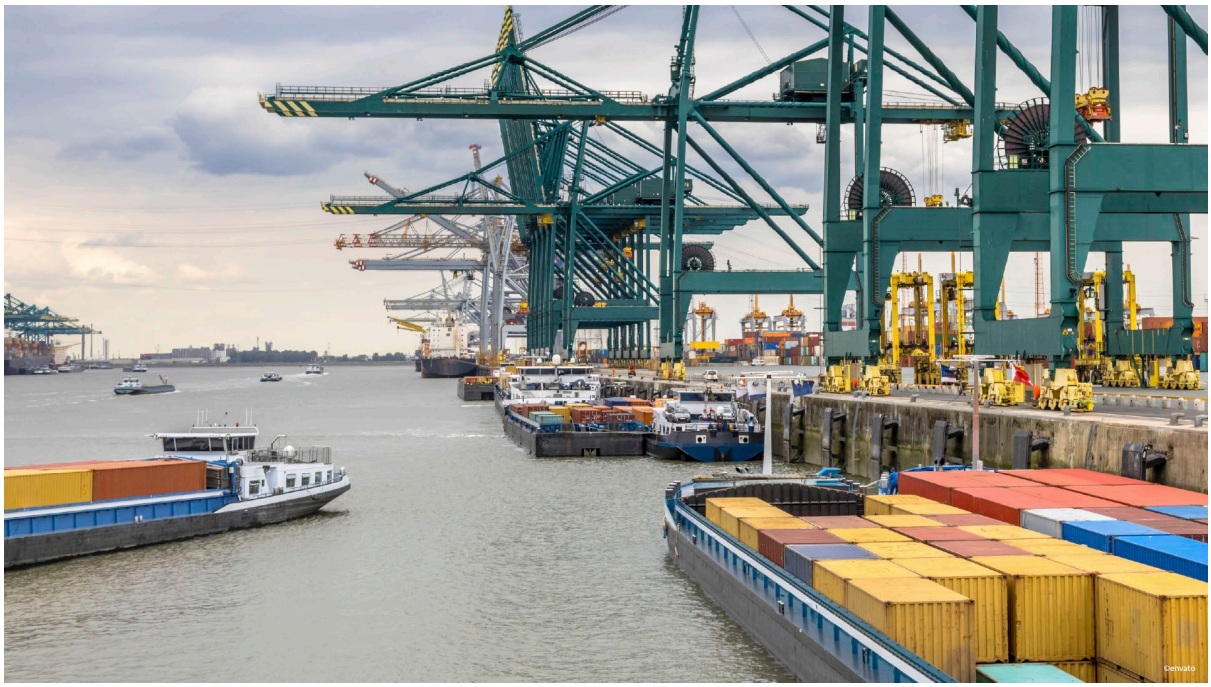
# EMODnet marine data for ports, marinas and boating

## Online workshop, 22 October 2024



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*Cover image credits: Top image: Busy port of Antwerp (open source stock photo from envato); Bottom image: Alcaidesa Marina, Spain, with new solar power installation (credit: Alcaidesa Marina )*

# Executive Summary

On 22 October 2024, the European Marine Observation and Data Network (EMODnet)[1] and the European Commission's Directorate-General for Maritime Affairs and Fisheries (EC DG MARE) hosted an online workshop titled "EMODnet Marine Data for Ports, Marinas and Boating." The event was also co-designed with key stakeholders from the target Blue Economy sectors, including the European Boating Industry, TransEurope Marinas and the European Sea Port Organisation, with the workshop bringing together over 70 stakeholders representing a wide array of sectors, such as port authorities, research, policy, marine data services, non-governmental organizations, sectoral associations and thematic networks and projects. EMODnet was well-represented by thematic experts from Seabed Habitats, Human Activities, Physics, Data Ingestion, and the Secretariat.

The workshop provided a platform to raise awareness about the public EMODnet EC marine data service, its diverse offer and value for the Blue Economy and for cross-sectoral dialogue on data use and data sharing across the value chain of the ports, marinas and boating sectors. Other complementary services including the Copernicus Marine Service and the European Blue Economy Observatory also participated and presented at the event. The workshop was divided into two sessions, with the first session focusing on the value of open data, demonstrating EMODnet's services, showcasing the existing and potential uses of EMODnet data and interactive cross-sectoral dialogue on *in situ* marine environmental and human activities data needs and requirements of the ports, marinas and boating sector. Session two focused on data sharing, with a particular emphasis on how the ports, marinas and boating sector can contribute marine environmental and human activities data to EMODnet, and the value of EMODnet's Data Ingestion public service, including interactive dialogue on data sharing opportunities and challenges.

Key outcomes of the workshop included recognition that stakeholders from the ports, marinas and boating sectors increasingly require marine environmental and human activities data for their operations, including to support the green transition and to help feed data needs for the ongoing transformations of city ports from exclusively transport hubs to also data hubs (e.g., Port of Livorno), utilising data lakes, Artificial Intelligence and Digital Twining. The workshop also demonstrated that many stakeholders in the sector are already collecting – or are planning to collect – marine data that could be relevant for EMODnet, with interest in sharing marine data with EMODnet. There was also motivation from stakeholders including the European boating industry to help EMODnet fill data gaps in key data layers e.g., marinas, and a request for EMODnet to develop a similar data layer for ports in Europe. Finally, European Boating Industry and TransMarinas recommended that EMODnet could develop targeted resources for the sector, including more information on the EMDOnet offer that could be most relevant for the ports, marinas and boating sectors, data sharing guidelines, etc, noting that these stakeholders demonstrated motivation to co-develop these resources together with EMODnet. These recommendations and insights are being taken forward, with a view to further promotion of the EMODnet offer at upcoming events, including the World Conference on cities and ports (Lisbon, Portugal, November 2024), the BOOT boat show (Düsseldorf, Germany, January 2025) and European Maritime Day (Cork, Ireland, May 2025), among others. This workshop report will be made publicly available on the EC Maritime Forum and EMODnet Portal, together with reports from other workshops in the EMODnet for Business workshop series, with other sectoral dialogues to-date having included the Aquaculture, Offshore Renewable Energy and Coastal Tourism sectors.

