



EMODnet



European Marine
Observation and
Data Network



EMODnet

ANNUAL REPORT 2021



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Acknowledgements_____

This Annual report is produced by the EMODnet Secretariat, with input from EMODnet thematic Coordinators (thematic content) and Trust-IT (design).

References_____

More detailed information on progress, together with the access to the latest data and data products can be found on the Central Portal emodnet.ec.europa.eu

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About EMODnet

The European Marine Observation and Data Network (EMODnet) is a long-term marine data initiative funded by the European Maritime, Fisheries and Aquaculture Fund (previously: European Maritime and Fisheries Fund).

EMODnet connects a network of over 120 organisations supported by the EU's Integrated Maritime Policy who work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products. This 'collect once and use many times' philosophy benefits all marine data users, including policy makers, scientists, private industry and the public.

This kind of integrated marine data policy saves costs for offshore operators, while also opening up new opportunities for innovation and growth. The aim of EMODnet is to increase productivity in all tasks involving marine data, to promote innovation and to reduce uncertainty about the behaviour of the sea. This will lessen the risks associated with private and public investments in the blue economy, and facilitate more effective protection of the marine environment.

EMODnet provides easy and free access to marine data, metadata and data products and services spanning seven broad disciplinary themes: bathymetry, geology, physics, chemistry, biology, seabed habitats and human activities. Each theme is dealt with by a partnership of organisations that possesses the expertise necessary to standardise the presentation of data and create data products. To demonstrate the power of opening up Europe's wealth of marine observations and data, EMODnet turns marine data into maps, digital terrain models, time series & statistics, dynamic plots, and provides map viewers and other applications ready to support researchers, industries and policy makers to tackle grand societal challenges.

High quality marine data are the foundation for delivering the EU Green Deal, and the digital transition, and the digital transition. The EMODnet service plays a key role as the focal point in Europe, for *in situ* integrated marine environmental and human activities data and data products that are used by thousands of users who need high quality, harmonised and standardised data and information as input to operations at sea, as observations and information on the health of the ocean and on human impact for regional sea-basin assessments and European Directives e.g., the Marine Strategy Framework Directive, and as evidence to underpin wider policy decisions, international ocean governance and more.

EMODnet is also a core data infrastructure and ocean service which, together with the Copernicus Marine Service and Copernicus Data and Information access service (DIAS), forms the backbone of a future European Digital Twin Ocean, a key contribution to the EU marine data space and regional best practices for the global ocean data ecosystem.



THE EUROPEAN MARINE OBSERVATION AND DATA NETWORK - AT A GLANCE

EMODnet



European Marine Observation and Data Network

Over **120 organisations** assembling and making available **marine data, metadata & products**

7 Thematic areas

- Human Activities
- Physics
- Chemistry
- Biology
- Seabed Habitats
- Geology
- Bathymetry

EMODnet Timeline

Year	Phase	Key Features
2009	Phase I	Limited sea basins, 59 institutes
2013	Phase II	Low resolution all basins, 120 institutes
2017	Phase III	Multi-resolution, Over 150 institutes
Beyond 2020	Future	Further increase volume, coverage & resolution of data resources; All data & products made available directly via EMODnet Central Portal; Expand the network of data providers, users and associated partners; EMODnet and Copernicus Marine Service for the EU marine data space

1 Central Portal - emodnet.ec.europa.eu

Gateway to all EMODnet data resources and tools allowing users to retrieve data layers from multiple themes

1 Ingestion Portal

facilitating submission of new datasets

EMODnet Secretariat

Why EMODnet?

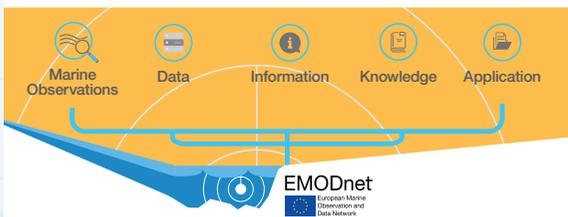
Every year, the EU & its Member States invest a huge amount in marine observations and data collection.

Most of this data ends up in different databases and systems scattered around Europe and is difficult to find, access, assemble and use.

EMODnet is making a difference



From raw data to real-life applications



Who is EMODnet for?

Professionals from: Public Sector Civil Society Private Sector Research Community

Benefits

- More productivity:** Avoid costs of repeated collection of data by improving access to already existing data in compatible formats
- More innovation:** Anyone (including SMEs) can build value-added services using data from different sources
- Less uncertainty:** Better access to data improves forecasts of the behaviour of the seas, reducing costs of protecting life and property in coastal areas and offshore
- Adding value to your own data:** Sharing data with EMODnet allows your own data to be combined with data from others to generate better value-added products and information and supports the global open data movement.

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund and its predecessor, Regulation (EU) No. 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.



emodnet.ec.europa.eu
@EMODnet



Jan-Bart Calewaert
Head of the EMODnet
Secretariat

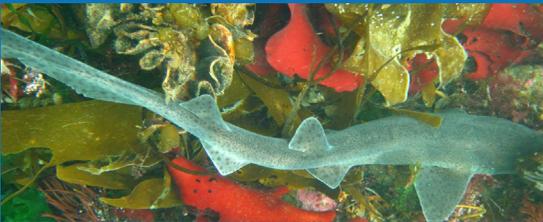
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Introduction from the Head of the EMODnet Secretariat

Following the 10 years' anniversary of EMODnet in 2020, we came together in 2021 to reflect on the achievements and highlights over the past decade during the [EMODnet second Open Conference and Jamboree](#). This event marked the **end of an era and the beginning of a new one**. In 2020, the EMODnet partnership collectively met the EC Marine Knowledge 2020 vision targets, i.e. producing a seamless multi-resolution digital seabed map of European waters by 2020 of the highest resolution possible, covering topography, geology, habitats and ecosystems; accompanied by access to timely observations and information on the present and past physical, chemical and biological state of the overlying water column, by associated data on human activities and by their impact on the sea. And, at the start of the new era, in 2021 the **EMODnet Central Portal became fully embedded into the ec.europa.eu domain**, reinforcing the clear connection between EMODnet and the EU family and setting the stage for the developments to come.

New products and services

2021 saw the end of the third phase of development for all of the EMODnet projects, which delivered a wide range of new and updated datasets and data products across hundreds of parameters. Some notable examples include the latest [EMODnet Digital Terrain Model \(DTM\) for the European Seas](#) from [EMODnet Bathymetry](#), released in early 2021 as an update from previous versions, including new data and improvements following expert inputs. [EMODnet Seabed Habitats](#) released its newest version of the [EUSeaMap 2021](#), with an updated, higher resolution seabed substrate layer from the EMODnet Geology project, the inclusion of a biogenic substrate class and attribution in five different classification

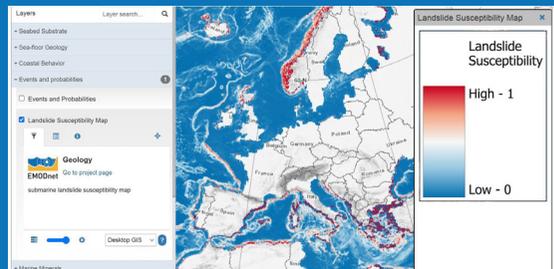


©Nicholas Chopin

systems. It is available in three European-wide classification systems (EUNIS habitat classification 2007, EUNIS marine habitat classification 2019 and MSFD Benthic Broad Habitat Types), and two regional classifications (HELCOM Underwater Biotores in the Baltic and Barcelona Convention habitat types in the Mediterranean). [EMODnet Chemistry](#) built upon its collaboration with the European Commission

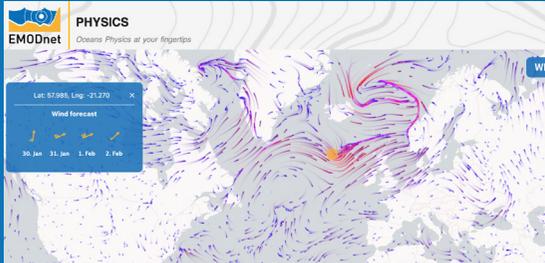
Joint Research Centre (JRC) to offer a focal point for marine litter data and information for the Marine Strategy Framework Directive Descriptor 10 assessments. The thematic lot also released updated [Eutrophication maps](#) including new data collections that are used to support the evaluation of the state of the eutrophication of the European sea basins.

[EMODnet Biology](#) demonstrated what can be done by combining marine biodiversity and ocean physical and biogeochemical data, information and knowledge by developing [proof of concepts](#) including on the potential vulnerability of commercial shellfish species to ocean acidification. Two years after the first release of the algae production dataset, [EMODnet Human Activities](#) complemented this with [new data on spirulina production](#). This was the result of a very fruitful cooperation between the thematic portal, the European Commission JRC and EMODnet Data Ingestion. [EMODnet Geology](#) released, among others, an updated [Sea Floor Geology](#) product, with new datasets on earthquakes, submarine landslides, volcanoes, tsunamis, fluid emissions and Quaternary tectonics in seas surrounding European countries.



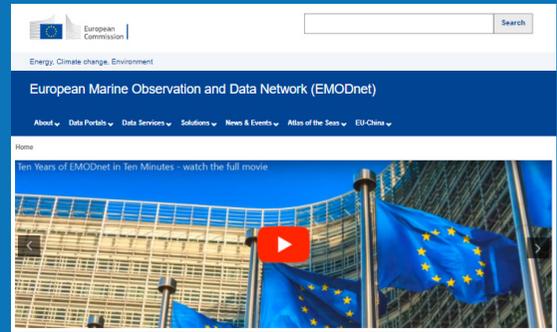
©EMODnet Geology

For this product, EMODnet Geology partners extended the geographical coverage, integrating data from neighbouring countries so that the product extends from Iceland to Turkey, including the Caspian Sea. **EMODnet Physics** continuously updated its **products** throughout the project phase for all of its parameters ranging from temperature and salinity to underwater noise, river flow and multiple data layers and products related to sea level, in collaboration with European research infrastructures, EuroGOOS and wider data producers.



©EMODnet Secretariat

©EMODnet Physics



The full EMODnet offer was also published in an updated EMODnet data and data product **portfolio 2021** spanning all thematics and outlining the latest data services and web services of the EMOD-network.

2021 also marked the end of the second phase of **EMODnet Data Ingestion**. At the end of the phase, there were 1.071 data submissions, ranging from single datasets to large integrated data from publicly funded research, the private sector, civil society and citizen science.

EMODnet's expanding number of datasets continue to power the EC DG MARE **European Atlas of the Seas** online communication tool. EMODnet remains the main data provider (> 50% of data layers) of this important data visualisation, web-mapping and ocean literacy tool which now contains almost 300 maps, with content available in the 24 official EU languages. To further improve the accessibility and usability of the Atlas, a new version (version 7) was released in April 2021, with improvements to the legends, the inclusion of layer labels indicating new or updated layers, and optimised visualisation of data layers at small spatial scales. User visits to the European Atlas of the Seas continue to increase yearly, and in fact more than doubled in 2021 compared to the previous year.

Extending our network and reaching new communities

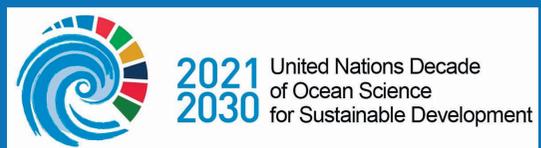
EMODnet continues as a user-driven service, used by a wide range of stakeholders. This is demonstrated in a **series of eight videos**, which were released one by one throughout 2020 and 2021, illustrating the **fundamental role of EMODnet in society**.

EMODnet for Business and the Blue Economy also goes from strength to strength. In 2021 EMODnet organised a series of events focused at the private sector, including the workshop "Ocean Observation

and Marine data for the Blue Economy" delivered online to over 200 stakeholders at European Maritime Day 2021. EMODnet also teamed up with the European Aquaculture and Technology Platform (EATiP), Copernicus Marine Service and the EC DG MARE and DG Defis to deliver two virtual **workshops on the topic "Marine data for Aquaculture"**. These events brought together aquaculture farm operators, national authorities, policy makers, data service providers to demonstrate the EMODnet and Copernicus services, and to encourage the aquaculture sector to use EMODnet and Copernicus marine environmental data for their operations, and to encourage more data sharing in this sector.

In 2021 we were delighted to welcome new EMODnet **Associated Partners** such as **Cerema** and **develogic GmbH** with many representatives taking on active roles at EMODnet flagship events in 2021. We continue to welcome suggestions from the community to further expand and diversify our network.

Finally, at the global level EMODnet has continued to expand its contributions to **international initiatives**, among others in support of the **UN Decade of Ocean Science for Sustainable Development**, the **International Oceanographic Data and Information Exchange (IODE) programme of IOC-UNESCO** and more.



Via the **EMOD-PACE project (EMODnet partnership for China and Europe)**, for example, several key EMODnet implementers have been engaging with colleagues from the Chinese National Marine Data and Information Service (NMDIS) to (i) exchange best practices on ocean data management and sharing; (ii) develop interoperable data sharing solutions; (iii) evaluate European and Chinese methods for ocean circulation (forecast) modelling, seabed habitat mapping and environmental carrying capacity assessments; and (iv) develop joint products relevant to coastal adaptation. The results of these efforts are made available via the **EMODPACE website** under the EMODnet Central Portal.

