



ROMANIAN HYDROGRAPHIC MARITIME DIRECTORATE



ROMANIA NATIONAL REPORT 2023

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1. HYDROGRAPHIC OFFICE

According to the Romanian Law no 395/2004, The Ministry of National Defense, through the Maritime Hydrographic Directorate(MHD), is the national authority in the field of maritime hydrographic activity.

MHD creates, manages and keeps up-to-date the data and information fund on cartography, marine geodesy, maritime navigation and navigational safety through lighthouse insurance actions.

The Directorate is committed to bilateral arrangements, developed in co-operation with other international government hydrographic authorities, regarding data exchange.

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Steps are being taken to update Law no 395/2004 to be in line with international legislation.

2. SURVEYS

Coverage of new surveys

Hydrographic, oceanographic and topographic surveys were executed in the Romanian area up to the 1000m bathymetric and at this time we have completed up to 60% of the Romanian coast where the bathymetry has an effect on the safety of navigation, and several surveys were done for military exercises.

In 2023 we have performed the following surveys:

- ✓ Topographic survey of the entire Romanian coastline (yearly activity). During this activity we verify the erosion process and the effects of sediments from Danube River and also the activities done in order to preserve the beaches
- ✓ Hydrographic and oceanographic surveys for military purposes;
- ✓ Shoreline surveys for military exercises;
- ✓ Hydrographic surveys, in order to update the national database in the following areas:
 - Constanta Harbor ;
 - Romanian EEZ;
 - Mangalia Harbor;
 - Midia Harbor approach
 - Tulcea Harbor.

Also, in 2023 we performed the specific measurements for expanding and updating the database managed by the "Romanian Mine Warfare Data Center" in order to increase the safety of navigation in the Romanian territorial waters.

Other surveys done by other national authorities based on Romanian national law:

- Surveys of Constanta and Midia Ports - done by Port Authority (the data has been provided to ROU MHD);
- Navigation Channel surveys for the Danube River - done by Romanian Danube Administration.

Survey platforms and equipment

The surveys were done using the following platforms and equipment:

The Romanian Hydrographic ship Cpt. Cdor ALEXANDRU CĂTUNEANU



Equipment: - Multibeam 712 Kongsberg capable of reaching depths that are more than 3000 meters;

- EA 400 Single-beam this system was kept in service;
- Edgetech 3200 side scan that has an integrated sub bottom profiler;
- ADCP system from Kongsberg Simrad EK 80;
- USBL system from Edgetech BATS;
- Kongsberg Seapath 300 series equipped with IMU system V+ series;
- Magnetometer – Marine Magnetics;
- Gradiometer- Marine magnetics.

Survey Launch Hidrografica 3



Equipment: EA 400 Single-beam
Magnetometer - Marine Magnetics

Survey Launch – OCEAN 1



Equipment: T 20 R Multi-beam for bathymetric surveys of water column reaching from 5 to 500m;

Echotrack T 20 Single-beam for ground truth and multibeam nadir area confidence also capable of reaching 3000 m;

Santinel V ADCP for providing profiles up to 300 m depth;

BATS USBL system for positioning underwater equipment or towed systems

Edgetech 4200 side scan sonar;

PosMV positioning with RTK network from shore.

In 2023 was the finalization of the Tender for survey launches with the reception of OCEAN 2.

Survey Launch – OCEAN 2



Equipment: T 20 R Multi-beam for bathymetric surveys of water column reaching from 5 to 500m;

Echotrack T 20 Single-beam for ground truth and multibeam nadir area confidence also capable of reaching 3000 m;

Santinel V ADCP for providing profiles up to 300 m depth;

BATS USBL system for positioning underwater equipment or towed systems

Edgetech 4200 side scan sonar;

PosMV positioning with RTK network from shore.

Fixed stations:

We have at these stage, four locations for tide measurements with Radar systems and 4 RTK fixed stations spread on the Romanian coast line in support of survey operations and data gathering.

3. CHARTS

MDH produces official standard nautical charts (SNC) and electronic navigational charts (ENCs) covering the waters within the national responsibility area. For details see: <https://www.dhmf.ro/en/>.

ENCs

We have a 22 ENC cells portfolio. From 1st March 2022 to 31th January of 2024, MHD has produced: 56 updates, 29 new editions for the cells available. Since June 2022 we have sent to distribution, 3 new ENC cells, band 3 as follows: RO310001, RO310002, RO310003.

MHD intends to maintain the entire ENC portfolio through New Editions and updates.

Usage band	Navigation purpose	No of cells released	No of cells planned for production(this year)
1	Overview	N/A	N/A
2	General	1	N/A
3	Coastal	3	N/A
4	Approach	6	N/A
5	Harbor	5	N/A
6	Berthing	7	N/A
Total		22	