[1] emodnet.ec.europa.eu

# Session 1: Demonstrating the EMODnet marine data 'offer' and gathering feedback on existing and emerging marine data needs and requirements to support the ports, marinas and boating sector

## 1.1 Welcome and Opening remarks

Kate Larkin (KL, Head of EMODnet Secretariat) welcomed the participants as meeting Chair. She noted that over 100 experts had been invited to attend the EMODnet workshop, following a mapping exercise of key stakeholders across the ports, marinas and boating sector that had been conducted by the EMODnet Secretariat in collaboration with EC DG MARE, CINEA and with three stakeholder sector representatives, namely the European Boating Industry, TransEurope Marinas and the European Sea Port Organisation. She thanked the co-organisers for their inputs also to the agenda, noting that their input to tailor the workshop content for the ports, marinas and boating sector was particularly valuable. She noted that 70 people were online for the workshop and that participants ranged from marina network operators to city ports, and from the private sector and Geographic Information System (GIS) experts to non-governmental organisations (NGOs) and associations and networks across the boating, marinas and ports sectors at National, regional and European to international. She also recognised that many EMODnet partners were present at the workshop, and that this was an opportunity for stakeholders to interact directly with EMODnet experts. She concluded the welcome noting that this workshop was part of a series of EMODnet for Business workshops, with previous editions focusing on aquaculture, offshore renewables and finally coastal tourism in 2023, which had provided motivation for a further workshop aimed at the coastal sectors of ports, marinas and boating which was a well-developed sector but for which there was an increasing and expanding demand for marine data, and an opportunity for data collection and sharing.

Zoi Konstantinou (ZK, EC DG MARE) provided opening words from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE) by emphasising the growing recognition of the European Marine Observation and Data Network (EMODnet) for its valuable marine data services which are open and free for public use. She noted this reflects the increasing understanding of the importance of accessible marine data across policy, research, and society. Acknowledging the high costs associated with collecting and managing *in situ* data, ZK stressed the need to maximise this investment, and that EMODnet offers this added value by aggregating, standardising and harmonising data from diverse sources into pan-European data layers and data products. She noted the collaboration between EMODnet and the European ports, marinas and boating sector is important, as these parties benefit from high-quality data and concluded by expressing optimism for the workshop's outcomes and their relevance to both the sector and the broader marine data community.

