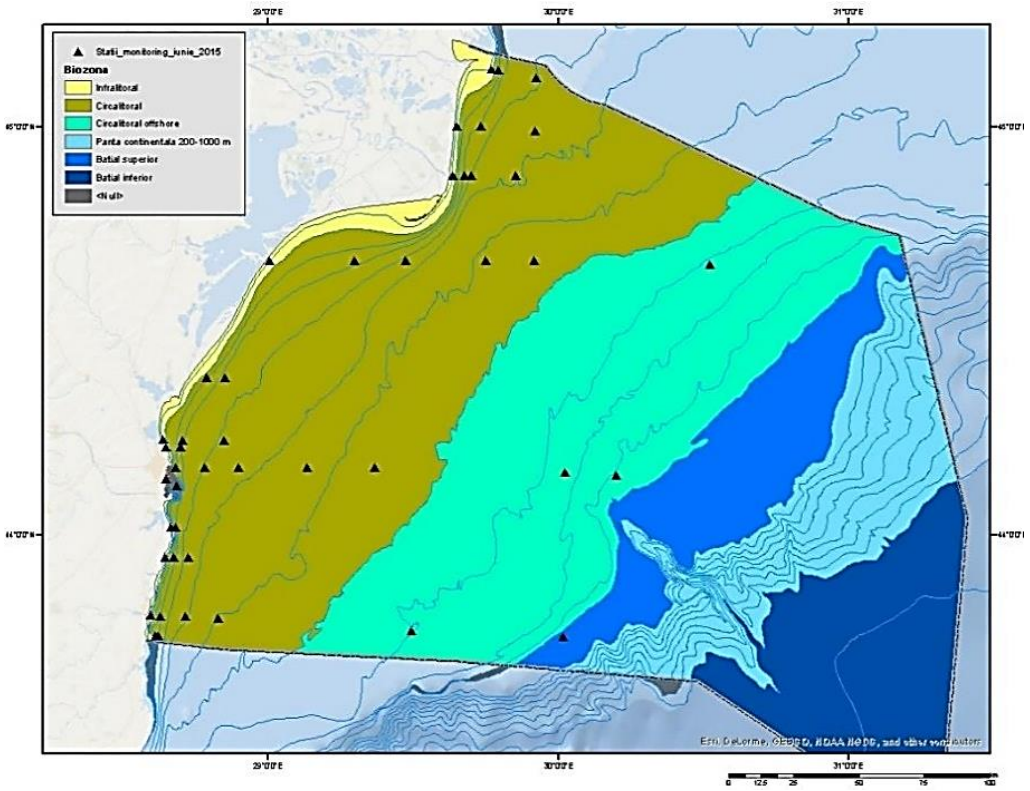

Figure 19. The main kind of habitats of the Romanian Black Sea waters *(NIMRD, GEM)*

- **Phytoplankton**

In BULGARIA

The diversity of phytoplankton in the Bulgarian waters of the Black Sea includes about 600 species. The greatest diversity is made up by dinoflagellates (163), which are 50% of the total number, followed by diatoms (88 species) and species of the classes Chlorophyceae/ Trebouxiophyceae (20) Prymnesiophyceae, Cyanophyceae, Cryptophyceae and Microglenaphylagelates and Euglenophylagelates species. There is a clear trend to increase the species diversity, which is associated with the inclusion of 37 new taxonomic classes of small-sized mix/heterotrophs *Gymnodinium/Gyrodinium*.

The intensive development of agriculture, industry and urbanization has led to a load of nutrients on the marine environment (nitrogen and phosphorus compounds). These processes caused an increase in the frequency and intensity of phytoplankton "blooms", on large areas.

After the implementation of the monitoring programmes under the Water Framework Directive 2000/60/EC, the phytoplankton is observed in Bulgaria as a mandatory biological quality element (BEQ) of coastal marine waters, divided into 17 water bodies. The analysis of the data on the phytoplankton indicator in the period 2010-2017 shows the predominance of water bodies in a moderate state. The two largest Black Sea bays - Varna and Burgas, which are subject to the strongest anthropogenic pressure, are in poor condition. The future state of the phytoplankton community in the Bulgarian waters of the Black Sea will depend mainly on the inflow of nutrients from the land and the measures implemented to limit the process.

In ROMANIA

In 2018, 7 taxonomic groups (Bacillariophyta-35%, Dinoflagellata-31%, Chlorophyta-17%, Cyanobacteria-9%, Chrysophyta-5%, Euglenophyta-1% and Cryptophyta-2%) and a total of 173 species with different morphoforms were identified. The biomass varied in the coastal

waters within a range of 200-1200 mg/m^3 and within 300-1200 mg/m^3 in the transitional waters respectively, whiles a maximum of 600 mg/m^3 was registered in the marine waters. In summer, cyanobacteria dominate (57-68%) the coastal waters due to the impact of the Danube, while a shift in composition and abundance occurs in autumn when the diatoms dominate, correlated with environment quality and the feeding season for fish. Higher total densities were recorded in the northern area, between 5 and 20 m depths (751-994*10^3 cells/L) decreasing southward (39*10^3 cells /L) and to the sea, to the isobaths of 20 m (less than 200*10^3 cells / L). The biomasses in coastal (1843 mg / m^3) and transitional waters were 1678 mg/m^3 at 5 m isobaths, and 879 mg / m^3 at 30 m isobaths, respectively (Figure 20, 21).

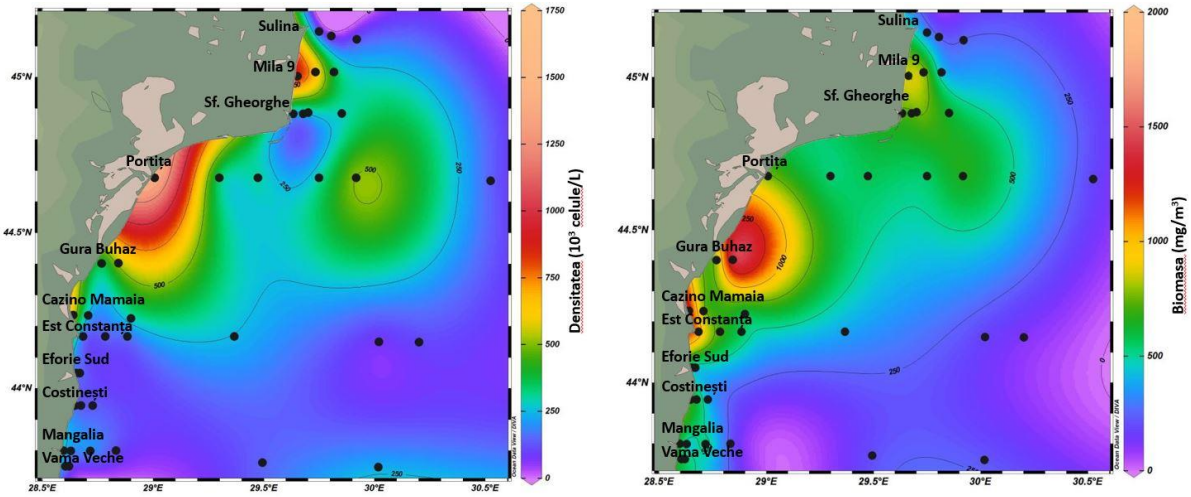

Figure 20; 21; Distribution of phytoplankton densities (10^3 cel/L, left) and biomasses (mg/m^3, right), in 2018 *(NIMRD)*

➢ Zooplankton

The species composition and abundance of food zooplankton is a major factor in the condition of fish populations and sustainable catches. In the second half of the 20th century, invasive species entered the Black Sea, the most invasive of which is *Mnemiopsis leidyi,* which uses zooplankton as a food resource, and it itself is irrelevant to the higher trophic units of the marine ecosystem. This leads to shortening of food chains and lack of food resources for marine fish, birds and mammals. After the appearance of another invasive species - *Beroe ovata*, which is a predator for *Mnemiopsis leidyi,* the state of the populations stabilizes, but remains uncertain.

In BULGARIA

According to the zooplankton biomass indicator, the condition fluctuates between poor and moderate without a clear tendency. The data show that in the spring and early summer the condition is bad. In the remaining months it is moderate or good. According to the Shannon-Wiener Index (H '), a similar pattern is observed - the condition is poor in spring and early summer, and moderate in other months. According to the indicator *Noctiluca scintillans*, the condition is moderate or very good, in present in low concentrations, and the good condition prevails during the summer and autumn months. According to the *Mnemiopsis leidyi* indicator, the condition is good to very good. The future condition depends on preventive measures against the invasive alien species entrance; but, practically impossible to know.

The obtained results of BEQ zooplankton indicate the achievement of good (44%) to excellent (33%) condition in the studied coastal sea waters in 2017. For the period from 2012 to 2016, the trend is to maintain the condition between moderate - bad, but with a higher percentage to

moderate. Accordingly, the situation in 2017 can be considered extremely positive. The water bodies in poor condition are located in front of the mouth of the Kamchia River and in front of Burgas bay in the urbanized areas with diverse local anthropogenic sources, which probably lead to a worse condition of the environment.

The main measures for achieving good status are aimed at maintaining the ratio of the predominant native species and preventing the introduction of alien species through control of ship ballast waters.

In ROMANIA.

The zooplankton community on the Romanian shelf recorded a clear increasing tendency, as a good sign for fish stocks communities which use it as main food. In the last two years a biomass production ranging between 0.4 and 1991.6 mg.m^{-3}, with an average of 238±404.1 mg.m^{-3}, in the period 2017 – 2019.

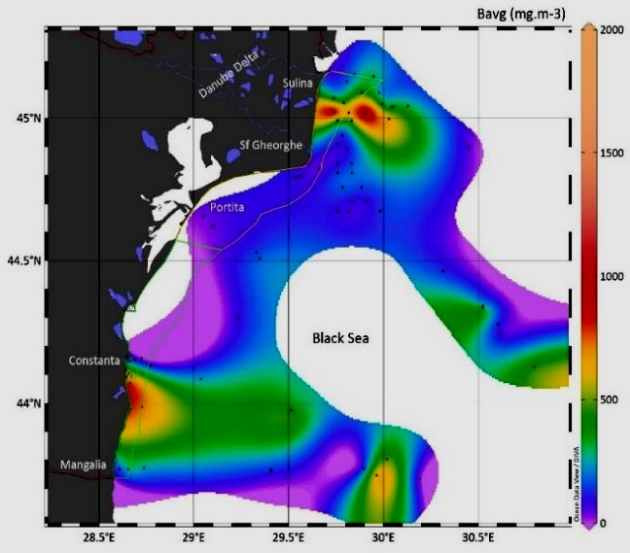

Figure 22. Spatial distribution of zooplankton biomass within the period 2017 -2019 *(GEM)*

The biomass within the transitional pelagic habitats varied within 24.49 – 231.73 mg.m^{-3}, with the maximum in the Sulina area and minimum in the shallow waters of the Portita bay.

The coastal habitats covering the waters up to 30 m isobaths were characterized by an average biomass of 241.39±406.1 mg.m^{-3}, with highest values offshore Sulina (Danube influence) and the lowest ones in front of Constanta (impact of urban area).

Due to their higher productivity, the transitional (the Sulina area) and the coastal waters (Mangalia) could be considered as appropriate for the spatial planning of aquaculture activities and the fishing areas. In the open waters habitats, the biomasses fluctuated within 0.36–1991.64mg.m^{-3}, average of 259.64 mg.m^{-3}, in the fish population's aim. (Figure 22).

- **Benthic habitats** (Figure 23)

Currently, in the Black Sea there are two classification systems of habitats in different development stages: NATURA 2000, the most used, and EUNIS, strongly recommended by EC in the process of MSFD implementation. Therefore, within this report, the present status and trends of marine benthic habitats is carried out in accordance with EUNIS classification.

In BULGARIA

- ***Benthic habitats*** *– Macrozoobenthos*

About 1350 species of organisms from the macrozoobenthos groups - vertebrates or invertebrates benthic animals are known in the Black Sea. The wide types of bottom habitats under MSFD in the Bulgarian Black Sea area, their corresponding types under EUNIS and Annex I of DHM, as well as the national subtypes of each habitat are determined on the basis of the associated fauna; the shallow coastal zone having a particularly greater diversity (Figure 24). The bathyal and abyssal zones are naturally anaerobic and do not support multicellular fauna (Tables 5, 6, 7, 8).

The mediolittoral habitats have small distribution in the Bulgarian part of the Black Sea and cover the surf zone of the wind waves - from about 0.7 m above sea level to about 3 m deep. For the Bulgarian Black Sea coast the rocky mediotoral prevails, the sandy mediotoral and the other types of substrates are insignificant.
The **shallow sublittoral habitats** are limited between the medioliteral area and the 20-meter isobaths (the perceived lower limit of the wave impact on the bottom in front of the Bulgarian coast).
Shallow rock substrates along the Bulgarian Black Sea coast cover 26.81% of the area of the shallow water zone. Most of them is located in Emine-Sozopol and Sivriburun-Kaliakra areas and Sozopol - Rezovska River.
Shallow sublittoral sands occupy 36.47% of the area of the shallow water zone up to the 20-meter isobaths, or a total area of 218.67 km^2 for the entire Bulgarian Black Sea coast. The largest part is located in the region of Burgas and Varna bays.
The **shelf sublittoral habitats** are located at depths of 20 m to the periphery of the shelf at 90-100 m.
Subtype **Circalitoral rocks** overgrown with black mussels *Mytilus galloprovincialis*, hydrozoa and fungi has a total area of 32.69 km^2; its distribution is wider in the southern shelf and insignificant in the northern and central.
Shelf sublittoral sands are widespread in the central and southern shelf at 20-40m depths, 171.89km^2 total area.
The **shelf sublittoral muds** cover depths of 20-130 m in the Bulgarian EEZ. Their total area is 8753.37km^2 - the most extensive bottom habitat in the Bulgarian area, in the central, southern and peripheral regions of the shelf.
The **shelf sublittoral mixed sediments** are distributed at depths of 60-130 m, with a main range in the northern region of the Bulgarian Black Sea shelf. Their total area is estimated at 2626.91 km^2.

Table 5. Existing definitions of habitat type 1110 in Bulgaria and Romania. NB.

** There is not necessarily a direct correspondence in the subsidiary code numbers (1110-1 etc.) between the habitat sub-types in Bulgaria and Romania. E.g. habitat sub-type 1110-5 in Bulgaria does not corresponds to habitat sub-type 1110-5 in Romania.*

Bulgaria	**Romania**
Nine types of sublittoral sands distinguished on the basis of medium or dominant species of macrophytes or macrozoobenthos, which are nationally important for conservation purposes	Seven types of sublittoral sands distinguished on the basis of sediment characteristics
1110-1. Underwater meadows with seagrass	1110-1 Fine clean or slightly muddy fine sands with *Zostera* meadows
1110-2. Large and medium shallow sands with *Donax trunculus*	1110-2 Medium sands in the form of submarine dunes
1110-3. Small and medium sands with *Lentidium mediterraneum*	1110-3 Fine sands of shallow depth
1110-4. Pure sands with *Arenicola marina* and *Callianassa* spp.	1110-4 Well sorted sands
1110-5. Sands and fine sands with *Chamelea gallina*	1110-5 Coarse sands and fine gravels beaten by waves
1110-6. Silent sands with *Upogebia pusilla*	1110-6 Infralittoral cobbles
1110-7. Organogeneous sands and gravels with *Modiolus adriaticus* and *Gouldia minima*	1110-7 "Camca" from the mouth of the Danube.
1110-8. Infralittoral gravel and stones	
1110-9. Sands with *Solen marginatus*	

Table 6. Existing definitions of habitat type 1140 in Bulgaria and Romania. NB.

**There is not necessarily a direct correspondence in the subsidiary code numbers (1110-1 etc.) between the habitat sub-types in Bulgaria and Romania.*

They are not covered by seawater at low tide	**Under the microtides of the Black Sea this habitat is limited to the supralittoral and mediolittoral of sandy beaches**
Subtypes	
Large and Medium Mediolitorial sands with *Donacilla cornea* and *Ophelia bicornis*	1140-1 Supralittoral sands, with or without fast drying drift lines
Mediolitoral gravel	1140-2 Supralittoral slow-drying drift lines
Mediolittoral fine sands	1140-3 Midlittoral sands

Mediolittoral muds	1140-4 Midlittoral detritus on shingle and boulders
Ejected algae area	

Table 7. Existing definitions of inlets and bays in Bulgaria and Romania

Bulgaria	**Romania**
Extensive coastal recesses where, unlike estuaries, access to fresh water is limited. These shallow concave areas are usually protected from the effects of waves and contain a wide variety of sludge and substrates and have a zoning of benthic communities. The boundary of shallow water is sometimes determined by the distribution of communities of the *Zosteretea* and *Potametaea* classes. Depth is typically up to 15m.	In the Romanian Black Sea, this type of habitat is represented as a subtype of bay (embayments).
Subtypes	
1160-1 Sheltered sands in depths which do not exceed 3m. On muddy sands located in sheltered areas, shallow, rich vegetation and diverse fauna develop, both with marine and brackish elements.	

Table 8. Existing definitions in Bulgaria and Romania of habitat type 1170 NB.

*[*There is no direct correspondence in the subsidiary code numbers (1170-1 etc.) between the habitat sub-types in Bulgaria and Romania; e.g. habitat sub-type 1170-1 in Bulgaria corresponds to sub-type 1170-5 in Romania]*

Bulgaria	**Romania**
Definition is framed around the physical characteristics - substrate, depth range wave mode, light regime, trophic conditions and the structure of the biological community (medium, dominating and characteristic species, floor, species richness). Classification designates the dominant or dominant habitat-forming species. Based on this principle, the classification distinguishes 10 basic subtypes based on medium or dominant types of macrophytes or macrozoobenthos, 3 of which are further subdivided. The classification introduces some hierarchy based on the type of substrate (rocks of geological origin or biogenic structures), the depth zone and the characteristic community.	
1170-1 Mediolitoral rocks with sea urchins and black mussels 1170-1.1 Upper mediolittoral with *Chthamalus stellatus, Melaraphe neritoides* and *Ligia italica* 1170-1.2 Lower mediolittoral with *Mytilaster lineatus* and *Mytilus galloprovincialis*	1170-1 Biogenic reefs of *Ficopomatus enigmaticus*
1170-2 Mediolittoral rocks with *Corallina*, *Nemalion*, *Scytosiphon*	1170-2 Biogenic reefs of *Mytilus galloprovincialis*
1170-3 Infralittoral rocky bottom with perennial brown algae of *Cystoseira* 1170-3.1 Association of *Cystoseira barbata* 1170-3.2 Association of *Cystoseira criNiță* f. *bosphorica*	1170-3 Shallow sulphur hydrothermal vents
1170-4 Infralittoral rock bottom with annual green and red macroalgae	1170-4 Agglomerations of rocks and boulders
1170-5 Bottom Infralittoral, with a *Phyllophora crispa* association	1170-5 Supralittoral rock
1170-6. Infra- and circalittoral rocks with *Mytilus galloprovincialis* and *Mytilaster lineatus*	1170-6 Upper mediolittoral rock
1170-7 Rock bottom with stonecutter clams 1170-7.1 Soft rocks with *Pholas dactylus* and *Barnea candida* 1170-7.2 Limestone rocks with *Petricola lithophaga*	1170-7 Lower mediolittoral rock:
1170-8 Biogenic reefs built by *Ostrea edulis*	1170-8 Infralittoral rock with photophilic algae
1170-9 Animal fossils on a rock bottom	1170-9 Infralittoral rock with *Mytilus galloprovincialis*
1170-10 Mussel beds on sediment banks	1170-10 Infralittoral hard clay banks with Pholadidae

According to the assessment of the state of the bottom habitats (2017), out of a total of 6 assessment areas, in 5 regions the habitats are in poor condition, excluding Emine-Maslen Nos region. The expected trend is negative (continuing damage/loss) as a result of increasing anthropogenic pressure in the coastal zones. Achieving good status on this indicator depends on the effect of the measures on the sources of pressure indicated for macrozoobenthos, developed in the River Basin Management Plans, according to the WFD and MSFD.

In ROMANIA

In the last 5 years, the number of macrozoobenthic species has not underwent major variations, a slight increasing trend being recorded (Figure 24). According to the most recent inventory, showed a diversity of: 33 species in transitional waters, 34 species in coastal waters, 57 species between 30 to 60 m depths and 29 species within 70-100 m depths range.

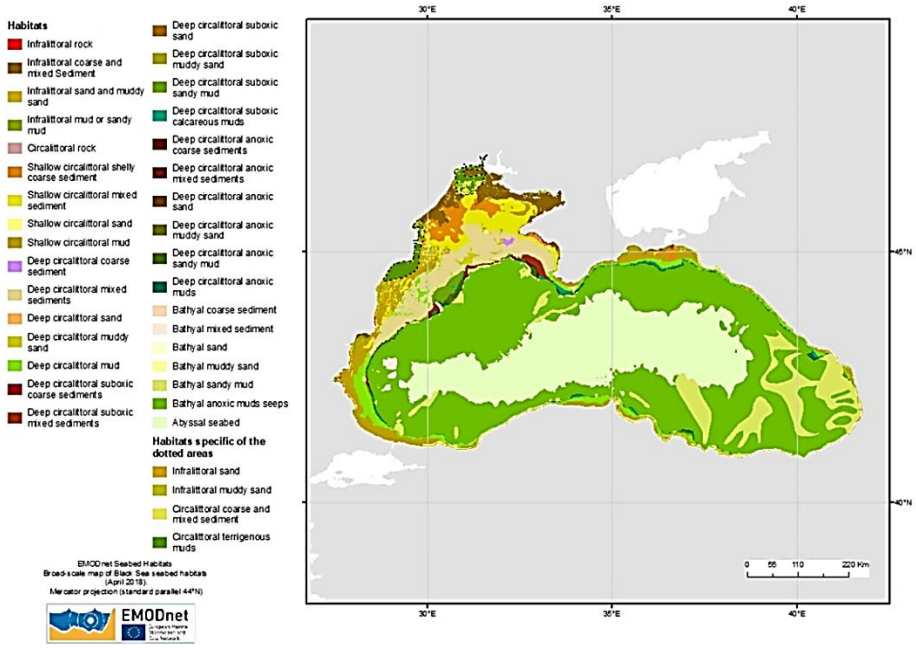

Figure 23. The main benthic habitats (http://www.emodnet-seabedhabitats.eu/ - EUSeaMap - Seabed habitats lot output) – the whole Black Sea (biological zonation according to EUNIS categories, adapted to Black Sea)

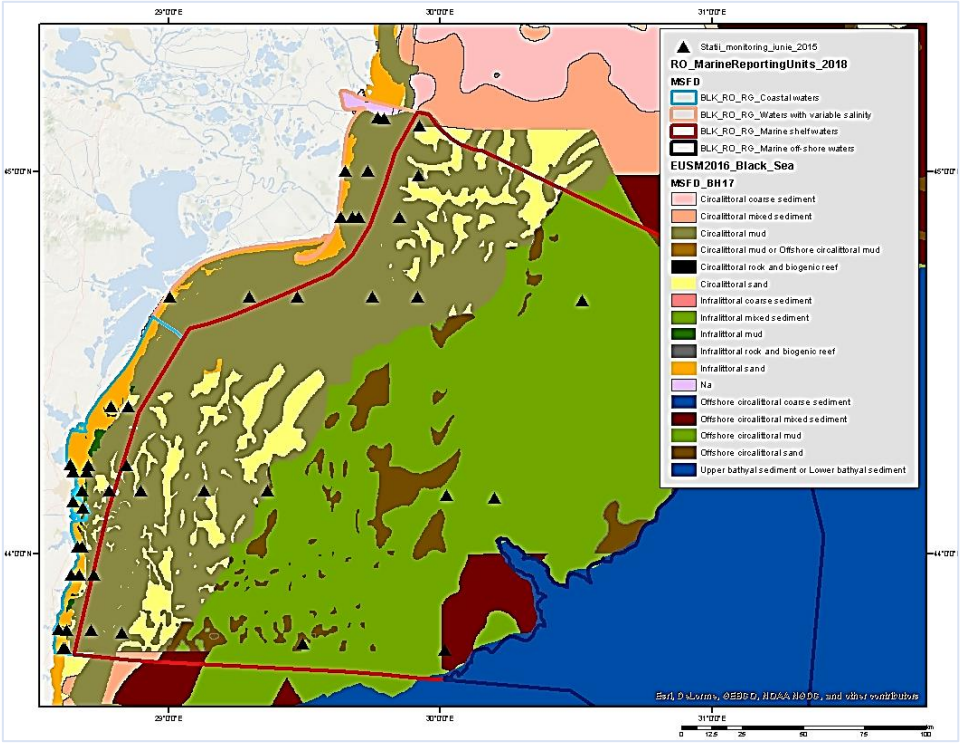

Figure 24. The main benthic habitats – details (http://www.emodnet-seabedhabitats.eu/, - EUSeaMap - Seabed habitats lot output)

References

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4.2.3. Marine mammals *(species, distribution, population, trends)*

Eugen Anton, Laura Alexandrov, Hristo Stanchev, Margarita Stancheva, Milena Manova, Emil Nikitov

✓ *Present Conditions*

In BULGARIA

Three species of marine mammals are distributed in the Bulgarian sector of the Black Sea:

- **bottlenose dolphin** *(Tursiops truncatus ponticus*) with conservation status: in Bulgaria: vulnerable VU [D1]; international: IUCN-DD;
- **common dolphin** (*Delphinus delphis ponticus*) with conservation status: in Bulgaria: vulnerable VU [A1acde + 2ce]; international: IUCN [VU];
- **harbour porpoise** (*Phocoena phocoena relicta*) with conservation status: in Bulgaria: vulnerable VU [A1acde + 2ce]; International: IUCN [VU].

The distribution areas of these three species overlap. The results of modern observations in the area between Galata and Emine up to 30 miles from the coast show that *D. delphis* is most often observed in the 10-17 mile zone, *T. truncatus* at 5 – 7 miles from the coast, and *Ph. phocoena* at only 2-4 miles away from the shore. Last years observation are similar to the 2006-2010 period, being at 20 to 100 m depth marine water (shelf zone), approximately at 30 miles from the shore; this shows that all three species are equally well represented, in all seasons. The total number of observations was about 933 during this period.

BOX 26. Species	**Observation concerning distribution in Bulgaria, 2006-2013**
Delphinus delphis	*Delphinus delphis* is found in the high seas, but also visits coastal waters, following the seasonal aggregations and migrations of the pelagic fish species on which it mainly feeds. Most specimens were observed in front of Varna, Kaliakra and near the border with Turkey. *Delphinus delphis* is associated with the hunting of pelagic fish species. They have relatively distribution; no correlation with the intensity of marine fishing. (Figure 26)
Turciops truncatus	The *Turciops truncatus* distribution is similar, more intense at the Kamchia and Emine rivers mouth, with preference for areas with moderate and intensive sea fishing. They are following fishing vessels and feeding on fish slipped out of nets. Annually, in spring, it migrates into Bulgarian waters from southeast and northeast. Migration routes, breeding areas, calving, dolphin feeding coincide with fishing grounds, where intensively exploited turbot gillnets are.
Phocoena phocoena	*Phocoena phocoena* is observed mainly in the coastal and shelf zone (6 - 200 m isobaths), often found in the high seas depending on the distribution of food resources (pelagic and demersal fish). They are in front of Varna, Cape Emine, Cape Maslen Nos south of Bourgas, preferring areas with moderate-intensive sea fishing or following fishing vessels and nets.

✓ *Conclusions*

The population of the three species of marine mammals is not well studied. There is insufficient data to draw conclusions about the number, density and trends. In the Bulgarian waters of the Black Sea a total of 1423 marine mammals were observed, during for the period 2006-2013, of which the bottlenose dolphin - 618 individuals registered in 120 observations, followed by the common dolphin - 554 individuals in 101 observations and 251 harbour porpoise in 68 observations. The total frequency of encounters is 3.18 observations/100 NM.

The assessment of the state of the three species shows that the bottlenose dolphin *(Tursiops truncatus*) condition is "unfavorable-bad"; for the common dolphin (*Delphinus delphis*) and the harbour porpoise (*Phocoena phocoena*), it is "unfavorable-unsatisfactory".

In ROMANIA

The surveillance activities covered area from the sea shore to almost 100 m isobath (about 24700 km2 surface), between April and November. The inventory of dolphins stranded at the seaside, respectively live dolphins in the supervised area (Figure 25).

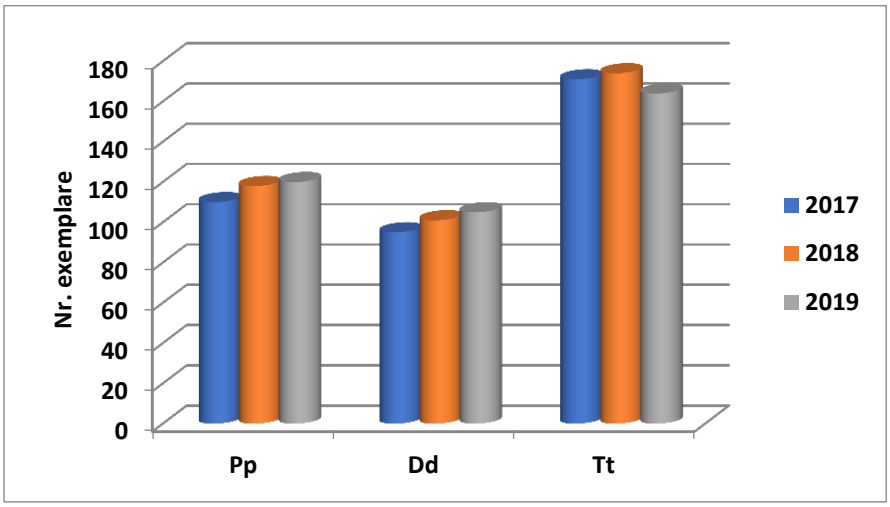

Figure 25.
The situation of live dolphins recorded by species during 2017-2019 (*NIMRD*)

In 2019, monitoring activities were carried out on the sea on board of ships, on motor boats or from the oil platform,

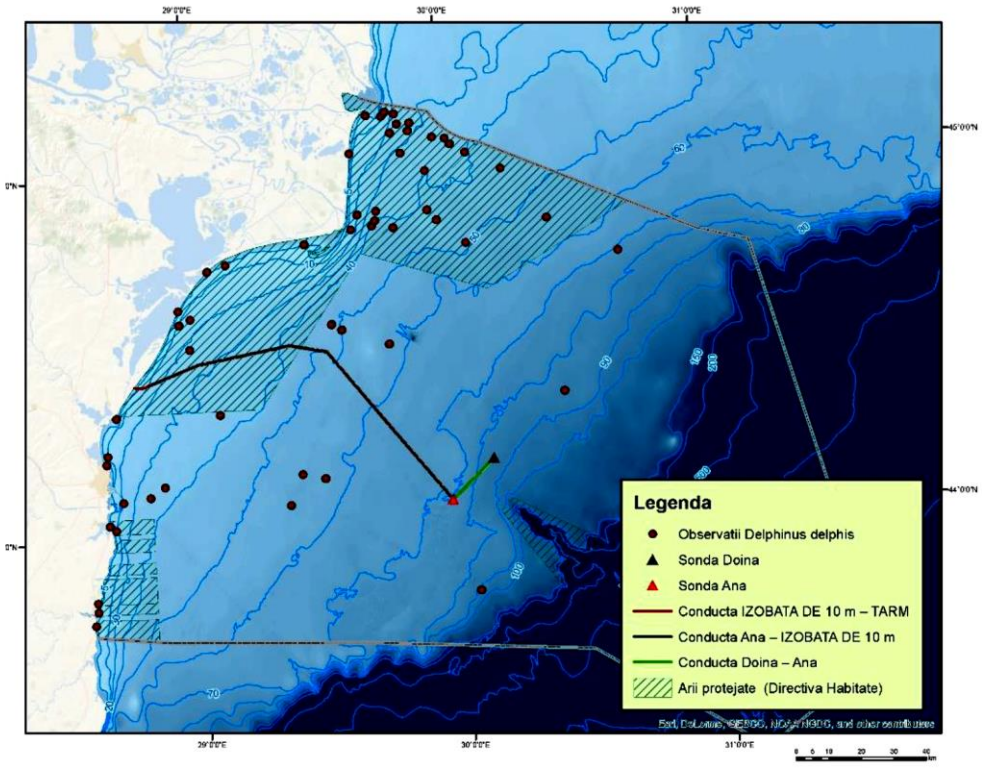

Figure 26.

Distribution example of *Delphinus delphis ssp. ponticus* commun in the Romanian marine waters (in 2018, *Black Sea Oil & Gas S.R.L-(NIMRD*[4])

from the coast to the sea, from dams, during April-November, covering the area from the coastal line to the seashore, up to the 100 m isobath (surface area of 24 700km^2), adding the inventory of stranded dolphins on beaches and the seashore. The distribution of the *Delphinus delphis ssp. ponticus* was done. Similarly spatial representation was done for the other two species in 2018 in the Romanian marine space.

✓ *Conclusions*

The frequency of dolphin occurrence is influenced by environmental conditions and anthropogenic activities (fishing, pollution, shipping, field operations, etc.).

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4.2.4. Birds *(distribution, migration lines)*

Laura Alexandrov, Hristo Stanchev, Margarita Stancheva, Milena Manova, Emil Nikitov

The coastline has a guiding effect on the direction and density of migratory birds. Their distribution on a certain territory along the Black Sea coast of Bulgaria and Romania and the altitude distribution is known as *Via Pontica* or the Western Black Sea migration route.

The Old World Birds share one of the most important migratory routes in the world, the Palearctic African migratory pathway that connects Europe, Asia and Africa.

Black Sea coastal lakes have a particular importance as wintering, feeding and breeding habitats for waterfowl where they are concentrated in significant numbers during winter and migration, offering optimal nesting conditions for rare and endangered bird species. Among aquatic birds are the representative species of the orders Gaviiformes, Podicipediformes, Procellariiformes, Pelecaniformes, Anseriformes, Gruiformes and Charadriiformes.

In BULGARIA

The Mediterranean petrel (*Puffinus yelkouan*) and the middle (hooded) cormorant (*Phalacrocorax aristotelis desmarestii*) are the only two species of birds, completely dependent on the sea during the periods of nesting, migration and wintering in the Black Sea area. Both species are included in the Annex I of the Wild Birds Directive 2009/147/EC and theAnnex II of the Berne Convention.

The Mediterranean petrel is a migratory species, listed in the Red Book of the Republic of Bulgaria as 'endangered', but with a relatively high number, especially on the Northern Black Sea coast with increasing numbers in recent years. The species is included in the Red Book of Bulgaria in the category 'vulnerable'. Both types are appropriate indicators of the state of the marine environment, and included in the MSFD monitoring program. In addition to them, there are other species of birds depending on the marine environment.

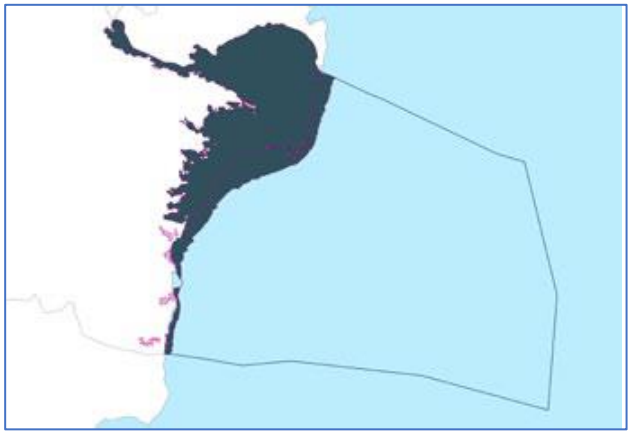
The Western Black Sea migration route gathers migrants from northern latitudes, forming concentrations or places with a narrow front of migration (bottle necks). There are such places along Varna coast, cape Emine and especially around Burgas and the Burgas lakes. Along the northern Black Sea coast and southern Dobrogea, the migratory route of the birds is on a wider front, reaching 60-80 km, as the birds use dry valleys and the relief far from the coast. Studies and monitoring initiatives have been proven that the intensive migratory route of birds *Via Pontica* is concentrated in the eastern part of the country, east of the line Ruse, Karnobat, Malko Tarnovo to the coast, where 74% of soaring birds fly during spring migration and over 89 % of soaring birds during the autumn migration.

In ROMANIA

Marine Natura 2000 Progress Assessment Protection of marine Important Bird and Biodiversity Areas (mIBAs), and sites at sea for seabirds.
Marine Important Bird and Biodiversity Areas (mIBAs), (Natura 2000)

- Special Potection Areas (SPA)
- Marine Area, Territorial Sea,
- Exclusive Economic Zone

Figure 27. Overlap of Marine Important Bird, Biodiversity Areas and Special Protection Areas (Natura 2000)



Across Europe, migratory species share a common strategy, which includes several stopover sites along their routes for feeding, resting and essential to individuals' survival; one of them is Danube Delta and Romanian coastal lakes. The extensive wetland complex of the Danube Delta Biosphere Reserve is a stopover site for millions of birds, belonging to over 200 different species, travelling annually to and from Northern Eurasia and Africa, mainly a great number of breeding bird species. (Figure 27)

Romania has a relatively small marine area (19th out of all EU countries) in the Black Sea. The central Black Sea is particularly important for Yelkouan Shearwater (Red List, Vulnerable) during its non-breeding period, and the Romanian coast sees large numbers of birds passing through its marine area (Figure 28). Romania is also important for various gull and tern species, and overwintering seabirds and seaducks, such as grebes, eiders, scoters, mergansers and the Common Goldeneye.(Tables 9, 10).

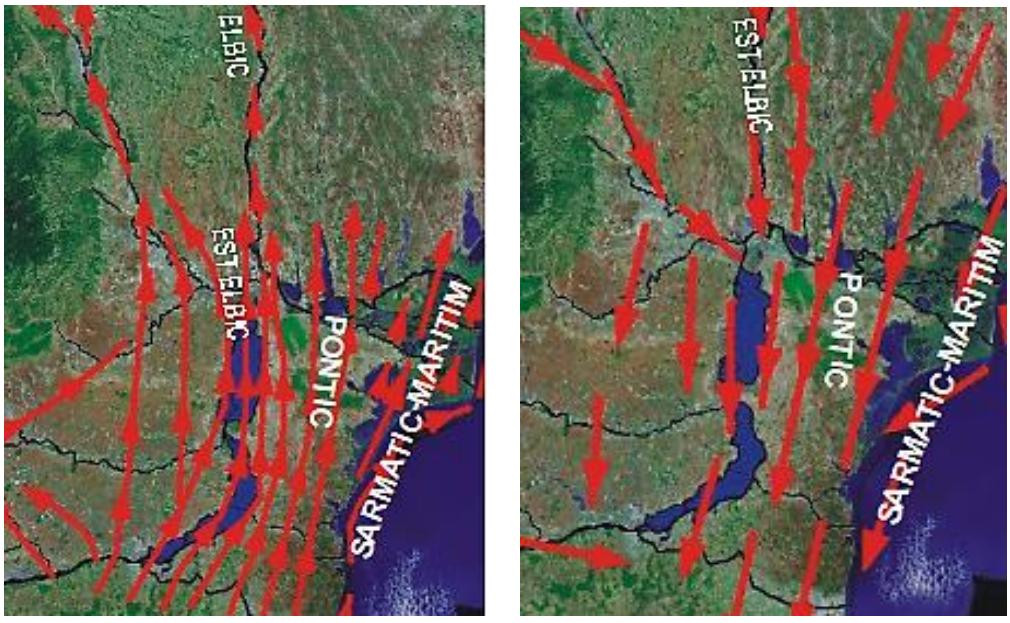


Figure 28. Birds Migration lines in the East-Southern area in Romania
a. Spring Migration, b. Autumn Migration *(EPA Report)*

The Berne Convention protects a large number of birds, 313 out of a total of 331 species from Romanian coast, mainly in the Danube Delta. They include MGD-D-PE-STU5-005-D02:

- most of the European population of the common pelican (*Pelecanus onocrotalus*) and curly pelican (*Pelecanus crispus*);

- 60% of the world's small cormorant population (*Phalacrocorax pygmaeus*); - 50% of the world's population of red-necked geese (*Branta ruficollis*) (during the winter).
Its most threatened seabird is the Velvet Scoter (Red List, Endangered). The Romanian Government has designated 8 coastal SPAs. There are currently only two mIBAs in the Romanian mIBA inventory, and 99% of their area is overlapped by the SPAs. The mIBAs were compiled by BirdLife's Romanian Partner (SOR). Although the coastal SPA network can be considered well developed, additional work is needed to protect offshore areas, as 5% of its marine area is currently protected (Ranked12th) and this is only covering the inshore area. Romania's overall SPA progress is assessed as being 'Mediocre', due to the need for work on offshore SPA identification and designation. SOR collaborated with BirdLife partners in Turkey, Bulgaria and Greece under the '*Black Sea Seabird Project'* to identify mIBA sites throughout the Black Sea.

Table 9. Zones for birds' characteristics

Additional information		**EU Rank**
Total Marine Area, Territorial Sea&Exclusive Economic Zone, (ha)	2972193	19
Area of sea protected by SPA (ha)	144958	16
Percentage of marine area (territorial sea & Exclusive Economic Zone) protected by SPA	5%	12
No. of seabird species protected in SPAs	30	13

Table 10. Marine Protected Areas dimension

Marine Protection	**No Sites**	**Area (ha)**	**Area Overlap (ha)**	**% Overlap**
Marine Important Birds and Biodiversity Areas	2	657877	654261	99%
Coastal &Marine SPA	8	667072		

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5) *http://www.anpm.ro/documents/840114/36560604/black+sea+oil+gas.pdf/e942f0e0-9959-44d0-91bc-6860becb113d*
6) *Seabird Tracking Database, http://www.seabirdtracking.org/*
7) *SOR http://www.sor.ro/*
8) *The Facebook page and the YouTube channel, as well as the website, birds in Romania, Bulgaria and Turkey (https://twitter.com/Blackseaproject)*
9) *https://maps.birdlife.org/european_infographic/Resources/Birdlife%20Int_Fact%20Sheet_ROMANIA.pdf*
10) *http://www.birdlife.org/europe-and-central-asia/european-seabird-resource-hub-home European Seabird Resource Hub NK*
11) *xxx- EPA – Environmental* Protection Agency – multiannual reports

4.2.5. Fish (*species, distribution, population, trends*)

Laura Alexandrov, Victor Niță, Simion Nicolaev, Valodia Maximov, Hristo Stanchev, Margarita Stancheva, Milena Manova, Emil Nikitov

✓ *Existing Conditions*

Marine biological resources obviously contribute to the survival of humanity. Although they have the property of regenerating, they are not infinite and therefore must be managed correctly. The study of ichthyofauna biodiversity is the basis for sustainable fisheries management.

In BULGARIA

There are identified 134 fish species in the Bulgarian Black Sea, which belong to 44 families. Most of these species are Mediterranean immigrants (100 species), 23 are Ponto-Caspian relicts and 10 species are Boreal-Atlantic relicts. One species of mullet (*Mugil soiuy*) was introduced accidentally in the Black Sea and is currently widespread on the Bulgarian coast. There are 62 species that migrate between the coastal and high seas, while 64 species migrate between the northern and southern parts of the Black Sea. The total number of species that breed in the pelagic (open waters) is 66. About 27-29 of them breed on the Bulgarian coast: 17-19 of them near the coast and 10 in the open waters. 46 species of fish lay their eggs at the bottom, of which 41-42 breed in the Bulgarian waters. There are 3 live-bearing species, two of which are found along the Bulgarian coast. With the exception of 6 species that breed during the autumn-winter season, the other species breed in spring and summer. Most fish species breed in the coastal zone and are more vulnerable to pollution.

Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora includes the following species of Black Sea fish: German sturgeon - *Acipenser sturio*; and species from the Alosa River (*Karagiozovi*). Annex 2 to the Black Sea Biodiversity Protocol includes a list of 38 fish species that are important for the Black Sea ecosystem.

The MSFD distinguishes fish species subject to commercial fishing and species that are not subject to commercial fishing. There are two main types of commercial fishing: one pelagic - sprat (*Sprattus sprattus*) and one benthic - turbot (*Scophtalmus maximus*). Observations show that the condition of the populations of the sprat is good and that of the turbot is bad. The other 3 species for which data are available: horse mackerel (*Trachurus. mediterraneus*), whiting (*Merlangius. merlangus*) and mullet (*Mullus barbatus*) are in 'poor' condition.

In 2018, for the first time, fish that are not subject to commercial fishing were monitored. Out of the 21 species, 2 are in good condition: seahorse (*Hippocampus guttulatus*) and sea dragon (*Trachinus draco*), 15 species are in poor condition, and for 4 species the condition cannot be determined, due to the fact that no value has been determined on each of the indicated status indicators.

In ROMANIA

The living marine resources are represented by fish species, with over 140 number of species and subspecies, in the whole Black Sea. Analyzing samples collected in 2018, from the Romanian coast ichthyofauna, were identified 43 marine species belonging to 30 families; 15 are brackish species. The predominant constant species are: anchovy, horse mackerel, red mullet, sprat, aterine, with slight monthly variations. The number of fish increases in the southern part of the coast, due to a greater availability of food, rocky substrate and salinity. Sturgeons fishing has been banned in Romania since 2006 for 10 years, with other 5 years extension. Until 2021, the recovery of the Acipenseridae population it is planned.

➢ Status of stocks of priority species

The swept area method is used for assessment of the biomass of fishing agglomerations of sprat, whiting, turbot, dogfish based on the statistic processing of productivity data obtained in sampling and industrial trawling. The evolution of fish catches is presented (Figure 29). An example of spatial distributions of fish stock (sprat) is done (Figure 30, 31).

The structure of the catches'species mirrored only partly the composition of Black Sea ichthyofauna from the Romanian sector, because of the type of gear conditions and the ratio between the different fish species.

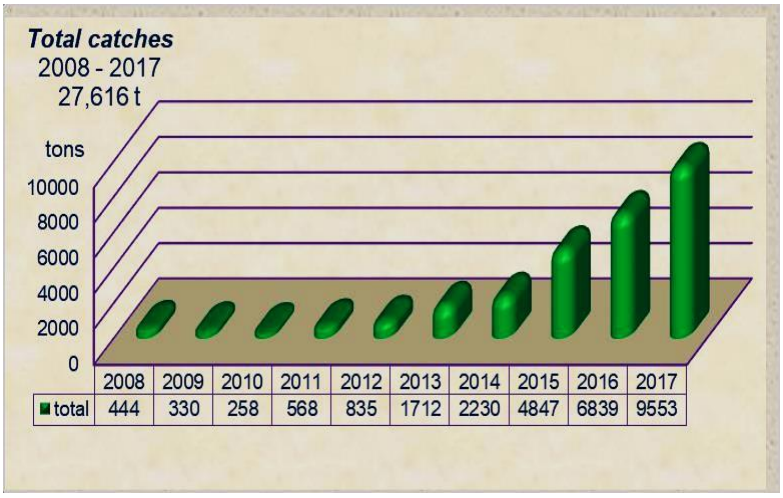

Figure 29. Total fish catch (t) at the Romanian Black Sea sector, 2008-2017 *(NIMRD)*

✓ *Conclusions*

The study of ichthyofauna biodiversity is the basis for sustainable fisheries management, for the main living comercial resource of Black Sea, spatially important as biomass, diversity and distribution.

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3) NIMRD, Report of Environment Status, 2017-2019, *http://www.rmri.ro/Home/Products.EnvStatusReport.html*,
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5) NIMRD - DG Mare-NAFA (ANPA) RO Project - National Fisheries Data Collection Program

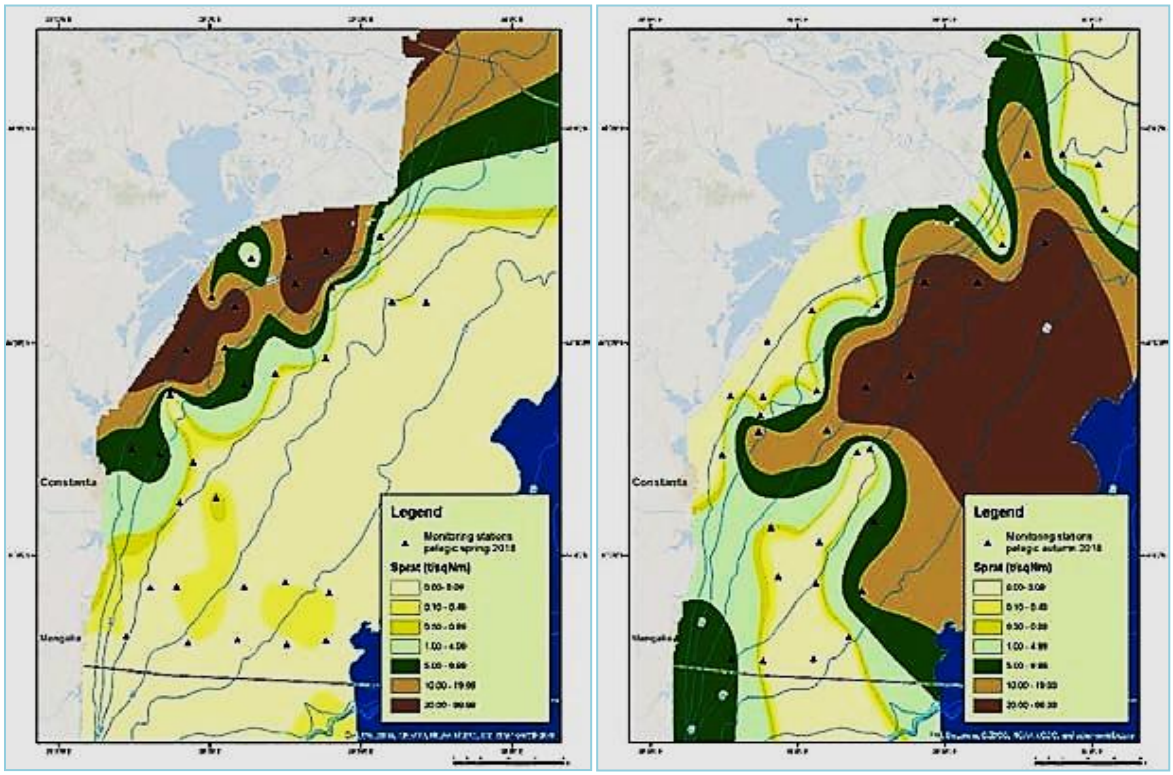


Figure 30,31. The distribution of the sprat agglomerations: in the spring and respectively in the autumn; pelagic trawl survey, in the Romanian area; 2018 *(NAFA-NIMRD).*

4.2.5. Spawning ground and nursery

Laura Alexandrov, Victor Niță, Simion Nicolaev, Dragoș Niculescu, George Țiganov, Alina Spînu, Hristo Stanchev, Margarita Stancheva, Milena Manova, Emil Nikitov

Present Conditions

In BULGARIA

Over the last decade, aquaculture production in Bulgaria has increased and species have been enriched, mainly due to the rapid growth of freshwater aquaculture farms over the years. In 2018 only 16% fell on the Black Sea aquaculture, compared to the total production of aquaculture. Marine aquaculture production facilities are mainly used to produce black mussels. Other species of molluscs introduced into the Black Sea, such as the sand mussel (*Mya arenaria*) and the rapana (*Rapana venosa*), are also of market interest and are currently only caught without developing methods for breeding and rearing them. According to the Executive Agency for Fisheries and Aquaculture among marine aquaculture, in recent years there has been a variety of other species, such as turbot, demersal sea worm and others (Table 11). In 2017, 2018, the aquaculture production in the coastal waters showed a slight decrease.

In 2019, an increase in the production is expected, as the construction of new farms contributes to the development of the sector, as well as the modernization and increase of production capacities under the Maritime Affairs and Fisheries Programme. The total number of production centres in 2018 is 764, of which 34 are Black Sea aquaculture. When analysing the production in the sector during 2015-2018, the trend of production increasing reach to 16 349 tons (2018). The national production is mainly due to inland waters quantities.

The requirements and factors for the creation of marine aquaculture in the Bulgarian waters of the Black Sea are diverse. As limiting factors for the development of aquaculture on the Black Sea coast can be indicated the lack of well-protected areas, such as estuaries, heavily incised inland bays, the temperature regime of the Black Sea waters in annual terms.

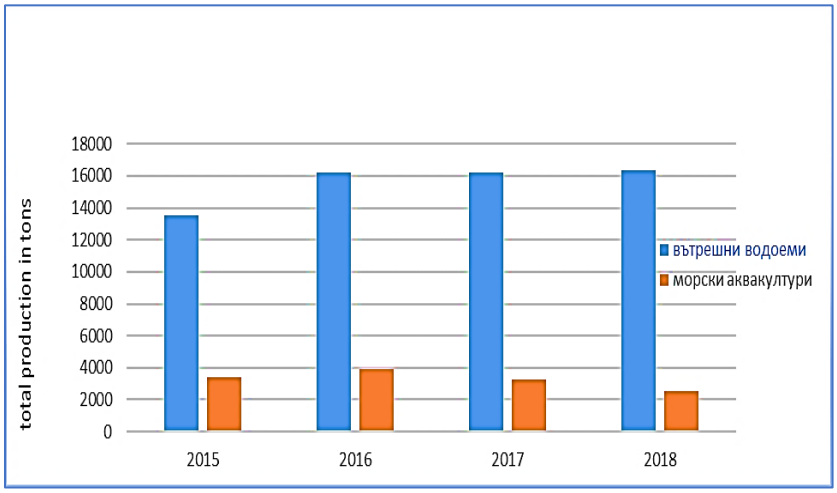
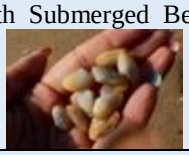


Figure 39. Annual production of aquaculture in Bulgaria for the period 2015 - 2018 in tons.