2021 at a glance

Signing of a Memorandum of Understanding (MoU) between EMODnet and the National Marine Data and Information Service (NMDIS) of China to mark the start of the EU-China marine data interoperability project EMOD-PACE, and counterpart project in China, CEMD-NET.



©NDMIS ©EMODnet Secretariat

Release of the **EMODnet for Maritime Spatial Planning** video, setting the stage for EMODnet's key role in transboundary marine environmental data to support Maritime Spatial Planning, and for hosting national Maritime Spatial Plans.

The EMODnet for Business video was released, as part of a series of videos illustrating the fundamental role of EMODnet in society.



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The European **Atlas of the Seas** revealed the first twelve ambassadors, which advocate



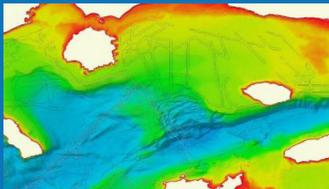
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for advanced ocean literacy.

EMODnet users now have access to the maritime spatial plans (MSPs) for Belgium and Finland via the **EMODnet Human Activities portal**, with more Member State National MSPs on the way, with more Member State National MSPs on the way.

JANUARY

Release of **EMODnet Bathymetry** Digital Terrain Model (DTM) version 2021.



©EMODnet Bathymetry

The EMODnet for Business video was released, as part of a series of videos illustrating the fundamental role of EMODnet in society.

The EMODnet Secretariat submitted responses on the European Commission (DG MARE) **public consultation towards a common EU approach to ocean observation**.

EMODnet Biology released a new data product on the numerical abundance of benthic macroinvertebrates in North Sea and Baltic Sea, consisting of more than 80.000 samples of more than 4.000 benthic species that have been found in both seas.

EMODnet Physics updated products on operational river data, by adding an overview of the Swedish and Iberian coastline with near-real time data rivers outflow.

MARCH

EMODnet Geology released a new shoreline-migration map based on field measurements and aerial photography.



©EMODnet Geology

EMODnet co-organised a **workshop on marine data for the aquaculture sector** in the Mediterranean and Black Sea, in collaboration with EATiP, Copernicus Marine Service, DG MARE and DG Defis.



FEBRUARY

2021



Release of the videos **EMODnet for Aquaculture and EMODnet for Marine & Maritime Policy**.

Organisation of a workshop on “Ocean Observation and Marine Data for the Blue Economy” for **European Maritime Day 2021**. Among the panel members was the coordinator of EMODnet Human Activities.

From 19 to 21 April EMODnet held its **14th Steering Committee and 9th Technical Working Group** meetings. The EC Marine Knowledge Expert Group joined for an open session, where updates across all EMODnet thematics were presented and discussed.

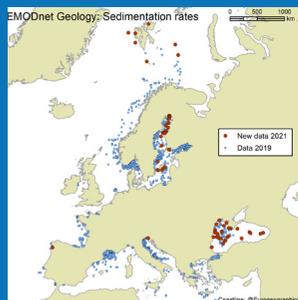


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June 2021 was a pivotal month for the EMODnet-network. From 14 to 16 June 2021, the online 3-day **EMODnet Open Conference** brought together many EMODnet partners, data providers, users and stakeholders from Europe, On 18 June 2021, EMODnet played a keyrole in co-organising the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE), unit A1 Maritime Innovation, Marine Knowledge and Investment **EC Ocean Observation** event, co-organised with European Marine Board (EMB), EuroGOOS and Copernicus Marine Service (CMEMS) communities.



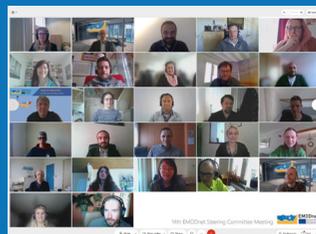
EMODnet Geology updated their sedimentation rates data product. The data is compiled from all available information on the rate of sedimentation in European maritime areas, provided by EMODnet project partners from their national waters (incl. EEZ).



©EMODnet Secretariat

EMODnet Chemistry released new harmonised data sets, including the regional data collections for eutrophication and contaminants and the global collections for beach litter.

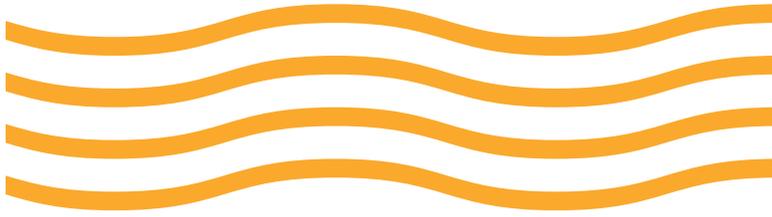
To gear up to the next phase where access to all thematic data and data products will be centralised and with a further expansion of the data and product catalogue, EMODnet solicited wide feedback from EMODnet users and stakeholders in an **online survey** (May-July 2021).



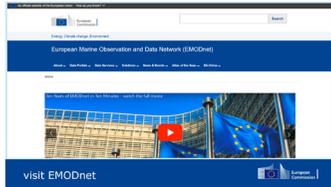
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Launch of **EMODnet and Copernicus Marine Service joint marine data and data product catalogue** for the Baltic Sea aimed to support European Member States with the implementation of the Marine Strategy Framework Directive (MSFD).



Repatriation of EMODnet Central Portal to a European Commission (Europa) web address: emodnet.ec.europa.eu.



©EMODnet Secretariat



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The **EMODnet Secretariat** was invited by Blue Bridge and Flanders' Blue Cluster, to welcome EU Commissioner for the Environment, Oceans and Fisheries, Virginijus Sinkevičius on his 'Blue Economy' visit to Oostende (Belgium), together with Blue Bridge and Flanders' Blue Cluster.



©EMODnet Secretariat

EMODnet Geology released a series of new and updated data products (Marine Minerals; Seabed Substrate; Seafloor Geology; Geological Events).

JULY

AUGUST

SEPTEMBER

2021

Release of the **EMODnet for Offshore Renewable Energy** video.

Release of the new video from **EMODnet Data Ingestion** explaining how data from hundreds of diverse data collectors and producers is turned into high-end data for science, engineering and policy making.



©EMODnet Data Ingestion

EMODnet Seabed Habitats and EMODnet Biology teamed up to produce a guidance document on data standards aimed at OBIS/EurOBIS data providers submitting information on habitat types and species occurrences.

The European Commission Joint Research Centre (EC JRC) expressed interest to work with EMODnet regarding acute pollution events derived from oil and other contaminant spills. **EMODnet Chemistry** and **EMODnet Human Activities** were requested to support a core group of experts working together to design a single, agreed reporting strategy, and a centralised database containing all standardised and validated data.

From 8 to 10 September, the EMODnet partnership held its **15th EMODnet Steering Committee** and **10th Technical Working Group** meetings. The EC Marine Knowledge Expert Group joined for an open session.



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2021 at a glance

EMODnet Physics presented at the GLIDER School 2021, which is a hands-on and training forum on ocean-gliders technology.



©EMODnet Physics

EMODnet Chemistry co-organised the UN Ocean Decade Laboratory: A Clean Ocean workshop "One Integrated Marine Debris Observing system for a Clean Ocean".

Release of the video **EMODnet for Civil Society**.

The EMODnet Secretariat presented EMODnet for Business at the EC Blue Economy Conference on 18 November 2021, back-to-back with Sealogy in Ferrara, Italy.

2021 OCTOBER

NOVEMBER

DECEMBER

EMODnet Seabed Habitats released the newest version of the EMODnet broad-scale seabed habitat map for Europe, EUSeaMap 2021.

EMODnet was a partner in the first edition of the EU Open Data Days.

EMODnet Secretariat spoke at a webinar on the "All Atlantic Ocean Data Space" organised by the All Atlantic Cooperation for Ocean Research and Innovation (ANNCHOR-CSA).

Data collections in the **EMODnet Chemistry** product catalogue are now even more accessible, through direct links with the webODV tool.

The last data harvest of 2021, brought the total number of datasets in **EMODnet Biology** to 1181, representing 26.5 million occurrence records.



©EMODnet Biology

The EMODnet Secretariat released the last video of the series: **EMODnet for Tourism**.

The EMOD-network joined the **8th European Marine Board Forum on 'Supporting the Ocean Decade in Europe'** including dialogue on EMODnet's contributions across the UN Ocean Decade key objectives including the delivery of FAIR marine data for a transparent and accessible Ocean.

8th EMB Forum

Supporting the Ocean Decade in Europe

1 December 2021. BluePoint Brussels and Online



EMODnet services facts and figures

Total of
EMODnet

144

Partner Organisations
by end 2021

Total of
EMODnet

25

Associated Partners
by end 2021

Data offered for over **70**
parameter groups
across **7 thematic**
areas at the level of
the marine and human
activities environment, with
over **17,000 Gigabytes**
of data and data products
downloaded in 2021 alone.

333 JIRA tickets
generated in 2021 by
the Technical Working
Group to find technical
solutions to EMODnet
services

More than

89,000

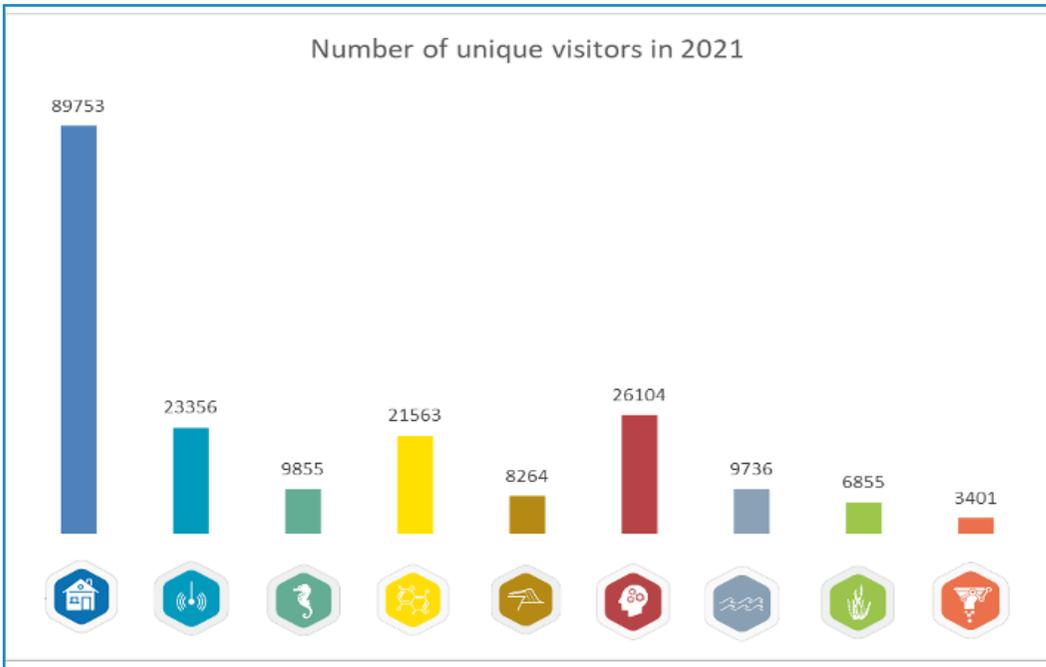
unique visits to the
EMODnet Central Portal
in addition to some
users going directly to
thematic portals
(being centralised by
end of 2022)

More than

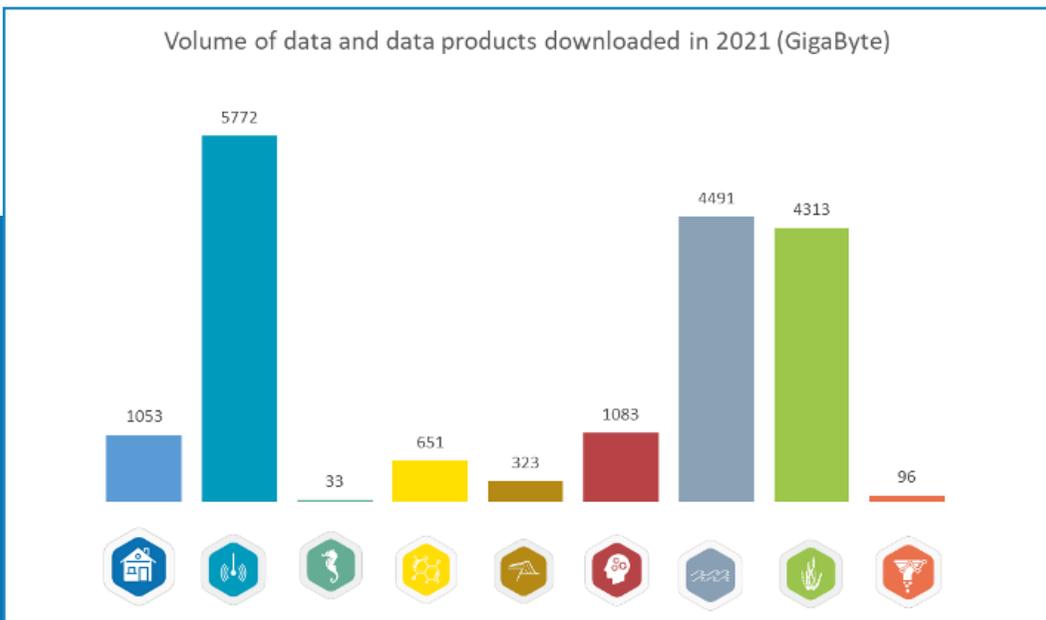
5,400

Twitter followers
by the end of 2021





In 2021, already more than 89,000 unique visitors accessed EMODnet through the Central Portal. By the end of 2022, all of the visitors will be channelled through the EMODnet Central Portal.