## 1.2 Setting the scene for ports marinas and boating

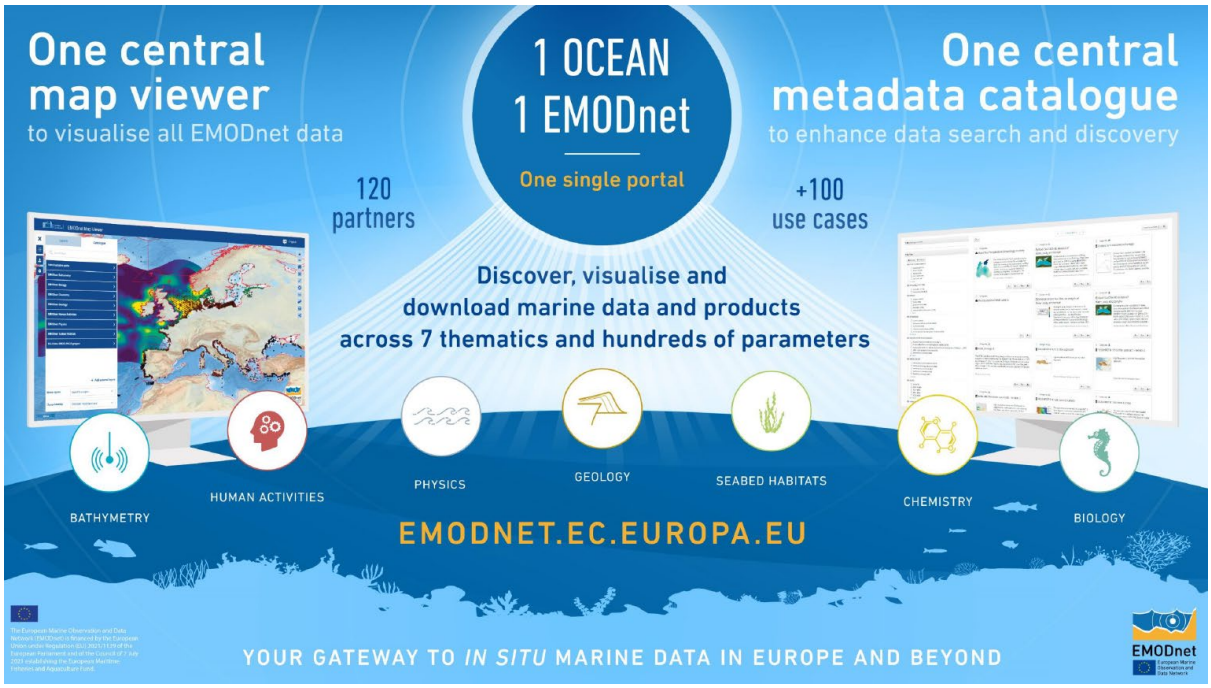
### EU Blue Economy Observatory

Antonio Borriello (AB, EC Joint Research Centre (JRC) presented the EU Blue Economy Observatory on behalf of EC DG JRC and DG MARE Unit A4. He noted the EU Blue Economy Observatory provides sector-specific data on blue economy activities in the EU, covering educational and employment opportunities, energy transition, fishing, aquaculture, and maritime transport. It includes interactive dashboards with economic and social indicators dating back to 2009. This data offer complements EMODnet in that the EU Blue Economy Observatory data is focused on socio-economic data and information, whilst EMODnet covers marine environmental and human activities at sea. Speaking of the annual EU Blue Economy report as the main product of the EU Blue Economy Observatory, he noted that the report monitors established sectors like ports, marinas, boating, and emerging sectors where data is limited. He explained that data sources include Eurostat.

In a short Q&A the statistical classification of economic activities (NACE[2]) was mentioned, with AB (EC JRC) explaining that the EU Blue Economy take data as they are published and aggregate activities to present results by sectors (e.g. Port activities, Coastal tourism, etc.), and noting that there is a new classification coming out soon (NACE 2.1). The concern from industry stakeholders is that "marinas" are not included in the same classification as other tourism services, such as hotels.

## EMODnet: an EU marine data service for ports marinas and boating and wider blue economy

Kate Larkin (KL, Head of EMODnet Secretariat) provided an overview of the EMODnet service, noting that EMODnet's value chain starts with ocean observation and marine monitoring efforts that are collected *in situ*[3]. EMODnet works with hundreds of different stakeholders producing primary data to source, aggregate, standardise and harmonise data from disparate sources into data layers at pan-European scale that are Findable, Accessible, Interoperable and Reusable (FAIR). She explained that the EMODnet offer is very diverse, offering the most comprehensive open and free offer of marine environmental and human activities data in Europe across seven broad thematics, from open ocean to the coastal zone and from the surface ocean to the deep seafloor. Regarding the land-sea interface and coastal zone, EMODnet's offer is broad, spanning sea level rise and coastline erosion, to beach litter, ocean currents, temperature and wider physical and biogeochemical parameters and marine biodiversity, including seabed habitat maps, together with information on main ports in Europe (in terms of goods traffic, passenger traffic, etc), to name a few. She explained that the EMODnet service is delivered by > 120 partner organisations and their respective experts in marine data management, standards and best practices, and digital data services. The online EMODnet Portal is the single-entry point for all EMODnet's thematic data and data products, visited by > 120,000 users per year.




[2] https://ec.europa.eu/eurostat/web/nace

[3] *In situ* ocean observations are collected by sensors and samplers placed in seawater, on/in the seafloor, the coastal zone and surrounding air (see communication on the *in situ* marine data landscape in Europe : https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/PDF/EUInSituMarine_EMODnet_CMEMS_FINAL.pdf

*Figure 1: EMODnet Central Portal (infographic, 2023, produced by the EMODnet Secretariat)*

She gave some concrete use cases, including the use of EMODnet's high-resolution bathymetry and Digital Terrain Model to support the private sector in the operational planning of new offshore renewable energy installations, and the fact that EMODnet works with Member States to offer National Maritime Spatial Plans via EMODnet in geospatial data formats, enabling national and regional stakeholders to assess cross-border maritime spatial planning, and to utilise these MSPs together with marine environmental data for future planning of climate-smart Maritime Spatial Planning. She noted that the multi- and inter-disciplinary EMODnet marine data offer was considered a real strength by users, and that participants would shortly receive some in-depth demonstrations of the EMODnet offer from thematic Coordinators, followed by use cases to illustrate the power of EMODnet's open and free data services for the blue economy, with a focus on ports, marinas and boating sectors. She noted that in addition to funded partners, EMODnet also has an Associated Partnership scheme that is a flexible no-fee network for stakeholders including the private sector that would like a closer dialogue with EMODnet.

## 1.3 Demonstrating the EMODnet *in situ* marine data 'offer' for ports, marinas and boating

Three EMODnet Coordinators demonstrated EMODnet's offer in the thematic areas of ocean Physics (Antonio Novellino (AN), ETT), Human Activities at sea (Alessandro Pititto (AP), Cogea – BIP Group), and Seabed Habitats (Helen Lillis (HL), JNCC). The diverse offer of data and data products was highlighted, spanning temperature to underwater noise for ocean physics, positions of coastal and offshore platforms to vessel density maps and National Maritime Spatial Plans for human activities, and offering a flagship broad-scale seabed habitat map for Europe (EUSeaMap) made possible by bringing together multi-disciplinary FAIR data of seafloor depth (bathymetry), seafloor geology and substrate, seafloor (benthic) biodiversity, and bottom water ocean currents, among others. For all demonstrations, participants were shown how to access the offer via the EMODnet Common Map Viewer[4], as the single point of access to discover, visualise and download all EMODnet data and data products since the unification of the service in January 2023.

## 1.4 Use Cases and perspectives of open source EMODnet and wider data and data products to support, optimise and innovate the ports, marinas and boating sector

Three external speakers gave presentations on their existing and emerging uses of EMODnet data and services, with a focus on the ports, marinas and boating sector.