Figure 1. General band, scale 1:350000, covering Romanian Coast

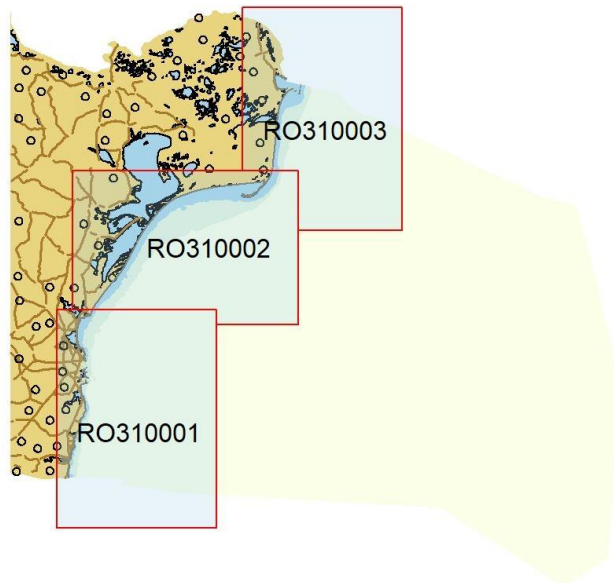


Figure 2. Coastal band, scale 1:90000, covering Romanian Coast

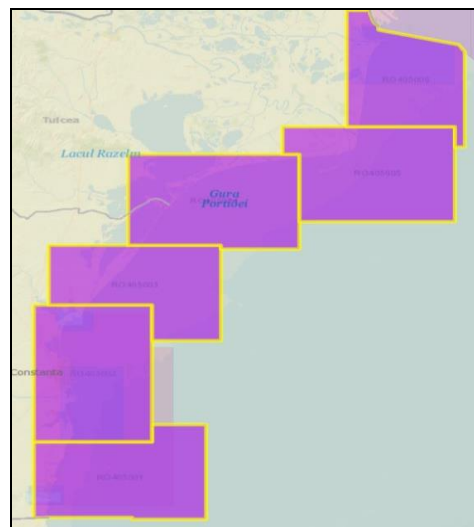


Figure 3. Approach band, scale 1:45000, covering Romanian Coast

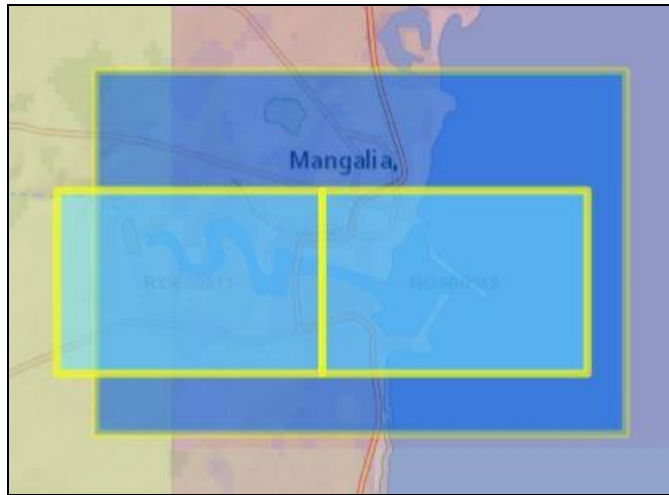


Figure 4. Harbor and berthing bands - Port of Mangalia

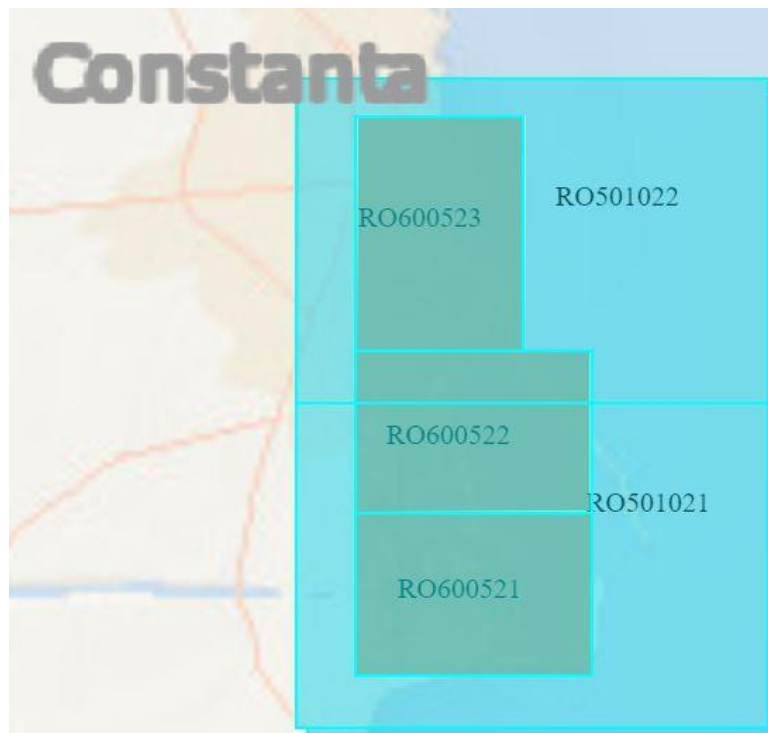


Figure 5. Harbor and berthing bands - Port of Constanța

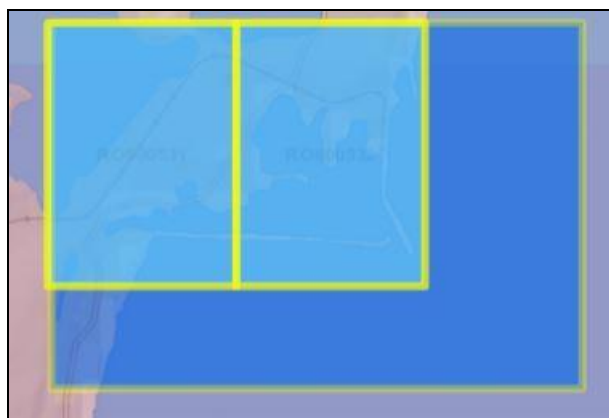


Figure 6. Harbor and berthing bands - Port of Constanța – Zone Midia



Figure 7. Harbor band - Port of Sulina

ENC distribution method

MHD distributes its ENCs through IC-ENC RENC.

RNCs

Romania does not produce RNCs.

INT Paper Charts

Romania has in its portfolio 6 INT numbers which cover the entire Romanian coast of the Black Sea and the Romanian ports.

The current status of INT charts produced by MHD is:

INT No.	SCALE	MAIN TITLE	Edition Year
3820	1:300000	<i>From Kaliakra to Danube Delta</i>	2021
3902	1:10000	<i>Port of Mangalia</i>	2021
3904	1:10000	<i>Port of Constanta – Midia zone</i>	2021
3905	1:30000	<i>Port of Constanta and approaches</i>	2021
3907	1:50000	<i>From Gura Sf.Gheorghe to Gura Musura</i>	2021
3908	1:30000	<i>Port of Sulina and approaches</i>	2021

The new edition of INT 3820 is planned to be published in 2024.

Details on MHD INTs (title, chart limits, current status etc.) are accessible for all chart users in IHO Web Catalogue (Figure 8). Although MHD tried to update the current status of INT charts the update has still not been recorded in IHO Web Catalogue due to some technical problems.

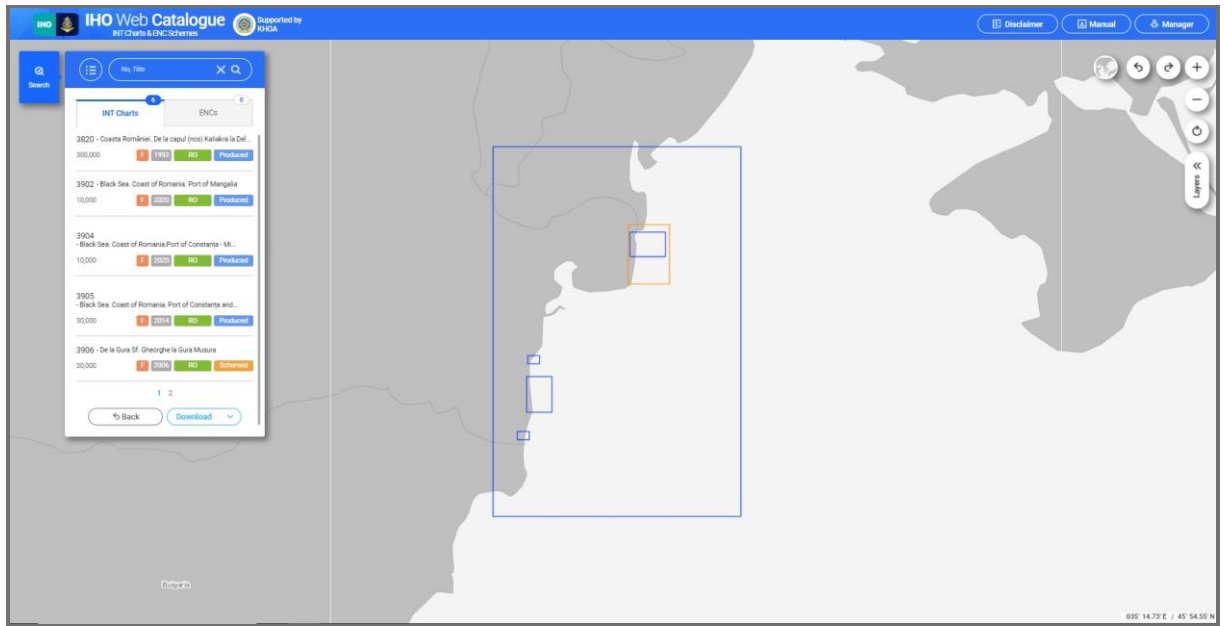


Figure 8. IHO Web Catalogue – Romanian INT charts

National Paper Charts

From 1st March 2022 to 31th January of 2024, RO MHD has published new editions for 11 national paper charts (all in WGS-84 datum):

