D.T1.1.1 – Data analysis report

Version n. 1.00

Subtitle **10/2023**

Summary

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LIST OF ACRONYMS

ADRIREP - Mandatory ships reporting system in the Adriatic Sea

AIS – Automatic Identification System

AMSPM - Administration for Maritime Safety and Port Management of Montenegro

ASL - Above Sea Level

ASTERIX - All-Purpose Structured Eurocontrol Surveillance Information Exchange

ATA - Actual Time of Arrival

AtoN - Aids to Navigation

BC - Beneficiary Country

BoQ - Bill of Quantity

BS - Base Station

CA - Contracting Authority

CAMP - Coastal Area Management Programme

CBC – Cross border cooperation

CS - Coastal Station

CCTV - Closed Circuit TV

DB - Database

DF - Direction Finding

DGNSS – Differential Global Navigation Satellite System

DGPS - Differential Global Positioning System

EC – European Commission

ECDIS - Electronic Charts Display and Information System

EEZ - Exclusive Economic Zone

EMSA – European Maritime Safety Agency

ETA - Estimated Time of Arrival

ETD - Estimated Time of Departure

ENI - European Neighbourhood Instrument

EU – European Union

FAL - Convention on Facilitation of International Maritime Traffic

GMDSS - Global Maritime Distress and Safety System

GIS - Geographic Information System

GHG - Greenhouse gas

GPS - Global Positioning System

HAZMAT - Dangerous and Polluting Goods

HM - Harbour Master

IALA - International Association of Marine Aids to Navigation and Lighthouse Authorities

ICG - Italian Coast Guard

IMDG - International Maritime Dangerous Goods

IMO - International Maritime Organization

IMS - Integrated Maritime Services

IPA II - Instrument for Pre-Accession II

ISPS - International Code for the Security of Ships and of Port Facilities

ITOPF - The International Tanker Owners Pollution Federation Limited

IVEF - Inter VTS Exchange Format

LRIT - Long Range Information and Tracking system

MAREΣ – Mediterranean Regional AIS server

MARPOL - International Convention for the Prevention of Pollution from Ships

MEPC - Marine Environment Protection Committee

MMSI – Maritime Mobile Service Identities

MPA – Marine Protected Areas

MRCC - Maritime Rescue Coordination Centre

MTTR - Mean time to repair

N.A. - Not Applicable

NAS - Navigational Assistance Service

NAIS - National Agency for Information Society

NCA – National Competent Authority

NM - Nautical Miles

OPRC - International Convention on Oil Pollution Preparedness, Response and Cooperation

OSD - Oil Spill Detection

PCS - Port Community System

PFSO - Port Facility Security Officer

PMC - Port Monitoring Centre

PSSA - Particularly Sensitive Sea Area

PS - Port State

PSC - Port State Control

RF - Radio Frequency

SafeSeaNet - Vessel traffic monitoring in EU waters

SAR - Search and Rescue

SOLAS - Safety of Life at Sea SP State Police

SAR - Synthetic Aperture Radar or Search and Rescue

SLA – Service Level Agreement

SSL - Secure Sockets Layer

TBC - To Be Confirmed

UPS - Uninterruptible Power Supply

VHF - Very High Frequency

VoIP - Voice over Internet Protocol

VPN - Virtual Private Network

VTMIS - Vessel Traffic Monitoring and Information Services

VTS - Vessel Traffic Services

WAN - Wide Area Network

WMS - Web Mapping Services

XML - eXtensible Markup Language

1. INTRODUCTION

Maritime transportation among Italy, Albania and Montenegro has enormous potential for the rise. It has a positive effect on the economic side but also increases the chance of disasters related to hazardous materials, which may have a negative impact on the economy. The Interreg Albania-Italy-Montenegro project CRISIS (Cross-border RISk management of hazardous material transportation) aims to study these peculiar risks by considering data and records in the Italian, Albanian and Montenegrin territories. The project intends to develop Decision Support modules, to assist cross-border management of hazardous materials, from risk prevention to cooperation in case of disaster. These modules will implement an ICT platform for monitoring the transportation of these materials, which will assist the stakeholders in several ways to minimise risks[1].

1.1 General Background

Safety at sea, prevention of pollution and hence protection of biodiversity of the Adriatic Sea are necessary conditions for the sustainable development of Albania, Italy and Montenegro. Pollution prevention and, consequently, the preservation of biological diversity of the Adriatic Sea is a condition *sine qua non* of sustainable development of Montenegro and neighbouring countries. Considering that the vast majority of the population in Montenegro's coastal area depends directly or indirectly on tourism, safe and clean seas and ports are crucial for further development and sustainability. Also, as a signatory of international conventions, Montenegro has an obligation to protect and preserve its coastal area and marine environment.

There is concern about the effects of a large marine oil spill that could affect the Montenegro coastal zone. Despite the framework of preventive measures currently in place, the national community of Montenegro have shown concerns and provided a trigger for the ongoing development of regulations, technology and systems to reduce the risks of marine incidents. According to some documents, the capacities of responsible authorities are very limited in response to incidental oil spills on the sea [1], [2].

From a purely economic perspective, the financial loss to the tourism and fishing industries from a significant oil spill or incident within the Montenegro Coastal Zone would be massive. An incident of this nature could cause, among other consequences:

- Loss of jobs and wages.
- Loss of fishing.
- Huge income losses due to fewer tourist visits.

[1] https://crisis.italy-albania-montenegro.eu/

2 OBJECTIVES, BENEFICIARIES, DESCRIPTION OF ASSIGNMENT AND OUTPUTS

This chapter will describe objectives, beneficiaries, and descriptions of assignments and outputs.

2.1 General Objective

The main objective of this project is to improve the transportation activities in the programme area, emphasising the transportation of hazardous materials. In particular, this project will contribute to the specific objective "4.1 Transport" by studying the peculiar risks in the programme area and developing novel decision support modules aiming to assist cross-border management of hazardous materials.

2.1.1 Specific Objectives

The CRISIS project will contribute to allocating ships carrying hazardous materials to berths based on real-time numerical simulations of weather (wave and wind) conditions. The main outputs of the project will be: the identification of specific risk measures capturing the main aspects of hazardous material transportation in the programme area, the design and development of a multimodal safest routing algorithm for dangerous material transportation in the programme area, and the design and development of a berth allocation algorithm for hazardous material transportation in the programme area.

2.2 Beneficiaries

The main beneficiaries are listed below:

- Città di Molfetta (IT)[2], Lead partner
- FLAG Molise Costiero[3] (IT), project partner and
- Municipality of Ulcinj[4] (ME), project partner and
- National Environment Agency (AL), associated partner.

[2] https://www.comune.molfetta.ba.it/

[3] www.Flagmolise.it

[4] www.ul-gov.me

However, the benefit from the project will have the whole society in the programming area, where the action is taking place.

2.3 Description of the assignment and tasks

In order to ensure the smooth implementation of the project and tasks, in line with the approved application form, project partners have engaged external experts to support the spread of project activities, results, and outputs to the Programme area and beyond.

According to ToR, the following objectives must be achieved: data collection and analysis of the problems of routing hazardous materials inside the ports, and the surrounding areas, monitoring and supporting passing ships and allocating ships carrying dangerous materials to berths according to the approved Application Form of the project CRISIS „Cross-border RISk management of hazardous material transportation".

The requested services are divided into four activities and presented below.

2.3.1 Activity A.T1.1 - Data collection and analysis

This activity aims to analyse the problems of routing hazardous materials inside the ports and surrounding areas, monitoring and supporting passing ships and allocating ships carrying dangerous materials to berths [3]. The goal is to identify the peculiar problems, and to collect the data related to the different ports and areas where the proposed methodologies could be implemented.

In this activity, maritime traffic analysis in the programming area and data related to maritime dangerous cargo transportation in the programming area will be performed.

2.3.1 Activity A.T1.2 - Definition of specific risk measures

This activity will define specific risk measures that will be considered when designing the models and algorithms.

In the frame of this activity, data on previous incidents while handling dangerous cargo in the programming area and Montenegro will be performed. Based on historical data, the specific risk measures will be proposed.

2.3.2 Activity A.T1.3 - Multimodal safest path algorithm design

This activity aims to develop models and algorithms to route shipments in the transportation network in such a way that not only is travel cost reduced, but also transportation risk is minimised.

2.3.3 Activity A.T1.4 - Berth allocation algorithm design

The berth allocation problem aims to optimally assign and schedule ships to berthing areas along a quay. The objective is the depreciation of the total (weighted) service time for all ships, defined as the time elapsed between the arrival in the port and the completion of handling the minimisation activity. It includes the estimate of the downtime due to wave and wind action at a particular berth.

2.4 Required output and deliverables

The Consultant will participate in preparing the following four deliverables.

2.4.1 Deliverable D.T1.1.1 - Data analysis report

A report with a preliminary analysis aimed at making sense of the data collected in order to highlight the peculiarities and critical aspects of hazardous transportation in the programme area.

Project partners with the Consultants will conduct desk research and collect data on the maritime transport and transport of dangerous cargo in programme area.

2.4.2 Deliverable D.T1.1.2 - Risk measures report

A report on specific risk measures capturing the main aspects of hazardous material transportation in the programme area.

The Consultant will perform desk research and provide data on previous incidents and potential risks during the maritime transport of dangerous cargo in Montenegro.

2.4.3 Deliverable D.T1.1.3 - Multimodal safest path algorithm design report

A report on designing the multimodal safest routing algorithm for hazardous material transportation in the programme area.

2.4.4 Deliverable D.T1.1.4 - Berth allocation algorithm design report

A report on the design of the berth allocation algorithm for hazardous material transportation in the programme area.

3 LEGAL FRAMEWORK FOR REPORTING DANGEROUS CARGO

There are three levels of the legal framework for reporting dangerous cargo on vessels:

- International level set by IMO
- European level set by EU
- National level set by national laws and bylaws acts

3.1 International Maritime Organisation – IMO

The International Maritime Organization (IMO) is a specialised agency of the United Nations. IMO has developed an international legal framework for reporting dangerous cargo on ships and vessels. The framework is designed to ensure the safe transportation of hazardous materials and protect the marine environment from potential pollution incidents.

The International Convention for the Safety of Life at Sea (SOLAS) is one of the main legal frameworks that govern the transportation of dangerous cargo on ships. SOLAS requires shippers to provide the necessary information about the dangerous goods being transported by sea, such as the type, quantity, and packaging of the goods. The information must be provided to the ship's master and the relevant authorities in the port of departure, transit, and arrival.

The International Maritime Dangerous Goods (IMDG) Code is another framework that sets out the rules for the safe transportation of dangerous goods by sea. The IMDG Code provides guidelines for the classification, packaging, labelling, and stowage of hazardous goods on ships. It also requires the shipper to provide a declaration with relevant information about the dangerous goods being transported.

In addition to SOLAS and the IMDG Code, the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) provides guidelines for responding to marine pollution incidents. The OPRC Convention requires ships to report any incidents involving dangerous cargo that could lead to marine pollution. The Convention also provides for establishing national and regional contingency plans to respond to oil spills and other pollution incidents.

In summary, the legal framework for reporting dangerous cargo on ships and vessels includes SOLAS, the IMDG Code, and the OPRC Convention. These frameworks aim to ensure the safe transportation of hazardous materials and protect the marine environment from potential pollution incidents.

3.1.1 IMO forms for reporting dangerous cargo on board a vessel

The forms for reporting dangerous cargo on board vessels depend on the specific legal framework that applies to the vessel and its voyage. However, some general guidelines and requirements for reporting dangerous cargo on vessels are established by international conventions, such as the International Maritime Dangerous Goods (IMDG) Code, International Convention for the Safety of Life at Sea (SOLAS) and Convention on Facilitation of International Maritime Traffic (FAL).

According to the IMDG Code, dangerous goods must be declared and described in detail on a "Dangerous Goods Declaration" form before loading them onto a vessel. This form must include information such as the proper shipping name, UN number, class, packing group, and quantity of each dangerous good. The form must be signed by the shipper and submitted to the carrier or master of the vessel before loading.

Under SOLAS, vessels carrying dangerous goods must also submit a "Cargo Information" form to the appropriate authority at the port of departure. This form must include information about the vessel, the dangerous goods being carried, and the voyage details.

Under FAL, vessels must fill and submit seven FAL forms before arriving at a port. From the perspective of dangerous cargo on board, the following forms are attractive and could contain helpful information:

- IMO General Declaration (FAL form 1): general information about the vessel
- Cargo Declaration (FAL form 2) includes information from the bill of loading such as the number and kind of packages, description of goods or, if available, the HS Code, gross weight and measurement.
- Ship's Stores Declaration (FAL form 3) could contain information on fuel tanks that could be considered hazardous material.
- Dangerous Goods (FAL form 7) is the most crucial form containing information about all dangerous cargo onboard, such as stowage position, marks and numbers, freight container Identification number, vehicle registration number, UN Number, shipping name (Technical Specifications), class/ (Subsidiary Risk(s)), Packing Group, additional information/marine pollutant/flash point/etc., number and kind of packages, mass (kg) or Volume (L) etc.

The forms mentioned above can be found on IMO website.

In addition to these specific forms, there may be additional reporting requirements depending on the specific circumstances of the voyage and the cargo being carried. It is essential for vessel operators and shippers to be familiar with the applicable legal framework and reporting requirements to ensure compliance with international regulations and promote sea safety.

3.2 European legal acts on reporting

The European Union (EU) has established a legal framework for transporting dangerous goods by sea, which aims to ensure the safety of people, property, and the environment. The EU's legal framework for reporting dangerous cargo on vessels is based on the International Maritime Dangerous Goods (IMDG) Code and the International Convention for the Safety of Life at Sea (SOLAS) but also includes additional requirements and regulations. The key components of the EU's legal framework for reporting dangerous cargo on vessels are:

- Classification of Dangerous Goods: The EU has adopted the UN system for classifying dangerous goods, categorising them into classes based on their physical and chemical properties. The classification determines dangerous goods' packaging, labelling, and handling requirements.
- Packaging and Labelling Requirements: The EU has established strict requirements for the packaging and labelling dangerous goods, designed to ensure that they are transported safely and securely. The packaging must be designed to prevent leaks or spills and be labelled with the proper shipping name, UN number, hazard class, and other relevant information.
- Documentation Requirements: The EU requires that all dangerous goods be accompanied by proper documentation, which includes a Dangerous Goods Declaration form, a Stowage and Segregation Plan, a Notification of Dangerous Goods form, and a Cargo Information form. These forms provide detailed information about the dangerous goods being transported, their properties, and their handling requirements.
- Training and Certification Requirements: The EU requires that all personnel involved in transporting dangerous goods receive proper training and certification. It includes ship operators, crew members, and other personnel who handle or transport dangerous goods.
- Inspection and Enforcement: The EU has established a system of inspections and enforcement measures to ensure compliance with its regulations for the transportation of dangerous goods by sea. This includes inspections of vessels, cargo, and documentation, as well as penalties and fines for non-compliance.

Overall, the EU's legal framework for reporting dangerous cargo on vessels is designed to ensure the safe transportation of dangerous goods by sea, and to protect the health and safety of people, property, and the environment.

3.2.1 Information to be notified

The following information shall be notified and reported related to dangerous cargo on board vessels, according to Directive 2002/59/EC of the European Parliament and of the Council of 27.06.2002 establishing a Community vessel traffic monitoring and information [4]:

- Cargo Information: This form is required by the EU's Ship Reporting System (SRS), and it is used to provide information about the dangerous goods being transported. The form includes details such as the name of the vessel, the port of departure and destination, the nature and quantity of the dangerous goods, and any special requirements for handling or transport.
- Dangerous Goods Declaration: This form required by the IMDG Code is used to provide detailed information about the dangerous goods being transported. The document includes information such as the proper shipping name, UN number, hazard class, packing group, and quantity of each dangerous good.
- Notification of Dangerous Goods: This is the form also required by IMO, and it is used to provide information about the dangerous goods being transported. The form includes details such as the name of the vessel, the port of departure and destination, the nature and quantity of the dangerous goods, and any special requirements for handling or transport.

It is important for shippers and vessel operators to be familiar with the specific reporting requirements of the EU's legal framework for the transportation of dangerous goods by sea, as failure to comply with these requirements can result in penalties and fines.

3.2.2 Reporting HAZMAT in SafeSeaNet

Several major accidents around the European Union coast have occurred over recent years, raising questions regarding the accuracy and level of information in dangerous and polluting goods (HAZMAT) reports. Information on HAZMAT goods is essential when allocating and providing incident response measures. Therefore, determining whether this information is complete, accurate and available on time, as established in Directive 2002/59/EC, is a significant concern. In order to address this issue, the EU agreed to take several measures to improve the quality of information on dangerous and polluting goods in SafeSeaNet.

The data elements which form part of HAZMAT notifications are those identified in Article 13 and Annex I (3) of the VTMIS Directive and FAL Form 7. Table 3-1, below, identifies the data elements required by Directive 2002/59/EC and indicates why the data elements are needed and where to find further guidance in this document. The combined list of data elements (following Directive 2002/59/EC and FAL 7) is included in Annex 2. The table in Annex 2 compares the data elements required in the technical implementation of

SafeSeaNet with the Directive 2002/59/EC requirements and data elements of IMO FAL form 7, which is the most typical form used by the shipping industry [5].

Table 3-1 - Data Elements of SafeSeaNet and references in these guidelines (source [5])

What and Why to report?	Where to find relevant guidance
DG Classification – Provides information to which IMO Code(s) or Convention the HAZMAT product relates to and identifies the nature of the cargo on board.	Annex 1 and Figure 1
Textual reference – Provides the product's name as found in the legal instruments, but may be different when the product is not yet listed in the legal instruments. It may be supplemented with the hazardous materials description.	Annex 3
UN Number - allows the identification of the cargo.	Annex 3
IMO Hazard Classes - essential for the proper identification of the characteristics and properties of the substances, materials and articles.	Annex 3
Quantity – essential to assess the risk posed by certain goods.	Chapter 5
Location on board – essential to identify the location of dangerous and polluting goods which are onboard a ship. This information is vital for providing the necessary assistance during rescue or salvage operations.	Chapter 5
Identification of the transport units - allows a quick identification of a Unit containing dangerous or polluting goods.	Chapter 5
Where appropriate, the class of the ship as defined by the INF Code.	Chapter 5

At the moment SafeSeaNet is mandatory in all EU member states. In Montenegro, SafeSeaNet is partly implemented by only sending *PortPlus messages*, while in Albania, it is not implemented. Several EU initiatives and projects, like the EUREKA InterregADRION project, aim to include IPA countries in the SafeSeaNet system.

4 HAZARDOUS CARGO CLASSIFICATION

Maritime shipping is the primary transport mode for global trade: around 90% of traded goods are carried over the seas[5]. Various hazardous cargo is transported over the seas and oceans.

Hazardous cargo classification is an essential aspect of maritime transport, as it helps to ensure the safe and secure transportation of potentially dangerous goods. The classification system used for hazardous cargo in maritime transport is based on the International Maritime Dangerous Goods (IMDG) Code.

The IMDG Code divides hazardous cargo into nine classes based on the type of danger they pose. These classes are:

1. Explosives
2. Gases
3. Flammable liquids
4. Flammable solids
5. Oxidising substances
6. Toxic and infectious substances
7. Radioactive materials
8. Corrosives
9. Miscellaneous dangerous goods

Each of these classes is then further divided into different subcategories based on the specific characteristics of the hazardous material. For example, Class 1 (Explosives) is divided into six different divisions based on the type of explosive, while Class 3 (Flammable Liquids) is divided into four different packing groups based on the flashpoint of the liquid.

It's important to note that different types of hazardous cargo may require different handling and storage procedures, depending on their classification. In addition, vessels carrying hazardous cargo may be subject to additional regulations and inspections to ensure that they are being transported safely.

Overall, hazardous cargo classification plays a crucial role in ensuring the safe and secure transport of potentially dangerous goods in maritime transport.

Reporting parties must know precisely how dangerous cargo is carried on-board ships and from where to obtain the correct information. Depending on the type of hazardous cargo (liquid, gas, solid etc.) there are different types of conventions to be used, as shown in Figure 4-1.

[5] https://www.oecd.org/ocean/topics/ocean-shipping/

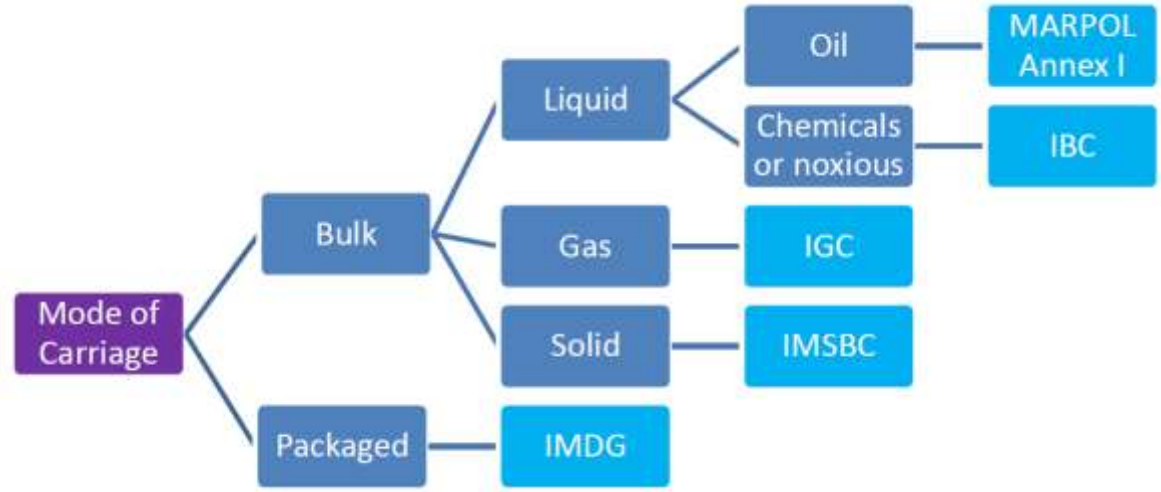

Figure 4-1 - Types of dangerous goods and relevant codes and conventions (source [5])

5 MARITIME TRAFFIC AND DATA ANALYSIS

A comprehensive analysis of maritime traffic in Montenegro and the programming area of the south Adriatic was performed in this chapter, with particular regard to dangerous and polluting goods (HAZMAT). Data have been collected from several national and EU sources. For this purpose, the Consultant performed desk research and analysis. During the research number of problems were identified, which were also noticed by a previous study conducted by the European Maritime Safety Agency (EMSA) and Members state, among them [5]:

- Low quality of reporting,
- Incorrect reporting and different data from different sources,
- Misinterpretations of data,
- 'Mis-declarations'

In the initial phase, the Consultant collected data that are available from many sources, such as:

- Eurostat,
- EMSA,
- Marine Traffic
- EMODNet
- Web sites of competent national authorities in Montenegro (Ministries, Departments, Statistical offices, Ports, Marinas etc.)

In some cases, the Consultant prepared questionnaires sent individually to some organisations. After analysis of the collected data, interviews were conducted with representatives of some institutions to acquire additional data or clarify some of the data received. In the following subchapters will be presented the data received from these sources.

5.1 EUROSTAT Data on handled goods in Adriatic sea ports

The following diagrams show the overall throughput (inwards and outwards) of liquid and dry cargoes handled in Adriatic ports, including Montenegrin ones, from 2012 to 2021. The specification of dangerous goods within all cargo handled distribution is not provided due to the lack of this particular information in the EUROSTAT database. Generally, most liquid shipments in these ports could be categorised under „dangerous goods" since the export/import operations of liquified cargoes in this region are mostly related to the throughput of various types of natural or crude oil, oil derivatives and LPG/LNG.

Figure 5-1 shows the overall throughput in ports of the Adriatic region (except those from Albania, as there are no data for this country)) including all commodities in the period from 2012-2021. The figure shows the

increasing trade scope and sea activities in the Adriatic region, where east Italian ports perform remarkably in all cargo handling.

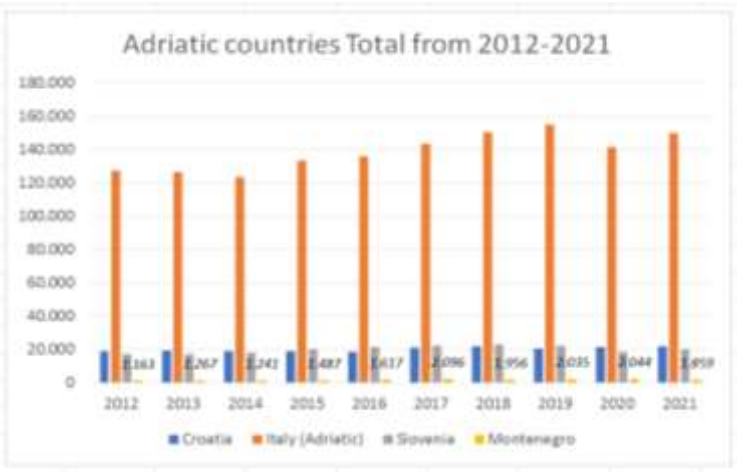

*Figure 5-1 Chart Gross weight of goods handled in all ports by direction – **Total** annual data for Adriatic region (thousand tonnes)*

Croatia and Slovenia have quite similar outcomes in the gross weight of goods dealt with in all their ports, while Montenegro records modest, still, upraising trends in cargo throughput (Figure 5-2).

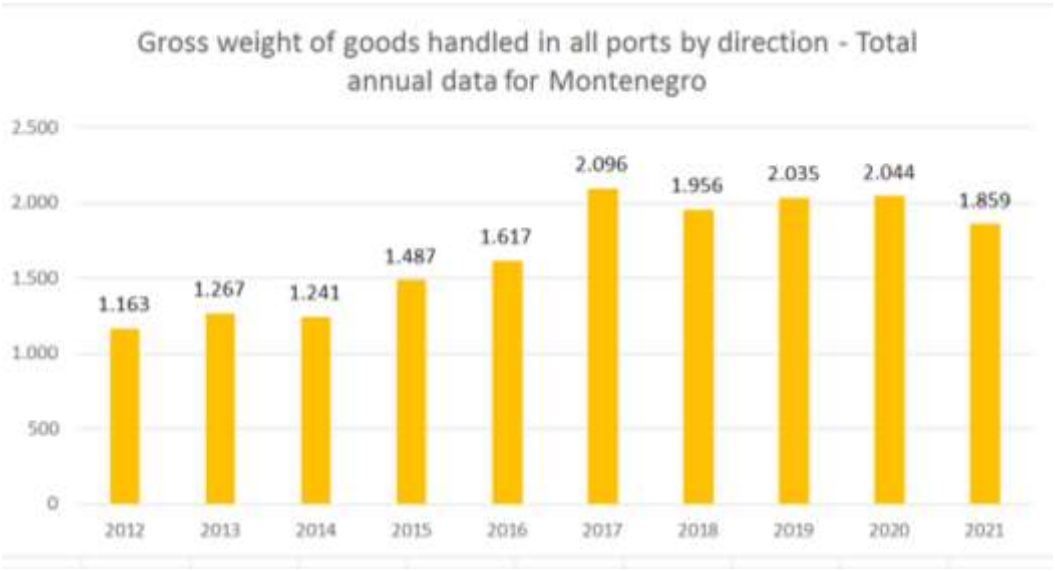

Figure 5-2 Gross weight of goods handled in all ports by direction – Total annual data for Montenegro (thousand tonnes)

Figure 5-3, Figure 5-4, Figure 5-5 and Figure 5-6 present the extracted activities of export and import over Adriatic ports and Montenegro, respectively. In Figure 5-7 is presented the comparison of the gross weight of goods handled in Montenegro ports, related to Inwards and Outwards flows from 2012 through 2021, in thousand tonnes.