### Navigating a more sustainable course: Savvy navvy

David Cusworth (Savvy navvy) presented Savvy navvy, a leisure boating app that acts like Google Maps for boaters, providing safe routes and data on depths, hazards, weather, and tides. With over 2 million downloads across 100 countries the app aggregates anonymised data on boating locations, creating unique heat maps for recreational boating activities. The application incorporates data, including from EMODnet, such as seagrass locations to encourages eco-friendly anchoring, and advanced eco-mooring systems. He noted that Savvy navvy had recently joined the EMODnet Associated Partnership Scheme to facilitate further dialogue on utilising EMODnet data and on data sharing. He noted that users can also access data on protected areas, global marina facilities, and seasonal no-entry zones, with the aim to support responsible boating practices, informed, eco-friendly decisions by delivering relevant scientific information directly to boaters, which also promotes the sustainable use of marine areas, whilst enhancing safety and environmental awareness among leisure boaters.

[4] https://emodnet.ec.europa.eu/geoviewer/

## From Logistic Hub to Data Hub: Livorno Port Experience

Michele Bonistalli (Autorità di Sistema Portuale del Mar Tirreno Settentrionale) presented the North Tyrrhenian Port Network Authority which manages multiple ports in Tuscany. Focusing on the Livorno Port Experience, he demonstrated how this international seaport leverages data – including EMODnet and wider data - to enhance its transformation from a logistics hub to a data hub. He noted that with advancements in digitalisation, ports now focus not only on managing goods but also on data collection and sharing, improving efficiency and supporting environmental goals. He further explained that their architecture includes sensors (e.g., pollution, meteorological, acoustic) and a data lake platform, namely an ICT reference architecture called MONICA, which provides dashboards for monitoring weather, emissions, noise, and more. He noted that EMODnet's standardised marine data could be increasingly important, including for real-time monitoring, AI integration, and connection with European Digital Twin Ocean (EDITO) applications, enabling the port to optimise decision-making and environmental sustainability strategies.

## Copernicus Marine data for ports, marinas and boating

Isabel Garcia Hermosa (Mercator Ocean International) presented the Copernicus Marine Service[5], a component of the wider European Commission's Copernicus programme which includes other thematics such as land. Copernicus Marine Service is a complementary service to EMODnet, providing free and open access to data on the marine environment derived from satellites (remote sensing) and targeted parameters derived from *in situ* ocean observations, some of which are provided by EMODnet, that are required to validate the satellite data and model outputs, which offer a leading capability for forecasting and reanalysis. She noted that the service covers the global ocean and European regional seas and focuses on physical, ice-related and biogeochemical parameters. Coastal data, like high-resolution sea level and ocean colour, are accessible through partnerships with Copernicus Emergency, Land Services, EMODnet, and others. She demonstrated a case study in the Gulf of Riga showing the downscaling of marine data to support ports in forecasting waves, currents, and sea levels, aiding decision-making for port authorities and maritime operators.

## Q&A

In the Q&A session, EMODnet experts addressed several questions, taken live in live discussion and in the online meeting chat. One question related to how to access EMODnet data, where it was confirmed that the EMODnet Portal is a single-entry point, and that it offers a variety of web services according to international Open Geospatial Consortium (OGC) standards. In addition, all EMODnet thematics data are also accessible via Application Programming Interfaces (APIs). AN (EMODnet Physics Coordinator) clarified that EMODnet also offers numerous tutorials and services to help users with data integration, including examples for R and Google Sheets, including for biological, seabed, and physics data, among others.

A question was raised about how users can read how the different EMODnet data sets have been treated to become harmonised data at European (and some at global) scale. EMODnet experts responded that this information is usually included in the metadata that you can also download from the catalogue or directly from the map viewer. Data processing and harmonisation varies a lot depending on the data set and the sources involved. For instance, for EMODnet's Human Activity data there a section called "lineage" in the metadata where we describe what we did with the primary data. It was noted that the EMODnet common metadata catalogue[6] was a rich source of information on which datasets were available, with metadata describing the data included in each data layers, often from tens if not hundreds of different sources.

[5] https://marine.copernicus.eu/

[6] https://emodnet.ec.europa.eu/geonetwork/srv/eng/catalog.search#/search?resultType=details&sortBy=sortDate&from=1&to=20

Questions were raised about how to download EMODnet datasets in standard formats to process programmatically (e.g. csv). It was noted that EMODnet deals with geographic data, so they come in formats such as shapefile, geodatabase, NetCDF, etc. However, EMODnet is not a GIS service, and includes diverse data and also diverse formats, according to standards and user demand. It was noted that almost all EMODnet's Human Activity data sets can also be downloaded in .xls or .csv format., except for the vessel density maps which are not suitable for a .csv file as the user would end up with millions of 1-sq-km cells described by their coordinates, with density values associated with them. In addition, there are a few ways to access EMODnet data for processing programmatically, including via EMODnet's web services, where documentation is available on the EMODnet Portal[7]. Continuing this, it was noted that EMODnet offers many gigabytes of data, and that the EMDOnet Map Viewer is a 'shop window' offering visualisation features for EMODnet's core data layers and data products, supported by a common metadata catalogue where the comprehensive EMODnet offer is made available as a searchable asset.

The EMODnet ERDDAP data server was also noted as a good starting point to download data in a simple consistent way that also allows subsets of datasets in several common file formats, including the ability to retrieve data by using python, R, or Google Sheet.