Chart No.	SCALE	MAIN TITLE	Edition No.
1.005.11	1:5000	Portul Mangalia. Partea de vest	3 rd Edition
1.005.12	1:5000	Portul Mangalia. Partea de est	4 th Edition
1.005.21	1:5000	Portul Constanța	3 rd Edition
1.005.22	1:5000	Portul Constanța	3 rd Edition
1.005.24	1:5000	Portul Constanța	3 rd Edition
1.005.31	1:5000	Portul Constanța - Zona Midia. Partea de vest	4 th Edition
1.005.32	1:5000	Portul Constanța - Zona Midia. Partea de est	4 th Edition
1.050.01	1:50000	De la Vama Veche la Capul Tuzla	2 nd Edition
1.050.03	1:50000	De la Midia la Grindul Chituc	2 nd Edition
1.050.04	1:50000	De la Grindul Chituc la Zaton	2 nd Edition
1.050.05	1:50000	De la Zaton la Sf. Gheorghe	2 nd Edition

The national charts folio covers Romanian Exclusive Economic Zone and the Black Sea (Figure 9).

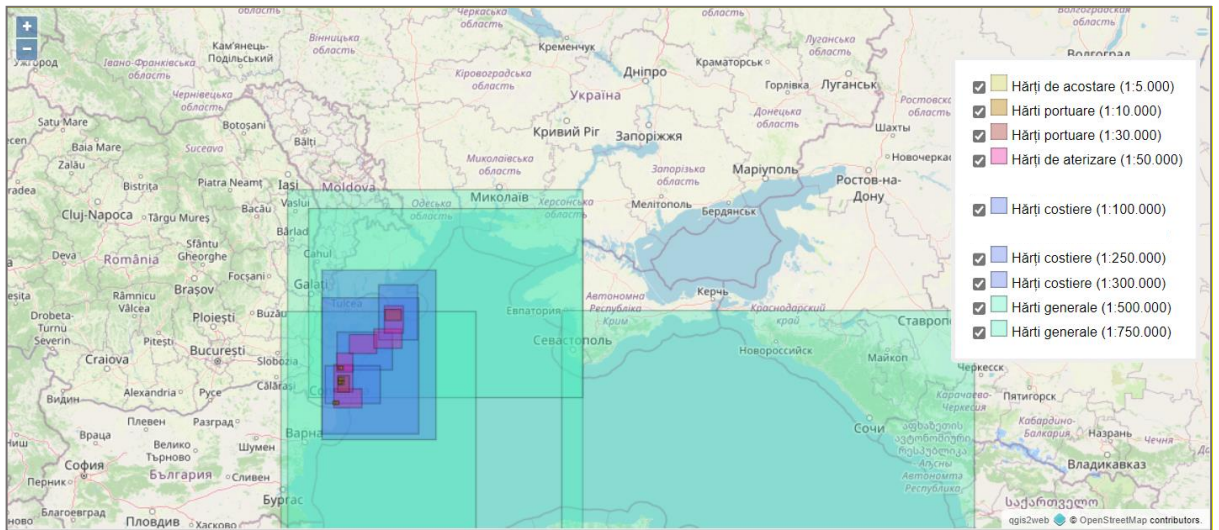


Figure 9. MHD Chart Folio coverage of Black Sea

An intensive work is carried on by the cartographic staff of MHD to produce new editions for the national paper charts older than 2020.

Starting from 2020 all paper charts editions have a QR code that allows the end user to check for updates. Since April 2021, *Updates for paper charts* service is available on RO MHD Internet webpage: https://www.dhmf.ro/en/cautare_an.html

Cartographic Production

The production of paper charts with CARIS Paper Chart Composer is fully established. For ENC's CARIS S57 Composer is the production software.

Since 2017, MHD is using a large format plotter capable of printing high-quality paper charts (Figure 10).

MHD intends to introduce the Print on Demand (PoD) system, using the new A0 print system (Figure 11). This is capable of prints with high image durability and exposure to light over extended periods.



Figure 10. Plotter system



Figure 11. Digital printing system

Problems Encountered: Shortage in specialized human resources.

4. NAUTICAL PUBLICATIONS

MHD Official Notices to Mariners

Notification of the failure of lighthouses or buoys, notification of temporarily prohibited areas and all changes affecting charts in Marmara and Black Sea area are provided, monthly, to users of the marine environment through *Notices to Mariners* (Figure 13), in Romanian and English languages.

MHD publishes every year (Figure 12 and 13):

- Special Edition of Notices to Mariners
- Annex to Special Edition of Notices to Mariners
- Cumulative List of Notice to Mariners

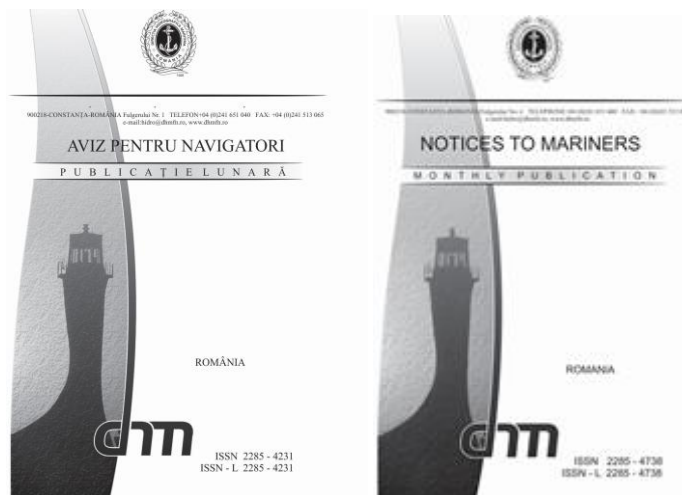


Figure 12. MHD monthly Notices to Mariners



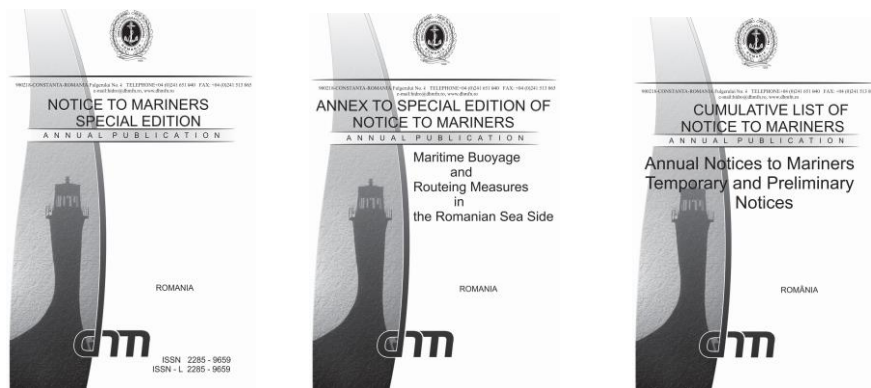


Figure 13. MHD annual Notices to Mariners

Other MHD Nautical Publications

The portfolio includes the following documents:

- The Mariner's Handbook, three volumes, *Romanian language only*
- *Black Sea Pilot, Romanian language only*
- *List of Lights and Fog Signals, Romanian language only*
- *Charts and Nautical Publications Catalogue, Romanian language only*
- *Maritime Buoyage System, Romanian language only*
- *Symbols and Abbreviations used on Romanian Paper Charts, Romanian language only*
- *Nautical Tables, Romanian language only*

All publications are printed and are available only in hard copy format (Figure 14).

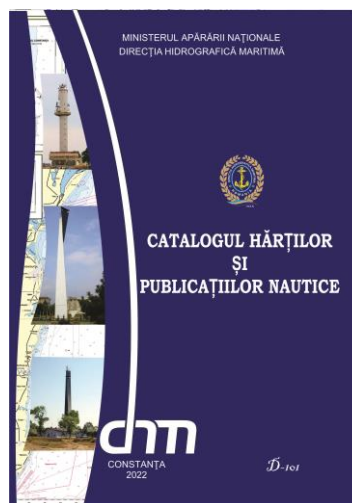
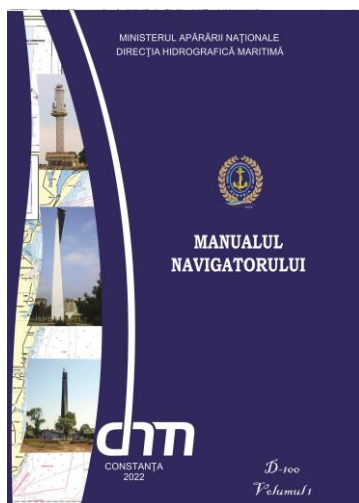


Figure 14. MHD official nautical publications

New Publication/ Edition of Nautical Publications

In 2022 were published:

- The Mariner's Handbook, romanian language, three volumes, new publication;
- Catalogue of charts and nautical publications, romanian language, new edition.



5. MARITIME SAFETY INFORMATION (MSI)

Existing infrastructure for transmission

Maritime Hydrographic Directorate is the national coordinator for navigational warnings. MHD promulgates navigational warnings and is cooperating with NAVAREA III coordinator on behalf of Romania.

Navigational warnings issued by Maritime Hydrographic Directorate are available on MHD website at the following link: <https://niord.dhmf.n.ro/#/messages/details> (Figure 15), on Safety Net for the information that is considered necessary by the NAVAREA coordinator, according to IMO Resolution A.706(17), and on NAVTEX with support from Bulgarian Varna Radio NAVTEX Station.

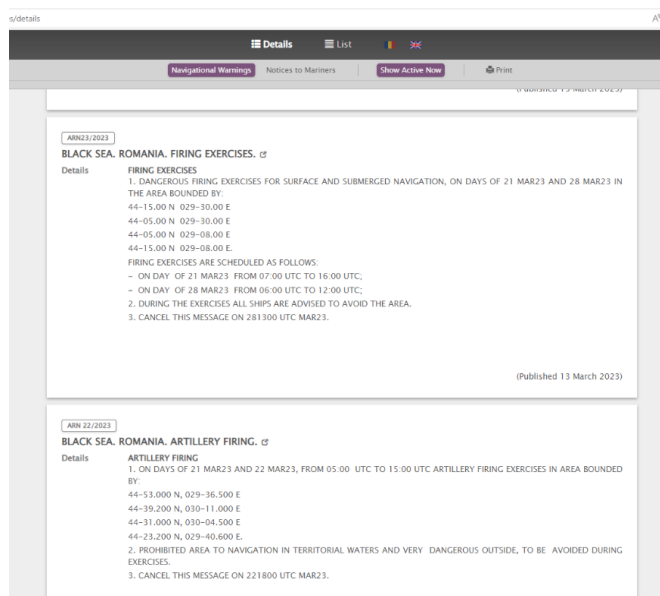


Figure 15 – Romania Maritime Hydrographic Directorate MSI web page -

<https://niord.dhmf.n.ro/#/messages/details>

NAVTEX

Steps have been taken to approve the normative act on the establishment, organization and operation of the NAVTEX service (The normative act was sent for approval).

MSI Services are provided on 7/24 basis. The navigational warnings and meteorological warnings covering Romanian maritime area of responsibility are sent by MHD to Varna Radio, in English language, in order to be broadcasted on 518 KHz.

International NAVTEX service is performed through Varna Radio (on behalf of Romania - as agreed by IMO`s INTERNATIONAL NAVTEX COORDINATING PANNEL).

Coordinates – 43-04 N, 27-46 E;

NAVTEX coverage – 350 nautical miles;

MMSI - 002070810;

B1 character – [J];

Language – English;

Frequency – 518 kHz.

Graphic (UTC)	Navigation and Storm Notices
01:30	•
05:30	•
09:30*	•
13:30	•
17:30	•
21:30*	•

- Forecast on behalf of Romania, received from Constanta Radio

Number of Coastal and NAVAREA Warnings disseminated by MHD are listed below:

Year	NAVTEX Warnings	NAVAREA-III Warnings
2022	108	1
2023	160	1

MSI Equipment

MHD owns a NAVTEX receiver (NAV6/NAVTEX) since 2018, in order to stay up to date with the promulgation of all the MSI messages via NAVTEX in the Black Sea (Figure 16).

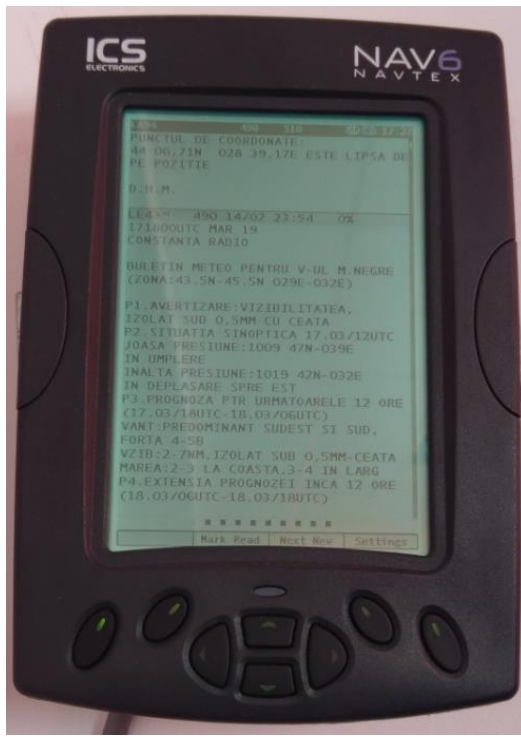


Figure 16. NAVTEX receiver

New infrastructure in accordance with GMDSS Master Plan

Ntr.