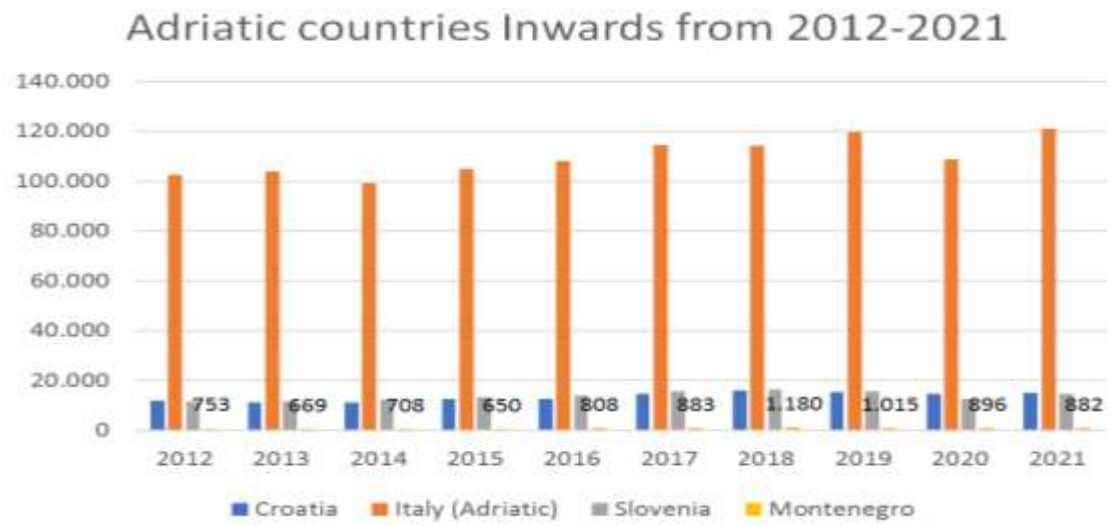

Figure 5-3 Adriatic countries all cargoes Inwards from 2012-2021 (thousand tonnes)

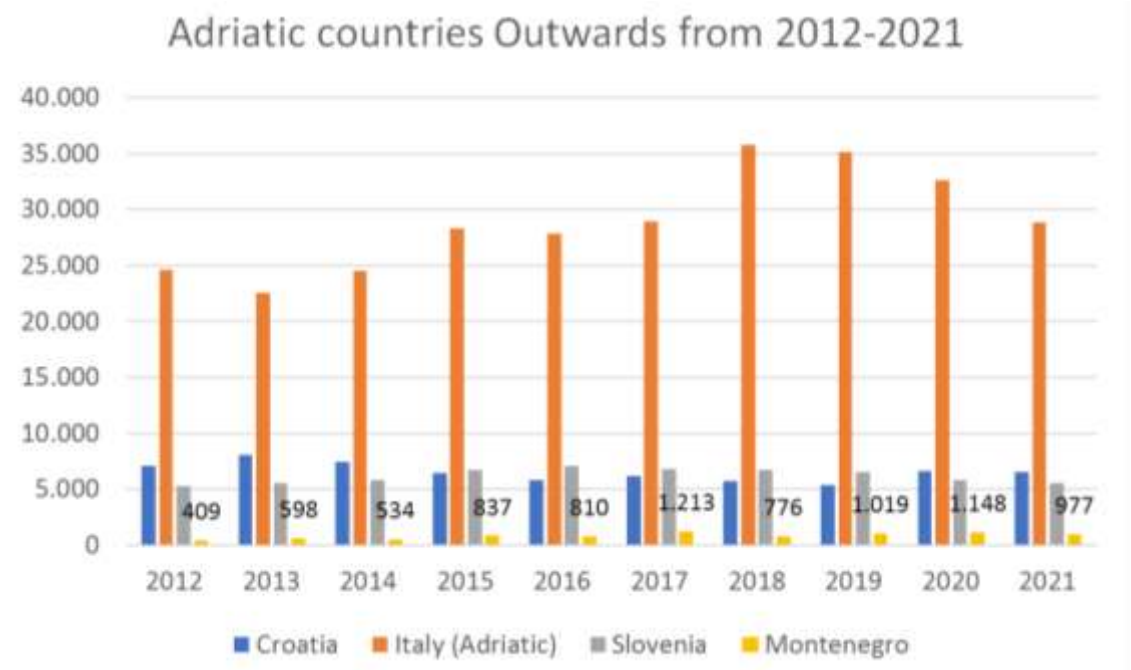

Figure 5-4 Adriatic countries all cargoes Outwards from 2012-2021 (thousand tonnes)

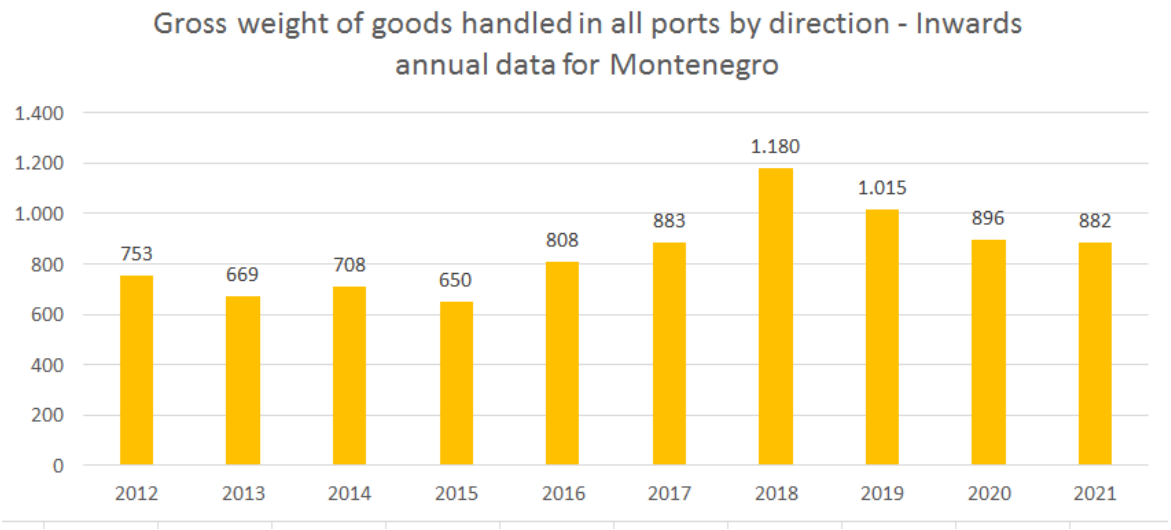

Figure 5-5 The gross weight of goods handled in all ports by direction – Inwards annual data for Montenegro (thousand tonnes)

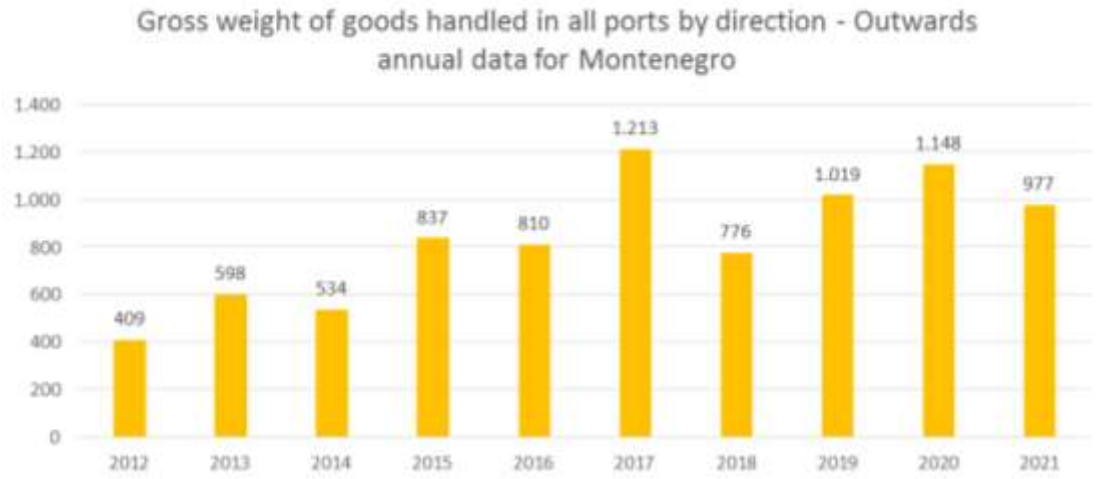

Figure 5-6 The gross weight of goods handled in all ports by direction – Outwards annual data for Montenegro (thousand tonnes)

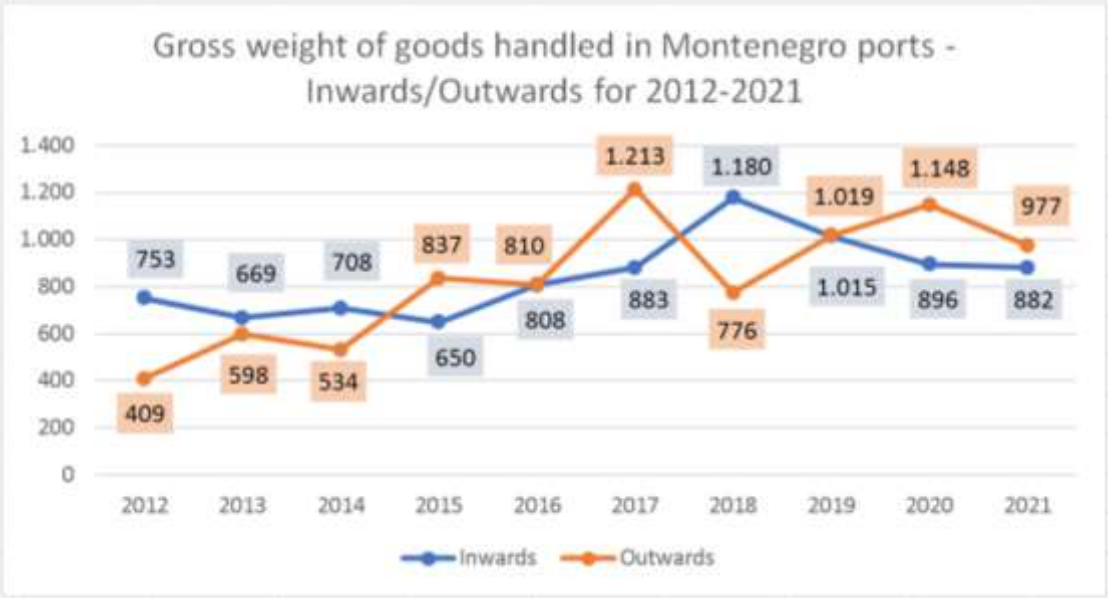

Figure 5-7 - The gross weight of goods handled in Montenegro ports – Inwards/Outwards for 2012-2021 (thousand tonnes)

Liquid goods are a particularly sensitive group of cargo in international seaborne trade. They should be handled with appropriate safety procedures to avoid the risk of oil spills or any other accident that may severely damage the environment and endanger human lives. With the liquid cargo, the most important part made the crude oil and oil derivatives, which also represent the hazardous goods. This commodity is predominantly handled in Italy in the Adriatic region, as shown in Figure 5-8, indicating huge quantities in thousands of tonnes in east coast ports. Conversely, Montenegro records very modest quantities of this cargo in its main port, Port of Bar, showing a slight increase after the COVID-19 pandemic, as shown in Figure 5-9.

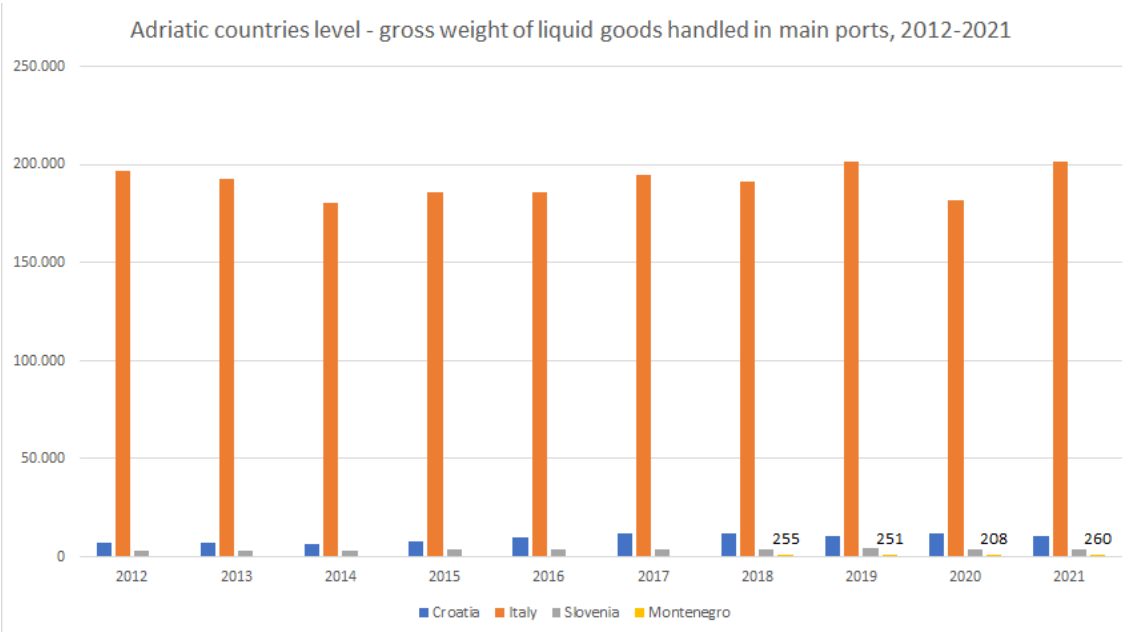

Figure 5-8 - Adriatic countries level - the gross weight of liquid goods handled in main ports, 2012-2021 (thousand tonnes)

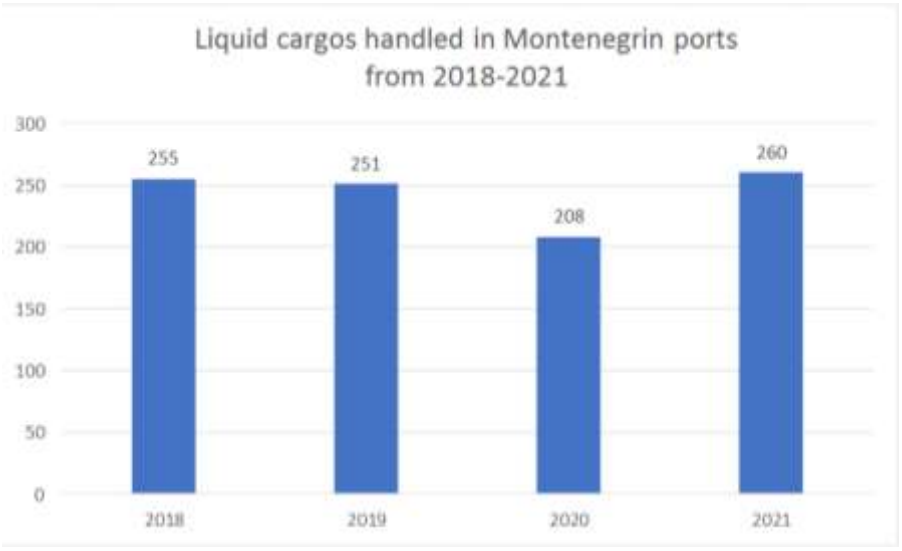

Figure 5-9 - Gross weight of liquid goods handled in Montenegrin ports, 2012-2021 (thousand tonnes)

The detailed data on liquid goods throughput broken by countries to which or from which the cargo is distributed are shown in Figure 5-10 and Figure 5-11.

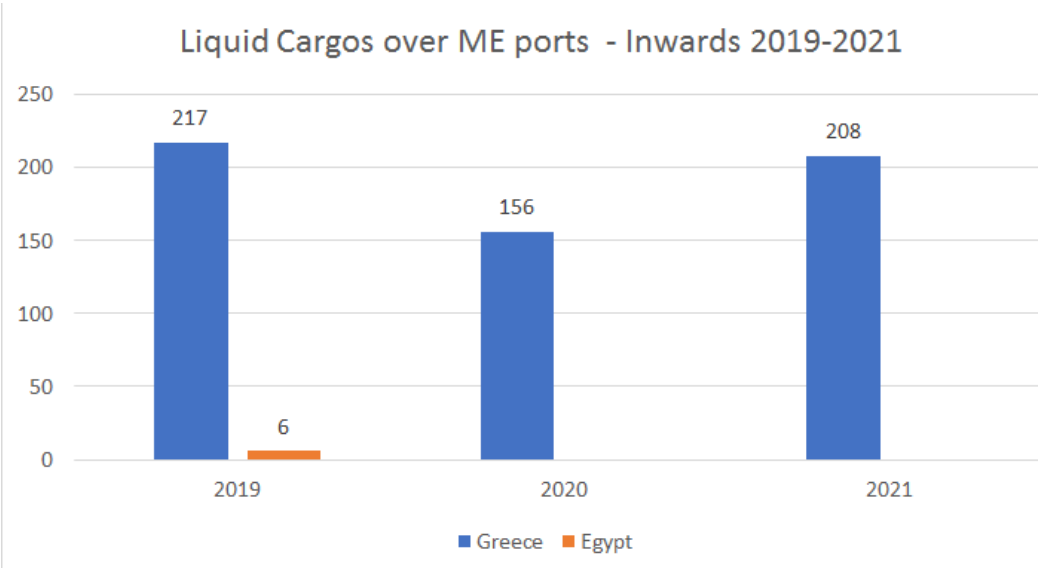

Figure 5-10 - Liquid Cargos over Montenegrin ports – inwards from 2019-2021 (thousand tonnes)

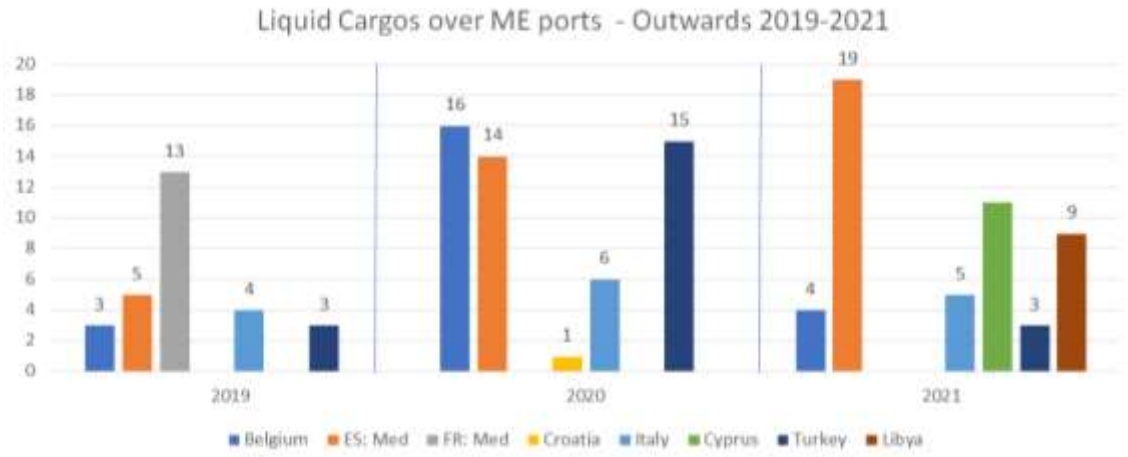

Figure 5-11 - Liquid Cargos over Montenegrin ports – outwards from 2019-2021 (thousand tonnes)

The total throughput (inwards + outwards) is shown in Figure 5-12, indicating the intensive export/import cooperation and flows with mostly Mediterranean countries such as Greece, Spain, France, Italy, Turkey and Egypt. Greece and Montenegro have significantly developed business cooperation due to many Greek supplier companies for the Montenegrin and West Balkans regional oil market.

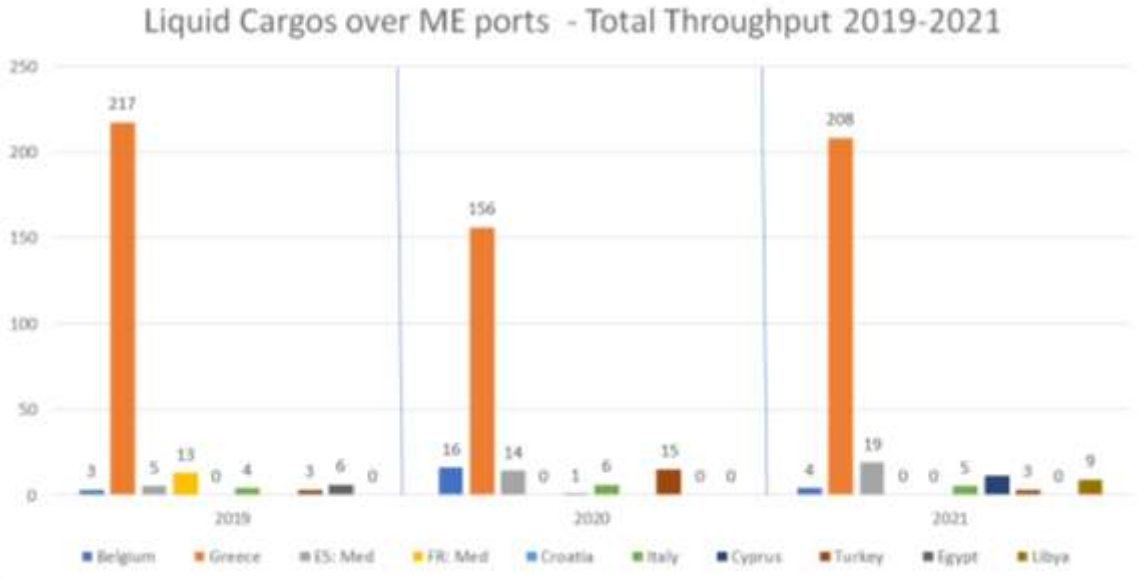

Figure 5-12 - Liquid Cargos over Montenegrin ports – total throughput from 2019-2021 (thousand tonnes)

Also, it is essential to mention that several dry cargo types can be part of the dangerous goods group. In the lack of detailed distribution of handled dry cargoes in Adriatic and Montenegrin ports, we show the overall throughput of these cargoes in the period of 2019-2021, including inwards and outwards flows for easier comparing the current trends. All these data are shown on the Figure 5-13, Figure 5-14 and Figure 5-15,

indicating significant trade flows and cooperation of Montenegrin ports with mostly Adriatic and Mediterranean countries.