Puertos del Estado (EMODnet Associated Partner) noted that they represent the 46 Ports of Spain and 28 port authorities, and that they are working on meteo-ocean systems, already in collaboration with EMODnet, Copernicus Marine Service and EuroGOOS.

Plan Bleu-UNEP MAP thanked EMODnet for its work on data aggregation and asked how EMODnet chooses the most relevant attributes (parameters) to represent for a given dataset, and asking if in terms of ports and marinas, whether other variables e.g., depth location could be represented. He added that for biodiversity datasets, Plan Bleu generally choose to map population cover, but this is very specific to each species. And for human activity datasets, e.g., desalination plants he asked if EMDOnet would represent the capacities of production of the facilities which would be very topic-relevant. EMODnet Human Activities noted that the process to decide which attributes to include starts with an analysis of the available sources. Then, since EMODnet harmonises multiple data sets into something consistent, EMODnet goes by the "lowest common denominator" and include information that can be covered by pretty much all sources. In the case of desalination, EMODnet does report plant capacity. EMODnet Seabed Habitats added that when they combine data from multiple sources they prioritise the information that is most likely to be common to most input datasets. Depth information is sometimes recorded alongside species and habitat *in situ* observations and EMODnet does try to keep this information in the database, but it is not consistently recorded.

There was interest in EMODnet's existing datasets related to ports. AP (EMODnet Human Activities Coordinator) noted that for this, data are sourced from the public sector e.g., National governmental data. Currently, datasets are not currently complete for all EU Member States or wider countries and lack of a National dataset in EMODnet in most cases was not because there is a real gap in data, but rather because the stakeholders involved have either restricted their data, or that they are not yet aware of the opportunity to share data to EMODnet. AP invited stakeholders to collaborate with EMODnet to extend this offer, noting that it is an ongoing action of EMODnet to further extend its communication, outreach and dialogue with data providers, and that they meeting today was already making important links with the ports, marinas and boating sectors. In addition, AP explained that EMODnet is looking into potential data sources to produce a marina dataset as there is a demand for

[7] https://emodnet.ec.europa.eu/en/emodnet-web-service-documentation

this, despite it not being in the current workplan for EMODnet's Human Activities. He noted that marinas are available on Google Maps but there remained an issue with creating attributes. He suggested that EMODnet follow up with TransEurope Marinas and European Boating Industry to explore this further and to collate potential data sources, and to provide advice on how to best structure the data model. He noted that it was likely that multiple data sources would be required to produce a complete dataset for Europe, and that the data sourcing and collection was likely to be a time-consuming, manual process, and would likely take some time to produce especially since it is currently outside of the core EMODnet workplan. this was likely to require manual work to collect the data.

EMODnet experts noted that they welcome requests, feedback or questions about specific datasets, and that stakeholder input is very important to help shape EMODnet's service and offer into the future to produce outputs that fit for use. EMODnet has an operational helpdesk[8] and an online feedback form on the Central Portal for reporting bugs and providing feedback on the service.
Some external stakeholders interest in contributing data to EMODnet, which was noted to be a focus of Session 2.

## 1.5 Breakout session 1: Gathering feedback on existing and emerging marine data needs and requirements to support the ports, marinas and boating sector

Registered participants were pre-assigned a breakout room to ensure diversity of stakeholder profiles and expertise across the two break-out rooms, with each breakout group discussing the same questions in parallel for each session. EMODnet Coordinators from Seabed Habitats (HL) and Human Activities (AP) moderated the two groups. In the first breakout session, the goal was to share experiences about *in situ* data needs and requirements to support the ports, marinas and boating sector. All groups – including a mix of people from the private sector, research, civil society and policy sectors – tackled the same discussion points, with the inclusion of an online poll (see Figure 1) which highlighted that many stakeholders require multi-disciplinary marine data, particularly meteorological and surface ocean data (metocean), bathymetry, biological and human activities data, but also ocean physics, (biogeo)chemical and geological data.

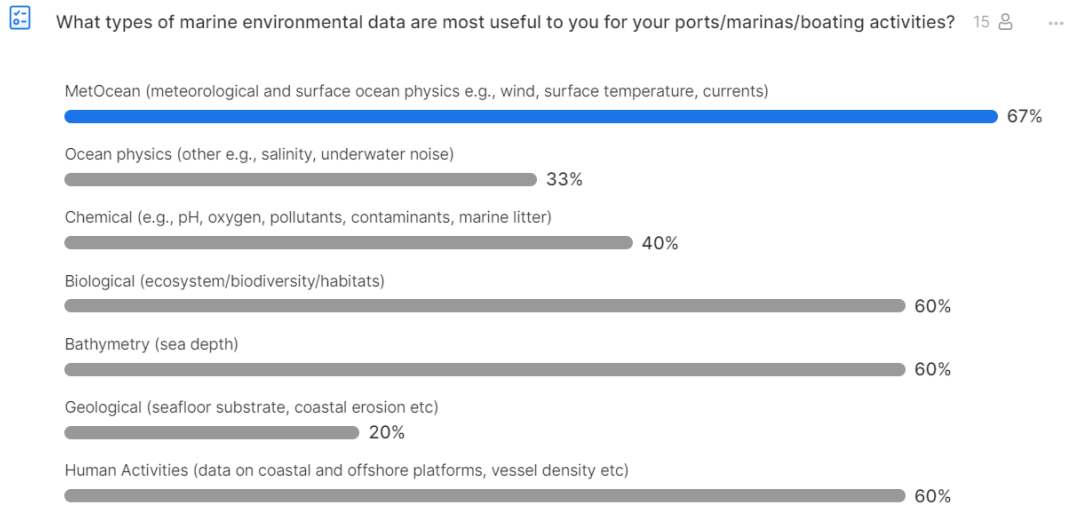



***Figure 1:*** *Online polling question on marine data requirements by the ports, marinas and boating sectors posed to participants of the EMODnet for Business workshop, 22 October 2024*