Sources: EAFA, 2019 (blue-freshwater; red-mariculture

These factors negatively affect the value of marine organisms' production. At the same time, favorable conditions for the establishment of mussel farms on the Bulgarian coast exist, as the farmed mussels are of good quality and high yield (Figure 39). Another significant factor with a negative effect on the development of marine aquaculture is the strong anthropogenic pollution, which is expressed in significant eutrophication and 'blooms', causing 'oxygen deficiency'. The creation of treatment facilities, the prevention of oil products pollution, will allow the development of aquaculture in more parts of the Bulgarian Black Sea coast.

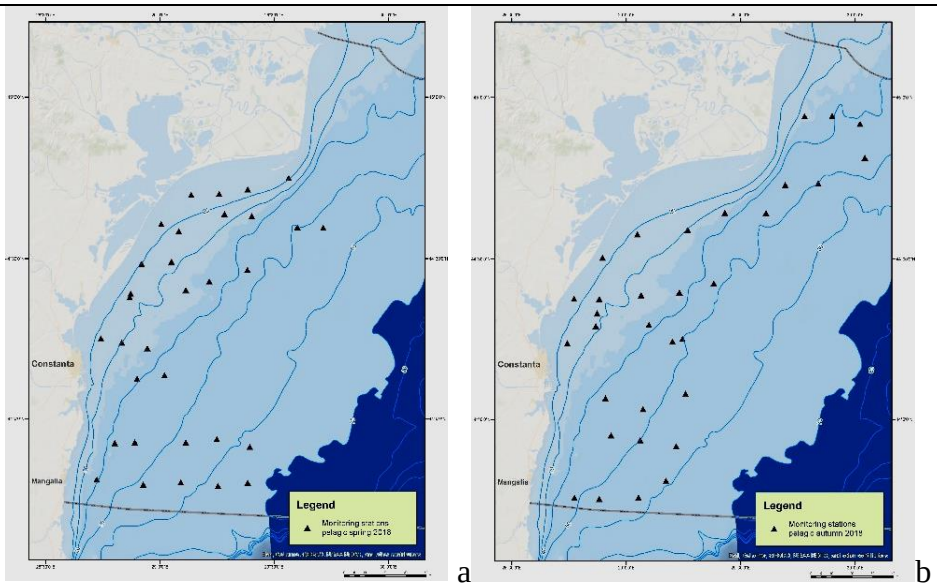
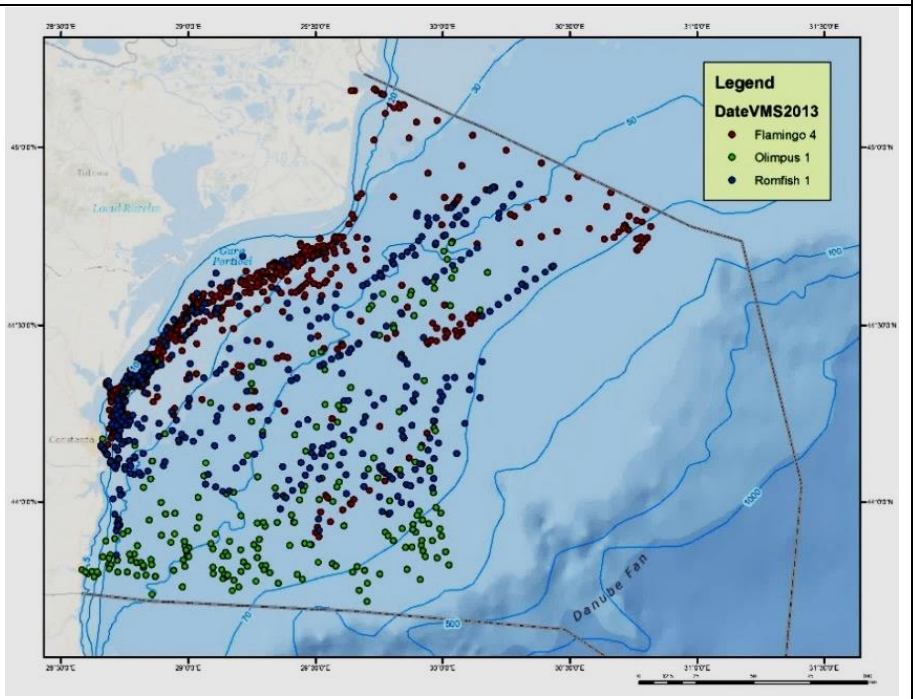
Table 11. Fishing in the Marine Protected Area in Romania and Bulgaria (Figure 32–38 *NIMRD*)

Marine Protected Area/Site area (km^2)	***Fish and Mammal species indicator /* Distribution Area**	**Observation**
1. ROSCI0311 / 353.77 Viteaz Canyon	1349 *Tursiops truncatus* Longitude 30.0042916 E, Latitude 43.0132972 N	Habitat present only in the Black Sea in only two locations, here and in EEZ of Ukraine
2. ROSCI0413 / 1868.15 Southern Lobe of Zernov *Phyllophora* Field,	1351 *Phocoena phocoena relicta* 1349 *Tursiops truncatus ponticus* 4125 *Alosa immaculata* Longitude 30.0121666 E, Latitude 44.0088611 N	Zernov's *Phyllophora* field is unique in the world. Is MPA by Ukraine nomination. It is recovery after a 40-year interruption is extending
3. RO SCI0281 / 135.92, Cape Aurora 	1351 *Phocoena phocoena relicta* 1349 *Tursiops truncatus ponticus* 4125 *Alosa immaculata* 4127 *Alosa tanaica* Longitude 28.0103833 E, Latitude 43.0137444 N	Has INMOD qualification; is important for other species with ecological and econimic value: *Mytilus galloprovincialis, Donax trunculus, Cystoseira barbata Arenicola* and *Callianassa*
4. RO SCI0066 Danube Delta - marine zone 	1351 *Phocoena phocoena relicta* 1349 *Tursiops truncatus ponticus* 4125 *Alosa immaculata* 4127 *Alosa tanaica* Longitude 28.0103833 E, Latitude 43.0137444 N	Danube Delta, the largest and most comprehensive MPA along the Romanian Black Sea coast has the third place in the world concerning biodiversity, like Amazon; it influence most marine area; most significant and valuable are migratory fish species
5. RO SCI0094 / 57.85 Mangalia Sulphide Seeps 	4125 *Alosa immaculata* 4127 *Alosa tanaica* Longitude 28.0028111 E, Latitude 43.0143416 N	It has largest diversity of marine habitats and species, and their conservation status is the best in Romania, containing 78% of the *Zostera* habitat in Romania, and 90% *Cystoseira barbata*
6. ROSCI0197 / 57.17 Eforie North - Eforie South Submerged Beach 	1351 *Phocoena phocoena relicta* 1349 *Tursiops truncatus ponticus* 4125 *Alosa immaculata* 4127 *Alosa tanaica* Longitude 28.0030055 E, Latitude 44.0090055 N	The only beach in the southern coast not modified so far by the constructions till 2019. *Donacilla cornea* and *Donax trunculus* bivalve mollusks survive today
7. RO SCI0269 / 123.11 Vama Veche - 2 Mai 	1351 *Phocoena phocoena relicta* 1349 *Tursiops truncatus ponticus* 4125 *Alosa immaculata* 4127 *Alosa tanaica* Longitude 28.0019777 E, Latitude 43.0064000 N	Unique habitat, like a mozaic, rich benthic and pelagic life forms: many fish and bivalves with high ecological and economic value, registered by the scientific community with perspectives for a MPA cross-border expansion
8. RO SCI0273 / 49.47 Marine Area of Cape, Tuzla 	1351 *Phocoena phocoena relicta* 1349 *Tursiops truncatus ponticus* 4125 *Alosa immaculata* 4127 *Alosa tanaica* Longitude 28.0059555 E, Latitude 43.0057916 N	Significant flora and fauna species of conservative interest, Black Sea and Mediterranean species: all sturgeons, shads, mackerel; bivalves, macrophytes. It is far of navigation lines
9. RO SCI0293 / 48.84 Costinești - 23 August 	1351*Phocoena phocoena relicta* 1349 *Tursiops truncatus ponticus* 4125 *Alosa immaculata* 4127 *Alosa tanaica* Longitude 28.0083555 E, Latitude 43.0086166 N	It has the largest expansion, both in the nearshore and in the offshore zone (30-45 m depth), diversity, and 7 subtypes, as classification, with very good conservation status and Significant species: *Mytilus galloprovincialis Pholas dactylus*, photophylic algae

In ROMANIA

- **Fishing ground and nursery in marine protected areas – areas for fish cultivation in ecological purposes**

By extending the ROSCI0066 site - the Danube Delta - Marine Zone towards the offing and the designation of the new ROSCI0413 site - Southern Lobe of Zernov's *Phyllophora* Field, the site ROSCI0237 - Methanogenic carbonate structures from Sfantu Gheorghe was abolished, its territory and its objectives and related conservation measures being taken over entirely by the new sites.

Sampling Network - Spatial Distribution Figures 40 a, b. Distribution of sampling stations during **spring and autumn** period, 2018 (*NAFA annually changed sampling network-NIMRD*)	 a b
Figure 41. ***VMS in the marine space of Romania*** *(Source: NAFA annully changed network)*	
Romania	**BOX 27. Spatial features in marine fisheries**
Fishing area	The whole marine space is a polygon for marine fishery; on the coast: between Sulina and Vama Veche; coastline extends for over 240 km.

Area of competence	The Romanian fishing fleet is operating in the area of the G.F.C.M (Regional Fisheries Management Organisations), Mediterranean and Black Sea Area 37, Sub-area 37.4, Division 37.4.2, GSA 29. (Figure 40, 41, 42)
Geographical & geomorphologic sectors	- the northern sector (about 158 km in length) lies between the secondary delta of the Chilia branch and Constantza, constituted of alluvial sediments; - the southern sector (about 85 km in length) lies between Constantza and Vama Veche characterised by promontories with active, high cliffs, separated by large zones with accumulative beaches, often protecting littoral lakes.

Concerning Marine Protected Areas (surface) representative fish species, have been established in January 2016, by the Order no. 46 of the Minister's of Environment, Waters and Forests, the main fish species of each one have been also underlined, as Species listed in Article 4 of Directive 2009/147/EC and in Annex II of Directive 92/43/EEC.

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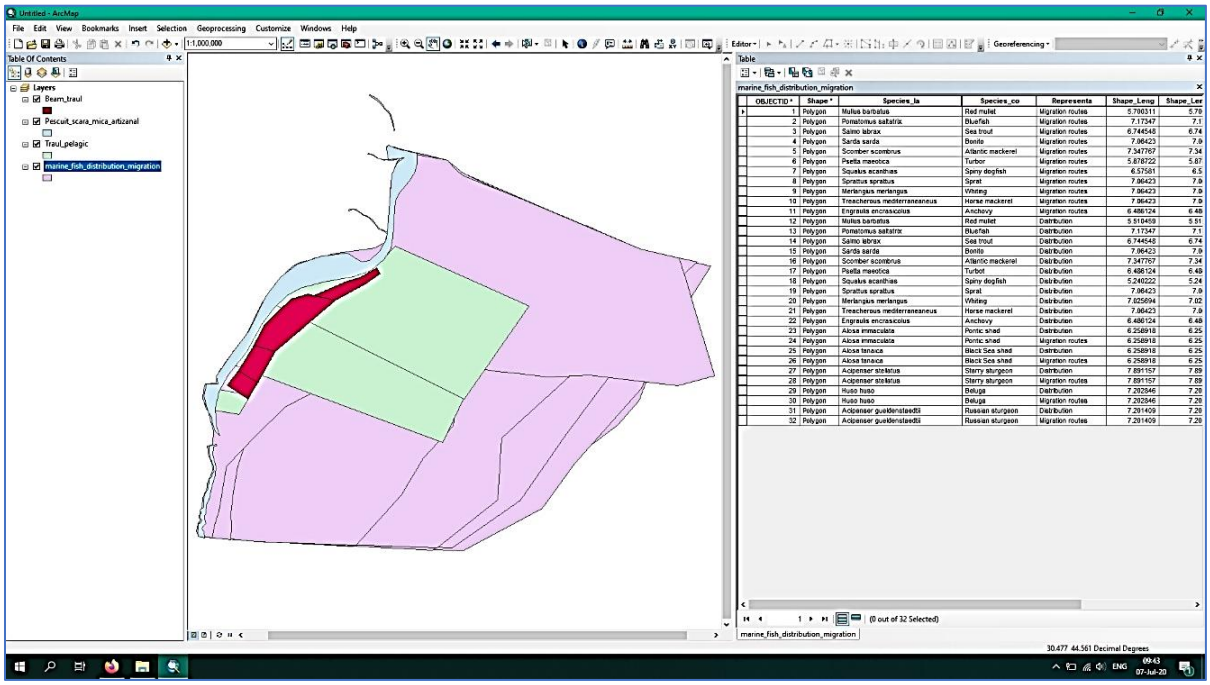

Figure 42. Zoning concerning distribution of the main fishing tools activities and migration of the main fish species **(***NAFA-NIMRD)*

4.2.7. Shellfish *(species, distribution, abundance, trends)*

Laura Alexandrov, Valeria Abaza, Victor Niță, Cristian Danilov, Hristo Stanchev, Margarita Stancheva, Milena Manov, Emil Nikitov, Tatiana Begun, Mihaela Mureșan

✓ ***Existing Conditions***

In BULGARIA

The overgrowth of *Mytilus galloprovincialis* and *Mytilaster lineatus* on infralittoral rock bottom is one of the most noticeable and widespread biotopes in the Bulgarian coastal sea waters. The small black mussel *M. lineatus* is characteristic only of the infralittoral, while the large black mussel *M.galloprovincialis* also penetrates the circalitoral. The mussel overgrowth develops on a solid monolithic rock bottom, rock blocks and biogenic reefs 'islands' at a depth of 0-20 m. The large black mussel spreads deeper in the habitat of the shelf sublittoral rocks, to the maximum depth of distribution of the rock substrate. The most common in our country is the Black Sea' black mussel (*Mytilus galloprowincialis*). The natural stocks of black mussel (*Mytilus galloprowincialis*) in the Bulgarian shelf are limited. According to the Bulgarian Fishing Association, the stocks, excluding floodplains and rocky outcrops, amount to 137 thousand tons. The most productive is the layer with a depth between 3 and 10 m, which unfortunately has been decreasing in recent decades. Data from the research of the Institute of Fish Resources (Varna) on two species of black mussel and rapana up to a depth of 35 m show reduced quantities.

Characteristic of the Bulgarian sector of the Black Sea are both species of white mussels *Chamelea gallina* and *Donax trunculus*, subject to economic exploitation. Mass unregulated exploitation has led to depletion of stocks and a reduction in the biotopes dominated by these species. However, due to the lack of data on the populations and biology of these mussels in the Bulgarian Black Sea, at this stage the effects cannot be accurately estimated. In the current 2020, research on white mussels on the Black Sea shelf began.

The snail Rapana (*Rapana venosa*), was first found in the Bulgarian Black Sea in the mid 1950s on sandy, muddy or rocky substrates at a depth of 45 m. Its wide distribution is supported by its high productivity, fast growth, as well as its pronounced tolerance to a wide range of salinity and temperature (4-35˚C), to pollution and hypoxia (ICES, 2004). The development of a significant population in the Black Sea is due to the absence of competing species, the limited predation on itself, as well as the abundance of food. *Rapana venosa* has a strong negative impact on two habitat types: the shallow sublittoral rocks and the sublittoral mussel banks of *Mytilus galloprovincialis* on sediment.

In ROMANIA

In 2018, the results of macrozoobenthos monitoring performed along a sampling research network, consisting of 13 profiles set across the Romanian Black Sea shelf (Figure 43), evinced the following results:

Soft bottom infralittoral and shallow circalittoral (up to 25 m depth)- communities dominated by mollusks such as *Chamelea galina, Mya arenaria, Anadara kagoshimensis, Rapana venosa* (Figure 43)
In shallow rocky infralittoral and shallow and offshore circalittoral - communities dominated by *Mytilus galloprovincialis*
In shallow circalitoral (between 20 and 40 m): *Spisula subtruncata, Acanthocardia paucicostata* and *Abra prismatica.*

Over the last decade, interest in the exploitation of marine mollusks in the Black Sea has grown significantly, with Turkish fisheries being an example in this regard. Clam fishing was not regulated in Romanian waters until recently, the hydraulic dredge being introduced among the legal tools in 2018 (Ministry of Agriculture and Rural Development - Order No. 1369/2018 in marine and inland waters).

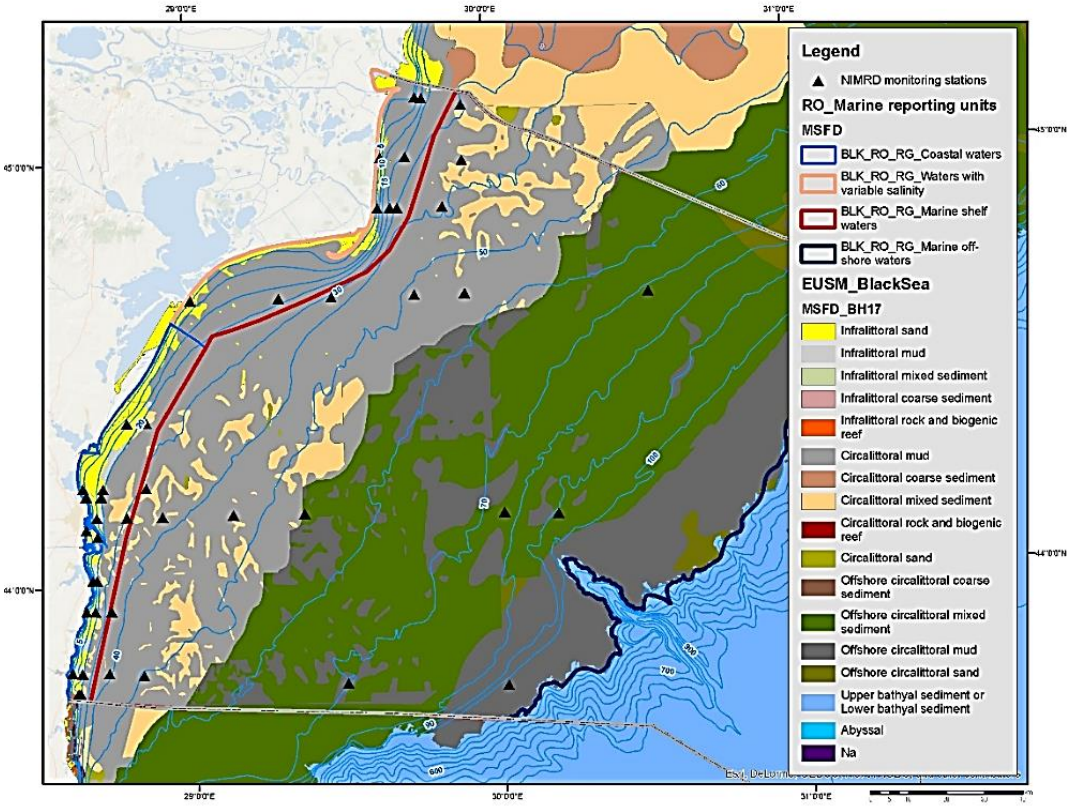

Figure 43. Zoobenthos sampling network including shells communities on the Romanian shelf (*EMODnet)*

At present, the main methods used for harvesting are: diving, rakes, shovels, but also dredging. There are exploited mollusk species such as *Chamelea gallina, Rapana venosa, Mytilus galloprovincialis*. At the Romanian littoral, the most harvested is the gastropod whelk (*Rapana venosa*) (98%). Mussels (*Mytilus galloprovincialis*) are collected only with the help of scuba diver. In 2018, the National Agency for Fisheries and Aquaculture (ANPA) introduced a quota (Total Allowable Catch) for mussels.

On the continental shelf, where muddy substrate dominates, mollusk shells form a suitable substrate for fixed mussels, which develop a deep community called *biogenic reefs* with *Mytilus galloprovincialis* at 30 and 57-60 m depths, on the circalitoral mudflats.

In the bathymetric interval of 70-100 m, the fauna is composed by bivalves *Modiolula phaseolina* (110 and 310 ind / m^2), polychaetes (100 ind./m^2), crustaceans (<100 ind./m^2), and others (based on the results of analysis of samples collected within the monitoring network: one profile on Portița (70 m), two on the east Constanța (72 and 90 m) and two on the Mangalia (70 and 100 m).

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4.2.8. Algae and marine plants *(species, distribution, abundance, trends)*

Oana Marin, Alina Spînu, Hristo Stanchev, Margarita Stancheva, Milena Manova, Emil Nikitov

✓ ***Existing Conditions***

In BULGARIA

There are 157 species of macroalgae described along the Bulgarian Black Sea coast, which represent about 53% of the total number of species described in the whole. Of the total number of macroalgae, the group of red macroalgae (Rhodophyta) with 55% of the species is the richest, followed by brown (Ohcrophyta) and green (Chlorophyta), with a similar percentage of the total number.

The sea grasses in the Bulgarian waters of the Black Sea are represented by two species of the genus Zostera - *Zostera marina* and *Zostera noltei*, as well as the species *Zannichellia palustris*, *Potamogetom pectinatus* and *Ruppia maritima* typical for brackish waters. Underwater meadows of seagrass in the Black Sea are of mixed type - there are several species within one habitat located at different depths and floors - *Z. noltei* in the range of 1-3 meters, mixed communities of *Z. noltei* - *Z. palustris* - *Z. marina* in the range of 3-4 m, and the dominance of *Z. marina* below 4 meters to the lower limit of field distribution.

Recent studies of macroalgae structure and distribution of Black Sea seagrass communities have described more than 15 plant associations inhabiting various biotopes and geographical areas along the coast. These widespread phytobenthos communities are classified according to the Habitats Directive (92/43/EEC), the Marine Strategy Framework Directive (MSFD) (2008/56/EC) and EUNIS. The distribution and ecological condition of these habitats are studied in the monitoring programs and periodic assessments under the MSFD.

The distribution of such distinguished wide habitat types of macroalgae and seagrass is limited in the shallow coastal zone. The area of the wide habitat type 'mediolittoral rocks' is estimated at a total of 26.7 km^2; the highest distribution is 11.36 km^2 (between Cape Emine and Cape Sozopol). The area of a wide type of habitat '*shallow sublittoral rocks'* is 160.76 km^2: 81.04 km^2 are between Cape Emine and Sozopol, and 20.79 km^2 - between Sozopol and the mouth of the river Rezovska. The national subtype '*underwater meadows with seagrass'* area is 8 km^2; 95% are located between Cape Emine and Cape Maslen nos (Burgas Bay).
The good ecological status of 'macroalgae' reflects the species composition, biomass and quantitative characteristics. The annual monitoring programs on the WFD of water bodies in the coastal zone determine the *ecological status*. The water bodies at the border with Romania (BG2BS000C001), Varna (BG2BS000C005) and Burgas Bay (BG2BS000C008) maintain '*poor' ecological status*, while the water bodies around Cape Kaliakra (BG2BS000C002), between the mouth of the river Kamnecia and Kamchia, as well as south of Sozopol are in good and excellent condition according to the 'macroalgae' BEQ index.
The Program of Marine Strategy measures implemented by the Black Sea River Basin Directorate concerning the analysis of the current state of the environment and the results of its implementation's monitoring, is improving (published data on the Marine Information system for Europe site[46]). The most scientific publications are on the Black Se' sensitive ecosystems and lower biodiversity, due to the specific sea basin' characters and features. Most of the identified problems are linked with the information and knowledge gaps.

The establishment of a common platform for Maritime Spatial Planning and the Biodiversity Information System for Europe, the links with the EEA and Climate Adapt platforms, significantly improved the information based environment for further studies, bypassing the

[46] *https://water.europa.eu/marine/data-maps-and-tools/map-viewers-visualization-tools/dashboards-on-marine-features-under-other-policies/marine-species-habitats-dashboards*

local competition among the institutions involved. For better analysis, assessment and monitoring results the next steps should address the knowledge communication, capacity building, as well as clear prioritizations of the scientific research and exploration topics.

In ROMANIA

Figure 44. Representation of the fresh biomass distribution per depth along the Romanian Black Sea coast (2019)

(NIMRD)

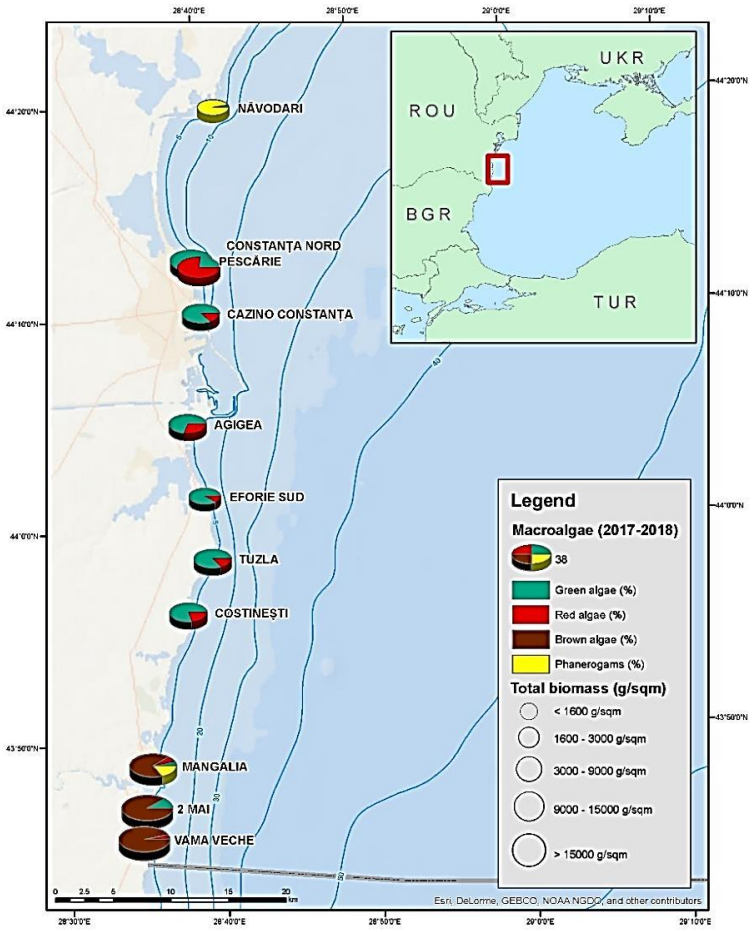
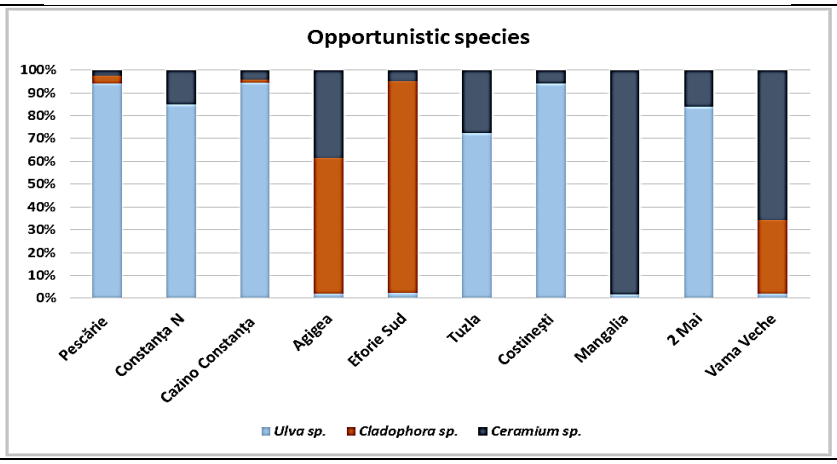


Figure 45. Biomass proportion at each sampling station for the dominant opportunistic species (2018) *(NIMRD)*



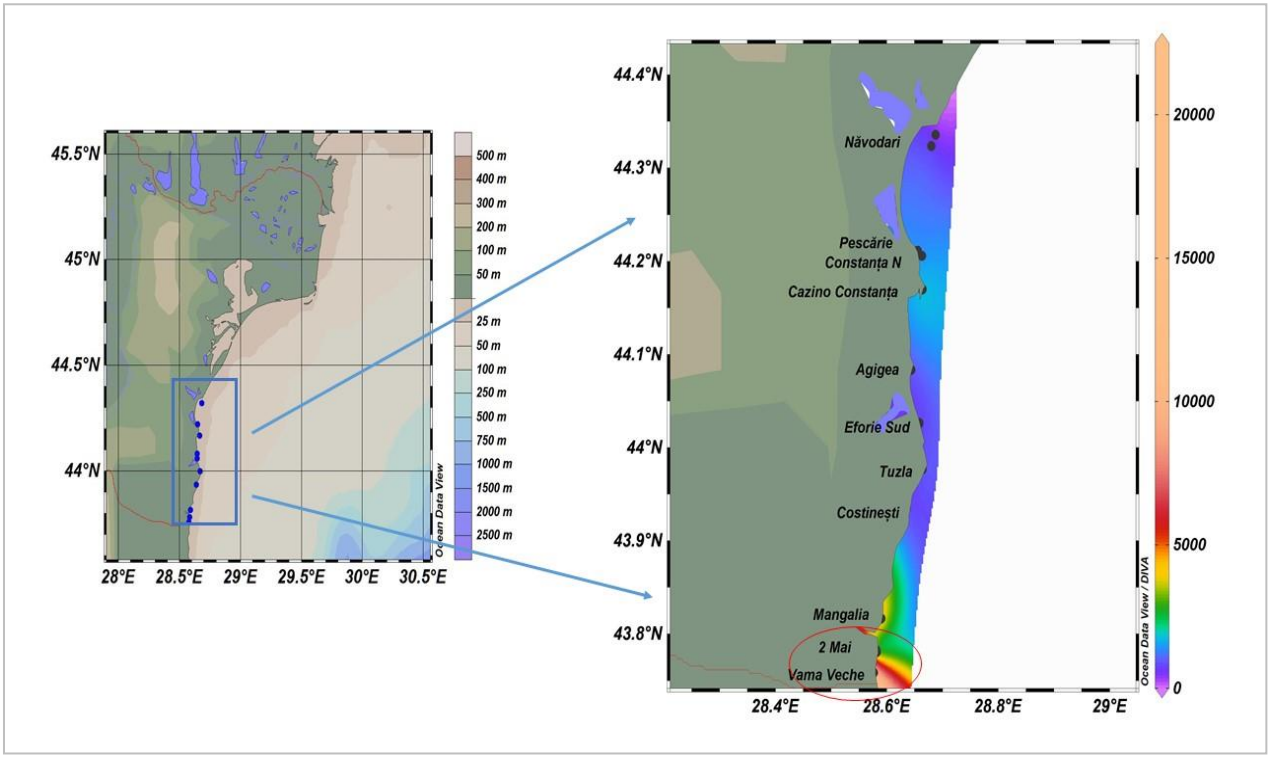
During the past years, the macrophytes communities (formed exclusively of opportunistic species) were quantitatively dominated by the green algae (*U. rigida* and *U. intestinalis* as main components), but also *Cladophora*. These species are part of the photophilic association *Ulva - Cladophora - Ceramium*. Their biomass is shown. *Ulva* species: fresh maximum biomass 1,700 g/m^2 (Central part of the Romanian coast). Among the rhodophytes, *Ceramium* have densely populated the rocky substrate from shallow waters (from 0 down to 5 meters depth).

As a result of the increased amount of nutrients in the middle area of the coast (Eforie Sud area) *Cladophora* species thrive, produced large stranded stocks on the coastal line and beaches (Figure 44, 45, 46).

BOX 28. Main Characteristic	
The perrenial species *Cystoseira barbata, Phyllophora* sp., *Zostera noltei*	A very small number of species comparing with previous decades, have a great ecological value and are highly sensitive to eutrophication. - The brown alga *Cystoseira barbata* forms well-developed fields in the southern part of the Romanian Black Sea coast, from Mangalia to Vama Veche, with, 3,500-10,500 g/m^2, in 2018, slightly higher, compared to the previous years. - The marine phanerogam *Zostera noltei* maintained its distribution area (Mangalia and Navodari: 850-1,000 g/m^2); also, is slightly higher compared to previous years.
The opportunistic species	*Ulva* sp. (dominant 2018), *Cladophora*, (in 2017) are dominant along the Romanian Black Sea coast even they do not have the same ecological value as the perennial ones, because life cycle is seasonally and they are not able to proper sustain a rich underwater life.

Analysing the biomass values, it is observed that the highest values were recorded in the southern part of the Romanian Black Sea coast, due to the presence of algal communities formed predominantly of perennial species, *Cystoseira* and *Zostera*.

Figure 46. Graphic representation of the fresh biomass distribution per depth along the Romanian Black Sea coast (2018, *NIMRD*)



✓ *Conclusions*

- The perennial species *Cystoseira barbata* and *Zostera noltei* maintained their regeneration along the Romanian Black Sea coast (from Mangalia to Vama Veche).
- The qualitative change of phytobenthic communities from north to south can be noticed.
- Opportunistic species dominate the northern part, while the perennial sensitive species, (*Cystoseira, Zostera, Corallina*) the southern part.

- *Cystoseira barbata* - *Ulva rigida* association is a type of algal associations resulted from similarity between sampling stations, analyse based on the fresh biomass values;
- Photophilic associations *Ulva* - *Cladophora* – *Ceramium* dominated from the middle coast to the south (Figure 45).

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2) NIMRD-Environment Status Report,http://www.rmri.ro/Home/Products.EnvStatusReport.html, 2017-2019
3) Romanian Report on the ecological status of the marine ecosystem of the Black Sea, according to art. 17 of MSFD (2008/56/EC) (2018)

5. PRESENT MARITIME ACTIVITIES AND USES

The maritime uses with particular significance for the national maritime spatial planning analyzed take into account the scope of the Marine spaces, Inland Waters and Ports in the both countries (according to the Bulgarian Act and MSP Committee related laws in Romania) with all sectors, among which fishing and aquaculture; extraction of non-living resources; maritime transport and technical infrastructure, ports, shipping, ship and ship repairing and the additional facilities; submarine cables and pipelines; coastal and maritime tourism; coastal defense/flood protection; dredging and dumping; underwater cultural heritage; military trainings, protected areas and sites.

The present section has the aim of orienting the collection of the background information concerning the maritime activities in the area (Table 12).

Table 12. Group Sectors / Activities

Maritime Domains	Recommended Spatial Elements	Existing Spatial Elements
1. **Fishing and Aquaculture**	- Fish and shellfish harvesting (professional, recreational) - Fish and shellfish processing - Marine plant harvesting - Aquaculture, including infrastructure	- Fishing zones, - Total landings by groups of target species, - Fishing fleets, gear, Fishing effort - Allocated Zones for Aquaculture - Zones for aquaculture installations
2. Extraction of non-living resources	- Extraction of oil and gas, including infrastructures - Extraction of minerals (rock, metal ores, gravel, sand, shell) - Extraction of salt - Extraction of water	- Extraction of oil and gas, including infrastructures - Extraction of minerals (rock, metal ores, gravel, sand, shell) - Extraction of salt - Interrelation with other maritime activities
3. Maritime Transport	- Transport infrastructure - Shipping - Shipbuilding	- Transport infrastructure - Shipping - Shipbuilding and ship repair - Traffic Separation System - Industrial Ports, Marinas
4. Submarine cables and pipelines	- Transmission of electricity and communications (cables) - Production of energy (if exists)	- Submarine cables - Offshore Gas Pipelines - Pipelines
5. Tourism	- Tourism and leisure - Coastal tourism - Beach-based activities - Maritime tourism, - Cruise tourism - Sailing and nautical activities	- Available spatial data - Coastal and maritime tourism - Tourism sectors, activities, structures, - Trends in the tourism flow

6. Coastal defense & flood protection	- Offshore structures (other than for oil/gas/renewables) - Land claim	- Marine Disposal Sites for Dredged Material - Ports works
7. **Dredging and dumping**	- Restructuring of seabed morphology - Materials depositing	- Restructuring of seabed morphology - Materials depositing
8. Underwater Cultural Heritage	- Archeological sites - Shipwrecks	- Underwater archaeological sites and artefacts, Shipwrecks - Natural Heritage Route (underwater protected areas
9. Military Trainings	- Training Areas - Defense/Military Areas	- Training Areas

5.1. MARINE FISHING AND AQUACULTURE

Simion Nicolaev, Laura Alexandrov, Victor Niță, Ivan Dobrev, Bogdan Bogdanov, Antoanetta Trayanova

5.1.1. Marine Fishing

✓ ***Existing Conditions***

The Fisheries sector covers all activities of catching, handling, processing and marketing of caught fish and aquaculture products. The Aquaculture sub-sector encompasses the cultivation of aquatic organisms - fish, mollusks, crabs and plants by intervening in the process of development and reproduction aquatic organisms, in order to increase their output, whereby the management and ownership of the resource may be individual and/or collective.

State of marine fish stocks diversity of species is the indicator estimating the quantity of fish for the main fish species in both countries. By the MSFD point of view, the indicator monitors the proportion of fish stocks overfished in the total number of commercial stocks, by fishing areas (e.g.RO32 and CSI 32=EEA indicator in Romania).

In BULGARIA

➢ **The Fisheries sector**

The Fisheries and Aquaculture Act (FAA) governs the ownership, organisation, management, use and conservation of fishery resources in the waters of the Republic of Bulgaria, and the trade in fish and other aquatic organisms. It aims to provide sustainable development of fishery resources, restoration and protection of the biological Bălance and enrichment of the diversity in the marine ecosystems. In addition, it regulates the commercial and recreational responsible fishing and aquaculture and supports the increase of fish and fish products the consumption in Bulgaria.

The Bulgarian Executive Agency of Fisheries and Aquaculture (EAFA) carries out the activities related to the state and operational management of the Fisheries sector within the framework of the Common Fisheries Policy of the European Union (EU), state supervision, control over fishing activities in fishery waters, and has been designated as the Managing Authority for the funding from the EU's European Maritime and Fisheries Fund (EMFF).

Almost all fishing activities in Bulgaria are carried out in the contiguous zone - up to 24 nautical miles, and most of them are carried out in the territorial waters - up to 12 nautical miles. The data from the Vessel Monitoring System (VMS), with which the Fishing Vessels Monitoring Centre (FVMC) to EAFA is equipped, indicate that fishing vessels operate mainly in the area between Cape Galata and Cape Cherni nos, between 10 and 16 nautical miles. In shallow waters near the coast, fishermen use fixed nets, gillnets, hooks and lines.

Based on the data provided from the VMS and FVMC the fishing areas could be traced and analyses. Additional information is provided for the fishing ports and landing sites for fish catches, thus the potential conflict zones with other uses can be identified. Contiguous land on shore, adjacent to aquaculture farms, is not regulated as a right of acquisition by operators which hinders the monitoring, guarding, harvesting the produce, etc.

Among the identified problems in the sector is the difficult access to information and different formats for provided data. Additional problems are the difficulties in the coordination procedures with other sectors, due to the lack of synchrony between the variety of institutions, operating on the coastal and in the water areas – Black Sea Basin Directorate, Bulgarian Navy Headquarters, Maritime Administration Executive Agency, Executive Agency of Fishery and Aquaculture.

In ROMANIA

➢ Fishing zones

The Romanian fishing fleet is operating in the area of competence of the Regional Fisheries Management Organisations - G.F.C.M, Area 37 - Mediterranean and Black Sea, Sub-area 37.4, Division 37.4.2, GSA 29.

Coordinated by the European rules and regulation in Romania is the same situation like in Bulgaria concerning governance and legislation.

Subsequent cartographic representations were able to achieve the fisheries production zoning, according to depth / isobaths / geographical coordinates, individually / thematically or integrated, in relation to one or two of other maritime activities, to estimate areas suitable for fishing, neutral or buffer zones, seasonal movements and changing the situation in special cases: natural disasters (floods, droughts, strong winds and waves), marine accidents, periods of prohibition, etc.

The fishing zone and the prohibited areas for fishing have been identified, due to industrial sectors and other restriction areas (MPAs). The main fishing ports and area of stationary fishing gears were spatially represented (Figure 63) The main ports are: Sulina, Sfantu Gheorghe, Vadu, Mamaia, Eforie, 23 August and Mangalia.

In the shallow coastal zone, the marine fishing sector using fixed gears is an intense activity mainly during March to September, when usually the migration to the coastal area is done by turbot for reproduction and by other species for feeding (Fig 64).

➢ Total landings by group of targeted species

The capture level differs from one year to another, it depending on the fishing effort (number of pound nets, number of turbot nets and effective fishing days), and also depends on the evolution of hydro climatic conditions and of fish stocks status. As a general rule, catches are dominated by pelagic, small-sized and short life cycle species.

Fish population structure indicates the presence of 20 number of species (sprat, anchovy, whiting, goby) and of the larger species such as the turbot and Danube shad. A lower presence in the fish production registered dogfish, horse mackerel, mullet, bluefish; the occurrence as isolated exemplars of blue mackerel and bonito were reported.

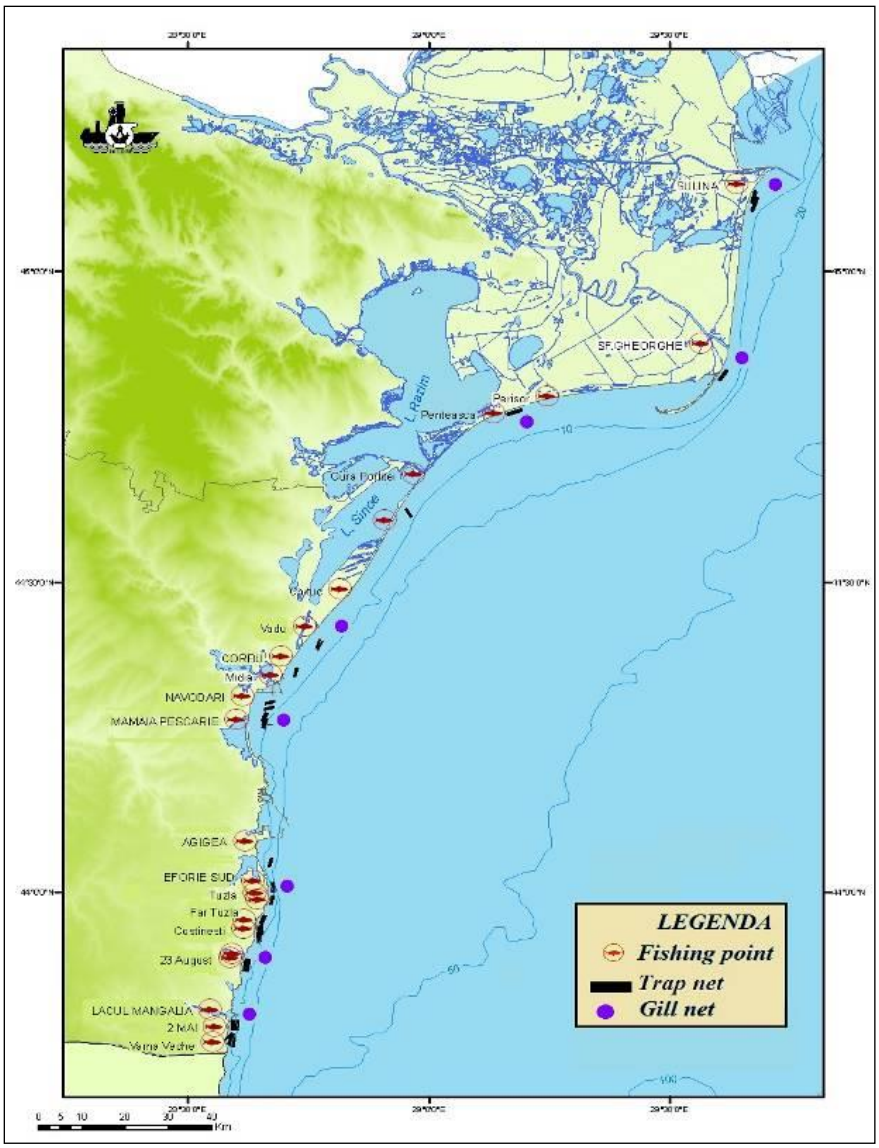

Figure 47. Fishery ports and distribution area for stationary fishing gears *(NAFA-NIMRD)*

The catches increasing is due not to fish species, but to Rapa whelk (*Rapana venosa*), which was about 10 % of the total catch in 2010 and became 96.2 % in 2017, according to the economic operators' registration.

➢ Fishing gears used at the Romanian littoral

There are different types of fishing gears for the active and passive fishery practised in the inshore and offshore coastal fishery (Figures 48, 49, 50).

The passive fishing gears include the equipment for catching in general the fish migrating for spawning and feeding in shallow waters, namely: long lines and bottom lines, gillnets for the Danube shad, turbot and gobies, sea pound nets, beach seine, beam trawl, pelagic trawl.

➢ Fleets, fishing gears and fishing effort

Year after year the activity of fishing vessels decreased gradually to the point where from 20 vessels with LOA between 24 - 40 m registered, in the last years in the Fishing Fleet Register was registered as active only two - three vessel for a very short period of time. In 2016, the total number of boats/vessels registered was 148, from which only 121 were active, most of them having LOA of 6 - 12 m (79,53%). (Figure 51)

There were used mainly gillnets and long lines (Figures 48, 49, 50). The fisheries of this small fleet are typically artisanal type as multi-species and multi-gear fisheries, fishermen switching from one gear to another several times throughout the year.

Taking into account these results, the covered areas of fishing vessels and the production obtained and possible prognosis could be were. Our estimation was for 2016, but the evaluation can be counted and spatially distributed for each year and fishing season. Reported to the employment in fishing, fisheries, fishing tools production and fish processing, it is

shown that the total number of fisherman slowly dropped from 471 people in 2012, to 404 in 2017.

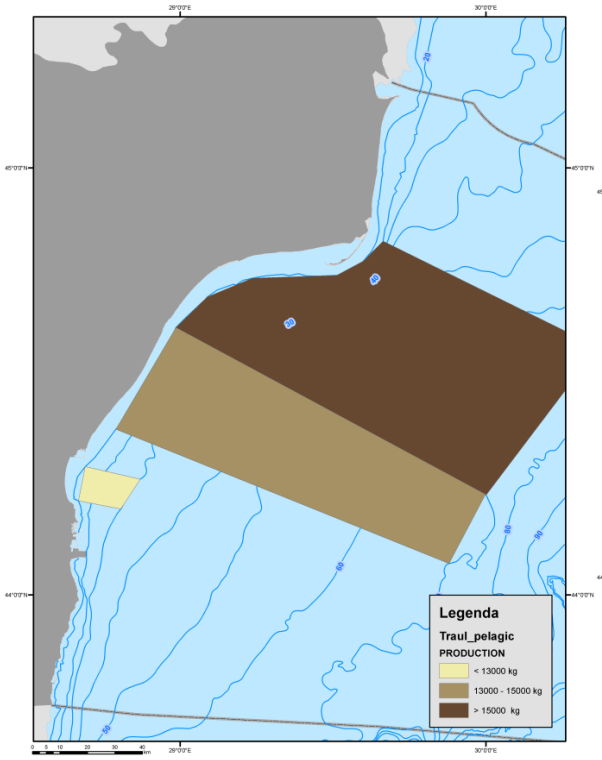

Figure 48. Zoning for Pelagic Trawl *(2016, NAFA-NIMRD, ECOAST)*

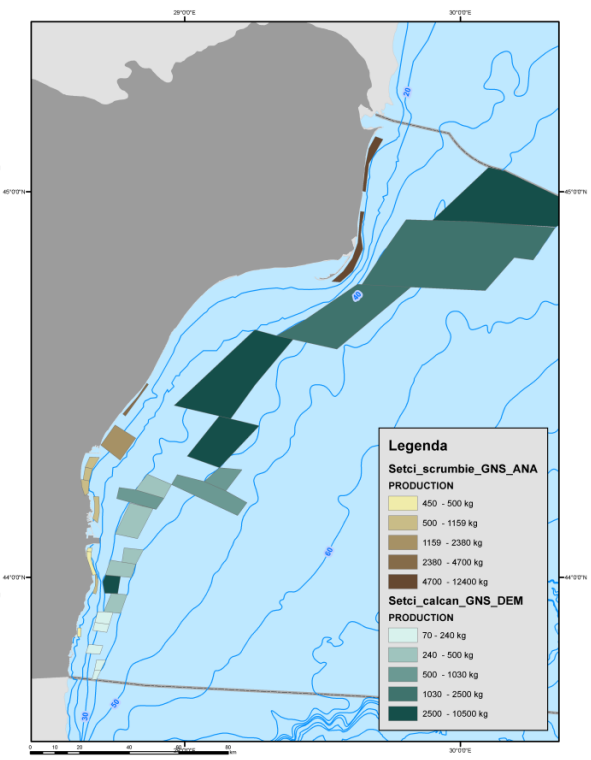

Figure 49. Areas for Nets installation *(2016, NAFA-NIMRD, ECOAST)*

The number of fishermen for vessels with length bigger than 24 m decreased from 200 people to the crew of only three vessels (24 persons). Similarly is the situation in the coastal fishing fleet, the stationary fishing has also declined at the Romanian coast (Figure 50, 51).

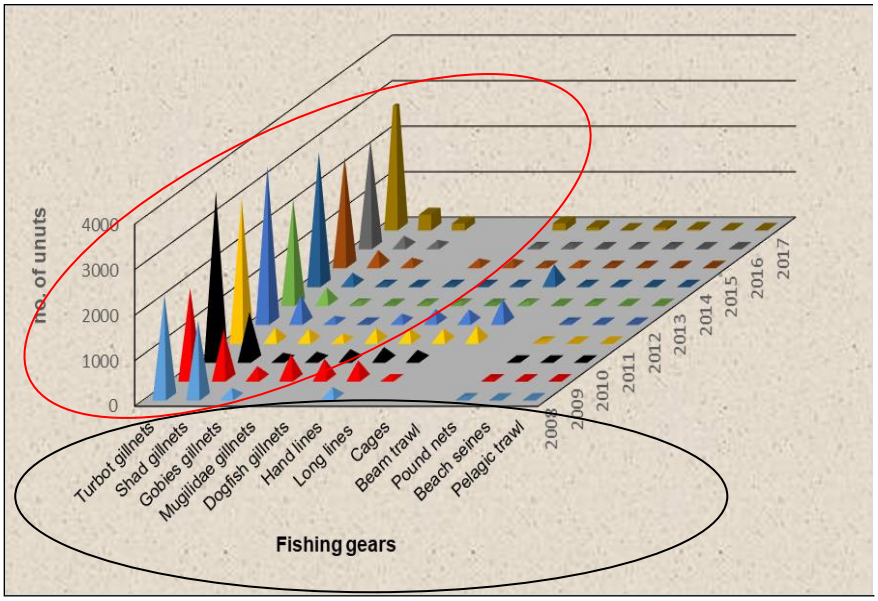

Figure 50. Number of units per fishing gear *(NAFA-NIMRD).*

271 fishermen activated in small scale fisheries (on 6-12 m boats) in 2017, using different types of gears; and 29 people activated on boats under 6 m. For 12 - 18 m boats, a personnel staff increase was reported, from 10 to 74 fishermen, from 2013 to 2017.

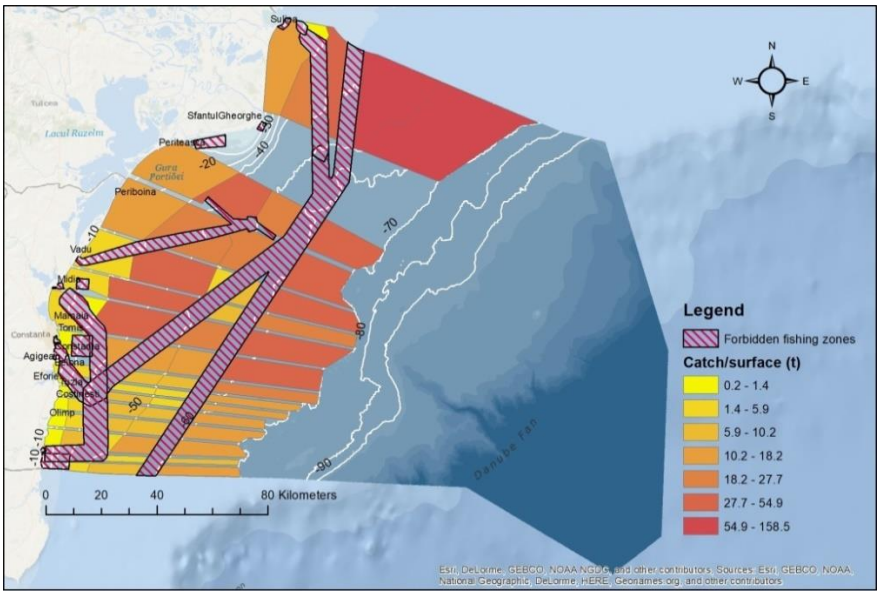

Figure 51. Fishing zonation example, according to areas of activity for the fishing vessels and tools. Interactions between fishing areas and other maritime activities *(2016, NAFA-NIMRD, ECOAST)*

5.1.2. Marine Aquaculture – aiming AZA - *Allocated Zones for Aquaculture*

✓ ***Existing Conditions***

In BULGARIA

Aquaculture is one of the pillars of the EU Blue Growth Strategy, and the development of the sub-sector contributes to the goals of the European Commission's "Europe 2020" strategy on employment creation, innovation, energy efficiency, lifelong learning, poverty reduction and social exclusion. Aquaculture production in Bulgaria is dominated by fish production, followed by mollusk production. Out of the molluscs in the coastal waters of the Black Sea, the cultivation of black mussels takes the leading place. Traditionally, most significant is the catch of sprat, which forms about 80% of the total catch of fish in the Bulgarian territorial waters in the Black Sea. Over the last decade, *Rapana venosa* has been one of the major marine species, accounting for about 50% of all catches and a major export-oriented product with the same share in the export of fish, mollusks and their products. The other species, subject to commercial fishing, generate ten times smaller catches. Leading species in this group are shad, red mullet, gobies, thornback ray, spiny dogfish and turbot.