Total volume of 17,816 GigaBytes of data and products downloaded across all EMODnet services in 2021.

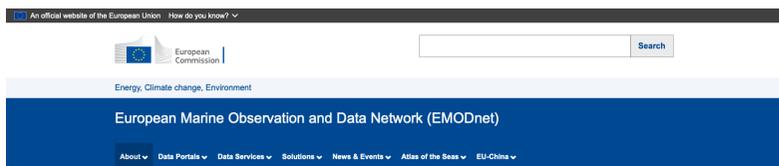
One Year of EMODnet

EMODnet Central Portal

In 2021 the Central Portal reached a total of 89,753 unique visitors, which is >20,000 more than in 2020.

Since July 2021 the EMODnet Central Portal is hosted on the ec.europa.eu domain, following a repatriation of all Central Portal content which was coordinated by VLIZ and the EMODnet Secretariat. 2021 also saw the start of a two-year activity to consolidate the EMODnet network into the Central Portal. This will result in a simplified user experience for data discovery, access, visualisation and download, with a common map viewer, central metadata catalogue and a single access point to all EMODnet data, data products and services will be the EMODnet Central Portal on the EC domain.

In 2020 a dedicated Central Portal Technical Team was set up composed of people from the EMODnet Secretariat, Flanders Marine Institute (VLIZ) and the European Commission, to manage, plan, implement and monitor the EMODnet centralisation process, in close collaboration with the EMODnet thematic Coordinators. In the course of 2021 the team made considerable progress towards the centralisation, with a view to further optimise the user experience and the EMODnet Central Portal providing a “one stop shop” for in situ marine data.



What is EMODnet?

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The Challenge

Data from the marine environment are a valuable asset. Rapid access to reliable and accurate information is vital in addressing threats to the marine environment, in the development of policies and legislation to protect vulnerable areas of our coasts and oceans, in understanding trends and in forecasting future changes. Likewise, better quality and more easily accessible marine data is a prerequisite for further sustainable economic development, so-called ‘blue growth’.

Unfortunately, marine data collection, storage and access in Europe has been carried out in a fragmented way for many years. Most data collection has focused on meeting the needs of a single purpose by a wide range of private and public organisations, often in isolation from each other.

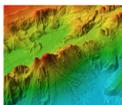
The Solution

The European Marine Observation and Data Network (EMODnet) is a network of organisations supported by the EU’s integrated maritime policy. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products.

This “collect once and use many times” philosophy benefits all marine data users, including policy makers, scientists, private industry and the public. It has been estimated that such an integrated marine data policy will save at least one billion Euros per year, as well as opening up new opportunities for innovation and growth.

How does EMODnet work?

EMODnet provides access to European marine data across seven discipline-based themes:



Bathymetry

Data on bathymetry (water depth), coastlines, and geographical location of underwater features: wrecks.



Biology

Data on temporal and spatial distribution of species abundance and biomass from several taxa.



Chemistry

Data on the concentration of nutrients, organic matter, pesticides, heavy metals, radionuclides and antifoulants in water, sediment and biota.



Geology

Data on seabed substrate, seafloor geology, coastal behaviour, geological events, and minerals.



Human Activities

Data on the intensity and spatial extent of human activities at sea.



Physics

Data on salinity, temperature, waves, winds, currents, sea-level, light attenuation, ice, river outflow, underwater noise.



Seabed Habitats

Regular interactions between the Central Portal Technical Team and subject matter and technical experts from each thematic lot took place in the course of 2021. During these interactions, the thematic lot’s current data sharing infrastructure and technical solutions currently implemented were discussed, as well as their views and recommendations for priorities for centralisation. The information is used by the EMODnet Secretariat and VLIZ to inform the technical architecture needs of the future Central Portal.

Other work by the Central Portal Technical Team consisted of the integration of the static web-content of the thematic data portal websites into the EMODnet Central Portal. Each thematic lot will receive ‘community pages’ on the new Central Portal. In parallel, the Central Portal Technical Team worked closely with EMODnet Secretariat partner Bilbomática on the development of a new common map viewer.

Key highlights of 2021 are featured throughout the Annual report, underpinning the continuous efforts and dedicated work by both the Secretariat and Central Portal Technical Team in providing a one-stop shop for in situ marine data.

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EMODnet Secretariat

The European Marine Observation and Data Network (EMODnet) is supported by a dedicated Secretariat funded by the European Commission. The Secretariat provides high-level support, coordination and technical advice to the network to guide the development of the EMODnet Central Portal, monitors the progress of the various EMODnet projects, and disseminates their results. In addition the Secretariat team fosters strong coherence, interaction and collaboration across the EMODnet partnership, and provides support and advice to the network on European ocean observation and the Atlas of the Seas. The main aim is to develop a more coherent, effective, efficient and fit-for-purpose EMODnet, and to stimulate its use by industry, policy and scientific data users.

Since 2013, the EMODnet Secretariat is administered by Seascope Belgium and hosted at the InnovOcean site in Oostende (Belgium) with the support from the Flemish Government. September 2018 – end 2021, the core secretariat staff from Seascope Belgium has also been supported by three other organisations: Trust-IT for communication and web design, the European Marine Board to support European Ocean Observation stakeholder interactions, and Bilbomática for technical and developments support for the European Atlas of the Seas.

2021 EMODnet Secretariat contributions to key events

Some examples of key events where the EMODnet Secretariat actively presented, participated and/or co-organised are presented below.

The full list is available from reports on the EMODnet Central Portal: <https://emodnet.ec.europa.eu/en/reports>

- » Copernicus Marine Service General Assembly, 26-28 January 2021, online meeting
- » SEARICA Blue Economy Conference, 28 January 2021, online conference
- » GEO Knowledge Hub webinar, 24 February 2021, online webinar
- » IODE XXVI – IOC Strategic Plan for Data and Information Management 2022-2026, 26 February 2021, online meeting
- » EOOs Operations Committee, 10 March 2021, online meeting
- » EOOs Steering Group, 21 March, online meeting
- » SEARICA Webinar: Presentation of the Ocean Framework, 17 March 2021, online webinar
- » Marine data for Aquaculture meeting workshop: Mediterranean & Black Sea, 24-25 March 2021, online workshop
- » JPI Ocean Strategy Launch, 29 March 2021, online meeting
- » International Conference on Marine Data and Information Systems (IMDIS), 12-14 April 2021, online conference
- » EU International Ocean Governance Forum 2021: Setting the course for a sustainable blue planet, 20 April 2021, online meeting
- » JPI Oceans Knowledge Hub on Sea Level Rise, 22 April 2021, online meeting
- » IODE XXVI global meeting, 20-23 April 2021, online meeting
- » EuroGOOS General Assembly, 4 May 2021, online meeting
- » European Maritime Day 2021 workshop “Ocean Observation and Marine Data for the Blue Economy”, 20 May 2021, online workshop
- » UN Ocean Decade Launch, 1 June 2021, online meeting
- » EMODnet Open Conference & Jamboree, 14-18 June 2021, online conference
- » European Aquaculture Technology Platform (EUTiP) General Assembly, 17 June 2021, online meeting
- » Ocean4Biotech Hackathon, 10 July 2021, online event
- » BlueMed workshop: unlocking the potential of ports and Harbours in preventing and reducing the effects of Marine Litter, 14 September 2021, online workshop
- » EOOs Advisory Committee, 14 September, online meeting
- » UN Decade of Ocean Science for Sustainable Development: a predicted ocean laboratory workshop, 15 September 2021, online workshop
- » Open Science Fair 2021, 20-23 September 2021, online conference
- » Ocean Hackathon Brest, 5-7 November 2021, online hackathon
- » EC Blue Economy Conference, 18 November 2021, online conference
- » EMB 8th Forum Ocean Decade for Europe, 1 December 2021, online forum



Portal:
EMODnet Bathymetry
emodnet-bathymetry.eu

BATHYMETRY

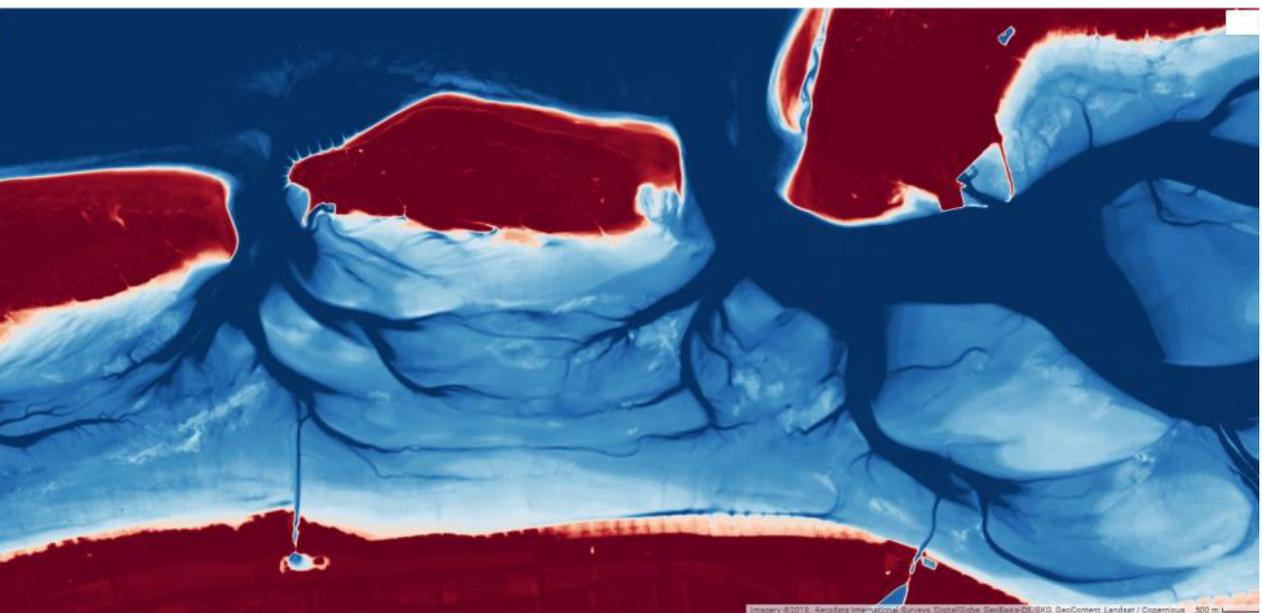
Bathymetry describes the topography of the seabed, by measuring the distance from the sea surface to the seafloor. It provides essential information to understand the dynamics of the marine environment: the shape of the seabed can influence ocean circulation and currents, local fauna and seafloor habitats. It is also very important for hydraulic models calculating tides and waves and other derived parameters.

The EMODnet Bathymetry thematic provides access to data and data products on bathymetry (water depth), such as the EMODnet Digital Terrain Model (DTM) for all European seas, depth contours, survey tracks, best-estimate satellite derived coastlines, national baselines, and various options to view, query, and download.

2021 Key Facts

In early 2021, the latest EMODnet DTM 2020 was released. This was prepared using a common methodology by an experienced team of bathymetry experts as a composite of more than 16,000 data sets, selected from the EMODnet Bathymetry catalogues and processed to common standards and grid. This EMODnet DTM has a grid resolution of 1/16 arc minutes * 1/16 arc minutes and can be viewed with several layers in the Bathymetry Viewer and Download service. Work is currently well underway for generating a further refined EMODnet DTM product, which is planned for release by the end 2022. This will include a selection of the latest data sets and efforts are undertaken for improving anomalies and artefacts identified in the current DTM version. As part of this effort, data providers in 2021 brought together another 900 bathymetric data sets, bringing the total collections of EMODnet Bathymetry to 31,432 survey data sets and 258 composite Digital Terrain Models (DTMs). These are available in the EMODnet Bathymetry catalogue services, based upon SeaDataNet.

The EMODnet DTM will be expanded with the Caribbean Sea region for which new data sets have been gathered, including generation of Satellite Derived Bathymetry data sets for coastal waters of several Caribbean islands.



Using Normalized Difference Water Index (NDWI) on satellite images to distinct land from water in the Wadden Sea as part of determining best-estimate digital coastlines for European coasts. ©EMODnet Bathymetry

EMODnet Bathymetry also continued publication of the highly successful EMODnet World Base Layer Service (EBWBL), available as OGC WMTS service. It provides a fast and easy access to worldwide bathymetric and topographic information as a composite of EMODnet DTM, General Bathymetric Chart of the Oceans (GEBCO) 2019, and a satellite derived DTM for land cover with a common grid and colour palette, while the coastline is based upon OpenStreetMap.