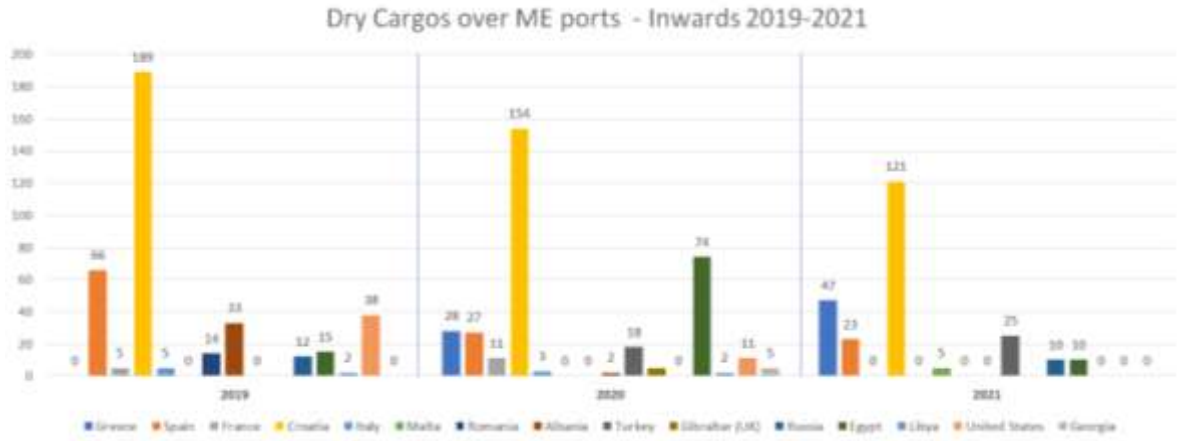

Figure 5-13 - Dry Cargos over Montenegrin ports – Inwards from 2019-2021 (thousand tonnes)

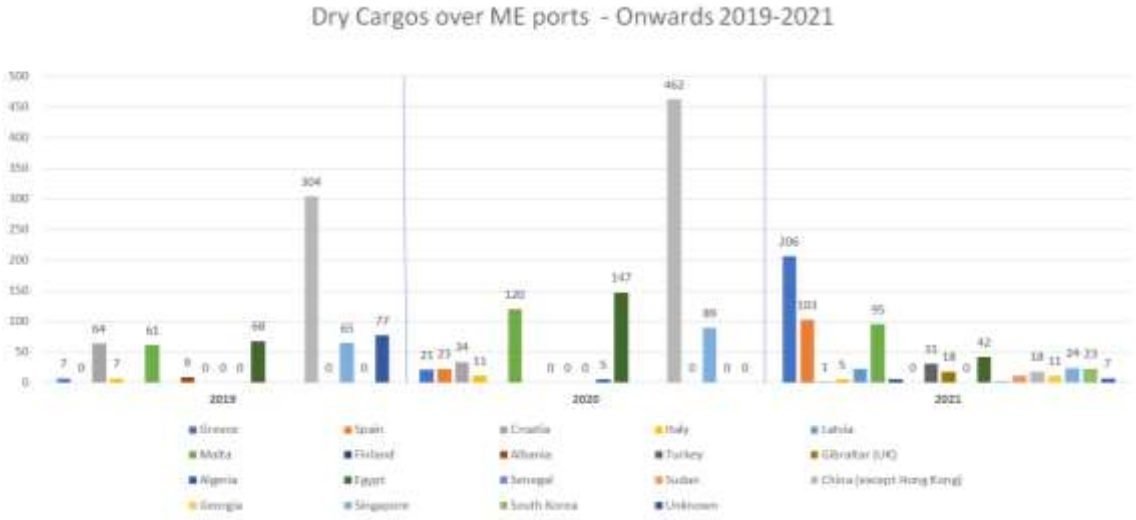

Figure 5-14 - Dry Cargos over Montenegrin ports – Outwards from 2019-2021 (thousand tonnes)

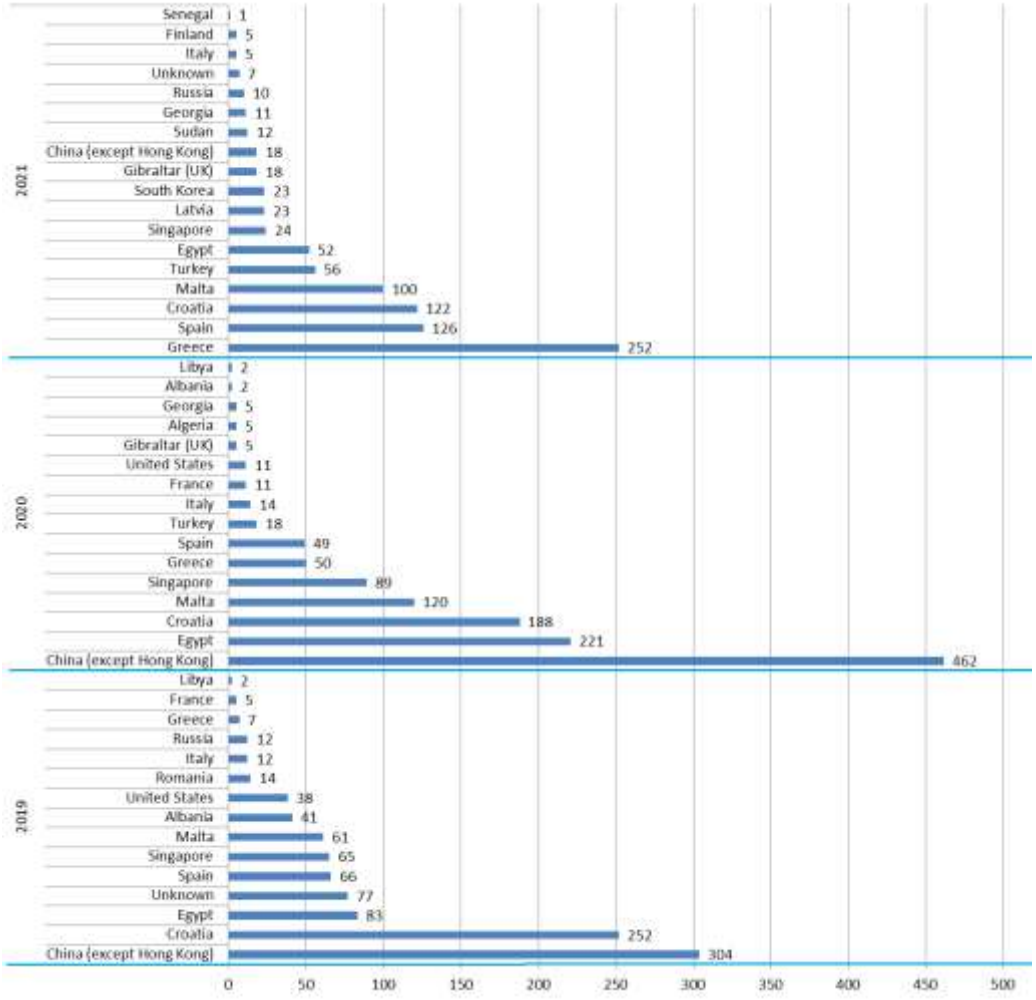

Figure 5-15 - Dry Cargos over ME ports - Total Throughput 2019-2021 (thousands of tonnes)

5.2 EMODnet- European Marine Observation and Data Network

The European Marine Observation and Data Network (EMODnet) is a web portal that brings uniformly together marine data, data products and metadata from diverse sources within Europe. It was initiated by the EC in response to the EU Green Paper on Future Maritime Policy launched in June 2006 [6], [7]. The purpose of EMODnet is to unlock fragmented and hidden marine data resources and to make these available to individuals and organisations without restriction, except in special cases. The primary motivation for EMODnet is to stimulate investment in sustainable coastal and offshore activities through improved access to quality-assured, standardised and harmonised marine data [8].

EMSA has made available some data and maps related to maritime traffic and ports available through the EMODnet portal. The data are on “EMODnet Human Activities“ Catalogue. The data are focused on general

cargo. The data related to tankers are interesting for the CRISIS project. The collected data will be presented in subchapters.

5.2.1 Route Density maps - EMSA

According to EMODnet the Route Density Map at 1 km resolution was created by EMSA in 2019 and made available on EMODnet Human Activities, an initiative funded by the EU Commission.

In the next three figures, route density maps are presented for a different types of vessels for the period 2019-2022. In Figure 5-16 all vessels are represented, in Figure 5-17 are cargo vessels, while in Figure 5-18 tankers.

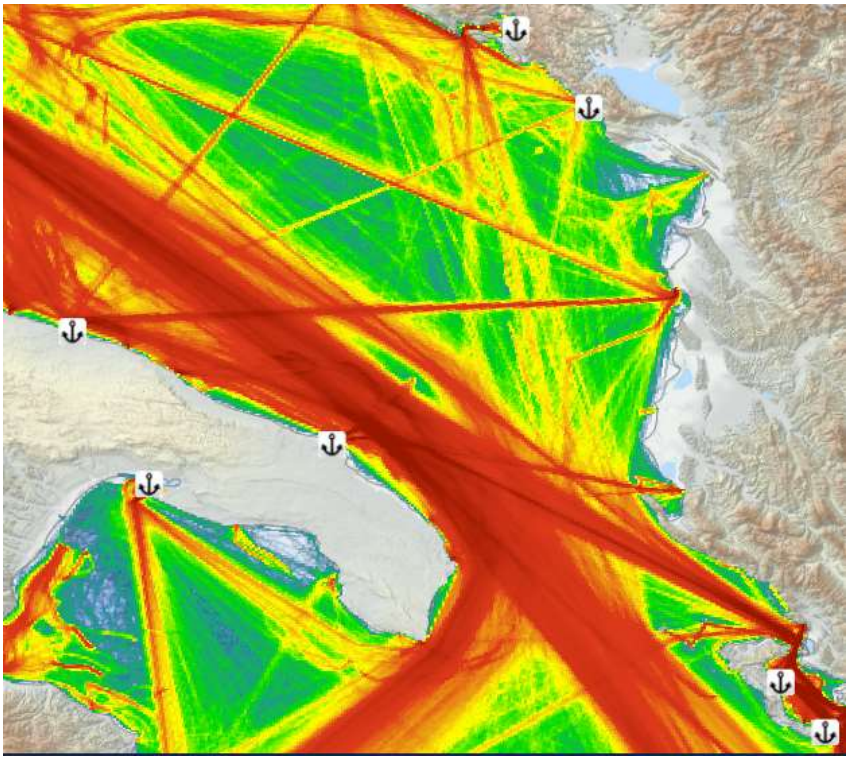

Figure 5-16 All vessels (Annual totals 2019-2022)

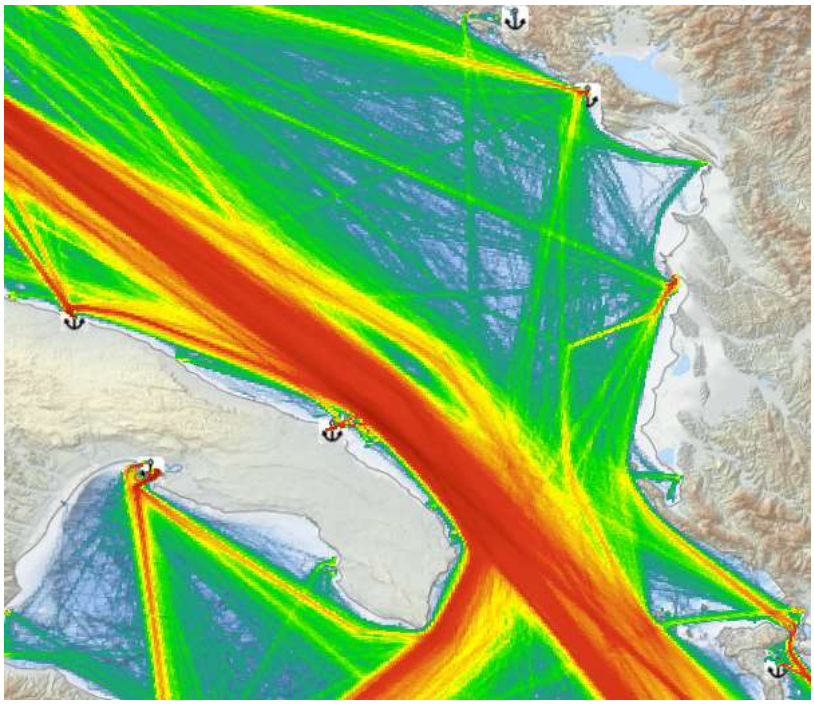

Figure 5-17 Cargo vessels (Annual totals 2019-2022)

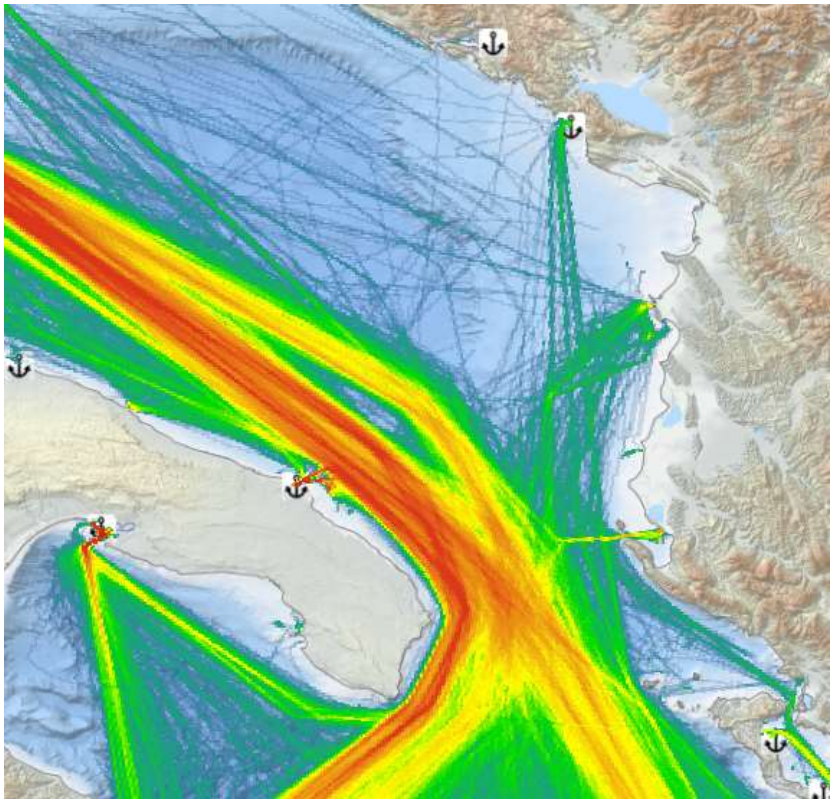

Figure 5-18 - Tankers (Annual totals 2019-2022)

5.2.2 Vessel Density maps – CLS and ORBISCOM data

The Vessel Density maps in the EU are created since the 2019 by Cogea for the European Marine Observation and Data Network (EMODnet). The dataset is updated annually and available for viewing and download on EMODnet Human Activities web portal [6]. The maps are based on AIS data yearly purchased from Collecte Localisation Satellites (CLS)[7] and ORBCOMM[8]. The maps, GeoTIFF format, show shipping density in 1x1km cells of a grid covering all EU waters and some neighbouring areas. Density is expressed as hours per square kilometre per month. The following ship types are available:

- 0 Other,
- 1 Fishing,
- 2 Service,
- 3 Dredging or underwater ops,
- 4 Sailing,
- 5 Pleasure Craft,
- 6 High speed craft,
- 7 Tug and towing,
- 8 Passenger,
- 9 Cargo, 10 Tanker,
- 11 Military and Law Enforcement,
- 12 Unknown and All ship types.

Data are available by month of year. Yearly averages are also available.

In the next three figures vessel density maps are presented for different types of vessels for the period 2017-2021. In Figure 5-19 all vessels are represented, in *Figure 5-20* are cargo vessels, while in Figure 5-21 tankers.

[6] https://emodnet.ec.europa.eu/en/human-activities

[7] https://www.cls.fr/en/

[8] https://www.orbcomm.com/

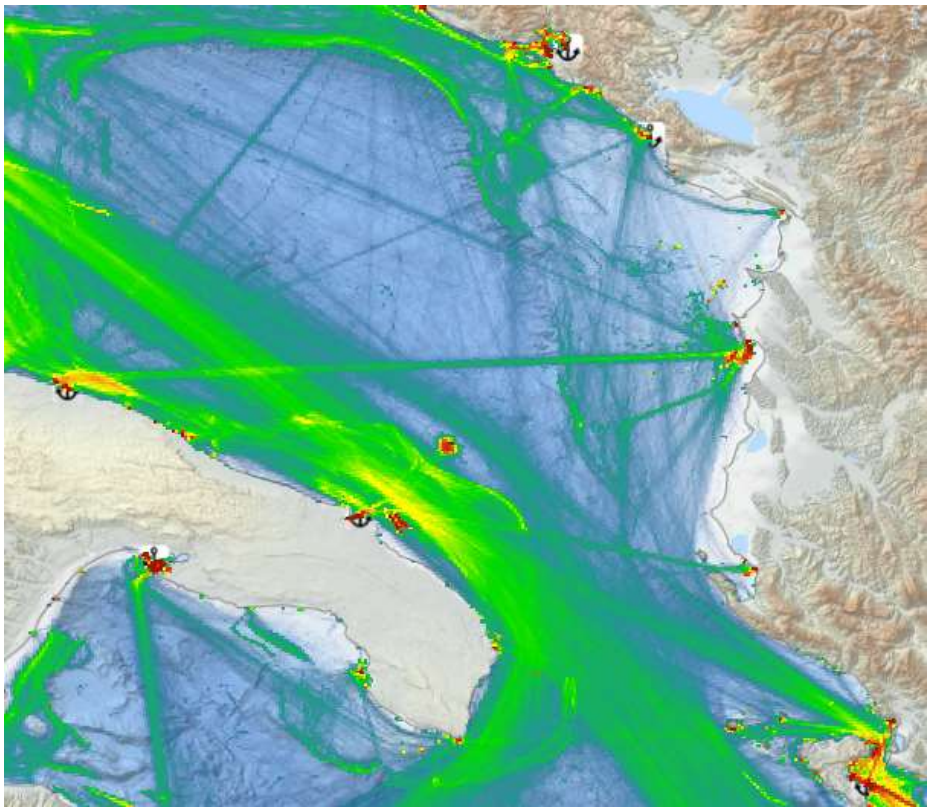

Figure 5-19 All Types of Vessels (Annual averages 2017 - 2021)

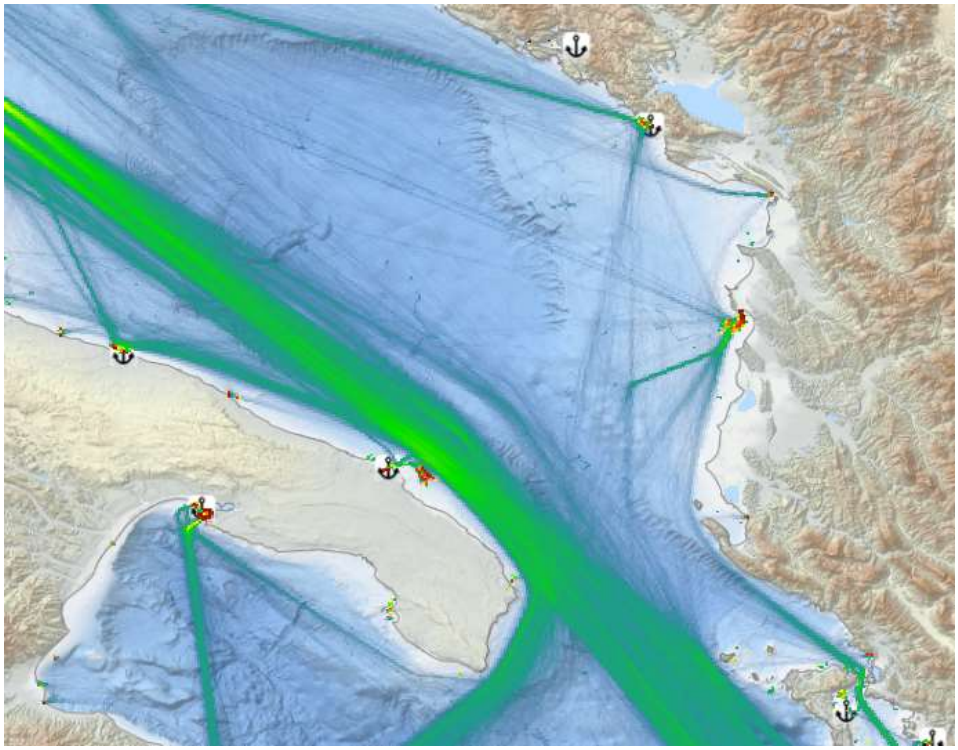

Figure 5-20 Cargo Vessels (Annual averages 2017 - 2021)

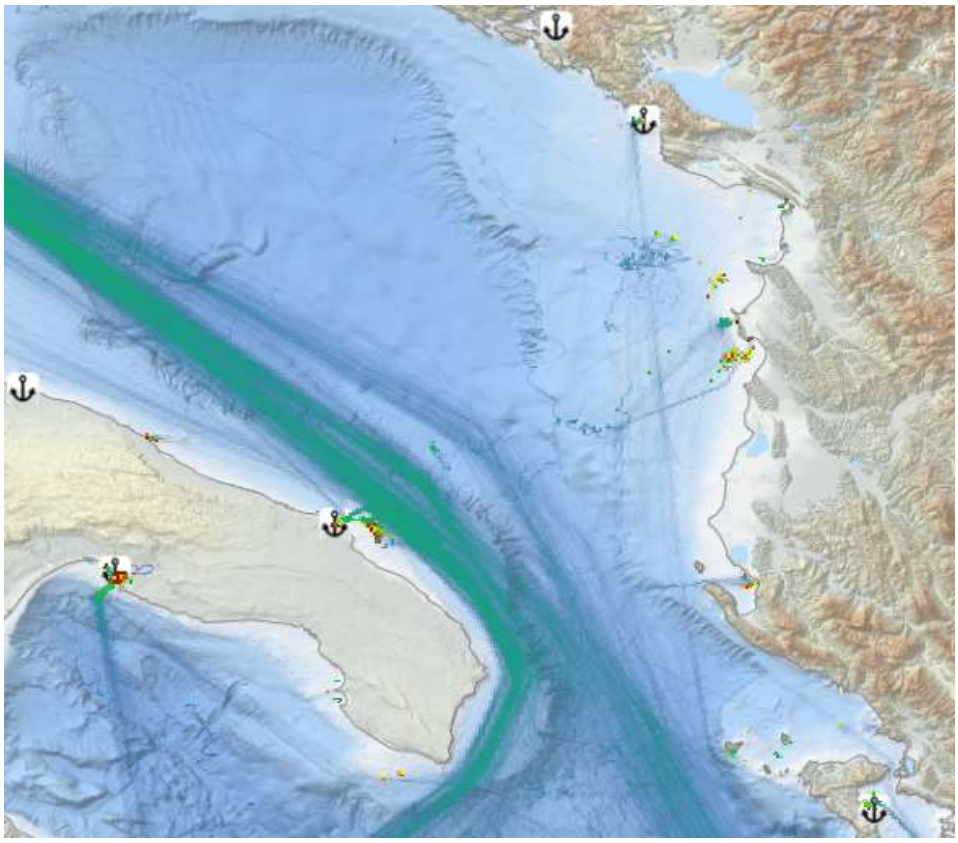

Figure 5-21 Tankers (Annual averages 2017 - 2021)

5.2.3 Data on ports and cargo

According to EMODnet the dataset on maritime transport includes goods, passengers and vessels traffic data in the EU main ports and was created in 2014 by Eurofish and Cogea for the European Marine Observation and Data Network. It is the result of the harmonisation and aggregation on an annual basis of the quarterly EUROSTAT Maritime transport data, provided by port in the EU Member States, Montenegro, Norway, Turkey and the UK. It is updated every year, and is available for viewing and download on EMODnet - Human Activities web portal[9]. EUROSTAT data have been related to the 'Ports 2013' GISCO's points georeferenced dataset. Goods traffic data are reported in thousand tonnes by type of cargo and direction. Passenger traffic data are reported in thousand passengers (excluding cruise passengers) by direction and traffic type. Vessel traffic data are reported in units and gross tonnage (thousand) of vessels by size class and type. Where available, the latest update includes data from 1997 up to 2021.

In the

[9] https://emodnet.ec.europa.eu/en/human-activities

Table 5-1 data for the Port of Bar related to goods traffic are presented for the year 2021.

Table 5-1 Port of Bar (goods traffic 2021)

Port Name	Bar
Port ID	MEBAR
Port Code	ME_0MEBAR
Country Code	ME
Year	2021
Dry bulk goods (Inwards)	241
Dry bulk goods (Outwards)	625
Dry bulk goods (Total)	866
Large containers (Inwards)	284
Large containers (Outwards)	119
Large containers (Total)	403
Liquid bulk goods (Inwards)	209
Liquid bulk goods (Outwards)	52
Liquid bulk goods (Total)	261
Other cargo not elsewhere specified (Inwards)	141
Other cargo not elsewhere specified (Outwards)	128
Other cargo not elsewhere specified (Total)	269
Ro-Ro - mobile non-self-propelled units (Inwards)	n/a
Ro-Ro - mobile non-self-propelled units (Outwards)	n/a
Ro-Ro - mobile self-propelled units (Inwards)	7
Ro-Ro - mobile self-propelled units (Outwards)	41
Ro-Ro - mobile self-propelled units (Total)	48
Total (Inwards)	*882*
Total (Outwards)	*965*

(Totals = tonnes x 1000

In the

Table 5-2 data for the Port of Bar related passenger traffic are presented for the year 2021.

Table 5-2 Port of Bar (passenger traffic 2021)

Port Name	Bar
Port Code	ME_0MEBAR
Port ID	MEBAR
Country Code	ME
Year	2021
Inwards National	n/a
Inwards International	2
Inwards Unknown	0
Inwards Total	2
Outwards National	n/a
Outwards International	2
Outwards Unknown	0
Outwards Total	2
Unknown National	n/a
Unknown International	n/a
Unknown Unknown	n/a
Unknown Total	n/a
Total National	*n/a*
Total International	*5*
Total Unknown	*0*
Total Total	*5*

(Totals = x1000 passengers excluding cruise passengers)

In the Table 5-3 data for the Port of Bar related vessel traffic are presented for the year 2021.

Table 5-3 Port of Bar (vessel traffic 2021)

Port name	Bar	
Port ID	MEBAR	
Port code	ME_0MEBAR	
Country code	ME	
Year	2021	
Vessel type	Number	Tonnage
Container ship	*107*	*1315*
Dry bulk carrier	*19*	*424*

(Tonnage = tonnes x 1000)

In the

Table 5-4 the only available data for Port of Kotor are presented related to vessel traffic for the year 2021.

Table 5-4 Port of Kotor (vessel traffic 2021)

Port name	Kotor	
Port ID	MEKOT	
Port code	ME_0MEKOT	
Country code	ME	
Year	2021	
Vessel type	Number	Tonnage
Container ship	*n/a*	*n/a*
Dry bulk carrier	*n/a*	*n/a*
Passenger ship (excluding cruise ship)	*64*	*862*

(Tonnage = tonnes x 1000)

5.3 MarineTraffic

MarineTraffic is a maritime analytics provider, which provides real-time information on the movements of ships and the current location of ships in harbours and ports. A database of information on the vessels includes for example details of the location where they were built plus dimensions of the vessels, gross tonnage, MMSI, IMO number etc.. The basic MarineTraffic service can be used without cost. More advanced functions such as density maps, weather maps and satellite-based tracking are available subject to payment[10]. For the purpose of this research the "Global Satellite" pricing plan was used to produce the report.

Global Satellite price plan includes tracking unlimited vessels during cross-ocean voyages and advanced density maps. It enables more control - switch vessel type layers on and off, or adjust their opacity. Also enables filter by ship type such as LPG carriers, LNG carriers, tankers, fishing, containerships, cargo, tugs and special craft, passenger and pleasure craft [11].

Data are available on desktop computers and mobile phones and tablets. There is no information on MarineTraffic related to cargo.

5.3.1 Density Maps

Figure 5-22 presents density map for all type of ships for data from 2020 and 2021.