Specific questions from the break-out discussion 1 are presented below, with a summary of stakeholder feedback after each question, as follows:

[8] helpdesk[at]emodnet.ec.europa.eu

**What types of data do you need about the marine environment and human activities at sea, and why? Are there regional or local specificities?**

- **Habitat and Biological Data:** Information on habitat types, biological parameters (e.g., chlorophyll concentration, phytoplankton types), and submerged habitats is essential for understanding ecosystem health and habitat vulnerability;
- **Human Activity Data:** Data on human activities, such as boat traffic (visits and anchoring), fishing areas, diving zones, and competitive sailing areas, is crucial for effective spatial planning and conflict resolution in marine areas;
- **Environmental Parameters:** Physical parameters like water temperature, salinity, suspended particulate matter, and turbidity (both natural and anthropogenic) are needed for impact assessments and understanding environmental changes;
- **Marine Protection and Risk Data:** Information on Marine Protected Areas, coastal risk datasets, and potential zero-emission zones for recreational boating helps in conservation efforts and risk management;
- **Meteorological and Oceanographic Data:** Utilizing weather data, metocean models, tidal data, and historical data is important for validating climate change predictions and improving safety for leisure boating;
- **High-Resolution Bathymetry:** High-resolution data on seabed topography and relief, particularly in shallow waters (10 metres or less), is necessary for leisure boaters and environmental assessments, as such data is often lacking near shorelines;
- **Impact Assessments:** Comprehensive data for impact assessments at reallocation sites, including oxygen levels, sediment contamination, and the distribution of protected species, is critical for evaluating the effects of human activities on marine ecosystems.

**How do you currently get the Marine data you need for your ports, marinas, and boating activities?**

- **Official Data Sources:** Data are primarily sourced from national monitoring authorities, hydrographic offices, and national organizations. This includes licensing data related to tides, weather, and environmental conditions;
- **Direct Contact:** There is frequent communication with local authorities, networks, and organizations to gather necessary data;
- **IoT Sensors:** Internet of Things (IoT) sensors installed in ports provide real-time data for monitoring;
- **Research and Development:** Some data is obtained from research and development sources, contributing to a broader understanding of marine conditions.
- **Online Platforms:** Data is also gathered from various reservation platforms, individual websites, and associations through web searches.

Discussions also highlighted that, in some cases, data are provided by local/national authorities directly to ports, marinas and boating stakeholders, whilst these data are not made open access to EU marine data services like EMODnet. This was seen as a challenge but also an opportunity for stakeholders in these sectors to communicate with local/national authorities on the value of sharing data with EMODnet.

**Are there any types of Marine data that you need but can't find easily?**

- **Environmental (including non-marine) Data:** There is a need for marine data that intersects with other environmental aspects, such as air quality;
- **Dissolved Oxygen Concentration:** Whilst some data exist in EMODnet, some specific data on dissolved oxygen levels is not readily available in EMODnet;
- **Global Data:** Interest exists for global marine data, although it's recognized that local-level collection is essential for accuracy;
- **High-Resolution Bathymetry:** Whilst EMODnet offers increasing high-resolution bathymetric data, for the ports, marinas and boating sectors even higher resolution is required for localised

operations. These data can be hard to access, particularly because private organisations tend to protect this commercially valuable information;

- **Historical Data Access:** There is a desire to access historical data within EMODnet to analyse changes in marine parameters over time. It was noted for some thematics e.g., some marine biodiversity parameters this may be available, but more historical data would be useful.

## 1.6 JPI Oceans Scoping Action on European Marinas

Melanie Symes (TransEurope Marinas) introduced TransEurope Marinas, a non-profit network of 08 marinas across Europe. She presented a new scoping action under JPI Oceans focused on leveraging European marina infrastructure for ocean research and environmental monitoring[9].

Working with TransEurope Marinas, European Boating Industry and other stakeholders, JPI Oceans aims to enhance research impact for sustainable oceans, while the joint action seeks to establish a network of marinas to gather vital coastal data. The project also intends to engage marinas in citizen science, enabling them to collect data on ocean temperature, sea level, and water quality, supporting ocean health and policy-making. It was noted that EMODnet has regular collaboration and dialogue with JPI Oceans and in this case the EMODnet Human Activities Coordinator (AP) is directly involved, noting that other JPI Oceans activities including a Knowledge Hub for Blue Carbon was also ongoing with EMODnet expert input, which may also be interesting for Blue Economy stakeholders.


*Figure 2: Map of the TransEurope Marinas (credit: TransEurope Marinas)*

[9] https://jpi-oceans.eu/en/joint-actions

# Session 2: Win-win marine data collection and sharing and gathering feedback on challenges and barriers for data sharing by the ports, marinas and boating sector.