Good progress was made with configuring a cloud-based prototype Collaborative Virtual Environment (CVE) with online Globe software. This CVE will be instrumental to Regional Coordinators to visualise the full regional DTMs and to investigate and annotate residual artefacts, with the aim of improving the quality. Moreover, the CVE will facilitate collaborative work between multiple Regional Coordinators, this way enabling better tuning between their DTMs in the transition zones.

The EMODnet Bathymetry portal with its products and services continues to be very popular among researchers, governments, industry, university and public users. In 2021 more than 50,000 DTM tiles were downloaded by more than 6,000 unique users as part of circa 16,000 transactions. Also, the OGC web services (machine-to-machine) are very popular with more than 36 million OGC service requests in 2021. The variety of uses can also be derived from EMODnet Bathymetry references in research papers, journals and books, with more than 180 references in 2021 using Google Scholar.

A major new challenge in 2021 was the preparation for the future migration (in 2022) of the various products and services of EMODnet Bathymetry from its existing own portal to the new EMODnet Central Portal, that will function as one-stop-shop for all EMODnet publications. While, EMODnet Bathymetry will remain responsible for generating its various products and for hosting machine-to-machine services which can be used by the Central Portal for its publishing services.

Key data providers and users in 2021

The key data providers of EMODnet Bathymetry continue to include national hydrographic services, marine research institutes, governmental departments, and companies, bringing the total number of data providers at 68 organisations. Key users of EMODnet Bathymetry are academia and research – including NOAA and the international community, governmental departments, Non-Governmental Organisations (NGOs), and a wide range of marine and offshore companies as bathymetry is a key input and base layer for many operations and projects at sea and along the coasts.

BATHYMETRY 2021 EVENTS

EMODnet Bathymetry was presented at several events, including:

- » Mapping the Gaps conference with IHO, GEBCO, and Seabed 2030, 16 January 2021, online conference
- » International Conference on Marine Data and Information Systems (IMDIS), 12-14 April 2021, online conference
- » North Sea Hydrographic Commission, 27 April 2021, online meeting
- » EMODnet Open Conference and Jamboree, 14-18 June 2021, online conference
- » IHO Baltic Sea Hydrographic Commission meeting, 2 September 2021, online meeting
- » IHO Crowd Source Bathymetry, 14-16 September 2021, online conference
- » Marine Strategic Data Infrastructure – Meso-American and Caribbean Working Group meeting, 22 September 2021, online meeting
- » GEBCO – Seabed 2030 Map the Gaps Symposium, 30 November – 3 December 2021, online conference
- » IHO Europe Network Working Group, 8-9 December 2021, online meeting





Portal:
EMODnet Biology
emodnet-biology.eu

BIOLOGY

Europe's seas and oceans are home to a staggering abundance and diversity of life. More than 36,000 known species of marine plants and animals are found in Europe, and understanding their geographical distribution, abundance and seasonal, annual or decadal variation is key to detecting change in the marine ecosystem.

The EMODnet Biology Portal provides access to data and data products on species temporal and spatial occurrences, biotic measurements, and abiotic parameters.

2021 Key Facts

2021 was a year of change for EMODnet Biology, with the end of the renewal period for Phase III and the start of Phase IV. It was also the year where work started towards making all EMODnet Biology's data, services, tools and information centralised in the EMODnet portal.

The Phase IV consortium consists of 22 partners, two of which joined as full partners following previous collaborations through data grants, UkrSCES (Ukraine) and IH Cantabria (Spain). The partnership now includes all European OBIS (Ocean Biodiversity Information System) nodes (EurOBIS, MedOBIS, OBIS UK and OBIS Black Sea) as well as two international organisations and European government and research organisations and one SME (small and medium sized enterprise).

COVID-19 continued to heavily impact our work throughout the year, with some delays felt throughout the network, as well as remote participation in various events and meetings. Despite the constraints, all deliverables were met and the data flow and publication did not stop. The year ended with 26.6 million occurrence records

from 1,181 datasets and 37 data products openly and freely available online.

The consortium partners' actively participated in various events, showcasing EMODnet Biology's strength and the connections through its wider network. Two highlights are worth a mention, the workshop held in March 'Data Solutions for a Changing Environment', and an interview given within the context of the micro-credential course based on MOOC (Innovative methods for assessment of marine ecosystems distribution) ran by University of Cantabria, University of Bologna, University of Coimbra and the Spanish Co Telefonica Educacion Digital, which will be available in 2022.

Search for Data Products

Bacillariophyceae

Phytoplankton community analysis in the Northern Adriatic

Source: EMODnet Biology, OGS & Deltares

Visualize

1950-1965 - Autumn

Gridded abundance maps of most common Atlantic Copepod species

Source: EMODnet Biology, VLIZ, UG And MBA

Visualize

1990 - 1999

2000 - 2013

Trends in abundance of fish species in the North Sea

Source: EMODnet Biology, ICES

Visualize

Distribution of macrobenthos living modes in European seas

Source: EMODnet Biology

Visualize

Long term zooplankton time series analysis from the West Med Sea

Source: CNRS, Deltares

Visualize

Invasive marine species occurring in European marine harbours

Source: EMODnet Biology

Visualize

The collaboration with Seabed Habitats in the establishment of guidance to support the inclusion of habitat data in EMODnet Biology has proven extremely successful and, upon the implementation of such guidance, we have supported other data providers with their habitats' data submission, thus continuing to increase the availability of these type of data.

Several consortium partners collaborated in the Elsevier published Ocean Science Data book, more specifically towards chapter 2 "Data services in ocean science with a focus on the biology" which was led by two EMODnet Biology Work Package leaders.

Key data providers and users in 2021

Our partners maintained the data flow that feeds EMODnet Biology and the creation of its products. The partners focused not only on recent data but also those from historical documents through e.g. processes of data archaeology and data rescue efforts. It is also worth mentioning the effort undertaken by the data grant holders (many of them Non-Governmental Organisations) in publishing their data, by applying standardisation, using vocabularies to improve its interoperability and following the overall FAIR guidance. The process allowed for data collected through citizen science efforts, as well as scientific surveys to be found and reused by a wider community. Additionally to the above, we have continued to receive data on an ad-hoc basis and worked with the providers to incorporate them in our holdings. Upon publication, data from one such provider (<https://www.emodnet-biology.eu/data-catalog?module=dataset&david=6556>) have been incorporated in the 'Background document on kelp forest habitats' published by OSPAR, showcasing the added value that these data have when made available.

We have continued our work with data and products submitted via EMODnet Ingestion and ended the year hosting two Marine Institute (Ireland) products as well as the publication of several datasets.



BIOLOGY

BIOLOGY 2021 EVENTS

EMODnet Biology was presented at several events, including:

- » EMODnet and Nature Directives meeting, 19 February 2021, online meeting
- » Data Solutions for a Changing Environment workshop, 24 March 2021, online workshop
- » VLIZ Marine Science Day, 24 March 2021, online conference
- » IMDIS, 12-14 April 2021, online conference
- » EMODnet Steering Committee and Technical Working Group meetings, 19-21 April 2021, online meeting
- » EuropaBON stakeholder workshop, 26-28 May 2021, online workshop
- » EMODnet Open Conference and Jamboree, 14-16 June 2021, online conference
- » UNEP/MAP on the 2023 Mediterranean Quality Status Report, 2 September 2021, online meeting
- » Hack4Oceans event, 20-21 October 2021, Brussels (Belgium)
- » Macroalgal workshop, 23 November 2021, online workshop
- » iNaturalist Steering Group, 7 December 2021, online meeting
- » 'Future of our Seas' marine stakeholder conference, 17 December 2021, online conference





Portal:
EMODnet Chemistry
emodnet-chemistry.eu

CHEMISTRY

A good understanding of seawater chemistry and its natural variability in a given region is fundamental in detecting short, medium and long-term changes in the environmental ecosystem, due to human pressures.

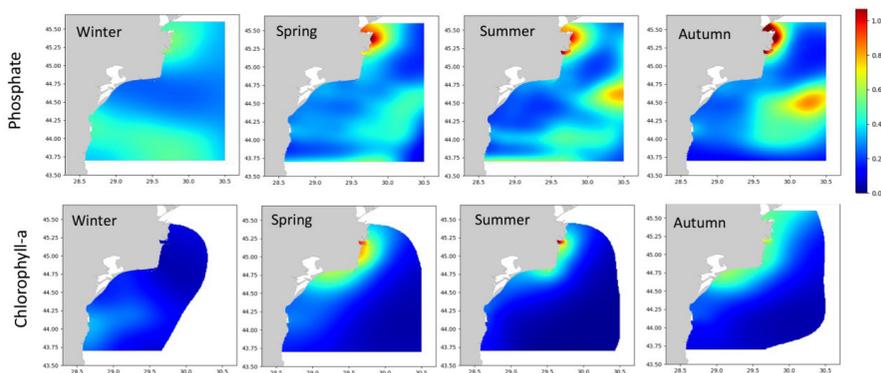
The EMODnet Chemistry thematic provides access to data and data products on concentrations of chemicals related to eutrophication and ocean acidification in water, contaminants in water, sediment and biota, and marine litter along the coastline, near the sea surface and on the seafloor. Data deriving from over 500 data originators are collected, harmonised and validated by a network of 66 data centres. The web portal enables users to visualise the spatial distribution and temporal variation of dissolved oxygen, nutrients, from agricultural fertilisers, and contaminants from land-based industry, shipping or dredging activities. Furthermore, specific maps show the abundance, composition and distribution of micro and macro litter deposits coming from land and sea-based sources.

2021 Key Facts

In 2021 EMODnet Chemistry expanded the quantity and quality of data, metadata and products according to user needs. Circa 130,000 more datasets were added to the Data Discovery and Access Service, now including 1,130,000 CDI entries, and new types of data were managed. Standardised, harmonised, and validated data collections for eutrophication, contaminants and marine litter of all European seas were made freely available online. In this matter, it is worth to highlight that the webODV tool was improved to also enable the exploration and extraction of data subsets from the contaminants collections. Regarding eutrophication, monthly climatologies for all European seas, the evolution of seasonal climatologies as 6-year running averages by sea region and seasonal climatologies for specific coastal areas were released. Lastly, updated and new maps for marine litter along the coastline and on the seabed were produced: the new visualisations for beach litter display the total abundance of marine macro-litter per beach per year from Marine Strategy Framework Directive (MSFD) monitoring surveys, and from non-MSFD monitoring surveys, research & cleaning operations.

In this way, EMODnet Chemistry confirmed its role as the platform for European marine pollution *in situ* observations. This is evidenced by the integration of the web Portal in some of the most relevant European infrastructures for Open Science. EMODnet Chemistry data products, for example, were indexed and made available via the Blue-Cloud Data Discovery and Access service, the marine thematic platform of the European Open Science Cloud (EOSC). The EMODnet Chemistry contribution to Open Science is described in the following scientific papers, published in 2021, which explain the advantages deriving from the application of FAIR principles when dealing with data stewardship: Data sharing, public engagement

and innovation: the Open Science pillars to support knowledge-based marine strategies (Environmental Sciences and Ecology: Current Research); Data quality and FAIR principles applied to marine litter data in Europe (Marine Pollution Bulletin). Another clear recognition of the consolidated leading position of the Initiative is the ever growing demand for new collaborations. It is to be mentioned here that EC Joint Research Centre confirmed to use EMODnet Chemistry as the web platform to manage marine litter



data so that the Consortium was assigned to gather data from all EU Member States to monitor floating micro-litter, as done before with data of seafloor and coastal macro litter. These latter data served for computing, and recently revising, EU beach litter quantitative baselines and threshold value and to draw up the Joint List of Litter Categories for Marine Macrolitter Monitoring. The Joint List has been elaborated capitalising on the experience obtained by the use of the pre-existing Master List in the context of the first pan-European beach litter database, developed and maintained by EMODnet Chemistry. Finally, it is to stress the cooperation with Copernicus Marine Environment Monitoring Service (CMEMS). As a result, the first joint portfolio of products for the Marine Strategy Framework Directive was released and the data collections have been contributing to the CMEMS REProcessed BioGeoChemistry (REP-BGC) data product.

Key data providers and users in 2021

EMODnet Chemistry data were used by marine scientists as evidenced by the articles: A Global Ocean Oxygen Database and Atlas for Assessing and Predicting Deoxygenation and Ocean Health in the Open and Coastal Ocean. (Frontiers in Marine Science), and Numerical modelling of marine litter distribution in Georgian coastal waters of the Black Sea. (JEPE, in press). Among providers, it needs to cite the above-mentioned EU Member States, and all countries engaged in implementing the Convention on the Protection of the Marine Environment of the Baltic Sea Area (the Helsinki Convention). The latter were asked to submit 2016-2021 data stemming from national coastline litter monitoring to EMODnet Chemistry.