[10] https://en.wikipedia.org/wiki/MarineTraffic

[11] https://www.marinetraffic.com/en/online-services/plans/advanced-density-map

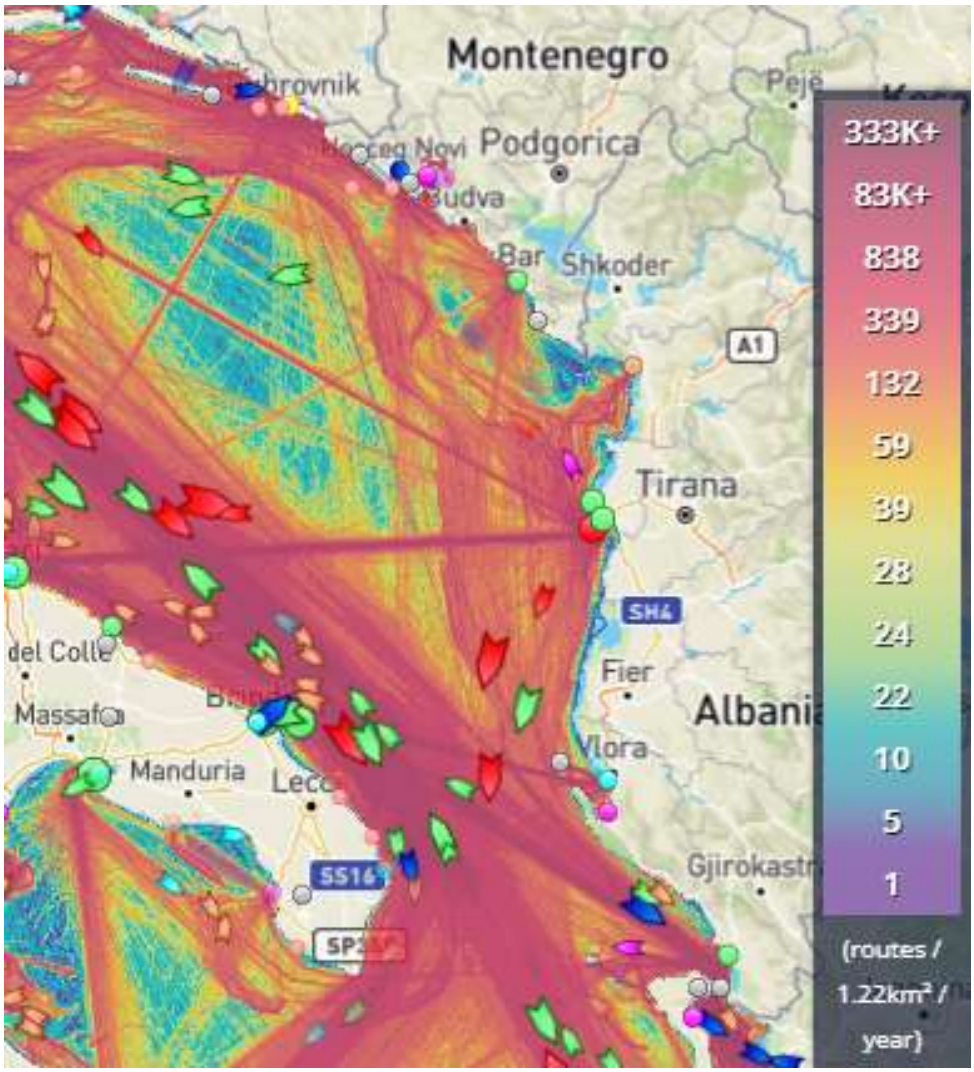

Figure 5-22 MarineTraffic Density Maps, years 2020 and 2021, all ships

Figure 5-23 presents a density map for cargo ships or data from 2020 and 2021.

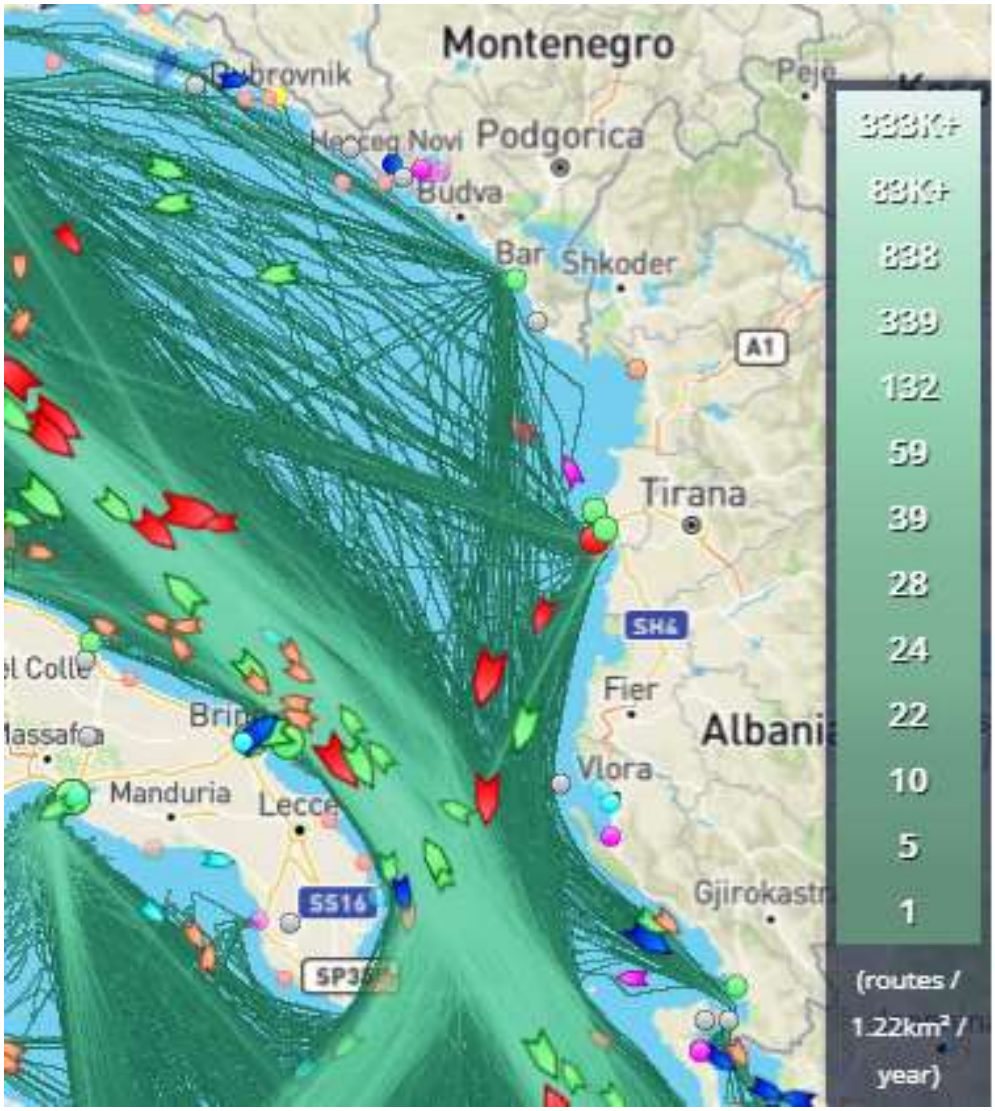

Figure 5-23 MarineTraffic Density Maps, years 2020 and 2021, cargo ships

Figure 5-24 presents a density map for tankers for data from 2020 and 2021.

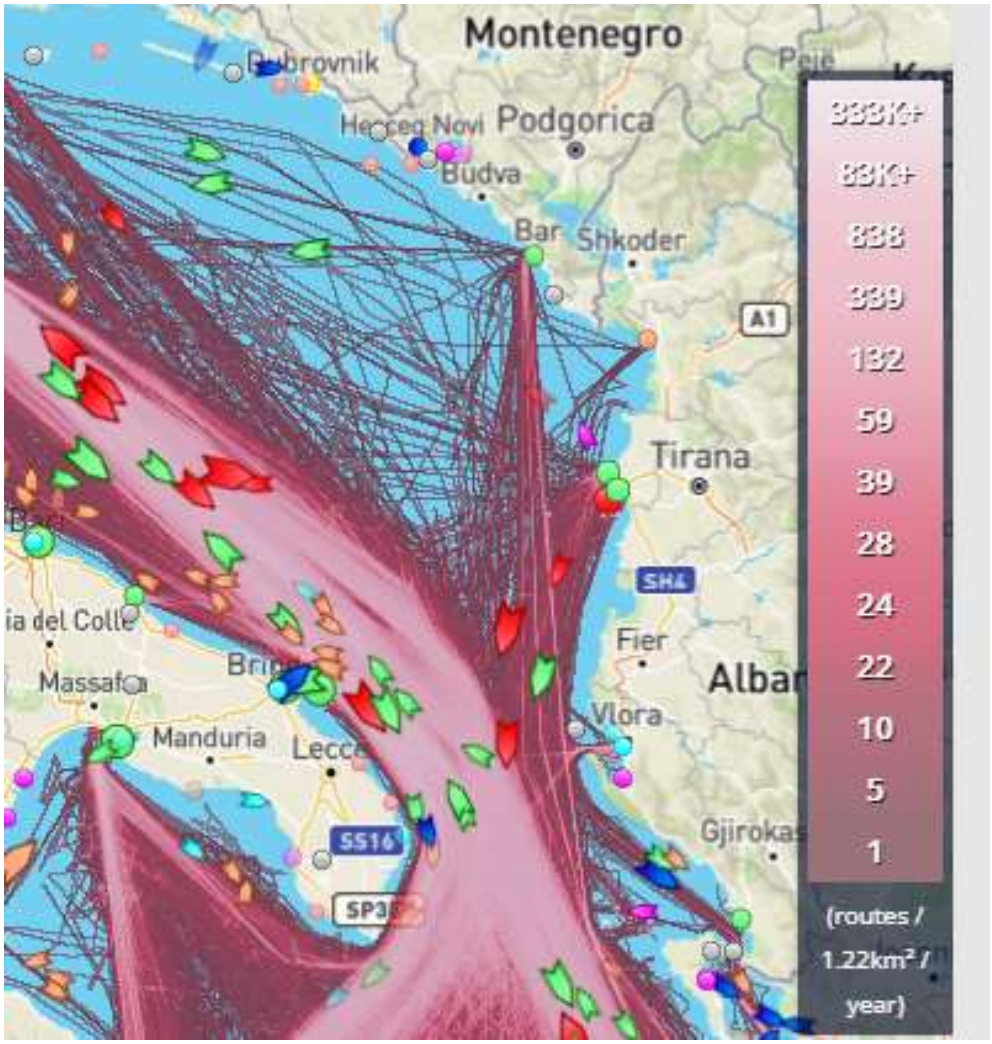

Figure 5-24 MarineTraffic Density Maps, years 2020 and 2021, tankers

5.3.2 Weather maps

MarineTraffic offers different weather maps with current or historical data. Data such as wind barbs, wind, wind flow, wind gust, tropical storms, wave height-direction, wind wave height, wind wave period, currents, swell height, swell period, visibility, temperature, sea temperature, sea salinity, ice coverage, max. temperature (last 24h), min. temperature (last 24h), clouds & precipitation 3h, cloud cover (density), precipitation 3h, precipitation probability, snowfall (last 24h), relative humidity, risk (last 24h) and sea level pressure.

In the Figure 5-25 as an example of available data on MarineTraffic for wave height direction is shown.

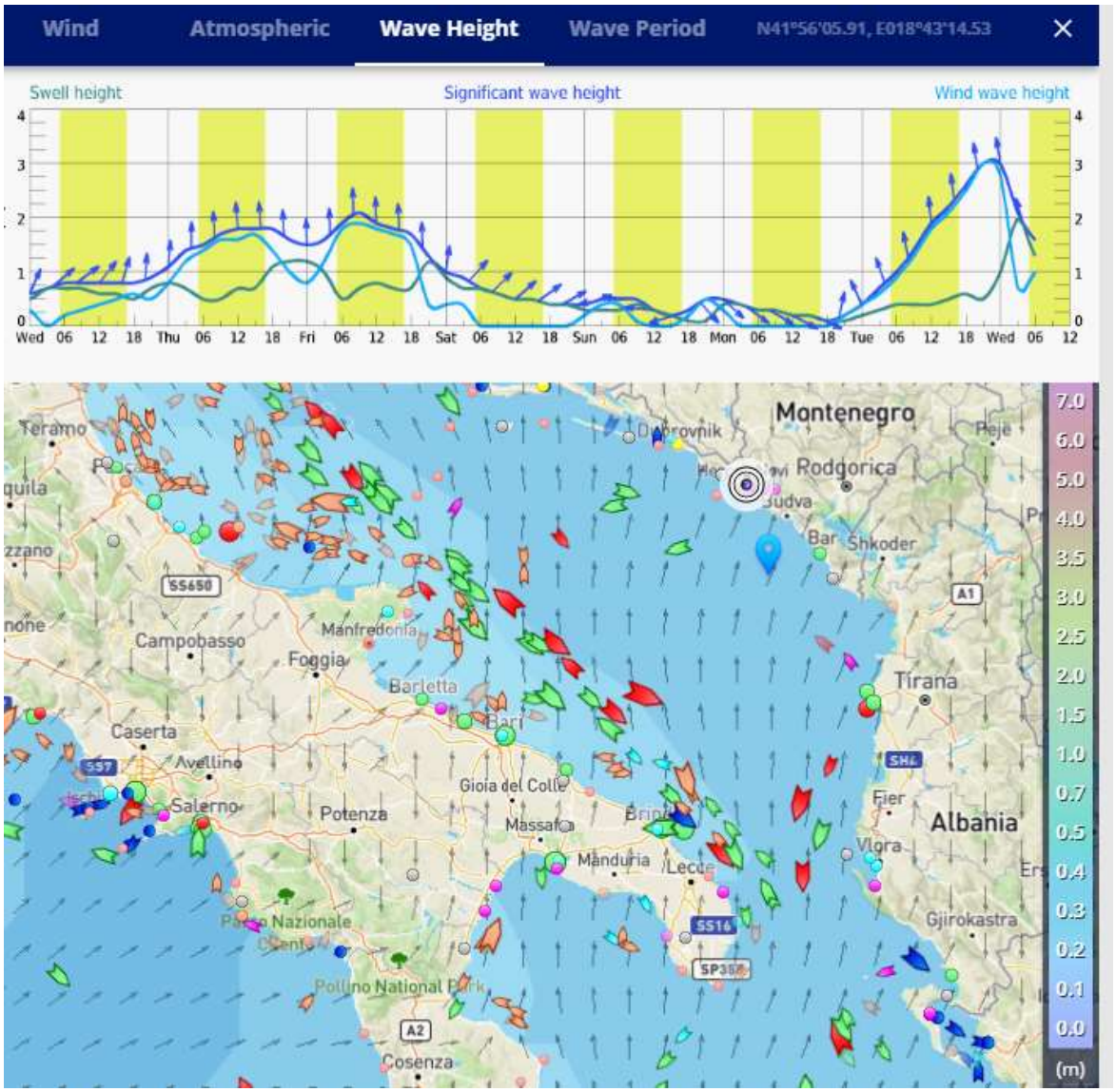

Figure 5-25 MarineTraffic Wave height-direction

5.4 EMSA – SafeSeaNet

The SafeSeaNet Ecosystem Graphical (SEG) User Interface of EMSA is the common web interface providing access to maritime applications and data sets including SafeSeaNet, Integrated Maritime Services, Long Range Identification and Tracking and CleanSeaNet[12] as shown in Figure 5-26 (source [9]). Data are available on desktop and mobile devices (IMS Mobile APP).

[12] https://www.emsa.europa.eu/ecosystem.html

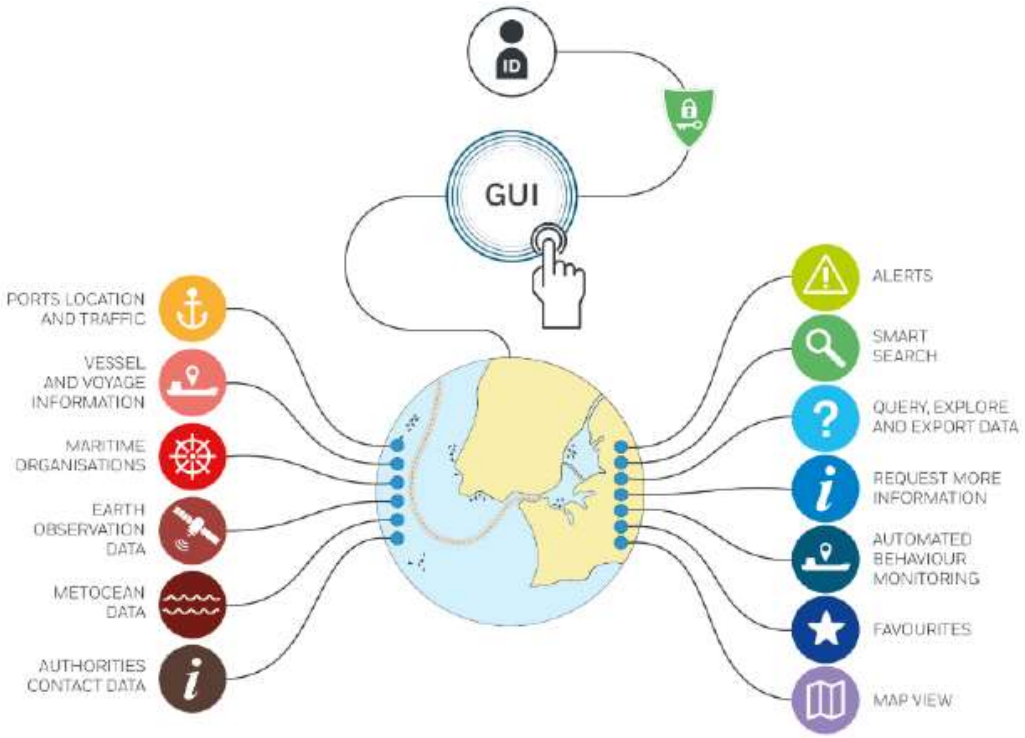

Figure 5-26 The SEG GUI provides access to multiple functions and data sets

SEG offers many information related to vessels and related information that are part of SafeSeaNet, and many useful layers with meteo, oceanic and Earth Observation data as shown in Figure 5-27 (source [9])

Figure 5-27 SEG Information on the layers and symbols

SEG is granted by the respective EMSA's application teams on the request of Member States National Competent Authority (NCA) for SSN/LRIT/CSN or through the Integrated Maritime Services (IMS) Point of

Contact. Apart from member states, access to some functionalities is also granted to non-member states as Montenegro and Albania.

SEG also offers density maps but only for member states users, as shown in Figure 5-28 (source [10]).

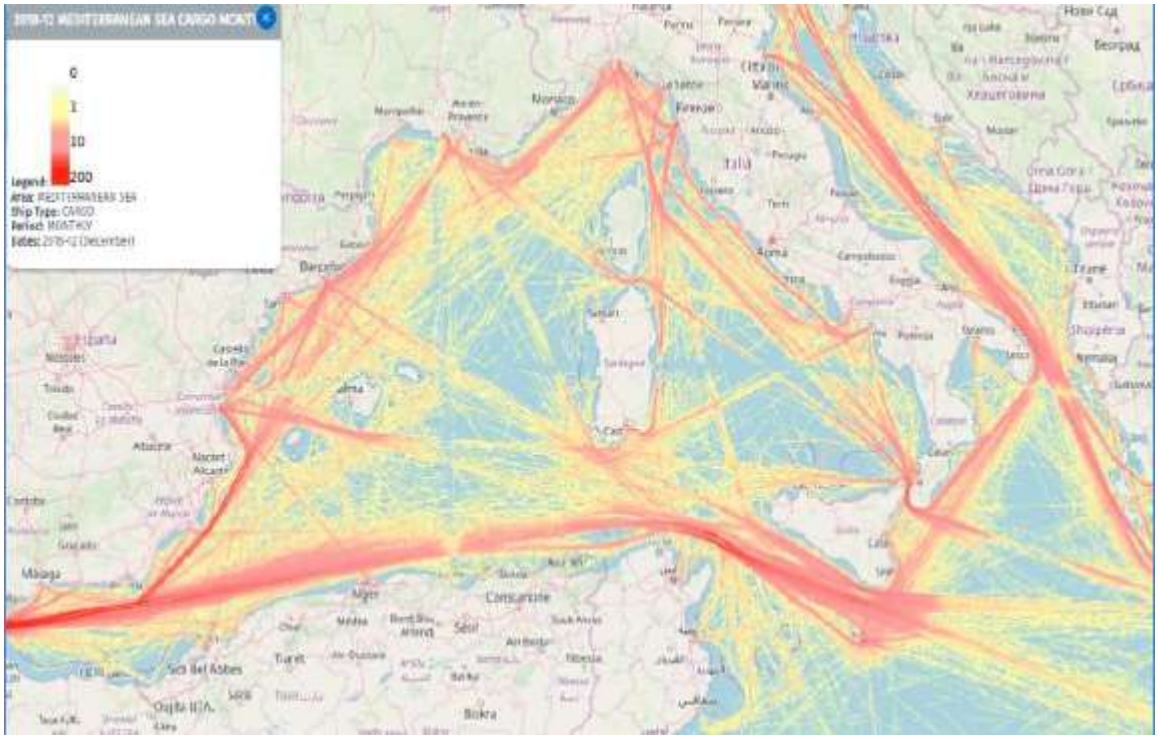

Figure 5-28 TDM (area – Mediterranean Sea; time criteria – monthly TDM; ship type range – Cargo)

5.4.1 HAZMAT reporting to SafeSeaNet

SafeSeaNet is European maritime safety and security network designed to enhance the situational awareness of maritime operators and authorities. One potential application of the network is to track and monitor maritime transportation of dangerous goods and HAZMAT.

The specific types of HAZMAT data that SafeSeaNet may collect could include information on the type of material involved, its quantity, location, and potential impacts on human health and the environment. This information could be gathered from a variety of sources, such as reports from maritime operators or authorities. HAZMAT data could be interesting for CRISIS project. All member states are obliged to report HAZMAT through SafeSeaNet. Unfortunately, Montenegro and Albania do not report HAZMAT through SafeSeaNet.

5.5 ADRIREP data and statistics

The IMO Maritime Safety Committee adopted the mandatory Ship Reporting System ADRIREP its 76th session of 5th December 2002 and entered into force on 1st July 2003 - Resolution MSC.139 (76) [11]. Reporting is mandatory for all oil tankers of 150 gross tonnage and above and for all ships of 300 gross tonnage and above, carrying on board, as cargo, dangerous or polluting goods, in bulk or in packages [12]. For the purpose of this system:

- "dangerous goods" means goods classified in the IMDG Code, in Chapter 17 of the IBC Code and in Chapter 19 of the IGC Code;
- "polluting goods" means oils as defined in MARPOL Annex I, noxious liquid

substances as defined in MARPOL Annex II, and harmful substances as defined in MARPOL Annex III.

The mandatory ship reporting system's operational area covers the Adriatic Sea, north from the latitude 40° 25'.00 N as shown in the Figure 5-29 [11].

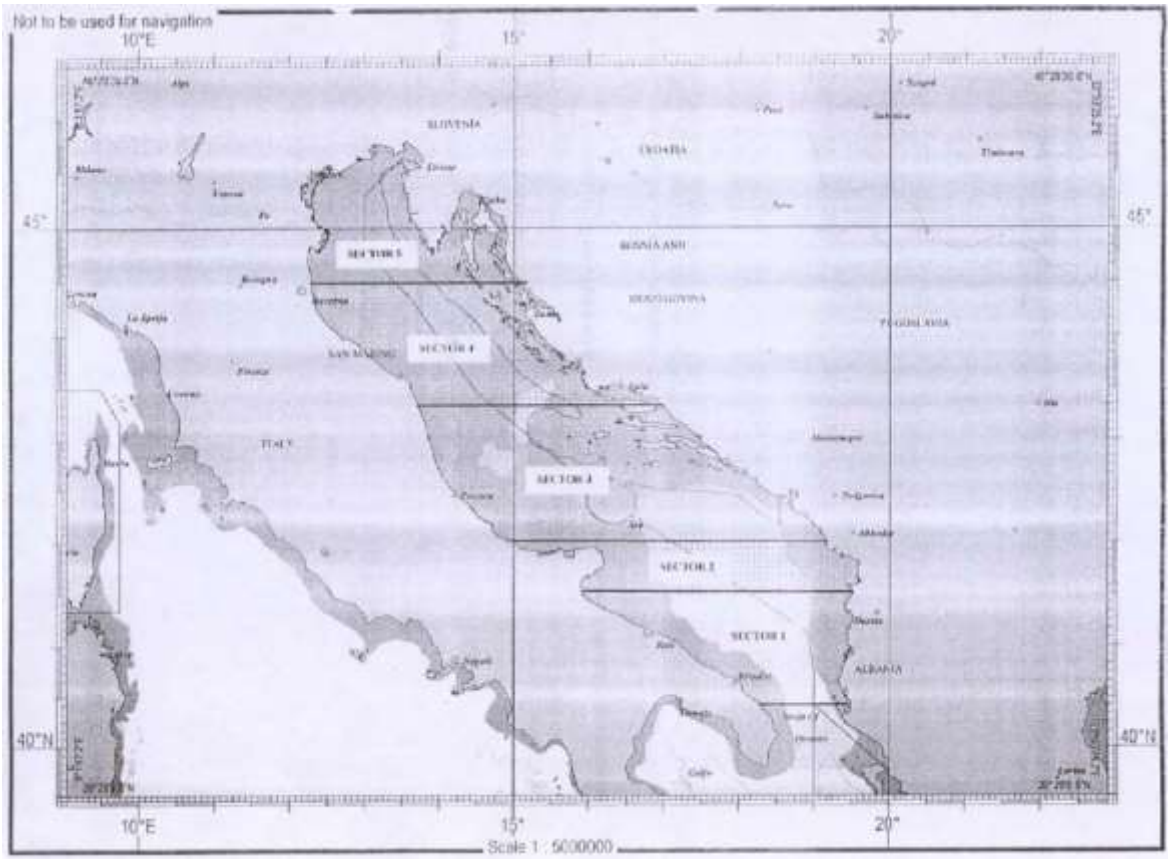

Figure 5-29 The operational area of the ADRIREP mandatory ship reporting system

The area is divided into 5 (five) sectors, each of them assigned to a competent authority, operating on a VHF channel as shown in the Table 5-5 [11].

Table 5-5 ADRIREP sectors, borderlines, competent authorities and operating VHF frequencies

SECTOR	SOUTHERN BORDERLINE	NORTHERN BORDERLINE	COMPETENT AUTHORITY	VHF FREQUENCIES
1	Latitude 40° 25'.00 N	Latitude 41° 30'.00 N	Brindisi Coast Guard (Italy)	Channel 10
2	Latitude 41° 30'.00 N	Latitude 42° 00'.00 N	Bar MRCC (Yugoslavia)	Channel 12
3	Latitude 42° 00'.00 N	Latitude 43° 20'.00 N	Rijeka MRCC (Croatia)	Channel 10
4	Latitude 43° 20'.00 N	Latitude 44° 30'.00 N	Ancona MRSC (Italy)	Channel 10
5	Latitude 44° 30'.00 N	Coastline	Venezia MRSC (Italy)	Channel 10
5	Latitude 44° 30'.00 N	Coastline	Trieste MRSC (Italy)	Channel 10
5	Latitude 44° 30'.00 N	Coastline	Koper MRCC (Slovenia)	Channel 12

The ship shall send the position report to the closest shore based authority of the country the ship is leaving, which shall inform the maritime authority of the destination port. The number of ship reports according to existing system includes a minimum of 4 and a maximum of 12 ship reports, depending on port of arrival, but always providing the same datasets to different coastal authorities on different VHF channels. The existing ADRIREP is managed by 4 countries and the area is divided in 5 separate reporting lines/areas.