Problems encountered

Ntr.

6. SAFETY OF NAVIGATION THROUGH MARITIME SIGNALLING

Our responsibilities are to:

- Operate the aids to navigation for the Romanian coastline;
- Perform the calibration and compensation of the following types of navigation equipment: compasses, hydrodynamic and electromagnetic locks, ultrasonic echo sounder, gyrocompasses, magnetic compasses, hydro-weather equipment, binoculars, alidade, navigation chronometers;
- Provide the maintenance of the coastline aids to navigation and maritime beaconing.

The navigation providing to the Romanian seaside is performed by: 7 landing lights located in Mangalia, Tuzla, Constanta, Midia, Gura Portiței, Sf. Gheorge and Sulina, 1 radiophare in Constanta, 3 entering lights in Mangalia, Constanta and Midia, 3 groups of entering lights in Mangalia, Constanta and Midia, 4 fog signals in Mangalia, Tuzla, Constanta and Sulina.

The Maritime Hydrographic Directorate broadcasts in emergency conditions the coastal radio by NAVAREA III and local radio warnings relating to the safety of navigation and the special weather conditions by the local NAVTEX system (in Romanian) and the coastal radio station (the frequency of 500 kHz , in English).

Maritime Signalling Equipment

LIGHT APPARATUS VLB 44

- The number of floors (1 or 2) and the divergence determine the range between 6 and 10 nautical miles.

- Light apparatus of type VLB-44 is designed for operation at a rated voltage of 12Vac and a maximum voltage of 18Vcc.
- VLB-44 can be synchronized by cable with other lights.
- Colors of light emitted: Red, Green, White

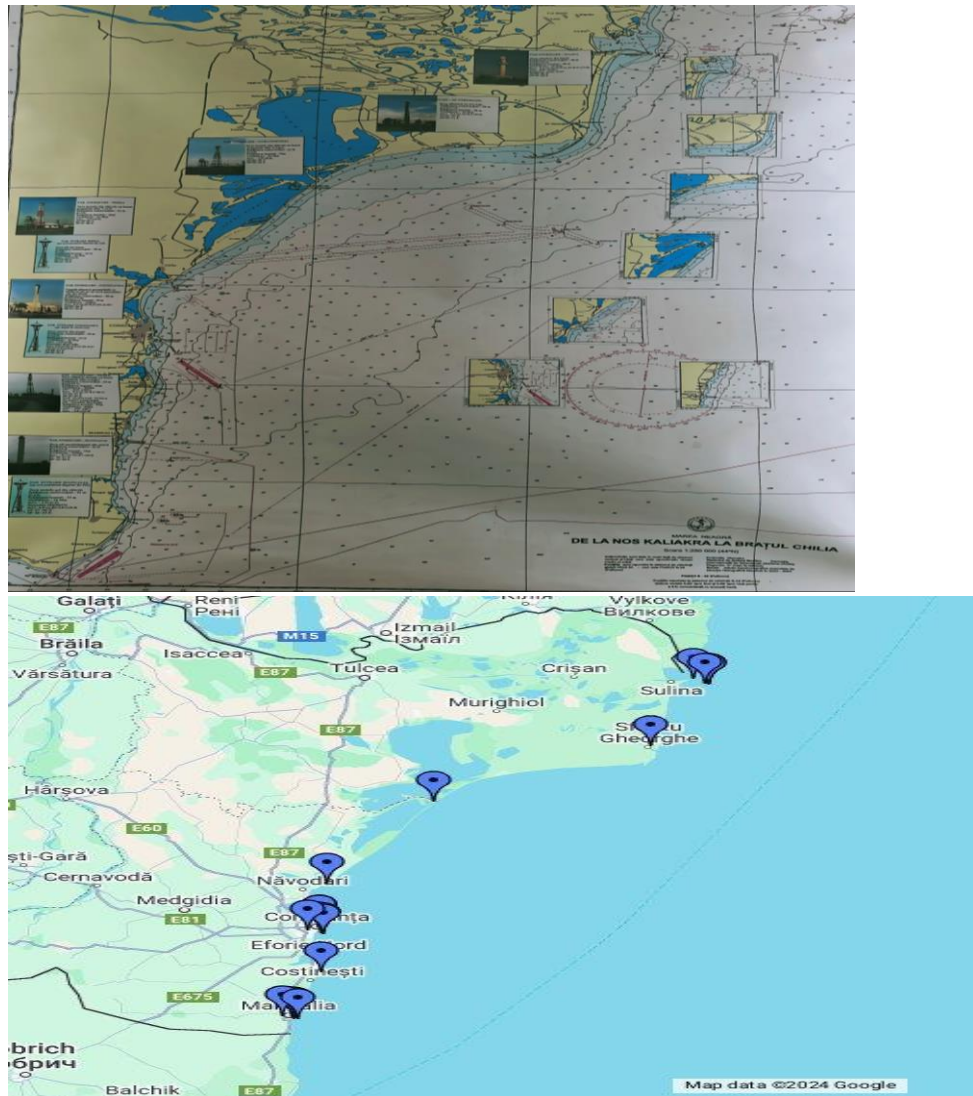
LIGHT APPARATUS VRB 25

Is a light rotating apparatus, designed for marine buoyming for use between 10 and 22 nautical miles. Its energy efficiency and optical quality give it an excellent performance.

The VRB-25 is equipped with a photoelectric (light dependent resistance) detector that detects the ambient light level and illuminates the lamp at dusk. The day/night transition threshold can be adjusted by the user, being factory set to about 100 lux (70 lux ON, 130 lux OFF).

The optical device always operates to prevent any damage caused by focusing sunlight.

Lighthouses



From North to South along the Romanian coast we have a total of 16 lighthouses such as :

- **SULINA LANDING LIGHTHOUSE**

It is located in the point $\varphi = 45^{\circ}08'53''N$, $\lambda = 29^{\circ}45'33''E$, on the south breakwater extremity of Sulina channel. The lighthouse is taken over by the Maritime Hydrographic Directorate in

1996. It has a group of three white flashing lights, period 16.2, range of visibility 240 ° (165 ° - 045 °), visibility 19 nm, height of light 48 m, height of building 48 m, height of tower 47.20 m. The lighthouse tower is a white concrete cylinder with a white cupola on the top.

The lighthouse is equipped with an active radar reflector.

- **SFANTU GHEORGHE LANDING LIGHTHOUSE**

It is put into service in 1968

It is installed on the head of Sf. Gheorghe in the point $\varphi = 44^{\circ}53'57''\text{N}$, $\lambda = 29^{\circ}36'01''\text{E}$. The lighthouse tower is constructed of metal, in the form of two slightly twisted triangular prisms, covered on two sides with stainless steel plates and the other two with polycarbonate plates. It has a group of two white flashing lights, period 7.2 s, visibility 19 nm, height of light 50 m, height of building 48 m.