At EU level, the strengthened cooperation with the MSFD group of experts on contaminants is of great relevance. On a global scale, UNEP/MAP involved EMODnet Chemistry in the Ecosystem Approach Roadmap considering its potential support to the 2023 UNEP/MAP Mediterranean Quality Status Report delivery. Other collaborations concerned: i) the implementation of the Global Ocean Oxygen Database and Atlas, ii) the development of the Global Ocean Acidification Data Portal, iii) the G20 global harmonisation and standardisation of monitoring and data management methods on marine plastics, and iv) the integration in the UN Global Partnership on Marine Litter Digital Platform.

CHEMISTRY 2021 EVENTS

EMODnet Chemistry was presented at several events, including:

- » OSPAR microplastic expert group meeting, 14 January 2021, online meeting
- » Copernicus Marine General Assembly, 26-28 January 2021, online meeting
- » G20 International Expert Meeting on Marine Plastic Litter Monitoring Data Sharing Project, 24 February 2021, online meeting
- » Marine Data to support Aquaculture in the Mediterranean and Black Sea, 24-25 March, online workshop
- » EMODnet Chemistry MSFD board of experts meeting on new marine litter products, 30 March 2021, online meeting
- » International Conference on Marine Data and Information Systems (IMDIS), 12-14 April 2021, online conference
- » European Geosciences Union: General Assembly, 30 April 2021, online meeting
- » European Technical Commission CEN/TC 444 workshop on microplastics, 20 May 2021, online workshop
- » Meeting with MSFD experts on new DIVA maps concerning eutrophication, 27 May 2021, online meeting
- » EMODnet Chemistry webinar on micro-litter data management, 27 May 2021, online webinar
- » Meeting with the MSFD experts on new contaminant maps, 1 June 2021, online meeting
- » Experts meeting to revise the chemical groupings, 25 June 2021, online meeting
- » Launch event of the Sulitest SDG 14 module in partnership with the UN Department of Economic and Social Affairs (DESA) and Mercator Ocean International, 9 July 2021, online event
- » Black Sea Basin Programme meeting (project BSB552 RedMarLitter), 20-22 July 2021, online meeting
- » Consultation on the 2023 UNEP/MAP MED Quality Status Report, 2 September 2021, online meeting
- » SDG 14.3.1 Data Portal and federated data system workshop, 7 September 2021, online workshop
- » GOOS, OECD and MEDIN webinar "Value chains in public marine data, a UK Study", 7 September 2021, online webinar
- » BlueMed workshop "Healthy Mediterranean Sea - Unlocking the potential of Ports and Harbours in preventing and reducing the effects of Marine LitterBlueMed workshop", 14 September 2021, online workshop
- » 5th Community Workshop of the IOC-UNESCO Ocean Best Practices System "Global Partnership on Marine Litter: New platform release & interoperability with the OBPS", 23 September 2021, online workshop
- » Meeting JRC - EMODnet on Contaminants data, 1 October 2021, online meeting





Portal:
EMODnet Geology
emodnet-geology.eu

GEOLOGY

The geology of Europe's seafloor is diverse, ranging from hard rock outcrops to glacial sediment layers that may reach hundreds of metres in thickness. The geological picture is further complicated by structural faults, episodic events such as earthquakes, submarine landslides and volcanic activity. Geological data is essential to support maritime spatial planning, coastline prediction, geohazard assessment, offshore installation design and environmental conservation.

A variety of marine landscapes, submarine processes and relics of ancient environments evident throughout our oceans have resulted in different types of mineral accumulations on and beneath Europe's seafloor from coastal areas to deep abyssal plains. The importance of submarine mineralisation systems is related to the abundance and exploitation-potential of many strategic aggregates, energy, metals and Critical Raw Materials (CRM), necessary for the modern society development.

The EMODnet Geology thematic provides access to data and data products on seabed substrate, seafloor geology, coastal behaviour, sediment accumulation rates, geological events and probabilities, and mineral occurrences, as well as submerged landscapes.

2021 Key Facts

The EMODnet Geology released a new update of the seabed substrates. The coverage of the data products has expanded to new sea areas and the broad scale data product (1: 1,000,000/5,000,000) now includes the Caspian Sea. In addition, the update adds new scales into the multiscale data product with the current data including scales from as detailed as 1:1,500.

EMODnet Geology also provided a substantial update of the geomorphology of the seafloor, amended by an additional layer of general physiographic features. The layer presenting the Quaternary seafloor Geology was made more user-friendly by a subdivision into four layers from larger to smaller scales.

Significant progress was made in the Prototype Area Southern Baltic Sea to investigate and test methods to create a geomorphological map. The methods encompassed three approaches, depending on data availability:

combining data from EMODnet Bathymetry and seabed Substrate data from EMODnet Geology using national bathymetric data combined with regional geological map data, and by deploying the software tool Benthic Terrain Modeler

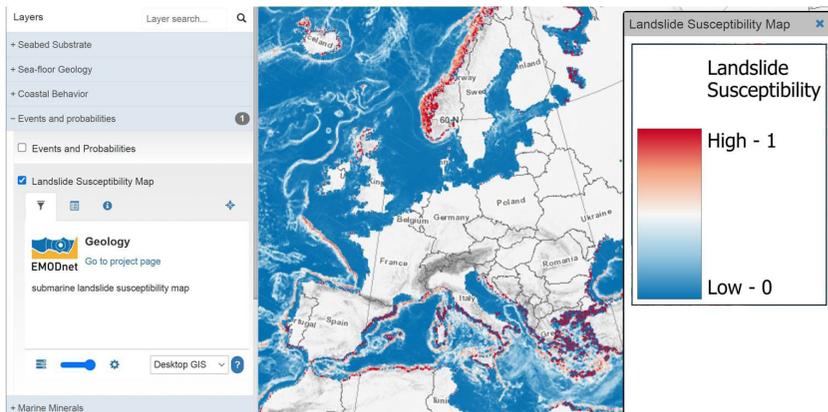
To facilitate harmonisation across political boundaries, common standard vocabularies and testbeds were defined. In this context a study for geomorphology and Quaternary data harmonisation was carried out for the region of the Southern North Sea (EMODnet Geology partners from: Belgium, The Netherlands, UK, France, and Germany).

Aside from coastal behaviour, EMODnet Geology now also hosts and distributes a data product on coastal type, a key parameter

in coastal erosion and accretion. It is helping us in mapping coastal resilience, for which we generated a georeferenced inventory of publicly available coastal-vulnerability index maps.

Geological events and probabilities layers were implemented by updates and data at higher resolution. Moreover, the map of landslides susceptibility, obtained by applying the MaxEnt model to data gathered by EMODnet Geology as well as EMODnet Bathymetry, was elaborated and published on the Portal.

EMODnet Geology collated 12 marine



mineral types on and/or beneath the European seafloor including aggregates, hydrocarbons, gas hydrates, marine placer deposits, phosphorite deposits, evaporite deposits, polymetallic sulphides, polymetallic nodules, cobalt rich ferromanganese crust, metal rich sediment, rock, pegmatite and vein hosted mineralisation and Sapropel.

During 2021 EMODnet Geology received several new submissions for the Submerged Landscapes work package. Of particular interest are submissions received from the Caspian Sea. These new submissions take the total database to over 20,000 submerged landscapes features. This underpins the goal to develop the key deliverable for this work package during this project phase: to create palaeogeographic reconstructions for the following time-frames: 20,000 years BP (before present), 9000 years BP and 6000 years BP. Finally, we have been strengthening our links with the NEw Procedures and Technologies for UNDERwater paleo-landscapE reconstruction (NEPTUNE) project and other key external stakeholders and partners through planned conference and external meeting participation.

Key data providers and users in 2021

Main data providers for EMODnet Geology are the marine geology departments of the national geological surveys of European maritime countries, participating in the project as project partners. Additional data are collected nationally by the project partners and added to our different data products.

Our North Sea and Baltic Sea data products are being taken up by end users from the spatial planning and underwater noise communities, ending up in story maps and models. The growing user community provides feedback that will help EMODnet Geology plan future deliverables such as sediment grain size.

Marine Aggregates maps featured by EMODnet Geology highlight the established sector of Marine non-living resources (in relation to “other minerals”), a sub-sector which is expected to be on the rise. This rise is associated with the demand for resources such as sand and gravel, used for construction purposes and for producing concrete. Likewise, as coastal communities attempt to adapt to new pressures posed by climate change, dredging, beach nourishment and sand reclamation intensify, emphasising the need of proper seafloor substrate knowledge.

GEOLOGY 2021 EVENTS

EMODnet Geology was presented at several events, including:

- » EuroGeoSurveys (EGS) Marine Geology Expert Group Annual Meeting, 27 January 2021, online meeting
- » Seabed substrate product meeting of EMODnet Geology and Seabed Habitats lots; 2 February 2021, online meeting
- » Meeting of institutions contributing to Italian WP6 deliveries (CNR-ISMAR, OGS, Universities of Genova, Palermo and RomaTRE), 18 February 2021, online meeting
- » Bi-annual Conference of Italian Marine Geologists, 25-26 February 2021, online conference
- » EMODnet Geology meeting with CMEMS and Eurogeosurveys Earth Obs Expert Group, 10 March 2021, online meeting
- » EMODnet Geology project meeting, 12 March 2021, online meeting
- » “Aquatic Sedimentary Environments” lectures at Helsinki University (Finland), 17 March 2021, online lectures
- » 2nd Meeting of institutions contributing to Italian WP6 deliveries (CNR-ISMAR, OGS, Universities of Genova, Palermo and RomaTRE), 19 March 2021, online meeting
- » vEGU (The European Geosciences Union) 2021 virtual meeting, 28 April 2021, online meeting
- » GeoHab 2021 – Europe and Africa node, 5 May 2021, online conference
- » 3rd Meeting of institutions contributing to Italian WP6 deliveries (CNR-ISMAR, OGS, Universities of Genova, Palermo and RomaTRE), 18 May 2021, online meeting
- » EMODnet Open Conference and Jamboree, 14-18 June 2021, online conference
- » EMODnet Geology project Meeting, 17 June 2021, online meeting
- » Cross-thematic meeting of EMODnet Geology, Bathymetry and Seabed Habitats lots, 18 June 2021, online meeting
- » 90th Congress of the Geological Society of Italy, 13-17 September 2021, Trieste (Italy) and online congress
- » External workshop organised in cooperation with the Italian Geological Society, 13 September 2021, online workshop
- » EMODnet Geology Phase IV Kick-off meeting, 11-12 October 2021, online meeting
- » European Marine Sand and Aggregate Group (EMSAGG) webinar, 18 November 2021, online webinar
- » 30th International Cartographic Conference, 14-18 December 2021, Florence (Italy) and online conference





Portal:
EMODnet Human Activities
emodnet-human-activities.eu

HUMAN ACTIVITIES

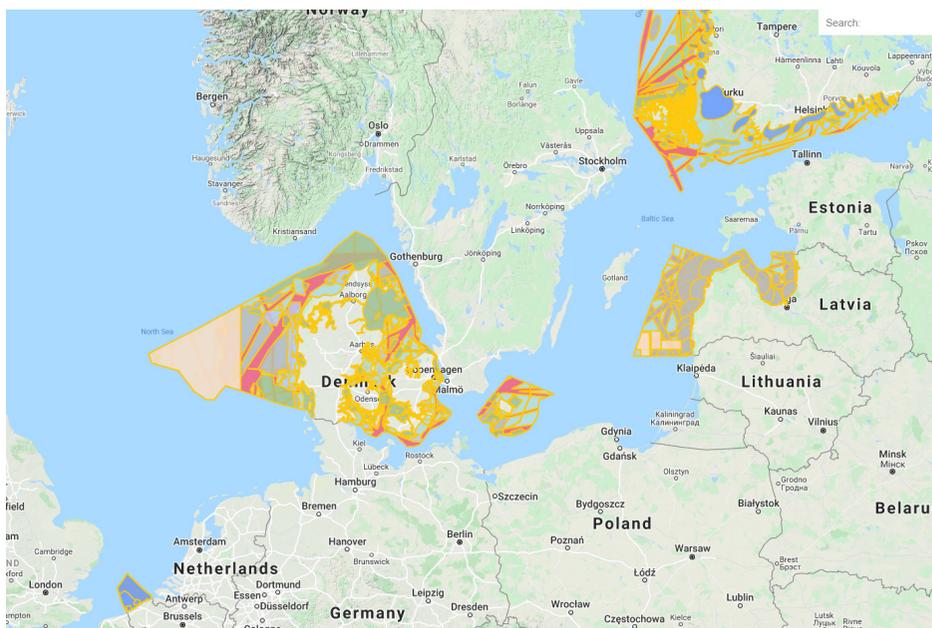
Pressure on Europe's marine space and resources is high. Continual demand for resources such as oil and gas, marine minerals and fish must be managed alongside the need to use marine space for renewable energy installations, communications cables, waste disposal sites and shipping. Additionally, societal demand for marine tourism and leisure activities, and the need to conserve marine ecosystems and habitats is leading to increased competition and conflict between different marine sectors.

The EMODnet Human Activities thematic provides access to data and data products on the intensity and spatial extent of human activities at sea.