Shore based facilities that receives ADRIREP reports are following [11]:

1. Brindisi Coast Guard (Italy)
2. MRCC Bar (Montenegro)
3. MRCC Rijeka (Croatia)
4. MRSC Ancona (Italy)
5. MRSC Venezia (Italy)
6. MRSC Trieste (Italy)
7. MRCC Koper (Slovenia)

5.5.1 Data collected by ADRIREP

The ship sailing through Adriatic sea, transporting dangerous cargo onboard has to submit several reports. We have two types of reports:

- First report and
- Position or final report.

First Report contains data that are indicated in Table 5-6 [11].

Table 5-6 Format of ADRIREP ship reporting system - First report

	Message identifier:	- **ADRIREP**
	Type of report	- 01/FR (first report)
A	Ship	- Name, call sign, IMO identification number and flag of the vessel
B	Date/time (UTC)	- A 6 – digit group giving date of month (first two digits), hours and minutes (last 4 digits)
C	Present position	- A 4-digit group giving latitude in degrees and minutes suffixed with "N" or "S" and a five-digit group giving longitude in degrees and minutes suffixed with "E" or "W"
E	Course	- a three digit group giving the course in degrees
F	Speed	- a three digit group giving a speed in Knots
G	Departure	- port of departure
I	Destination and estimated time of arrival	- ETA in UTC expressed as in B above, followed by port of destination
N	Estimated time of arrival at the next check point	- Date/time group expressed by a 6-digit group, as in B above, followed by the parallel of the check point
O	Draught of the vessel	- draught expressed by a four digit group indicating centimetres
P	Cargo information	- the general category of hazardous cargo as defined by the IMDG, IBC, IGC Codes and MARPOL Annex I.
T	Agent	- ship's representative and/or owner available on 24-hour basis
U	Size and type	- type, DWT, GT, and length overall in meters
W	Total number of persons on board	- The total number of crew and other persons on board
X	Miscellaneous	- Any other relevant information

Position report or Final report contains the data indicated in Table 5-7 [11].

Table 5-7 Format of ADRIREP ship reporting system - Position report or Final Report

	Message identifier:	**- ADRIREP**
	Type of report	- 01/PR (position report) - 02/PR - 03/PR - ER (final report)
A	Ship	- Name, call sign, IMO identification number and flag of the vessel
B	Date/time (UTC)	- A 6 – digit group giving date of month (first two digits), hours and minutes (last 4 digits)
C	Present position	- A 4-digit group giving latitude in degrees and minutes suffixed with "N" or "S" and a five-digit group giving longitude in degrees and minutes suffixed with "E" or "W"
E	Course	- a three digit group giving the course in degrees
F	Speed	- a three digit group giving a speed in Knots
G	Departure	- port of departure
I	Destination and estimated time of arrival	- ETA in UTC expressed as in B above, followed by port of destination
N	Estimated time of arrival at the next check point	- Date/time group expressed by a 6-digit group, as in B above, followed by the parallel of the check point
X	Miscellaneous	- Any other relevant information

On the reports type of dangerous cargo is indicated (IMO/cargo class), cargo quantity and unit of measurement (kg, litter, metric tonne, cubic tonne or tonne). The cargo classes and their description are presented in Table 5-8.

Table 5-8 Cargo classes and Cargo Class Descriptions in the ADRIREP system

Cargo Class	Cargo Class Description
1	Explosives
2	Gases
2.1	Flammable Gases
2.2	Non-flammable Gases
2.3	Toxic Gases
3	Flammable liquids
4	Flammable solids
4.1	Flammable solids,self-reactive s...
4.2	Substances liable to spontaneou...
4.3	Substances which, in contact wit...
5	Oxidizing and organic
5.1	Oxidizing substances
5.2	Organic peroxides
6	Toxic and infectious substances
6.1	Toxic substances
6.2	Infectious substances
7	Radioactive material
8	Corrosive substances
9	Miscellaneous dangerous

5.5.2 Montenegro ADRIREP data and statistics

MRCC Bar is responsible for receiving ADRIREP reports for ships entering Zone 2, and forwarding them to other shore stations in participating countries. Till year 2015 data was collected via VHF from ships. Since 2015, the data are collected through Montenegro VTMIS (Vessel Traffic Monitoring and Information System) and partly VHF. In the Table 5-9 are presented the numbers of reports received by MRCC Bar from ships caring dangerous cargo on board (source AMSPM).

Table 5-9 Number of ADRIREP reports received by MRCC Bar on a yearly basis

Nr	Year	Number of reports per year
1	2011	1744
2	2012	1621
3	2013	1547
4	2013	1647
5	2014	1624
6	2015	1522
7	2016	1942
8	2017	2015
9	2018	2132
10	2019	2443
11	2020	2340
12	2021	2260
13	2022	2415

In the Figure 5-30 and Figure 5-31 are presented number of reports receives from vessels sailing South-North and North-South respectively and the destination or port of departure can be any port in Adriatic sea. We can notice that there are more reports in S/N direction, having in mind that the ports in Adriatic are mostly receiving dangerous cargo than originating such transport, and it is mostly as tankers are delivering the fuel do destination ports.

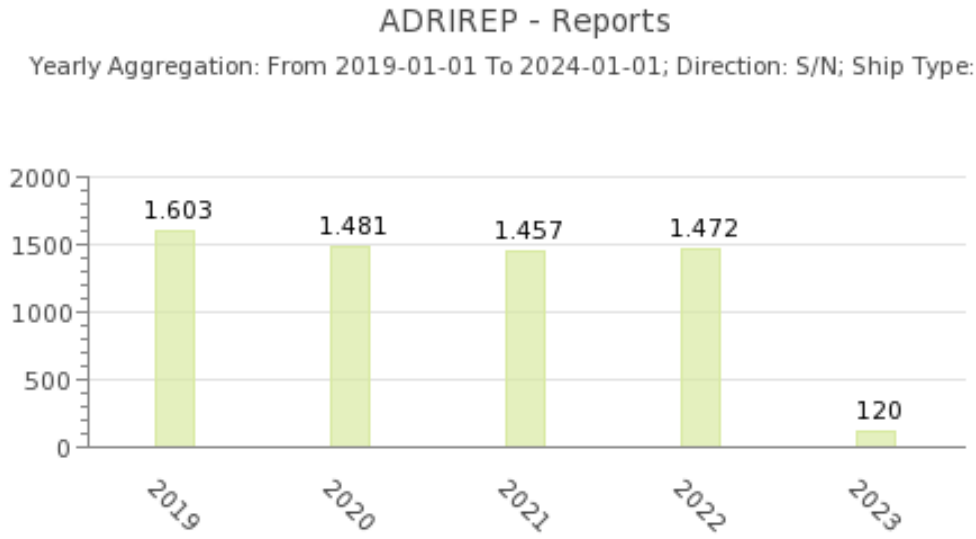

Figure 5-30 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: South/North, Ship Type: All

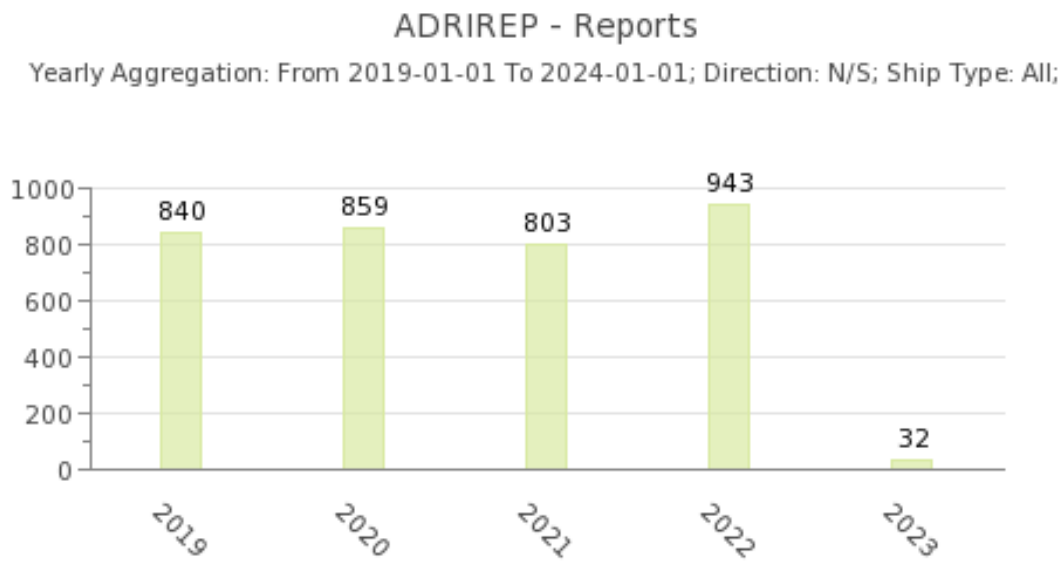

Figure 5-31 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: North/South, Ship Type: All

5.5.2.1 ADRIREP data and statistics – Destination Port of Bar

In the next three figures we will focus on the reports received by MRCC Bar and ships with dangerous cargo on board which has final destination port of Bar. In the Figure 5-32 are presented all vessels with dangerous cargo calling Port of Bar, while in Figure 5-33 tankers and in Figure 5-34 cargo ships.

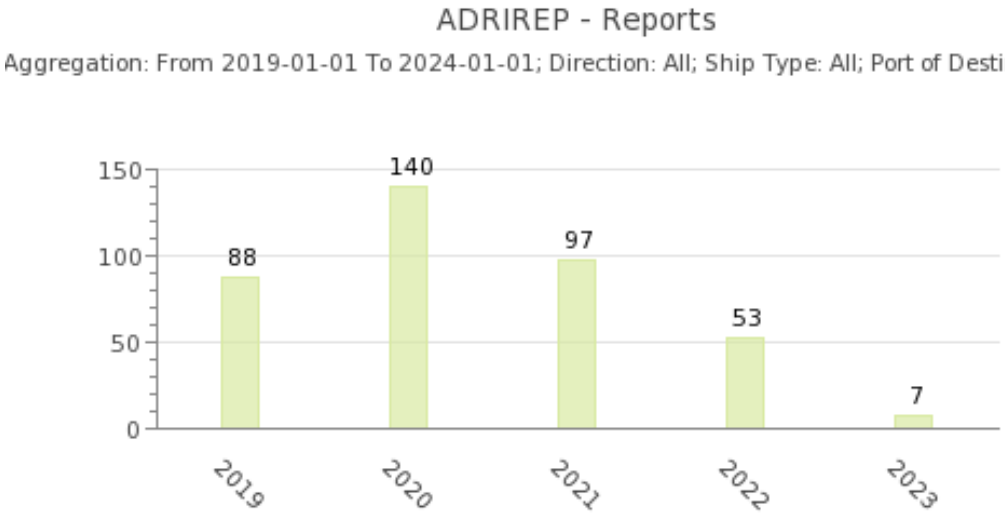

Figure 5-32 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: All, Ship Type: All, Port of Destination: Bar (MEBAR)

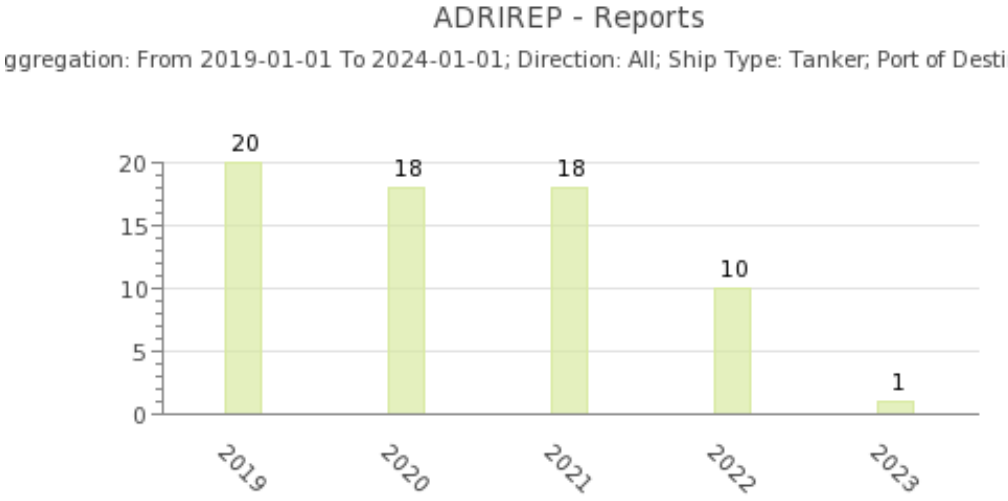

Figure 5-33 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: All, Ship Type: Tanker, Port of Destination: Bar (MEBAR)

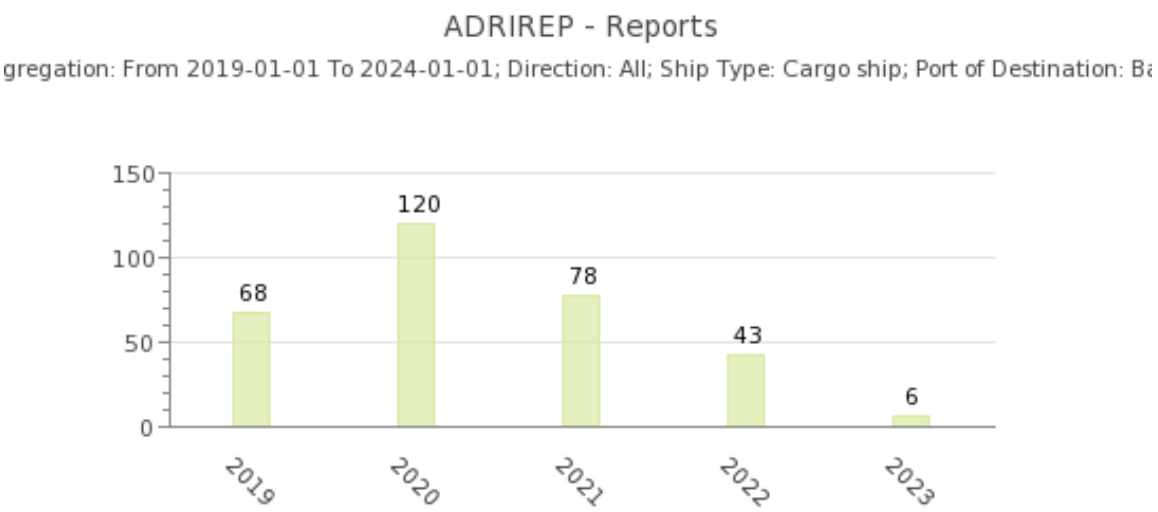

Figure 5-34 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: All, Ship Type: Cargo ship, Port of Destination: Bar (MEBAR)

5.5.2.2 ADRIREP data and statistics – Departing from Port of Bar

In the next three figures we will focus on the reports received by MRCC Bar and ships with dangerous cargo on board which are departing from Port of Bar. In the Figure 5-35 are presented all vessels with dangerous cargo calling Port of Bar, while i Figure 5-36 tankers and in Figure 5-37 cargo ships.

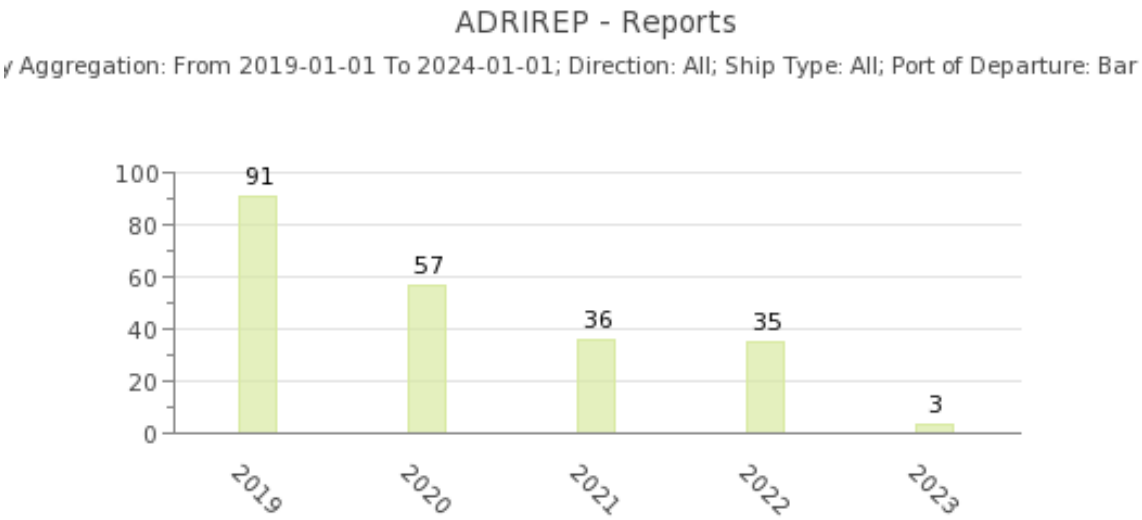

Figure 5-35 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: All, Ship Type: All, Port of Departure: Bar (MEBAR)

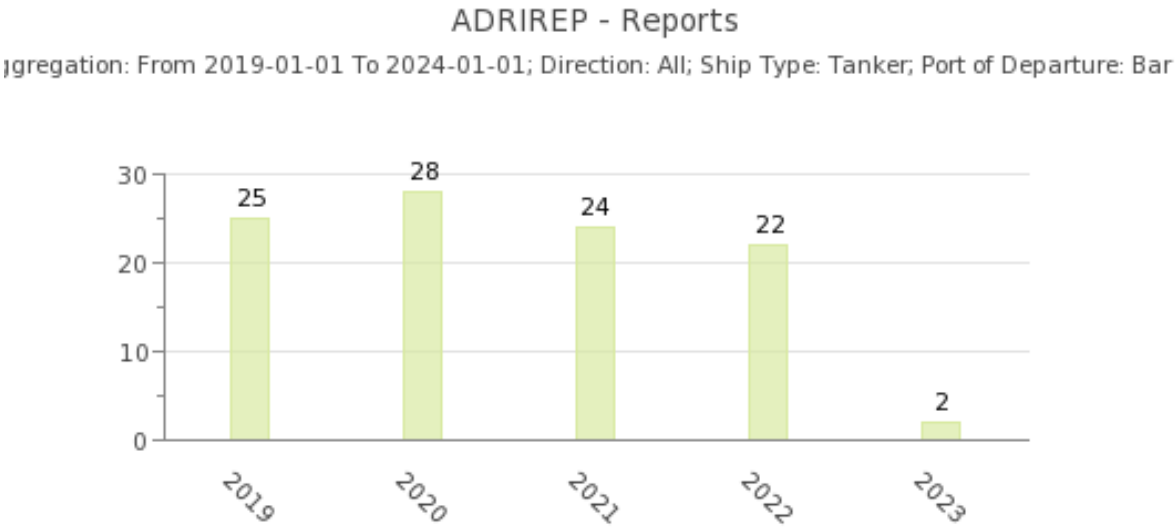

Figure 5-36 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: All, Ship Type: Tanker, Port of Departure: Bar (MEBAR)

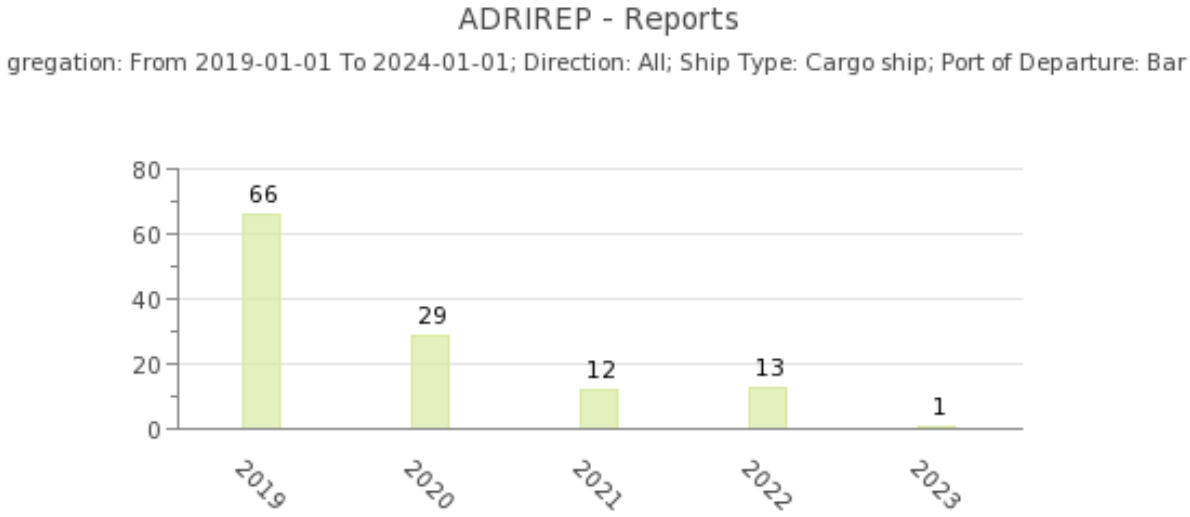

Figure 5-37 Yearly Aggregation: From Jan 2019 To Mar 2023, Direction: All, Ship Type: cargo ship, Port of Departure: Bar (MEBAR)

5.5.3 Existing limitation of ADRIREP – future improvements

At the moment, data from vessels are taken via VHF which causes an administrative burden to the ship crew. Also, data received from hips are not stored in a structured manner, so they could be easily reused for statistical purposes. Because of that, getting quantities and cargo classes from MRCC Bar is impossible.

In order to overcome this issue, there is an ongoing EU-funded ADRION project EUREKA. Eureka aims modernisation of the ADRIREP mandatory reporting system with a proposal for a new resolution to the International Maritime Organization and a new simplified technological reporting solution, exchange of data on maritime traffic important for navigation safety between the countries of the Adriatic - Ionian area and standardisation of navigation safety services and VTS services in this sea space [13].

EMSA will provide technical assistance for the modernisation of ADRIREP. According to accepted business requirements, ADRIREP report could be sent via VHF, MF/HF communication equipment, e-mail, telephone and telefax communication facilities and reporting by electronic means. Modernisation will enable participation of all ADRION countries.

The updated list of the ADRIREP authorities with contact details is shown Table 5-10 [12] .

Table 5-10 Update list of the ADRIREP authorities with contact details

Participating Country	COMPETENT AUTHORITY	VHF CHANNEL	Phone	Fax	E-mail
ALBANIA	Interinstitutional Maritime Operational Centre – IMOC	CH 6; CH 11	+35552260201	+35552260201	imoc@imoc.gov.al
BOSNIA AND HERZEGOVINA	HARBOURMASTER OFFICE NEUM	CH 10; CH 60	+38736880020 +38736885028	N/A	kapetanija.neum@tel.net.ba
CROATIA	VTS CROATIA	CH 10	+385(0)51 312300	+385(0)51 312243	VTS3@pomorstvo.hr
ITALY	VTS BRINDISI	CH 10	+39 0831 521022	+39 0831 521022	so.cpbrindisi@mit.gov.it
ITALY	ANCONA COAST GUARD	CH 10	+39 071 22751	+39 071 22751	so.cpancona@mit.gov.it
ITALY	VTS VENEZIA	CH 10	+39 041 240 5711	+39 041 240 5711	so.cpvenezia@mit.gov.it
ITALY	VTS TRIESTE	CH 10	+39 040676611	+39 040676611	so.cptrieste@mit.gov.it
ITALY	VTS Bari	CH 14	+390805281511	+390805281557	so.cpbari@mit.gov.it
ITALY	PESCARA COAST GUARD	CH 14	+39085694040	+390854510117	so.cppescara@mit.gov.it
MONTENEGRO	MONTENEGRO VTS	CH 11	+38230315386	+38230313600	vts@pomorstvo.me
SLOVENIA	MRCC KOPER	CH 12	+38656632106 +38656632107 +38656632108	+38656632110	koper.mrcc@gov.si kp.promet@gov.si

Also, ADRIREP area will be enlarged as shown in Figure 5-38 [12]. A modernised version of ADRIREP will provide more accurate statistical data on quantities and class of cargo when it will be operational.

[13] https://mmpi.gov.hr/more-86/projekti-113/eureka/22624

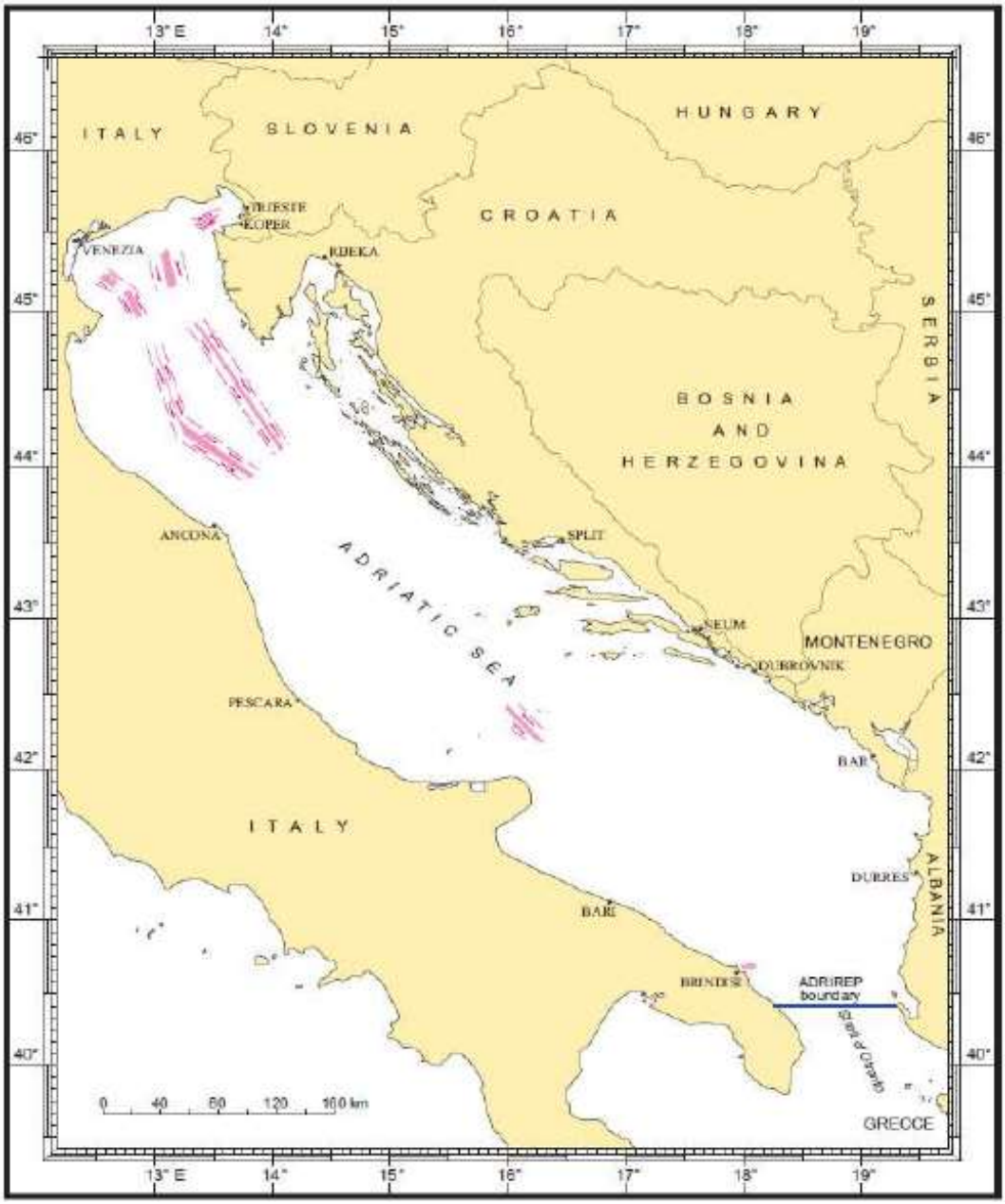

Figure 5-38 New proposed ADRIREP area

5.6 Data collected from Albanian ports

Albania has four significant ports located in Durres, Shengjin Vlora, and Saranda, as presented in Figure 5-39.