## 2.1 EMODnet Data Ingestion: EU public service supporting the Blue Economy towards FAIR marine data sharing

Sissy Iona (SI, HCMR, Greece, EMODnet Data Ingestion Scientific Coordinator) presented an overview of the EMODnet Data Ingestion service, which facilitates data sharing among marine data holders so that it can be ingested into EMODnet. A key component of the EMODnet public service, EMODnet's Data Ingestion service aims to democratise access to marine data, open to all and with a focus on data collectors and providers such as the private sector and citizen science, among others, that do not typically have existing data pipelines to EMODnet. On this, it was noted that EMODnet already has well streamlined pipelines for public research data collected at National level that flows through the National Oceanographic Data Centres (NODCs), and that across all pipelines and ingestion, EMODnet adheres to the FAIR data principles, that were introduced in Session 1. Sissy highlighted successful collaborations across sectors, emphasising the benefits of sharing data through EMODnet, such as increased visibility of data collectors and providers, compliance with funding requirements, receipt of your data in more standardised and harmonised formats, contribution to European Marine Knowledge goals, uptake by EU Policy and streamlined provision of data into the European Digital Twin of the Ocean, among others.

## 2.2 Breakout session 2: Data sharing challenges, barriers and opportunities

Registered participants were pre-assigned a break out room to ensure diversity of stakeholder profiles and expertise across the two break-out rooms, with each break out group discussing the same questions in parallel for each session and with the EMODnet Coordinators moderating the group discussions.

In the second break out session, the goal was to share experiences about *in situ* data use by the ports, marinas and boating sector. An online poll was posed to the participants on what types of marine environmental and/or human activities data are already collected by their organisation. The results (Figure 2) show that chemical ocean data is a key priority in data collection efforts by the ports, marinas and boating stakeholders that attended the meeting, followed by bathymetry, and human activities (focus on boating data, then ports data), then ocean physics and biological data, with geological data collection currently the lowest.

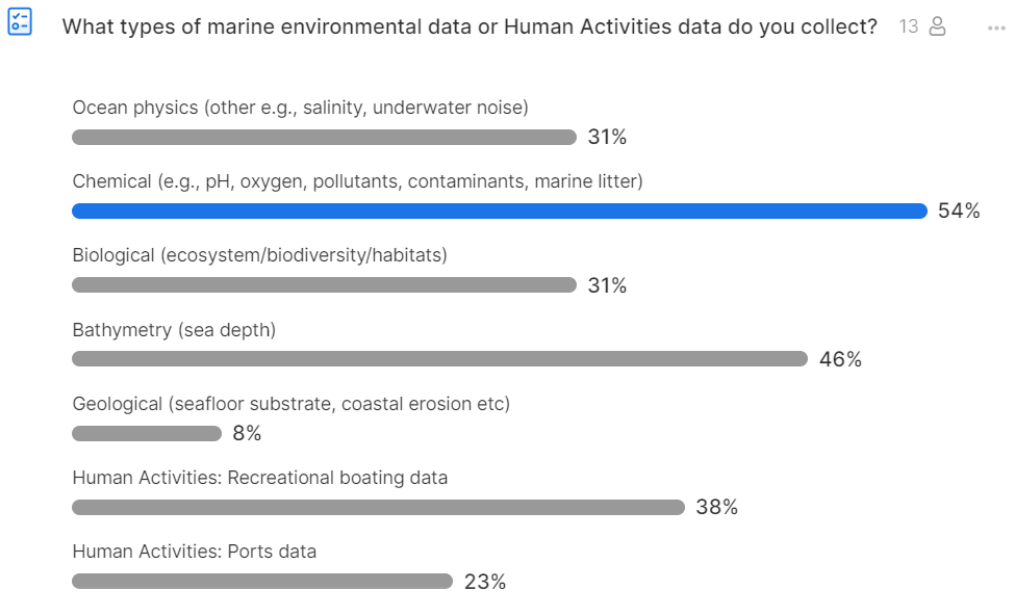



***Figure 2:*** *Online polling question on marine data collection by the ports, marinas and boating sectors posed to participants of the EMODnet for Business workshop, 22 October 2024*

All groups – including a mix of people from the private sector, research, civil society and policy sectors – then moved to breakout rooms with participants divided into the same groups as session 1. All participants then tackled the same discussion points, which are presented below with stakeholder feedback:

**Do you/your organisation collect marine environmental data?** (Please state which types of data e.g. temperature data)

- **Seagrass/Eelgrass Data:** Data is collected on seagrass and eelgrass, though standardization of quality and collection methods varies, making it challenging. There is a preference for centralized data sources instead of multiple organizations;
- **Water Analysis:** Data on biological parameters from water analysis is collected by some stakeholders;
- **Environmental Observations:** A range of Essential Ocean Variables (EOVs) is monitored, including temperature, sea level, oxygen, turbidity, chlorophyll-a, currents, and waves. Data collected is often more relevant just off the pier compared to conditions within the harbour;
- **BioHuts:** Artificial reefs, called BioHuts, are monitored in collaboration with a local university;
- **Remote Sensing:** Remote sensing data is processed to create habitat maps (e.g., seagrass, kelp) and optical water parameters, along with calculations of carbon sequestration for these habitats.