2021 Key Facts

In 2021 EMODnet Human Activities focused on consolidating the database built over the past few years, by providing regular updates, expanding the number of data sources, and adding new data sets. An entirely new data set on desalination plants was developed and will be made available online in February 2022. The cables data set received a major update, with many new cables – now also including power cables – acquired through the addition of new sources.

2021 was also a special year for Maritime Spatial Planning (MSP). 31 March 2021 was the deadline for Member States to develop their national MSP plans and share them with the European Commission. EMODnet Human Activities supported – and continues supporting – this effort, by collaborating with a Technical Expert Group (TEG) on MSP established by the European Commission. In the framework of this TEG, the EMODnet Human Activities team developed an INSPIRE-compliant MSP data model. As the first plans were adopted by Member States, EMODnet Human Activities acquired them and made them available online, thus providing a consistent view of planned ocean uses in the EU. Further, the EMODnet Human Activities team is providing technical support to those Member States that are still in the process of devising their plans.



A snapshot of having harmonised and consistent maritime spatial plans. ©EMODnet Human Activities

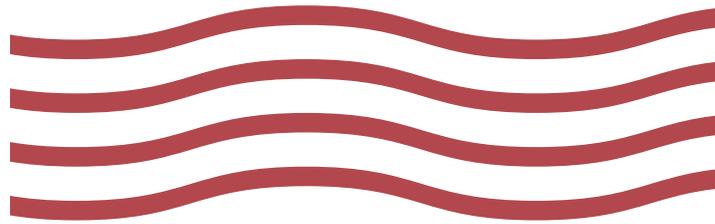
Vessel density maps remain the most used data products on EMODnet Human Activities, with an ever-increasing number of downloads, and several scientific papers using these data to carry out research in the maritime domain.

Last but not least, the EMODnet Human Activities team worked on a proof of concept to develop fully INSPIRE-compliant data models for its data sets. These data models will be adopted over the coming year 2022

Key data providers and users in 2021

EMODnet Human Activities caters to a wide and diversified range of users. Most of them are researchers, but around 35% of users are from industry. Most industry users are wind and ocean energy developers and companies that lay pipelines and cables. They use EMODnet Human Activities data mostly when scoping opportunities for installing new infrastructure and in the pre-planning phase of their projects. The data are especially useful to facilitate siting and identify obstacles or activities potentially interfering with their projects. A good number of users are undergraduates and PhD students, who use EMODnet Human Activities in their research projects. A new generation of EMODnet-aware students is born: they will be tomorrow's EMODnet-aware professionals.

EMODnet Human Activities would not exist without its data providers. Their number keeps increasing and now includes governments, public bodies, international organisations such as the FAO and ICES, and commercial providers.



HUMAN ACTIVITIES

HUMAN ACTIVITIES 2021 EVENTS

EMODnet Human Activities was presented at several events, including:

- » Workshop on Marine Data for Aquaculture, 24-25 April 2021, online workshop
- » European Maritime Day workshop on Ocean Observation and Marine Data for the Blue Economy, 20 May 2021, Den Helder (Netherlands) and online workshop
- » Technical Expert Group on Maritime Spatial Planning, several online events throughout the year



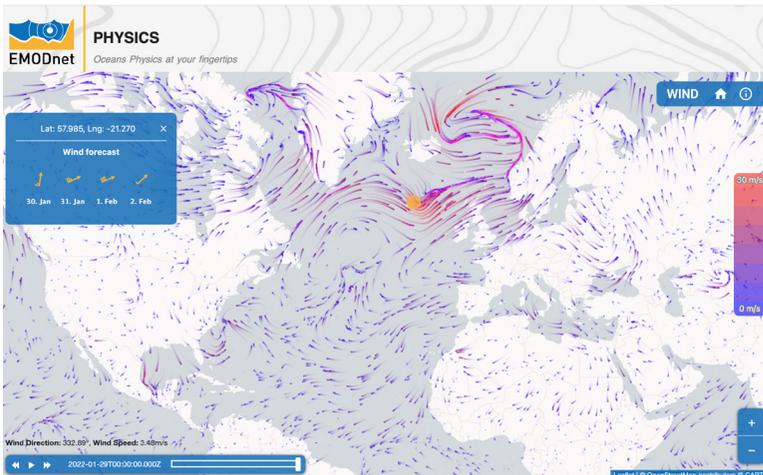


Portal:
EMODnet Physics
emodnet-physics.eu

2021 Key Facts

During 2021, the EMODnet Physics data system was largely updated and re-designed to provide an even better user experience. The system provides different entry-points to search for data and products: the [Map Viewer](#) that provides access to more than 900,000 platforms and millions of datasets; [thematic product pages](#), each page is an advanced dashboard to explore a product in time, space, depth and retrieve validated datasets; [ERDDAP](#) offering an easy to use data catalogue and machine-to-machine service that provides access to more than 600 European and global data collections; [GeoServer](#) that offers shape files, vectorial data and consolidated maps; the catalogue.emodnet-physics.eu, a geonetwork based tool to list the EMODnet Physics data collections and data products.

As previous years, the EMODnet Physics team have been very active in promotion and dissemination activities. Organising and attending events has always been an integral part of EMODnet Physics and provides an important source for collecting feedback, manage user requirements, identifying needs, new developments and activities to be planned. The organisation of thematic events and workshops for further engaging, problem-solving and idea-gathering (and follow-up actions) are key activities for the development of the EMODnet Physics network and goals.



Wind at sea level (products.emodnet-physics.eu/EP_MAP_WIND_001). ©EMODnet Physics

PHYSICS

Prompt and continuous access to physical properties of the ocean such as ocean circulation, distribution of and transport of heat, salt and other water properties, etc. is crucial to deliver ocean forecasts and early warnings, climate projections and assessments and protect ocean health and its benefits.

EMODnet Physics provides access to collections of ocean physical data and data products covering: temperature of the water column, salinity of the water column, horizontal velocity of the water column, changes in sea level and sea level trends, wave height and period, wind speed and atmospheric pressure, water clarity (light attenuation), underwater sound (noise), inflow from rivers, and sea ice coverage. Provided *in situ* data products include collections of *in situ* data, reanalysis and trends from data, elaboration in space and/or time of *in situ* data and model output for a given parameter.

In 2021, the EMODnet Jamboree was an excellent opportunity to collect feedback and new ideas. The good and proactive collaboration and interaction with CMEMS was highlighted together with the importance of EMODnet Physics as a first data entry point and its key role in unlocking new data types and observing platforms, reaching out to - and collaborating with - other data networks and the increasing involvement and emerging role in citizen science. The Jamboree session "EMODnet dialogue: Citizen Science" indicated that EMODnet (in particular EMODnet Physics, Chemistry and EMODnet Ingestion have a very high potential and already deal with the topic) could develop targeted actions to incorporate

and connect citizen science projects to improve the data resolution in time and space mainly in the coastal zone where citizens are most active. Emerging marine citizen science technologies have the potential to engage broad audiences, motivate volunteers, improve data collection, control data quality, corroborate model results and contribute to better and faster decision making.

Last but not least, in 2021, the publication of the “Ocean Science Data Collection, Management, Networking and Services” Elsevier book (<https://doi.org/10.1016/B978-0-12-823427-3.01001-X>), which was organised and edited under the EMODnet Physics coordination, represented an important milestone to present and report on the involvement and contribution of several EMODnet partners.

Key data providers and users in 2021

EMODnet Physics users are mainly from Research and Academia sector (59% since ever, 55% in 2021), nevertheless the number of users from Private Sector keeps increasing (19% since ever, 23% in 2021). Users from Government and Public Administration, NGO and others are quite stable over time and represent 11%, 4% and 7% respectively. Data are mainly used for implementing Marine and Coastal applications (48%) and Climate and weather forecasting (27%). Other uses are Marine resource (16%) and Marine safety (9%). Notably, EMODnet Physics users are not limited to the EU Countries.

EMODnet Physics collaborates and integrates both single data providers (e.g. a University, a research project, etc.) and data aggregators (e.g. National Oceanographic Data Centres, ICES, Copernicus Marine Service INS-TAC, etc.). Among the others, 2021 set a huge increase of the river inflow stations ($\pm +30\%$) delivering near real time data, fast sea level monitoring stations - tsunami warning systems ($\pm +10\%$), validated temperature and salinity data from SOCAT (Surface Ocean CO₂ Atlas) international scientific community initiative and from citizen science initiatives (e.g. Fishing Vessels), impulsive underwater noise data (EMODnet Physics registry is interconnected with the ICES system that hosts both the OSPAR and HELCOM registries and that were largely updated by EU Member States).

PHYSICS 2021 EVENTS

EMODnet Physics was presented at several events, including:

- » EuroGOOS Tide Gauge Task Team Workshop, 12-14 January 2021, online workshop
- » 5th EMODnet-CMEMS coordination meeting, 9 February 2021, online meeting
- » Arctic ROOS General Assembly, 16 February 2021, online meeting
- » AtlantOS Ocean Hour, 9 March 2021, online workshop
- » Hack the Artic, 12-14 March 2021, online hackathon
- » EMODnet – HFR Network, 16 March 2021, online meeting
- » EuroGOOS Ferrybox and High Frequency Radar virtual workshops, 17-18 March 2021, online workshop
- » Workshop Marine data to support aquaculture in the Mediterranean Sea, 24-25 March 2021, online workshop
- » IMDIS Conference, 12-14 April 2021, online conference
- » EuroGOOS International conference, 3-5 May 2021, online conference
- » EMODnet Open Conference and Jamboree, 14-18 June 2021, hybrid (online conference and Ostend (Belgium))
- » SHAREMED WS-REMTECH, 24 September 2021, online workshop
- » Workshop Polar Data Forum, 22-24 September 2021, online workshop
- » BluePlanet Forum, 8 October 2021, online event
- » AtlantOS Ocean Hour – All-Atlantic Ocean Data Space, 12 October 2021, online workshop
- » Glider School, 25 October 2021, online workshop
- » Annual MONGOOS meeting, 26 October 2021, online meeting
- » TG NOISE, 26 October 2021, online meeting
- » EMODnet Ingestion/SBM Offshore, 29 October 2021, online meeting
- » SOOS DMSC, 3 November 2021, online meeting
- » VOTO Data, 11 November 2021, online meeting





Portal:

EMODnet Seabed Habitats
emodnet-seabed-habitats.eu

SEABED HABITATS

EMODnet Seabed Habitats deliverables, datasets, and models can be used to inform effect monitoring of environmental change on the ecosystem and biodiversity in European seas and adjacent regions.

Understanding the occurrence and distribution of different seafloor habitats is important for effective planning, conservation and sustainable development of the marine environment.

EMODnet Seabed Habitats facilitates access to the EUSeaMap product (broad-scale seabed habitat map for Europe) and is the one-stop-shop for accessing seabed habitat data. The largest European collection of habitat maps from individual surveys and survey-based sample points, with detailed metadata, can be accessed here.

2021 Key Facts

In January 2021, a [report](#) was published with the aim of identifying areas where the pan-European broad-scale seabed habitat map for Europe, EUSeaMap, can make progress. The report also argued that other types of spatially explicit complementary products on seabed habitats might be useful to stakeholders.

Throughout the year, the compilation of spatial data and products from around Europe on European seabed habitats has continued to grow. 42 new habitat maps from surveys and nearly 22,000 new point observations of habitats from surveys were made available online and via webservice.

EMODnet Seabed Habitats teamed up with EMODnet Biology to develop guidance on a standard approach to including habitat observations as Event Core measurements when submitting data into the European node of the Ocean Biodiversity Information System (EurOBIS). The work aimed to facilitate interoperability between two benthic habitat data repositories and improve standardisation of species and habitat observations that may be recorded simultaneously.

2021 was also devoted to the construction of new composite data products – these are products that are a composite of data from multiple data sources, brought together to show the best available evidence on the spatial distribution of a particular habitat or set of habitats. The following new products were developed and can be found under 'Composite data products' on the interactive map: [Biogenic substrate in Europe](#) (polygons), [Live hard coral cover in Europe](#) (points), [Seagrass cover in Europe](#) (points), [Macroalgal canopy cover in](#)

[Europe](#) (points) and [Coralligenous and other calcareous bioconcretions in the Mediterranean](#) (points and polygons). Other composite data products, not produced by EMODnet Seabed Habitats, were added and can also be found under 'Composite data products' on the interactive map, including, but not limited to, 8 layers showing the official 2018 reported distributions of Annex I habitats, as reported by Member States under Article 17 of the Habitats Directive 92/43/EEC, and the latest version (2020) of the official OSPAR Threatened and/or Declining Habitats data product.

In September 2021, a [new version of the EMODnet broad-scale seabed habitat map for Europe \(EUSeaMap\)](#)



was released. That version, named EUSeaMap 2021, updates the previous version with the most recent data on seabed substrate, of which the data produced by EMODnet Geology in 2021 are the main source, and is translated into three new classification systems: the new version of the marine section of EUNIS (EUNIS 2019), the Baltic HELCOM Underwater Biotopes (HUB) classification, and the revised classification of Mediterranean habitat types. Some issues identified in the previous version were also fixed.