Figure 5-39: Map of Albania (source: http://www.cruiserswiki.org/wiki/Albania)

Dures Port is the main port. More than 75% of import and export is done through this port. Port handles container vessels, general and bulk cargo vessels and passenger ferries. Lately, many yachts have visited this port. Oil handling is done by Romano port.

The Port of Shengjin handles bulk cargo, and there is a lot of fishing vessel activity, as seen in AIS density maps.

Port of Vlora is the second port by importance in Albania. Passenger traffic dominates at this port, while Petroliferas Port at the north handles tankers.

Port of Saranda can handle both passengers and goods. In recent years, there is an increase in pleasure crafts calling this port.

Statistical data and AIS density maps are used to analyse maritime traffic in Albania.

5.6.1 Statistical data

The following three tables will present relevant maritime transport statistical data from previous years. Table 5-11 gives the volumes of freight transported by sea from 2012 to 2019.

Table 5-11: Transport of freights, 2012-2019 (Source: INSTAT)

Description / Year	2012	2013	2014	2015	2016	2017	2018	2019
The volume of freight by sea (000/tonnes)	3,984	4,001	4,066	3,840	3,756	4,022	3,890	4,455

Table 5-12 gives the number of sea passengers transported by sea from 2012 to 2019.

Table 5-12: Transport of passengers, 2012 -2018 (Source: INSTAT)

Description	2012	2013	2014	2015	2016	2017	2018	2019
Number of sea passengers	1,101,025	1,009,186	1,094,569	1,185,957	1,288,988	1,507,116	1,522,896	1,574,095

Table 5-13 is given the distribution of fishing vessels by the port for the period from 2014 to 2019.

Table 5-13: Fishing fleet by ports, 2014 – 2019 (Source: INSTAT)

Description	2014	2015	2016	2017	2018	2019
Distribution of Vessels by Port						
Durres	219	209	209	204	233	243
Vlore	210	183	184	181	198	198
Saranda	91	86	86	84	99	103
Shengjin	52	65	65	73	78	79
Himara	4	11	11	10	12	15
Lushnje -Fier	5	10	10	7	12	13
Total	**581**	**564**	**565**	**559**	**632**	**651**

According to FAO, marine fisheries are the most important sector of the fisheries. Capture production in 2018 was 8 648 tonnes, with marine fisheries constituting 75 per cent of the total. The Albanian fishing fleet is currently located in four ports: Durres, Vlora, Shengjin and Saranda, where about 1,870 persons are employed. Besides, 1,000 fishers were directly engaged in inland fisheries in 2018. There were 1 137 commercial vessels in 2018.

5.7 AIS Density maps

Marine traffic software was used as a source of AIS data to produce AIS density maps. The year 2019 is analysed. Six different density maps have been created that are represented in the following figures:

- Figure 5-40: Density map for all types of vessels based on AIS data for the year 2019 (source www.marinetraffic.com)
- Figure 5-41: Density map for vessels with dangerous cargo onboard (tankers, LPG and LNG) based on AIS data for the year 2019 (source www.marinetraffic.com)
- Figure 5-42: Density map for passenger's vessels based on AIS data for the year 2019 (source www.marinetraffic.com)
- Figure 5-43: Density map for cargo and container vessels based on AIS data for the year 2019 (source www.marinetraffic.com)
- Figure 5-44: Density map for fishing vessels based on AIS data for the year 2019 (source www.marinetraffic.com)
- Figure 5-45: Density map for pleasure crafts based on AIS data for the year 2019 (source www.marinetraffic.com)

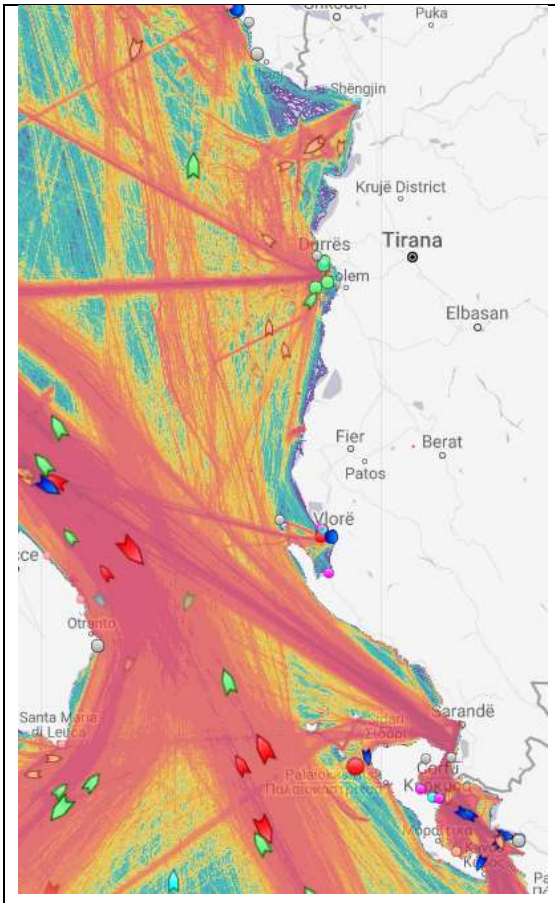

Figure 5-40: All type of vessels

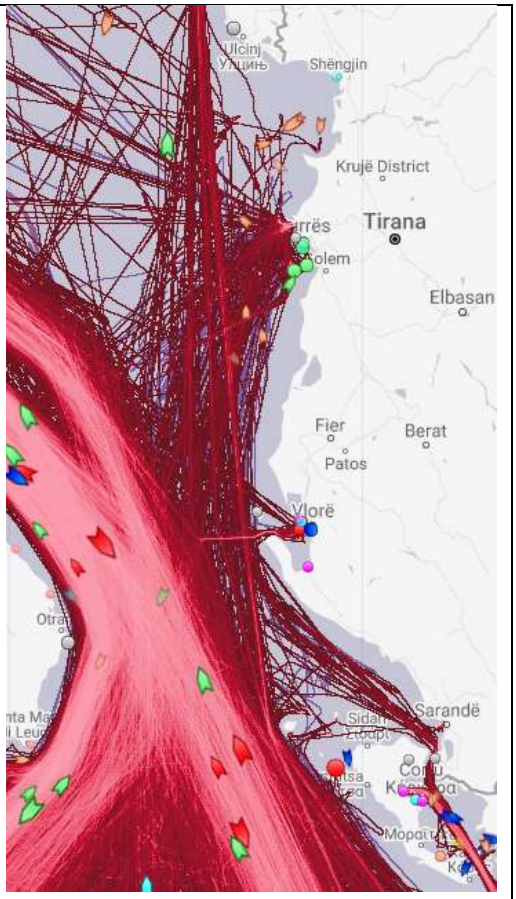

Figure 5-41: Vessels with dangerous cargo on board

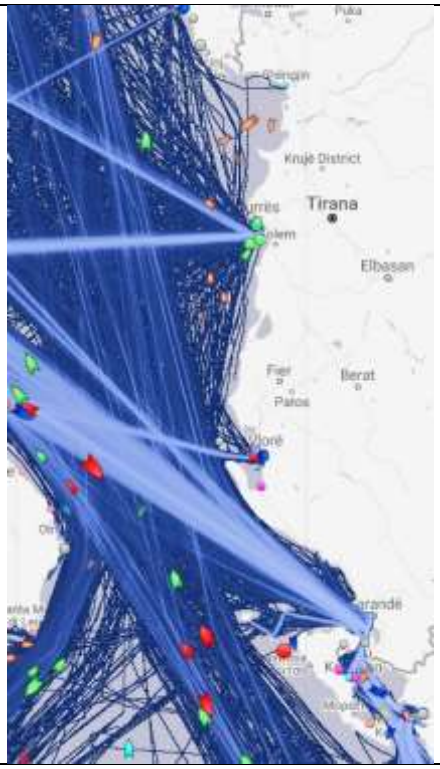

Figure 5-42: Passenger's vessels

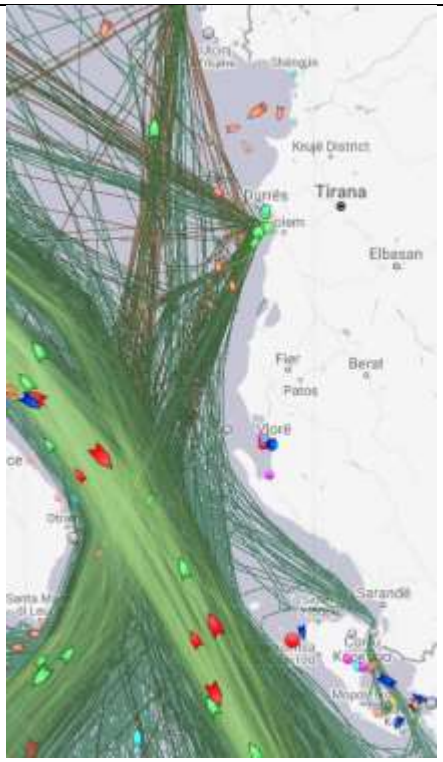

Figure 5-43: Cargo and container vessels

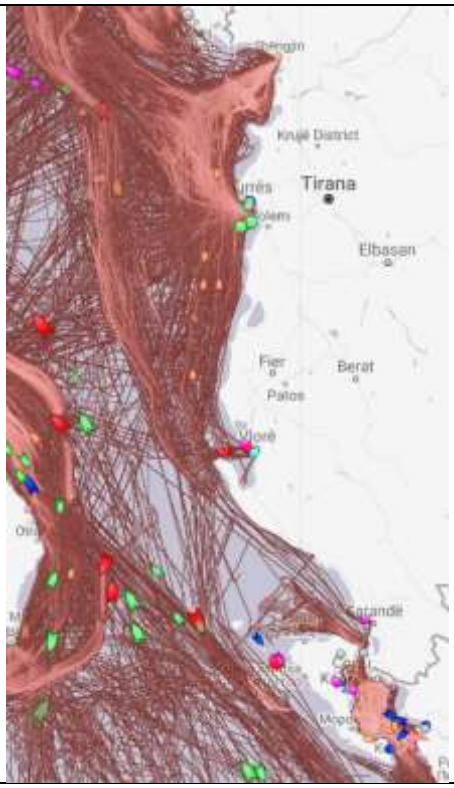

Figure 5-44: Fishing vessels

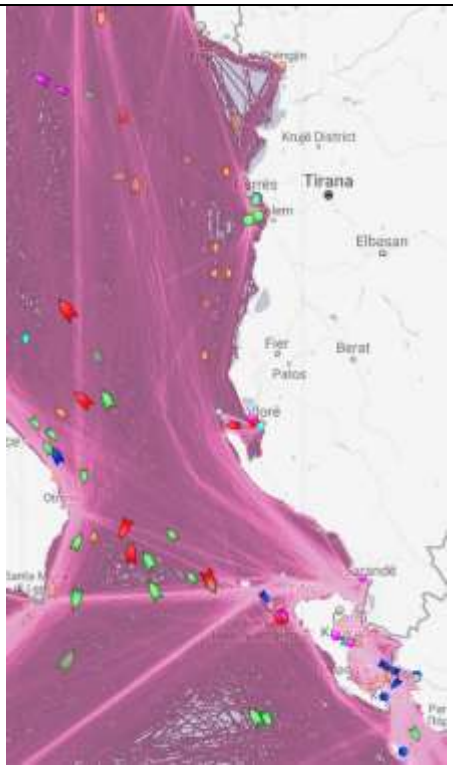

Figure 5-45: Pleasure Crafts

5.8 Data collected from Italian ports

5.8.1 Ports on the Southern Adriatic Sea

Southern Italy has six main ports located in Bari, Brindisi, Manfredonia, Barletta, Monopoli, and Termoli.

5.8.1.1 Brindisi Port

In 2022, the port of Brindisi reaffirmed its status as the most efficient port in the system for cargo management, with a total handling of 7.6 million tons. Despite the impacts of the pandemic and the initiation of the decarbonization process, there was a significant increase in the flow of goods. Specifically, general cargo reached the figure of 3 million tons, marking a growth of 6% compared to 2020 and 8% compared to 2019, confirming an upward trend[14].

In the first months of 2023, this positive trend further strengthened with an encouraging increase of +2.4% compared to the previous year. This result is noteworthy considering the reduction of 300 thousand tons of coal delivered to the port of Brindisi due to the ongoing decarbonization process at the Enel power plant[15].

Figure 5-46 shows the structure of the port.

[14] https://www.informazionimarittime.com/post/sistema-porto-di-bari-da-record-nel-2021

[15] https://www.portnews.it/ottimo-quadrimestre-per-bari-e-brindisi/

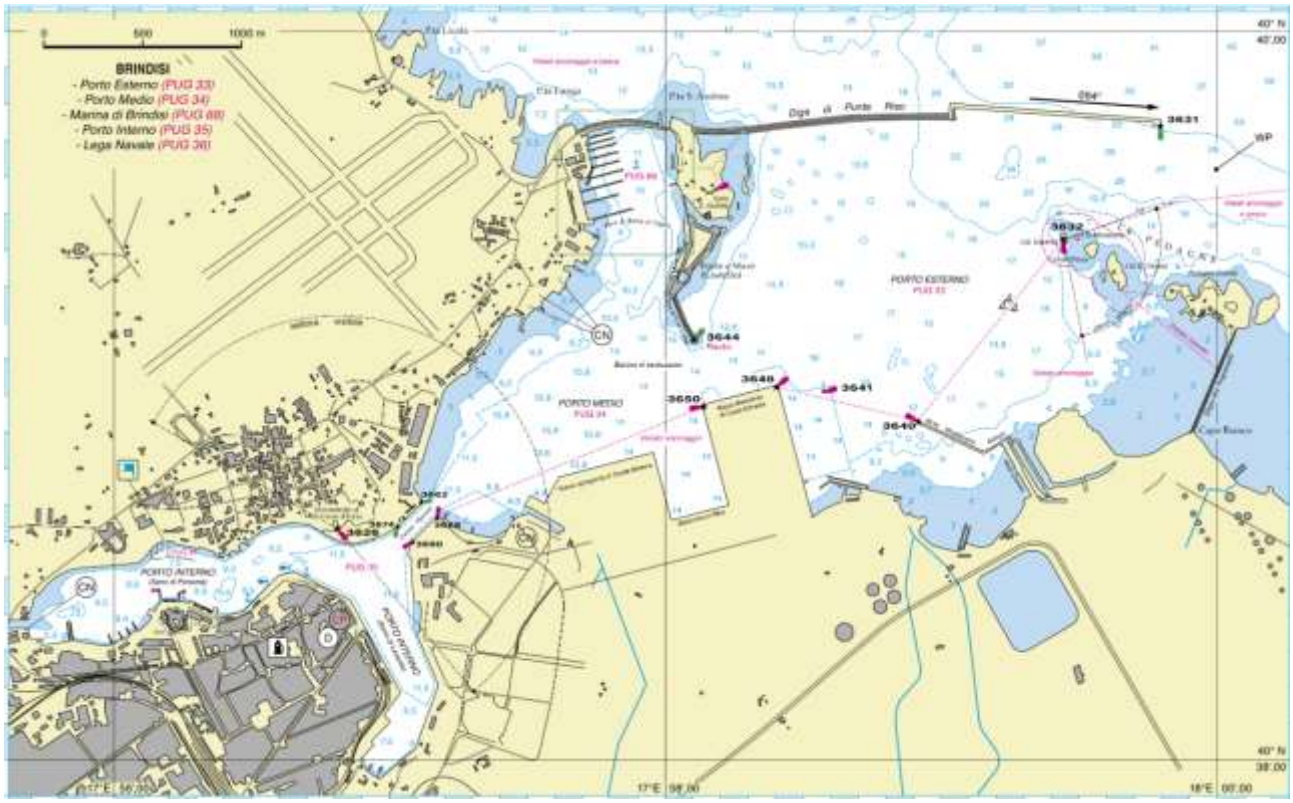

Figure 5-46: Brindisi port

5.8.1.2 Bari Port

In 2022 the port of Bari has set a new historical record in freight traffic, with 2,102 dockings leading to a 6.7% increase in handled tons compared to 2020. This growth was mainly driven by the handling of general cargo, which saw a notable +16.3% increase compared to 2020, surpassing even the 2019 figure of +5.1%. Over the past year, the port has witnessed the transit of over 176,000 rolling units (+18% compared to 2020) and more than 70,000 TEUs[1].

In 2023, the analysis of individual port performances highlights the distinction of the port of Bari in terms of the number of dockings. In the first four months of the year, the main port of the region has managed 643 dockings. On the quay, between loading and unloading, approximately 2.6 million tons of goods have been handled, marking a +13% increase compared to the same period in 2022. The sector of solid bulk and cereals marks the most significant increase, with a +60% compared to the previous year. Solid bulk includes commodities such as minerals, coal, gravel, sand, and other similar materials, while cereals encompass products like wheat, corn, rice, and other grains. Such a significant increase is undoubtedly a positive signal, not only for the port but for the entire surrounding economy, indicating a higher demand for these products in both the domestic and foreign markets. During the examined period, almost 65,000 trucks and trailers and over 20,000 TEUs have also transited[2].

Figure 5-47 shows the structure of the port

Figure 5-47: Bari port

5.8.1.3 Manfredonia Port

The port of Manfredonia stand out as the only terminal in the system to report growth even in the handling of solid bulk, with an increase of +4.3%. The port in Manfredonia has maintained a consistent and continuous growth trend throughout 2021, handling a substantial 638,000 tons of goods and confirming a positive trend of +3.3% compared to 2020[1].

In 2023 the increasing numbers and prominent role in the freight traffic consolidate the position of the port of Manfredonia. From January to April, 62 ship calls were recorded, representing an increase of about 22% compared to the previous year, and an overall increase in total freight traffic of approximately +4%. The handled tons exceed 200,000, particularly in the case of solid bulk, which grew by approximately 3% compared to the previous year[2].

Figure 5-48 shows the structure of the port.

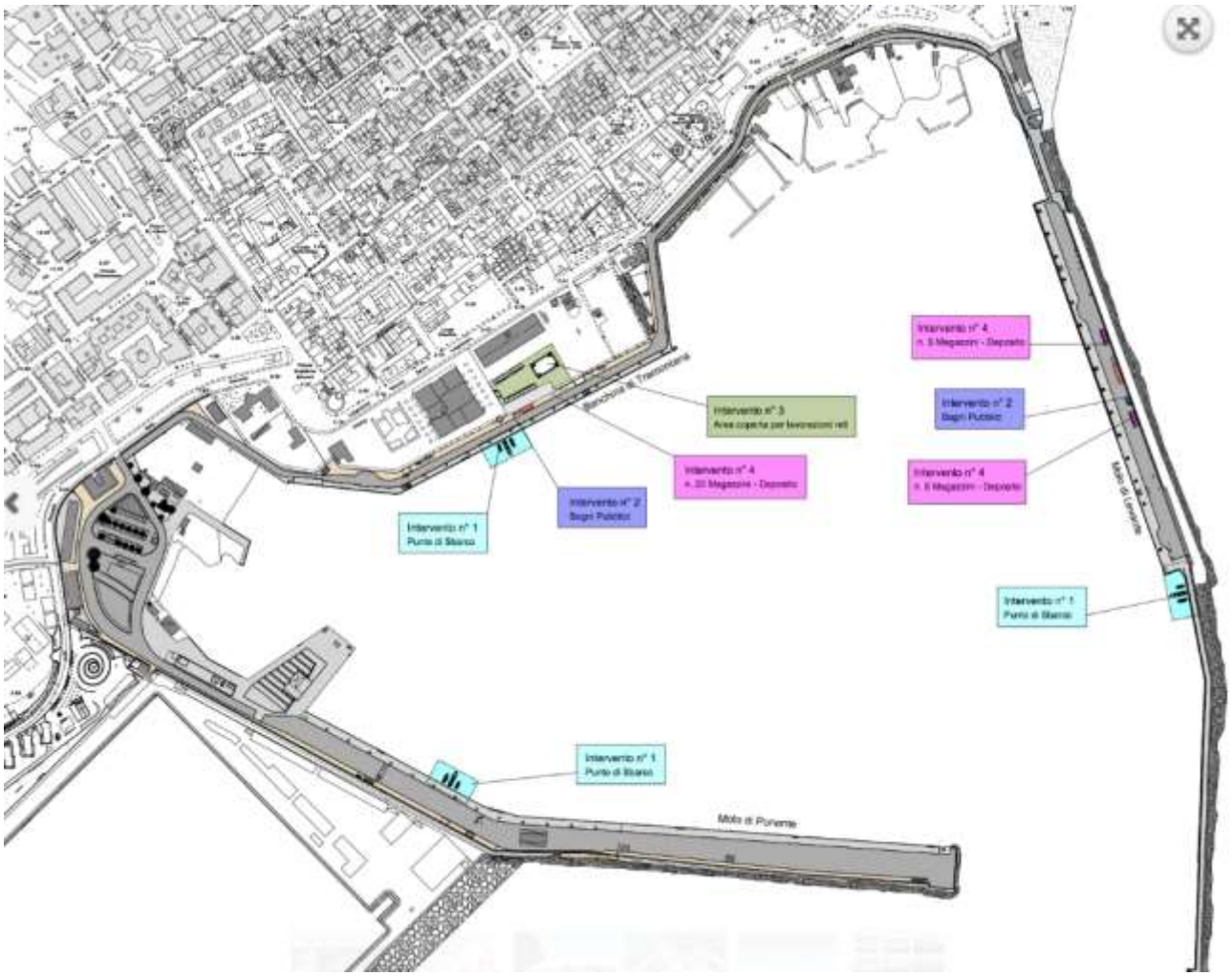

Figure 5-48: Manfredonia Port

5.8.1.4 Barletta Port

In 2022, the port of Barletta recorded a 1.4% increase, reaching 728,000 tons and showing a significant recovery in the handling of liquid bulk, with a growth of around 24%. Furthermore, there was a notable increase in the number of dockings, experiencing a 3% growth[1].

In 2023, the port of Barletta demonstrated a decidedly positive performance. Dockings increased to 64, representing a 7% rise compared to 2022, and the handled tons of bulk cargo exceeded 260,000. This led to a growth trend of +22% compared to the previous year, propelling the port to surpass the activity levels of 2019 with a +2% increase[2].

Figure 5-49 shows the structure of the port

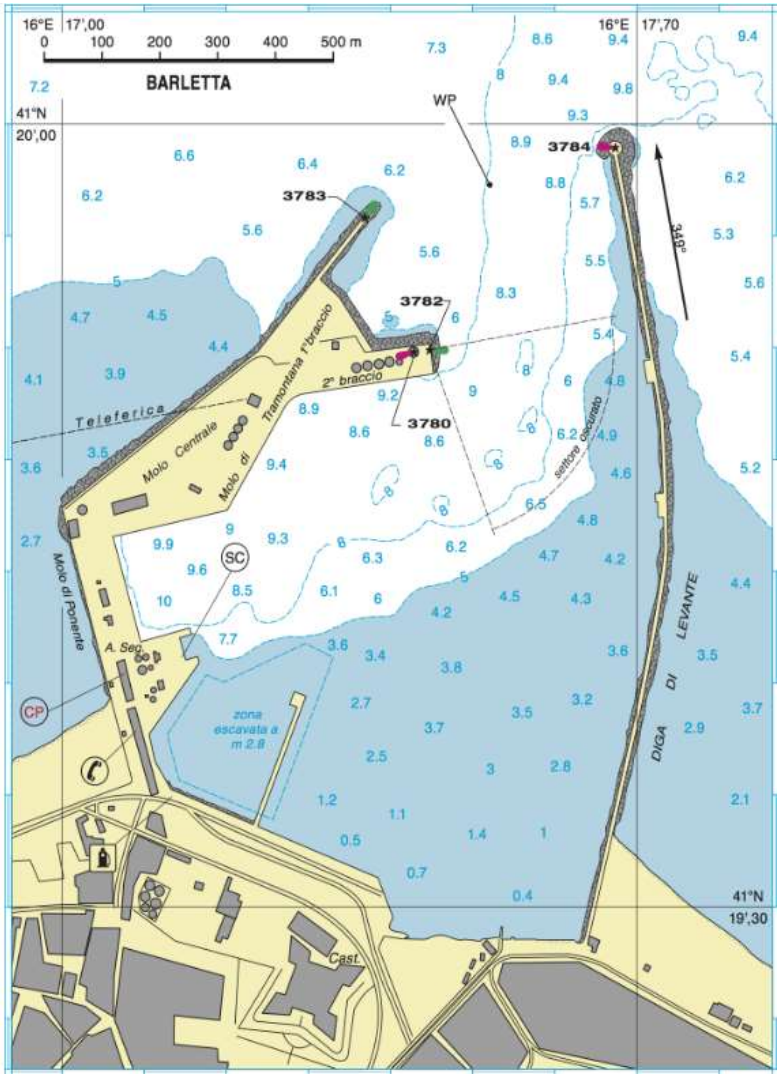

Figure 5-49: Barletta Port

5.8.1.5 Monopoli Port

The port of Monopoli is primarily focused on cruise itineraries, but it also achieves significant results in commercial routes. In 2022, the port of Monopoli experienced a notable increase of +30% in dockings and +27% in handled goods, surpassing 500,000 tons[1].

In 2023, with its 34 dockings, the port of Monopoli stands out in the analysis period due to a remarkable +460% increase in handled packaged goods[2].