- **GURA PORTIȚEI LANDING LIGHTHOUSE**

It is put into operation in 1944, being modernized in 1952 and 1958. Due to the flooding of the old location, the lighthouse is moved, in 1966, on the south bank of the former channel Gura Portitei. In 1977 it had a new flood, being moved again on the north bank of the former channel Gura Portiței.

Currently it is located in the point $\varphi = 44^{\circ}40'31''\text{N}$, $\lambda = 28^{\circ}59'14''\text{E}$, having a white flashing light, period 9 s, visibility 10 nm, height of light 22 m, height of building 23 m. The tower is a metal lattice construction in black and white horizontal stripes and a white cupola. Until 1994, the lighthouse operated on acetylene, the year in which it was connected to the national electricity grid.

- **MIDIA LANDING LIGHTHOUSE**

The landing lighthouse of Midia is put into operation in 1942, being modernized and electrified in 1958.

It is installed in the point $\varphi = 44^{\circ}20'50''\text{N}$, $\lambda = 28^{\circ}40'58''\text{E}$. It has a white flashing light, period 5 s, visibility 17 nm, height of light 36 m, height of building 22 m. The tower lighthouse construction consists of red steel frame lattice with white horizontal stripes and a white octagonal cupola.

There is also a **fog signal (nautophone)** issuing the letter "U" in the Morse code, period 30sec.

The entering lighthouse of Midia is put into operation in 1989, being installed on the new breakwater extremity (east) in the point $\varphi = 44^{\circ}19'16''\text{N}$, $\lambda = 28^{\circ}41'40''\text{E}$. It has a white flashing light, period 5 s, visibility 10 nm, height of light 25 m, height of building 18 m. The tower white concrete building.

The green entering light of Midia is put into operation in 1989, being installed on the south breakwater extremity in the point $\varphi = 44^{\circ}19'28''\text{N}$, $\lambda = 28^{\circ}41'31''\text{E}$. It has a green flashing light, period 5 s, visibility 6 nm, height of light 14 m, height of building 9 m, a white concrete tower with a glass cupola in the top.

The Red entering light of Midia is put into operation in 1989, being installed on the south end of the breakwater in the point $\varphi = 44^{\circ}19'24''\text{N}$, $\lambda = 28^{\circ}41'22''\text{E}$. It has a red flashing light, period 5 s, visibility 6 nm, height of light 14 m, height of building 9 m, a white concrete tower with a glass cupola in the top.

- **CONSTANȚA LANDING LIGHTHOUSE**

The **landing lighthouse** of Constantza is put into operation in 1960.

It is located in $\varphi = 44^{\circ}09'29''\text{N}$, $\lambda = 28^{\circ}37'49''\text{E}$. It has a white light with two flashes group, period 29.8, visibility 24 nm, range of light 360 °, height of light 87 m, height of building

58 m. The lighthouse tower is pyramidal, white concrete with a blue cupola, pyramid shape, point downwards.

The **entering lighthouse of Constantza** is put into operation in 1972. It is located on the NE breakwater extremity in the point $\varphi = 44^{\circ}08'36''N$, $\lambda = 28^{\circ}40'22''E$. It has a white flashing light, period 4.5 s, visibility 10 nm, height of light 24 m, height of building 18 m. The tower is a grey building of granite, with a white round cupola in the top.

There is installed a fog signal (nautophone) issuing the letter "U" in the Morse code, 30sec period.

The **green** entering light of Constantza is put into operation in 1972, being located on the NE breakwater spur extremity of Constantza Port, in the point of coordinates $\varphi = 44^{\circ} 08' 51''N$, $\lambda=28^{\circ} 40' 19''E$. It has a green flashing light, period 3 s, visibility 5nm, height of light 14 m, height of building 10 m, a gray masonry building with a green round cupola in the top.

The **red** entering light of Constantza is put into operation in 1972, being located on the south pier in the point of coordinates $\varphi = 44^{\circ} 08' 49''N$, $\lambda= 28^{\circ} 40' 07''E$. It has a red flashing light, period 3 s, visibility 5 nm, height of light 14 m, height of building 10 m, a gray masonry building with a red round cupola in the top.

• TUZLA LANDING LIGHTHOUSE

Tuzla landing lighthouse is the oldest lighthouse on the seaside which is still in operation today. It entered into operation in 1900, operating with oil lamps, was upgraded in 1946, 1957 and 1972, and in 1958 it was electrified.

It is located in the point $\varphi = 44^{\circ}59'26''N$, $\lambda = 28^{\circ}39'58''E$ having a white light with two flashes group, period 9.7 and visibility 20 nm, range of visibility $191^{\circ}-014^{\circ}$ (183°), height of light 62 m, height of building 44 m.

On this lighthouse it is installed an auxiliary light, which has a fixed red light, visibility 6 nm, range of visibility $162^{\circ}-192^{\circ}$ (30°), height of light 57 m and a fog signal (nautophone) issuing the letter "U" in the Morse code. The fixed red light indicates to mariners that they are in a dangerous shallow water area.

• MANGALIA LANDING LIGHTHOUSE

The landing lighthouse of Mangalia is put into operation in 1958.

It is located at the point $\varphi = 43^{\circ}48'39''N$, $\lambda = 28^{\circ}33'30''E$, having a group of two white flashing lights, 5.5 s period, visibility 22 nm, height of light from the sea 72m, height of building 42 m. The lighthouse tower is rectangular shaped, white stone, with a round white cupola in the top.

The **entering lighthouse** of Mangalia is put into operation in 1979, being located on the NE breakwater extremity, in the point $\varphi = 43^{\circ}47'56''$, $\lambda = 28^{\circ}36'01''E$. It has a white flashing light, period 4 s, visibility 10 nm, height of light 23 m, height of building 21 m. The lighthouse tower is a metallic gray lattice, having a round white cupola in the top. There is also a **fog signal (nautophone)** issuing the letter "U" in the Morse code.

The **green** entering light of Mangalia is put into operation in 1979, being located on the NE breakwater spur extremity in the point $\varphi = 43^{\circ}48'04''N$, $\lambda = 28^{\circ}35'43''E$. It has a green flashing light, period 3 s, visibility 5 nm, height of light 15 m, height of building 13m, being a beige concrete building with a green round cupola in the top.

The **red** entering light of Mangalia is put into operation in 1979, being located on the SE breakwater extremity in the point $\varphi = 43^{\circ}47'56''N$, $\lambda = 28^{\circ}35'37''E$. It has a red flashing light,

period 3 s, visibility 5 nm, height of light 15 m, height of building 13 m, being a beige concrete building with a red round cupola in the top.



MANGALIA HARBOR BEACONING SYSTEM



At the end of December 2013 it was achieved too the beaconing with light buoys of Mangalia Harbor, area between Daewoo Naval Shpyard and Limanu village, ensuring also the safe nighttime navigation both visually and radar in the whole harbor.

The delimitation of the navigable channel was done using SLB1250 SEALITE light buoys equipped with compact optical mode, GSM command and control and SLC420 GPS synchronization.