Phase 4 of the EMODnet Seabed Habitats project commenced in September 2021, and will run for 2 years through to 2023.

Key data providers and users in 2021

In 2021, dozens of data providers from across Europe contributed to growing the compilation of habitat maps and observations from surveys. These included public bodies, academia, NGOs and businesses.

EMODnet Seabed Habitats users are very diverse, ranging from researchers to policy-makers to the private sector. For example, light at the seabed layers produced by EMODnet Seabed Habitats were crucial in predictive mapping of kelp and seagrass beds extent for regional and nationwide blue carbon assessments in Nordic countries ([Frigstad., et al., 2021](#)) and UK ([JNCC, 2021](#)). EMODnet seabed habitat data and data products are aid environmental impact assessments, allowing companies to identify the main habitat types at the seabed intersecting proposed infrastructure such as cable routes and wind farms. Such datasets are essential to assess potential impacts on habitats and plan mitigation strategies to resolve these. Furthermore, EMODnet Seabed Habitats acts as the European node to the UNEP WCMC Global Distribution of Seagrasses data product ([UNEP-WCMC, Short FT, 2021](#)), which is widely used in global assessments.



SEABED HABITATS 2021 EVENTS

EMODnet Seabed Habitats was presented at several events, including:

- » Workshop on integrating an ecosystem-based approach into MSP (Black Sea), 27 January, 2021, online meeting
- » EMODnet Geology and Seabed Habitats joint meeting, 2 February / 18 June, 2021, online meetings
- » ICES Workshop on the Use of Predictive Habitat Models in ICES Advice (WKPHM), 2-5 February, 2021, online meeting
- » EMODnet and Nature Directives (DGMare), 19 February, 2021, online meeting
- » Habitat Mapping for OSPAR BH3 Extent of Physical damage to predominant and special habitats, 24 March, 2021, online meeting
- » EMODnet Biology and Seabed Habitats joint meeting, 18 June, 2021, online meeting
- » SGEM – XXIIth International Multidisciplinary Scientific GeoConference Surveying, Geology and Mining, Ecology and Management, 5 July, 2021, online meeting
- » Mission Atlantic (H2020)/One Ocean Hub - First Draft of Atlantic Scale Marine Habitat Map, 12 July, 2021, online meeting
- » Scientific Conference on Climate Change in the Caspian Sea Region, 28 October 2021, online meeting
- » 4th EuroSeas Workshop: Towards a Coordinated European Observing System for Marine Macroalgae, 03 November 2021, online Meeting.





Portal:
EMODnet Data Ingestion
emodnet-data-ingestion.eu

DATA INGESTION

There is a wealth of marine data collected in Europe by public and private users, such as governmental organisations carrying out environmental monitoring, academic researchers studying the marine environment, private companies planning and building marine infrastructures, such as pipelines and wind farms, and even citizen science initiatives. In recent years, EMODnet has made huge progress in facilitating access to data from many sources. However, numerous data still remain hidden or unusable.

EMODnet's Data Ingestion Portal tackles these problems by reaching out to data holders, explaining the benefits of sharing their data and offering a support service to assist them in releasing their data for subsequent processing and quality control.

2021 Key Facts

The Data Submissions service achieved a steady increase of submissions from 853 to 1107 from the start to the end of 2021. In turn, the number of completed submissions went from 721 to 982 throughout 2021, with submissions being published for discovery and downloading by users via the View Submissions service. Most data sets are published 'as-is', however, the number of elaborated data sets went up from 315 to 442. This means that these datasets have been curated by assigned data centres from the EMODnet Ingestion network to common formats and are made available through EMODnet Thematic Portals and as input for EMODnet data products.

The network of qualified data centres collaborating through EMODnet Data Ingestion now counts 50 data centres from EU countries. These data centres are experts in marine data management for specific EMODnet data themes and are also populating European marine data management infrastructures such as SeaDataNet, EurOBIS, ICES, and others which feed into EMODnet.

The (semi-)automatic coupling as established in 2019 between SEANOE and EMODnet Ingestion again performed well with many deliveries. SEANOE, operated by IFREMER, is a SeaDataNet service, inviting European scientists to publish their scientific papers and associated data collections in return for a

Digital Object Identifier (DOI) which will facilitate their wider citation. The coupling facilitates that (selected) scientific submissions from SEANOE are harvested by EMODnet Ingestion for further metadata completion, publishing 'as-is', and elaboration of datasets for inclusion and publishing in national, European and EMODnet Thematic Portals.

EMODnet Data Ingestion together with EMODnet Physics also reaches out to operators of Near Real Time (NRT) and Real Time (RT) oceanographic monitoring sites, consisting of fixed platforms such as moorings, buoys, tide gauges, High Frequency (HF) radars, and moving

YOUR DATA WORK IT

15+ success stories
140+ data providers
800+ data sets



With the **UN Ocean Decade** in front of us, all eyes are on the data. More data for accurate science, smarter engineering and durable policy making. More data for a resilient ocean.

Take part in our success story.
Join the EMODNET community !

DISCOVER OUR SUCCESS STORIES

WAKE UP YOUR MARINE DATA
EMODnet INGESTION

More than 15 ingestion success stories were described by partners in 2021 to share best practices. Do's and Don'ts. Nine of them are collated in a booklet to serve as inspiration for others and more are gradually published on the Data Ingestion portal and on Twitter (@MarianneBiodiv). ©EMODnet Data Ingestion

platforms, such as surface drifters, ferryboxes, argo floats, and gliders. In 2021, several oceanography operators and platforms were motivated and given guidance for connecting and sharing their data streams within the European oceanography data exchange as managed by Copernicus CMEMS-INSTAC, EuroGOOS, and SeaDataNet, which are pillars under EMODnet Physics. These include more than 400 river stations from operators in Spain, Italy, Scandinavia, UK, and other countries, more than 70 sea level stations, including the JRC Tsunami Alert Device network and EMSO, and a monitoring station for underwater noise. In addition, new opportunities were explored, that will be given a follow-up such as possible cooperation with Arctic networks (e.g. EU ARICE project and IADC Italian Arctic Data Centre), Ocean Race Europe, LAMMA network (Italy), EU NAUTILOS project, and SBM Offshore.

The cooperation with H2020 Eurofleets+ project was continued. This concerns adoption of Sensor Web Enablement (SWE) standards by the European research vessel fleet for the transfer of events, metadata and underway data such as meteo and navigation data from the Vessels to a data hub on shore during scientific cruises for publishing and open access. Involving EMODnet Ingestion experts, the open source SeaDataNet SWE Toolkit has been adapted and implemented at several research vessels, involved in Eurofleets+ scientific cruises as part of their Transnational Access activities.

Key data providers and users in 2021

The data for the 982 published data submissions originated from more than 150 data providers of which circa 59% from academia & research, 16% from companies such as Berring Data Collective, Nord Stream 2 AG, Saildrone, The European Marine Energy Centre (EMEC) Limited, Scientific - Research Firm "GAMMA", just to name a few, 21% from governmental organisations, and 4% from NGOs such as Black Sea NGO Network, Keep the Estonian Sea Tidy Association, Mare Nostrum, and NGO Marine Sound.

DATA INGESTION 2021 EVENTS

EMODnet Data Ingestion was presented at several events, including:

- » EuroGOOS Tide Gauge Task Team Workshop, 12-14 January 2021, online workshop
- » EuroSEA annual meeting, 18-22 January 2021, online meeting
- » Blue Data Conference 2021, 26 January 2021, online conference
- » CMEMS General Assembly, 26-28 January 2021, online meeting
- » E00S Operation Committee meeting, 9-10 February 2021, online meeting
- » Arctic ROOS General Assembly, 16 February 2021, online meeting
- » Italian Marine Geologist Conference, 25 February 2021, online meeting
- » VLIZ Marine Science Day Conference, 3 March 2021, online conference
- » Hack the Arctic, 12-14 March 2021, online conference
- » NL Copernicus Marine conference, 30 March 2021, online conference
- » IMDIS – International Conference on Marine Data and Information Systems, 12-14 April 2021, online conference
- » EuroGOOS International conference, 3-5 May 2021, online conference
- » GEOHAB (Marine Geological and Biological Habitat Mapping) conference, 5 May 2021, online conference
- » European Maritime Day 2021, 20-21 May 2021, online conference
- » EMODnet Jamboree, 14-18 June 2021, online conference
- » 10th Spanish Geological Congress. Conference, 5-7 July 2021, online conference
- » Geospatial Commission Coastal Zone Mapping, 21 July 2021, online meeting
- » GOOS-OECD-MEDIN Webinar, 7 September 2021, online meeting
- » 11th Crowdsourced Bathymetry Working Group, 14-16 September 2021, online workshop
- » Panhellenic Conference, 16-20 September 2021, online conference



EMODnet in practice



©EMODnet Secretariat

Our users' opinion

Users are at the centre of EMODnet's strategy. EMODnet's data and data products across all seven thematic areas are now widely used across sectors including scientists, engineers, managers and policy-makers. The data and web services are crucial to the discovery and access of such data and data products by diverse communities across Europe and beyond, to enable marine and maritime stakeholders to generate the information necessary to improve our knowledge of the seas; support the Blue Economy and its sustainable management and diversification; and to provide citizens, businesses, NGOs and policy makers alike with the information to help meet the ambitious targets of the European Union's Green Deal, and to wider evidence-based decision making and policy assessments at European and global levels.

In this section, we present a number of concrete uses of EMODnet. The full portfolio of use cases can be consulted at <https://emodnet.ec.europa.eu/en/use-cases>.

PORTAL



PHYSICS

USE CASE SECTOR Research

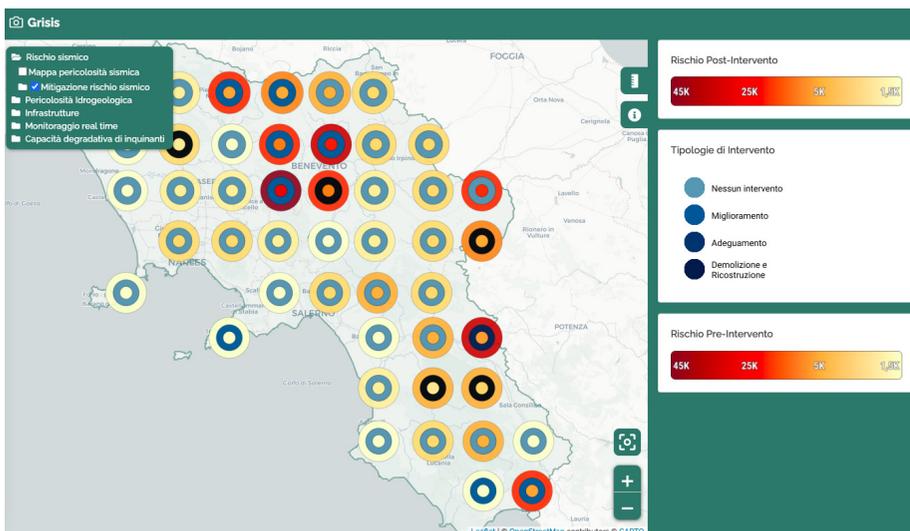
1. EMODnet Physics' integrated wind, wave and sea level data supports Coastal Infrastructure Risks and Safety Management in South Italy [GRISIS research project]

Coastal urban areas and built heritage may be exposed to different types of risk. To assess both natural and human-made risks, the **GRISIS** research project (Risks and Safety Management of Infrastructures at Regional Scale) aims to develop a multi-risk technological **platform** for Campania region, in South Italy. The platform allows to gather and store different types of data concerning the area of interest, thus providing essential information in order to conceive methods and tools for management and mitigation of multiple risks to infrastructures and building networks.

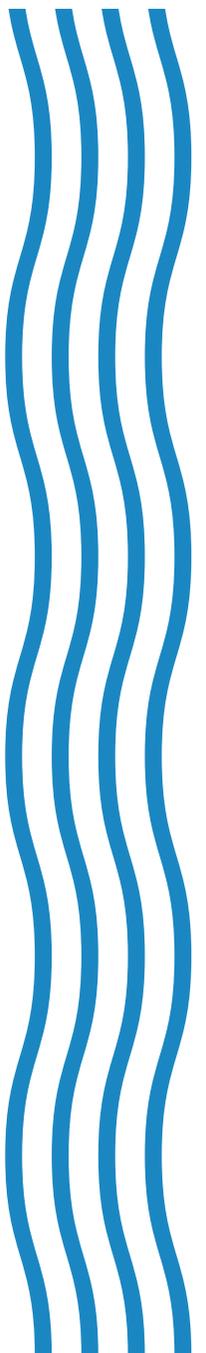
Wind, wave and sea level data are valuable sources under the GRISIS multidisciplinary and holistic analysis of natural risks. EMODnet Physics is making available aggregated and easy to use products that can be easily machine-to-machine integrated into the innovative multi-risk technological platform that GRISIS project is developing.

Both the *in situ* data and aggregated data products in the GRISIS area of interest (Regione Campania) are useful tools for feeding the decisional support system for management and mitigation of multiple risks. This information plays a key role in the risk assessment and the development of infrastructures and building resilience plans.