The development of marine aquaculture in the Black Sea is promising, due to the limited industrial pollution, the lack of dangerous toxins produced by algae (e.g. in the Mediterranean) and the relatively small tidal waves (8-9 cm). The presence of phytoplankton (the main food source of the mussels) also has a beneficial effect on the cultivation of black mussels. There are no marine predators in the Black Sea, such as starfish, etc., which could damage the installations. In the last 10 years the cultivation of black mussels has developed rapidly. The environmental benefits of shellfish production are numerous. Within a year of installing mussel farms in the sea, there is an effect on improving water quality, as mussel plants function similarly to vertical reefs covered with mussels - the natural habitat of the species. The black mussel filters 80 liters of seawater per day, retaining organic matter and purifying the sea. In addition to the above benefits, the installation offers places for rest and more intensive feeding of birds (due to the higher density of ichthyofauna - fish, crabs and whelks), which in turn leads to a lasting beneficial effect on the avifauna. Cultivated amounts of mussels also release additional spat, which supports the natural reproduction of populations and their survival. The weak point of this type of aquaculture is the lack of naturally protected waters in the mussel cultivation areas. There are no suitable bays and/or fjords in the Black Sea that protect the facilities from sea storms and currents.

In ROMANIA

In the last decade, interest in the exploitation of marine mollusks in the Black Sea has increased significantly, with Turkish fisheries being an example in this regard; using methods such as diving, the use of rakes, shovels, but also dredging methods, mollusk species such as *Chamelea gallina*, *Rapana venosa*, *Mytilus galloprovincialis*, etc. are collected.

Currently, in Romania, bivalves are not considered a common food, but in the last decade were registered a slight increase in the consumption of Rapa, mussels and oysters:

- The most fished is the gastropod Rapana (*Rapana venosa*) (98%), in present,
- In 2018, the National Agency for Fisheries and Aquaculture (ANPA) introduced the quota (Total Allowable Catch) for mussels (*Mytilus galloprovincialis*).
- Clam fishing was not regulated in Romanian waters, and the tool used (hydraulic dredger) was introduced among the legal tools in 2018, by the Ministry of Agriculture and Rural Development by the Order No. 1369/2018 in marine and inland waters.

➢ **From North to South, the three areas proposed for classification, and further on, to be analysed in a future AZA process that shall be developed in Romania*:***

Area 1 - between Perişor and Chituc, 215 Mm^2, having the coordinates:

- ✓ in NE, the line between 44°48',13 N / 29°17',59 E and 44°37',20 N / 29°30',00 E;
- ✓ in E the limit of Romanian territorial waters;
- ✓ in S, the line between 44°30',19 N / 28°51',18 E and 44°30',40N / 29°10',48 E;
- ✓ in NW, the line between 44°48',13 N / 29°17' ,59 E and 44°30',19 N / 28°51',18 E;

Area 2 - between Năvodari and Constanţa (Baia Mamaia), 109 Mm^2; coordinates:

- ✓ in N, the line between 44°19',30 N / 28°39',00 S and 44°19',50 N / 29°00',50 E;
- ✓ in E the limit of Romanian territorial waters;
- ✓ in S, the line between 44°10',50 N / 28°40',00 E and 44°10',50 N / 28°56',50 E;
- ✓ in W the 5 m isobaths;

Area 3 - between Agigea and Mangalia, 101 Mm^2

- ✓ in N, from the most Southern protection dike of Constanta Harbour and 44°05',40 N / 28°41',00 E point;
- ✓ in NE the line between: 44°05',40 N / 28°41',00 E; 43°57',80N / 28°48,'20E; 43° 50',00N / 28°48',20E;
- ✓ in S, the line between 43°50',00 N / 28°35',80 E and 43°50',00 N / 28°48',20 E;
- ✓ in W the shoreline (in unpopulated areas) and the 5 meters isobaths at the beach areas from Eforie Nord, Eforie Sud, Costineşti, Olimp-Neptun-Saturn and Mangalia.

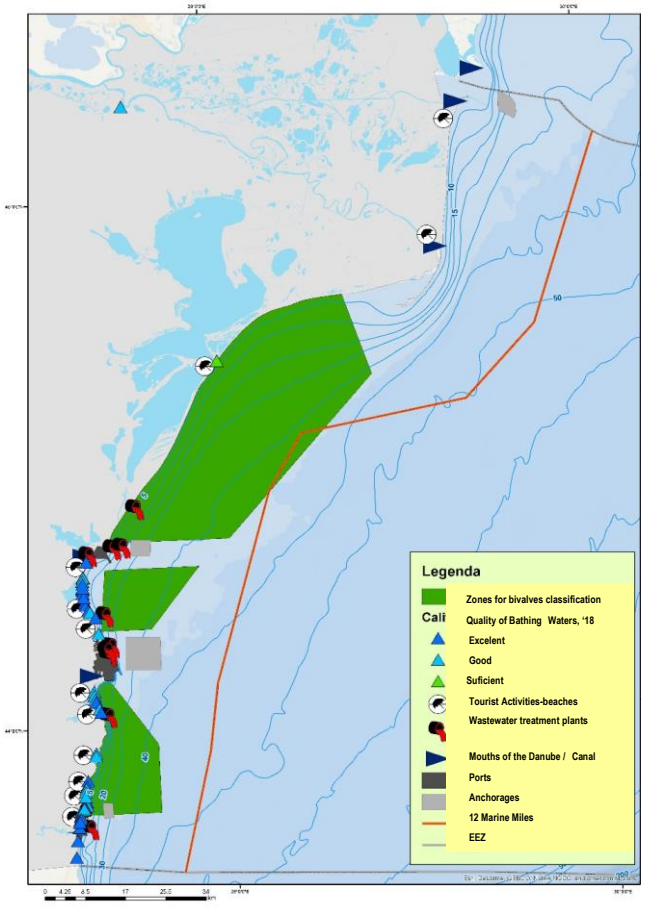

Figure 52. Map of the area currently undergoing the process of microbiological classification for shellfish aquaculture and harvesting in Romania (*NIMRD*)

By virtue of operating the Shellfish Aquaculture Demonstrative Center, under the aegis of FAO - GFCM, NIMRD develops a pilot aquaculture mussel farm in the Black Sea.

➢ The current status of the Allocated Zones for Aquaculture and of the microbiological classification of suitable water bodies for shellfish aquaculture in Romania

The major problem that prevented both the cultivation and the harvesting of bivalves from the natural environment in Romania was the lack of microbiological classification of the Black Sea waters, as required by Regulation (EC) no. 627/2019 (previously 854/2004). This proceeding started in June 2019, after consultation and studies which involved important EU and national authorities and institutions: NIMRD, with the support of the GFCM, National Sanitary-Veterinary and Food Safety Authority (ANSVSA), National Agency for Fisheries and Aquaculture (NAFA), Ministry of Environment, Waters and Forests (MEWF), Institute of Diagnosis and Animal Health (IDAH), by the "*Inter-ministerial agreement for the classification of production and relaying areas of live bivalve molluscs*".(Figure 52)

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5.2. EXTRACTION OF NON-LIVING RESOURCES *(oil, gas, salt, water, etc.)*

Margarita Stancheva, Hristo Stanchev, Dan Vasiliu, Jenica Bujini, Glicherie Caraivan, Vlad Rădulescu, Raluca Țuțuianu, Alina Spînu

✓ *Existing Conditions*

In BULGARIA

Extraction of non-living resources is an important generator to GVA (around 11.3%) in Bulgarian Blue Economy (or 83,000,000 Euro) although the sector employs only around 4,200 persons in 2017 (5.8 % of the Blue Economy jobs) (EC 2019).

Bulgaria benefits from the advantages of its geographical location on important gas transport corridors and access to major gas resources recently discovered in the Black Sea. The strategic location of Bulgaria in the Black Sea has made it a transit point for Caspian Sea oil exports headed towards European refineries. The country is also a transit route for gas exports from Russia to Turkey and the EU. While oil is imported through Burgas port, oil and gas exploration in the country occurs mostly in the northern part of the Black Sea. From the Burgas port, both the oil terminal and refinery are further connected to many cities in Bulgaria through pipelines. In 2005, Bulgaria offered the offshore Shabla block in the northern Black Sea shelf for exploration, as the potential reserves of the Shabla block are likely to be 200 million barrels (Country Fiche Bulgaria, 2014). Currently, there is only one company which extracts offshore gas - Melrose Resources Plc, but new players are expected in the coming years.

According to the Ministry of Energy, on the territory of the Bulgarian coastal municipalities fall few deposits of oil and natural gas. The deposits are under exploitation by concessions issued in favor of 'Exploration and Production of Oil and Gas' JSC, Sofia.

In the nearshore Bulgarian part of the Black Sea, four natural gas fields are registered and are under exploitation. The Galata Platform with its associated infrastructure (pipelines) is the only one production facility located in the Bulgarian Black Sea. It is a natural gas field located on the continental shelf of the Black Sea, approximately 25 km southeast of Varna, Bulgaria. The field was the first one developed and maximum production provided more than 16% of Bulgaria's domestic gas needs.

The extraction of oil and gas has been made since 1960s near Tulenovo village (Shabla Municipality) and it is still ongoing. Despite that continuously declining yield from existing wells, the extractions are important for economic and social development of Shabla Municipality. For oil and gas exploitation, the operating company *'Exploration and production of oil and gas'* has been granted with 35-year concession. The concession territories are located south of the Romanian border and south of Cape Shabla, Northern Bulgarian coast. According to the last information, as of 2016, the exploitation of gas and oil is in decline, and the company is intended to build a new tourist infrastructure on the oil and gas fields, such as golf courses and resorts. The operating company is authorized to use 16 discharges of treated waters into the sea. Treatment of contaminated water is made only mechanically (incl. dehydrated sludge). This procedure is among the main sources of pollution of the soil, coastal littoral and sea waters. The company performs a programme to reduce the wastewater discharges pollution and enforcement activities in accordance with legal requirements in the field of water. By fulfilling the requirements of this programme it is expected that the influence of this source of pollution will be reduced.

BOX 29. An offshore oil and gas exploration in the deep Black Sea is a complex and long process, especially in an untested area. During the last decade several deep sea explorations for oil/gas were conducted in Bulgaria: Figure 53. Offshore oil & gas explorations in deep Black Sea

- Total E&P Bulgaria B.V., its partners OMV Offshore Bulgaria GmbH and Repsol Bulgaria B.V. have started drilling of the third exploration well on Block 1-21 Han Asparuh since the end of 2018. The 1-21 Han Asparuh block is located deep offshore in the Bulgarian sector in the western part of the Black Sea and covers an area of 14,220 km^2 with water depth up to 2 200 m. Following the completion of the first two exploration wells, this drilling is a new important step for TOTAL operations in the Black Sea.
- Royal Dutch Shell holds the license for the 1-14 Han Kubrat/Silistar block, covering about 6,900 km^2 of Bulgaria's Exclusive Economic Zone (EEZ). In 2019, Shell's Khan Kubrat-1 exploration well has been plugged and abandoned after encountering non-commercial hydrocarbon shows in target reservoirs. The well reached target depth of 3327 m in late May 2019 with non-commercial hydrocarbon shows in target reservoirs.

	Other non-living resources
Gas hydrates,	Iron-manganese concretions, sapropels and sapropeloid oozes should be mentioned among the alternative mineral resources in the Bulgarian water area. The support of further research and exploration, especially in a cross-border context, is expected to improve the knowledge, to support biotechnologies development and other wide spectrum potential uses.
Salt extraction	Is practiced for centuries in the two coastal lagoons (Pomoriysko and Atanasovsko Lakes near Burgas) through solar evaporation of sea water**.** The currently operating companies are 'Chernomorski solnitsi' JSC and 'M-Pomoriyski solnitsi" SJSC. The production is about 32-34 thousand tons of salt per season. Besides sea salt, other by-products are extracted too - lye for winter road maintenance, medical lye, magnesium salts and others.
	The development potential of the sector is largely in the more efficient use of resources for alternative purposes, mainly in medicine and pharmacy. There are functioning SPA treatment facilities in Balchick, Pomories and Burgas areas, that use mud, salt and its derivatives and a further development of this activity may attract additional number of patients and tourists.

There is currently no data on the *minerals extraction* of sand and gravel from the seabed

and underground mining in the Bulgarian part of the Black Sea (Figure 53).	
Identified ***potential conflicts*** are related to the increasing pressure on the environment, in case of intensifying the extraction of minerals, oil and gas. These marine uses may compete for the access to space with fishing, aquaculture, offshore wind energy and shipping.	
Interactions with other maritime activities include	
Shipping and ports	-continuous use of ports in supply, maintenance and hydrocarbon transfer; exclusion of shipping from a safety zone around infrastructure; decommissioning activities will require greater shore-based facilities for the dismantling of offshore rigs and platforms.
Pipelines and cables	-offshore oil and gas production represents the main demand for the installation and operation of pipelines; installation of new infrastructure needs to consider existing pipelines and cables to ensure that these aren't affected.
Fishing	displacement of fishing activity from the installation during operation and decommissioning from a 500 m safety exclusion zone, and temporary potential displacement during the installation of pipelines.
Aquaculture	-potential competition in demand for space development, although only where the resources are available for both types of development; where suitable, and if technological and regulatory obstacle can be addressed, co-location of aquaculture facilities with existing oil and gas infrastructure may be possible.
Environmental conservation	Potential for ecological interactions, particularly during seismic use in exploration and associated disturbance of marine mammals. Oil spills are of increasingly low risk, but with significant potential ecological consequences, depending on the location and timing of the incident. This includes particularly coastal areas of conservation importance and which may be sensitive, such as wetlands (Stancheva, Stanchev, 2017). Offshore installations have the potential to provide protected habitat in the form of artificial reefs, which can support associated biota.

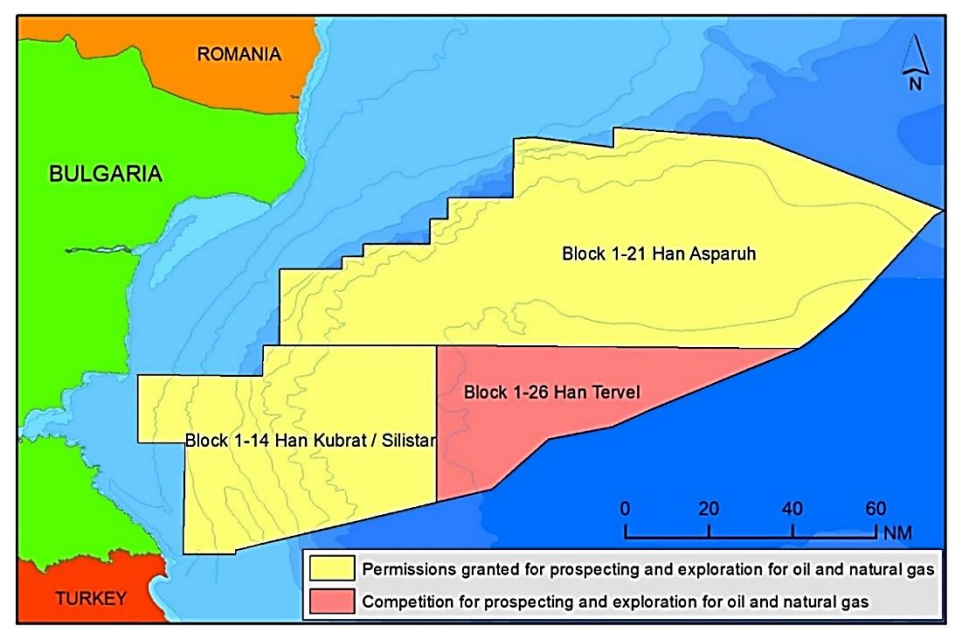

Figure 53. Mineral extraction in the Bulgarian marine space (*CCMS*)

In ROMANIA

The western part of the Black Sea Basin is one of the most promising hydrocarbon-bearing areas in the SE Europe. However, the offshore projects in the Romanian Black Sea area have a specific investment risk profile, given that offshore operations involve high costs associated

with exploration and exploitation activities, and the geological and technical uncertainties assumed by investors for the exploration phases are significant (Figure 54).

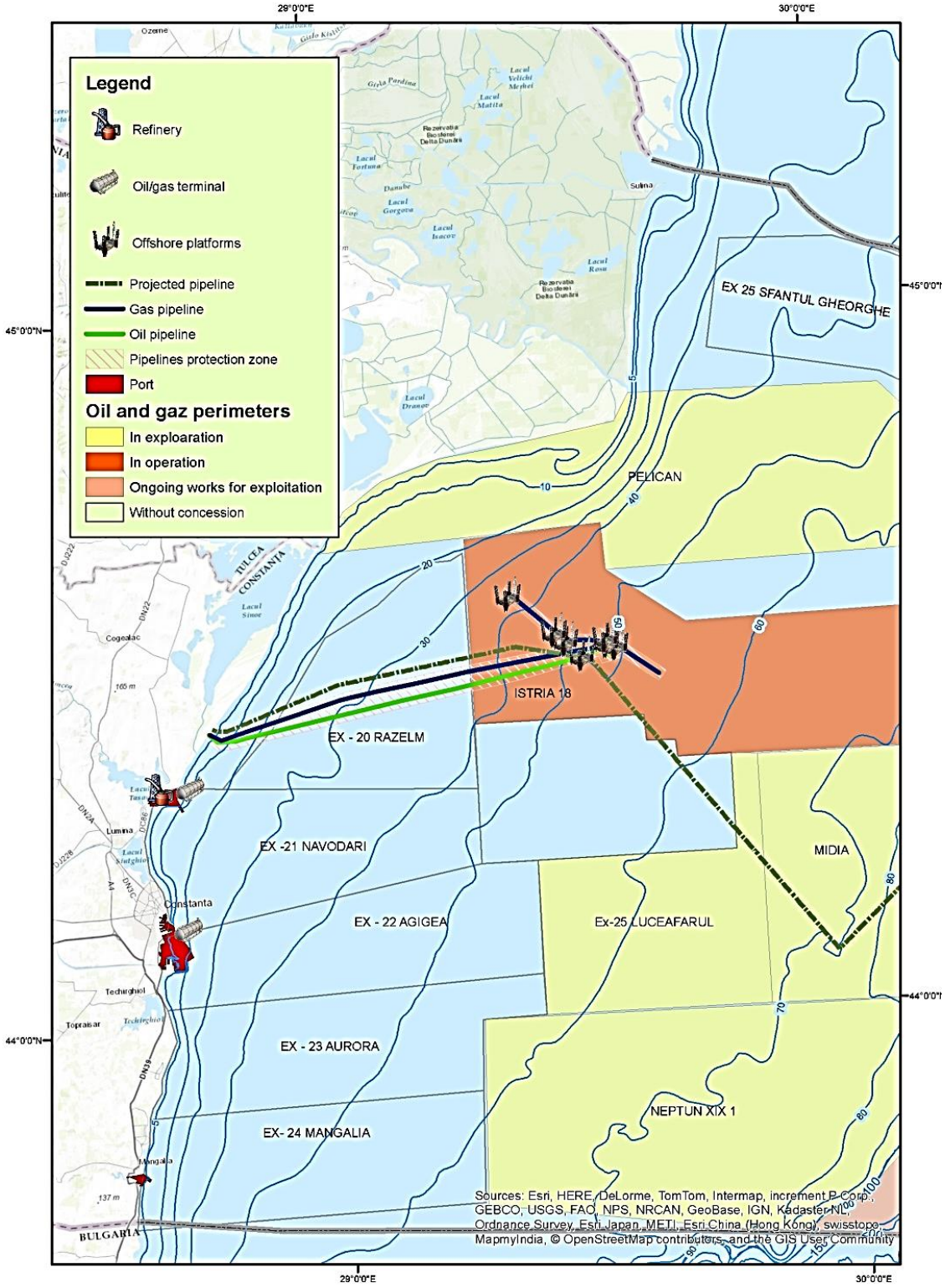

Figure 54. Lines for the Oils and Gases Transport from the platforms to the coast *(NIMRD)*

There is also a lack of upstream offshore infrastructure, and the lifespan of offshore projects is much longer compared to other investment projects, requiring more than ten years from the confirmation of field discoveries to the production phase.

The Romanian offshore area covers 22,000 km^2 and reaches depths beyond 1000 m. The whole area is divided into blocks of different sizes (Figure 55), some of them being awarded to operators for exploration, development and exploitation activities. Each offshore project has its own characteristics, based on the geology and other circumstantial factors. Although the Romanian EEZ sector comprises 16 perimeters of hydrocarbon exploration (out of which only 10 being given in concession), only one perimeter (XVIII ISTRIA) is currently in operation. This perimeter (comprising five production fields) accounts for 185 million barrels of oil, 8 million barrels of condensate and 48 bcm of gas.

The quantities of crude oil extracted in 2017 (209,483 t) showed a decreasing trend as compared to the previous period. In 2015, there was extracted 256,072 t, while in 2016 a maximum of 258,171 t crude oil was reached (with ca. 19% more than 2017).

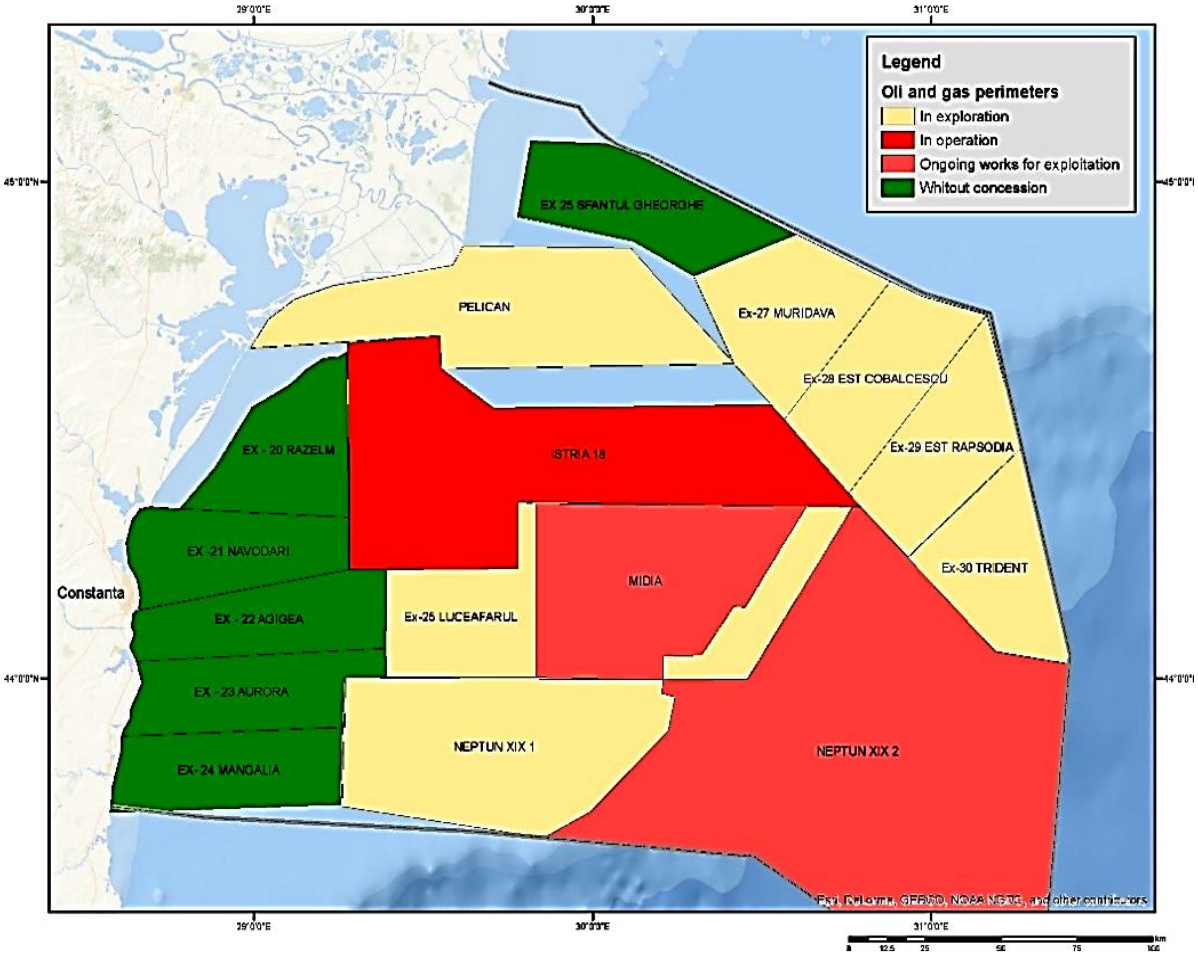

Figure 55. Black Sea exploration, development and exploitation perimeters *(NIMRD)*

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5.3. MARITIME TRANSPORT *(infrastructure, shipping, ships building, shipyard)*

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✓ *Existing Conditions*

In BULGARIA

➢ Maritime transport and port infrastructure

The development of the maritime transport with all supportive infrastructure follows the EU common transport policy and the main recommendations of the Integrated Transport Strategy for the period until 2030, adopted by the Council of Ministers of the Republic of Bulgaria with Decision No. 336/23 June 2017.[47] The Strategy underlines the main aspects for the development of the national transport system for the period until 2030, including a chapter for the maritime transport. Interpreted in the context of maritime transport, the main objectives of these strategic documents are increased effectiveness and competitiveness of the sector, improved connectivity and access and limited negative impacts of the maritime transport sector.

The Marine spaces, Inland Waterways and Ports of the Republic of Bulgaria Act regulates the exploitation of the port infrastructure in Bulgaria, which includes water area, territory and infrastructure on the Black Sea coast, islands and canals and provide links with road and railroad infrastructure. Art. 93 defines the ports as: 1) for public transport, regardless of whether they carry out domestic or international traffic; 2) fishing ports; 3) yachts ports; 4) with special purpose; and 5) military, including ports of the border police.

The port infrastructure is old and badly needs renovation and technological upgrade. Among the current developments are the new terminals "Varna-West", Ferry Complex Varna", "Lesport", "Balchik" terminal and some of Burgas terminals to the south. Two additional terminals are under construction in Varna.

Within the maritime spatial planning cross-border area the most important terminals are the national ones Varna port terminals and Balchik.

BOX 30. *Bulgarian maritime ports*

The port of Varna East[48] is a multifunctional port terminal, opened in 1906. It has 14 berths, quay length of 2,345 m and total area of 97,600 m^2, including Storage Base. The Port of Varna West is the most modern port facility at the northern Black Sea coast of Bulgaria, located at 30 km west of Varna city, on the western shore of Beloslav Lake. It serves the chemical factories of Devnya, handling goods on the 'factory-to-ship' manner and well connected to the national rail and road networks. It has been also recognized as Bulgaria's container gate, well equipped with the modern technology for all types of operations to handle various types of cargoes.

According to the latest data from the Executive Agency of the Maritime Administration about 60 tons of cargo has passed through the port of Varna, during 2014-2018, meanning an average of about 12 tons per year. While the transported goods remained relatively constant during these 5 years, passenger traffic marked a significant decline from 2014 to 2018. It was further affected by the Covid'19 measures and the suspension of traffic.

The Port Lesport S.A. Varna[49] is located on the northern shore of Lake Varna, protected from wind and accessible all year round. It was established in 2005 as a public port of national importance. The Concession contract covers a period of 30 years (2006-2036). It has a total area of 124,000 m^2, 3 berths with a total length of 450 m and a maximum draft of 9.10 m. It handles general, bulk and Ro-Ro cargoes and vegetable oils. According to the Master plan of the port the planned investments are 129 million BGN.

[47] https://www.mtitc.government.bg/en/category/42/integrated-transport-strategy-period-until-2030
[48] https://www.port-varna.bg/index.php?lx=en&mx=TERMINALS&px=Varna-Iztok
[49] https://www.chimimport.bg/en/sektori/transport/water/pristani-sht-e-lesport-ad

The port Balchik[50] is another important port of Bulgaria, located 40 km north of Varna and linked to the grain production areas of the country. It occupies a total area of 13,514 m^2 and is specilised in the processing of bulk cargo, mainly grain. The Balchik port terminal has two cargo places with a total length of 164 m. The safe draft of ships is 8.0 m. The processed cargo varies yearly only between 25 and 35 million tons. Starting from 2006, the Balchik port terminal has been granted a concession for a period of 25 years.

Among the main limitation factors for the development of the ports are the old infrastructure and technological equipment, poor connections with road and railroad networks; the insufficient depth of many ports and terminals, limiting the safe draft; different ownership of port infrastructure for some port terminals; complicated logistic, planning, technical and funding solutions for extension and renovation. A basic external factor is the competition of some of the ports in the region (Constanta, Istanbul, Thessaloniki).

➢ Shipbuilding and ship repair Sector

The shipbuilding and ship repair industry is a dynamic and competitive sector. It offers a wide range of technologies, ensures high direct and indirect employment, and great added value to the economy of the country. In addition, the sector is connected with many other sectors, including transport, security, energy, research and innovation.

In recent years the Bulgarian shipyards focused on the construction of more complex, high-tech, and specialized ships, which made them competitive on the international market. The ship repair yards have modern equipment and provide reliability, short deadlines for repair work and high level of technology. The technologies used in shipbuilding and ship repair, the highly qualified workforce and the quality of the offered services have won Bulgarian companies a stable position as a reliable partner in the sector. According to the EU Blue Economy Report 2020, the sector generated in 2018 GVA of EUR 91 million and offers 4.9 thousand jobs for highly qualified specialists[51] at the national level.

Similar to other industries, the European marine technology sector has been hit hard by the COVID-19 pandemic. Export-oriented and dependent on global macroeconomic trends, the Bulgarian shipbuilding and ship repair sector is no exception. Despite difficult conditions during the sanitary crisis, it currently provides direct employment to more than 3,500 persons. Apart from the direct employment provided by the sector and the taxes that directly support the municipal and state budgets, shipbuilding and ship repair have a multiplier effect, providing revenue for a large number of additional economic activities such as engineering, shipping, agency, towing services, pilot services, etc., with which the total number of jobs provided by the sector amounts to over 10,000 directly and indirectly employed.

Most of the **shipyards and ship repair plants** are concentrated in Varna ("MTG – Dolphin" PLC Shipyard and Ship Repair Plant, Odessos Shiprepair Yard S.A., Bulyard Shipbuilding Industry AD, Shiprepair Yard TEREM - KRZ Flotski arsenal Varna EOOD etc.). Shipbuilding and ship repair yards have the capacity to design and build different types of vessels up to 75,000 tons DWT. The yards have the capacity to repair ships up to 70,000 tons DWT in dry dock and up to 150,000 tons of DWT in water.

There are many ship engineering plants and enterprises, providing services in the field of manufacture, installation and outfitting, electrical installations and ship electrical engineering and enterprises engaged in repair and manufacture of yachts, boats and catamarans. The companies specialized in light shipbuilding have long-established traditions and experience in the manufacture of fiberglass vessels: boats, cutters, catamarans, etc.; repair and re-equipment

[50] http://www.port-balchik.com/en/
[51] The EU Blue Economy report, 2020. https://ec.europa.eu/commission/presscorner/detail/en/ip_20_986

of motor and sailing yachts and other small vessels. The majority of the companies working in shipbuilding and ship repair are located on the territory of Varna municipality.

➢ Traffic Separation System (TSS)

In order to ensure the safety of the vessel traffic, to perform business, science, entertainment and other activities, as well as to effectively protect the marine environment, currently in the maritime space of the Republic of Bulgaria operates a system of zones in which specific activities are performed. The existing traffic separation system is used to sail between ports along the coast and approaching (exit) to (from) them by all vessels with a capacity exceeding 300 tons, irrespective of their flag. Ships are obliged to move in the designated corridors for, while respecting the rule that the separation line shall always be to the left of their board. Traffic lanes should be entered, as a rule, at their ends. When moving in the TSS seafarers are required to comply with the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs).[52] Berths follow the mandatory rules for the seaports of the Republic of Bulgaria.

The regulation of the marine traffic operates with several zones with different regimes, such as: areas prohibited for marine traffic; areas prohibited for anchoring, fishing by demersal means, underwater and dredging works, bottom trawling and explosions; areas for disposal of dredging materials; areas for underwater activities with educational purposes and underwater tourism.[53]

The characteristics of the existing system of zones are revealed through analysis and evaluation of the impact of the physiographic conditions and the requirements to the functions. Maritime traffic of commercial vessels, equipped with automated information system (AIS) pursuant to Rule 19 of Chapter 5 of the Convention SOLAS'74, traveling daily in areas of the Bosphorus, Bourgas, Varna, Constanta, Odessa and the Sea of Azov exceeds 2,500 ships simultaneously. If the fishing vessels, not equipped with an AIS (less than 15 m.), yachts and other vessels for entertainment, are added, their number will significantly increase. In the recent decades, vessel traffic has constantly been increasing, which creates prerequisites for the emergence of more incidents and accidents at sea. In order to reduce such risks a new TSS has been discussed the last couple of years, in parallel with the forthcoming revision of the MPAs and Natura 2000 sites in the Black Sea that would not jeopardize the adoption of the country's Maritime Spatial Plan.

The traffic separation scheme is in a functional connection to the recommended routes to sail to ports Balchik and Kavarna, the recommended route to the port of Nessebar, as well as the recommended routes for small passenger vessels of up to 300 tons from the Varna roadstead to the port of Balchik, from the port of Balchik to the port of Kavarna, from the Varna roadstead to the port of Nessebar, from the port of Nessebar to the Bourgas roadstead, from the roadstead of Bourgas to the port of Sozopol, from the port of Sozopol to the port of Primorsko, from the port of Primorsko to the port of Tsarevo. TSS is in a functional connection to the system of FVC and berths in the BBSC.

The areas, prohibited for marine traffic, declared in the territorial sea and internal waters by the competent authorities are important elements of the maritime spatial planning and especially in the cross-border context. Control over navigation in the internal waters, territorial sea and inland waterways of the Republic of Bulgaria of Bulgarian and foreign yachts, boats and other vessels for sports, tourism and entertainment is performed individually and jointly by the Executive Agency "Maritime Administration", Directorate General "Border police" of the Ministry of Interior and the Navy.

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[52] *http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/COLREG.aspx*

[53] Regulation № Н-7 from 12.06.2008 on the performance of diving and other underwater activities.

The areas prohibited for anchoring, fishing by demersal means, underwater and dredging works, bottom trawling and explosions are situated within the internal waters or territorial sea of the Republic of Bulgaria because of the existing of infrastructure, facilities and equipment that could be damaged as a result of these activities; sunken navy vessels in the areas, historical and archeological objects in the areas, that could be damaged; necessity for protection of the natural resources and/or presence of risk factors and an ongoing threat.

Part of the TSS consists of the system of Berth areas, protected from dangerous winds, with specific characteristics in terms of safe depth, safe distances, strong winds protection and the integrated system for vessels traffic control.

In ROMANIA

According to the Law No. 235 (November 29, 2017) for amending and supplementing the Government Ordinance no. 22/1999 (chapter II, article 6) regarding the administration of ports and waterways administration and the shipping activities in ports and waterways: "The naval transport infrastructure comprises: *the national navigable waters of Romania, the maritime or navigable waterways, the land on which the ports, dams, docks and other hydrotechnical constructions for ships mooring are located, hydrotechnical constructions related to ports, waterways, water locks, defences structure, access channels to the ports, technological roads inside the ports or along waterways and railways in ports*.

The port of Constanta, its satellite ports - Midia and Mangalia – as well as Tomis and Mangalia marinas are public-private maritime ports owned by the Romanian State. The entity responsible for their regulation and operation are the National Company "Maritime Ports Administration" S.A. Constanta (MPA) and Romanian Naval Authority (RNA), both of them subordinated to the Ministry of Transports and Infrastructure.

BOX 31. *The Port of Constanta*

It is an important hub for Central and Eastern Europe, leader in the western Black Sea region. Due to an important key point of its infrastructure, the Danube-Black Sea Channel, Constanta Port has the advantage to be located at the end of the Pan-European Transport Corridor VII (Danube) that link the North Sea to the Black Sea through the Rhine-Main-Danube corridor.

The Port of Constanta covers 3,926 ha, out of which 1,313 ha is land and the rest of 2,613 ha is water. The Constanta Port has a handling capacity of ca. 120 million tons, served by 156 berths. The total quay length is 29.83 km, and the depths range between 8 and 19 meters. Constanta Port is both maritime and river port. The connection of the port with the Danube River is made through the Danube-Black Sea Canal, which represents one of the main strengths of the Constanta Port.

As the commercial limits, the port of Constanta is confined by the North and South breakwaters with lengths of 8,344 m and 5,560 m, respectively.

The terminals of the port of Constanta are:

- Liquid bulk terminal – used for the import of crude oil and other oil products and for the export of refined oil products, oil derivatives and other liquid chemical products;
- Dry bulk terminals – there are two specialized terminals that operate iron ore, bauxite, coal and coke. The terminals can operate both maritime and river vessels, with an unloading rate over 45,000 tons/24 hours. The storage capacity is 4.7 million tons simultaneously and the annual operation capacity is over 27 million tons. There is also a specialized terminal (storage capacities over 100,000 tons and the operation capacity is 4.2 million tons/year) where fertilizers, phosphate, urea, apatite and other chemical products are operated;
- General cargo - all range of services for general cargo are efficiently provided by stevedoring companies;
- Ro-Ro/Ferry terminals - in Constanta Port there are two Ro-Ro terminals situated in the southern part of the port with storage areas of 17,000 and 71,000 square meters, respectively. The Ferry-Boat Terminal is located in the southern part of Constanta Port, and offers proper conditions of loading/unloading operations for specialized vessels, being equipped for handling trains using the European train gauge;
- Cruise terminal – is designed to accommodate 100,000 passengers/year. It is connected with the Constanta city centre (1 km), the international airport M. Kogalniceanu (25 km), and Constanta Railway station (3 km);
- Non-propelled terminal-improves the navigation conditions and expanding facilitates of mooring river units (south of Constanta port). Investments allow to use a mooring capacity for about 10 mill. tons of cargoes.

Table.13. The traffic separation scheme (TSS) for arriving into and departing from the port

The traffic separation scheme (TSS) for arriving into and departing from the port	
1. The separation zone limits	**4. The roadstead of Constanta port limits**
44°04.75'N 028°43.77'E 44°04.44'N 028°43.22'E 43°59.40'N 028°48.60'E 43°59.70'N 028°49.17'E	(A) 44°10.50'N 028°44.00'E (B) 44°10.50'N 028°49.50'E (C) 44°06.50'N 028°49.50'E (D) 44°06.50'N 028°44.00'E.
2. The entrance channel into the port has the general direction NW, True course is 322°	**3. The departure channel from the port has the general direction SE, True course is 142°**
44°00.19'N 028°50.04'E 44°05.24'N 028°44.65'E	44°03.96'N 028°42.35'E 43°58.90'N 028°47.74'E.
The meridians of 028°46.7'E and 028°48.2'E divide the anchorage into 3 zones, numbered from West to East	
Zone 1: Anchorage for vessels up to 40,000 GRT (except tankers)	
Zone 2: Anchorage for vessels over 40,000 GRT (except tankers)	
Zone 3: Anchorage for tankers, LPG carriers and vessels carrying dangerous cargoes	

The depth in the anchorage area is 20 m. There are 14 berths (11 operational berths, 3 berths belonging to Constanta Shipyard) with a total length of 2.24 km.

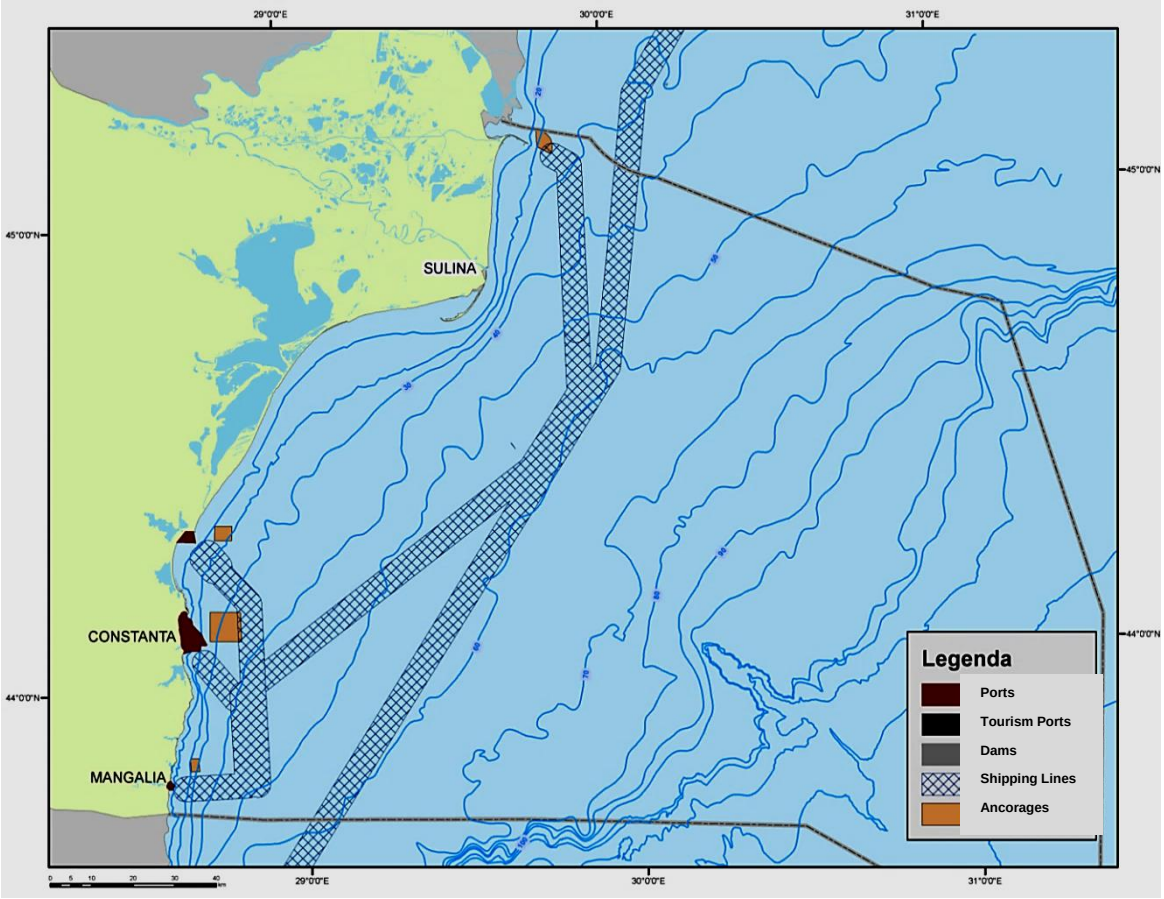

Figure 56. Navigations Lines / Maritime Transport *(NIMRD)*

The general traffic in the Constanta port showed an annual increase during the last years. The most significant increases were observed for coal, coke, iron ores and scraps, meal ware, natural and chemical fertilizers.

In terms of ship traffic, the statistical data for all Romanian commercial ports had shown a slight decreasing tendency (more evident for port containers).

The maritime traffic in the Constanta port confirms the slight decreasing tendency, data on calls of sea-going vessels showing a decrease for low capacity ships (capacities < 5,000), as well as for the ships with capacities within 45,000 – 90,000. In terms of river traffic, there is no obvious tendency in the last years.

BOX 32 ***Midia port***
It is located at about 13.5 nm north of Constanta and serves the adjacent petrochemical industrial complex, due to the direct access to the Black Sea and to the Danube - Black Sea Channel. It covers 834 ha, of which 234 ha is land and 600 ha water. The port is limited by the south and east breakwaters and it is accessed through an approach channel with a width of 80 m and a depth of 5.6 m.
Midia port has an annual operating capacity of more than 300 ships through four operational specialized berths in handling and storing oversized products, containers, fertilizer, and general cargo. One of the main activity consists of providing services to livestock exporters, especially sheep and cattle. The maritime traffic in the Midia port confirms a slight decreasing tendency; data on calls of sea-going vessels showing a decrease for low ships capacity (< 5,000), as well as for the large ships capacities within 90,000 – 180,000). Here, there is a Liquefied Petroleum Gas terminal – with an area of about 24,000 m2 and a storage capacity of 4,000 m3. The terminal is connected to the railway, road and water transport network and provide 20 jobs.
Mangalia port
It has 142.19 ha, of which 27.47 ha is land and 114.72 ha water. The north and south breakwaters have a total length of 2.74 km. There are 4 berths (2 operational) with a total length of 540 m and max. depth 9 m. The main cargoes operated are bitumen, general cargo and LPG. The maritime traffic shows a slight increasing tendency; and data on calls of sea-going vessels, a significant increase for low capacity ships (< 5,000).

As regarding the marine traffic, it is concentrated in the Danube mouths area and in the southern part of coast. The routes are to main ports of the Black Sea, especially to Istanbul and Bosphorus strait, with density higher than 1,200 route/0.4 km^2/year (Fig.56,57,Tab.13).

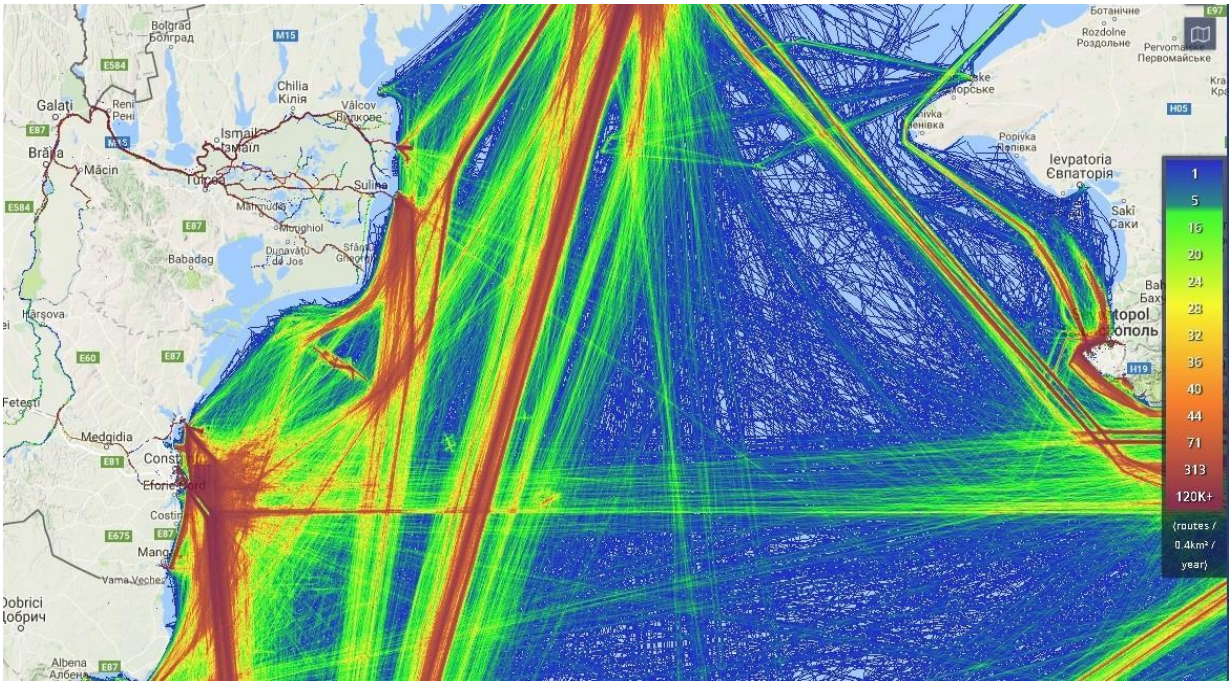

Figure 57. Marine traffic intensity in 2017 (*Source: Marine traffic*)

- **Marinas**

BOX 33. ***Tomis Marina***
It is located in the historical center of the Constanta city. It was built in 1958 by closing the Dolphin Bay by two dams: the northern one, with 400 m length (extended in 2007 with 200 m); the eastern one with 500 m length starting from the cliff of the Casino, the historical building in Constanta, representative city's symbols (1909).

From 2008 to 2010 some investments were made to allow the increase of the annual traffic and the tourist attendance. Through its location and infrastructure, Tomis Marina offers a high potential for a wide range of nautical sport activities, nautical tourism, leisure activities and shelter facilities for sailing boats.
Mangalia Marina
It is located near the Bulgarian border and is the most modern tourist port in Romania for small tourist vessels (up to 18 m long). It has a capacity of 146 berths and 155 m of docks. The port was built within 2006-2008, with EU financial assistance of 4.071.365.77 euros (by Phare Program CES 2004/016-772.04.01.01.01 - Major Regional Infrastructure Projects - non-reimbursable European funds) and a contribution of 651.418.52 euros from the Local Council and Mangalia Municipality, improved and extended according to European technical and quality standards. Now is included in the most prestigious networks of the Black Sea and European marinas.

➢ Ship building

BOX 34.	**Ship building Harbor features**
Constanta Shipyard	– is accessible by sea through the Bosphorus Strait and by river through Danube – Black Sea Canal. The Constanta SA Shipyard provides to the worldwide ship-owners and managers the ideal location for building and repairing of sea-going vessels up to 200,000 dwt. The shipyard has two dry docks, one used for the construction of ships up to 150,000 dwt, and the second one used for the construction of ships up to 250,000 dwt, and two floating docks with a capacity of 8,000 tons and 15,000 tons. It is the largest shipyard in Romania and Black Sea and one of the largest in Europe, the market share being 20% in the Black Sea basin.
Damen shipyard	is located 45 km south of the Port of Constanţa, spread on over 980,000 m^2 and has 3 dry docks with a total length of 982 m and 1.6 km of berths. It has also adequate unique facilities for almost all kind of ship repairs and conversion projects, from routine maintenance up to major conversions for ships up to 250,000 dwt. Initially known as 2 Mai-Mangalia Shipyard, it is a joint venture between the Romanian Government and Damen. Between 1997 and 2018, the shipyard was under the administration of Daewoo-Mangalia Heavy Industries S. A. which built and repaired the large container ships, bulk carriers and tankers. In 2018 Damen took the operational control, Mangalia Shipyard becoming the biggest shipyard of Damen portfolio, opening the Damen possibility to build larger and more complex vessels than before (RoPax ferries, cruise ships, big offshore vessels and offshore structures, Jack-up units, cable-laying vessels, research and survey vessels, fishery research vessels, expedition cruise vessels, roll-on and roll-of vessels, modular floating dry-docks, etch; to maintain, repair ships; core provision.
Mangalia Shipyard	is a former military shipyard, also the only specialized in repairing the war technique. The main activity of Mangalia Shipyard is the manufacture of small and medium sized civil and military ships. After 1990, the shipyard was re-profiled on maritime and river vessels construction for different ship-owners. Until 2007, the works were carried out to ensure the compatibility between communications systems of Romanian military vessels and the NATO systems. The company has the technical capacity to implement the integrated communications systems on the board of military ships, according to the NATO standards.

The shipyard executes a wide range of works with a high degree of diversity and complexity: metal constructions, ships block-sections, shipbuilding, plasma cutting, etc. The overall production of ships and floating structures for 2015-2017 has shown a decreasing trend.

Year	Production value	Year	Production value	Year	Production value
2015	368,376,038 RON	2016	308,479,268 RON	2017	285,876,426 RON

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5.4. SUBMARINE CABLES AND PIPELINES

Todor Kalinov, Dan Vasiliu, Vlad Rădulescu, Alina Spînu

✓ *Existing Conditions*

The underwater infrastructure inventory in the western Black Sea includes submarine cable and pipelines, as well as cables for electricity and communications transmission. Cables Protection Committee (ICPC) recommends that existing cables in shallower waters (up to 75m depth) to be a default 500 m exclusion zone on either side. Member States established different distance around them. Inside the protected zone it is recommended no sand extraction may take place and no other pipelines may be placed at 1000 m in the both sides.

In BULGARIA

➢ Submarine cables

Underwater cables are a primary means of reliable and fast transfer of information, despite the development of radio communications and space technology. Currently 99% of the data traffic that is crossing oceans is carried by undersea cables.