Figure 5-50 shows the structure of the port

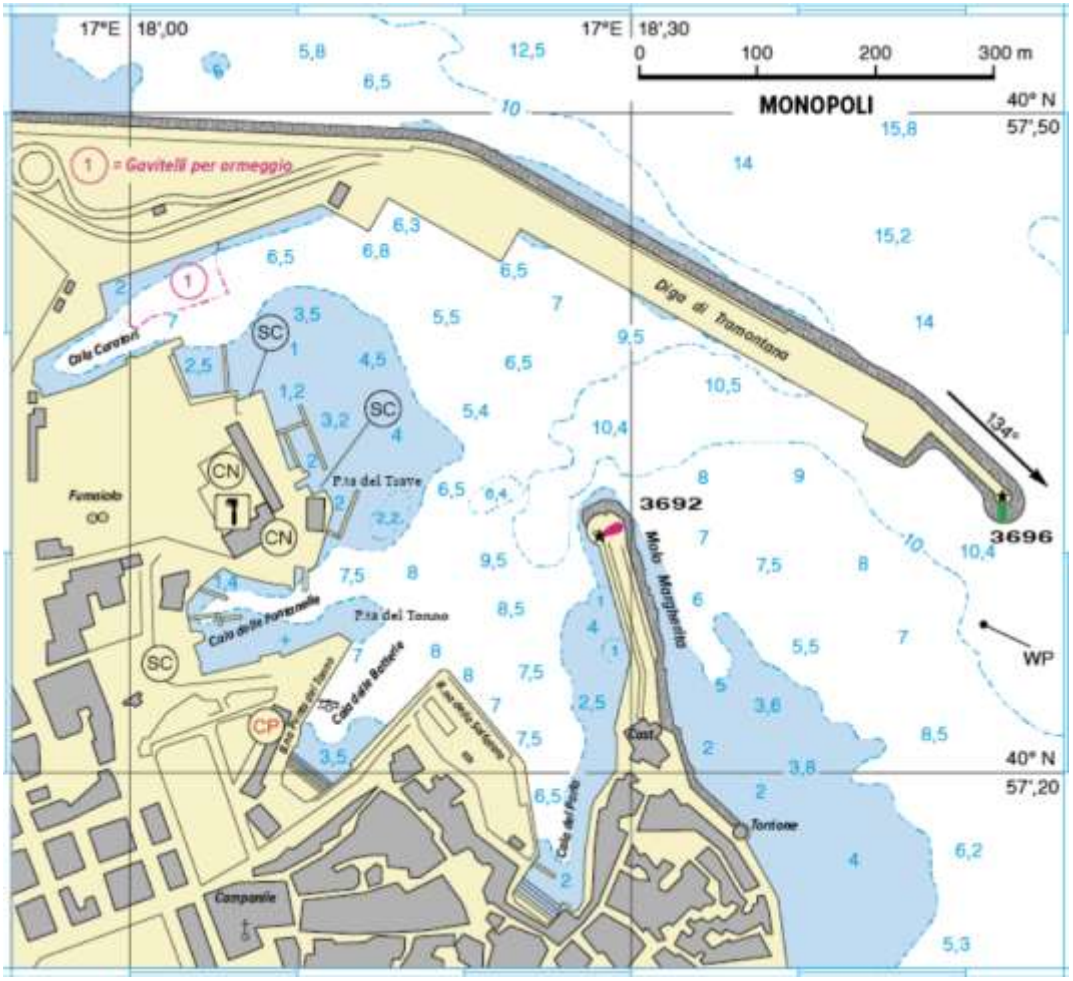

Figure 5-50: Monopoli Port

5.8.1.6 Termoli Port

In the first four months of 2023, 155 ships entered the port in Molise, marking a +6% increase compared to the same period in 2022. The most significant figure is related to a substantial +54% rise in general cargo. This outcome indicates a greater diversification of goods handled by the port, providing an advantage in terms of economic resilience. This is because the port becomes less dependent on a single sector or type of cargo[2].

Figure 5-51 shows the structure of the port.

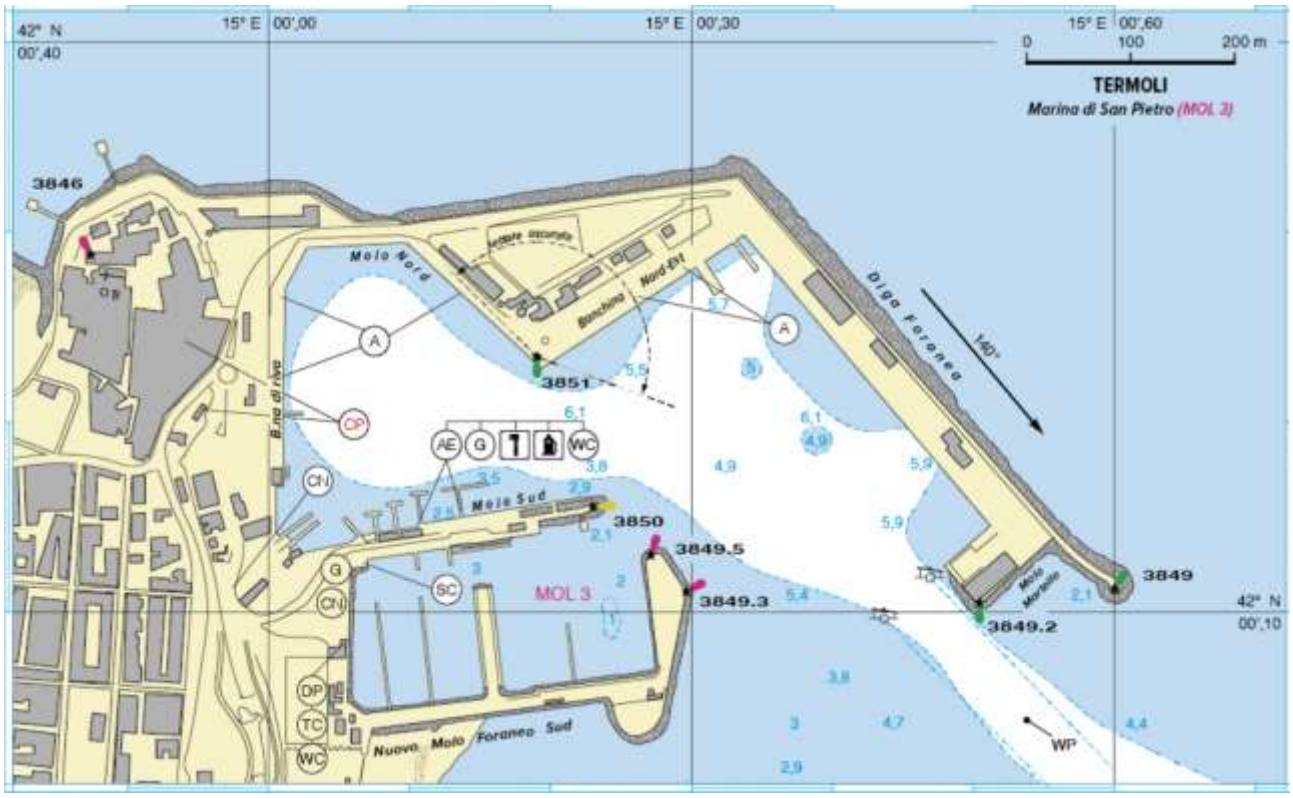

Figure 5-51: Termoli Port

5.8.1.7 Molfetta Port

The port of Molfetta is in the preparation phase to become an additional reference center for commercial activities. The final project for the new commercial port of Molfetta was approved *through Deliberazione della Giunta Comunale* No. 94 dated 25/09/2006 and involves a total amount of 55,000,000 euros, with an expected release date in 2022[16].

Figure 5-52 shows the structure of the port.

[16] https://www.comune.molfetta.ba.it/vivere-il-comune/attivita/cantieri/item/nuovo-porto-commerciale

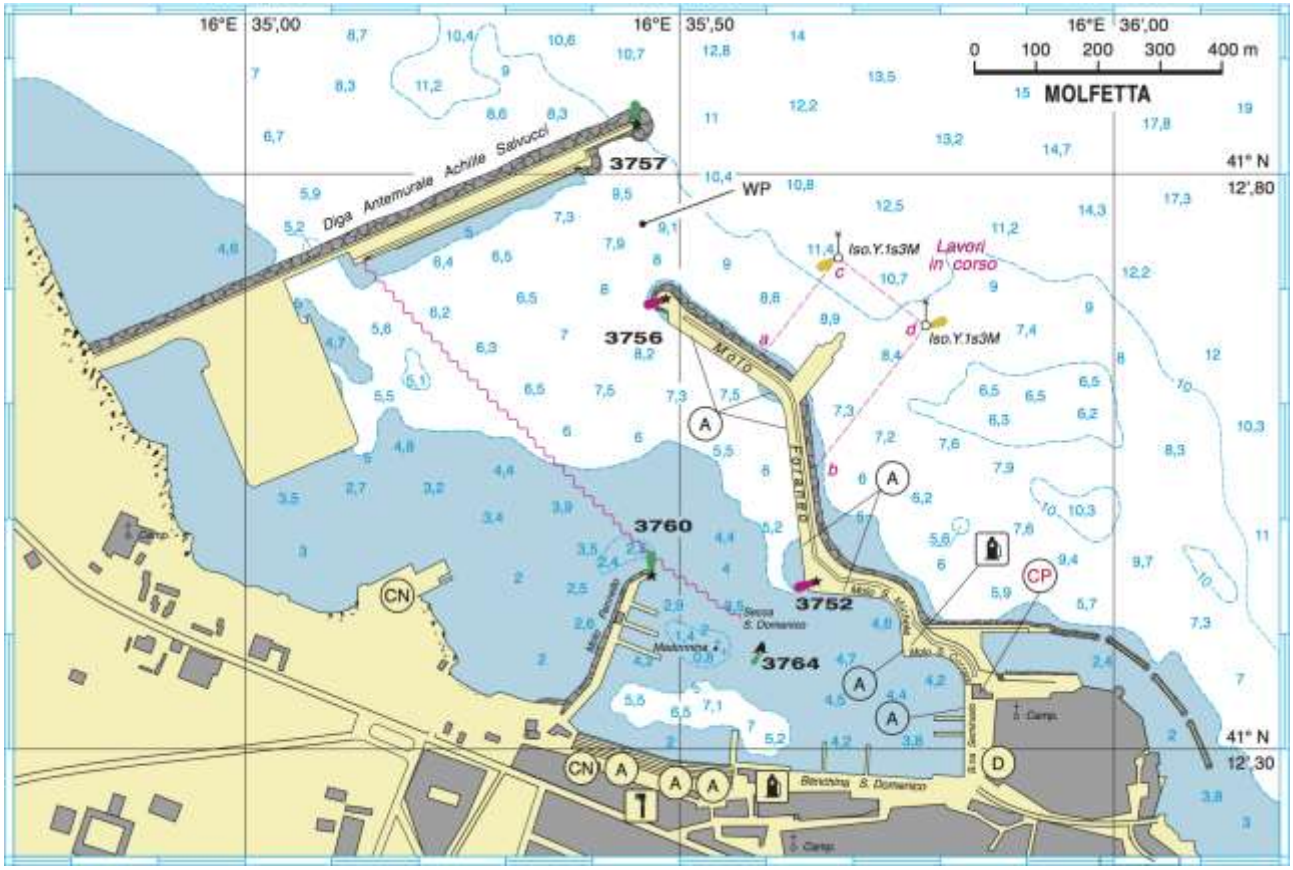

Figure 5-52: Current status of Molfetta Port

5.8.2 Port Movements

The Autorità di Sistema Portuale[17] (AdSP) makes available data on trade movements in all ports in Italy. Through the observation of this data, it is possible to verify how in recent years there has been an ever-increasing increase in maritime trade on various types of products. An overview will now follow in which this data will be provided.

Table 5-14 2019 annual data[18]

AdSP	Liquid Bulk tons.	Dry Bulk tons.	General Cargo			Total tons.	TEU			Unity Ro-Ro Num.
			in containers tons.	Ro-Ro tons.	Other general cargo tons.		"hinterland" num	"transfers" num.	Total num.	
Bari	1.146	1.965.124	666.149	3.421.584	48.018	4.135.751	82.627	-	82.627	166.070
Brindisi	2.165.794	3.009.984	252	2.248.628	120.273	2.369.153	105	-	105	115.652
Manfredonia	135.348	410.223	5.084	-	17.974	23.058	10	-	10	-
Barletta	324.516	462.808	-	-	17.283	17.283	-	-	-	-
Monopoli	315.639	200.754	-	-	1.449	1.449	-	-	-	-
Termoli	-	-	-	-	-	-	-	-	-	-

Table 5-15 2020 annual data[19]

AdSP	Liquid Bulk tons.	Dry Bulk tons.	General Cargo			Total tons.	TEU			Unity Ro-Ro Num.
			in containers tons.	Ro-Ro tons.	Other general cargo tons.		"hinterland" num	"transfers" num.	Total num.	
Bari	-	2.179.003	559.001	4.090.570	15.939	6.844.513	71.223	-	71.233	160.056
Brindisi	2.144.660	2.388.842	-	3.158.298	50.026	7.741.826	-	-	-	117.702
Manfredonia	111.555	450.639	123	-	55.790	618.107	15	-	15	-
Barletta	267.787	431.981	-	-	19.042	718.810	-	-	-	-
Monopoli	218.112	183.995	-	-	9.228	411.335	-	-	-	-
Termoli	-	-	-	-	-	-	-	-	-	-

[17] https://www.assoporti.it/it/autoritasistemaportuale/adsp/

[18] https://www.assoporti.it/media/11082/adsp_movimenti_portuali_annuale_2019.pdf

[19] https://www.assoporti.it/media/10685/adsp_movimenti_portuali_annuale_2020.pdf

Table 5-16 2021 annual data[20]

AdSP	Liquid Bulk tons	Dry Bulk tons	General Cargo			Total tons	TEU			Unity Ro-Ro Num.
			in containers tons	Ro-Ro tons	Other general cargo tons.		"hinterland" num	"transfers" num.	Total num.	
Bari	-	1.877.708	752.242	4.664.399	10.079	5.426.720	70.254	-	70.254	176.850
Brindisi	2.021.960	2.200.662	-	3.387.408	16.702	3.404.110	-	-	-	124.686
Manfredonia	127.520	470.033	22	-	41.073	41.095	2	-	2	-
Barletta	331.046	396.347	-	-	4.368	4.368	-	-	-	-
Monopoli	326.224	183.347	-	-	15.036	15.036	-	-	-	-
Termoli	-	-	-	-	-	-	-	-	-	-

Table 5-17 2022 annual data[21]

AdSP	Liquid Bulk tons	Dry Bulk tons	General Cargo			Total tons	TEU			Unity Ro-Ro Num.
			in containers tons	Ro-Ro tons	Other general cargo tons		"hinterland" num	"transfers" num.	Total num.	
Bari	1.730	1.526.132	722.941	5.317.501	34.786	6.076.228	65.729	-	65.729	196.452
Brindisi	2.082.207	4.368.184	1.302	3.562.577	30.851	3.594.730	383	-	383	115.101
Manfredonia	119.273	529.251	-	-	56.920	56.920	-	-	-	-
Barletta	278.020	324.773	-	-	14.852	14.852	-	-	-	-
Monopoli	286.788	187.754	-	-	8.687	8.687	-	-	-	-
Termoli	120.076	-	-	-	25.879	25.879	-	-	-	-

[20] https://www.assoporti.it/media/12507/adsp_movimenti_portuali_annuale_2021_agg2942023.pdf

[21] https://www.assoporti.it/media/12508/adsp_movimenti_portuali_annuale_2022.pdf

Table 5-18 2023 January-September data[22]

AdSP	Liquid Bulk tons	Dry Bulk tons	General Cargo			Total tons	TEU			Unity Ro-Ro Num.
			in containers tons	Ro-Ro tons	Other genera cargo tons		"hinterland" num	"transfers" num.	Total num.	
Bari	-	1.513.156	601.151	4.007.158	42.794	4.651.103	57.189	-	57.189	146.186
Brindisi	1.532.638	1.773.895	-	3.308.357	26.802	3.335.159	-	-	-	106.468
Manfredonia	84.594	426.229	-	-	53.031	53.031	-	-	-	-
Barletta	227.777	391.623	-	-	14.516	14.516	-	-	-	-
Monopoli	141.637	141.768	-	-	4.008	4.008	-	-	-	-
Termoli	59.969	-	-	42.151	1.211	43.362	-	-	-	-

5.8.3 2018-2019 port movement survey forms

This session will provide a more accurate look at the entries and exits of the most active trade routes on the Southern Adriatic side in the years 2018-2019. The items considered will be Liquid Bulk, Solid Bulk, and General Cargo.

Table 5-19 Bari[23]

DESCRIPTION	January-December 2018			January-December 2019			Difference	
	IN	OUT	TOT	IN	OUT	TOT	TOT	%
TOTAL THROUGHPUT	3.483.382	2.005.703	5.489.085	4.105.698	1.994.147	6.099.845	610.760	11,1%

LIQUID BULK	0	0	0	0	1.146	1.146	1.146	-
Of which:								
Crude oil	0	0	0	0	0	0	0	-
Refined (petroleum) products	0	0	0	0	1.146	1.146	1.146	-
Gaseous, liquefied, or compressed petroleum	0	0	0	0	0	0	0	-

[22] https://www.assoporti.it/media/13762/adsp_movimenti_portuali_gen-sett_2023.pdf

[23] https://www.assoporti.it/media/6722/bari-2018-2019.pdf

products and natural gas								
Chemical products	0	0	0	0	0	0	0	-
Other liquid bulk	0	0	0	0	0	0	0	-

DRY BULK	1.441.941	14.245	1.456.186	1.952.850	12.274	1.965.124	508.938	35,0%
Of which								
Cereals	1.292.092	14.245	1.306.337	1.818.106	11.480	1.829.586	523.249	40,1%
Foodstuff/Fodder/Oil seeds	12.774	0	12.774	5.033	794	5.827	6.947	-54,4%
Coal and lignite	0	0	0	0	0	0	0	-
Ores/cement/lime/plasters	686	0	686	33.383	0	33.383	32.697	4766,3%
Metallurgical Products	19.993	0	19.993	20.338	0	20.338	345	1.7%
Chemical products	113.323	0	113.323	74.847	0	74.847	38.476	-34,0%
Other dry bulk	3.073	0	3.073	1.143	0	1.143	1.930	-62,8%

GENERAL CARGO	2.041.441	1.991.458	4.032.899	2.152.848	1.980.727	4.133.575	100.676	2,5%
Of which								
Containerized (including Ro-Ro containers)	364.955	330.816	695.771	387.789	278.360	666.149	29.622	-4,3%
Ro-Ro (excluding Ro-Ro containers)	1.644.760	1.648.296	3.293.056	1.728.960	1.690.448	3.419.408	126.352	3,8%
Other general cargo	31.726	12.346	44.072	36.099	11.919	48.018	3.946	9,0%

Table 5-20 Brindisi[24]

DESCRIPTION	January-December 2018			January-December 2019			Difference	
	IN	OUT	TOT	IN	OUT	TOT	TOT	%
TOTAL THROUGHPUT	6.134.496	1.814.500	7.948.996	5.788.759	1.754.556	7.543.315	405.681	-5,1%

LIQUID BULK	1.905.777	424.501	2.330.278	1.766.689	399.105	2.165.794	164.484	-7,1%
Of which:								

[24] https://www.assoporti.it/media/6725/brindisi-2018-2019.pdf

Crude oil	0	0	0	0	0	0	0	-
Refined (petroleum) products	1.080.007	294.276	1.374.283	938.076	257.188	1.195.264	179.019	-13,0%
Gaseous, liquefied, or compressed petroleum products and natural gas	571.297	130.225	701.522	599.977	141.917	741.894	40.372	5,8%
Chemical products	2.998	0	2,998	0	0	0	2.998	-100%
Other liquid bulk	251.475	0	251.475	228.636	0	228.636	22.839	-9,1%

DRY BULK	3.073.871	160.061	3.233.932	2.865.411	144.573	3.009.984	223.948	-6,9%
Of which								
Cereals	100.449	0	100.449	84.487	0	84.487	15.962	-15,9%
Foodstuff/Fodder/Oil seeds	190.677	0	190.677	191.285	0	191.285	608	0,3%
Coal and lignite	2.587.446	15.551	2.602.997	1.880.765	0	1.880.765	722.232	-27,7%
Ores/cement/lime/plasters	7.000	53.775	60.775	499.407	22.072	521.479	460.704	758,0%
Metallurgical Products	112.892	34.294	147.186	125.745	26.762	152.507	5.321	3,6%
Chemical products	16.819	0	16.819	28.050	0	28.050	11.231	66,8%
Other dry bulk	58.588	56.441	115.029	55.672	95.739	151.411	36.382	31,6%

GENERAL CARGO	1.154.848	1.229.938	2.384.786	1.156.659	1.210.878	2.367.537	17.249	-0,7%
Of which								
Containerized (including Ro-Ro containers)	0	97	97	12	240	252	155	159,8%
Ro-Ro (excluding Ro-Ro containers)	1.136.014	1.136.014	2.345.862	1.106.652	1.140.360	2.247.012	98.850	-4,2%
Other general cargo	18.834	19.993	38.827	49.995	70.278	120.273	81.446	209,8%

Table 5-21 Barletta[25]

DESCRIPTION	January-December 2018			January-December 2019			Difference	
	IN	OUT	TOT	IN	OUT	TOT	TOT	%

[25] https://www.assoporti.it/media/6723/barletta-2018-2019.pdf

TOTAL THROUGHPUT	762.009	114.416	876.425	727.903	76.704	804.607	71.818	-8,2%

LIQUID BULK	346.629	0	346.629	324.516	0	324.516	22.113	-6,4%
Of which:								
Crude oil	0	0	0	0	0	0	0	-
Refined (petroleum) products	343.629	0	343.629	316.515	0	316.515	27.114	-7,9%
Gaseous, liquefied, or compressed petroleum products and natural gas	0	0	0	0	0	0	0	-
Chemical products	3000	0	3000	8001	0	8001	5001	166,7%
Other liquid bulk	0	0	0	0	0	0	0	-

DRY BULK	403.617	93.071	496.688	400.247	62.561	462.808	33.880	-6,8%
Of which								
Cereals	177.095	0	177.095	133.988	3.440	137.428	39.667	-22,4%
Foodstuff/Fodder/Oil seeds	0	0	0	0	0	0	0	-
Coal and lignite	0	0	0	0	0	0	0	-
Ores/cement/lime/plasters	42.135	89.071	131.206	84.755	53.150	137.905	6.699	5,1%
Metallurgical Products	0	0	0	0	0	0	0	-
Chemical products	159.361	4.000	163.361	155.727	5.971	161.698	1.663	-1,0%
Other dry bulk	25.026	0	25.026	25.777	0	25.777	751	3,0%

GENERAL CARGO	11.763	21.345	33.108	3.140	14.143	17.283	15.825	-47,8%
Of which								
Containerized (including Ro-Ro containers)	0	0	0	0	0	0	0	-
Ro-Ro (excluding Ro-Ro containers)	0	0	0	0	0	0	0	-
Other general cargo	11.763	21.345	33.108	3.140	14.143	17.283	15.825	-47,8%

Table 5-22 Manfredonia[26]

DESCRIPTION	January-December 2018			January-December 2019			Difference	
	IN	OUT	TOT	IN	OUT	TOT	TOT	%
TOTAL THROUGHPUT	300.858	138.792	439.650	418.035	150.594	568.629	128.979	29,3%
LIQUID BULK	3.805	113.670	117.475	20.265	115.083	135.348	17.873	15,2%
Of which:								
Crude oil	0	0	0	0	0	0	0	-
Refined (petroleum) products	0	0	0	0	0	0	0	-
Gaseous, liquefied, or compressed petroleum products and natural gas	0	0	0	0	0	0	0	-
Chemical products	0	0	0	0	0	0	0	-
Other liquid bulk	3.805	113.670	117.475	20.265	115.083	135.348	17.873	15,2%
DRY BULK	277.761	25.122	302.883	378.220	32.003	410.223	107.340	35,4%
Of which								
Cereals	196.303	25.122	221.425	227.056	26.503	253.559	32.134	14,5%
Foodstuff/Fodder/Oil seeds	17.298	0	17.298	30.237	5.500	35.737	18.439	106,6%
Coal and lignite	0	0	0	0	0	0	0	-
Ores/cement/lime/plasters	4.168	0	4.168	42.131	0	42.131	37.962	910,8%
Metallurgical Products	12.479	0	12.479	20.989	0	20.989	8.510	68,2%
Chemical products	43.363	0	43.363	57.808	0	57.808	14.445	33,3%
Other dry bulk	4.150	0	4.150	0	0	0	4.150	-100%
GENERAL CARGO	19.292	0	19.292	19.550	3.508	23.058	3.766	19,5%
Of which								

[26] https://www.assoporti.it/media/6736/manfredonia-2018-2019.pdf

Containerized (including Ro-Ro containers)	100	0	100	5.084	0	5.084	4.984	494%
Ro-Ro (excluding Ro-Ro containers)	0	0	0	0	0	0	0	-
Other general cargo	19.192	0	10.192	14.466	3.508	17.974	1.218	-6,3%

Table 5-23 Monopoli[27]

DESCRIPTION	January-December 2018			January-December 2019			Difference	
	IN	OUT	TOT	IN	OUT	TOT	TOT	%
TOTAL THROUGHPUT	328.782	56.917	385.699	406.216	111.626	517.842	132.143	34,3%
LIQUID BULK	118.384	56.917	175.301	205.462	110.177	315.639	140.338	80,1%
Of which:								
Crude oil	0	0	0	0	0	0	0	-
Refined (petroleum) products	0	0	0	0	0	0	0	-
Gaseous, liquefied, or compressed petroleum products and natural gas	0	0	0	0	0	0	0	-
Chemical products	0	0	0	0	4.882	4.882	4.882	.
Other liquid bulk	118.384	56.917	175.301	205.462	105.295	310.757	135.456	77,3%
DRY BULK	190.267	0	19.267	200.754	0	200.754	10.487	5.5%
Of which								
Cereals	0	0	0	0	0	0	0	-
Foodstuff/Fodder/Oil seeds	21.257	0	21.257	47.685	0	47.685	26.428	124,3%
Coal and lignite	0	0	0	0	0	0	0	-
Ores/cement/lime/plasters	141.310	0	141.310	121.840	0	121.840	19.470	-13,8%

[27] https://www.assoporti.it/media/6740/monopoli-2018-2019.pdf

Metallurgical Products	0	0	0	0	0	0	0	-
Chemical products	27.700	0	27.700	31.229	0	31.229	3.529	12,7%
Other dry bulk	0	0	0	0	0	0	0	-

GENERAL CARGO	20.131	0	20.131	0	1.449	1.449	18.682	-92,8%
Of which								
Containerized (including Ro-Ro containers)	0	0	0	0	0	0	0	-
Ro-Ro (excluding Ro-Ro containers)	0	0	0	0	0	0	0	-
Other general cargo	20.131	0	20.131	0	1.449	1.449	18.682	-92,8%

5.8.4 Routes

This section will show the main trade routes in the Southern Adriatic, especially to Albania and Montenegro[28].