The buoy body is manufactured in "rotationally-molded UV" technology having as filling material the closed cells of polyurethane foam, which ensures their buoyancy in almost any condition with minimal maintenance.

All submodules required for lighting and power supply are contained in the compact module, being interchangeable and sealed to the outside environment, ensuring autonomous operation for many years.

The features chosen for the lights are 4 seconds, red flash, respectively 4 seconds, green flash, with over 2 miles visibility.

7. CAPACITY BUILDING

Training received through capacity building program

- One nautical cartographer attended the CAT B cartography training course organized within the *GEOMAC (Geospatial Marine Analysis and Cartography) Project* between 7th February – 27th May 2022 at UKHO headquarter in Taunton, UK.
- One cartographer attended in person the MBSHC CB Workshop on *Cartographic Data Management* organized by ESRI, in December 2022, in Istanbul, Turkey.
- Four cartographers attended online the CB *Cartographic Data Management* workshop organized by Teledyne CARIS on 20th December 2022.
- One person attended in person MBSHC CB Workshop on *MSDI Development & Implementation*, in December 2022, in Istanbul, Turkey.
- One nautical cartographer attended the CAT B cartography training course organized within the *GEOMAC (Geospatial Marine Analysis and Cartography) Project* between 17th July – 15th December 2023 at UKHO headquarter in Taunton, UK.

It is the intention of the MHD to enroll other personnel in hydrographic and cartographic training every year.

Training needed:

- S-100 product specification course and transition to S-100 products
- MSI training course
- S-102 product creation course
- Cartographic Data Management course
- Nautical cartography and hydrography courses for cat A and cat B;
- Oceanography course;

We have only a few specialized personnel in hydrography and marine cartography. At this time, we have only 3 people that hold certifications in hydrography and 3 people in marine cartography.

8. OCEANOGRAPHIC ACTIVITIES

Tide gauge network:	4 water level monitoring systems in Constanta, Midia, Sulina and Mangalia
Equipment:	OTT radar stations
Oceanographic measurements:	Oceanographic measurements were performed for: Midia, Mangalia, coastal route Constanta – Mangalia and the pouring mouth of Danube in Black Sea through Sulina and Sf. Gheorghe.
Problems encountered:	Lack of training courses for the oceanography personnel

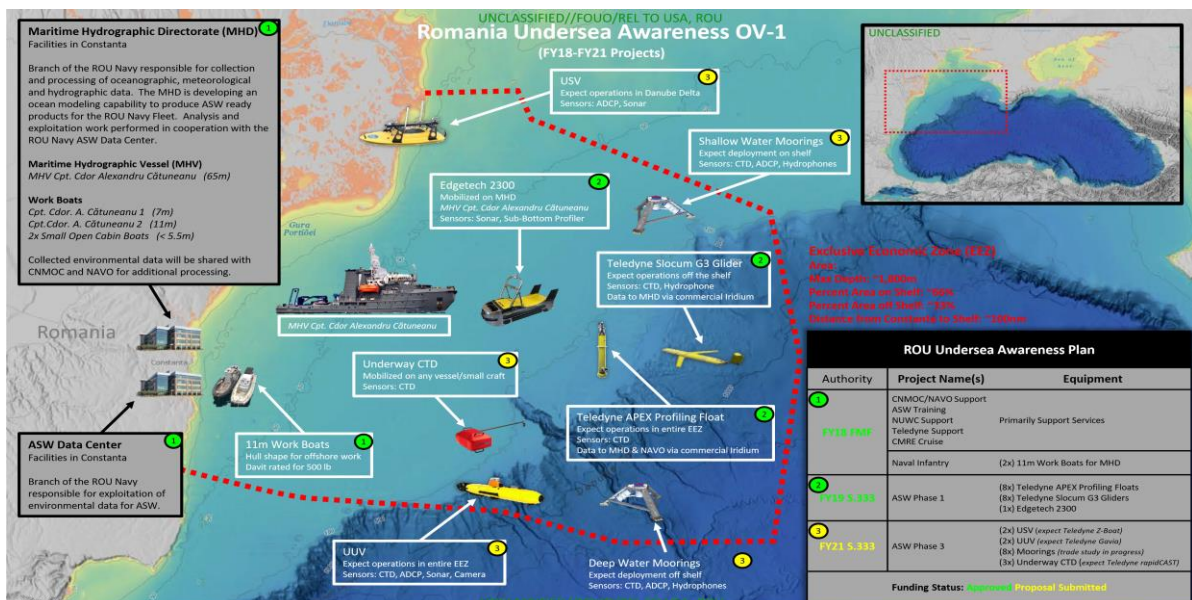
9. UNDERSEA AWARENESS AND RAPID ENVIRONMENT ASSESSMENT (REA)

Taking into consideration the new threats that are emerging in the Black Sea, Maritime Hydrographic Directorate (MHD) is developing a subsurface surveillance capability oriented in monitoring the oceanographic parameters in AOR, undersea awareness and detecting and identifying treats to critical infrastructure.

Using underwater gliders and other types of Unmanned Underwater Vehicles (UUV) MHD is monitoring and gather subsurface environment data IOT make scientific models and products that have various applications from environment assessment to subsurface resource exploitation.



Figure 17. – UUV Slocum Glider G3



10. COLLABORATION FOR EDUCATION AND EXCHANGE OF MARINE GEOSPATIAL INFORMATION

There were initiated collaboration with PRT, FRA, TUR, UK, ESP, NOR, USA.

11. MARINE GEOSPATIAL SUPPORT TO DECISION-MAKING AND BATTLESPACE MANAGEMENT

Mine Warfare Data Center (MWDC)

Starting with 2011, the MHD has established a Mine Warfare Data Center, based on NATO standards and requirements, in order to be able to provide specialized support to national and Allied forces in the mine warfare domain. Its main purpose is to collect, manage, analyze and disseminate the whole range of mine warfare data, including underwater contacts of interest and environmental information required and necessary for the successful planning and execution of mine warfare operations. The structure can store and process specific geospatial data and also produce a wide range of products, including Additional Military Layers (tactical ENC's for MCM mine countermeasures) vessels), Electronic Mine Warfare Pilots and MCM specific environmental assessments.

Naval Cooperation and Guidance for Shipping (NCAGS)

Maritime operations frequently affect merchant shipping. Similarly, merchant shipping may impact, or be involved in maritime operations. Cooperation between military and civilian actors can minimize delays and increase the safety and security of merchant ships as they transit through maritime areas where theaters of operations exist. To this end state, NATO has created the idea of Naval Cooperation and Guidance for Shipping (NCAGS) which was implemented in the MHD starting with 2016.

NCAGS is the interface with merchant shipping in support of the commander's mission. This interface involves the provision of military cooperation, guidance, advice and assistance for the shipping industry. NCAGS is committed to enhancing the security of participating merchant ships in the area of operations while supporting military objectives.

An accurate assessment of the maritime picture is essential for achieving the main goal - enhancing the security of shipping. As a result, masters will be asked for basic information about the ship, cargo and voyage. The more accurate the information, the better the quality of the information and details provided through NCAGS.