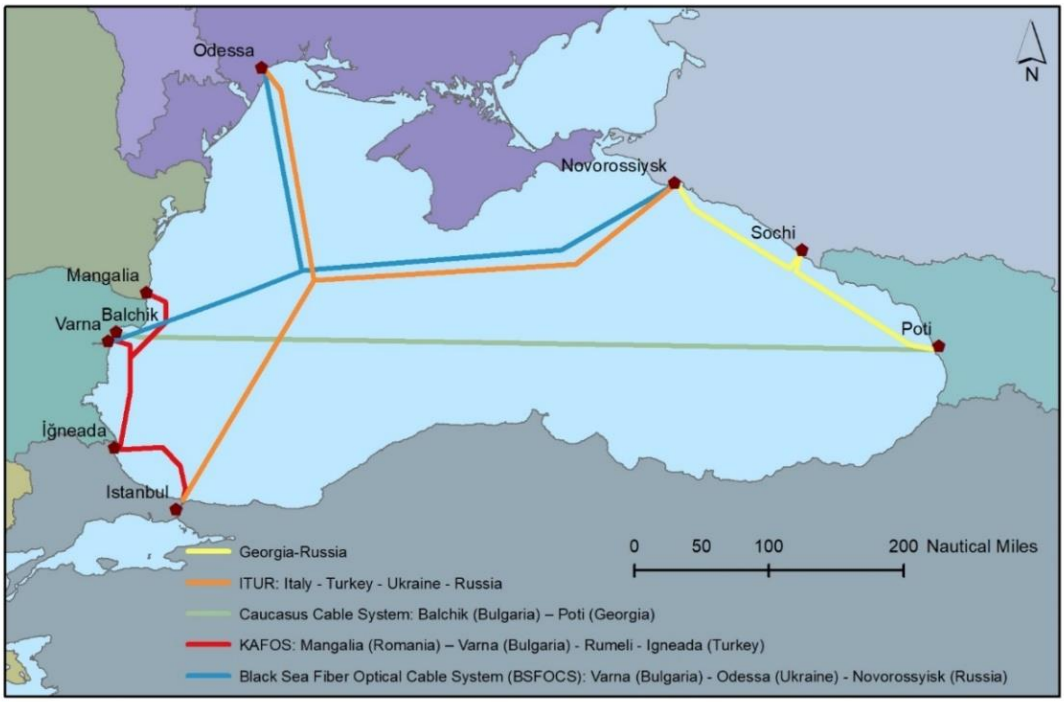


Figure 58. Cable network in the Black Sea, *CCMS*

A underwater communication cable is a cable laid on the seabed between land-based stations to carry telecommu -nication signals across stretches of ocean and sea. (Figure 58).

➢ Offshore Gas Pipelines

The Galata Project, situated about 20 km from Varna, is being developed by Melrose Resources. The Galata gas field is 23 km offshore Bulgaria in the Black Sea. The field lies at a water depth of 35 m and has gross and recoverable proven reserves of 49 billion cubic feet (bcf), and proved and probable reserves of 81 bcf. The development of the Galata field, a 100% interest in the exploration permits for the remainder of block-III and block Kaliakra offshore Bulgaria are the activities involved in the Galata Field project (Figure 59).

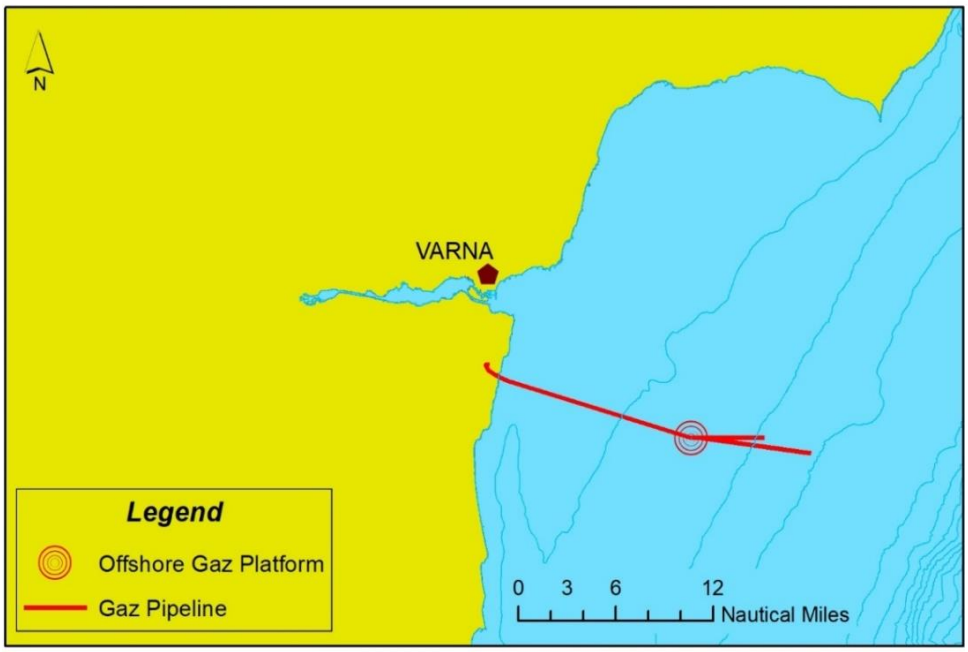


Figure 59. Gas pipeline in Bulgarian shelf (*CCMS*)

The natural gas production from three blocks offshore on the Bulgarian Black Sea - Galata, Kaliakra and Kavarna is concessioned.

The main block is Galata, which provides about three-quarters of the total production. According to Petroceltic, the company produced an average of 212.4 thousand cubic meters of gas a day in 2014, or about 78 million cubic meters a year. There is no data on volumes produced in 2015, but according to Petroceltic, since Worldview became the owner in July 2016, production has jumped 300%.

The previous owner, Melrose, proposed to transform the Galata deposit into a gas storage facility, but the idea never came to fruition.

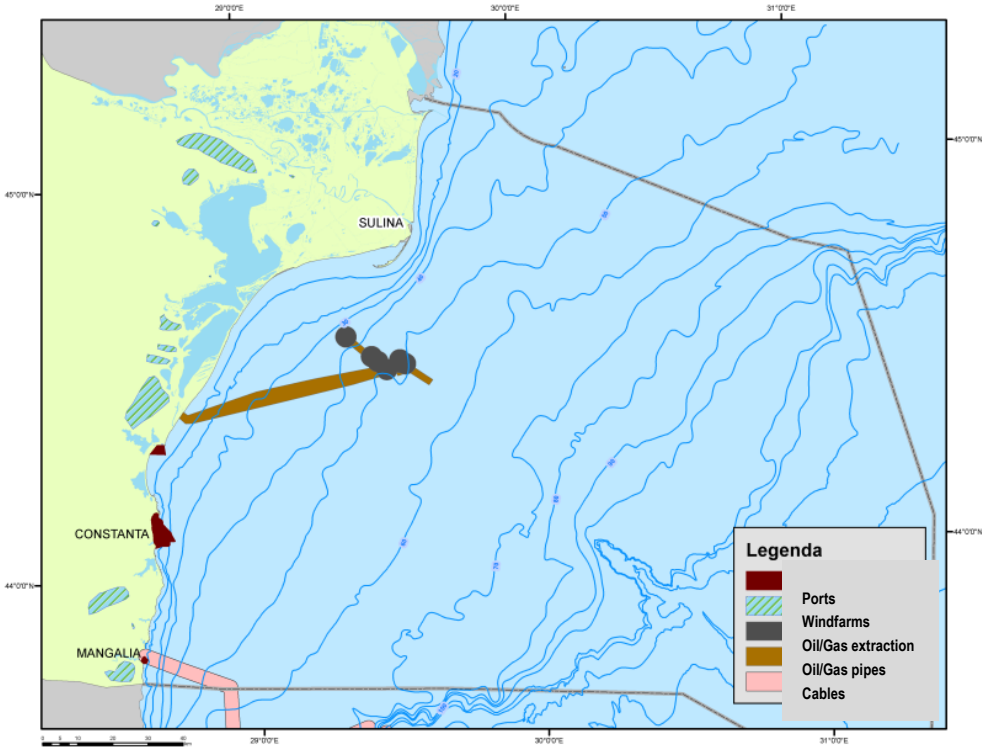
Submarine cables and pipelines must meet the requirements of the Spatial Development Act (Article 189a), the Energy Act, the Electronic Communications Act and the Maritime Space, Inland Waterways and Ports Act, as well as of a number of subordinate regulations. When planning additional activities close to the underwater technical infrastructure networks all potential conflicts and risks of accidents and pollution should be considered.

In ROMANIA

- **Submarine cables** in the Romanian waters, are:

- Diamond Link Global is an undersea cable system with landing points in Poti, Georgia and Constanta, Romania as part of a system that will directly connect Tbilisi, Georgia and Bucharest, Romania. This system significantly increases the capacity and connectivity in the region. In addition to its rapid construction and availability, the Diamond Link Global cable benefits the Black Sea region by offering significantly higher design capacity, lower unit costs, lower latency through direct connectivity, and the ability to leverage additional branching units in the future. The main characteristics of Diamond Link Global are: length – 1,083 km; latency 5.415 ms; RFS - Q2-2019; EOL – 2044).

KAFOS (Black Sea Fibre Optic System) is a submarine telecommunications cable system in the Black Sea linking Romania, Bulgaria, and Turkey. Its landings are: Mangalia (RO), Varna (BG) and Istanbul (TR). The main characteristics: total length - 504 km; transmission capacity - 622 Mbit/s; latency - 2.265 ms).



✓ *Pipelines*

The national network of pipelines connects the port with the main refineries in the country, ensuring a fast and safe transport. (Figure 60)

Figure 60. Gas and oil pipelines in the Romanian shelf (*NIMRD*)

The Romanian national system of oil transport on the Black Sea shore comprises two terminals (the first one owned by the Oil Terminal SA Constanța, in the Constanta Port and the second one run by KMG International - Midia Marine Terminal in Năvodari), main pipelines and local pipelines which are transporting crude oil from perimeters operating in the country and crude oil imported and delivered to refineries.

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5.5. TOURISM *(coastal and marine)*

Stoyco Motev, Yordan Cervenkov, Hristo Stancev, Kamer Aivaz, Isabella Stan, Ionela Ioniţiu

✓ *Existing Conditions*

Tourism is one of the most important and representative coastal and marine activity.

In BULGARIA

For the purposes of the MARSPLAN-BS II the analysis of the coastal and marine tourism development in Bulgaria is focused on the land-to-sea direct contact and interaction areas. In the specific dimensions, these are the zones A (100 m), B (2 km from zone A)[54], and the urban settlements bordering the coast.

[54] Regulated by the Black Sea Coast Planning Act (BSCPA)

As of 2015, the national territory of Bulgaria is divided into 9 tourist regions[55]. The aim is to maximize the use of tourism resources by creating and marketing regional tourism products with a recognizable brand. Two of these regions are bordering on the Black Sea coast - Varna and Burgas.

In addition to their narrow specialization in marine recreational tourism, these areas are expanding their tourist offer through many alternative forms - cultural, historical, festival, business, health (all types), rural, pilgrimage, ecotourism. This means that in addition to the coastline, the *functional tourism zone* in these areas spreads up to 80-100 km inland into the country's territory.

The most significant tourist asset of the country is the outlet of the Black Sea, which provides the dominant Bulgarian product "sea tourism". Natural limitations on the tourist utilization of the coast and maintenance of the beach resources are due to landslide processes, which are most active in the areas of Kavarna, Balchik, the Varna slope of the Frangen Plateau, and several localities along the Strandzha coast. An imBălance between excessive anthropogenic load and the capacity of the natural resources and technical infrastructure represents a major problem as well.

In addition to the purely natural features, the World Blue Flag certificate testifies for the attractiveness of the Bulgarian beaches. The assessments are based on indicators for seawater quality, beach cleanliness, environmental friendliness, safety, services and amenities provided to tourists. In 2019, this certificate was awarded to 14 Bulgarian beaches (12 in 2018) and one yacht port.

The tourism facilities are localized in the coastal settlements, in the resort zones to them, in separate settlement formations (tourist complexes) and in numerous holiday villa settlements. A list of 7 resorts of national importance has been announced by the Council of Ministers in 2005 - Albena (Balchik), Djuni (Sozopol), Golden Sands (Varna), IYC – Primorsko, St. Constantin & Elena (Varna), Sunny Beach (Nessebar), *Elenite* (dropped by a decision of the Supreme Administrative Court later in 2005).

➢ Available spatial data

Estimated by quantitative parameters, the large resort complexes along the Black Sea coast comprise only 10.8% of all accommodation in the country (as of 2018), but the share of beds in them is much larger - 42.2%. At the same time, over 44% of the overnight stays and nearly 48% of the national income are coming from these locations. A feature of the statistical surveys of the sector is that only accommodation with more than 10 beds is accounted for, despite of presence of many others with less capacity. Condominiums that have become popular over the last two decades are considered residential buildings, within the category "uninhabited". Such reporting leads to deformation of the statistical picture in the active season. Thus, the anthropogenic load of the tourist infrastructure concentration is much higher than the one stated in the statistics.

However, in municipalities such as Varna, Nessebar, Sozopol and partly Tsarevo, the anthropogenic congestion is a fact that focuses on various issues. In the active season, traffic is difficult; there are acute parking deficits, risks of collapse in normal power supply, water supply and wastewater treatment problems. In addition to the specific infrastructural problems, the overcrowded recreational environment compromises the quality of tourist services and the perceptions of tourists.

Considering the statistics for the monitoring of the tourism sector as a whole, it is reduced to a set of annually observed quantitative indicators, including the tourist superstructure and its capacity, the nights spent and the revenues from them. The baseline indicators allow for the

[55] *http://www.tourism.government.bg/bg/kategorii/strategicheski-dokumenti/koncepciya-za-turistichesko-rayonirane-na-bulgariya*

calculation of a number of derivatives, having also qualitative characteristics (usability of the accommodation base, length of stay, share of foreign tourists, etc.). Information on the tourist superstructure of Bulgaria is maintained in registers publicly available on the website of the Ministry of Tourism[56]. These are the National Tourist Register (accommodations, catering and entertainment establishments, tour operators and travel agents, tourist associations), Register of tourist attractions and Register of tourist festivals and events.

The territorial distribution of the beds is almost uniform - about 45% on the northern Black Sea coast and 55% on the southern one. Both coastal sectors alternate between natural breaks, moderate-urbanized environments, and over-concentration of tourist sites. The latter belong to the resorts Golden Sands (Northern Black Sea) and Sunny Beach (Southern Black Sea). By the end of 2018, the Bulgarian Black Sea coast offers over 230,000 beds in 1,421 accommodation units with more than 10 beds each[57]. 17.7 million nights, out of a capacity of 35.3 million nights, were achieved, which means more than 50% of the average occupancy of the accommodation base, despite of the highly seasonal nature of the main offer - sea recreational tourist, first time achieved.

The topic of "foreigners" in this statistical picture (over 81%) seems alarming from the point of view of national tourism, but given the presence of a huge unattended sector, occupied mainly by Bulgarians, the problem is minor. In dynamic terms, as compared to 2015, a clear growth was achieved in 2018 for all monitored indicators. Over the reference three-year period, the accommodation capacity increased by 19.5% and the number of nights spent - by nearly 30%. The biggest increase was the income from overnight stays - almost 45%. This is due both to the increased number of nights and their average price (from BGN 49.3 in 2015 to BGN 55.1 in 2018). Against this background, the average length of stay has slightly decreased (from 5.39 days to 5.29 days).

In terms of **spatial development of coastal tourism**, statistics on the indicator "nights spent" showed in 2018 that municipalities with large resorts (Balchik/Albena 12.1%, Varna/Golden Sands 29.3% and Nessebar/Sunny Beach 40.2%), cover a share of 81,6%. The development of the spatial model of Black Sea tourism in Bulgaria is similar to that of the urban network in the country. One of the differences is the fact that the settlement network has one prominent center at the first level (Sofia), and the tourist model has two competing centers at the highest level (Golden Sands and Sunny Beach resorts). The other fundamental and most important difference is that the natural growth of a settlement center is accompanied by a parallel increase of all functional systems allowing for the existence of a harmonious organism, while the mechanical growth of resort structures with one leading function leads to the destruction of the conditions for a qualitative realization of this function. Sustainable tourism cannot be developed in such locations. In order to not destroy themselves in the foreseeable future, the mechanical increase of Golden Sands and Sunny Beach resorts should be better regulated with the appropriate existing tools.

In terms of ***economic dimensions***, the total contribution of tourism[58] covers 11.7% of GDP (11.6 billion BGN) and 11% of employment (over 336,000 jobs). The upward development of national tourism is a fact, but in parallel there are serious negative factors – threats to the sustainable development of both established and new destinations. These are ageing population, high unemployment in peripheries, poverty, crime, climate change, increased pressure on natural resources, and political instability in the region. This context is politically recognized and institutionalized in the leading strategy document of the sector – the National

[56] *http://www.tourism.government.bg/*
[57] The supply of accommodation below this capacity is not monitored by official statistics, but according to empirical team studies, it is at least 2 times higher than the first one, ie. over 460 thousand
[58] *http://www.tourism.government.bg/*

Strategy for Sustainable Development of Tourism in the Republic of Bulgaria, 2014-2030 (updated version 2017)[59].

For the Black Sea municipalities, tourism is an important factor for economic development, but it is the dominant/leading industry only for some of them. These are Nessebar, Balchik, Primorsko, Sozopol, Tsarevo and to some extent Varna, where tourism competes (in contribution) with a developed marine industry and production of electrical appliances.

In conclusion, the importance of tourism for the economies of the Black Sea municipalities imposes priority on the measures for its sustainable development in the coastal areas.

➢ Coastal and maritime tourism are inseparable

Marine recreational tourism is highly dominant, but this does not mean that only thalassotherapy (sunbathing and bathing in the sea) is practiced. Often, this product is complemented by water walks, cultural programs in urban areas, attractions, water sports, hiking trips in the hinterland and even more distant destinations (e.g., Perperikon or Alfatar). In the language of tour operators, these are forms of sports, health, cultural-historical, adventure and religious tourism, ecotourism, ornithological tourism and more.

Water and land trips to natural and anthropogenic sites along the coast form a dense network of routes of varying lengths, duration and destinations. Tourists leave the locations of their main stay and diversify their time with similar trips (usually within one day). Many of the complementary attractions and services are in the tourist locations themselves and animate the main product of maritime tourism on site. One such example is the large resort complexes, which offer various forms of health tourism (spa, wellness, mud treatment, etc.), water parks, water sports (jet, ski, parachute, surfing, diving, boat, yacht, etc.), shopping, cultural events (Sunny Beach resort).

According to current data as of 2019[60], the Bulgarian Black Sea coast offers the services of 24 marinas and moorings. The numerous yacht berths, located almost evenly along our entire coastline, provide good conditions for complete tours by sea with visits to all the remarkable parts of the Bulgarian Black Sea coast. In recent years yacht tourism in Bulgaria has become more and more popular. Since it is currently in its "initial development and validation phase", any comparisons with countries like Greece, for example, would be inappropriate. At the same time the potential of Bulgaria is undeniable and hopeful.

✓ *Conclusions*

In order to ensure the sustainable development of the tourism sector, Bulgaria must address the challenges of the contemporary environment, including competition. In addition to marketing problems, there are deficits in governance and the legal framework. The shortage of qualified personnel is a threatening fact for tourism as well as for the entire economy. The information provision of tourism is not at the necessary level.

Regardless of the negative background presented, Bulgaria has good opportunities to utilize its tourist potential.

The main direction of the tourism policy for the Black Sea coast should be overcoming the seasonality of the sea recreational tourism and ensuring the year-round workload of the tourist base through a variety of alternative tourism products (sports, cultural-historical, festival,

[59] *http://www.tourism.government.bg/bg/kategorii/strategicheski-dokumenti/aktualizirana-nacionalna-strategiya-za-ustoychivo-razvitie-na*

[60] *https://experience.bg/kude-da-akostirate-po-bulgarskoto-kraibrejie-chast-i-severno-chernomorie* *u* *https://experience.bg/kude-da-akostirate-po-bulgarskoto-kraibrejie-chast-ii-iujno-chernomorie*

business, health). This means diversifying the regional tourist products and actively integrating the natural and cultural richness of the hinterland.

In ROMANIA

The Black Sea coast area has a natural tourist potential (both natural and anthropogenic) that is imposed by the long sandy beaches and sea water, by the Danube Delta Biosphere Reserve, and by the spa resources, which give the Romanian coast a wide range of tourist motivations: resting, sports, sailing, complex spa, birds watching, and others. The anthropic tourist potential is dominated by archaeological vestiges and the ruins of fortresses, historical monuments, art and architecture, museums and memorial houses. The Romanian Black Sea coast is known as a traditional place for holidays and summer vacations from the beginning of May until the end of September and even the beginning of October[61], as one of the most important and representative economic activities in the coastal area. According to the National Spatial Planning Plan - Section VIII - areas with tourist resources[62], ATUs with a high concentration of natural resources are defined, including Mangalia, Eforie, Istria in Constanța County and the localities of Murighiol and Sfantu Gheorghe from Tulcea County.

Between the geographical boundaries, Musura Bay, and Vama Veche, from the north to the south, the Romanian coast was divided into two parts, along the coastal line:

BOX 35.
The northern part, in front of the Danube Delta, from Musura Bay to Midia Port
In the northern coastal area, the natural tourist potential is given by the Danube Delta area (inscribed in the UNESCO natural heritage since 1991) is one of the most important national and international tourist regions due the originality of the complex landscape that attracts many tourists for recreation and science. Among the valences of the delta's tourist potential, are mentioned: the landscape, aesthetic and recreational values; the qualities of natural healing factors including the bioclimate; the existence of certain conditions that generate specific forms of tourism - lake complexes and reeds as specific resources; the presence of specific elements that contributed to the delta as a biosphere reserve declaring. The relief is also distinguished by sand dunes on the Letea, Sărăturile and Caraorman ridges associated with the specific vegetation and fauna, increasing the complexity and the aesthetic and scientific value; the fine sandy beaches from Sulina, Sfântu Gheorghe, Gura Portiţei capitalized by practicing spa tourism, physical support in heliomarine cure.[63]
The central-southern part, from Cape Midia to Vama Veche
The most important tourist resorts are: Mamaia, Eforie, Neptun, Olympus, Jupiter, Venus, Saturn and Mangalia with facilities and tourism services: accommodation in hotels, guesthouses and campsites, leisure facilities such as cinemas, swimming pools, clubs and discos, sports facilities such as tennis courts, mini golf courses, sports bases (swimming, diving and paragliding), restaurants network, confectioneries and bars, spa.
Dynamics of economic activity. The whole Danube Delta wetland is a specifical touristic area

From north to south, according to the researchers conducted under the Master Plan "*Protection and rehabilitation of the coastal area*" tourism activities cover a wide range, expressed in various types of tourism, as exemplified below (Box 35):

BOX 36. Location	**Tourism value and activities**
Sulina & C.A. Rosetti	City with its tourist port and fabulous heritage as well as the communes

[61] *Halcrow Romania, Master Plan "Protection and rehabilitation of the coastal area", Version: V8 (final), September 2012, http://www.rowater.ro/dadobrogea*

[62] *Law no. 190 of May 26, 2009 for the approval of the Government Emergency Ordinance no. 142/2008 on the approval of the National Territory Planning Plan Section VIII - areas with tourist resources, published in the Official Gazette. no. 387 of June 9, 2009*

[63] *Ministry of Regional Development and Tourism, "Zonal Territory Planning - Black Sea Coastal Area" - Analysis of the existing situation in the Black Sea coastal area, Phase III, June 2010, https://www.mdrap.ro/userfiles/PATZ_zona_costiera_fazaIII.pdf*

Sf. Gheorghe, Murighiol. Jurilovca	The increasing demand in tourism together with the local specificity and potential, has determined a higher complexity of tourism services in the fields of exploring protected natural areas, sport fishing, bird watching, etc.[64]:
Sulina, Sf. Gheorghe	Leisure and recreation tourism
Corbu, Vadu, Cap Midia	Nature tourism
Sfântu' Gheorghe, Murighiol	Rural tourism
Năvodari, Mamaia, Eforie, Olimp Mangalia, 2 Mai, Vama Veche	Mass tourism
Techirghiol, Eforie Nord, Mangalia, Murighiol	Spa, balneology, therapeutical mud treatment
Sulina, Sf. Gheorghe	Ecotourism
In all resorts on the Black Sea coast	Heliomarine cure tourism, Business tourism, Events-based tourism
In the resorts from the southern sector of the coastal area	Leisure tourism Sport tourism - sport hunting, sport fishing, water sports
Danube Delta Reserve, Movile cave reservations (Mangalia)	Scientific tourism
Constanța, Brăila, Galați, Tulcea, Medgidia, Bucharest	Weekend tourism: favoured by the proximity to the coast of some important urban centers
Whole Dobrogea	Vineyards tourism

Thus, according to the Master Plan for the Development of National Tourism 2007 - 2026 developed by the World Tourism Organization in cooperation with the Ministry of Regional Development and Tourism[65], the proportion of coastal tourism in the national total is estimated at approx. 60% of the total national registrations of tourists:

- It is one of the most important tourist areas of Romania related to other tourist areas, reflected by the indicators regarding the tourist circulation and accommodation capacities.
- An unsustainable bases through the erroneous approach of the tourism managers of the way to attract tourists on the Romanian coast which made the summer season to be shorter and shorter, and the tourist offer to be very limited.

➢ *The dynamics and structure of the tourist accommodation capacity of the administrative-territorial units in the Black Sea coastal area*

BOX 37. From a methodological point of view:
Dynamics and Structure of the tourist accommodation capacity

Through the multitude of problems approached from marketing, management, macroeconomics, trade, tourism and services economics, statistics, econometrics and addressing the issues from a historical, economic, social, political and environmental point of view, a strong multidisciplinary character was imprinted on the study.

During the documentation, statistical indicators provided by the Romanian competent bodies (such as the National Institute of Statistics and the Constanta County Directorate of Statistics) for a period of 6 years (2014-2019) were used. Considering the fact that the development of tourism is an important component of socio-economic activities, with a significant impact on the Black Sea coastal environment, the reference period 2014-2019 was chosen for the study and two types of indicators (considered representative for the tourism-environment relationship) were analysed: accommodation capacity and tourist flows.

These indicators can be expressed in: both absolute and relative quantities; absolute sizes (number of units, number of places, number of places-days) structured by types of units (reception structures) and territorial units (localities) and relative sizes by dynamics indices.

[64] Halcrow Romania, Master Plan "Protection and rehabilitation of the coastal area", Version: V8 (final), September 2012, *http://www.rowater.ro/dadobrogea*

[65] Romanian Government, Master Plan for the Development of National Tourism 2007 - 2026 elaborated by the World Tourism Organization in cooperation with the Ministry of Regional Development and Tourism, *http://turism.gov.ro/web/wp-content/uploads/2017/05/masterplan_partea1.pdf*

The indicators for evaluating the accommodation capacity include:	Regarding the tourist accommodation capacity, there are two types of indicators:
• *the tourist reception structures with tourist accommodation functions*, referring to the tourist accommodation units providing permanently or occasionally accommodation service to those interested, • *The existing and operating accommodation capacity, indices of net use of the tourist accommodation capacity in operation*, including the accommodation units existing at the end of the respective year, exclusively those that have interrupted their activity for a period of time.	• *The existing accommodation capacity (installed*) - which is given by the number of accommodation places for tourist use registered in the last act of reception, homologation, classification of the tourist accommodation unit, expressed in *number of places*; • *The tourist accommodation capacity in operation (available*) - which represents the number of accommodation places that tourists can benefit from, taking into account the • Number of days for the units is open in a certain period, expressed in *number of places-days*.

a) According to the data communicated by the Constanța County Directorate of Statistics, **the structures of tourist reception with tourist accommodation functions in the territorial units** varied during 2014-2019 with the following details.

BOX 38. From a methodological point of view – *Structure of tourist reception with tourist accommodation*	
The structure of tourist reception with tourist accommodation functions means any construction or arranged place, destined, according to the design and execution, for the tourist's accommodation. The structure of collective tourist reception with tourist accommodation functions is that structure that provides rooms or spaces to travellers, and the number of places it provides must be higher than a minimum specified for groups of people, more numerous than a simple family; all places in the receiving structure must have a common commercial administration even is a non-profit unit (for non-profit purposes).	
This indicator	It as a slow dynamics, given the consistent financial effort involved in any investment.
	For the analysed period, there is a significant increase in the number of accommodation structures in Mangalia (279 units in 2019 compared to 240 in 208), Murighiol (98 structures in 2018 compared to 24 in previous years) and Sulina (36 structures in 2018 compared to 4 in previous years) due to the increase in demand, i.e., the number of tourists and implicitly the number of overnight stays in these destinations.
The criterion for classifying accommodation capacities and structure	1. **classic forms** (hotels, motels, tourist inns, hostels); -the accommodation capacity represents a complex offer of accommodation services (in time, space and structure); during the peak periods of the season cannot satisfy in all circumstances the accommodation demand of the potential clientele; -The classic and complementary accommodation capacities (unequally distributed on territorial units and from country receiving tourist flows), directly depends on the evolution of the tourist demand but also on the intense character of the seasonality.
	2. **auxiliary** (complementary) forms of accommodation (bungalows, campsites, holiday villages, tourist houses, etc.) encounter in those areas where there are not sufficient accommodation places or where the tourist activity has a pronounced seasonal character. The complementary structures are arranged relatively simply, in a short period of time and with a lower financial effort compared to the classic accommodation structures, in order to take over a part of the requests from the maximum influx periods of customers
Significant changes are observed in the category of complementary structures (which require small investments and are made in a relatively short time). Murighiol city registered in 2018 a number of 47 agrotourism pensions, compared to 5 units in the previous years and 17 new bungalow constructions, thus suggesting that this destination has become particularly attractive for tourists.	

Also, in the locality of Sf Gheorghe there was reported in 2018, for the first time, 7 new agrotourism pensions.

b) As regarding **the existing or installed tourist capacity** (expressed in number of places), the situation on the main structures during the period 2014-2019 is evaluated, also for existing accommodation capacity in Sulina, Murighiol and Sf. Gheorghe (2019).

c) **The operational tourist accommodation capacity,** represents the number of accommodations, taking into account the number of days (no. of places x no. of days).

BOX 39. From a methodological point of view –
Tourist accommodation capacity in operation

Cf = (LP x DP) + (LS x DS) + (LC x DC), where: Cf - tourist accommodation capacity in operation; LP – the average number of beds in permanent rooms; LS - the average number of beds in the seasonal rooms; LC - the average number of seasonal places offered in cottages and campsites; DP - the number of days in a certain period in which the structure was opened for the beds in the permanent rooms; DS - the number of days in a certain period in which the structure was opened for the beds in the seasonal rooms; DC - the number of days for a period in which the structure was opened for the seasonal places offered in cottages and campsites.

The operational tourist accommodation capacity of the coastal area, expressed in number of places-days, has shown a quite similar evolution to that expressed in number of places through the existing accommodation capacity. If in 2014 the tourist accommodation capacity of the territorial units in the coastal area registered a value of 10,523,366 places-days, in 2018 it reached of 10,710,182 places-days, thus higher with 186,816 places days.

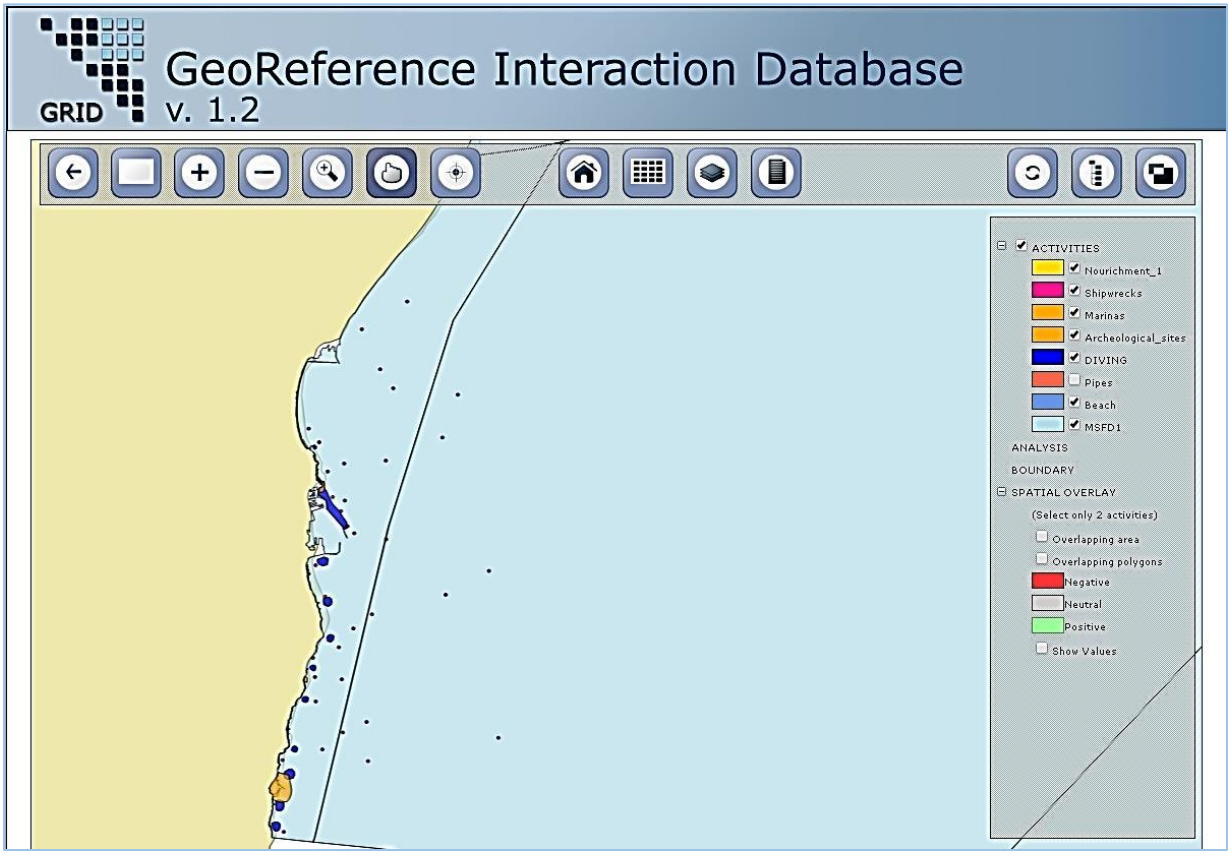

Figure 61. Romanian Tourism features related to other maritime uses (*NIMRD-ECOAST)*

BOX 40. From a methodological point of view-
Index of net use of the tourist accommodation capacity

The **Index of net use of the tourist accommodation capacity *in operation*** expresses the relationship between the accommodation capacity in operation and its effective use by tourists, in a certain period.

The index of net use of the tourist accommodation capacity in operation is calculated as follows: In = (N / Cf) x 100, where: In - the index of net use of the tourist accommodation capacity in operation; N= the number of overnight stays recorded in a certain period (Annex 8 (10.1). Cf - tourist accommodation capacity in operation

The **dynamics of the index of net use of the tourist accommodation capacity of the territorial units** in the coastal area, by tourist reception structures is presented. The index represents an indicator that helps to assess the efficiency of the operation of the equipment and accommodation spaces. It is considered that represents the most expressive and cumulative indicator for the evaluation of the results of the activity carried out in the tourist accommodations. The indicator shows the percentage of the existing accommodation capacity that has actually been used. Average length of stay is counted by dividing the number of overnight stays by the number of tourist arrivals.

✓ *Conclusions*

The last few years have been a challenge for the Tourism and Travel Industry.

BOX 41. Since the summer of 2008 in the world

- the demand for tourism has diminished as a result of the international economic crisis as well as terrorism concerns which have raised many challenges for this industry, having a significant share in the gross domestic product worldwide but also in employment;
- for developing countries to move the value chain towards higher value-added production from services
- the tourist circulation takes the form of tourist flows - in the emission areas and the receiving areas.

In Romania

The tourist circulation in Romania has known different tendencies, which have been determined by the major changes suffered by both the global and the domestic economy.

- The natural tourism potential represents one of the most important resources, which is possible to be developed in the frame of the tourism industry (worldwide evolution, with economic beneficial impact.
- Romania's position on the international tourism market was influenced not only by the political regime, but also by the socio-economic situation: place of tourism in the economy structure and public consumption

During 2014-2019

The dynamics of the number of tourists arriving in the administrative-territorial units was analysed; also the tourist arrivals on tourist reception structures and tourist accommodation functions

As it can be seen, in all localities of the coastal area, the number of tourist arrivals in 2019 has increased; Significant in Murighiol, Sf. Gheorghe and Sulina. It is interesting the obvious development of these 3 territorial units belonging to Tulcea county, in the context in which the coastal area of Constanta county is much better

It is necessary *to approach with scientific rigor the complexity of the aspects involved in the development of Romanian tourism on the Black Sea and especially of coastal tourism, in the context of the expansion of the integration phenomenon at European level* (Figure 61).

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5.6. COASTAL DEFENSE/FLOOD PROTECTION – Hydrotechnical Works

Detelina Toteva, Valerya Hitova, Margarita Stanceva, Yordan Chervenkov, Detelina Apostolova, Dan Vasiliu, Glicherie Caraivan, Jenica Bujini, Vlad Rădulescu, Alina Spînu, Dragoș Niculescu

✓ *Existing Conditions*

In BULGARIA

Responsibilities for the protection of the Black Sea coast from identified harmful effects of natural factors and human activity in Bulgaria are distributed among individual institutions at national, regional and local levels.

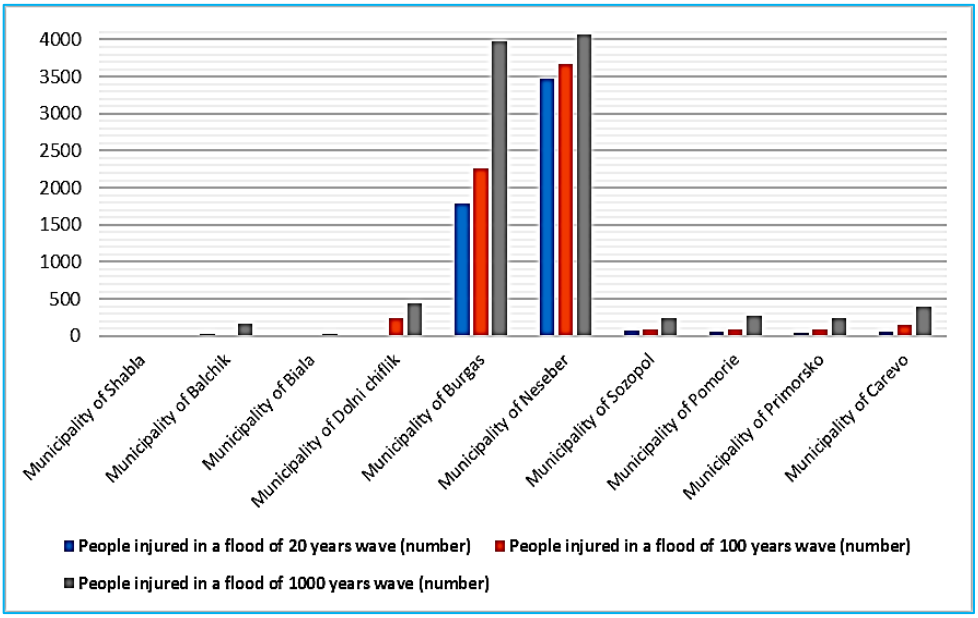
The Ministry of Regional Development and Public Works, assisted by the Geoprotection and Public Works Directorate and the state company Geoprotection Varna EAD, carries out a set of activities for registration and monitoring of landslide areas on the territory of the Republic of Bulgaria and the abrasion and erosion processes along the Black Sea coast. The Ministry of Environment and Water, together with the Regional Inspectorates in Varna and Burgas and the Black Sea Basin Directorate, Varna carries out preventive, current and follow-up control related to the implementation of regulations governing the quality of environmental components and the factors that affect. The General Directorate" *Fire Safety and Civil Protection"* at the Ministry of Interior, with its regional directorates and centers for emergency medical care are main components of the rescue system.
European Parliament Directive 2007/60/EU and of the Council of 23 October 2007 regulate the framework for floods[66] assessment and management in the EU-Member States, transposed into Water Act in 2010.[67]/Bulgaria

The long-term flood risk reduction planning approach for each basin management area goes through three stages: 1) Preliminary flood risk assessment; 2) Preparation of maps of the areas at risk of flooding and maps of the areas at risk of flooding; and 3) Development of a Flood Risk Management Plan with a Program of Measures (Figure 62).

Figure 62.

Flooded areas of the coastal settlements located in the flood risk zones

Sources: Black Sea Basin Directorate, 2019



The latest River Basin Management Plan (RBMP) for the Black Sea river basin region is updated every 6 years, according to Art. 157 and Art. 159 of the Water Act and is developed for the period 2016-2021. Flood risk management plans (FRMPs) have been developed for

[66] https://eur-lex.europa.eu/legal-content/BG/TXT/?uri=celex%3A32007L0060
[67] Promulgated SG No. 67/27.07.1999, amended SG No. 61/02.08.2019

the same period, together with an Environmental Assessment. Under the grant procedure BG16M1OP002-4.005 *"Implementation of studies and assessments in connection with the second FRMP for the period 2022-2027*" the second generation of plans is being developed, which must be adopted by the Council of Ministers by the end of 2022. The Black Sea basin management region includes all rivers forming their currents mainly on Bulgarian territory, which flow directly into the Black Sea or through coastal lakes and bays, including inland waters and the territorial sea.[68]

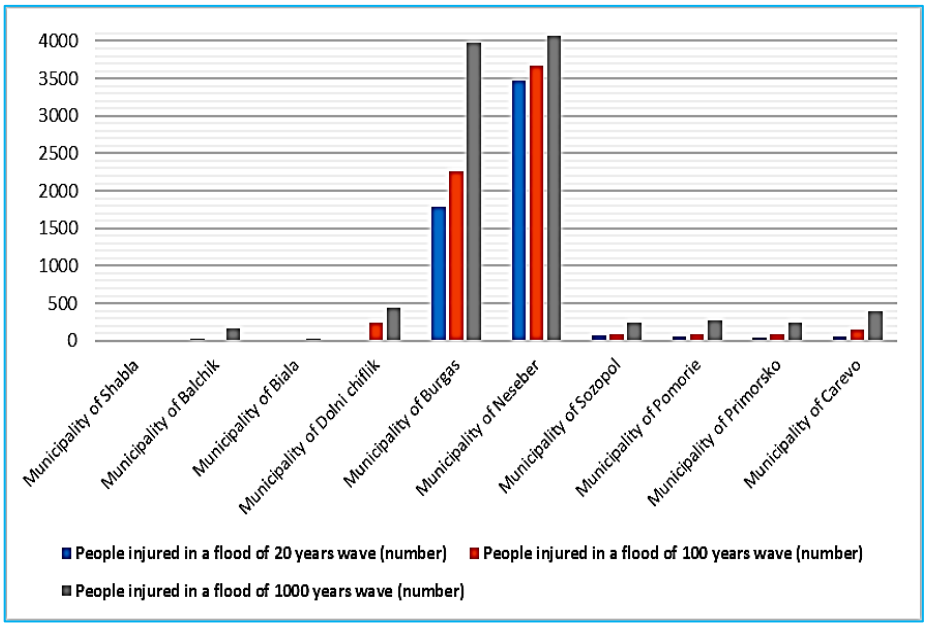
The areas with significant potential risk of sea floods within the scope of the Black Sea Basin Directorate according to the FRMP for the period 2016-2021 are a total of 11 with a total length of approximately 267 km, and in the territorial scope of Marsplan-BS II on the Bulgarian Black Sea coast are: Black Sea - Durankulak with a length of 14 km and a low degree of risk; Black Sea - Shabla with a length of 15 km and a low degree of risk; Black Sea - Balchik with a length of 31 km and a medium degree of risk; Black Sea - Varna with a length of 36 km and a high degree of risk (Figure 62).

The interpretation of the risk is based on the Methodology approved by the MoEW, using three main categories in accordance with Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European Critical Infrastructure and the assessment of the need to improve their protection[69], and the Disaster Protection Act[70]: i) high risk - construction or expansion of an existing building stock in which people or animals are kept is not allowed; ii) medium risk - construction is possible, but with limitations in the context of the potential flood threat; iii) low risk - construction is possible, the site owners must be warned of the potential threat of flooding (Figure 63, 64, 65).

Figure 63.

Population of the coastal municipal - lities affected by floods

Sources: *Black Sea Basin Directorate, 2019*



The National Statistic Institute data on flood damage[71] show a clear trend of their increase for the period 2010-2017.[72]

[68] *https://www.bsbd.org/bg/BSPLAN2009.html*
[69] *https://eur-lex.europa.eu/legal-content/bg/TXT/?uri=CELEX%3A32008L0114*
[70] Promulgated SG No. 102/19.2006, amended SG No. 77/18.09.2018
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[72] 2018 not included due to the last of data for Dobrich district.

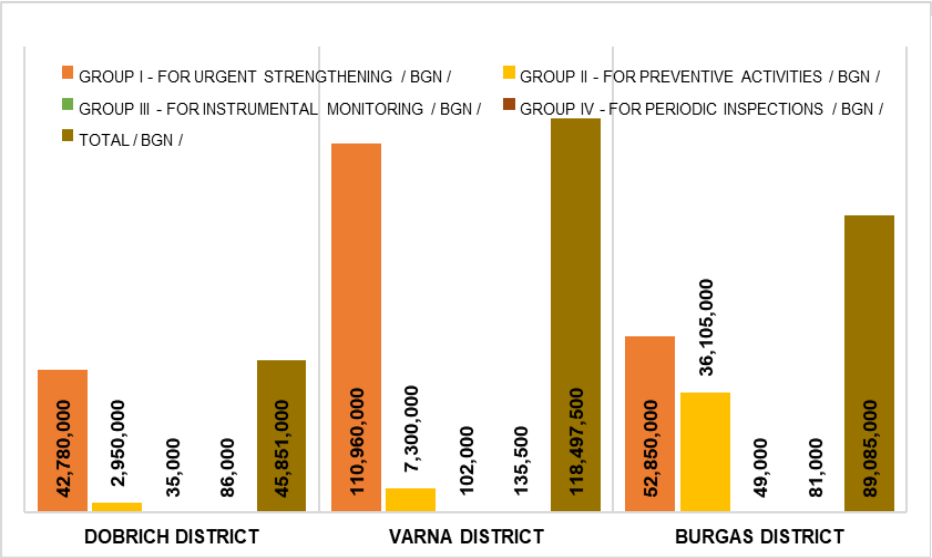
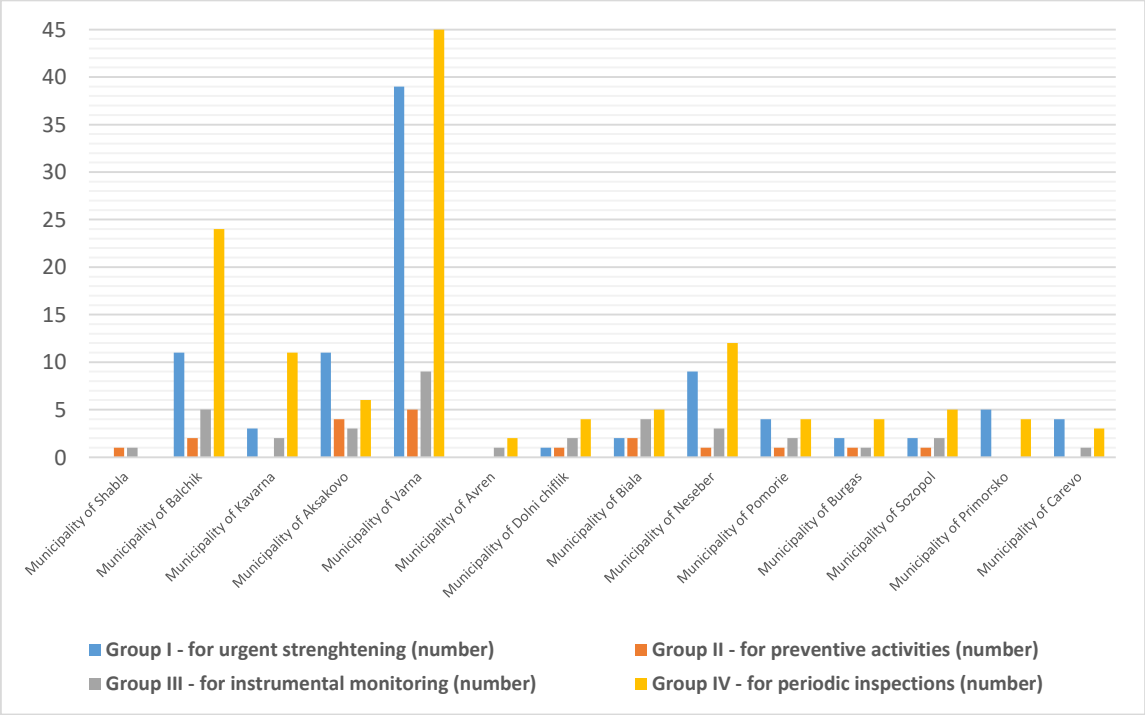


Figure 64.

Funds Distribution for landslide protection in the Bulgarian coast

Source: *National Programme for Prevention and Limitation of landslides on the territory of the Republic of Bulgaria, erosion and abrasion of Danube and Black Sea coasts 2015-2020 (2020)*

The share of damages in the Black Sea regions compared to those for the country in 2015 and 2017 exceeded 80%.



Sources: Geoprotection Varna, National Programme for Prevention and Limitation of landslides on the territory of the Republic of Bulgaria, erosion and abrasion of Danube and Black Sea coasts 2015-2020, (2020).

Figure 65. Registered and categorized landslides (31.12.2018)

The city of Varna is the most vulnerable in all three scenarios of floods, as its flood areas reach up to 10% of its total territory.
The analysis of the RBMP and the FRMP 2016-2021 for the Black Sea Water Management Region shows that in case of high, medium and low probability sea floods (with a recurrence of 20, 100 years and 1000 years), the most affected is Varna municipality with affected areas between 2 km^2 at 20 years of wave and 4 km^2 at 1000 years of waves.
The most affected would be the municipality of Balchik with 22 settlements.
The system of facilities and sites whose shutdown, malfunction or destruction would have a serious negative impact on the health and safety of the population, the environment, the national economy or on the effective

functioning of public administration is being examined as critical infrastructure in different flood scenarios. The number of affected inhabitants of the coastal settlements is the largest in the municipality of Balchik, with an affected population between 50 and 170 people in floods of 20 years and 1000 years.
The strategic document outlining the vision in the geoprotection policy is the National Program for landslide prevention and control on the territory of the Republic of Bulgaria, erosion and abrasion along the Danube and Black Sea coast, 2015-2020, adopted by the Ministry of Regional Development and Public Works.[73] It aimed at preventing and reducing the degree of erosion and landslide hazard, limiting and quickly eliminating the consequences of these processes, as well as protection of the population, tangible assets, critical infrastructure and the environment.
Between Lahna and Atanasovsko Lake shore is one of the highest abrasion rates-2.0 m/y.
Monitoring of abrasion as an irreversible process of destruction of the root rocks of the sea shore and the underwater coastal slope is of utmost importance. The analysis of the data on the abrasion activity along the Black Sea coast shows that the least susceptible to abrasion are 48% of its total length, 2% with the highest intensity; the rest are of medium intensity.

In conclusion, the significant progress in the fight against landslides on the Bulgarian Black Sea coast, in the establishment of a national landslide register and the access to information, should be noted. Similar activities should be carried out for coastal areas, affected by erosion.

In ROMANIA

Disturbing factors of coastal ecosystems includes anthropogenic action which consists in the construction of dams and reservoirs to control water flow. From a hydrological point of view, Dobrogea is divided into two large basins: the Danube tributary basin and the Coastal hydrographic basin. Out of the total surface of 10813 km2, the surface of the coastal hydrographic basin covers 5,480km2. The surface of BH Littoral includes all rivers that discharge into coastal lakes or lagoons and those that discharge directly into the sea (with a total area of 143 km2). The particularities of the elements of the natural environment of Dobrogea, especially those of geological, geomorphological and climatic order, imprint on the hydrographic network and the hydrological regime of the watercourses, characteristics that are not found in any other region of the country.

In Romania, substantial efforts to protect the coastal zones against erosion and related flood-risk have started very recently. The Romanian coastal protection approach consists of designing and implementing the measures that come from a series of “hard” and “soft” structural rehabilitation solutions, methods introduced by the coastal engineering, which offer solutions in the integrated management of the coastal zone. During 2013 – 2015, the phase 1 of the Master Plan “*Protection and rehabilitation of the coastal area*" implemented the measures to protect the beach against the risk of accelerated erosion for 5 areas in the central part of the Romanian littoral (Mamaia Sud, Tomis Nord, Tomis Centru, Tomis Sud and Eforie Nord) covering a shoreline length of about 7.3 km

Cases of flooding in the northern part of the coast were registered in 2006 and 2010, when the whole Danube Delta was covered by waters and houses of two villages were totally destroyed.
In the sour then part of the Romanian littoral, the most known flooding event was registered in 2005, in Costinesti resort, where the flood caused serious damages (houses destroyed, ca. 1.5 km of the railway embankment, numerous access roads, motels, terraces and restaurants). The flood spread upstream from the European road in 24 hours more than 300 mm recorded. A large part of Costinesti Lake became a gulf again (Figure 66a, b) by washing the perisip, the beach area on 2 km length, led to its destruction, human lives loss.