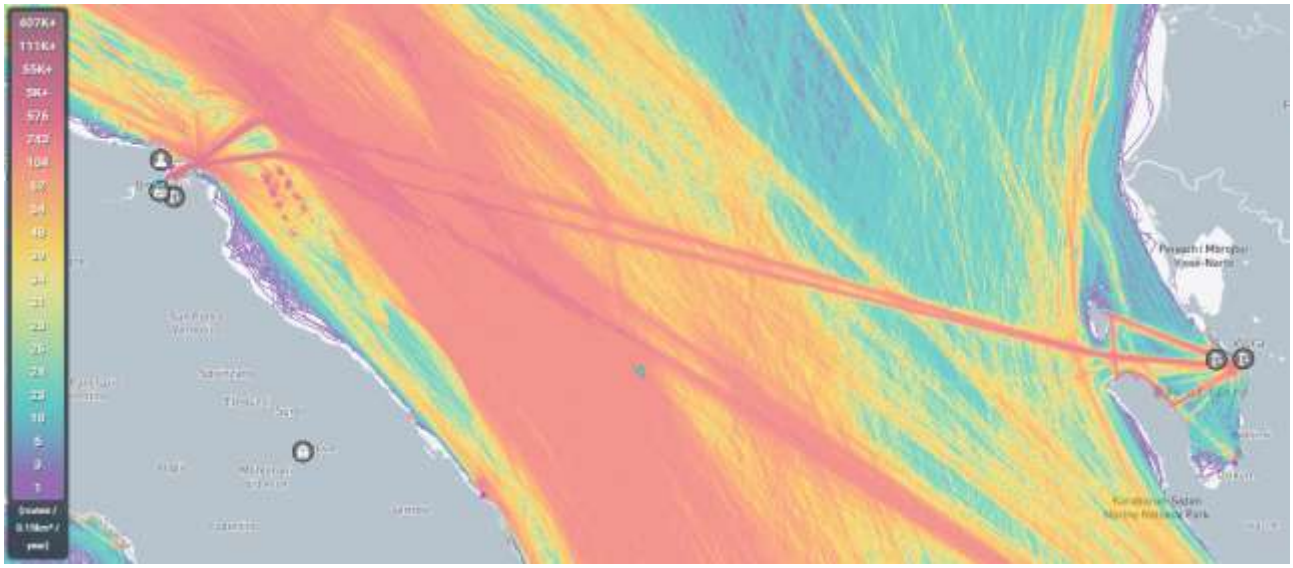

Figure 5-53: Brindisi- Vlora route density (2022)

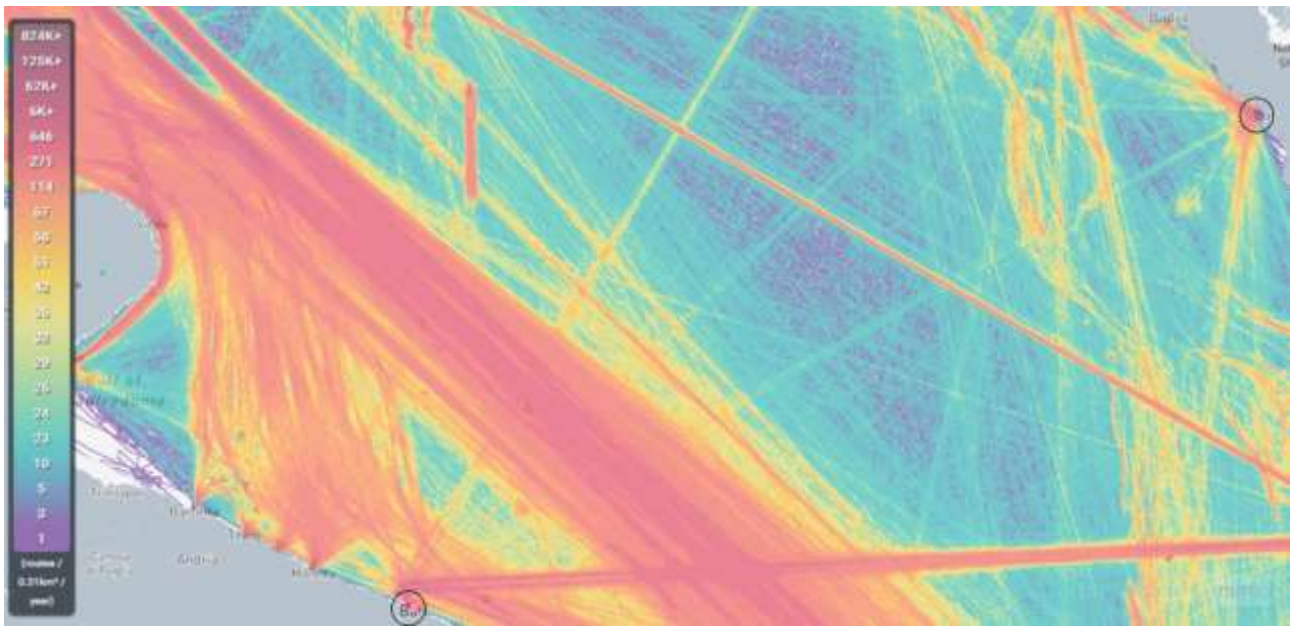

Figure 5-54: Bari- Bar route density (2022)

[28] MarineTraffic: Global Ship Tracking Intelligence | AIS Marine Traffic

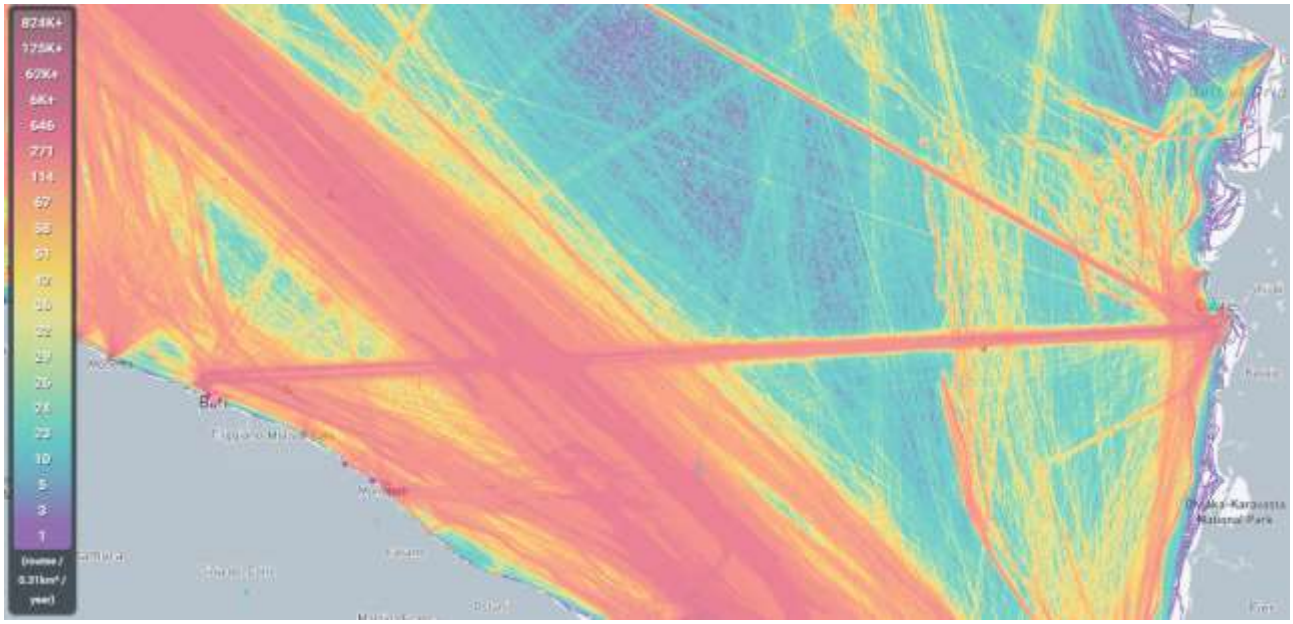

Figure 5-55: Bari- Durres routes density (2022)

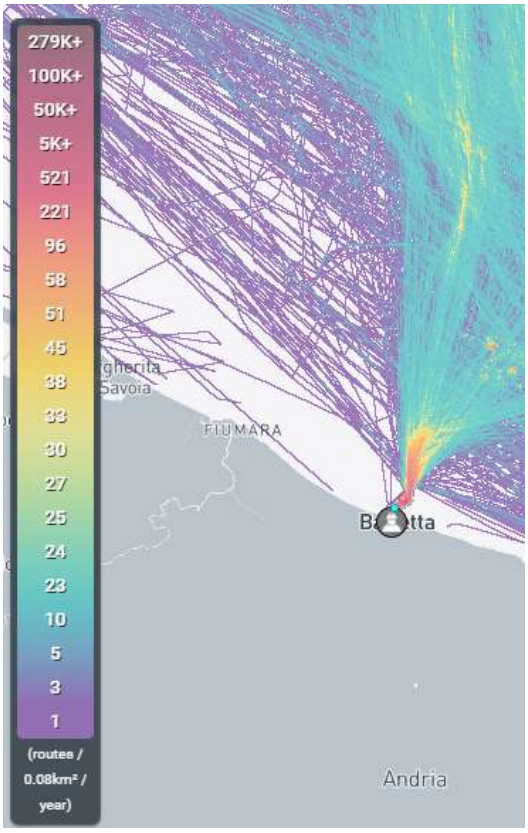

Figure 5-56 Maritime traffic density in the neighbourhood of Barletta Port (2022)

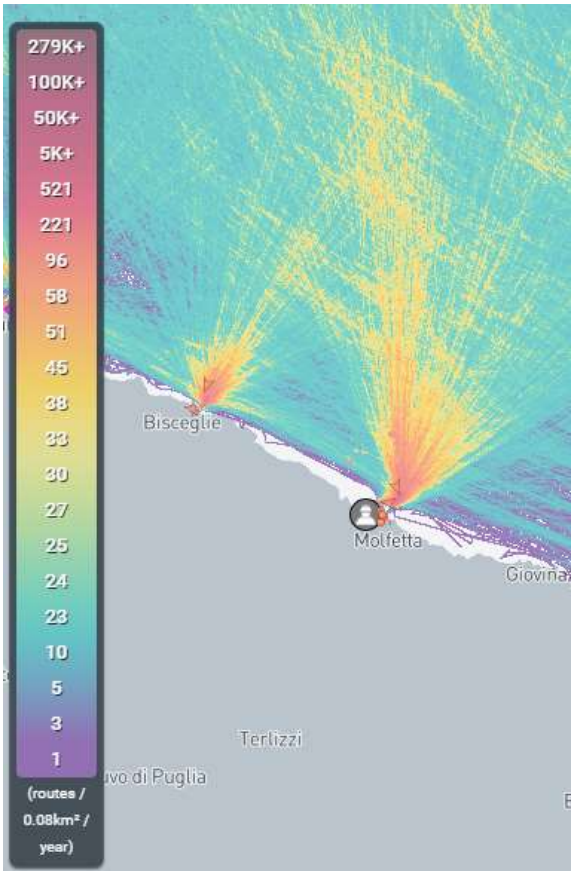

Figure 5-57: : Maritime traffic density in the neighbourhood of Molfetta Port (2022)

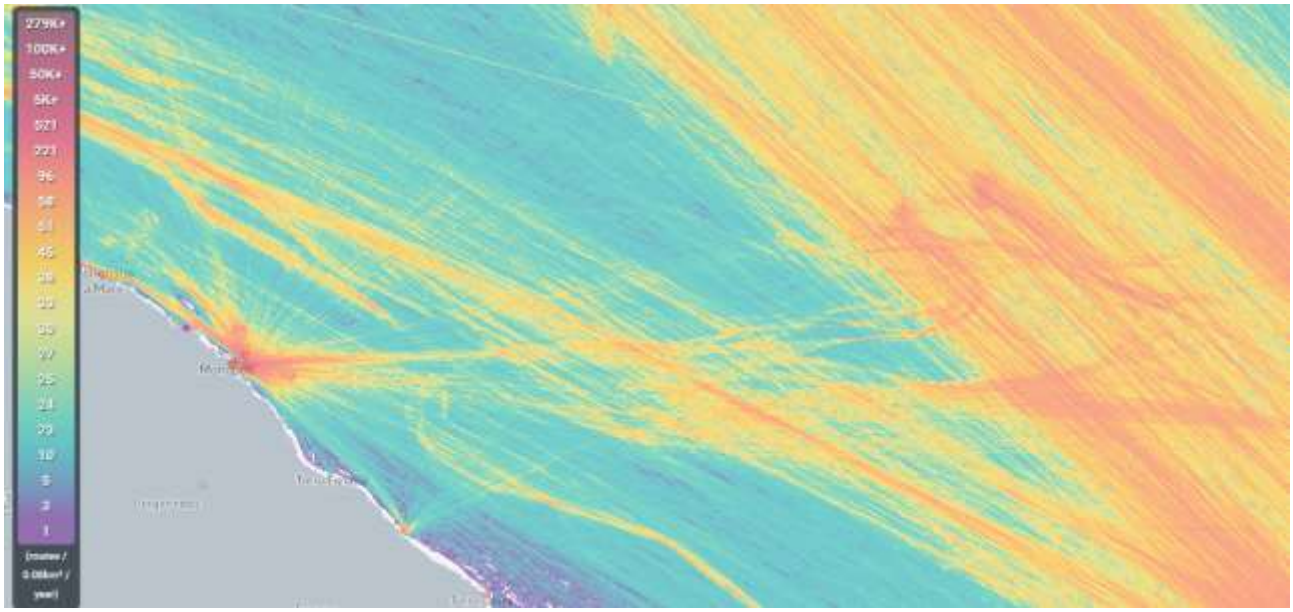

Figure 5-58 Maritime traffic density in the neighbourhood of Monopoli Port (2022)

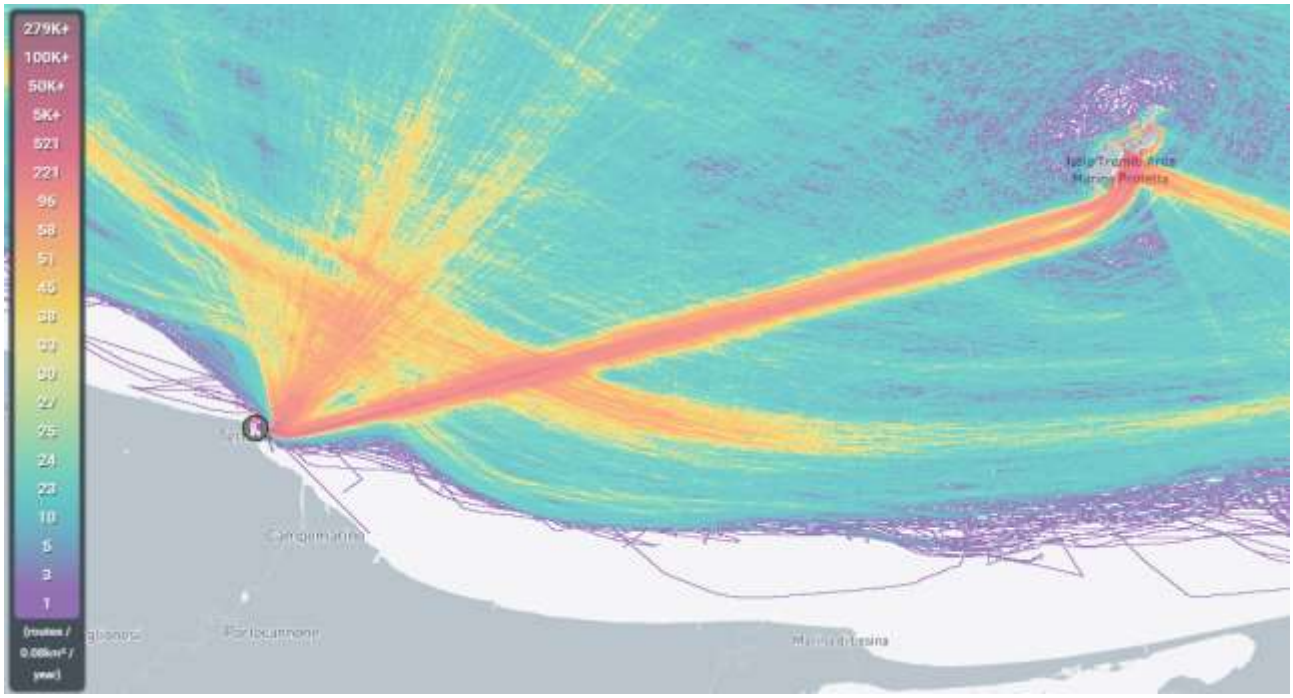

Figure 5-59 Maritime traffic density in the neighbourhood of Termoli Port and Tremiti islands(2022)

5.9 Data collected from Montenegro ports

Montenegro has four ports of national importance, which are open for international traffic:

- Port of Bar, including Port of Adria,
- Marina Bar,
- Port of Kotor,
- and Shipyard Bijela.

There are other official ports of entry of local importance open for international traffic: Porto Montenegro, Porto Novi, Dukley Marina Budva and Port of Zelenika.

Port of Bar is the largest and the crucial cargo port in Montenegro. It can handle dry cargo, liquid cargo, bulk cargo, general cargo, containers and ro-ro ships, as well as cruise ships, and ro-ro ships. Port of Bar also has a Passenger terminal but is mainly oriented to transport of goods. Almost 95% of products coming from the sea to Montenegro are transported through this port.

Port of Adria is a multipurpose port, located on the western border of Bar, with dedicated terminals for container ships, general cargo ships, ro-ro and cruise ships. Whole area of Port of Adria is completely comprehended by the Free zone regime.

Port of Kotor is mainly a cruising destination. Marina Bar is dominantly oriented to pleasure crafts, similar to other ports of local importance, while Shipyard Bijela is in the process of transformation. As such, the letter two ports, together with the ports of local significance, are outside this project's scope.

The Consultant contacted the most important ports and received feedback and data which will be presented in next subchapters

5.9.1 Statistical Office of Montenegro - MONSTAT

The Statistical Office of Montenegro - MONSTAT is a national competent authority (NCA) for producing official statistics. The national and international public bodies recognise MONSTAT role as a provider of official statistics in Montenegro's statistical system. MONSTAT is obliged to collect data, processes and disseminate statistics performed independently, professionally, transparently and highly expertly. MONSTAT relies on contemporary European trends related to the production of statistics and try to adapt their work to the rules of the supreme European statistics body Eurostat[29].

MONSTAT in the field of maritime traffic statistics in accordance with Directives (EC) no. 2009/42 and no. 2012/186 conducts a quarterly survey on the arrival and departure of ships in ports. The reporting units for MONSTAT are the Harbour Master's Offices in Bar and Kotor, which submit reports on paper forms by mail, and the Administration form Maritime Safety and Port Management (AMSPM) Administration, which submits monthly electronic tables (VTMIS1) and (VTMIS2) with data on ship arrivals in for Port of Bar and Kotor respectively.

MONSTAT, when it comes to maritime transport, does not collect data on dangerous cargo but mostly on ships, yachts, passengers and general cargo. MONSTAT publishes the available data from the aforementioned surveys in:

- the annual periodical, data available in the regular annual traffic publication (tables:22,23) [30]

- the quarterly periodical data are available in traffic statistics announcements (tables: 2, 6, 7)[31]

In the Table 5-24 data on maritime traffic are presented (source [13]). Data are aggregated from different sources from MONSTAT databases[32] [33] [34] and reports [14].

[29] https://www.monstat.org/eng/page.php?id=2

[30] http://www.monstat.org/cg/page.php?id=1420&pageid=36

[31] http://www.monstat.org/cg/page.php?id=1339&pageid=36

[32] http://monstat.org/cg/page.php?id=634&pageid=588

[33] https://www.monstat.org/cg/page.php?id=591&pageid=43

[34] https://www.monstat.org/cg/page.php?id=633&pageid=590

Table 5-24 Data on maritime trafic in Montenegro for period 2007–2020. (source [13])

Year	Maritime Transport					
	Passengers in ports	Cargo	Yachts	Passangers in Yachts	Cruisers	Passengers on cruissers
2007.	–	–	–	–	174	45.653
2008.	–	–	–	–	245	50.554
2009.	–	–	–	–	268	70.749
2010.	–	1.758.692	2.807	12.877	313	142.259
2011.	–	1.749.982	2.964	13.977	319	187.171
2012.	–	1.227.877	2.987	14.494	348	244.084
2013.	–	1.295.366	3.786	15.778	409	314.961
2014.	107.814	1.241.431	3.961	18.129	350	306.397
2015.	98.974	1.488.399	4.018	20.859	411	441.513
2016.	110.127	1.645.797	4.384	21.544	480	532.337
2017.	118.535	2.096.122	4.598	23.001	430	540.445
2018.	98.455	1.963.204	4.710	27.685	424	506.198
2019.	88.729	2.050.869	4.775	28.562	490	649.038
2020.	428	2.043.632	1.858	7.458	9	3.007
2021.	–	1.858.769	4.176	25.123	63	9.067

5.9.2 Port of Bar

Port of Bar is handling dangerous cargo in the port. They classified the hazardous cargo into nine classes:

- Class 1. Explosive substances
- Class 2. Gases under pressure, in liquid state or dissolved under pressure
- Class 3. Flammable liquids
- Class 4. Flammable solids
- Class 5. Oxidising substances
- Class 6. Poisonous (toxic) and infectious substances
- Class 7. Radioactive substances
- Class 8. Corrosive substances
- Class 9. Mixed dangerous substances

Mainly they handle two types of hazardous cargo: Class 1 and Class 3.

Class 1 has six subclasses such as:

1.1. Materials and objects with an imminent danger of an accumulated (concentrated, mass) explosion (accumulated explosion is an explosion that causes practically the entire charge to react instantly). Examples:

TNT, gunpowder, nitro-glycerine, ANFO (a mixture of ammonium nitrate and diesel fuel, sometimes kerosene). This explosive is most common in mining (coal, metals) and construction.

1.2. Materials and objects with an imminent danger of scattering shrapnel but not the threat of an accumulated explosion. Examples: bombs, grenades, and anti-hail missiles.

1.3. Materials and objects that present an imminent danger of fire, minor detonations, scattering of shrapnel or both of these last dangers together, but not the danger of an accumulated explosion. When burning, it releases significant energy via radiation or which burns progressively, producing less detonation, less shrapnel scattering or both of these effects together. Examples: rocket fuel, fireworks.

1.4. Materials and objects that present only a minor risk of explosion in case of ignition or initiation (activation) during transport. The effects are mainly limited to packets so that no fragments of significant size or scope are expected to be ejected. An external fire must not lead to practically the entire contents of the package exploding instantly. Examples: firecrackers, manoeuvring bullets.

1.5. Materials with an imminent danger of accumulated explosion but which are so insensitive that the probability of their activation or transition from regular to detonative combustion under normal transport conditions is really very small. The minimum requirement for these substances is that they must not explode when tested in an environment affected by the fire. Example: GX20 explosive

1.6. Extremely insensitive objects that do not have an inherent danger of an accumulated explosion. They contain exclusively highly insensitive detonating substances, with minimal possibility of accidental activation or spreading.

Class 3 includes liquids with a boiling point of 35°C or lower and a flash point of 60.5°C or lower. Class 3 flammable liquids are the most common substances transported. They cover a wide range of substances such as some solids melts, liquid explosives rendered insensitive, and all liquids with an ignition temperature ≤100°C (gasoline, diesel, solvents, paints, thinners, alcohols, etc.). Flammable liquids are divided into packaging groups.

- Packaging group I: Highly flammable liquids with a boiling point below 35°C Example: diethyl ether, carbon disulphide.
- Packaging group II Flammable liquids with an ignition temperature below 23°C and a boiling point above 35°C Example: gasoline, acetone, methanol.
- Packaging group III Liquids with a flash point above 23°C but not above 61°C and a boiling point higher than 35°C Example: kerosene, mineral turpentine.

Port of Bar has submitted the data for dangerous cargo handled in tonnes for the last five years, presented in Table 5-25.

Table 5-25 – Handled dangerous cargo in Port of Bar for the last five years

Year	Dangerous cargo Class 1 (t)	Dangerous cargo Class 3 (t)
2018	7.65	253,754.66
2019	0.00	232,593.82
2020	3,323.05	167,147.94
2021	3,538.60	234,539.03
2022	2,322.82	273,785.60

5.9.3 Port of Adria

So far no data has been received from the Port of Adria.

5.9.4 Porto Montenegro

According to feedback from Porto Montenegro, they do not handle dangerous cargo, and because of that, they have no data to share.

5.9.5 Porto Novi

According to feedback from Porto Novi, they do not handle dangerous cargo. They have reported that they do reception of polluted waters and oils transferred from the vessels in compliance with the MARPOL 73/78 Convention. Reception is done by the licensed company HEMOSAN for sanitary measures and ecological protection in Montenegro. They have submitted the collected oily waste for the year 2022, which is presented in Table 5-26. Data are for each month of the year 2022, where quantities are given for materials like sludge, motor oil, hydraulic oil, oil, oil filters and oily packing.

Table 5-26 - PORTONOVI MARINA – Reception of Polluted waters and oils transferred from vessels

PORTONOVI MARINA – Reception of Polluted waters and oils transferred from vessels						
2022	**SLUDGE (l)**	**MOTOR OIL (l)**	**HYDRAULIC OIL (l)**	**OIL s (kg)**	**OIL FILTERS (kg)**	**OILY PACKING (kg)**
January	22					
February						
March						
April	10	120		6	6	4
May	25	70				
June	20	1		1		20.5
July						
August	12	25				
September	8		30		5	10
October	37	55		0.5	10	4.5
November	40	12		310	2	7
December						
TOTAL	**174**	**283**	**30**	**317.5**	**23**	**46**

5.9.6 Luštica Bay

According to feedback from Luštica Bay, they do not handle dangerous cargo, and because of that, they have no data to share. No vessel with hazardous cargo on board has entered to their port since they opened it in 2018.

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