NCAGS will in turn ensure that the maritime authorities are informed in sufficient detail about security in the area of responsibility. If required, specific information on maritime traffic and security in the area will also be transmitted to vessels.

The two-way flow of information on which NCAGS is based is a huge step in building trust between military and civilian actors. One of the most critical objectives for the NCAGS in this relationship is to collect and manage all the national and NATO required information regarding port/operators capabilities, capacities and facilities, by means of Port Assessment activities.

METOC Analysis and Military Climatology

The METOC Information Analysis Laboratory has as field of competence and activity marine meteorology and military oceanography, being the only specialized structure of Romanian Naval Forces for providing METOC data and products.

The role of the laboratory is to analyze, develop and distribute geospatial information support products, specific to all types of maritime operations. For this purpose, the meteorological data from The Maritime Meteorological Surveillance Network of the Naval Forces (RSMM-FN)) and from the National Integrated Meteorological System (SIMIN-FN), are analyzed and processed, together with the oceanographic data collected by the DHM specialists or external sources.

METOC Information is transmitted in the "traffic lights" format: green-minimum operational impact, yellow - moderate operational impact, red- severe operational impact.

Also, the Military Climatology and Weather Data Management personnel in the structure are specialized in collecting, decoding, processing, storing and analyzing meteorological data from all available sources. The role of laboratory is to provide climate characterization of the Area of Responsibility and to elaborate climatology statistics, that support the planning and execution of Romanian Naval Forces exercises and missions.

The structure coordinates the activity and training of personnel in the METOC domain from the Naval Forces and carry out cooperation for the exchange of METOC data and products with similar structures in NATO or partner member states. It also develops and revises manuals, instructions and orders that implement METOC support in Romanian Naval Forces.

Digital and Analog GIS Products

In order to unify all the geospatial information required for the support of Naval Operations in the AOR, the MHD also provides specialized GIS services in the form of special custom digital or analog, thematic or tactical maps. Based on NATO standards or on specifications of military entities, the GIS personnel collects, analyzes, processes and delivers custom Military Geospatial Information that contains topographic, hydrographic, METOC, MCM, NCAGS and other required type of specific data, all connected and integrated in order to provide the most user friendly and optimal interaction and usefulness in support of planning and execution of Navy missions.

Problems Encountered: multi-domain staff shortage (MW-GIS-METOC, NCAGS-GIS, METOC-GIS).

11. OTHER ACTIVITIES

a. Research-Development and Innovation activities

Maritime Hydrographic Directorate within the **Research-Development and Innovation Center**, ensures the scientific research activities and technological development, capable of

contributing in the field of hydrography, oceanography, topo geodesy, meteorology and maritime signaling, as well as in the field of classical and electronic nautical charts, respectively in the improvement of the procedures specific to the MCM (Mine Counter Measures) missions, in close connection with the concrete objectives of the International Hydrographic Organization, of the North-Atlantic Alliance and the European Union on standardization and interoperability between organizations.

Recent activities of the RD&I Center include:

- the implementation of three national research projects in the Sectorial Research and Development Plan under Ministry of Defence;
- the ongoing **ESA NAVISP EL3-026:- RIPTIDE - Phase 2** project. Contract reference No. 4000140424/23/NL/RR/kg;
- successful completion of the international “**QUIETSEAS**” project - *Assisting (sub) regional cooperation for the practical implementation of the MSFD second cycle by providing methods and tools for D11 (underwater noise)*, European Commission – DG Environment Nr. 110661/2020/839603/SUB/ENV.C.2;
- within the J7 / USA initiative, as Contributor member - Romanian representatives, in the Multinational Capability Development Campaign (MCDC) program - **CLIMATE CHANGE IN THE ARCTIC: SECURITY IMPLICATIONS AND MILITARY CONSEQUENCES (CLIMARCSEC)** project (2023 – 2024);
- winning by competition within the call HORIZON-CL4-2023-SPACE-01 Topic: HORIZON-CL4-2023-SPACE-01-34 - FOCCUS project no. 101133911 - Forecasting and observing the open-to-coastal ocean for Copernicus users, with a duration of 36 months (starting date 1 January 2024);
- 1 ISI paper as co-author: Elena Stancu, Gianina Chiroasca, Maria Emanuela Mihailov, Alecsandru Vladimir Chiroasca, 2023. ***Neutron field exposure estimation using passive cr-39 detectors within a water tank using a moderated PuBe neutron source***, Romanian Journal of Physics, vol. 68, no. 5-6, art. no. 302;
- and 1 Open-access academic quarterly, nationally acknowledged by CNATDCU, indexed in CEEOL, EBSCO, Index Copernicus, ProQuest, WorldCat and ROAD international database: ***Climate change and security: the case for Black Sea***, authors: Maria – Emanuela MIHAILOV, Lucian GRIGORESCU and Romel PERA, Strategic Impact nr. 3/2023, Eds.“Carol I” National Defence University Publishing House Bucharest, Romania (https://cssas.unap.ro/en/pdf_periodicals/si88.pdf)
- participation in 6 consortiums for Horizon Europe research project proposals;
- participation at national and international conferences for research project dissemination results:
 - **EMODnet Open Conference 2023**, Brussels, Belgium, 29-30 November 2023 ***“Romanian Maritime Hydrographic Directorate's approach to the "collect once and use several times" philosophy”***, authors: Maria Emanuela Mihailov, Petrică POPOV;
 - **Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023)- “Resilient PNT for the Black Sea and Danube Region”**, authors: Florin Mistrapau, Roxana Mihaela Clopot, Ciprian-Vladut Circu, Vlad Gabriel Olteanu, Irina Beatrice Stefanescu, Mirela Bivolaru, Lucian Dumitrache, Petrica Popov;
 - Poster and in-extenso paper: within the Climate Change & Security Workshop (CC&SW), organised by NATO Science & Technology Organization (STO) Centre for Maritime Research and Experimentation (CMRE) in Lerici (La Spezia, Italy), October 3-5, 2023

(<https://www.climatechangesecurity.org/abstracts-proceedings/>), Poster and paper: *Climate Change, Arctic Security and Future Operations (CLIMARCSEC): A Multinational Capabilities Development Campaign (MCDC) Project*, authors: Tobias ETZOLD, Maria – Emanuela MIHAILOV, William SPOON and Albert CHAN.

- Attending at IC-ENC Steering Committee, July 2023
- Attending at IC-ENC Technical Conference, March 2023
- Attendance to IHO 9th Nautical Cartography Working Group (NCWG 9) - December 2023;
- continuous improvement by attending training courses.

b. Geospatial studies

Erosion of the Romanian coast (in Romanian language).

12. CONCLUSIONS

The cooperation with Hydrographic Services and national research institutes regarding the hydrographic activity, education and information exchange represent key points in improving the quality of hydrographic products and services in the near future in Romania. Maritime Hydrographic Directorate will continue to strengthen the cooperation in the field of hydrography and cartography with similar organizations within and outside the Black Sea.

The cooperation in the field of hydrography, marine cartography and oceanography conducted to good results on the coverage of the responsibility areas, reducing the financial and human effort involved in such activities.