[73] *https://www.mrrb.bg/bg/nacionalna-programa-za-prevenciya-i-ogranichavane-na-svlachistata-na-teritoriyata-na-republika-bulgariya-eroziyata-i-abraziyata-po-dunavskoto-i-chernomorskoto-krajbrejie-2015-2020-g-i-dopulnenie-kum-neya-s-novovuzniknali-77199/*

The eroded beach area between 1982-2007 and 2007-2012 exceeds one hectare, which shows the impact of the coastal dams in the first phase of sediment redistribution, after the construction of the protection dams of the water drainage channel during the flood periods (flash floods).

Phase 2 of the Masterplan is currently underway, the "Romanian Waters" National Administration through the Dobrogea - Littoral Water Basin Administration singeing in 2018 the financing contract. The project is co-financed by the Large Infrastructure Operational Program (POIM) 2014 - 2020, Priority Axis 5 - Promotion of adaptation to climate change, prevention and risk management, Specific objective 5.1 Reduction of the effects and damages on the population caused by the natural phenomena associated with the main risks accentuated by the changes climate, mainly from floods and coastal erosion (http://www.rowater.ro/dadobrogea).

2004  2007 

Figure 66. Costinesti coastal belt a) before b) after flood control hydro-works building

The coastal protection works are planned to be carried out either in the northern area (between Stăvilar Periboina and Stăvilar Edighiol) or southern littoral (Mamaia, Constanta/Tomis, Agigea, Eforie, Costinești, Olimp, Jupiter-Neptun, Venus, Saturn, Balta Mangalia-Venus-Aurora, Mangalia-Saturn, and 2 Mai). The main objectives of the project are to prevent the coastal erosion and limit its negative effects on the Romanian littoral by carrying out rehabilitation and protection activities, including beach extension (through artificial sanding), construction of connected or parallel coastal structures, artificial reefs, dams to stabilize the cliffs, support walls, etc. Also, a series of measures are envisaged, such as: the use of satellite monitoring techniques to identify the areas affected by the erosion, the use of satellite technology for constructing projections on the evolution of the erosion phenomenon and the use of satellite technology to evaluate the impact of the measures taken to limit the phenomenon of coastal erosion.

✓ *Knowledge gaps*

- Incoherent legislative framework regarding coastal zone.
- Conflicts between the local authorities and the coastal area administrator regarding the legal regime of cliffs and beach.
- Non-compliance with urban plans by economic agents.
- Lack of a coherent plan for flood protection for the hydrographic network tributary to the coastal area (e.g., Costinești Valley, Tatlageac Valley-August 23, Lazu Valley)

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6) *** Dobrogea-Litoral Water Basin Administration, "*Reducing Coastal Erosion* Phase II (2014 - 2020)", available at http://www.rowater.ro/dadobrogea
7) *** many other documents like plans, methodologies, programs.
8) xxx MARSPLAN Studies, *www.marsplan.ro/en*

5.7. DREDGING AND DUMPING

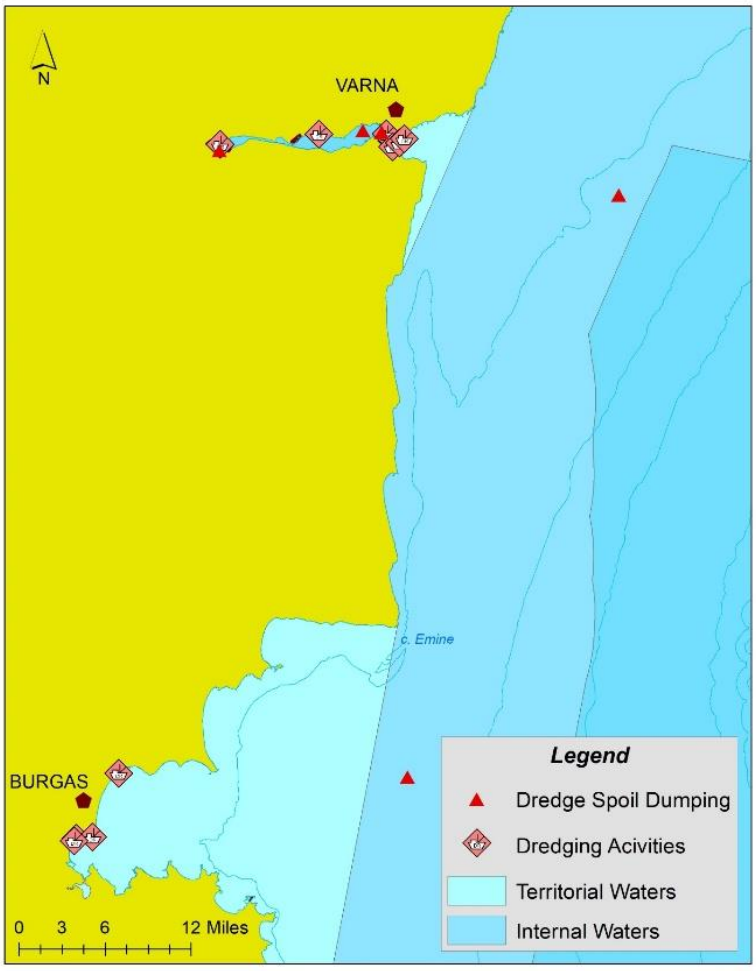
Hristo Stanchev, Dan Vasiliu, Jenica Bujini, Glicherie Caraivan, Vlad Rădulescu, Alina Spînu, Dragoș Niculescu

✓ *Existing Conditions*

Sediments are considered essential, integral and dynamic part of the marine ecosystem. Sediments dumped at sea are resulted from dredging in ports and from the cleaning and widening of waterways. The dredged materials are placed in specific designated areas, sometimes for specific reasons such as for the extension of the beaches or for the lands recovery, situations frequently encountered in the Black Sea area.

In BULGARIA

Figure 67, Dredging Activities and Dredge Spoil Dumping Sites along the Bulgarian coast.



Navigation channels and permanent dredging activities for their maintenance are other types of human activities in the coastal zone that have adverse impacts on processes similar to those arisen from the effects of defense structures. Dredging, the removal of sediments shoals from navigation channels is the primary activity that assures safe and efficient navigation. Typically, such works remove the sediments as their effects are similar to sand mining.
The two navigational channels (the older one – built in 1907 and the newer deep-water – in 1976) in the bay of Varna that connect the Varna Lake with the sea are typical example for such types of structures.

For maintenance of the deep-water navigation channel to a required depth of 15 m, constant dredging activities are performed. As well as the harbor structures and particularly the navigational channel obstruct the sediment delivery to the underwater coastal slope north and south from the bay (Stanch Eva, et al., 2008).

According to the EMODnet data, for the period 2006-2015, dredging activities were carried out at 12 locations along the Bulgarian Black Sea coast (Figure 67, Table 14). The purpose of dredging is mainly maintenance dredging and capital dredging. The extracted amount of sediment materials is 1,387,702 m^3. All dredging activities are for harbor's needs. In 2020, the Council of Ministers approved the deepening of Channels 1 and 2 in the port of Varna.

Dredging and dumping of sediment in the coastal marine waters of Bulgaria is limited in scope. Dredging and less frequent dumping (at certain locations) is done due to the periodic need to maintain the navigation routes to the Port of Varna - East, Maritime Port and Port of Varna West, in Channel 1 and Channel 2 Black Sea - Varna Lake, Varna Lake, Varna - Beloslav Lake Canal, and in Beloslav Lake, Burgas ports.

After the construction of the port terminal Varna-West and the digging of Channel 1 and Channel 2, this is the largest investment in Varna - BGN 350 million. The implementation of the deepening will ensure reaching a draft of 13.50 m, which is with 2 m more than the draft at the moment, thus allowing the larger ships to enter the waters of the port terminals after Channel 1 and Channel 2.

Table 14. Dredging sites along the Bulgarian Black Sea coast (*source: EMODnet*)

Region	Extraction area	End use	Extracted Amount (m^3)	Extraction type	Purpose	Year	Data source
Varna	Port of Varna – West	Lake disposal	211000	Harbor dredging	Maintenance dredging	2013	EMODnet
Varna	Port of Varna (Port Lesport S.A.)	Lake disposal	242000	Harbour dredging	Maintenance dredging	2009	EMODnet
Varna	Port of Varna (Port Odesos PBM)	Lake disposal Sea disposal	16282	Harbour dredging	Maintenance dredging	2015	EMODnet
Varna	Port of Varna (Odessos Ship repair Yard)	Lake disposal	1200	Harbour dredging	Maintenance dredging	2012	EMODnet
Varna	Port of Varna (PCHMV Base Oil Terminal)	Lake disposal	820	Harbour dredging	Maintenance dredging	2014	EMODnet
Varna	Port of Varna (Oil Terminal of Petrol)	Sea disposal	400	Harbour dredging	Maintenance dredging	2013	EMODnet
Varna	Port of Varna	Lake disposal Sea disposal	309000	Harbour dredging	Maintenance dredging	2015	EMODnet
Burgas	Fishing Port of Sarafovo (Burgas Bay)	Sea disposal	64000	Harbour dredging	Maintenance dredging	2013	EMODnet
Burgas	KRZ Port of Burgas JSC & FISH Port of Burgas (Burgas Bay)	Sea disposal	375000	Harbour dredging	Maintenance dredging	2006	EMODnet
Burgas	Burgas Bay (aquatory of Port of Burgas – West, Container Terminal 4)	Sea disposal	128000	Harbour dredging	Maintenance dredging	2008	EMODnet
Burgas	Port of Burgas	Sea disposal	N/A	Harbour dredging	Capital dredging	2007	EMODnet
Burgas	KRZ Port of Burgas JSC (Burgas Bay)	Sea disposal	40000	Harbour dredging	Maintenance dredging	2008	EMODnet

The project includes the deepening of the navigational Canals 1 and 2, together with the lake part of the navigation route of the approach and the turning circle of the port terminal Varna-

West, shore protection, and if necessary - relocation of engineering infrastructure (electrical and water communications, etc.). Its implementation will allow the acceptance of ships with greater draft depths, respectively, this will be reflected in the size of ships up to 60-70 thousand tons. According to this, the interest of shippers will be greater and, accordingly, the investment interest in our terminals will increase.

➢ Marine Disposal Sites for Dredged Material

Dredged material is sediment excavated or otherwise removed from the bottoms of the navigable waters of the Bulgaria to maintain navigation channels and sea ports. The permitting process for marine disposal of dredged material requires the identification and designation of a site where materials may be disposed. Marine disposal sites are precise geographic areas within which marine disposal is permitted subject to specific conditions.

Threats arising from the movement of vessels in these areas are navigation accidents with a vessel, transportating and disposing dredging masses; accidents as a result of change in the water depth; detonation of ammunition, dumped together with dredging materials and detonated due to the contact with a ship's anchor, bottom trawl activities of divers or an underwater explosion. In the Bulgarian part of the Black Sea there are two designated areas for the deposit of dredged sediments that fall into the territorial waters of the Republic of Bulgaria (12 NM zone of the Black Sea) against the Varna and Bourgas bays. In order to reduce the risk of adverse impacts, it is necessary to conduct studies (monitoring) and an in-depth analysis of the suitability (including capacity) of existing landfills and the identification of possible new sites. No such activities are currently underway.

In ROMANIA

The depth of the water at the berths and in the port maneuvering areas is one of the major constraints in the ports. This situation has been reached for the following reasons: poorly maintained projected depths and unsuccessful dredging programs in the past.

➢ Constanta Port

Currently, the project “Modernization of the port infrastructure by ensuring the increase of the depth of the channels and basins and of the safety of navigation in the Port of Constanța”, financed through EU Large Infrastructure Operational Program POIM 2014-2020, Priority Axis 1 Improving mobility through the development of the TEN-T network and metro transport Specific Objective 1.3 Increasing the use of waterways and ports located on the central TEN-T network, is in the implementation phase. As a result, the water depths within the port (including in the docks and berths) will be in line with the projected ones; thus, strengthening the current position of the Port of Constanta in the Black Sea region and the European transport system.

The project provides dredging works in 17 port areas in order to bring to the projected level of the basins and channels in the Port of Constanța, the deepening the basin of the working port from 7 to 9m, as well as the access channel to the port (Constanța South)(Figures 68, 69).

➢ Midia Port

The water depth at the berths is the main restrictive factor for operating in the port of Midia. This situation arose due to the delay of the investments for the dredging works and resulted in significantly decrease in the operations efficiency due to the difficulty of receiving larger ships. The investment plan for dredging works is strongly necessary to achieve the following objectives

➢ Mangalia Port

The water depth of water and the access in the port aquatorium are the main constraints in the Mangalia port. This situation has been reached due to: improperly managed depths and non-compliance with past dredging campaigns, and no execution of investment plan for dredging, especially at the entrance to the port. The main consequence is the limited operational capacity of the DAEWOO Mangalia Shipyard, which obstructs the entry of larger vessels.

Figures 68 (Tab.15) Dams and sandy nourishing works.

In all ports an investment plan for dredging work is needed to achieve next objectives:

- Elimination of draft restrictions on entry into port;
- Improving manoeuvring conditions and and safety in navigation
- Increasing the operators efficiency, avoiding completion and double handling operations.
- Full use of existing maritime infrastructure as originally planned;
- Increasing the operators efficiency, avoiding completion and double handling operations.

Benchmark	Beach width (m)		Nourishment
	Before nourishment	After nourishment	
CT1	128	209.5	81.5
CT2	38.2	170.4	132.2
CT3	33.6	129.5	95.9
CT4	42.8	137.5	94.7
CT5	31.9	164.4	132.5
CT6	33.8	147.6	113.8

Table 15

Benchmark	Beach width (m)		Nourishment
	Before nourishment	After nourishment	
Ef17	58.1	159.5	101.4
Ef18	34.4	147.5	113.1
Ef19	42.6	175.2	132.6
Ef20	7	144.1	137.1
Ef21	7	149.7	142.7
Ef22	7	114.7	107.6

Table 16

Figure 69. (Table 16). Nourishment profils lenghts

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5.8. UNDERWATER CULTURAL HERITAGE

Milen Kolev, Antoanetta Trayanova, Jeni Bujini, Dan Vasiliu

✓ *Existing Conditions*

Underwater cultural assets are an integral part of the immovable cultural assets on the coast. Under cross-border cooperation the discovery, identification, research, protection, conservation and socialization require huge efforts and resources, modern equipment and international cooperation. The analysis and prognosis for integration of the topic in the maritime spatial planning follow the requirements of all international documents and the Convention on the protection of the underwater cultural heritage (UNESCO, Paris, 2001).[74] The latter gives a definition of the "*Underwater cultural heritage*" (art.1) which includes "*all traces of human existence having a cultural, historical or archaeological character, partially or totally under water, periodically or continuously, for at least 100 years such as: i) sites, structures, buildings, artefacts and human remains, together with their archaeological and natural context; ii) vessels, aircraft, other vehicles or any part thereof, their cargo or other contents, together with their archaeological and natural context; and iii) objects of prehistoric character*".

In BULGARIA

In Bulgaria the underwater cultural heritage is systematized by experts in following groups:
- Seabed settlements and structures from the Late Stone-Copper and Early Bronze Ages. Such settlements have been partially studied in coastal lakes and in some of the bays.
- Archaeological structures found on the seabed, fallen from the sea surface, such as shipwrecks.
- Archaeological structures built in the past, on land, but due to local tectonic and landslide processes currently found on the seabed, as part of the submerged fortress walls of Nessebar.
- Archaeological structures built in the past as underwater facilities, as the remains of ancient ports.
- Individual artefacts and objects of historical, cultural or archaeological character on the seabed.

BOX 42. There are a lot of immovable cultural assets on the Bulgarian Black sea coast
The earliest settlements in the Black Sea region belong to the early and late Neolithic Age. Numerous prehistoric settlements from the transition between the Mesolithic and the Early Neolithic Ages are expected to be found along the ancient swamps from the 10th to the 8th millennium BC, located today at 30-40 m depth. The earliest architectural traces are those around Durankulak Lake and are dated to the early Stone-Copper Age (5th millennium BC). These are the first continental Europe'stone structures (scientists oppinion)
The cultural heritage includes also the immovable cultural assets located along the coast, which are in direct, semantic and physical connection with the underwater ones. In the two-kilometer land area, the onshore assets are dated from all historical periods: Prehistory, Antiquity, Middle Ages, Renaissance, and modern times.
There are prehistoric sites in the village of Durankulak (Neolithic settlement and a Neolithic necropolis), the village of Kamen Bryag (Neolithic cave complexes), the town of Kavarna (settlement), the town of Varna (Chalcolithic necropolis), the town of Chernomorets (settlement) and the town of Primorsko (dolmen and megalithic sanctuary). The most significant of them is the archeological complex "Big Island" near the village of Durankulak. There, in a settlement mound, the oldest stone architecture in Europe was discovered.

[74] https://unesdoc.unesco.org/ark:/48223/pf0000126065

Some of the prehistoric settlements were inhabited also in Antiquity and the Middle Ages.
Most archeological sites are those from Antiquity. They are evenly distributed along the entire coast at a distance of 5 to 25 km. These are remains of settlements, necropolises, mounds, fortresses, monasteries and others from the Thracian, Roman and Byzantine periods. Conservation and socialization activities have been carried out at less than half of the sites. Almost all ancient fortresses were used also in the Middle Ages.
Since 1959, underwater expeditions have been conducted in the waters of Cape Kaliakra to search for the remains of shipwrecks related to the battle of August 11, 1791 between the Ottoman and Russian fleets. Underwater archeological excavations were carried out east and southeast of the Yailata Reserve, Kavarna municipality, in the 1980s. Stone blocks from the fortress wall, fragments of building pottery, amphorae and stone anchors from the late Hellenistic period and late Antiquity were found. In the small bay in front of the fortress, in the bay of the holiday village Rusalka, there were small piers. Later underwater expeditions found amphorae, suggesting that the medieval port was located on promontory west side, below the fortress.
In the waters of the islands of St. Ivan and St. Peter, there were found stone and iron anchors, stone and lead sticks. The chronology of the findings follows that of the historical development of Apollonia Pontica - Sozopol, as the earliest finding date back to the 7th century BC and testify intense shipping in the area. The natural phenomenon "*stone forest*" is included in the protection zone of the reserve in the water area: fossilized forest remains (logs, piles, branches) of swamp cypresses. The phenomenon is located at a depth of between 12 and 16 m between the island of St. Ivan and the Skamni peninsula (the old town of Sozopol).
There are medieval sites in the cities of Varna, Saint Vlas and Sozopol, which are monastery complexes created during the period 9 - 12 century. During the First and Second Bulgarian States they were important literary centers. The monasteries in the town of Sveti Vlas were part of the Emona Holy Forest. Regular archeological excavations are carried out at some of the sites. The most impressive is the rock Aladzha Monastery, located north of Varna, with preserved frescoes from the 14th century.
Renaissance architecture is preserved in the towns of Nessebar, Pomorie and Sozopol with approximately 300 preserved residential buildings (18th-19th centuries), remarkable examples of the Black Sea type of housing. The ancient Nessebar is part of the UNESCO/world cultural and natural heritage, since 1983. The first status of legal protection of sites in Nessebar is regulated by list №1 for declaring antiquities, based on a decision of the Commission on Antiquities at the Ministry of National Education (State Gazette, issue No. 69 of 1927). The current legal status of the cultural heritage in Nessebar is determined in accordance with the requirements of the Cultural Heritage Act (Promulgated SG No. 19 of 13.03.2009, amended SG No. 93 of 24.11.2009) According to Article 50 (1) of the CHA, "Ancient Nessebar" is a cultural asset of "world importance", included in the World Heritage List. There is currently an "Ancient Nessebar Reserve" with 118 single cultural assets of which 20 are in the category "national importance", 50 are of local importance, 34 are registered for information purposes, 5 are in the category of ensemble significance and 8 are without category. The reserve covers the entire peninsula with the isthmus, including the returned territories on the north coast, with the exception of the newly acquired territories in the southwestern part of the peninsula (total 27.7 ha). The defined protection zone in the water area has a radius of 2 km.
Since the post-liberation period, there have been immovable cultural assets of high cultural and scientific significance in the cities of Balchik, Varna, Pomorie, Burgas and Sozopol. Residential and public buildings in the styles of Art Nouveau, Baroque, Art Deco, Neoclassicism and Neo-Baroque form architectural and construction ensembles in the historic centers of Varna, Pomorie and Burgas. In the 1930s, a summer residence with a park of the Romanian Queen Maria was built in Balchik. After the Second World War it became part of the coastal architectural and park complex "The Palace". In 1908 the construction of the Euxinograd Palace, summer residence for Bulgarian monarchs, was completed. A park was created next to the palace, the compositional construction of which was completed in 1935. In the first years after the Liberation, in Varna and Burgas, the creation of the Sea Gardens began. Due to the preserved planning and vegetation, the two gardens are one of the existing emblematic examples of park and garden art in Bulgaria.
The research of each group of sites in recent years resulted from international expeditions and modern research technologies. Remains of shipwrecks in the area of cross-border maritime spatial planning have been studied in the Varna, Cape St. Atanas region. The extracted identical amphorae and tiles were cargoes from ancient shipwrecks. Remains of wooden sailing ships (17th-19th centuries) have been discovered near the northern beach of Durankulak (17th century's shipwreck), near Shabla, north of the Dobrudja campsite (17th-8th century's shipwrecks) and area of the village Krapets (19th century sailing ship). The specific conditions in the Black Sea (low salinity, anoxic conditions at depths of more than 150 m, poor water exchange, low temperature) preserve wooden ships remains. Black Sea's deep-sea shipwrecks and especially those of western half of the basin, have the full potential to be declared a World Heritage Site under the 1972 UNESCO Convention.
During deep-sea research of the Institute of Oceanology of the Bulgarian Academy of Sciences, 4 shipwrecks were registered east and north of Varna, at depths between 100 and 140 meters. Two shipwrecks date back to the Roman period (3rd – 5th century AD), and the others are dated to the 19th century. During

the implementation of the deep water project “MAP Black Sea” in the studied northern zone with a width of 2 to 10 km along the route of the unrealized South Stream gas pipeline, north of Varna to the edge of the Bulgarian EEZ, the remains of 55 shipwrecks were discovered, most of which are dated as follows: 1 ancient (late 5th century - early 4th century BC), 6 from the Roman era (1st - 5th century), 2 medieval (9th-10th century and 13th - 14th century), 20 Ottoman types (17th - 19th century), 16 large rowing boats (18th century), and 7 Western European types of ships from 18-19th century. The analysis of the data shows a similar density of shipwrecks of about 1 shipwreck per 4 км^2. The number and chronological distribution of registered shipwrecks corresponds quite well with what is known from historical sources about maritime economic activity in the respective periods
In addition to these shipwrecks, there are a number of other remains in the Bulgarian waters that have the character of military graves or which, within the meaning of the Convention for the Safeguarding of the Underwater Cultural Heritage, are also protected by law. These are Soviet submarines that sank between November 1941 and December 1942 east and south of Varna and in the Shabla region. Of all the submarines lost during World War II, only the S-34, which is believed to lie east-southeast of Cape Emine, has not yet been found. In 2010, a German submarine from the UB-I project from the time of the First World War was discovered east of Varna, which probably served under the Bulgarian flag as Submarine № 18 and was lost in 1919 while trying to escape to Constantinople. In addition to submarines in Bulgarian waters are the remains of several ships over 50 years old.
Remains of anchors, amphorae and other single finds that allow to indirectly study the ancient shipping and cultural contacts are found almost along the entire Bulgarian coast. In the 70's and 80's many of them were removed and the data on their finding were lost. In the 1990s, the uncontrolled extraction of archaeological materials continued. A large number of finds have been discovered along the coast in Shabla, the region of ancient Caria, Kavarna, the region of Cape Chirakman and the ancient colony Bison, in Varna, in Varna Bay port area and down on the southern Black Sea coast near almost all capes.
Ancient ports and port facilities are documented in the same areas where anchors, amphorae and other objects were discovered. In the area of a natural reef east of the flyover and the lighthouse of Shabla, finds of amphorae, poles and stone anchors were discovered (the port of Karia). Numerous amphorae from the Hellenistic period (the port of Bison) were found in the Gulf of Kaliakra. In the port of Varna there are finds that are interpreted as remains of the ancient port of Odessos. In the area of the southern shore of Varna Bay there is a concentration of finds, which are believed to be from a small port of Late Antiquity and the Middle Ages. Similarly, on the southern coast there are finds around the ancient ports of Mesembria, Anhialo, Cape Accra north of Chernomorets, between the peninsula of Skamni and the island of St. St. Kirik and Yulita near Sozopol, at the mouth of the Ropotamo River, on the bay of Maslen Nos and south of it.
Submerged settlements, structures and facilities, originally built on the coast, but found on the 30-40 m isobaths are specific to the Black Sea and are relatively poorly studied. Most of the sites are dated to the end of the 5th millennium BC (Late Chalcolithic) or to the 4th - 3rd millennium BC (Early Bronze Age). Along the northern Black Sea coast of Bulgaria, prehistoric finds and structures have been discovered in the water area, east of Durankushak Lake and north of the Dobrudzha campsite (prehistoric necropolises). In Varna and Beloslav lakes there have been discovered about 13 prehistoric settlements from the Late Chalcolithic and the Early Bronze Age.

✓ *Knowledge gaps*

Due to the need for significant resources for underwater research, the Black Sea is poorly studied. Although Bulgaria was among the first countries in Europe to establish a research center in 1978 to study underwater cultural heritage, which gradually expanded its capacity, financial resources are still needed to improve its facilities and equipment and to attract new staff. Bulgaria is the first country in Europe and the second in the world to accede in 2003 to the UNESCO Convention for the Safeguarding of the Underwater Cultural Heritage, but still very little has been done to study and exhibit the numerous findings. The knowledge about the water area remote from the coastline is still fragmentary and insufficient and is mainly related to the research areas for laying pipelines and cables along the seabed.

✓ *Spatial data*

With the development of modern technologies for underwater research, data processing and interpretation, increases the information security of this type of research, as well as the accuracy of determining the location of finds on the seabed, and their dating. At the same time

data and coordinates of previously discovered artifacts and evidence of active shipping in the Black Sea from the 1970s and 1990s are missing.

✓ *Conclusions*

The research and preservation of the cultural heritage, its connections with the cultural assets on the shores of the Black Sea is an important topic for joint research by the specialists in this field in the Black Sea region. Research so far in the area of cross-border cooperation between Bulgaria and Romania and the findings suggest opportunities for joint projects with other countries in the region, for joint scientific publications and presentation of invaluable underwater resources in a unified system of tourism and cultural heritage.

In ROMANIA

➢ Underwater archaeological sites and artefacts

Apart from wrecks, the underwater cultural heritage in the Romanian coastal waters includes also ancient archaeological remains. They are accumulation sites, where objects from different historical epochs overlap with objects from previous epochs. These sites, called submerged structures with great diversity (jetties, piers and other port facilities, cities from all historical periods, etc.), cover areas between a few hundred square meters or tens of hectares. (Figures 70, 71). The significant bets, with amount to several thousand square meters, of the Romanian Black Sea coast Tomis and Callatis cities are underwater or clogged with alluvium.

Figure 70.
Map of Route I *(GEM)*

✓ ***Route I***
Marina Tomis Constanta
- „Arkadia" wreck
- „Schuka 213" wreck
-Marina Tomis Constanta
total lenght-26.7 nm

Route 1 includes,
-„ARKADIA" wreck
44.18.448 N / 28.48.431 E

-Russsia submarine
"SCHUKA 21344.17.333 N / 28.54.005 E

In Romania the main underwater archaeological discoveries are submerged settlements such as Tomis (currently Constanta), Callatis (currently Mangalia) and Histria, wrecks (more than 70 targets) and six MPAs Romanian submerged landscapes (protected areas).

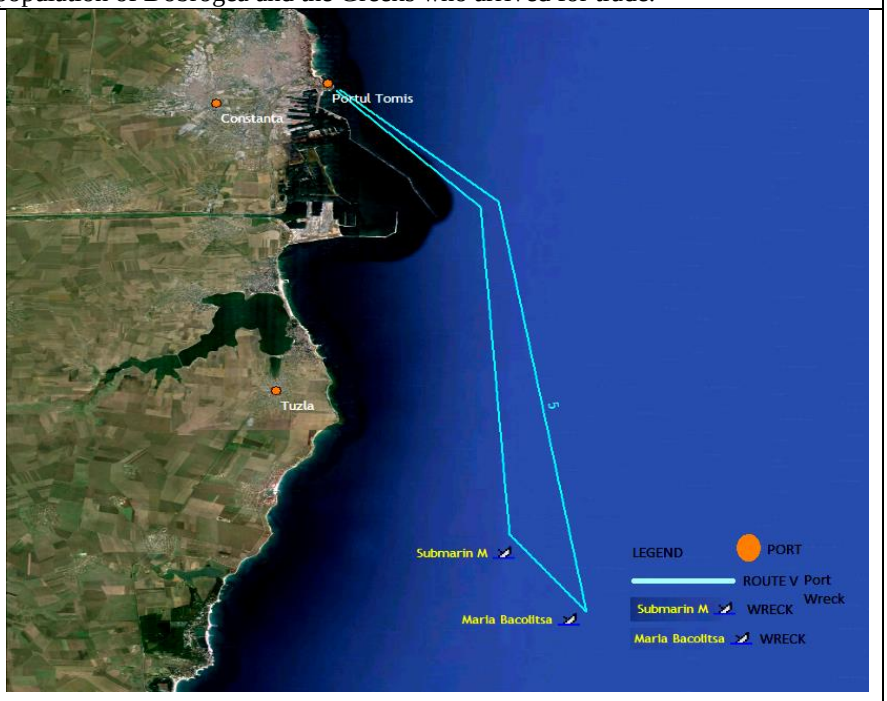
✓ **BOX 43. Tomis site**	
Tomis settlement, first a small market town (*emporium*), fell under the process of the Greek colonisation of the Black Sea's left banks, organised by Miletus (7th-6th centuries BC). At Tomis site, the underwater archaeological research highlighted the existence of a large underwater deposit of historical remains (architectural fragments of marble, Roman sarcophagi, etc.) occupying an area of about 10,000 square meters. The objects discovered brought evidence about an old tradition of navigation, about the maritime commercial	

connections between the native population of Dobrogea and the Greeks who arrived for trade.

Figure 71.
Map of Route V*(GEM)*

Route V : Marina Tomis Constanta - Maria Bacolitsa wreck - M Class wreck - Marina Tomis Constanta (total wreck of 37.6 nm)

Route V includes
„MARIA BACOLITSA”
43°52'32.46"N /
28°46'30.78"E
and
Russian submarine
CLASS M
M34 or M58” wrecks
43°54.749'N; 28°44.676'E



✓ **Callatis site** Geographical coordinates 43°49′N 28°35′E

Callatis was a Dorian colony, founded by Heraclea Pontica which, in turn, was founded by Megara. The set-up date is not known, with the only clues relating to its beginning, being archaeological ones. Archaeological excavations have shown an early habitation level, dating not earlier than the 4th century BC. The main element of underwater archeology research is the discovery of the configuration of the ancient port of Callatis (topographic determination). The port and a large part of the citadel of Callatis were above sea level in ancient times is demonstrated by the ruins discovered under water and the objects found. At a depth of about 20 meters, two anchors were found, one of lead and the other of iron. Also, a large number of Greek amphorae, some stamped, produced in Rhodes, Thasos, Lesbos, etc., have been found.

BOX 44. ***Gaps***

- *The UCH in the cross-border area of Bulgaria and Romania still remains insufficiently explored and there is no map of the points, types and periods of underwater archaeological finds;*
- *Lack of regulated zones for UCH sites exposure and monitoring, and information of the exact perimeter for underwater surveys, control over the zones explorations respectively, both in terms of maritime traffic, and in terms of protection of the underwater archaeological artefacts;*
- *Lack of information on identified zones for visiting UCH sites the exploitation of which will increase the tourist visits and pressure on the environment respectively.*
- *Insufficient knowledge of national legislation and the UNESCO Convention in the field.*
- *Inappropriate use of the underwater heritage of the Black Sea*
- *Lack of support and a low degree of awareness of local authorities for underwater heritage.*

✓ ***Policy strategies/legislation***

- UNESCO Convention on the protection of underwater cultural heritage, adopted on 2nd November 2001. The
- UNESCO Convention is the international treaty targeting the safeguarding of underwater cultural heritage.
- Law of the Sea (UNCLOS, 1982)
- Law no. 182/2000 regarding the protection of the movable national heritage
- Law no. 36 of 16th January 2002 on the statutory regime of inland maritime waters, of the territorial sea and of the contiguous area of Romania.
- Law no. 99/2007, on protecting underwater cultural heritage was adopted through the UNESCO Convention Law no. 99/2007.
- Cultural Heritage Act, promulgated in State Gazette No. 19/2009, last amended State Gazette No. 1/03.01.2019.

References

1) Cultural Heritage Act. Promulgated State Gazette No. 19/2009, last amended State Gazette No. 1/03.01.2019.
2) HERAS Project (*http://www.herasprojectcbc.eu/*)
3) United Nations Convention on the Law of the Sea (1982) Articles 149 & 303
4) UNESCO (2009-2014) Underwater Cultural Heritage, About the Convention on the Protection of the Underwater Cultural Heritage
5) *EASME/EMFF/2015/1.2/ "Western Black Sea Underwater Cultural Touristic Routes"* *http://wbsunderwatertours.eu/*
6) UNESCO, 2001. Convention on the Protection of the Underwater Cultural Heritage *http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/2001-convention*
7) Cultural Heritage Act, promulgated in SG No. бр.19/13.03.2009, amended SG No. 44/13.05.2020
8) *https://www.cua-sozopol.com/bg/index.php/proekti*

5.9. MILITARY TRAININGS

✓ *Existing Conditions*

As all spatial areas, the military exercise one is determined by specifical factors and conditions aiming security and safety environment: geographical location, hydro meteorological factors, availability of logistical resources, purpose and nature of the activity carried out, ship traffic, proximity of air corridors and intensity of air traffic, etc. The military zones for conducting exercises and/or operations, are differentiated by functional signs.

A number of pre-regulated additional activities can also be carried out in the military zones which are positioned in a wide range of drills, include conducting routine operations related to international commitments, ensuring safety of navigation, training, fire practice for others than the armed forces, whose nature of work requires the use of a weapon.

In the spirit of good practice, the areas for the preparation of military units operate in several main options. In the maritime space, it is distinction between the following types of zones:
• for conducting gunnery practice and missile launches on air, surface and shore targets; • for conducting torpedo launches, depth charges and other underwater blast work; • for the use of mine and mine countermeasure weapons; • for practicing evolutions as a single ship or as part of a formation; • for conducting exercises using submarines; • for conducting diving descents and carrying out underwater works; • for conducting exercises with amphibious and heterogeneous forces; • for practicing search and rescue operations at sea, including rescue operations for crews and passengers of ships and aircraft in distress in the Bulgarian maritime search and rescue region of responsibility.

In BULGARIA

Military zones, or training areas, are intended for training and conducting of military exercises and operations of military units from the Republic of Bulgaria, alone or jointly with military units from other countries. Exercises, preparations and real activities are carried out using weapons and ammunition and include activities endangering life and people's health.

There are special training areas for the preparation of divers from the Navy, located within the territorial sea when required, the navigation, shipping, and other underwater activities are prohibited in the areas. They have received their names of a geographical establishment, from the close proximity. The coordinates of the regions are proclaimed by Regulation No H-7 of 12.06.2008 for the performance of diving and other underwater activities. The boundaries of such areas, the restrictions on scuba diving, underwater activity and restrictions in the shipping regime are declared in due course by the Navy Hydrographic Office in *'Notices to Mariners'*, as per the regulatory documents in force.

The zones in question for conducting military exercises are situated in the littoral area. There are some nuances in the introduction of the concepts for the littoral zone and the meaning assigned to them to reflect the specifics of each particular zone of the maritime space in geographical, geopolitical and naval aspect. To the concept of '*littoral zone'*, Milan Vego assigns a meaning by using the terms 'narrow seas' or '*shallow waters'*, which include inland seas and large navigable rivers. This underscores the interrelation of the maritime space located near the shore and the coast adjacent to this maritime space. According to the increasingly predominant understanding in physic-geographical aspect, the depths are around 60 m. This is the coastal zone where conflict of various natures is generated, and also where 'asymmetrical threats' are formed.
The security environment for the maritime transport system is the space where the coastal state independently or as part of an alliance counters the adverse effects from the materialization of threats and hazards against the economic activities. The enclosed nature of the Black Sea also determines the peculiar character of the security environment. There is a real possibility for crisis resulting from environmental catastrophes, natural disasters, and major accidents sea, to be used by hostile states or transboundary, supranational groups to affect the security environment and to do harm to the interests of the coastal state.
Related to the geopolitical factors, there are the processes of delimitation of the maritime space and the application of the principles of Article 15 of the UNCLOS, which is yet another essential factor that gives specific features to the relations in the region of the Black Sea. The delineation of the borders of the maritime spaces has been done by virtue of signed agreements, which enabled the Black Sea countries to declare by legislation their exclusive economic zones in the maritime space – the USSR in 1984, the Republic of Romania and the Republic of Turkey in 1986, and Bulgaria in 1987.
Practically, the only indisputably established delimitation line of the EEZ is between the Republic of Bulgaria and the Republic of Turkey. In 1997, and Agreement was signed between the Republic of Bulgaria and the Republic of Turkey to determine the border in the area of the mouth of the Rezovo River and the division of the maritime space between the two. The borders of the continental shelf and the EEZ are unambiguously defined in Article 4 of the Agreement.
An important prerequisite to ensure the security of shipping is the clear determination of the jurisdiction over a given zone of the maritime space. The legal basis for planning and conducting naval exercises are derived from there. The coastal state in the sense of UNCLOS, having jurisdiction over the particular part of the maritime space, becomes entitled to restrict the right of navigation in strict compliance with the international legal norms.
In the process of safety management in the scheduled zones for conducting military exercises, the acquired information about the state of the safety and security environment undergoes transformation under the conditions of a controlling action adapted to the situation, so that each iteration cycle should lead to a desired end state at the system level.

In ROMANIA

✓ *Spatial Data*

According to the Law no. 17 of August 7, 1990 on the legal regime of inland maritime waters, territorial sea and contiguous area of Romania, there are established regulations for security and military aspects. There are also mentioned rules for the foreign vessels that enter Romanian territorial waters for different purposes. According to the Art.10 of the above mentioned law, the national and foreign vessels passing *in the territorial sea, in the internal maritime waters and in the ports of Romania, the access of any ship that has on board nuclear weapons, chemical or other weapons of mass destruction, or that transports such weapons or ammunition for them, as well as any other goods or products prohibited by Romanian law* (Art. 10). The most important polygons for military exercises are located in front of Sf. Gheorghe, Histria, Corbu and Constanta, in addition to military infrastructures from Tulcea, Sulina and Mangalia.

References

1) Law no. 414/2006 for the accession of the Romanian Government to the Convention on the International Hydrographic Organization, adopted in Monaco on May 3, 1967
2) Law no. 256/2018 on some measures necessary for the implementation of oil operations by the holders of oil agreements regarding offshore oil perimeters

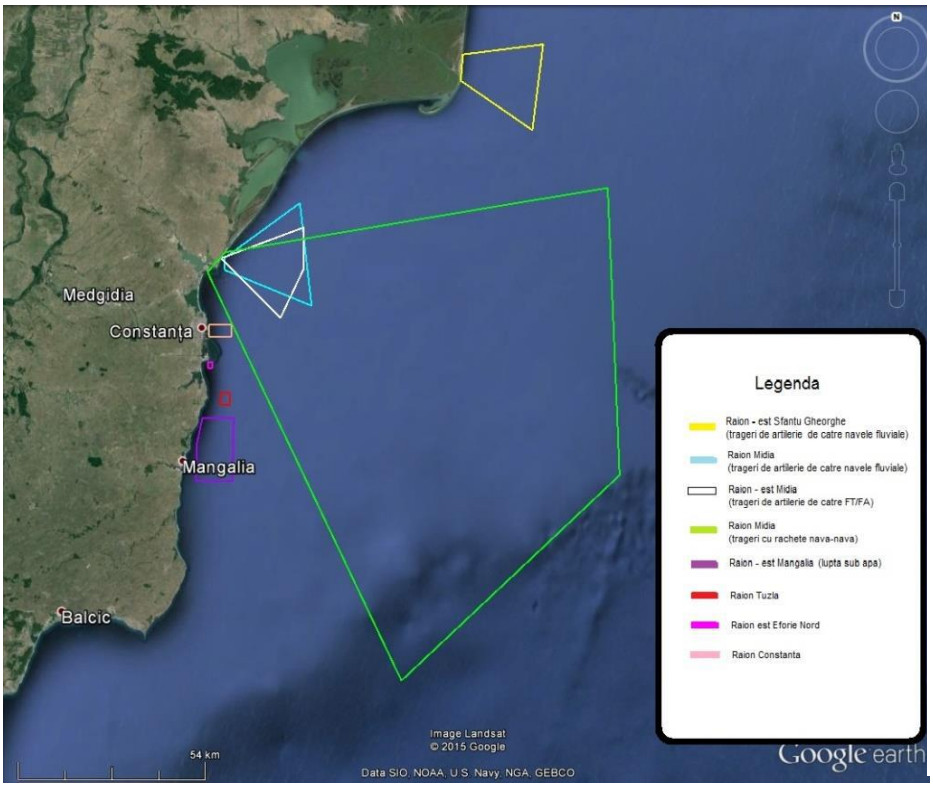


Figure 72. Zone for military exercises *(GEM)*

In the coastal zone there are some areas for military exercises, but in the marine area the entire surface of the territorial sea is the area of military practices, with specific rules referring to maritime and navigation activities, exploitation of resources, etc.

3) Decision no. 546/2004 regarding the approval of the Methodology for the delimitation of the public domain of the state in the coastal area
4) LAW no. 395 of October 10, 2004 - on maritime hydrographic activity, which aims to create the necessary conditions for the safe conduct of navigation, in order to protect ships, cargo, crew and passengers, their property and protection of goods
5) ORDER No. M 235 of December 27, 2018 - for the amendment of the Order of the Minister of National Defense no. M129 / 2016 regarding the establishment of the public data obtained from the maritime hydrographic activity that are made available to the users, of the hydrographic, cartographic and publishing activities that can be carried out against cost, as well as of the tariffs related to them

6. NATURAL AND ANTHROPOGENIC PRESSURES

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Natural and anthropogenic pressures are included in the study to identify and present the main vulnerabilities and risks marine space of the both countries. It can be noted that the marine environment of the Romanian Black Sea is subject to the risk of altered phenomena, due to multiple and diverse pressures on natural resources and ecosystem services. Threats to marine ecosystems may arise from the effects of climate change, commercial fishing, introduction of non-indigenous species, introduction of nutrients, organic matter and pollutants from Mikhailov point and diffuse sources, transport or accidental spills of hydrocarbons, introduction of marine litter and thermal or acoustic energy, etc. These anthropogenic pressures on the marine environment are clustered in three main themes: biological pressures (Descriptors 2 and 3), physical pressures (Descriptors 6 and 7) and substances, litter and energy (Descriptors 5, 8, 9, 10 and 11), as listed in Annex III to Directive 2008/56/EC.

6.1. NATURAL HAZARDS AND CLIMATE CHANGE IMPACTS

In both National Maritime Spatial and transboundary Plans, it is important to take into account the (potential) geological risks (such as landslides, coastal erosion, also cliff retreat in particular) on the shoreline and critical infrastructure along the coast (railways, roads, pipelines, etc.). The vulnerability and sensitivity maps to various natural hazards are necessary, to identify the location of the vulnerable zones, to the degree of hazards and the impacts of different events and the human response to extreme pressures. The information on the climate changes and their impact on the sea level, but not only, will add value to the efforts made in the recent years to reduce the costs of these impacts and of the management of disaster risks. Other identified risks and vulnerabilities will be mentioned.

6.1.1. Main natural hazards (*as landslides, coastal erosion, cliff retreat*)

In BULGARIA

Landslide activity is typical for the Bulgarian coast and especially for its northern part. Landslides are strongly influenced by anthropogenic activity - excessive construction, which changes the load in potentially dangerous areas, unfinished and inefficient sewerage network, frequent heavy rainfall, sea abrasion, unfinishedcoastal protection facilities. From a geoengineering point of view, the most affected by landslides, abrasion and erosion processes along the Black Sea coast are all cliff sections in the sub-regions within the scope of Dobrudzhansko - Frangenski, Dolnokamchiiski and Staroplaninski regions. Depending on the specific conditions of a given coastal section, including the underwater coastal slope, these coastal destruction processes are more intense and destructive at Cape Kaliakra, Cape Galata, the sections between Kavarna and Balchik, between Kranevo and Golden Sands resort.
The landslides were registered and monitored by the state company Geozashtita Varna[75]. The Annual reports describe preventive activities related to registration and monitoring of landslide areas and areas with abrasion processes along the Black Sea coast:

- Cape Sivriburn – Cape Shabla - in addition to abrasion processes, there is a greater risk of flooding, due to the formation of large floodplains;
- Cape Shabla – Cape Kaliakra - landslides are activated by frequent and sometimes strong earthquakes with nearby epicenters around Cape Kaliakra. Significant step-like landslides are Yailata and Taukliman.
- Cape Kaliakra - Cape Galata - typical for the region is the active abrasion, which destroys the front parts of the landslides, forming a landslide zone with a width of 500 to 4000 m.

Further on the southern coast are some of the most extensive and active landslides, among which are the landslide around Cape Lahna, near Sarafovo, up to 150 m wide, and in the Rezovska river estuary a large number of landslides, small in size and relatively shallow.

According to the latest data of Geozashtita Varna, by 2020 the district of Varna stands out at the district level with over 37 thousand acres of land occupied by landslides. Next is the other northern district - Dobrich with about 17 thousand acres, and the Burgas district with the smallest area of landslides - about 1300 acres. Of the municipalities, the municipality of Varna stands out, with nearly 33,000 acres with developed landslide processes. The necessary actions with regard to landslides are taken depending on the category in which they fall - for urgent strengthening; for preventive activities; for conducting instrumental monitoring or in the group of landslides, subject to periodic inspections.

Data: While for the landslides in the country there is a relatively good register and regular monitoring, for the monitoring of marine abrasion the data are scarce and irregular. It is necessary to resume the monitoring of the erosion-abrasion processes along the Black Sea coast.

[75] http://gz-varna.mrrb.government.bg/landslide/

Conclusions: Landslide activity and sea abrasion are particularly developed along the northern Bulgarian Black Sea coast, causing significant damage to the economy. Recommended measures in the crossborder cooperation in the field of landslide, abrasion and erosion protection could be experience and knowledge exchange.

In ROMANIA

➢ Coastal erosion, cliff retreat

From geomorphological point of view, the Romanian littoral includes two major units: the northern unit which comprises the deltaic coast (from the Chilia Branch to the Cape Midia) and the southern one (extending from Cape Midia to Vama Veche, the border with Bulgaria). Both units are subject to erosion processes under the conditions of coastal dynamics changing.

BOX 45. The northern unit (the deltaic coast of the Danube) is most affected by erosion	**The southern unit** is characterized by the presence and the evolution of the cliffs
The sediment transport load of the Danube River has become less than one half in recent several decades owing to human activities, particularly hydro-technical works, in her mainstream and tributaries (Bondar and Panin, 2000), and strongly contribute, along with the natural factors, to the beaches loss.	It results from the interaction between the geological and tectonic-structural factors (specific for Central and Southern Dobrogea) with other environmental factors controlling the development of the coastal processes. The relatively high cliffs formed by waves and currents during a slow sea level rise are very well developed between Cape Singol and Vama Veche. There are areas with active retreating cliffs, but also some areas where the cliff is protected by littoral sand bars (sandy littoral accumulations at the cliff base).

The **natural stressors which strongly contribute to erosion** processes on the Romanian littoral are:

BOX 46. Climatological
• wind regime, with its overall impact on the wave and current regimes; • fluctuations in the Danube's flow (with respect to natural conditions); • variations in air temperature (evaporation, freezing phenomena – with related changes in the dynamics of coastal sediments); • precipitation regime - strictly on the coastal zone – with impacts of beach sediments • mobilized and transported offshore (episodic events); • variations in sea water salinity (influenced by the Danube freshwater pulses – with impacts on currents).
✓ **Geological, geomorphological, structural and sedimentological**
• general aspect/grain size composition of the coast (lowlying delta / lagoon sandy beaches – with beaches fed by Danube alluvia redistributed by waves and longshore drift and cliffs with small pocket beaches – separated by small littoral sand bars); • stratigraphy of the cliffs with impacts on cliff stability; • general orientation of the coast (generally N-S – when the main storm winds and related waves are from NE – having thus the strongest impact of the mobilization and transport of coastal sediments during storms); • structural aspects – subsidence of all the Dobrogean tectonic units (from various sources – 1,5 – 2,5 mm) – adding to the sea level rise; hydrographic specificity - lack of other rivers except for the Danube River
In the Northern Unit, the estimated eroded area was ~ 3-5 km^2 (~ 117 km from the shoreline, including the Sacalin sector), and the accumulated area 1-2 km^2) (~ 30 km from the shore) is represented in the Figure 73.

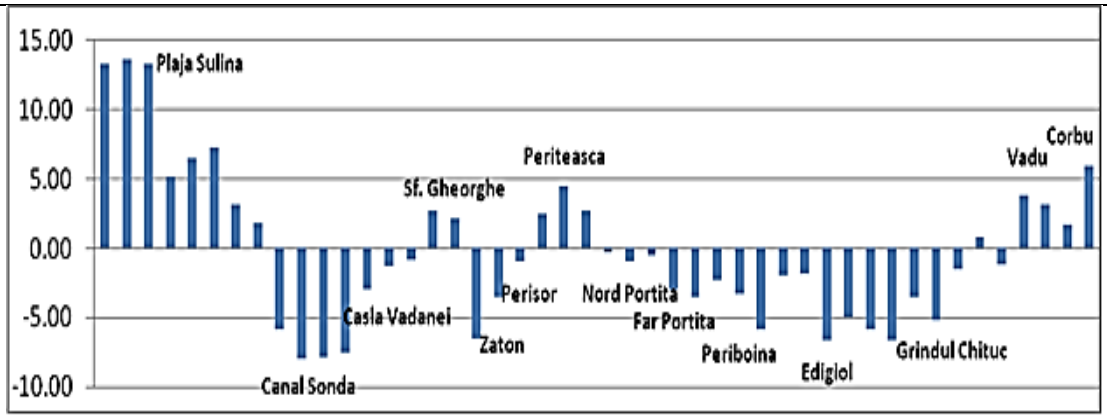


Figure 73. Erosion/Accumulation Rate, 2011-2017 *(GEM)*

➢ Earthquake

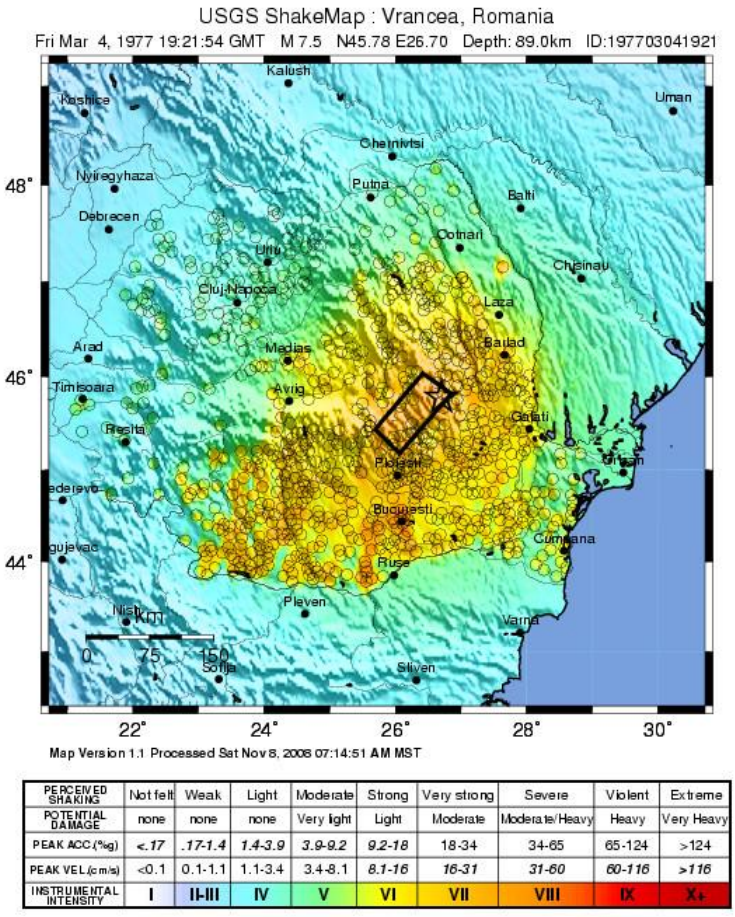


Figure 74. The main seismic zone in Romania with impact on the coast and sea.