**Are you or your organization currently sharing data with EMODnet? If not, could this be possible in the future?**

- A small number of organisations/entities e.g., national authorities noted they are actively sharing data with EMODnet and other data centres.
- **Several organizations noted that they do not currently share data with EMODnet,** but they expressed a willingness and interest **to share data in the future**, highlighting a positive attitude towards collaboration.
- **A specific citizen science project "Sailing for Oxygen" initiative noted that it shares data collected from marinas where instruments for measuring oxygen, temperature, and salinity are loaned to boaters**. This initiative contributes valuable data from the southwest Baltic.
- **The Sharing an Ocean of Possibilities (S.O.O.P) initiative also noted interest to further strengthen collaboration with EMODnet, including for data sharing.** It was noted that EMODnet

Physics has been actively integrating *in situ* data from various participatory and citizen science projects, and EMODnet sees great value in expanding the network, including with SOOP.

**What are the challenges of sharing data and how can EMODnet help?**

- **Reliable Information Collection:** Some stakeholders highlighted a significant challenge is gathering reliable and accurate information. It was noted that EMODnet can advise on metadata and data collection standards to ensure primary data are suitable for ingestion into EMODnet;
- **Lack of Submission Standards:** It was noted that EMODnet works with INSPIRE European geospatial standards, but that these do not always translate to global standards for data collection e.g., the Essential Ocean Variables (EOVs). In addition, it was noted that not all EMODnet parameters are EOVs (e.g., the high-value parameter Bathymetry is not an EOV). EMODnet was recommended to assess how it could contribute to, and utilise clearer standards for EOVs, and input to create more standardized methods for less commonly measured variables, which pose a significant hurdle;
- **Acknowledgment of Efforts:** Some individuals feel that their contributions are not adequately recognised, especially regarding downloadable maps and data. It was noted that EMODnet acknowledges data collectors and providers in the metadata but it was noted this is not so visible and more could be done to communicate the data collection efforts and data provision to EMODnet;
- **Technical Barriers:** To engage more marinas in data sharing, EMODnet should minimise technical hurdles in data submission and ingestion. Starting with a limited set of variables and establishing easy standards and clear processes could encourage participation.

## Closing words from EMODnet and DG MARE

KL provided closing remarks for the workshop, summarizing key points and outlining next steps. Kate began by thanking the co-organisers, including the European Boating Industry (EBI), TransEurope Marinas, and the European Sea Ports Organisation (ESPO) for their collaboration in organising and co-designing the workshop. She noted a summary report will be available by year-end on the EMODnet portal and the European Commission's Maritime Forum. KL further invited continued dialogue with EMODnet and stakeholder networks. Participants were encouraged to contact EMODnet for collaborative use case development, which could be featured on their portal. The Open Sea Lab 4.0 hackathon in March will offer participants the chance to use EMODnet data for societal challenges, with exclusive access to the European Digital Twin Ocean (EDITO). KL encouraged reaching out via the helpdesk or Secretariat email and joining the associated partnership network for data sharing and best practices. KL finally thanked participants, highlighted EMODnet's comprehensive data services, and invited suggestions for new data connections.

## Follow-up

Key outcomes of the workshop included recognition that stakeholders from the ports, marinas and boating sectors increasingly require marine environmental and human activities data for their operations, including to support the green transition and to help feed data needs for the ongoing transformations of city ports from exclusively transport hubs to also data hubs (e.g., Port of Livorno), utilising data lakes, Artificial Intelligence and Digital Twining. The workshop also demonstrated that many stakeholders in the sector are already collecting – or are planning to collect – marine data that could be relevant for EMODnet, with interest in sharing marine data with EMODnet. There was also motivation from stakeholders including European Boating Industry to help EMODnet fill data gaps in key data layers e.g., marinas, and a request for EMODnet to develop a similar data layer for ports in Europe.

Finally, European Boating Industry and TransEurope Marinas recommended that EMODnet could develop targeted resources for the sector, including information on the EMODnet offer (focus on coastal/land-sea interface) that could be most relevant for the ports, marinas and boating sectors, data sharing guidelines, etc, noting that these stakeholders demonstrated motivation to co-develop these resources together with EMODnet. Post-meeting, TransEurope Marinas and European Boating Industry liaised with the EMODnet Secretariat to discuss the contents of a future guidelines on EMODnet for ports, marinas, and the boating community, with the following considered to be important for maximum relevance, uptake and impact:

- A brief introductory overview of EMODnet, what it is, and its value to the marine and maritime community – including Blue Economy as a public EC marine data service, potentially including an explanation of the FAIR data principles;
- A description of key topics relevant to marinas and boating, illustrating practical examples—from identifying nearby marine reserves and sensitive seabed habitats for environmental education to more advanced applications;
- A user-friendly "how-to" guide for extracting data from EMODnet;
- Information on programmes and initiatives (such as SOOP) that marinas can engage with to contribute to data collection, pending willingness;
- Guidelines on collecting and preparing marine data and metadata for submission to EMODnet, and the value of data sharing with EMODnet, including visibility for data providers, uptake and use of data by EU Policy, provision of data to the European Digital Twin Ocean;
- Contact details for further inquiries and support.

These recommendations and insights are being taken forward, with a view to further promotion of the EMODnet offer at upcoming events, including the World Conference on cities and ports (Lisbon, Portugal, November 2024), the BOOT boat show (Düsseldorf, Germany, January 2025) and European Maritime Day (Cork, Ireland, May 2025), among others.

After the workshop, several new contacts were established for expanding the EMOD network with potential new EMODnet use cases and potential new EMODnet Associated Partners.

This workshop report will be made publicly available on the EC Maritime Forum and EMODnet Portal, together with reports from other workshops in the EMODnet for Business workshop series, with other sectoral dialogues to-date having included the Aquaculture, Offshore Renewable Energy and Coastal Tourism sectors.