According to the data provided by National Institute for Earth Physics (Romania), there were 19 earthquaques with magnitude more than 1 ml in the western Black Sea, during 2018-2019. Generally, the earthquaques produced in the western Black Sea are of relatively low magnitude, the strongest ones (magnitude of 4.2 ml) being recorded both in the Bulgarian (in March 2018) and Romanian waters (in December 2019), Table 17.

As regarding the Southern Unit, in 2015, in the Mamaia, Constanța and Eforie Nord areas, there were carried out works for **coastal protection and beaches rehabilitation** (sanding): rehabilitation of wave-breaking structures; construction of a main dam connected to the shore (to retain sand); dams spurs (~ 3-4 m high) as a conservation measure, which retain sand on the beach with the aim of increasing stability. Based on geomorphological measurements (25 sections,) performed by NIMRD "Grigore Antipa" before and after sanding, the average width of the beach was 86.4 m in Mamaia Sud, 117.7 m in Tomis Nord, 105 m Tomis Center, 108.5 in Tomis Sud and 122.4 m in Eforie Nord. During the period 2016-2017, the variations of the beach width, determined by the comparison of the measurements, were of +/- 5-10 m.

➢ ***Seism's Risks*** Figure 74, Table 17. From the centralized information in the seismic prospecting activities and the exploration-exploitation activities of the natural resources in the Black Sea Romanian coast.

Table 17. Classification of seismic studies according to the level of the sound source, 2014

Magnitude	Source Level (pressure zero-to-peak)
Very low	209 – 233 dB re 1 µPa·m
Low	234 – 243 dB re 1 µPa·m
Medium	244 – 253 dB re 1 µPa·m
High	> 253 dB re 1 µPa·m

References

1) ESNET - Black See Earthquake Safety Network *http://esnet.infp.ro/seismicitate/*
2) Live Earthquakes Map. https://earthquake.usgs.gov/earthquakes/map/?extent=22.47195,-130.16602&extent=51.45401,-59.85352

6.1.2. Climate changes (*Impact on natural systems, marine and coastal areas)*

✓ *Existing Conditions*

In BULGARIA. Climate change is a challenge for the whole Black Sea region. According to the available data of the National Institute of Meteorology and Hydrology (NIMH), Varna branch[76] for the period 1991-2011 for Varna station, the summers and winters are becoming warmer and the autumns – cooler as comparing with the data from the previous years. At a climatic norm of 12°C, 14 of the last 20 years have had a higher average annual temperature. The presented climate scenarios for Bulgaria in the National Report on the State and Protection of the Environment in the Republic of Bulgaria 2019[77], developed by NIMH-BAS within the CECILIA project, envisage the regional climate for the future for two intervals - "near future" (2021-2050) and "distant future" (2071-2100), compared to the reference climate period 1961-1990. Regarding the air temperature for the coastal and marine areas, positive trends are expected, i.e., a relatively uniform increase in the average annual temperature of about 1.5°C-2°C for the near future and between 2.5°C and 3.5°C for the distant future. Part of the marine area, located east of Cape Emine and ending south to the border with Turkey is expected to show higher increase in temperature - between 2.0°C - 2.5°C (3.5°C - 4.0°C for a small central zone) for the near future and between 3.5°C - 4.0°C for the distant future.

A negative trend is expected in terms of the annual amount of precipitation for the coastal water area, as in both periods the change is on average between 5 and 10 mm (in some areas against the Stara Planina coast - up to 15-20 mm). Further east in the water area, the annual amount of precipitation is expected to be close to the average for the reference period, and further east, an increase in precipitation is assumed. At the same time, the most significant increase in precipitation is expected in the waters east of Cape Maslen Nos till the border with Turkey.

The performed climate modeling in the River Basin Management Plan in the Black Sea region (2016-2021) found increased vulnerability of the Black Sea coast from drought, extreme temperatures, heat waves and floods. As a result of climate change, heavy rainfall is expected to increase, causing sudden floods and damage amid global warming and drought. According to the forecasted trends for the change of the outflow by seasons

[76] *http://varna.meteo.bg/meteofacts.html*
[77] *http://varna.meteo.bg/meteofacts.html*

for the period 2071-2100, the following areas are expected to be exposed to the strongest potential impact:
Black Sea Dobrudzha rivers and Kamchia river - North of Stara Planina, for the Black Sea Dobrudzha rivers, Provadiyska and Kamchia rivers, the forecast for runoff change is that spring runoff will decrease to -19%, summer runoff to -38%, autumn runoff to -9%, and winter runoff to - 17%.
Similar situation is found for the *North Burgas rivers*, outside the study areas. The spring and summer outflows decrease significantly (by forecast). The autumn outflow is expected to increase to 9%; the winter: 48%.

Data: Climate data are collected daily only from coastal stations. There are no regular data on the course of the climatic elements in the sea area and there are no monitoring stations. The available data are sporadic, the collected information inaccessible.

Conclusions: In recent years, the climatic norm for the average annual air temperature has been exceeded. Summers and winters are getting warmer, autumns are cooler, and the amount of precipitation has increased. There is an increased vulnerability to drought, extreme temperatures, heat waves, heavy rainfall and floods. Within the framework of the crossborder maritime spatial planning the most critical zones should be identified and joint pressures planned in order to reduce the climate change impacts and damages.

In ROMANIA

➢ Air temperature

BOX 47.
The proximity of the Black Sea impresses **the coastal climate**, the variation of temperatures is relatively small from day to night and from one season to another, compared to the rest of the country, due to the ability of sea water to store heat and release it gradually during winter. It also has a weighting role on the thermal maximums (during summer).
The winter is mild. The coldest month of winter is January, with an average of -0.3 degrees, and the warmest December, with 2.6 degrees. The lowest temperature recorded in winter was -25 degrees (on February 10, 1929), when the sea froze over a distance of 5 KM. Other severe winters were in 1954, 1963, 1985 or 2006. Thermal maximums are rarely negative in winter. Once every 10 years the sea water freezes (last in 2010). Snow is rare, but occurs in the form of violent blizzards, with very high wind speeds and large amounts of snow (2008).
Summers on the Romanian coast are moderately thermal; almost the daily circulation in the lower layers of the troposphere is from the east. The sea breeze weighs the maximum compared to the mainland of Dobrogea. Extremely rare are temperatures over 35 degrees, up to 38.0 degrees, very rare (in 2007). On the shore, the temperatures are a few degrees lower compared to the coastal urban area. So, as temperatures can exceed 40 degrees in the west of the cities (e.g., Constanta - unofficial data).
As comparing to the increase of the global annual (average) temperature of 0.6°C for the period 1901-2009, in Romania there was registered an increase of only 0.3°C. During 1901-2006 the increase was 0.5°C, compared to 0.74°C globally registered (1906-2009). Thus, in the Dobrogea area, the heating was more pronounced, reaching up to 0.8°. In the same context, similar to the situation registered at global and national level, in the Dobrogea area there were changes in the regime of extreme events: – increasing the annual frequency of tropical days (daily maximum> 30°C) and decreasing in the annual frequency of winter days (daily maximum <0°C); – significant increasing of the minimum summer (average) temperature and of the maximum (average) temperature of winter and summer. Dobrogea was up to 2°C during summer.

➢ Sea state

The exchange of kinetic energy between the marine environment and the atmosphere determines the formation of waves. The motion provided by the wind tangential tension at the sea surface turns into undulating motion at the surface of the water.

The geographical and bathymetric characteristics of the Romanian coast make possible the amplification of the sea state degree through the waves produced by the wind, acting from a sector of about 180°, between N and S, on the right side of the meridian, depending on the duration and intensity (Figure 75).

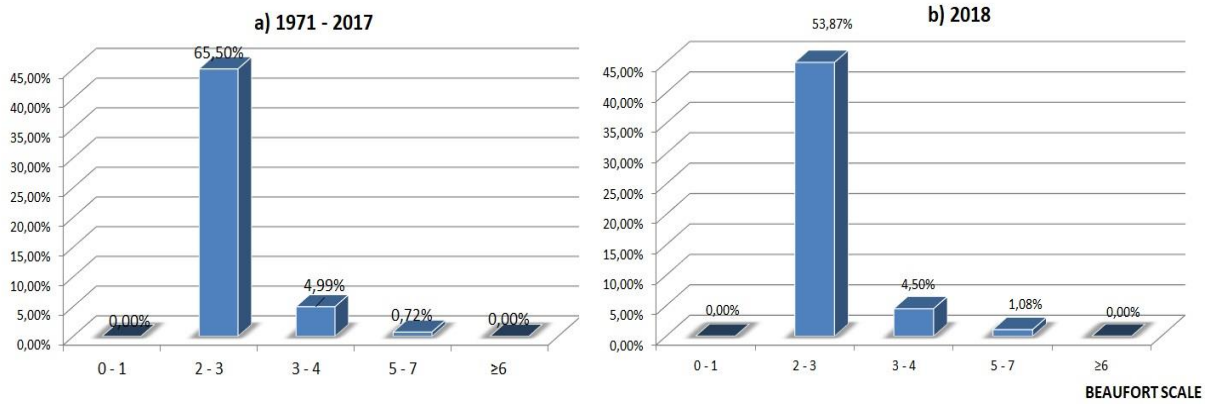


Figure 75. Sea state a) reference period (1971 - 2017) and b) 2018 (on the Beaufort scale).

Table 18. The characteristics of the waves in Constanța, during January - December 2018

Month	1	2	3	4	5	6	7	8	9	10	11	12
H_{max} (m)	2.60	3.8	3	1	1.4	1.3	0.8	1.0	1.0	1.0	3.0	1.8
H_{min} (m)	0.10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
H_{med} (m)	0.83	1.12	0.73	0.41	0.66	0.57	0.24	0.57	0.44	0.37	0.93	0.57
T_{max} (s)	7.10	8.2	7.40	5.20	6.70	7.50	3.80	3.90	4.90	5.90	8.10	7.90
T_{min} (s)	2.70	2.60	2.70	2.70	2.70	3.00	2.50	2.40	2.50	2.20	3.20	3.10
T_{med} (s)	4.61	4.79	4.59	3.70	3.68	3.94	3.11	3.47	3.50	3.64	4.16	4.58
0 – 0.1 m (%)	17.20	14.94	20.43	19.35	18.28	17.20	49.46	17.20	21.51	39.78	2.15	22.58
Wind wave (%)	31.18	36.78	26.88	31.18	46.24	35.48	12.90	51.61	40.86	31.18	54.84	15.05
Swell (%)	17.20	17.24	23.66	9.68	4.30	11.83	6.45	2.15	2.15	3.23	10.75	19.35
No Data (%)	34.41	31.03	29.03	39.78	31.18	35.48	31.18	29.03	35.48	25.81	32.26	43.01

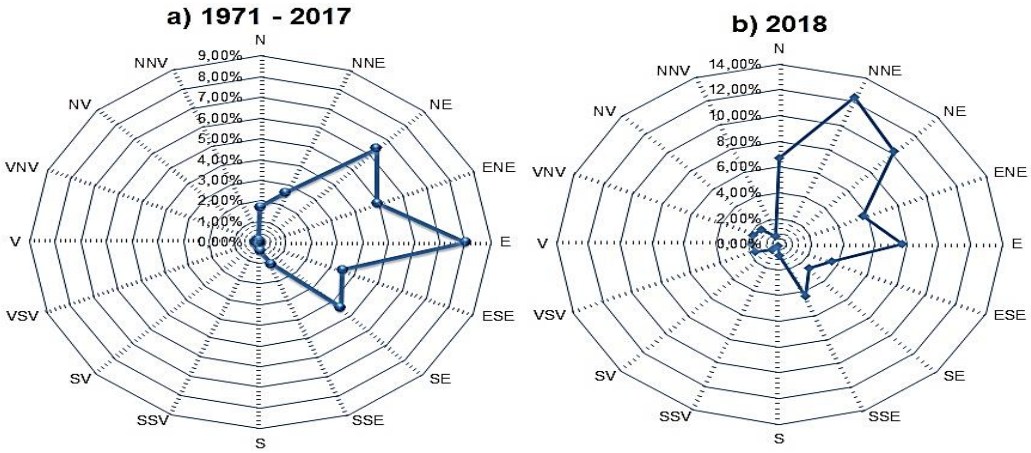


Figure 76. Wave direction at Constanța, reference: a) 1971-2017 and b) 2018 *(NIMRD)*

The results of the measurements from 2018 (N = 1107 observations), performed on daily basis at three terms were analyzed with respect to data from the reference period (1971-2017): carried out observation, in Constanta (Genovez Lighthouse, 44º10'19" N; 28º39'52" E).

In 2018, the sea state can be characterized as weak in July (calm of maximum 49.46% / 31 days). The wind waves showed a minimum of 12.9% in summer and the maximum of 54.84% in the winter season (Table 18). The maximum degree of sea state (measured on the Beaufort scale) was 5 - 7 (maximum wave height of 3.8 m) (Figure 103, Table 18). This maximum was determined on 26.02.2018, when the maximum wind speed was 13.6 m/s from the NE direction. The wave distribution based on their propagation directions is determined by the distribution of the prevailing winds and general orientation of the shore, respectively. Thus, in 2018, 61.19% of wind waves propagate from N, NNE and NE, while, due to stronger refraction at long wavelengths, 48.8% of surges propagates predominantly from E and 27% from SEE (Fig.76).

- **Storms**

Wave and current data collected from the Mangalia Coastal Gauge (NIRD GeoEcoMar) showed 25 storm events (Table 19), with maximum wind speed more than 5 m/s, during the period 2018 – 2019. However, those events can be classified as regular storms (the wind speed is much lower than 20 m/s corresponding to extreme events). The maximum wave height are below 5 m, confirms the absence of extreme events in south littoral (2018 – 2019).

Table 19. Directions and intensities of wind, currents and waves in 2018 (Mangalia)

Year	Date	Max. Wave height, m	Average wave period (s)	Max. Current speed, cm/s	Current direction	Max. Wind speed, m/s	Wind direction
2019	04.01	3,7	6	N/A	N/A	12,27	N
2019	10.01	3,4	6	N/A	N/A	2,64	SW
2019	15.02	3,1	6	N/A	N/A	9,03	N-NE
2019	22-23.02	4,4	6,5	N/A	N/A	14,72	N
2019	12.03	3,4	5,5	N/A	N/A	14,18	N-NE
2019	10.09	3	5,5	16,03	112,25	5,27	N-NE
2019	25.09	3	5,5	9,97	106,12	6,93	E
2019	31.10-1.11	3,4	5,3	17,25	99,78	17,85	N
2019	21-22.11	4,1	6,3	15,70	101,40	16,75	N-NE
2019	25-26.11	3,6	5,8	8,59	99,52	17,03	N
2019	13.12	3,5	5,5	8,04	93,50	12,87	N
2019	23.12	3,4	5,4	14,73	288	5,27	NV-N
2019	30.12	4,1	6,4	12,79	95,89	23,28	NV-N

The frequency of waves (the degree of the sea agitation) is higher than 1m. During winter it could reach 3.8 m (5 - 7 degree on the Beaufort scale), the quasi-homogeneous upper layer (SSQ), the seasonal thermocline and the cold intermediate layer (SIR). In the warm season SIR reaches depths greater than 25m and in autumn, depths greater than 40m. During the spring-summer no upwelling phenomena were registered in the coastal area.

6.1.3. Other identified risks and vulnerabilities

In BULGARIA

BOX 48. Risk *of* ***sea floods***
There are two sources of sea floods - rising static water levels due to non-wave factors and

- rising sea levels due to storm surges. Tsunami type waves have not been registered in the last 100 years on the Bulgarian coast. Non-wave factors include a threat in:

- ✓ the mouths of rivers flowing into the sea - Batovska, Panairdere, Dvoinitsa, Hadjidere, Aheloy, Dyavolska, Karaagach, Lisovo dere;
- ✓ lakes located in direct hydraulic connection to the sea - Varna and Burgas lakes;
- ✓ lakes without direct hydraulic connection to the sea - Durankulashko, Shablensko in the range of the cross border area, and the Atanasovsko and Pomoriisko lakes in the southern part of the Black sea coast.

11 *Significant potential risk* of sea floods (Black Sea Basin Directorate) approx. 267 km[78]

- ✓ Black Sea - Durankulak (code BG2_APSFR_BS_01) with a length of 14 km, low risk, Durankulak area;
- ✓ Black Sea - Shabla (code BG2_APSFR_BS_02) with a length of 15 km, low risk, Shabla area;

High and medium risk locations

- ✓ Black Sea - Balchik (code BG2_APSFR_BS_03) with a length of 31 km, medium risk, Albena resort, Kranevo, Karvuna resort;
- ✓ Black Sea - Varna (code BG2_APSFR_BS_04) with a length of 36 km, high degree of risk, Varna area, Kazashko, Ezerovo, Strashimirovo;
- ✓ Black Sea - Obzor (code BG2_APSFR_BS_05) with a length of 18 km, medium risk, Obzor area

6 more areas with a significant potential risk of sea flood, further down to the Turkish border.

In case of high probability floods (with a recurrence of 20 years) and in case of medium and low probability floods (with recurrences of 100 years and 1000 years) the most extensive are the flooded territories in Burgas and Varna districts. The most vulnerable are the city of Varna and the resort Sunny Beach, where floodplains reaching 10% of total territory in all three flood scenarios.

The most affected in the different flood scenarios would be the critical infrastructure of Burgas district. Also, the most affected will be the district of Burgas and by the number of affected residents of the coastal settlements during floods, the municipalities of Nessebar and Burgas have the highest share.

Technogenic type of coast

Economic activity and the need to protect against adverse geodynamic processes such as landslides, sea abrasion, erosion and floods have led to the construction of port infrastructure, wave protection walls and dams along the coastline. This kind of concreting of the coastline covers currently 16.2% (or 70 km) of the Bulgarian coast and turned the coast into a technogenic type. Extremely high degree of man-caused technogenic load has been established in the area between the town of Balchik and Cape Galata.

Data: The available data and observations made by the Black Sea Basin Directorate (BSBD) are sufficient to determine the risk areas in terms of flood risk and the need for adequate measures.

Conclusions: On the Bulgarian Black Sea coast there are 11 identified areas with significant potential risk of sea floods with a length of about 267 km. The Burgas region would potentially be most affected and this was among the reasons for establishing a GIS Flood monitoring system. The technogenic type of coast occupies about 16% of the Bulgarian sea coast. In order to reduce the risk, additional measures and environmentally friendly type facilities are recommended to be implemented.

In ROMANIA

BOX 49. *Risk of sea floods*

The hydrographic network monitored by the Dobrogea-Littoral Administration (Romanian Waters) includes 16 permanent watercourses. The total length of the permanent watercourses on the entire territory is 542 km. The distribution on river basins is as follows: 71% belong to the Coastal basin and 29% to the Danube basin, (90% of the total length of watercourses belongs to North Dobrogea, 10% to South Dobrogea).

The most important watercourses of Dobrogea are: Casimcea (S = 740 km2, L = 69 km), Taița (S = 591 km2,

[78] Flood Risk Management Plan of the Black Sea region (2016-2021)

L = 57 km), Slava (S = 356 km2, L = 38 km), Telita (S = 287 km2, L = 48 km) and Hamangia (S = 224 km2, L = 33 km), all belonging to Northern Dobrogea. The hydrographic network of the Danube Delta includes: the main arms through which The Danube crosses the Delta and flows into the Black Sea (Chilia, Tulcea, Sulina and Sfântu Gheorghe).

The total surface water resources at the level of the Danube River (Chiciu-Isaccea sector), Danube Delta and Dobrogea Hydrographic Area amount to approx. 404,136.4 million/year; 129 approx. 51,380.8 million m3/year were usable resources. In the Dobrogea Hydrographic Space, the underground resources are estimated at 2,090,818 million m3, of which 372.27 million m^3 come from groundwater sources and 1,718,548 million m^3 from deep sources. The hydrographic space has a complex system of hydrotechnical works having quantitative management role of water resources; containing several derivations for the transit of water volumes from one river to another. There were reported a number of 57 works of defense and consolidation of banks (approx. 54 km) and a number of 18 points in which regularization works were carried out, amounting to approx. 170 km.

The most important works were: •Regularization and damming v. Taiţa –25.5 km; • v. Teliţa –34.8 km; • p. Ciucurova -22 km; • p. Slava –35.0 km; • p. Hamangia – 19.0 km. years. They are largely clogged and are made behind some earth dams with heights between 4 -12 m (the average height of these dams is 7.5 m). has in operation a number of 57 dams of category C and D

✓ ***Technogenic type of coast***

Changes in the flow of water and sediments of the Danube can have catastrophic consequences for the Northern Unit, especially between Sulina and Sf. Gheorghe, and along the coastal cordon system that protects the Razim-Sinoe lagoon complex. Throughout the southern unit, the beaches are already depleted of sediment and have been segmented by a series of protection structures. The structures in the backshore area will be subject to increasing pressure in the event of a sea level rise scenario. In order to maintain current level of protection, additional work provided by the Romanian Water Administration is very useful, because the shore can remain in a more consolidated position.

The Danube-Black Sea Canal has 36 years since it was built. The third largest channel in the world, 95.6 km, after Suez and Panama, the Danube-Black Sea Canal has a depth of 7 m, and 70 meters wide, while at the surface the width is 90-120 meters. The maximum annual transport capacity of the main canal is 80-100 million tons. The traffic on the canal reached till 31 million tons, at only a third of the maximum capacity. Concluding, the channel has influence on the sea due to the freshening and also to the navigation impact (Figure 77).

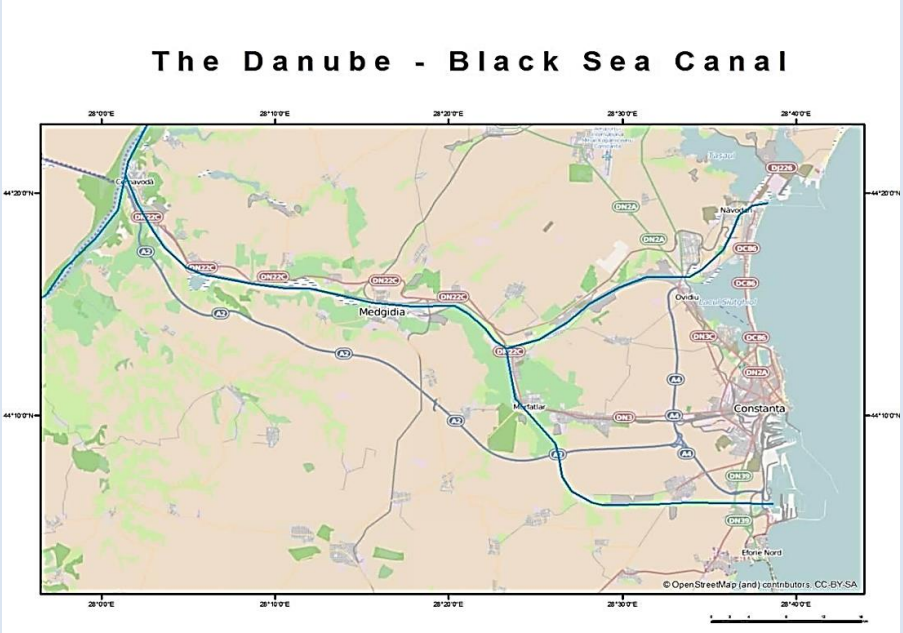


Figure 77

Due to erosive process intensification, the execution of certain protection measures was required at very short deadlines and a necessary fundamental research according to the necessities and the existent concrete situations in the areas was almost started. The temporal behavior and morphological effects over the nearest/adjacent zones agreed with to the forecasts in different proportions, and the acquired results after detailed research for the quantification of induced geomorphologic modifications entailed some corrections for optimization. Thus, in the last 20 years, more Masterplans of coastal protection were extended (in 2005 and 2011, by JICA - Japan International Cooperation Agency) through the ECOH Company and, respectively, EU structural funds through Halcrow Romania. At present stage, for several sectors including Mamaia, Tomis and Eforie North, some of works for protection and rehabilitation are finalized, but there are still some ongoing in the southern part of littoral.

6.2. ANTROPOGENIC PRESSURES

According to MSFD Descriptors D (5), D (2), D (5), D (8), D (9)

The identified anthropogenic pressures are briefly presented, underlining their importance for marine spatial analyses. The pressures described below refer to *Pollution, Eutrophication, Overfishing, Invasive species, Seabed integrity,* and *Hydrological changes.*

This section is expected to have a significant contribution to the cross-border context of maritime spatial planning in the future negotiations and consultations with the Black Sea countries.

✓ ***Existing Conditions***

In BULGARIA

6.2.1. Eutrophication

Eutrophication caused by anthropogenic factors has particularly adverse effects on the Black Sea ecosystems, leading to harmful algal blooms and lack of oxygen in the marine waters, as well as loss of biodiversity and ecosystem degradation. Depending on the degree of eutrophication, the Black Sea ecosystem goes through three periods - a reference "clean" period (the 1960s), a period of intensive anthropogenic eutrophication (1970s to 1990) and a modern period (from 1990), characterized by declining levels of eutrophication.

During the period 1970-1990, the influx of nitrogen and phosphorus compounds from industry and agriculture increased, leading to intensive anthropogenic eutrophication and intense phytoplankton blooms. The biomass resulted due flowering cannot be completely degraded under aerobic conditions due to the depletion of oxygen, resulting from its oxidation. Oxygen deficiency (hypoxia) occurs in bottom ecosystems, leading to mass death of benthic organisms. The decomposition of the accumulated excess biomass continues as anaerobic processes, whereby the importance of the bacterial food chain increases. Flowering of autotrophic dinoflagellates increased from 15% in the 1970s to 60% in the 1980s. They w accompanied by mass flowering of *Noctiluca scintillans* and high biomass of *Aurelia aurita*.

After 2000, a relatively low ratio Bacteriophyceae/Dinophyceaea is observed, for the whole period. In contrast to the period of intensive eutrophication, the phytoplankton community is strongly dominated by the coccolithophoride *Emiliania huxleyi* (Prymnesiophyceae), which is more pronounced in the open sea (up to 90% of the total number), as well as representatives of “alternative” taxonomic groups: microflagellates, euglenoids. and blue-green (MEC%).

According to BSBD data for 17 water bodies observed in the period 2010-2017, most of the biological quality elements (EQR) for phytoplankton are in a moderate state in terms of the status of the corresponding indicator. The water bodies in Varna and Bourgas bays are in “bad” condition of biological elements for quality EQR phytoplankton, due to the vicinity of the significant sources of

pressure from the land (large cities, industry and agriculture).

Data: The state of the sea waters is monitored annually by the Black Sea Basin Directorate, but the current data is difficult to access.

Conclusions: Nutrients and organic matter inflow influence eutrophication which causes significant damage to both Black Sea flora and fauna.

In ROMANIA

The main anthropogenic pressures identified in the Romanian coastal area result from the development of different economic activities both on land (agriculture and food industry, petrochemical industry, tourism and recreation; constructions; expansion and modernization of existing tourist ports; port activities) and sea (fishing and aquaculture; maritime transport, tourism, mineral resources extraction, dredging, etc.) (Boicenco et al., 2012). The eutrophication sources are: the Danube River, agricultural runoff (as diffuse sources), waste water treatment plant, harbor aquatories, industrial sites (as point sources).

BOX 50.

➢ Nutrients enrichment - transitional, coastal, marine waters up to 100 m bottom depth

Although the effects of nutrients enrichment in the Romanian Black Sea waters have decreased compared to the years of enhanced eutrophication, the analysis of the pressures from sources identified for 2012-2017 the risk of not achieving the good ecological status for descriptor 5 - Eutrophication. Subsequently, the assessment of parameters, indicators and criteria that represent, causes, directly and indirectly effects of nutrient enrichment showed that there is no good ecological status in any of the water bodies - variable salinity, coastal, and marine. Although an improvement in the water quality was observed for some parameters, in the Romanian Black Sea waters the nutrient concentrations are still high and can have adverse effects especially during the warm season. The coupled effect of climate change and anthropic impact from point and diffuse sources may have an impact on nutrients input, thus on eutrophication due to the changes in the hydrological rivers regime, water masses stratification and the regime of winds and currents by intensifying such eutrophication. Therefore, it is very important to reduce nutrient concentrations by approximately 34% (P, in northern area), 13% (P, in southern area), 86% (N, in northern area) and 62% (N, in southern area) for reducing the eutrophication level.

Gaps: Lack of harmonization between Water Framework Directive and Marine Strategy Framework Directive approach. Additionally, for eutrophication assessment the other EU Directives, such as – Nitrates, UWWT, Air Quality should be also considered. Lack of data for offshore waters (bottom depths more than 100m)

➢ Waste water treatment plants. Hot Spot identification

Waste water treatment plants (WWTPs) – there are 5 WWTPS (four of them discharge directly into the sea) Rompetrol Refinery, Constanta Nord, Constanta Sud, Eforie Sud and Mangalia. In the period 2012-2017, a total of 383,303.37 thousands m^3 of wastewater were discharged without identifying an evolution trend. Annually, between 61,377.50 thousands m^3 (2015) and 68,478.26 thousand m^3 (2012) were discharged. Out of these, a variable percentage between 8% (2015) and 57% (2012) of the discharged water is insufficiently treated. In 2017, 51.4% of the total wastewater discharged into the Black Sea was insufficiently treated.

For the WWTPs Mangalia and Constanta Sud (located in the Constanta Port aquatorium), total nitrogen and phosphorus concentrations exceeded regularly the maximum allowed concentrations (NTPA 001/2002). However, the data for the period 2012-2017 showed a decreasing tendency for TN and TP concentrations in the waste water discharged for all WWTPs

The impact of the WWTPs on the coastal water quality was analyzed using the 2012-2017 data collected from the neighbouring areas where the WTTPs discharge.

➢ Industrial pollution source

The main hot spot reported by Romania is the Constanta Port. Through the port sewage system, the wastewater resulting from various port activities is pumped to WWTP Constanța Sud, while bilge water and hydrocarbon residues are treated in the mechanical and biological treatment plant located in berth 79 (814,000m^3/year capacity). Data coming from the port treatment plant show a content decrease of solid suspension, total nitrogen and phosphorus after 2010; but during 2012-2017 no evolution trend was identified.

➢ Deoxygenation

Current data on bottom dissolved oxygen do not show anoxic and/or hypoxic events; the last major hypoxic event in the Romanian coastal waters was observed in summer of 2010. In present macroalgae are more developed and is well known that micro-and macroalgae are in equilibrium, using the same source of food. This phenomenon is met in the marine shallow waters and in coastal lakes.

➢ Algal blooms

In Romania, the highest algal blooms happened thirty years ago, when the agriculture and huge industry and discharges were high, under communism times. During last two years the density of algae were at the level of dozens of $\cdot 10^6$ cells/L.

Algal blooms **-** in 2017, there were observed three microalgae species showing densities more than 1,000,000 cells/L, as comparing to 2016, when 6 species registered densities corresponding to algal blooms. It can be remarked the considerable development of the diatom species *Skeletonema costatum* that showed a maximal density of $13.6 \bullet 10^6$ cells/L in the shallow coastal waters, in Mamaia Bay, in March 2017. This phenomenon is characteristic for the late winter period. The following algal blooms were weaker. The first one was observed in July, when the dominant species was *Emiliania huxleyi* (maximal density of de $1.06 \bullet 10^6$ cells/L, in the Portita bay), while the second one was produced by cyanobacteria *Planktolyngbya circumcreta* (maximal density of $2.2 \bullet 10^6$ cells/L, also in the Portita Bay), in November 2017

➢ The Danube River

It is the most important diffuse sources, collecting large quantities of organic matter and nutrients from its catchment area. During the period 2012-2017, the average intake of organic matter measured in the Reni station (expressed as BDO5) ranged from 292.7 kt/year (2017) to 445.7 kt /year (2013). There is observed a decreasing trend in 2012-2017. **From 2012 to 2017**, an average total nitrogen (TN) input was measured in Reni station (on the Kilia branch) varying from 258.0 kt/year in a very dry year (2012) and 695.1 kt/year in 2010, year with historical maximum flow of the analyzed period. The lowest average annual concentration was measured in 2017. Among the inorganic forms, there is a significant decrease only in the case of ammoniacal nitrogen. Total phosphorus inputs measured also in the Reni show average emissions ranging within 10.78–43.83 kt/year. No clear tendency was observed for the analyzed period. **The impact** of the nutrients discharges on the water quality of transitional waters was assessed based on the data collected in front of the Sulina and Sf. Gheorghe mouths in 2012-2017. **The results show**, for the period 2012-2017, exceedances of the values proposed in other studies or those of the national legislation (Ord.161 / 2006) as thresholds for GES.

6.2.2. Pollution

In BULGARIA

The Bulgarian Black Sea waters are subject to pollution due to transboundary transport of polluted river and sea waters, discharges of untreated domestic and industrial wastewater, unregulated discharges of wastewater from ships, pollution due to maritime activities, minerals exploration and extraction. The air pollution is also considered (different pollutants resulting from industrial and domestic activities: mostly fine dust particles).

Local pollution is high due to the discharge of domestic wastewater into the sea. In all cities (with 2 exceptions) on the Black Sea coast and in the large resorts, there are adjacent wastewater treatment plants (WWTPs).

On the territory of Burgas district there are still settlements without WWTPs, the wastewater being discharged untreated into water bodies. Most noticeable in this regard are the Black Sea settlements Aheloy, Sinemorets, Varvara and Ahtopol.

According to the data of the Black Sea Basin Directorate (*National Report on the State and Protection of the Environment in the Republic of Bulgaria, 2019*), describing the condition of the coastal waters in terms of physico-chemical quality elements in 2017, out of observed twelve water bodies, seven are in good condition: BG2BS000C002 (Shabla - Kamen Bryag), BG2BS000C1113 (Kavarna - Galata), BG2BS000C1008 (Cape Emine - St. Vlas), BG2BS000C1108 (St. Vlas - Pomorie), BG2BS000C1208 (Pomorie, Sarafovo) BG2BS000C1010 (Burgas Bay> 30m), BG2BS000C1011 (Cape Akin – Cape Maslen Nos). Five water bodies do not meet the criteria for good status and are assessed as being in a moderate condition: BG2BS000C001 (from Durankulak to Shabla), BG2BS000C1004 (Cape Kaliakra-Kavarna), BG2BS000C005 (Varna Bay), BG2BS000C1006 (resort

Kamchia-Shkorpilovtsi)), BG2BS000C1308 (South Burgas Bay <30m).
Data: The Black Sea Basin Directorate annually assess the pollution state of sea waters, on the basis of the results of monitoring carried out by the Institute of Oceanology at the Bulgarian Academy of Sciencies and Regional Health Inspectorates. Comparisons of published EEA reports on the state of the environment and the annual national reports of the ExEA for Bulgaria shows that data for other sea basins are significantly more up-to-dated (Baltic, North Seas, etc.). This is a result of the insufficient capacity to monitor all indicators in the sea, adjacent lakes, rivers flowing into the Black Sea, as well as in the coastal areas.
Conclusions: The most important of local pollution source is the discharge of untreated domestic wastewater. Of the observed 12 MWB, 5 are assessed to be in moderate condition. The overall assessment of the state of the EU's sea basins and the slowdown in achieving the objectives of their protection and reduction of the pressure on marine resources, proves the need of increasing capacity of local institutions.

In ROMANIA

➢ Organic pollutants

BOX 51. *Contaminants* - transitional, coastal and marine waters up to 100 m bottom depth	
Concentrations of heavy metals in seawater and sediments along the Romanian Black Sea coast were characterized by an increased spatial and temporal variability, under influence of various natural and anthropogenic pressures. Overall, the majority of data were situated below environmental quality standards. Although occurred with a low frequency, higher variation ranges, even outliers and extreme values, were noticed especially in the under the influence of Danube river, and in specific locations from southern area, situated in the vicinity of big harbors (Constanta, Mangalia) or WWTP outlets. In the recent years heavy metals concentrations were situated in general within the same variation ranges, in some cases with slightly decreasing trends. OCPs trend analysis for 2006 – 2014 show an obviously decreasing tendency in the last years The OCPs and PCBs distribution suggests that atmospheric deposition represent one important source of pollution. The average values of polycyclic aromatic hydrocarbons in environmental components (seawater, sediments) investigated were within the range of variation found in 2008-2013, period with a decreasing trend in the level of contamination compared to 2006-2007.	
(TH)-Total hydrocarbons	In 2017, all the measured concentrations of TH in the Romanian shelf waters were below the national threshold stated in the Order 161/2006; ranging within 5.5-148.3 µg/L. In sediments, the TH concentrations ranged within 3.86-148.93 µg/g in 2017 and only one value exceeded the maximum allowed values stipulated by Order No. 161/2006 (100 µg/g).
(PAH) Polycyclic Aromatic Hydrocarbons	The analysis of the 2017 data of PAH in seawater indicates the presence of the all (16) priority hazardous organic contaminants in all samples. For the assessment of the degree of the water contamination with PAH, the maximum allowed values stipulated by Order No. 161/2006 were taken into account. The results show that phenanthrene and anthracene are the dominant compounds, with concentration values ranging from 0.0746 to 2.7693 and 0.0239 to 1.0056 µg/L. 89% of the concentrations of the individual compounds exceeded the maximum allowed limit imposed by the quality standard. The trend of PAH concentrations in water was not clear observed, only for naphthalene a slight decreasing tendency was found as comparing the recent data with those gathered during 2006-2011. In sediments, PAH concentrations indicate a good ecological status, excepting for naphthalene, go, anthracene. However, the sum of PAHs in sediments exceeds the maximum allowed thresholds as is stipulated in the Order 161/2006 (1000 µg/kg dry wet).
Organochorinated pesticides	In terms of PPOs, the organochorinated pesticides concentrationsin water ranged within values below detection limit and 0.228 µg/L. Values exceeded the thresholds for defining the GES (according to the EU Directive 39/2013) were found mainly for sum of cyclodienes, sum of p,p' DDT and its metabolites, and lindane. As comparing the recent data with those gathered during 2006-2011, a stability trend was observed

	for the persistent organic pollutants in water. In sediments, most of pesticides (except lindane) and PCBs (except PCB 28 and 52) showed a good ecological status.
Organochorinated pesticides	In terms of PPOs, the organochorinated pesticides concentrationsin water ranged within values below detection limit and 0.228 µg/L. Values exceeded the thresholds for defining the GES (according to the EU Directive 39/2013) were found mainly for sum of cyclodienes, sum of p,p' DDT and its metabolites, and lindane. As comparing the recent data with those gathered during 2006-2011, a stability trend was observed for the persistent organic pollutants in water. In sediments, most of pesticides (except lindane) and PCBs (except PCB 28 and 52) showed a good ecological status.
As regarding the organic pollutants in commercial species of molluscs, the PAHs, PCBs and pesticides concentrations show values below the maximum allowed limit issued by national and European legislation.	

➢ Inorganic pollutants

The **heavy metals** concentrations determined in 2017 in the marine waters (at sea surface) ranged mostly within normal limits, as follows: 2.81-7.24 µg/L Cu; 0.52-1.69 µg/L Cd; 4.24-10.74 µg/L Pb; 1.32-3.81 µg/L Ni; and 1.21-3.59 µg/L Cr. Their concentrations generally corresponded to a good ecological status (only Cd shows concentrations exceed the quality limit in more than 25 of samples in the Danube influence area). Assessing the data collected by NIMRD '*Grigore Antipa*", there is no an obvious decreasing trend for any of the analysed heavy metal in surface water.

BOX 52. The concentrations of heavy metals determined in 2017 in surface marine sediments were mainly within normal ranges of variation (3.7 – 64.6 µg/g Cu; 0.2-1.6 µg/g Cd; 3.3 – 21.4 µg/g Pb; 24.4 -103.3 µg/g Ni; and 25.4 – 98.7 µg/g Cr. Most of the investigated elements, especially Cu, Cd and Cr showed higher values deeper areas, both in the north and in the south. Cases of exceeding the ERL (Effects Range-Low) threshold values (40 µg/g Cu; 1.2 µg/g Cd; 47 µg/g Pb; 35 µg/g Ni; 81 µg/g Cr) were found for all elements investigated, except Pb. The evaluation of the monitoring data shows in the last years a certain tendency of stability of the concentrations of heavy metals in sediments, especially Cu, Cd and Pb, compared to the previous period (2006-2011), but no significant decreasing trends are observed
Pb and Cd concentrations in the soft tissues of commercial molluscs have been also measured in three locations. The obtained data showed concentrations clear below the permissible levels for contaminants in marine molluscs for human consumption, stated in the EC Regulation no. 1881/2006). As comparing data gathered during the period 21012–2017 with those corresponding to 2006–2011, it can be seen a declining trend and stability of lead concentrations in commercial molluscs, while in the case of cadmium the multiannual variability is much more pronounced, overall, with an increasing trend in the evaluated period.

➢ Marine Litter

Beach litter – the distribution per category is shown in the Table 20. The data were collected by NGO Mare Nostrum during the period 2016 – 2018, based on the standard methodology for quantifying the beach litter. The surveys were conducted twice per year; in spring, before the start of the holiday season and in autumn, after the season.

Bottom litter – during the period 2012-2017, the average quantity of bottom litters varied from 0.04 (year 2017) to 0.27 (year 2015). From a numerical point of view, (i.e. items / m^2), the values were between 0.00005 (year 2012) and 0.0001 (years 2016 and 2017). Considering these values, the quantity, composition and spatial distribution of seafloor litter are at a level that does not pose a danger to the biotope and the biocenosis that populate it.

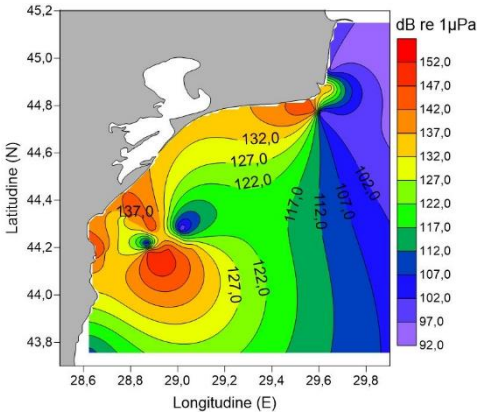
Table 20 Marine Litter distribution per category

Category (items)	2018 September
Polymers	19,740
Rubber	103,000

Cloth/textiles	597,000
Paper/Cardboard	1,342
Wood	640,000
Metals	884,000
Glass/ceramic	478,000
Other	317,000
Total	24,101

It can be also noted a slight decreasing trend with respect to seafloor litter quantity during the recent years (quantitative reduction from 0.27 g/m2 - 2015 to 0.04 g/m2 - 2017).

- **Underwater Noise -** transitional, and coastal



➢ Continuous low frequency noise (Indicator MSFD- D11C2)

Impulsive sound sources can be pile driving, seismic surveys, explosions and sonar. MSFD requires the reporting of impulsive noise sources, namely those with a frequency less than10 kHz and those that adversely affect marine life (Figure 78).

Figure 78. Spatial distribution of the underwater noise (dB re 1µPa) in the Romanian Black Sea shelf, in 2016 – 2017 *(NIMRD).*

Impulsive sound sources can be pile driving, seismic surveys, explosions and sonar. MSFD requires the reporting of impulsive noise sources, namely those with a frequency less than10 kHz and those that adversely affect marine life (Figure 78).

Such sources have been observed to cause temporary displacement of cetaceans (dolphins in the harbour area), increased physiological stress in some fish species and developmental anomalies in invertebrate larvae.

The western part of the Black Sea is an extremely intense route for maritime transport, being located at the intersection of trade routes linking developed countries from Western Europe with emerging markets of Central with suppliers of raw materials from Central Asia and the Transcaucasus. The vessels produce low noise frequently on the routes indicated in this figure (Figure 78).

BOX 53.
During the period 2010-2016, there have been identified 10 activities conducting in the Romanian shelf that generate impulsive noise, 2D and 3D seismic surveys. Inventory of the impulsive noise sources is necessary to realize the Registers of occurrence of the impulsive sounds on the Romanian Black Sea platform, and represents a first step in establishing the current levels and trends, according to the recommendations of the Noise Technical Group of the MSFD - TG Noise. The noise level can be classified as very low (234 – 243 dB re 1 µPa·m) and low (209 – 233 dB re 1 µPa·m).

The underwater noise measurements performed during 2016-2017 showed the maximum level in the areas with higher maritime traffic and close to the Constanta Port. The lowest level was determined in the southern littoral, in the MPA Vama Veche-2 Mai. In 2017, following the measurements made by the noise team on the RIB type boat, a maximum of 132 dB re 1 µPa and a minimum of 106 - 108 dB re 1 µPa was determined in the natural reservation 2 May - Vama Veche. A sound pressure of 155 dB re 1 µPa was recorded during measurements on a research vessel with the auxiliary engines on.

Gaps: There are no available data or information's concerning the sound level made by pile driving, explosions or sonars. No information about the explosions on the Romanian Black Sea shelf provided by the relevant entities.
The fixed-point measurements by the continuous recording method or the method used by the NIMRD should be used to validate the model. It is proposed to be achieved future marine noise modelling. The model uses a statistical approach to reduce uncertainty on the environmental properties and AIS data (for maritime traffic).
The results indicate that the current noise level on the Romanian continental shelf of the Black Sea justifies further investigations.

- **Abandoned fishing tools and nets**

The fishing nets collected from the seabed come from fishing gear (nets, trawl, Italian, etc.) lost or abandoned by companies that practice fishing activities on the Romanian coast. However, a large part of these items also comes from fishing gear abandoned by Turkish, Bulgarian and even Romanian vessels that practice illegal fishing (without authorizations and licenses or carry out fishing activities during periods of prohibition).

- **Urbanization**

Urbanization of the coastal area is mainly due to the concentration of population, housing, the development of uncontrolled tourism and the increase of leisure activities. Uncontrolled development has negative effects on the marine environment and landscape and increases pressures on the ecosystem, which eventually lead to the loss of marine habitats. In the last 20 years, the built area has expanded by more than 30%, being focused on residential tourist development, in the immediate vicinity of the Black Sea or coastal lakes (Siutghiol, Techirghiol, Tatlageac).

Urban development of coastal areas can cause the destruction and fragmentation of habitats through illegal construction, changing currents and sediment dynamics, but also through pollution due to wastewater discharge during construction and operation of these buildings.

6.2.3. Invasive species

In BULGARIA

There are 16 species, identified as invasive for the Bulgarian Black Sea area. (Yankova, 2016) The increased intensity of maritime traffic is the reason for the introduction of foreign phytoplankton species, which cause mass flowering. An example is the species *P. calcar-avis*, which was first discovered on the Bulgarian coast in 1926. Five species of phytoplankton have been identified as foreign invasive species and are able to cause mass harmful blooms. The most important of them are *Oxyphysis oxytoxoides* and *Phaeocystis pouchettii* (Hariot). Their mass development can cause poisoning and death of marine fish, mammals and birds, and in contact with seafood for human consumption – similar effects to humans.

The greatest pressure on the zoobenthos communities in the Bulgarian sector of the Black Sea is exerted by the invasive predatory snail *Rapana venosa*, introduced by ballast water and fouling on the hulls of ships. The most affected are the biotopes infralittoral rocks with overgrowth of black mussels *Mytilus galloprovincialis* and *Mytilaster lineatus* and Circalitoral rocks with overgrowth of black mussels *Mytilus galloprovincialis*, hydrozoa and fungi, as the medium-forming black mussels are the main food for Rapana. In the absence of its preferred prey, the rapana can also feed on sand mussels, thus, the sand infra- and sublittoral habitats are also potentially vulnerable.

In 2017, in the Bulgarian waters of the Black Sea (Burgas Bay) the foreign species of mussel *Arcuatula senhousi*a was established for the first time. So far, this species has been considered accidental for the Black Sea, but in other parts of the world's oceans it is considered invasive.

Data: There is no regular monitoring check of invasive species in order to use spatial data for applied research.
Conclusions: The identified 16 invasive species have caused significant damage to the natural biodiversity of the Bulgarian Black Sea ecosystems.

In ROMANIA

Five species of macrozooplankton have been identified during the scientific expedition: the crippled *Aurelia aurita*, the ctenophore *Pleurobrachia pileus*, *Mnemiopsis leidyi* and *Beroe ovata* and the crippled *Rhizostoma pulmo*.
Currently, a total number of 84 nonindigenous species has been estimated at the Romanian littoral and the tendency is increasing. Thus, besides the 74 species reported until 2012, 8 new ones have been identified after this period (2012 – 2017), their proportion reaching at 4.1% as comparing with that of the native species.

In the period 2016 - 2019, 3 new invasive ciliates species and a significant number of phytoplankton ones have been reported. On the other side, the level of benthic community, a decreasing frequency and a lower number of invasive species entering the Romanian Black Sea waters have been recorded, while the impact upon the benthic habitats have diminished. The last invasive species recordings date back to 2003, referring to the species *Dipolydora quadrilobata*, a polychaeta that presently forms its own habitat within circalittoral, without producing a significant negative impact upon the native species.

Concerning the species *R. venosa, Anadara kagoshimensis, Mya arenaria*, present since 60s - 80s, a reduction of their extending and impact upon the indigenous habitats and fauna have been noted in the last years. The abundance and distribution of the species *R. venosa* are currently under control, being harvested for commercial purposes.

A decreasing of pressure and negative effects of the species *M. leidyi* and *B. ovata* that entered the Black Sea plankton composition in the last decades (the 1990s) have been estimated according to the last evaluation (2012 – 2017) based on the Biopollution Indices of *M. leidyi* (The National Report on the Black Sea ecosystem according to MSFD art. 17, 2018). In 2018 and2019, the biomasses of the species *M. leidyi* were below the GES thresholds (Table 21); a lower pressure on the zoo- and ichthyoplankton communities is registered.

Table 21. The average biomass (g/m^3 and g/m^2) of *M. leidyi* in summer season in the water bodies in 2018 and 2019 comparative to 2012 – 2017 and GES threshold.

Water body	***GES thresholds***	***M. leidyi* (g/m^3)**		
		2012 - 2017	**2018**	**2019**
Coastal	< 4 g/m^3 or 120 g/m^2	0.74	1.78	0.78
Transitional		11.41	0.44	0.30
Marine		2.55	1.87	0. 29

6.2.4. Excessive fishing / Overfishing

In BULGARIA

More than 20 species of fish, defined in Annex № 2B of the Fisheries and Aquaculture Act[79] are subject of fishing in the Bulgarian Black Sea waters.

The fish populations in the Black Sea are most affected by the intense fishing pressure, in some cases due to fishing beyond the established quotas for each country. Additional damage is caused by unregulated fishing with gillnets by fishermen who are not registered for commercial fishing, by catches of fish species protected by national and international

[79] Promulgated in the SG No. 41/24.04.2001, amended SG No. 52/09.06.2020

legislation (*Acipencer sturio*, *Alosa spp*.) and by fishing in protected areas. Seabed integrity, thus the demersal fish habitats are strongly affected by the bottom trawling. The dredging operations in the port aquatories and dumping in the shelf area is another problem. Accidental catches of non-commercial fish are usually not reported, which makes unknown the scale of the problem. Insufficient control of over recreational fishing (both from the shore and sea), also creates additional problems, but the extent of its impact on fish populations is unknown.

The areas with the most significant pressure resulting from fishing are focused in the area around the two large bays, where the fishing fleets are located. According to EMODnet data, in 2017 the activities of fishing vessels were concentrated in two regions: in the north, from Kaliakra to the mouth of the Kamchia River and in the south, covering the water area of the Burgas Bay and reaching south to Cape Maslen Nos.

Conducted observations and research lead to the generalized conclusions that the condition of the fish species of fish subject to industrial fishing is "poor", excepting for sprat, which seems to be in good" condition (suggested by 2 out of 3 indicators). The condition of non-commercial fish species is "good" for 2 species: seahorse (*Hippocampus guttulatus*) and sea dragon (*Trachinus draco*). The remaining 15 species are in "bad" condition.

Data: The lack of monitoring data does not allow an assessment of the status of all fish species – from two cathegories: resulted or not from the industrial fishing.
Conclusions: There is a strong decrease in commercial fish species. The problems are cross border ones and need joint efforts and measures in each Black sea region country.

In ROMANIA

Fish stocks over the basin are still out of Balance, mainly as a result of overfishing but also due to eutrophication. For example, eutrophication-induced unfavourable conditions reduced sharply catches of demersal fish with high commercial value such as flounder and turbot and replaced them with large quantities of small pelagic such as sprat in the western shelf. As a consequence, the Ukrainian and Romanian fishing fleet in the Black Sea almost collapsed. The additional impact of overfishing exacerbated the decline of high trophic level fish relative to low trophic level fish and multispecies fishery is unsustainable during the present decade. Anchovy remains to be the top predator species of the Black Sea ecosystem together with sprat along the western coast. Illegal fishing and destructive harvest techniques, lack of regional cooperative fishery management, eutrophication-induced instability of the food web structure constitute ongoing major threats for fish resources.

The most significant ***threats for Black Sea Marine Living Resources*** remain **Overfishing:** the drastic drop of total landings by over 40% (5 years before) may be a result of significant changes in the structure and functionality of the marine ecosystem, but, to a similar extent, the result of an extremely high rate of fishing effort. The reduction of fishing vessels number registered in Turkey, Bulgaria and Romania is insignificant (367 vessels decommissioning, 7% since 2007), the fishing effort at regional level being high.

Illegal and unregulated fisheries (IUU): It is a general issue in all Black Sea countries. A RoadMap for reducing IUU fisheries was elaborated. In some cases, such turbot fisheries, the level of IUU catches exceeded 5 times the official data.

6.2.5. Seabed disturbances *(habitats alteration and loss)*

In BULGARIA

Disturbances in the coastal zone are mainly expressed in sealing and backfilling. The strongest pressure is on the mediolittoral and the shallow sublittoral, located closest or in direct contact with a large number of anthropogenic activities. As a result, there is a loss of

bottom substrates and associated species and communities, both directly - due to the construction of coastal protection and shore protection facilities, port infrastructure, fisheries and tourism in the coastal zone, and indirectly - due to disruption of natural hydrodynamics and water exchange in the area and corresponding jamming with mud and deterioration of the oxygen regime. The most urbanized areas - from Kaliakra to Galata and from Emine to Sozopol are subject to the strongest negative impact. Industrial catches of commercial shellfish using illicit demersal dredgers in recent years have led to significant depletion of *Chamelea gallina* and *Donax trunculus* - the so-called 'white mussel'.

Offshore disturbances are related mainly to industrial fishing. The use of trawls causes abrasion of the seabed. Biogenic substrates, such as sublittoral mussel banks on sediment are particularly vulnerable, as the environment-forming species *M. galloprovincialis* and the associated community are representatives of the epiphany and therefore fall under the direct physical impact of fishing gear. It is assumed that over 50% of the seabed area to a depth till 100 m. is subject to significant pressure from abrasion due to active fishing.

Data: There is no targeted and continuous monitoring of seabed disturbances.
Conclusions: The main violations of the seabed are sealing and backfilling. Commercial fishing exerts significant pressure on the seabed to a depth of 100 m.

In ROMANIA

➢ Physical disturbance, damage (temporary or reversible) or loss to seabed habitats

The major activities affecting the benthic habitats are related to: hydrotechnical works, sand extraction for beach nourishments, dredging, beam trawling and erosion/deposition processes as result of anthropogenic and natural induced hydromorphological alteration.

Table 22. Hydrotechnical protection works

Zone/Lot	Habitat	Habitats surface loss (%) within Phase II (2014 – 2020)	Foreseen Activity	2014 2015
Stavilare	1110	Less than 200 m^2 of the habitat area	Hydrotechnical protection works at Periboina	
Eforie	1110, 1170 1140, 1140	85%	Hydrotehnical works and nourishment	2.06 km^2
Costinesti	1170-10	100%	Hydrotechnical works and nourishment	
Olimp	1110	30%	Nourishment	
Saturn - Mangalia	1110-1,1170-8	100%		
2 Mai	1170–8,1110-1	15 - 20%	Nourishment	

➢ BOX 54. The hydrotechnical and nourishment activities

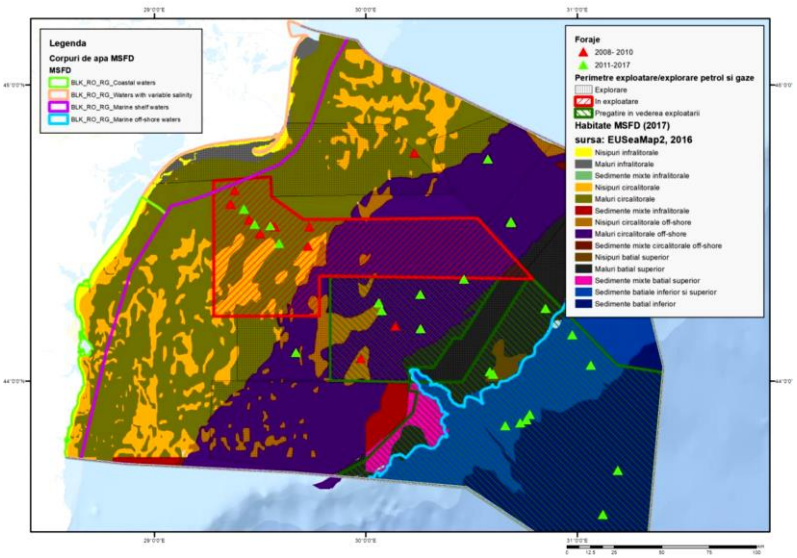
As a result of continuation of the hydrotechnical rehabilitation works started in 2014 – 2015 with the second phase of the project: „ *Reducerea Eroziunii Costiere Faza II (2014 - 2020)"* (*Reducing the coastal erosion Phase II*, 2014 – 2020), new areas of coastal habitats from both northern and southern units of the Romanian coast will be affected.

At the end of 2015, about 2.06 km^2 of the infralittoral sands habitats were already altered by the previous works (Phase I of the project). Within the new phase of the project, the hydrotechnical works will further cause a loss in proportions varying from 15 to 100% of coastal habitats surface that partially or totally overlap different project zones, the most affected being the habitats 1170 in

Costinesti area and 1110 in Mangalia and 2 Mai areas (Table 22).

Extraction of non-living resources (extraction sites)

- **Oil and gas extraction**



Currently, the EEZ in Romania comprises 16 perimeters for hydrocarbon exploitation of which 10 perimeters are given in concession by the National Agency for the Mineral Resources. One single perimeter is operated in the present (XVIII ISTRIA) – the drillings Lebăda East and West (exploited since 1987), Sinoe, Pescăruș and Delta. The drillings executed within the concession areas showed the presence of hydrocarbons within the perimeters XV Midia and XIX Neptun (Figure 79). The present and the planned exploitations affect/will further affect large areas of circalittoral muds habitat, offshore circalittoral sands and offshore circalittoral muds, and the bathyal ones.

Figure 79. Distribution of drilling activities within different habitats' perimeter (*Report MSFD*)[4]

According to the 2017 data, the following habitats' areas are currently affected by the extraction activities. Table 23.

In 2016, about 3,650,000 m^3 of sand were extracted from a perimeter of 2.82 km^2 (according to the Environmental Agreement for the project «*Relocation of sedimentary deposits (sand) from the burrowing perimeters located within the Black Sea territorial waters*» situated at 22 – 27 m depth in front of Constanta. Geophysical investigations performed in 2018 at the same site by GeoEcoMar revealed the presence of traces of former dredging, crossing the circalittoral sand habitat (Teaca et al, 2019, Mureșan et al., 2019) that suffered changes at the level of benthic fauna composition due to siltation and furrows appeared into sediments (Figure 80).

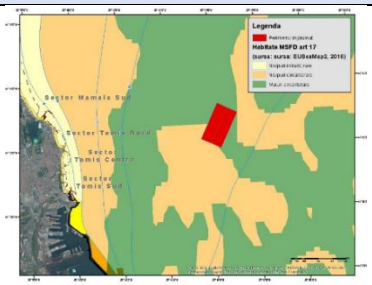


Figure 80. Loan perimeter location (*Report MSFD*) [4]

Table 23. Areas affected by drilling

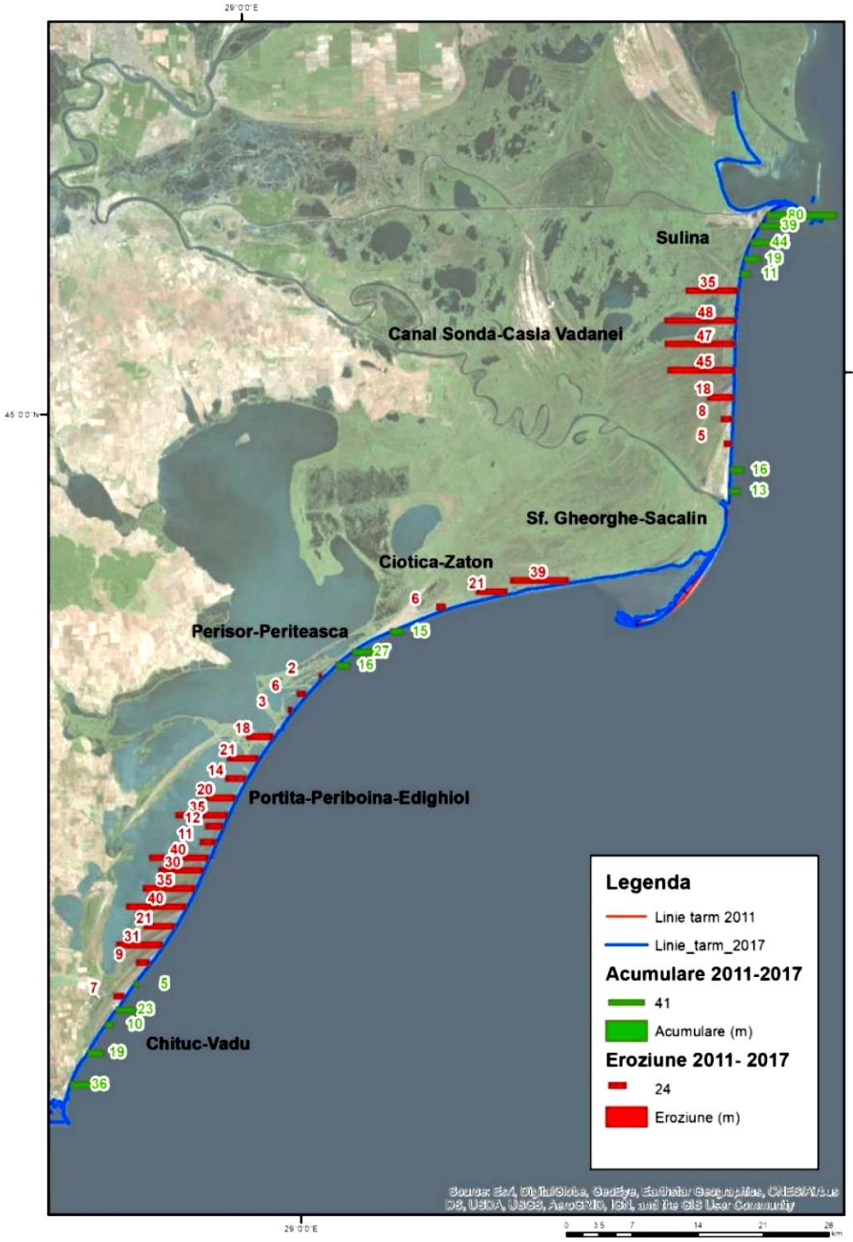
Habitat type	Area affected by drilling (km^2)	Habitat type	Area affected by drilling (km^2)
Circalittoral muds	2.6	Upper bathyal muds	0.4
Circalittoral sands	0.2	Upper and lower bathyal	1.6
Off-shore circalittoral muds	1.8		

Table 24. Affected area by beam trawling

Habitat type	Area affected by beam trawling (km^2)
Infralittoral sands	24
Circalittoral sands	150
Circalittoral muds	1152

- **Ports/Harbors and anchorage zones**

The three main harbors of the Romanian coast (Constanta, Midia and Mangalia) and the anchorage zones situated in their proximities occupy about 123 km^2 partially overlapping the circalittoral sand and mud habitats (Table 25)



➢ **Coastal erosion/ accumulation morphodynamic processes**

The erosion / accumulation coastal morphodynamic processes mostly affect the midlittoral (along the coastline) and infralittoral sands habitats, modifying the local bathymetry, grain size as well as the currents movement. The communities in these areas are in general well adapted to high energy waves and variable environmental conditions. (Figure 81).

➢ **Fishing activities impact**

According to VMS data, the fishing activities carried out by beam trawl within the perimeter situated between 5 and 30 m depth, from Constanţa to Sahalin Peninsula, extend on an area of about 1,326 km^2. The habitats affected by these activities belong to infra – and circalittoral bionomic zones (Table 24). According to the GeoEcoMar recent data (Teaca et al., 2019), the trawling activity for *Rapana venosa* harvesting affected more than 60% of the circalittoral mud with *Spisula, Abra, Pitar and Acanthocardia*.

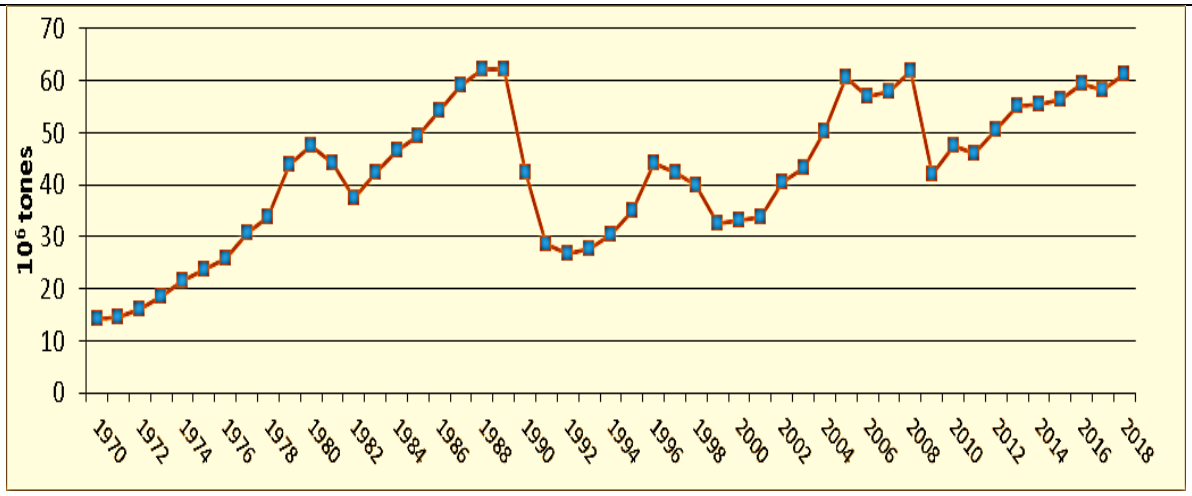
Figure 81. The coastal accumulation and erosion dynamic, Romanian northern coast unit *(GEM)*

Table 25. Maritime areas for ports and anchorage

Activity	Habitat type	Estimated areas (km^2)
Maritime ports		36
Anchorage zones	Circalittoral sands and muds	87

➢ **Intensification of the maritime traffic**

Figure 82. Total traffic. 1970-2018, (*Source: Maritime Ports Administration)*, excepting the last two years which the total traffic significantly decresead because of Pandemia



In 2018, the seaports Constanta, Constanța Sud-Agigea, Midia and Mangalia had a total traffic of 61,303,774 tons of goods (increase of 5% compared to 2017). According to the INS, traffic has increased continuously since 2009-2018 by ~ 32% (Figure 82), Part of the traffic being represented by products at risk of pollution: oil and petroleum products, chemicals, ores, chemicals derived from coal and tar (Figure 83).

The maritime transport sector generates risks both to the coast and to marine environment:

- Coastal erosion / intervention in sediment dynamics at regional level,
- Extraction of natural resources / submerged beach sand,
- Water / air pollution (hydrocarbons, greenhouse gases, solid waste from diffuse sources, etc.) in adjacent areas; noise pollution,
- Pollution due to maritime transport, ecosystem imbalance through the intrusion of alien species through ballast waters,
- Loss of endangered habitats / species,
  Uncontrolled development of industrial activities related to ports (spills, accidental pollution, tank washing).

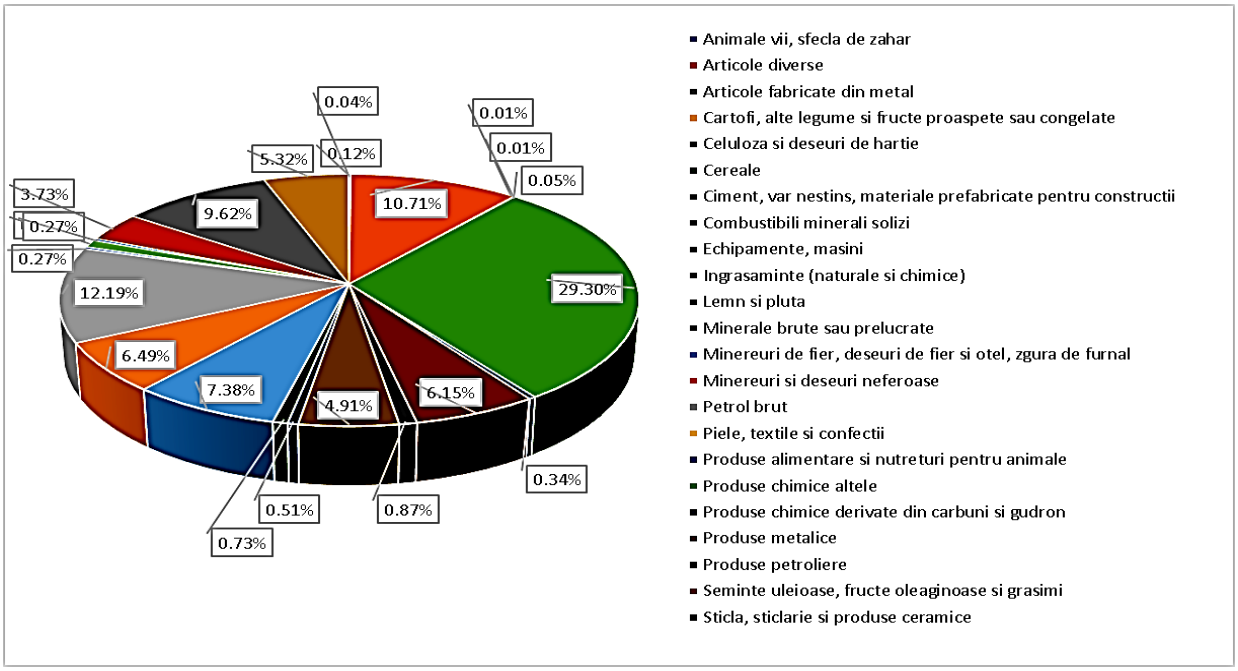


Figure 83. Commercial/Freight Traffic, Seaports, (*Source: Maritime Ports Administration)*

6.2.6. **Hydrological changes** - According to the MSFD Descriptors D (6), (7)

In BULGARIA

The general assessment of the disturbances of the hydrological processes, carried out according to published data, shows a tendency of increase by 1°C of the temperature of the sea surface in the western part of the Black Sea after 2006. There are no reports of lasting significant changes in the wave regime.

The latest research (E. Stanev et al., 2019) considers the development of the cold intermediate layer of the Black Sea in the course of 14 years (2005 - 2019) as a reaction to climatic trends in the region. The analysis shows that the fluctuations of the winter air temperature affect the temperature and salinity of the cold intermediate layer, as the density of the water mass hardly changes. Accordingly, the intermediate water mass warms and thins, blurring the boundary between surface and deep waters. If this trend continues, it could change the stratification of the sea. Layer restructuring can lead to the rise of sulphides, corrosive and harmful substances from the deep sea to the surface and this can affect marine wildlife as well as tourism.

Data: More research is needed on the hydrological changes in the Black Sea.

Conclusions: Climate change affects the sea level, the stratification and the hydrochemistry of Black Sea waters

In ROMANIA

The hydrologic conditions of the Black Sea are defined mainly by temperature, salinity and seasonal stratification. Sediment transport is mainly due to the sea level and sea currents. Atmospheric characteristics, bathymetry, and the nature and structure of the seabed lead to the composition of communities of marine ecosystems. Activities under the major infrastructure projects, such as ports, offshore installations, coastal protection, sanding works, sand extraction can lead to permanent changes in hydrographic conditions and the loss of the natural substrate of the sea.

Two types of significant changes can be considered:

- changes due to natural variability with time scales older than 50 years and changes long-term climate change;
- changes due to the human intervention mentioned above.

In order to evaluate the possible long-term and short-term changes (e.g.,12 years) of the natural variability of the hydrographic conditions, the long series of temperature and salinity data from the NIMRD database were analyzed (for 1963-2017, the data on the Romanian continental shelf and for 1959- 2017, data from Constanța station), as well as the sea level data series (Figures 84 a, b).

In the short term an increase in temperature (almost identical in the two periods) of approx. 0.03 ° C / year. Salinity, in the long run, shows a decreasing trend (0.004 PSU / year), while in the period 2012-2017 it shows a slight increase (0.02 PSU / year). The same characteristics in the evolution of temperature and salinity are observed in surface waters on the continental shelf.

Recent studies confirm the long-term negative trend of salinity, as well as the lack of a clear trend in the long-term evolution of temperature in the entire Black Sea basin. Stratification of water bodies is another important feature that can provide information on possible permanent changes in hydrographic conditions. Sea level is an indicator of the state of the coastal area, and the importance of its evolution lies in the influence it has in establishing adjacent areas, by flooding or denuding them. By default, sea level indicates the changing position of the shoreline.

The evolution of the main hydrological factors from the Romanian coast and on the continental shelf, was determined in 2018 based on the observations and measurements of waves (daily measurements, in the area of Genovez Lighthouse 44º10'19 "N and 28º39'52" E, of the characteristic elements - height, direction, period, length); of water temperature at Constanța station (44º13'55 ”N and 28º38'E, N = 216 data) and from the water column (0-90 m, taken during two oceanographic expeditions - July and September - from the network made up of 51 stations located in the Sulina – Vama Veche area.

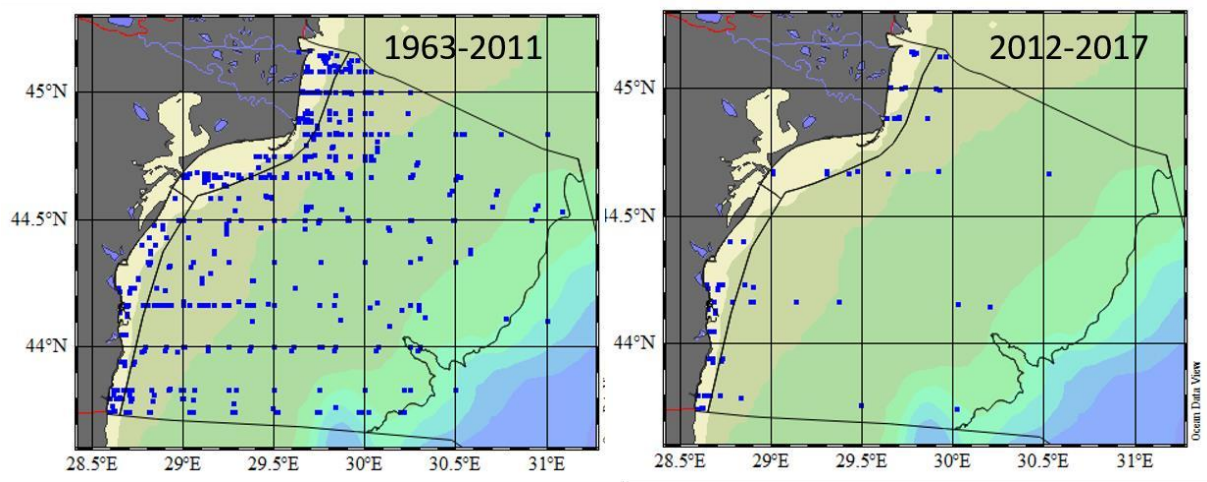


Figure 84. Network of stations for marine monitoring (*NIMRD)*:
a) 1963-2011: 3809 stations; b) 2012-2017: 361 stations

Physical losses caused by permanent changes in the substrate or seabed morphology. These losses are mainly caused by:

- Hydrotechnical works, coastal protection and sanding;
- Extraction of non-living resources (loan pits, oil and gas extraction);
- Fishing activities;
- Transport activities (ports and anchorage areas);
- Natural erosion / accumulation phenomena.

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7. CONFLICTS AND SYNERGIES BETWEEN MARITIME USES, AND BETWEEN MARITIME USES AND ENVIRONMENT

Vesselina Troeva, Maria Georgieva, Margarita Stancheva, Kalin Kalinov

7.1. FISHING AND AQUACULTURE

Knowledge gaps for relations between socioeconomic and ecosystem models; further research needs to be conducted to evaluate the interaction between maritime activities and environmental components, the CC and the associated impact; Insufficient knowledge of national legislation and the UNESCO Convention in the field.

✓ ***Miscellaneous Threats:***

- Deterioration of water quality;
- Chronic, volley and transboundary pollution of the Black Sea waters in the coastal zone from the discharge of domestic and industrial wastewater and the Danube River;
- Rise of bacterial pathogens that cannot be controlled;
- Significant increase in the rapa whelk population and destruction of mussel banks;
- Suspension of farm operations as a result of permits cessation for use of a water body.

- *Methodological gaps* – monitoring not only the ecological status, but the economic and social impacts of the implemented MSPs; cross-border conflict resolution tools.
- *Information gaps* - lack of reliable data in appropriate formats in almost all sectors – fishing and catchment areas, aquaculture, habitat distribution, extend and cartography, surveillance, control actions on ballast water and fouling; extraction of non-living resources; lack of access to information about the traffic and vessels visiting the ports - their characteristics; maritime tourism, yachting, cruise tourism, recreational boating; on shore and off shore sand deposits, long-shore sediment transport; environmental impact and monitoring of the dumping sites; insufficiently explored and lack of maps of the points, types and periods of underwater archaeological finds; military and defence areas. (being a matter of access for the project and not a matter of availability).
- *Legislative gaps* – marine waters concession in order to implement aquaculture projects based on European funding schemes or private capital; classification of harvesting and cultivation zones for mollusks, according to the European regulation 854/2004.
- *Technological gaps* – assembling of all intermediate products into a coherent MSP, ready for practical implementation is still unknown technology for all partners – for a natural reason – all preceding experience at this point is too limited.
- *Implementation gaps* – low effectiveness of long-term measures and immediately applied ones; institutional, administrative and expert capacity, needs of education (joint courses).
- *Communication gaps* - Conflicts between fishing community, tourist industry and fishing farm operators is limited; Poor communication in horizontal and vertical directions among almost all institutions involved, necessary for better ideas generation and synergy.
- *Governance gaps* – insufficient institutional, administrative and expert capacity, not enough effective management (conservation measures, species protection, preventing deterioration, restoration, monitoring and financing) and many marine Natura 2000 sites remain paper protected areas; Inappropriate use of the Black Sea underwater heritag; lack of support and low degree of awareness of local authorities for underwater heritage. Contiguous land on shore adjacent to aquaculture farms is not regulated as a right of acquisition by operators which hinders the monitoring, guarding, produce harvesting, etc.

- The coordination procedures for issuing permits for the water use are difficult due to lack of institutions synchrony in the operating the water – Black Sea Basin Directorate, Bulgarian Navy Headquarters, Maritime Administration Executive Agency.

7.2. EXTRACTION OF NON-LIVING RESOURCES

(oil, gas, salt, water, mineral resources, etc.)

The section includes brief overview of the geological risk and geo-environmental aspects of the modern Quaternary sediments impact of the Bulgarian sea shelf. Studying the modern status of the Upper Quaternary bottom sediments is a good foundation to forecast the geological risk and the stability of the environment where we live. As part of the marine ecosystem, these sediments are related to the future utilization of the shelf space. A number of different projects are zeroing in on the Bulgarian water area, involving the construction of hydraulic engineering installations, work on oil and gas drilling rigs, installation of underwater cables, gas pipelines, and other technogenic challenges, all of which will doubtlessly require contemporary knowledge of seafloor sediments. For

example, conducting marine survey along the routes of future gas pipelines could generate geo-environmental issues related to overlapping the protected marine zones of bottom habitats under Natura 2000 Galata and Emona.

A geo-environmental issue can occur when determining the surface area and the boundaries of the so-called temporary disposal sites for dredging spoils, which interfere with the natural course and rate of the sedimentation process on the shelf. Dredging activities can cause lasting destruction on the most superficial bottom sediments, which by their geological essence are dynamic physic-chemical deposits. In comparison with the petrified rock types, they are yet to undergo the diagenesis stage and are continuously changing.

The distribution of the different types of sea bottom sediments on the shelf and on the continental slope shows great lateral and vertical variability with regard to parameters like water saturation, gas saturation, plasticity etc. All this makes it necessary for them to be monitored in the context of the aims of MARSPLAN BS – II. In this sense, of geological risk for the drilling rigs are the Holocene gas-saturated clays, in which the so called shallow gas forms. In the peripheral area of the shelf and the foothill of the continental slope, of engineering and geological risk are the existing gas craters, which can cause gushing of free gas under high pressure. The potential danger of the gas crates for hydraulic engineering installations on the seafloor and for the vessels requires preliminary survey about their distribution and locality. The abrupt change of the incline of the relief on the shelf-slope boundary can be considered a risk factor for all types of survey activities on the seafloor. This is related to the stability of the sediments, their seismicity and the possibility to generate underwater slumping processes axially on the underwater canyons.

In the northern deep-sea part of the Bulgarian economic zone, perspective of gas hydrates have been charted, which however are unstable and can obstruct submarine gas pipelines.

7.3.MARITIME TRANSPORT *(infrastructure, shipping, ship building, shipyard)*

The Black Sea is a complex ecosystem that combines specific biodiversity, endangered species of flora and fauna. Protected areas of NATURA 2000 have been defined on the territory of the Black Sea. All these factors must be considered when analyzing the system for movement of vessels in the territorial sea and in case of violation of some of the ecological criteria, the shipping lines shall be positioned so that the vessel traffic cannot endanger the seamless development of biodiversity.

The anthropogenic pressure, mainly wastewater pollution from industrial and domestic origin, waters from agriculture and pollution from shipping significantly change the basic parameters of the seawater, causing major changes in water quality and worsening the environmental situation mainly in coastal areas. The impact on ecosystems causes various changes at the different levels of interaction.

Vessel traffic and the anthropogenic activities in port areas cause significant water pollution. The traditional sources are industry, agriculture, energy and urban polluted waters are typical for ports (Stoyanov St. Al., 2004). Bilge, ballast and washing water from ships, paint layers against fouling of ship hulls, use and discharge of oil and oil products, etc., are significant water pollution sources in ports. Attention is paid to accidental spills of and oil products.

Some categories of waste are included in the politics for management of waste in Bulgarian ports: waste generated by ships and ports; industrial waste (scrap metal, paper, wood, plastic, etc.); hazardous waste (used batteries, fluorescent lamps, etc.); bilge water generated by ships; water polluted with oil from a spill; hazardous liquid substances from the vessels. In order to reduce the water pollution caused by anthropogenic activities in port areas the main measure is to reorganize the

vessel traffic and to continue control over human activities.

7.4.SUBMARINE CABLES AND PIPELINES

The installed pipelines and cables are not imbedded in the seafloor and the majority of them run through areas with significant depth and far offshore. For these reasons and owing to the streamlined organization for zoning the maritime space, maintained primarily by MTIT&C, MoD and MoI, no issues have emerged with regard to the installed pipelines and cables.

Any conflicts with other zones are to be taken into account under maritime spatial planning process. The features described above subsection decrease the likelihood of conflict with other zones. For submarine cables this likelihood is further reduced by the improbability for pollution to occur from them. Submarine pipelines released a minimum amount of petroleum products in case of technological disaster or navigational accident by own construction.

The possible occurrence of a conflict when conducting military exercises and activities at sea (fishing, anchorage and dredging) is solved by marking the pipelines and cables on the sea charts and prohibiting such activities in such size-limited strips.

A possible risk arises from the large quantity of naval mines and ordnance left in the Black Sea after the two world wars. There is a very small risk for such a mine or piece of ordnance to be dragged by sea currents and catch on the installed pipeline or cable. The navigational marks of the pipelines and cables enable the planning of exercises and the performance of fishing, dredging and dumping dredging spoils without endangering them. Any discovery of unexploded ordinance is reported to the Navy, to send a modular unit for its disposal.

An effective organization has been developed among the Navy, Border Police Directorate General, Maritime Administration Executive Agency, and Port Infrastructure State Enterprise. They jointly coordinate their activities to ensure optimum conditions for economic activity in the maritime space and protection of the law and the interests and the sovereignty of the country. Furthermore, the agencies above maintain a good interoperation with the private sector. One of the reasons for the good interoperation between the agencies and the private organization is the contacts of the majority leadership with their education at N.Vaptsarov Naval Academy.

7.5.TOURISM *(coastal and marine)*

The main knowledge gaps are the relations between socioeconomic and ecosystem models. It is necessary to conduct further research to evaluate the interaction between maritime activities and environmental components, the tourist activities and the associated impact. Additional problem is the insufficient knowledge of national legislation and the UNESCO Convention in the field among the tourist operators.

The main methodological gaps are related to the necessity of monitoring not only the ecological status, but also the economic and social impacts of the implemented MSPs. It is necessary to establish cross-border conflict resolution tools.

The main informational gaps are related to the lack of reliable data in appropriate formats in almost all sectors – fishing and catchment areas, aquaculture, habitat distribution, extend and cartography, surveillance, control actions on ballast water and fouling; extraction of non-living resources. Additional problem is the lack of access to information about the traffic and vessels visiting the ports with their characteristics.

Next problem is the lack of reliable data in appropriate formats in almost all sectors. Coastal Data provided by regional administrations and town halls are incomplete or out of date. The formats of the presented data are old; there is no greater choice of cartographic formats.

Significant problem is the lack of reliable data in appropriate formats to maritime tourism, yachting, cruise tourism, recreational boating. The lack of data in appropriate formats for sea tourism, yachting,

cruise tourism is typical. There are places on the Bulgarian Black Sea coast that are preserved for beaches, but are not included in the cadastral plans, nor are there any cadastral sketches for them. There are also reverse cases when there is cadastral information, but it is not updated or not official. All this leads to difficulties in establishing both objects and to obtain their coordinates.

The biggest legislative gaps are related to marine waters concession in order to implement aquaculture projects based on European funding schemes or private capital.

In terms of the technological gaps the problem is assembling of all intermediate products into a coherent MSP, ready for practical implementation is still unknown technology for all partners – all preceding experience at this point is too limited.

The main implementation gaps are low effectiveness of long-term measures and immediately applied ones; institutional, administrative and expert capacity, needs education (joint courses).

Governance gaps are due to insufficient institutional, administrative and expert capacity, not enough effective management (conservation measures, species protection, preventing deterioration, restoration, monitoring and financing) and therefore many marine Natura 2000 sites remain paper protected areas; Inappropriate use of the underwater heritage of the Black Sea; lack of support and low degree of awareness of local authorities for underwater heritage.

The lack of cadastral information on some sites on the Black Sea coast that actually exist is due to the capacity to create such information or to update it. This information is not in one place, it is scattered in various institutions-ministries, agencies, district-city administrations.

The recommendations to regional and local authorities are generally related to the cadastral provision of all sites on the coast - beaches, campsites, dikes, dams, etc. Each administration - district administration or mayor's office must provide a complete cadastral plan with coordinates of all sites in the part of the coast for which they are responsible.

7.6.UNDERWATER CULTURAL HERITAGE

Republic of Bulgaria has a significant amount of cultural and historical sites, with international significance, for the world history and deserves effective conservation and adequate management.

In view of the world experience gained from practical and theoretical knowledge on the preservation and protection of underwater cultural heritage, it appears that the development of such activity in Bulgaria requires:

- building a management strategy;
- setting criteria;
- informing and involving the public in the conservation process;
- taking measures for their physical protection through underwater conservation, constant monitoring of their condition, prohibition of certain fishing activities which have a destructive effect on underwater cultural and historical heritage and control of activities carried out in the areas of underwater archaeological sites.

In order for the change to take place, it is necessary to make appropriate additions to the Protection and Development of Culture Act, which will lay the foundations for the implementation and development of activities for protection and preservation of underwater cultural and historical treasures in the Bulgarian maritime area.

7.7.MILITARY TRAININGS

The main conflict with military zones is with the proposed new Traffic Separation Scheme (TSS). The introduction of a new system for maritime traffic will require a whole new zoning of military polygons and areas, leading to expenditure of time and will burden the state budget.

The shift of the TSS to the east will create the following issues, related to its safety and/or leading to an increased vulnerability of the vessel moving in it:

- reduction of the probability of radar detection and tracking of small vessels, which are the main ships used for trafficking, smuggling and sabotage;
- reduction of the probability of optical detection, monitoring and control over the activities of vessels, especially in rain, snow and fog;
- reduction of the probability of detecting the placement of mines in the TSS;
- reduction of the ability for air defense of the maritime traffic, due to the distance from the position of anti-aircraft complexes;
- a need for the conduct of anti-mine actions to ensure the cleanliness of the new areas, which would require expenditure of time and burden to the state budget, these costs will grow exponentially when going beyond the isobaths 20 m, 50 m and 100 m;
- increase in response time and costs of necessary action in the TSS (check for violation, use of force, assistance, etc.).

All these possible problems are to be solved through establishment of an Interagency work group of representatives of the Ministry of Defense and the Ministry of Transport, Information Technologies and Communications, in order to establish a new TSS and military areas, taking into account the environmental state and the natural and cultural assets.

8. SHORT CONCLUSIONS AND RECOMMENDATIONS

8.1. DATA BASE STRUCTURE (GIS DATA BASE)

Maria Novakova, Valerya Hitova, Alina Huzui, Alina Spînu, Dragoș Niculescu, Laura Alexandrov

According to the project proposal – Sub-activity 1.2.2. GIS database update and GIS model design, a lot of necessary actions were performed.

- Database has been built, upon the established database in the first MARSPLAN-BS. Some of the information has been validated and updated, but some data still need to be updated with more refined information.
- Additionally, a lot of new information is planned to be put into the new database. Some of it is already collected, but still not everything has been proceeded.
- Data and information cover both maritime space and coastal zones within the plans' boundaries for both countries and cross-border area.

Data from first project MARSPLAN-BS are used, but extended in terms of additional aspects and included new thematic topics.

➢ Delimitation of the cross-border area

Cross-border area for the project is proposed to be: (1) in the sea – limited to 12-mile zone in order to be avoided some still not resolved between BG and RO delineation in EEZ zones. In the land territories – project's area should and will be cover corresponding and related to/bordering Black sea units. For Lau units- directly bordering for both countries, and Nuts III (for Bulgaria) and Nuts II (for Romania). These kinds of delimitations would be useful for extended scale of analyses, based on geographically related data, but also on the statistical data, which are and will be available on some administrative units (centres and boundaries of it). Basis for delimitation decisions about the area and for more detailed investigations in it is the basic analyses on huge range of components and indicators and characteristics of neighbouring territories.

- Database constructed will be fully compliant with the INSPIRE Directive 2007/2/EU and will provide secure data exchange and compatibility with Open Geospatial Consortium (OGC).

- In the MARSPLAN-BS II project, free (of charge) information, available as spatial data and Open sources, will be used. As main basic sources the European MSP Platform, EEA, EMODNet and other created metadata and data sets for the Black Sea Basin in different projects is used and will be used during the work on the project.
- All metadata and data in the GIS database are constructed to be compatible with the infrastructure and software products, used in main institutions involved in both countries and cover all related to the aims of the MARSPLAN-BS II data, indicators etc.
- For the purposes of realisation of this, a lot of models and database/data structures have been explored. This process will continue to the end of the project in order to be find most adequate structure and metadata descriptions for all indicators, data sets etc.
- According to the best practices, GIS model and modelling has been done and has been doing in few main aspects: a) Business model: covers all procedures for building a model for purposes of analyses, expected results, thematic aspects, coordination in all means of this, etc.; b) theoretical and physical aspects of planning process itself, coordination between actors, but coordination also between data etc.; c) possibility to support planning process (spatial, cross-border, cross-sectoral etc.) in both countries and in and for common analyses and decisions. d) as a basis for analyses and decisions in the fields of cross sectoral and sea-land interactions, for monitoring and evaluations of the MSPs implementation.
- During the process of modelling database structure, best practices from functioning portals for MSP was used: https://www.emodnet.eu; https://basemaps.helcom.fi/ and some others.

Following table represent proposed data base structure of working GIS Data base, at its stage on 12.2.2020. During the process of project realisation both, data base structure and its components will be changed, modified and improved according Project need, goals etc.

Data Base structure and content are subject of future changes and improvement according and in correspondence with new found data sources, their structure, etc.

➢ Metadate

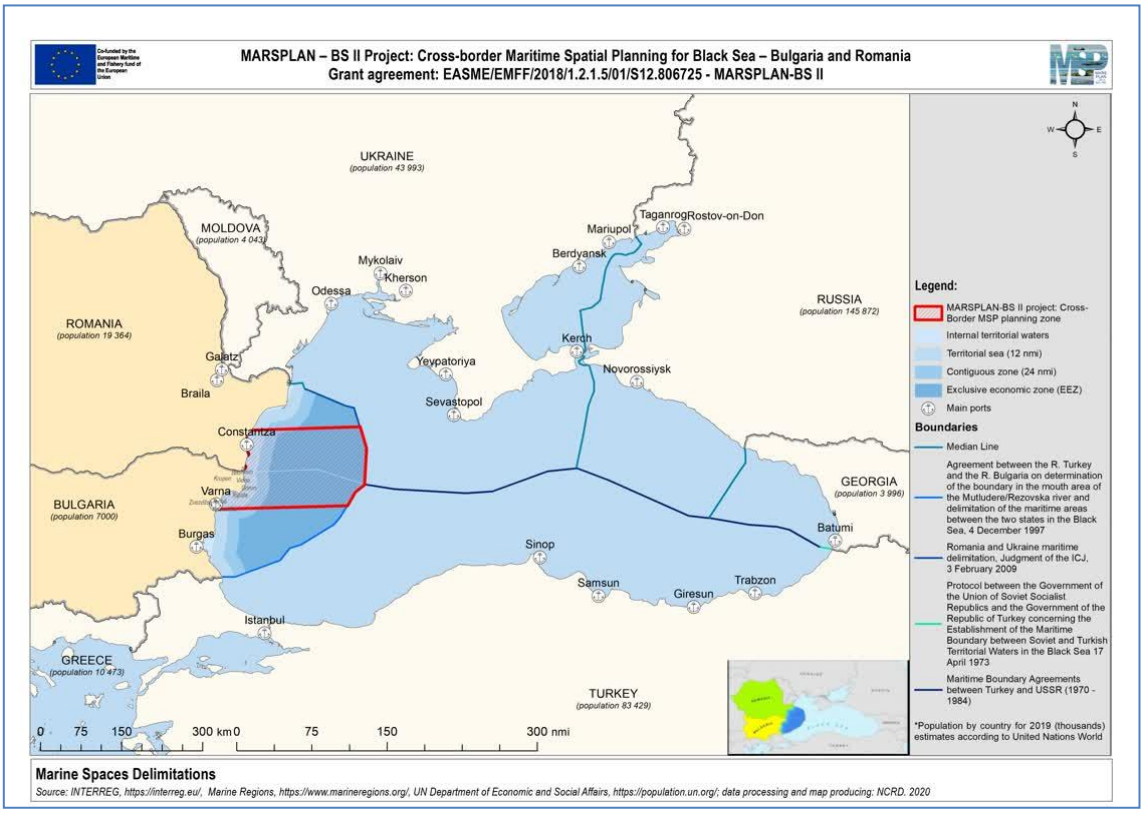
- Many of the data used for this study were collected under the National Integrated Monitoring Program, the National Fisheries Data Collection Programs approved by the European Union, national and international projects carried out during 2012-2019. Historical data belonging to NIMRD "Grigore Antipa" and GEOECOMAR were used, which can be found in the database of the National Center for Oceanographic and Environmental Data (CNDOM) (http://www.nodc.ro/) which is part of the infrastructure. Pan-European SeaDataCloud http://romania-seadatanet.maris2.nl/v_cdi_v3/browse_step.asp.
- All data on the situation of waste identified on beaches in the period 2015-2019 and on the seabed in the period 2012 - 2019 can be found on the EMODnet platform. They were uploaded in 2018 as an xlsx file (EMODNET format), according to the instructions in the EMODnet guide http://www.emodnet-chemistry.eu/welcome .
- Data on beach waste is also available on the European Environment Agency's website: https://marinelitterwatch.discomap.eea.europa.eu/.
- Metadata on bathymetry and habitat distribution are included in EMODnet High Resolution Seabed Mapping http://portal.emodnet-bathymetry.eu/ and EMODnet Seabed Habitats https://www.emodnet-seabedhabitats.eu/
- Annual reports on the state of the marine and coastal environment http://www.rmri.ro/Home/Products.EnvStatusReport.html
- Reports to the Black Sea Commission http://www.blacksea-commission.org/

8.2. MARSPLAN RESULTED MAPS – MARSPLAN *GIS execution* (8.2.1- 8.2.12)

Maria Novakova, Boyko Kermekchiev, Detelina Antonova, Vlerya Hitova, Alina Huzui, Alina Spînu, Dragoș Niculescu

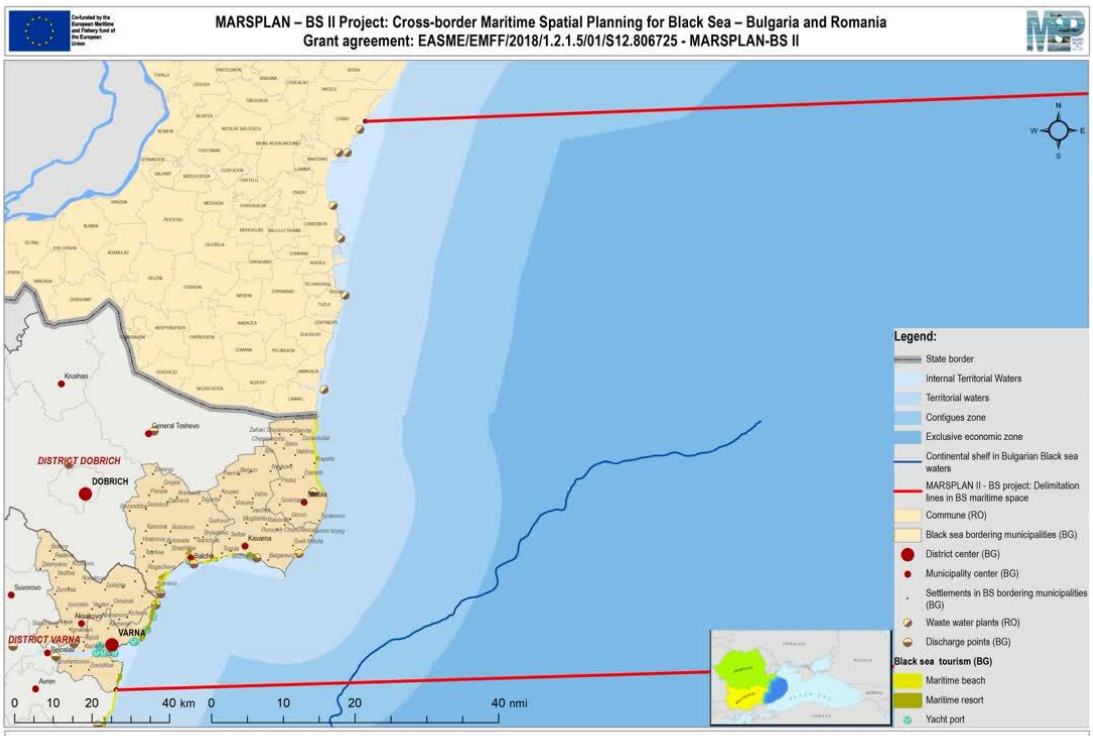
8.2. MAPS – BULGARIA - ROMANIA INTEGRATED MAPS

8.2.1. Maritime spaces delineation within the BS Region, Bulgaria-Romania



8.2.2. MARSPLAN BS area on study, Cross Border Area BG-RO

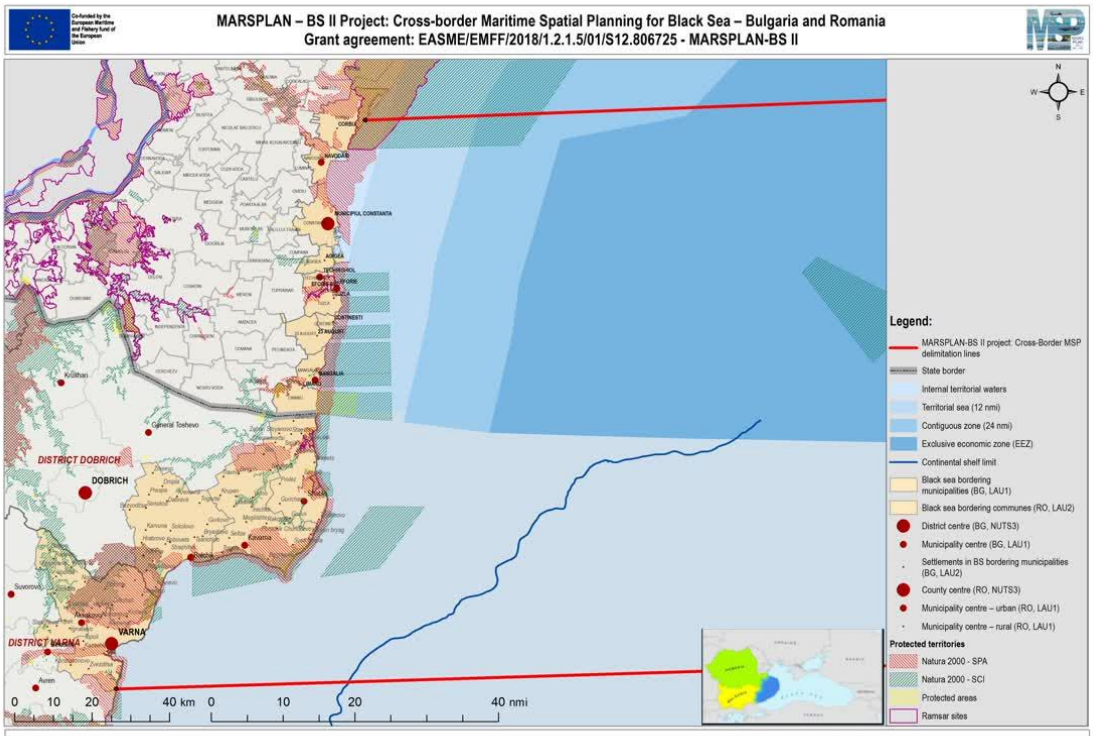
8.2.3. MARSPLAN BG-RO Cooperation



Waste water plants (RO), Discharge points (BG) and Black sea tourism (BG)

Source: BG: EMODnet, NCRD, 2019, RO: Data from MARSPLAN-BS Project

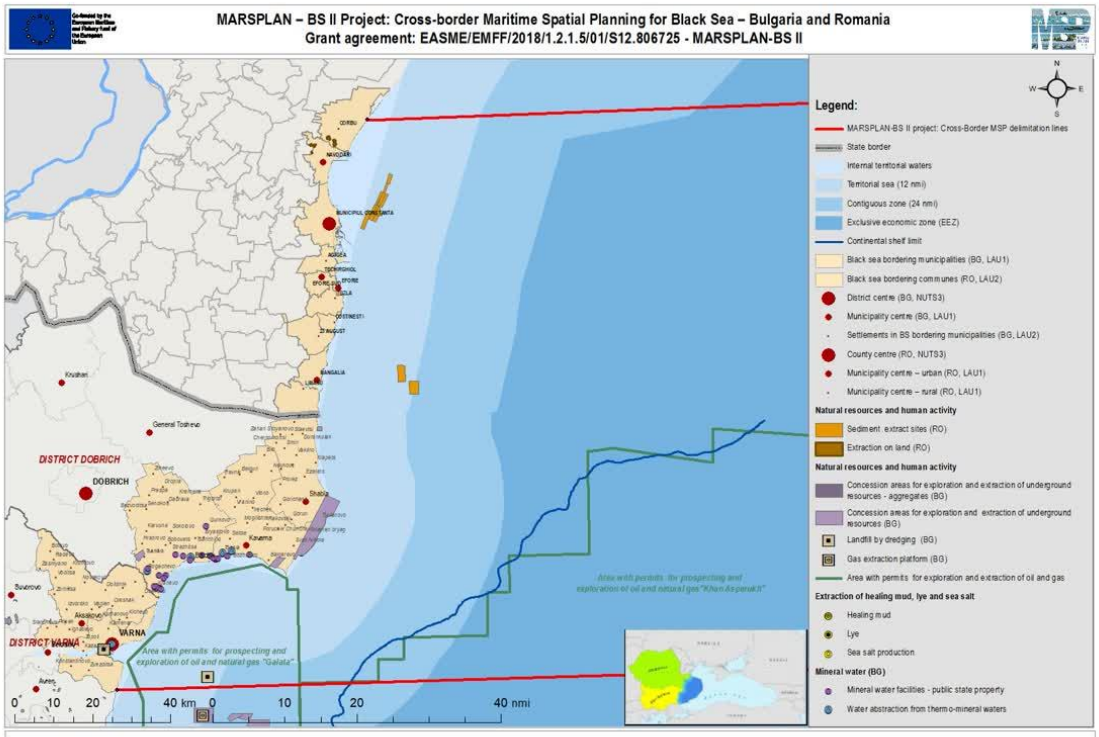
8.2.4. Natural protected areas and protected sites



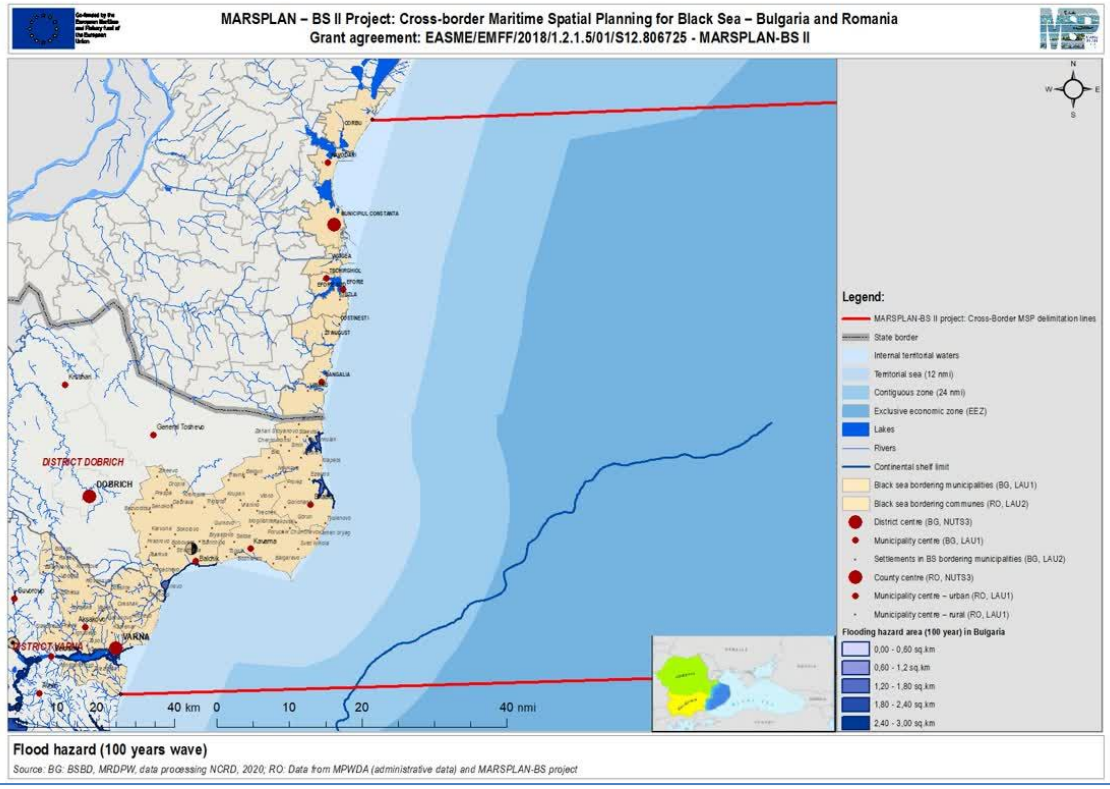
Protected Territories: Bulgaria and Romania

Source: BG: MOEW, EEA, NCRD, 2019; RO: MPWDA (administrative data) and MARSPLAN-BS project

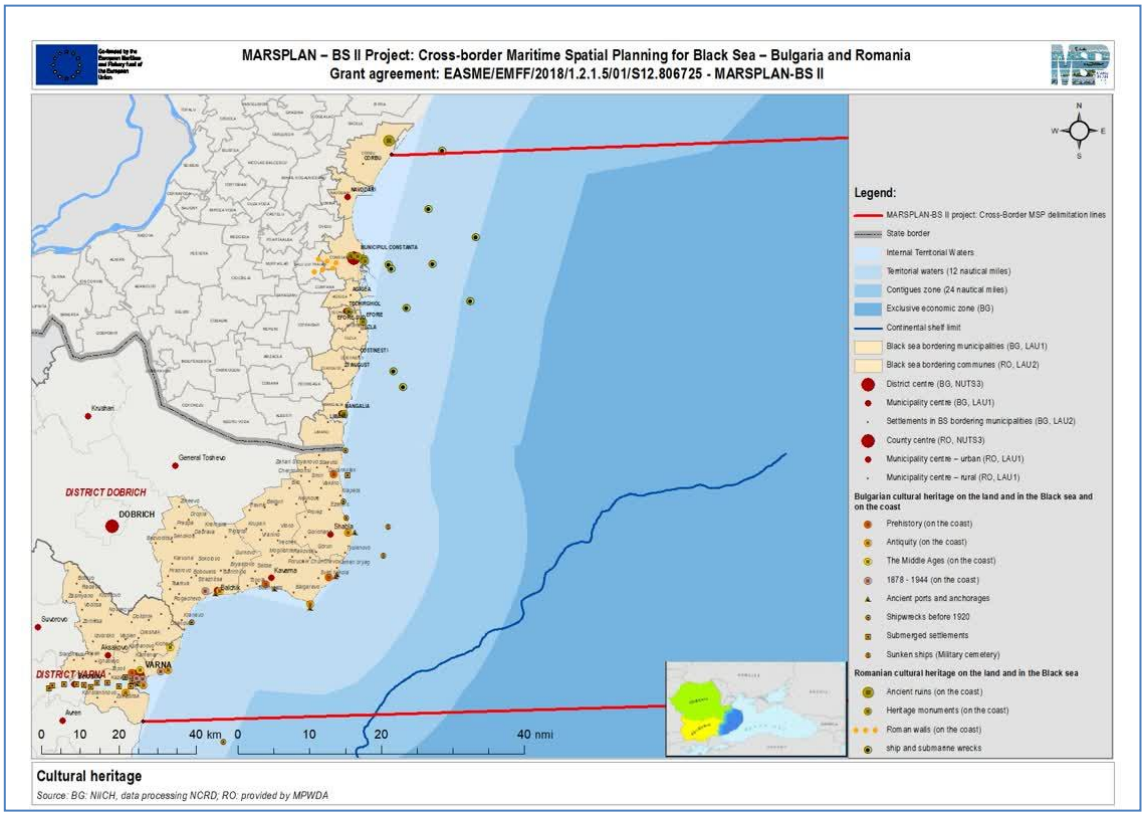
8.2.5. Natural Resources



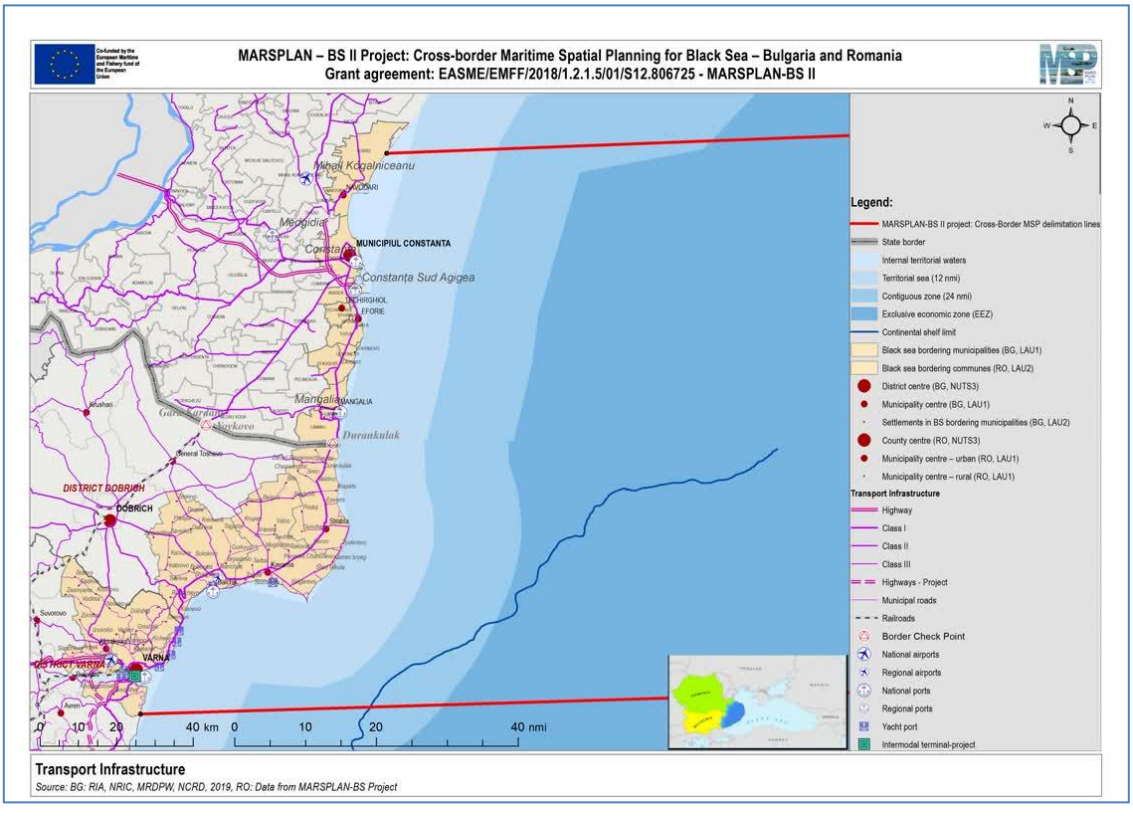
8.2.6. Natural – Flood Hazard



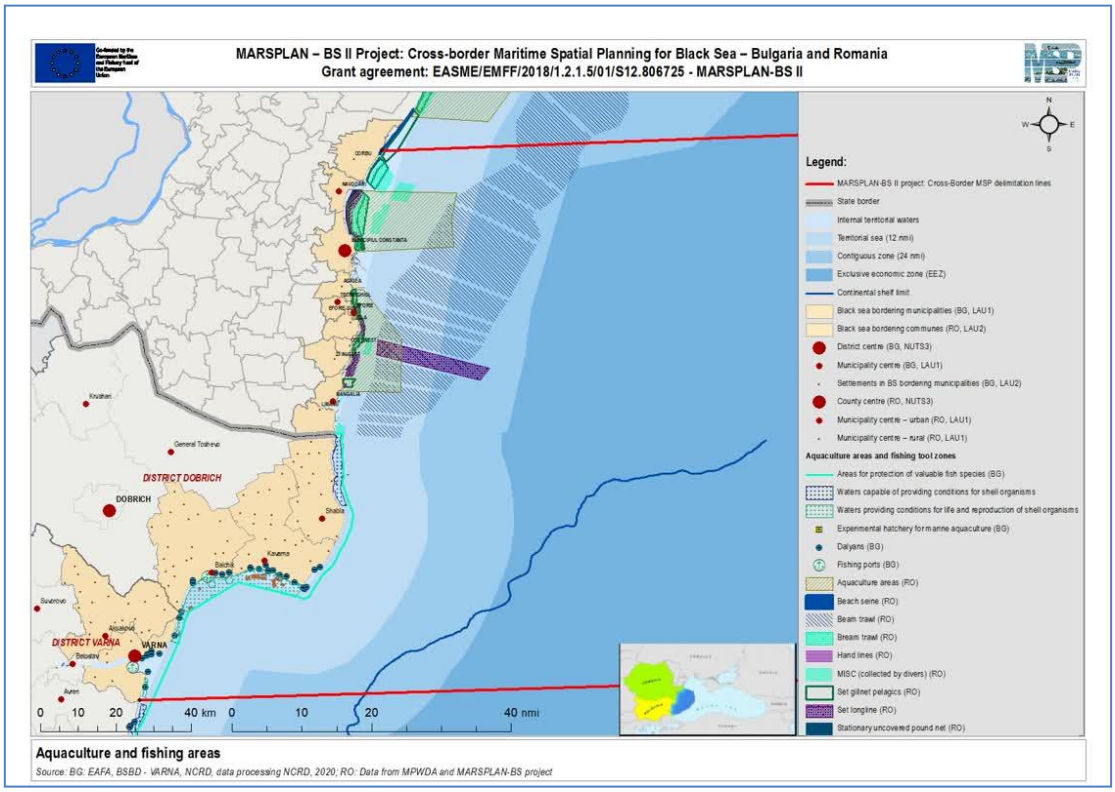
8.2.7. Cultural heritage and underwater archaeology



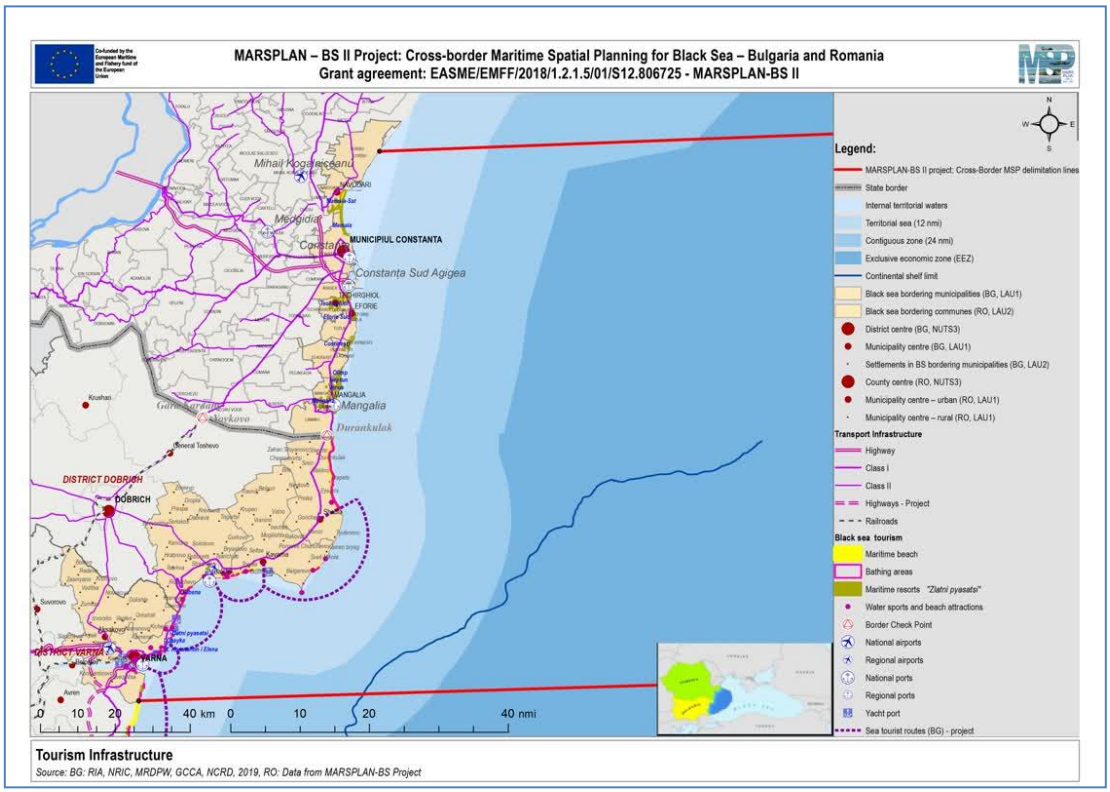
8.2.8. Transport Infrastructure



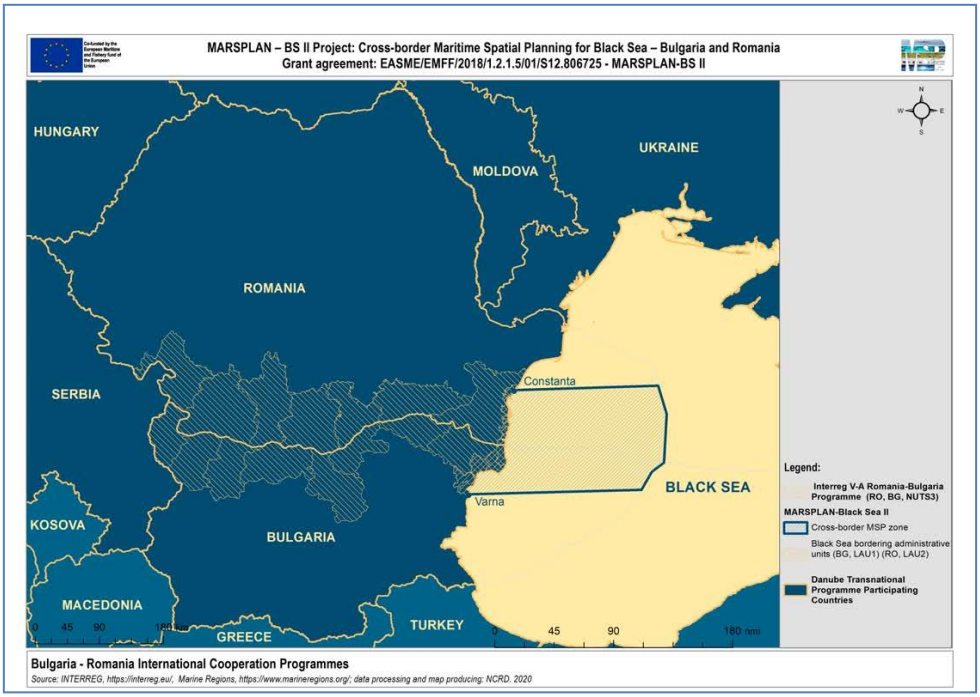
8.2.9. Fishing and Aquaculture Areas



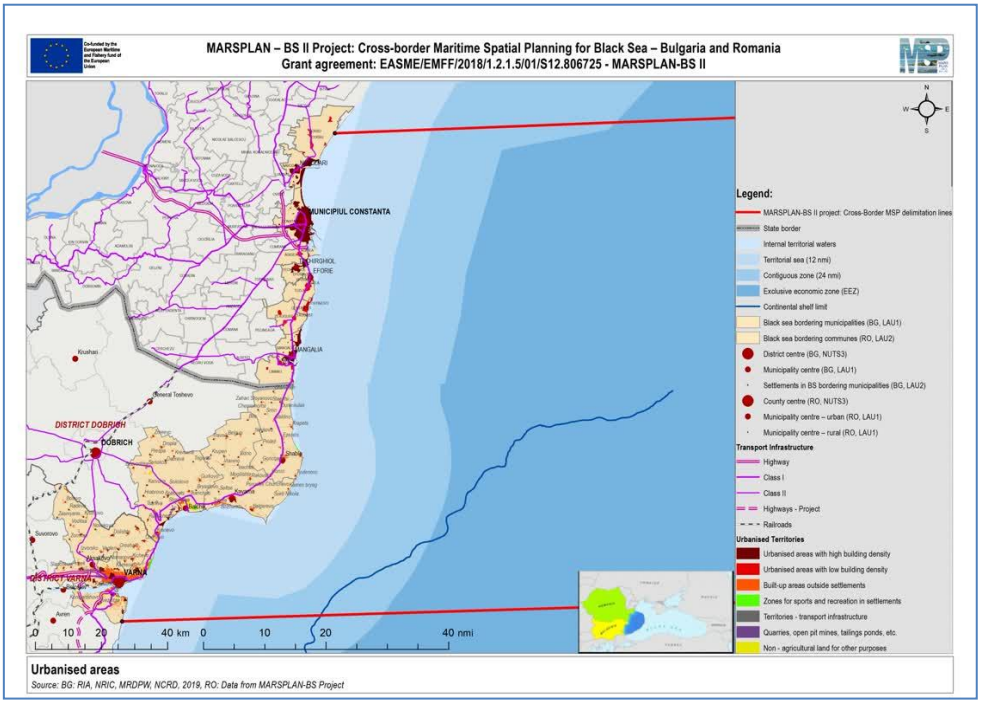
8.2.10. Tourism infrastructure, recreational sites, tourist zones and water sports



8.2.11. Tourism Risks Waste Water Treatment network



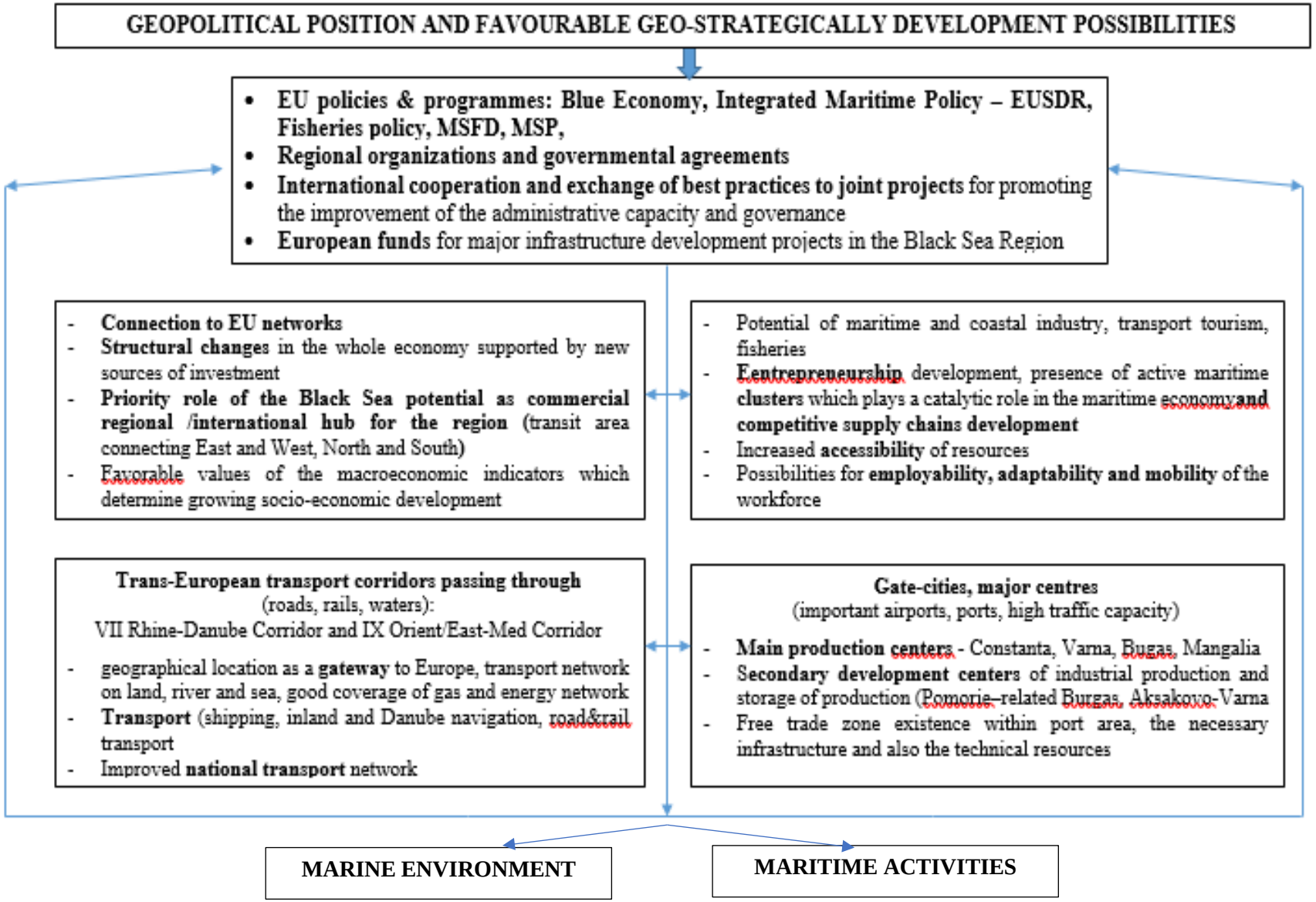
8.2.12. Urbanized Areas



8.3 . MAIN INTERRELATION RESULTS (8.2.1–8.2.9), *Laura Alexandrov*

The regional area of the Black Sea is very important by the geographic, economic and social considerations, taking into account the historical, ecological and cultural specificities. The marine spaces of Bulgaria and Romania, EU member States, have both significant features:

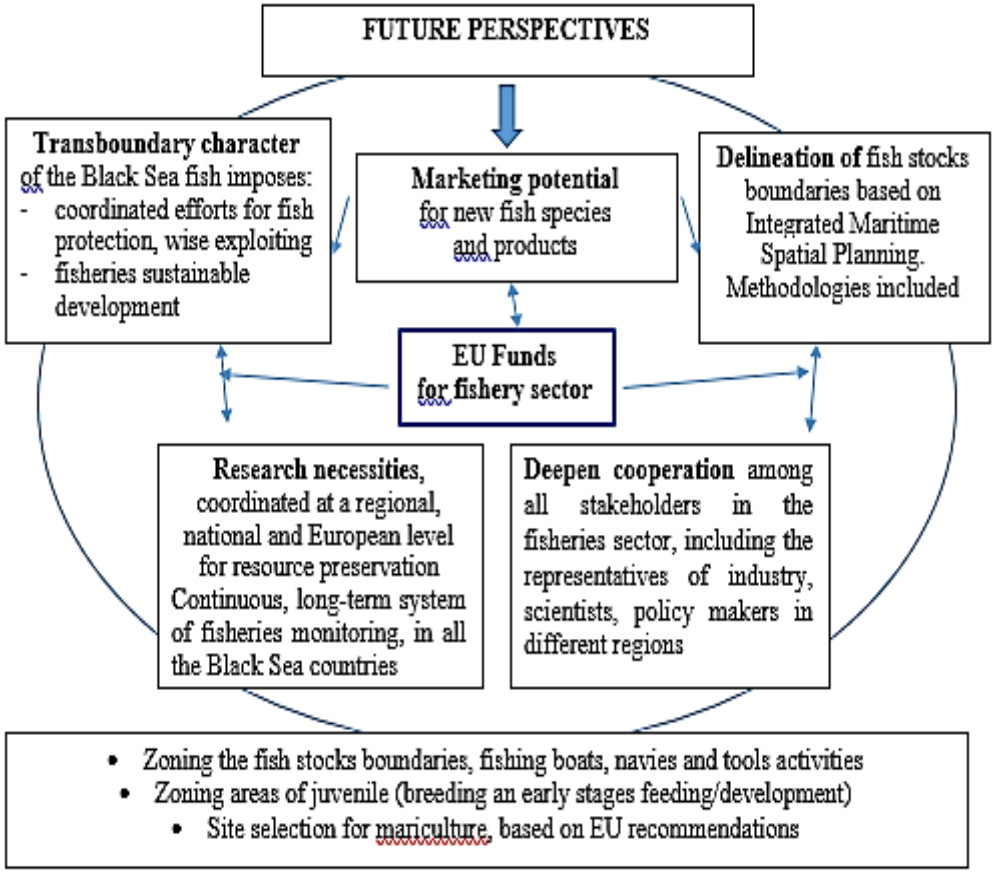
8.3.1. Geo-Strategically Development in the Black Sea area



8.3.2. Maritime Activities

MARITIME ACTIVITIES

FISHERIES IN PRESENT
• Fish, is the most important living resource, common for all Black Sea countries • Transboundary character of it imposed coordinated efforts exploiting and protection and sustainable development • The Directorate-General for Maritime Affairs and Fisheries (DG MARE) is responsible for the fisheries management policy • Commercial fisheries lie in the European coordination and regulation • Bulgaria and Romania have elaborated National Strategic Plan and Strategy for Fisheries and Aquaculture, 2014-2020 • Extension of the *Rapana* specie in the last years catches
AQUACULTURE
• Absorption of EU funds for marine fisheries and aquaculture: programs, research, infrastructure, fishing tools, gears, equipment, people employment, fish and seafood processing • Many possibilities exist for the cultivation of Black Sea native mussels in Bulgaria • Creation of the Demonstrative Center for specialists in aquaculture

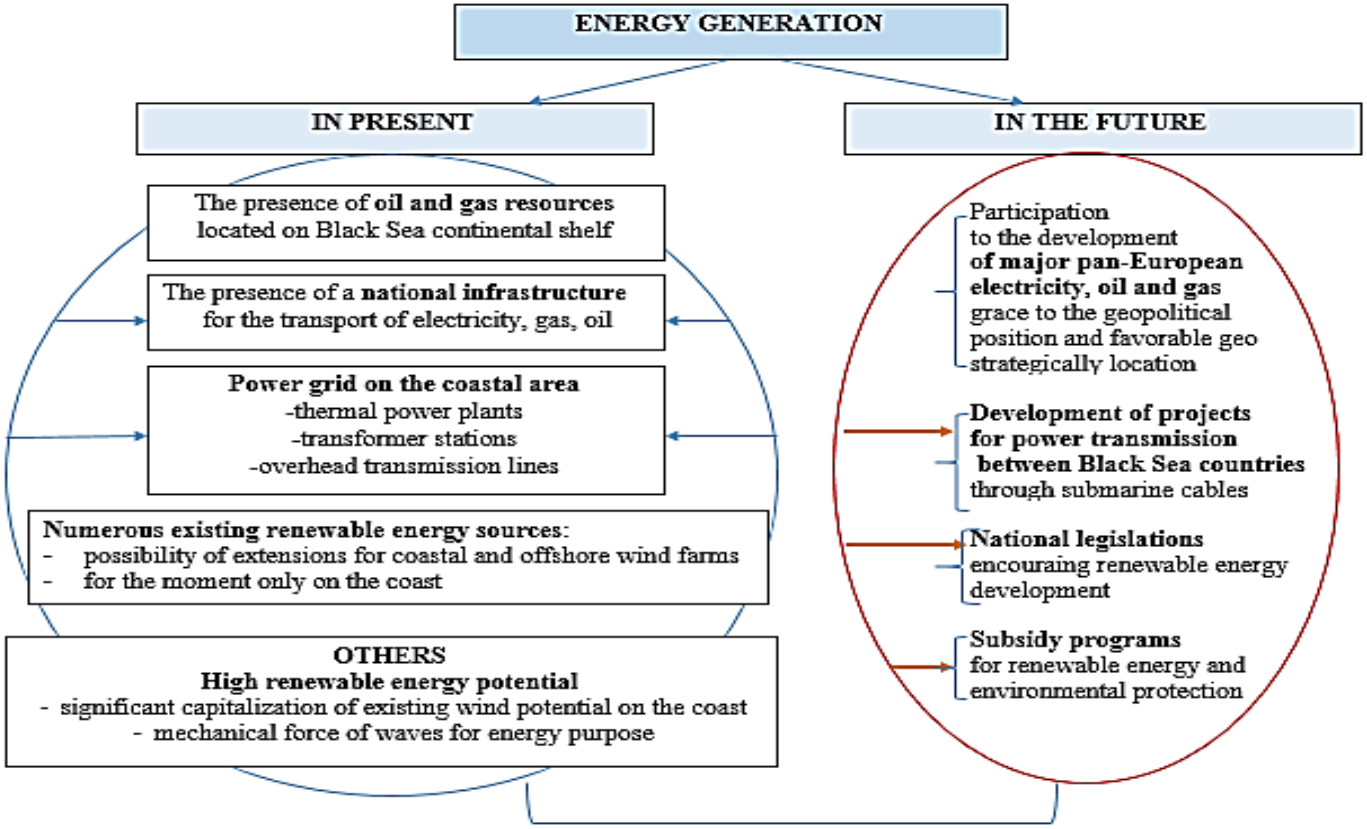


8.3.3. Human Activities, Pressures and their Impacts

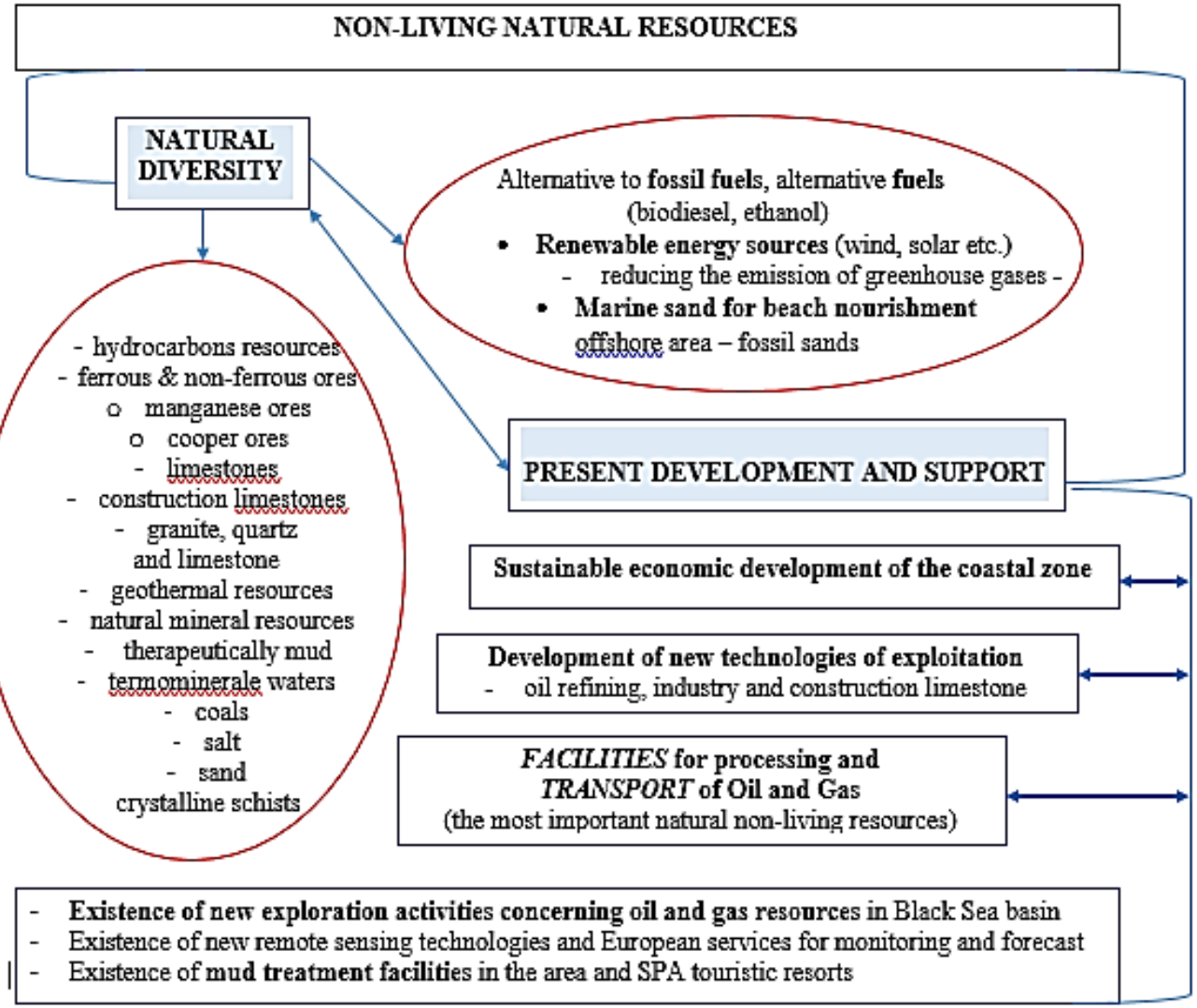
Present Human activities	Present and potential pressures and impacts	Possible consequences, measures, mitigation, improvement
Fisheries (fish and shellfish) including recreational fishing	Overfishing, seabed disturbance, pollution from processing plants, marine litter (ingestions & entanglement)	Possible disruption of marine food chains
Seaweed and other sea-based food harvesting (shellfish, bird eggs, etc.)	Overexploiting, seabed disturbance, pollution from processing plants, marine litter (ingestions & entanglement)	Disruption of marine food chains, Domains, possible to be more developed
Extraction of genetic resources / bio-prospecting / maerl (blue technology)	Uncertain yet,	Possible low impacts related to seabed life disturbance or bio-pollution (artificial reefs)
For Rapana, STECF does not consider FMSY to be an appropriate target, given that it is an invasive, predatory species, with negative impact on other species which are native in the Black Sea. All commercially important stocks should be managed in accordance with the principle of maximum profitability, sustainable (MSY).	The regulatory framework in the field of fisheries is promoted, being very little harmonized at regional level, even in the case of migratory species; only Bulgaria and Romania apply the EC Common Fisheries Policies (CFP) according to their national legal system; only for sprat and turbot DG MARE/EU allocated fishing quotas and management plans only for turbot and shark are developed by GFCM). The confidence level of the evaluation is low proved by several elements carried out by STECF and GFCM at regional level.	- Lack of dedicated research on migration and stock distribution - Stock assessment and monitoring fragmented, irregular - Data collected are incompatible with purpose of evaluation - Knowledge gaps are due to the way of data collection at regional level and their lack of credibility While Romania and Bulgaria have EU-funds for National Fisheries Data Collection Programs, the rest of the Black Sea countries are not constrained to collect fisheries data in the same standard format.
Aquaculture (fin-fish and shellfish)	- For fish; From shells aquaculture	Water pollution, escapes of alien species, water filtration
In Bulgaria there 33 farms of mussels cultivation. In Romania, there were few attempts by some individuals interested in reproducing small mussels. Inadequate legislation and a lack of funds for investment have led to stagnation in the mariculture business. Only a private company operated in the Romanian marine space, located in the southern part of Constanța, having as object the growth of *Mytillus galloprovincialis* mussels in the Black Sea water, with an annual production of only a few tons	This company has made efforts to introduce into the arrangement of the Japanese oyster, Crassostrea gigas, acclimatized and cultivated offshore, with the support of NIMRD. - In the northern part of Constanța (approx. 20 km) a marine fish farm was built with 50 pools, specially designed for raising turbot and flounder species, through Norwegian technology, in a recirculating system, which is also currently closed.	
Other marine aquatic products cultivation is possible	Research regarding all marine organisms groups have been made finalized with technologies elaboration, ready to be implemented by investors in marine waters of pontic areas.	Possible growing of algae

Present Human activities	Potential pressures and impacts	Possible consequences, measures, mitigation, improvement
Submarine cable and pipeline operations	Aggravation of coastal erosion in other sites, seabed occupation (high-density hotspots),	-Sand extraction, obstruction of sediment movement, -Land requirements for transmission facilities, installation works
Marine-based renewable energy generation (wind, wave and tidal power)	Claims to land and sea areas, installation works (including noise),	Visual seascape impact, refuge zone for marine organisms
Marine hydrocarbon (oil and gas) exploiting	Leaks from drilling works and operation of platforms	Installation and decommissioning of oil and gas platforms

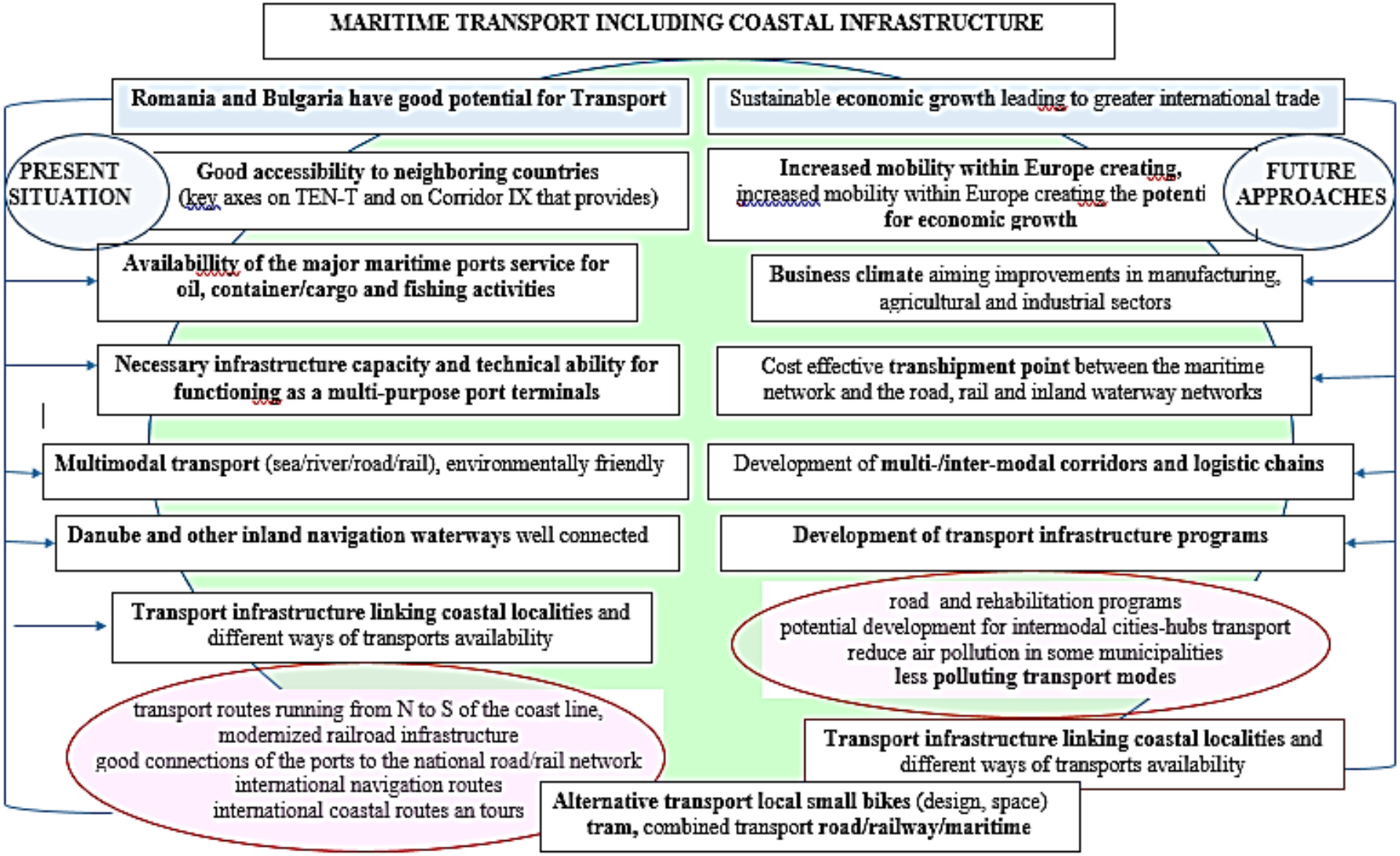
8.3.4. Energy Generation



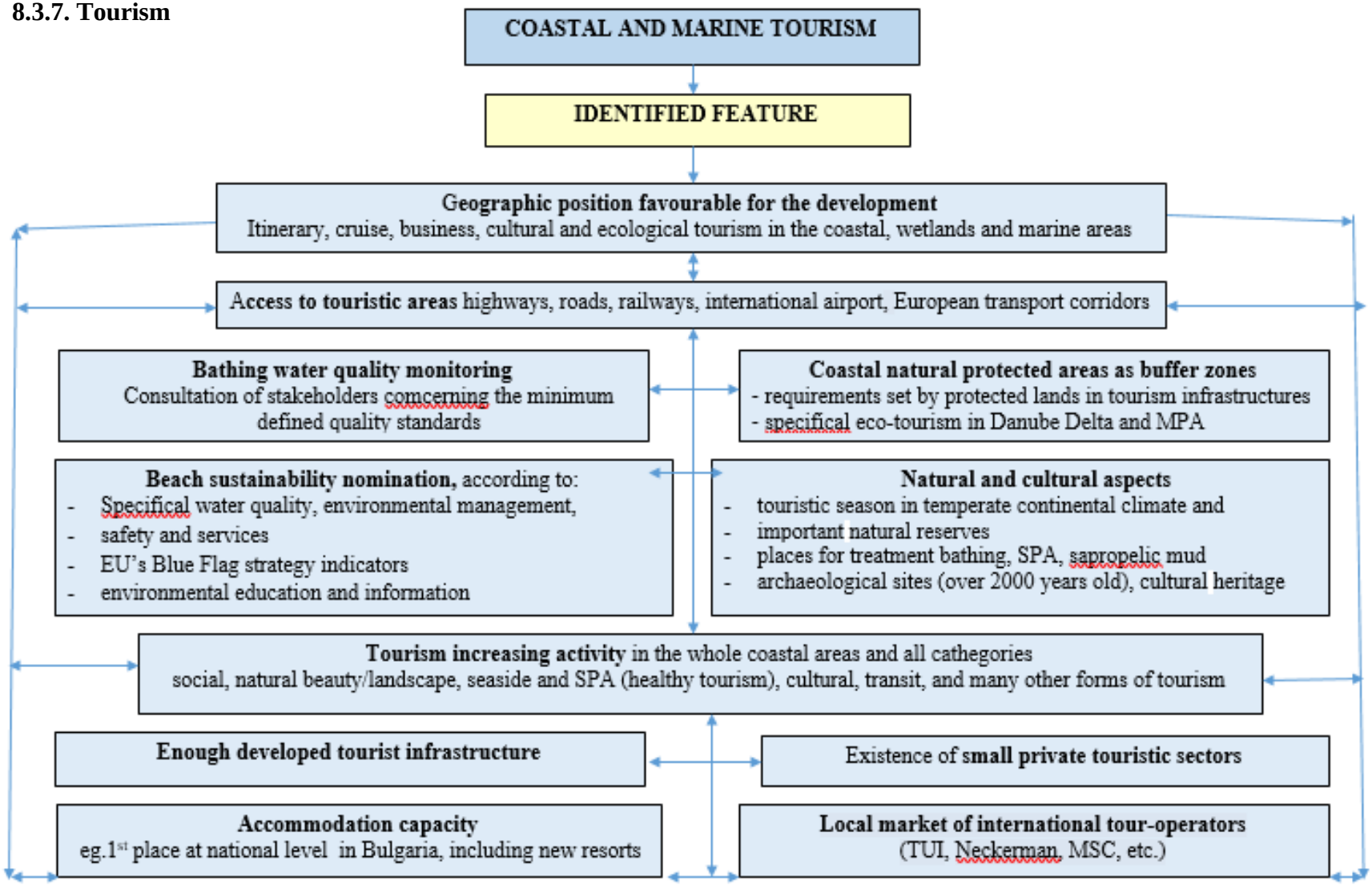
8.3.5. Non-living natural resources



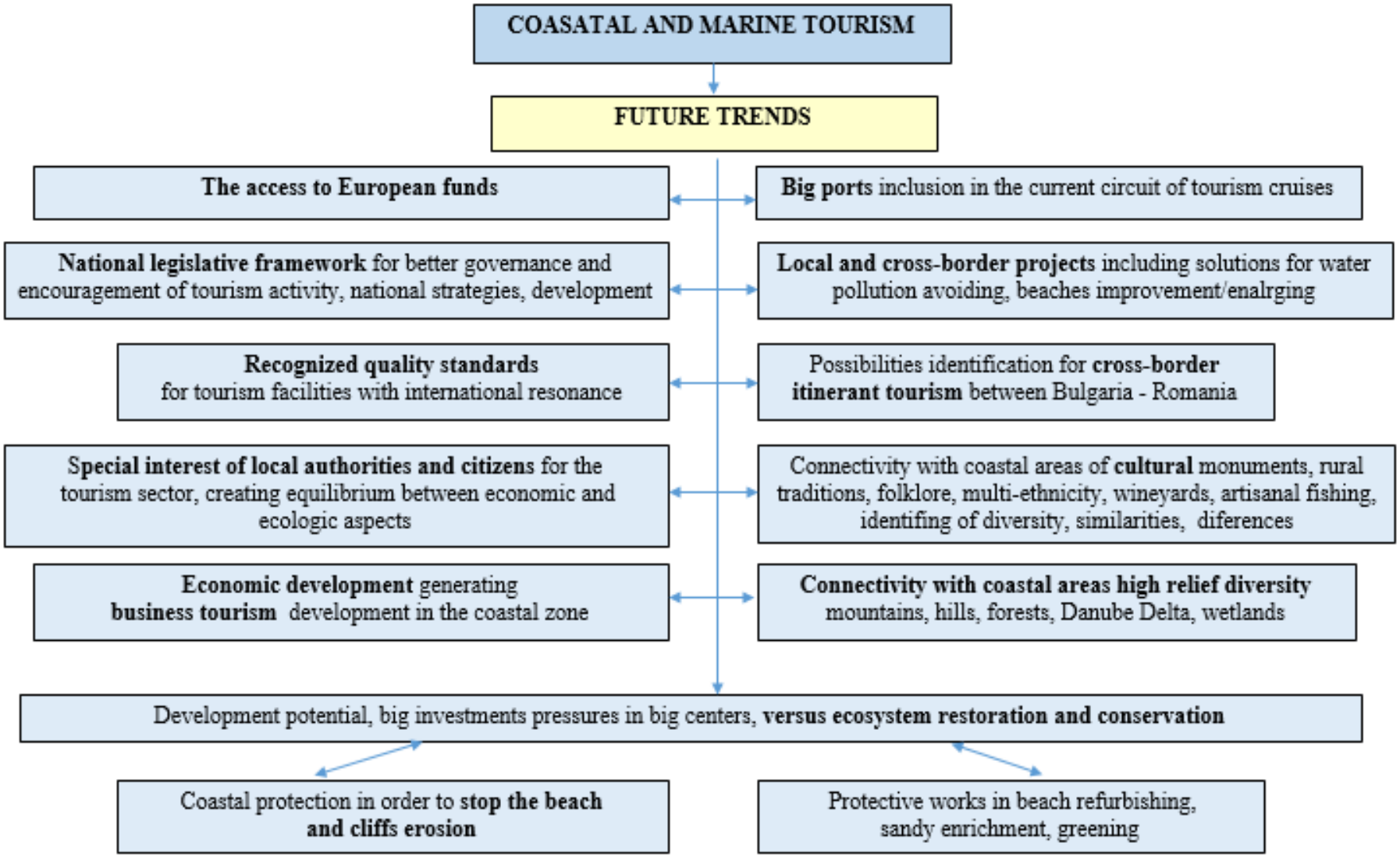
8.3.6. Maritime Transport and Coastal Infrastructure



8.3.7. Tourism


COASTAL AND MARINE TOURISM
IDENTIFIED FEATURE
Geographic position favourable for the development
Itinerary, cruise, business, cultural and ecological tourism in the coastal, wetlands and marine areas
Access to touristic areas highways, roads, railways, international airport, European transport corridors
Bathing water quality monitoring
Consultation of stakeholders comcerning the minimum defined quality standards
Coastal natural protected areas as buffer zones
- requirements set by protected lands in tourism infrastructures
- specifical eco-tourism in Danube Delta and MPA
Beach sustainability nomination, according to:
- Specifical water quality, environmental management,
- safety and services
- EU's Blue Flag strategy indicators
- environmental education and information
Natural and cultural aspects
- touristic season in temperate continental climate and
- important natural reserves
- places for treatment bathing, SPA, sapropelic mud
- archaeological sites (over 2000 years old), cultural heritage
Tourism increasing activity in the whole coastal areas and all cathegories
social, natural beauty/landscape, seaside and SPA (healthy tourism), cultural, transit, and many other forms of tourism
Enough developed tourist infrastructure
Existence of small private touristic sectors
Accommodation capacity
eg.1st place at national level in Bulgaria, including new resorts
Local market of international tour-operators
(TUI, Neckerman, MSC, etc.)

8.3.8. Tourism


COASATAL AND MARINE TOURISM
FUTURE TRENDS
The access to European funds
Big ports inclusion in the current circuit of tourism cruises
National legislative framework for better governance and encouragement of tourism activity, national strategies, development
Local and cross-border projects including solutions for water pollution avoiding, beaches improvement/enalrging
Recognized quality standards for tourism facilities with international resonance
Possibilities identification for cross-border itinerant tourism between Bulgaria - Romania
Special interest of local authorities and citizens for the tourism sector, creating equilibrium between economic and ecologic aspects
Connectivity with coastal areas of cultural monuments, rural traditions, folklore, multi-ethnicity, wineyards, artisanal fishing, identifing of diversity, similarities, diferences
Economic development generating business tourism development in the coastal zone
Connectivity with coastal areas high relief diversity mountains, hills, forests, Danube Delta, wetlands
Development potential, big investments pressures in big centers, versus ecosystem restoration and conservation
Coastal protection in order to stop the beach and cliffs erosion
Protective works in beach refurbishing, sandy enrichment, greening

8.3.9. Tourism Activities, Pressures and their impacts

Present Human activities	Potential pressures and impacts	Possible consequences, measures, mitigation, improvement
Marine and coastal tourism	Plant and soil trampling, wildlife disturbance, littering	removal from nature
Recreational activities (e.g., bathing)	Organic pollution, turbulence,	wildlife disturbance
Yachting and marinas	Exhausts from outboard engines, marine litter, oil pollution from the boat engines on beach (oil supply) and on the sea water (loss of oil)	Wildlife disturbance,
Cruise tourism	Discharges from cruise vessels in sea waters and in ports,	navigation traffic control
At first sight tourist activities are the least polluting, it is proved that over time they can have undesirable effects, like in the protected areas where is not taken into account the respect of ecological carrying capacity and the particularities of each protected area. .	The lack of an adequate spatial planning program proved to be detrimental to both the natural and the business environment. If the national legislation in force for spatial planning is not applied, it is responsible for the chaotic development and the tourism activity due to the lack of restrictions imposed on private entrepreneurs. This relationship is complex: on the one hand, the natural environment, through its components, provides basic resources for the tourism sector, on the other hand, tourism has both a positive and a negative impact on the environment, by changing its components. The tourism sector in Romania is affected by the absence of a general policy of management and orientation of the sector. A Master Plan for the development of tourism in Romania was drawn up over ten years ago, but its recommendations have never been implemented. In recent years, technical assistance has been provided by the United Nations Development Program (UNDP) and several non-governmental organizations and donor agencies including USAID, GTZ and CHF International for a number of separate projects (such as the National Tourism Authority).	The environment-tourism relationship has a special significance, the protection and conservation of the environment being probably the essential condition for the progress and development of tourism. Although the tourism sector has undoubtedly benefited for the most part from this assistance, the isolated implementation of these measures, without being integrated into a general strategic plan, seems to be generating partial results.
Currently, all coastal and marine activities that could change hydrographic conditions are at a scale (less than 2.5 km2) that is unlikely to produce adverse effects, although there may be some localized effects. It is very difficult to establish and quantify the cumulative hydrographic impacts in the assessment areas, and the lack of data and the current level of knowledge do not allow the establishment of threshold values.	The development and all activities development in the coastal and marine area are subject to environmental legislation and regulations. All anthropogenic developments must meet the requirements of the current legislative framework and environmental assessments must be carried out in such a way that the potential effects of permanent changes in hydrographic properties, including cumulative effects, are taken into account at the most appropriate spatial scale. It is an indicator for D7	

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Defining and analyzing existing conditions in the maritime space, support for Maritime Spatial Planning

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MARSPLAN Partnership

Ministry of Public Works, Development and Administration

MRDPW-BG, MDPWA-RO, NCRD-BG, NIMRD-RO, CCMS-BG, GeoEcoMar-RO, UOC-RO, NVNA-BG,

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Support the work of national competent authorities in charge of developing and implementing maritime spatial plans
WP1, Activity 1.1, Component 1.1.2

June 2021