Read the full use case [here](#).



©EMODnet Chemistry



PORTALS

SEABED
HABITATS

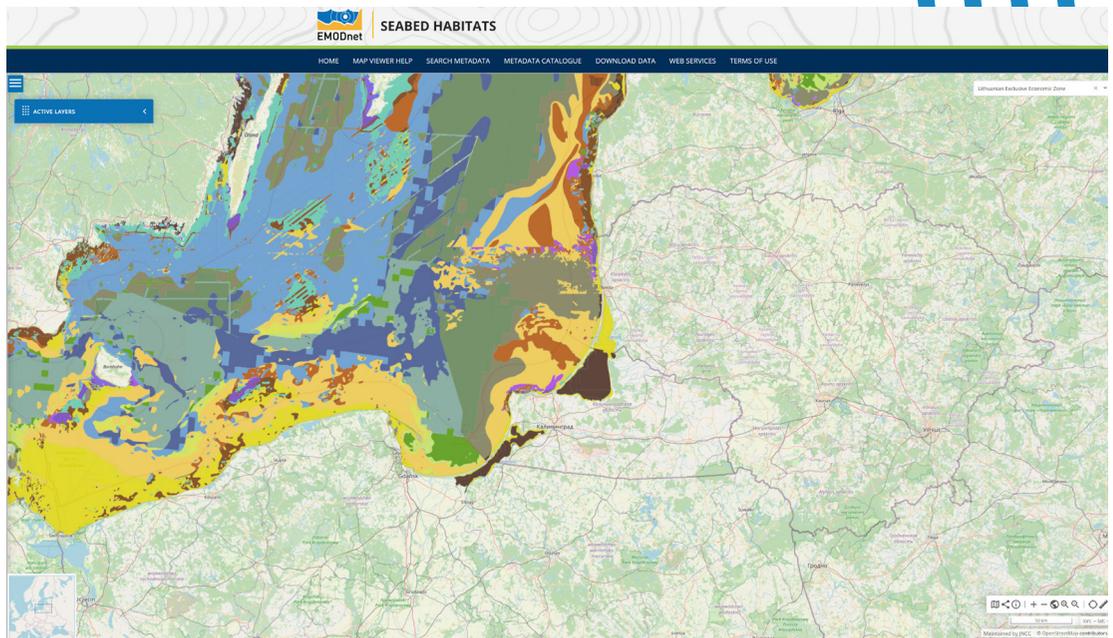
USE CASE SECTOR Research

2. Assessing ecosystem services richness and exposure to anthropogenic threats in Lithuania

Users were able to apply a marine ecosystem services model to the Lithuanian sea to identify areas where anthropogenic impacts most greatly affected valuable fish provisioning areas and cultural coastal regions. Authors stated the information was particularly useful for regional authorities to apply an ecosystem-based management approach to marine spatial planning. The researchers used the EMODnet Seabed Habitats EUSeaMap 2016 product (broad-scale habitat map of the Lithuanian Sea), by deriving an index of nutrient recycling potential from the different substrate types.

Read the full use case [here](#).

Read the peer-reviewed published article [here](#).



PORTALS

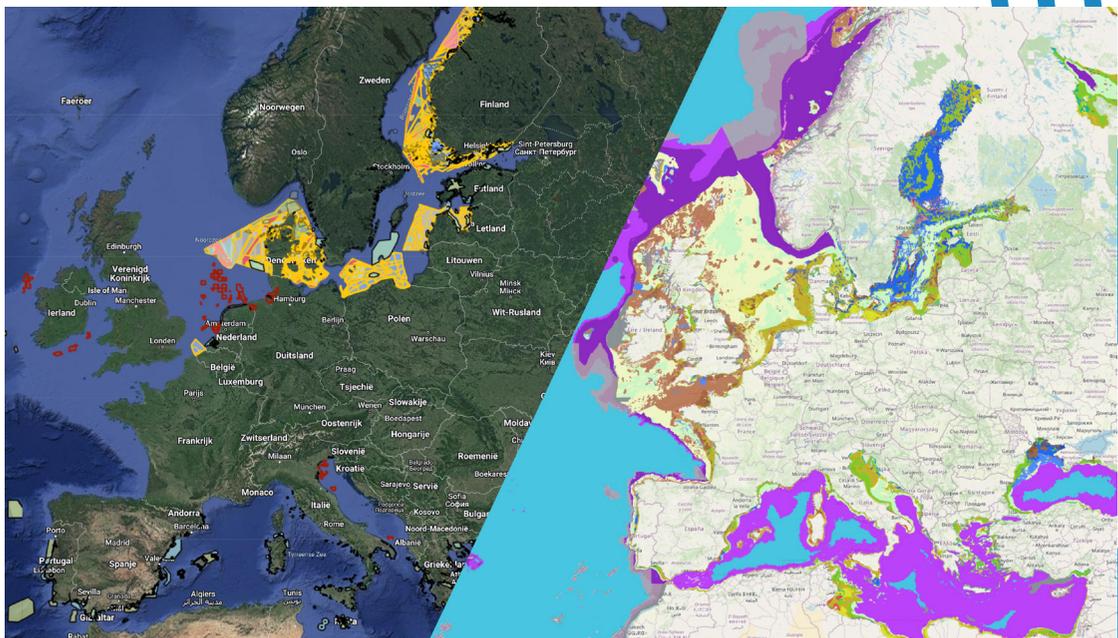
SEABED
HABITATSHUMAN
ACTIVITIES

USE CASE SECTOR Research

3. Spatial overlap between human activities and seabed habitats in European Seas: Insights into EMODnet's data for management purposes

Based on European seabed habitats and human activities datasets publicly available in EMODnet, and adopting the Marine Reporting Units (MRUs) defined by the Marine Strategy Framework and Water Framework Directives, the study analysed the (i) geographical overlap of human activities and seabed habitats, and (ii) the suitability, limitations and gaps of these datasets for management purposes. The information and datasets elaborated in this research were reported useful to support different environmental assessment and management initiatives. However, the completion and improvement of these datasets was highly recommended to fulfil policy requirements.

Read the peer-reviewed published article [here](#).



©EMODnet Human Activities

©EMODnet Seabed Habitats

PORTALS



CHEMISTRY

USE CASE SECTOR Policy

4. EMODnet Chemistry: a point of reference for management of marine litter data in the context of the EU Marine Strategy Framework Directive

For a coherent implementation of the Marine Strategy Framework Directive (MSFD), the Common Implementation Strategy (CIS) was adopted by Member States and the European Commission. The [Technical Group on Marine Litter](#) (TG ML) was set-up under the CIS as the interface between science and policy to support and accompany the [EU MSFD Descriptor 10](#) implementation process and the EU external activities on marine litter. Recently, the TG ML in close collaboration with EU Member States and the Regional Sea Conventions released a manual "[A Joint List of Litter Categories for Marine Macrolitter Monitoring](#)", devoted to the agreed list of categories for macrolitter, that represents a fundamental instrument for avoiding ambiguous identification. EMODnet Chemistry provided valuable contributions to the completion of this list that includes the litter types occurring in the coastal and marine environment. The list can be used to enable comparable monitoring across the European Seas and beyond, as well as across different compartments of the marine environment.

Read the full use case [here](#).



PORTALS



BATHYMETRY

USE CASE SECTOR

Research

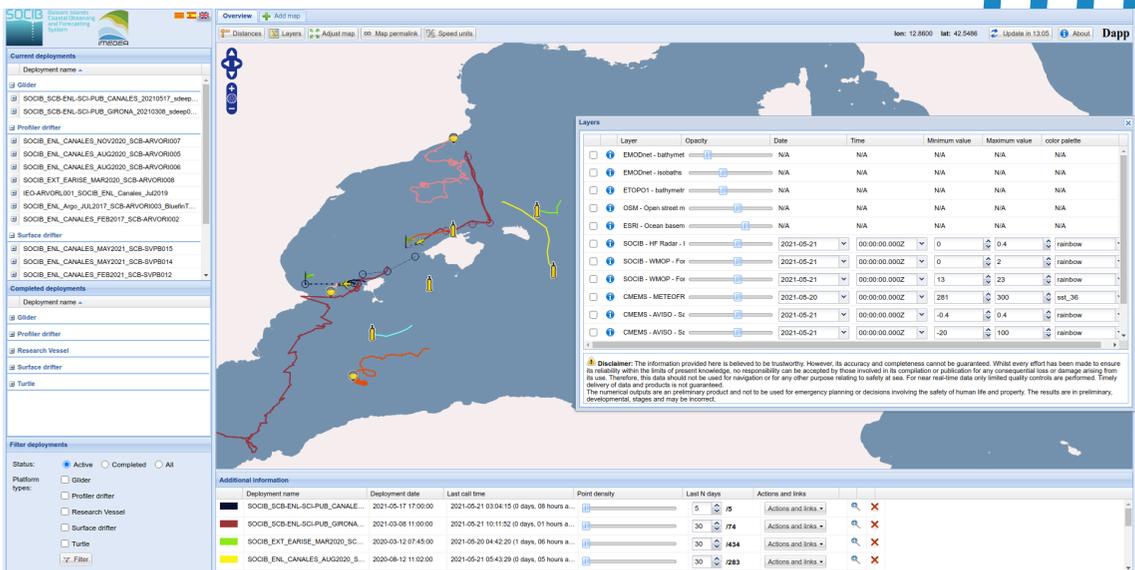
5. SOCIB Deployment Application (Dapp) multiplatform viewer enriched with Copernicus Marine and EMODnet data layers

SOCIB, the Balearic Islands Coastal Observing and Forecasting System, is a multi-platform distributed and integrated marine research infrastructure that provides streams of oceanographic data and modelling services. SOCIB has a long standing **partnership** with EMODnet and this collaboration has been key for improving data access both for SOCIB and the wider EMODnet community.



SOCIB developed a free and open access tool for operational decision support, called SOCIB Deployment Application (Dapp), that enables quick and easy access in real time to tracks, data and plots of SOCIB ocean observing platforms (e.g. ARGO profilers, gliders, research vessels, etc.). By means of web mapping services (WMS), the aforementioned information can be displayed on top of data layers from the portals Copernicus Marine Service (sea surface temperature, sea level, geostrophic currents, sea level, chlorophyll-a concentration) and EMODnet Bathymetry (bathymetry) to further contextualise the information.

Read the full use case [here](#).



SOCIB Dapp. ©SOCIB

EMODnet for Users: testimonials

The following two pages gather testimonials from a diverse selection of EMODnet users, each demonstrating the added-value of using EMODnet's integrated, harmonised and standardised *in situ* marine environmental and human activities data and data products to provide marine knowledge underpinning other key data services, operations at sea, EU policy, global data initiatives, ocean governance and more.



"We have heard from some member states that they have actually used EMODnet data for their Marine Spatial Planning, including MSP planning purposes and cross-border planning."

Felix Leinemann, EC DG MARE

"EMODnet is the third largest contributor of bathymetry to Seabed 2030, worldwide and EMODnet is also within the top three data contributors to GEBCO data grid. This is thanks to a trusting and pragmatic collaboration between Seabed 2030 and EMODnet, not just of sharing data, but also sharing views, strategies and best practices."

Jamie McMichael-Phillips, Nippon Foundation, GEBCO, Seabed 2030



"The Copernicus Marine Service has been the main user of EMODnet since its inception over a decade ago."

Fabienne Jacq, EC DG Defis





EMODnet for Policy

"The collaboration between EMODnet Chemistry and the EC Joint Research Centre has led to a common database with harmonised beach litter data from 300 beaches across Europe. This is a key contribution to enable Member States to carry out marine litter assessments for the Marine Strategy Framework Descriptor 10... and as a direct input to develop the EU Single Use Plastics Directive."

Georg Hanke, EC JRC

EMODnet for Industry

"EMODnet's open access data and data products, including from bathymetry, physics and human activities thematics, has improved offshore energy operators' efficiency and costs, e.g. at windfarm sites in the North Sea, and has enriched company data."

Gerben de Boer, Van Oord



"EMODnet's pre-processed and aggregated marine data, available through a single entry point and adhering to international standards, saves Deltares significant time and money, enabling it to help society and industry and deliver tailored services to different communities, sectors and regions."

Lórinč Mészáros, Deltares

EMODnet for Research

"Marine scientists are increasingly relying on EMODnet products, e.g., for implementation of the MSFD in Belgium, while the institute provides data and human expertise back into the EMOD-network."

Vera Van Lancker, RBINS



EMODnet for Civil Society and citizens

"EMODnet data can be used to support coastal eco-tourism, for example providing information to give citizens a better understanding of the ocean and providing marine data for better weather and physical ocean forecasting models so Outdoor Portofino can plan for touristic and stakeholder activities."

Arianna Liconti, Outdoor Portofino

EMODnet partnerships: Europe and beyond

EMODnet is itself a network of over 120 organisations. This involves a large “ecosystem,” of experts in *in situ* marine data collection, data management and service provision, spanning research institutes and associations, universities, hydrographic offices, national data centres, private companies and more.

In addition, EMODnet is actively connected to other key actors in the European marine and maritime landscape to achieve its goals and increase interoperability and advance data services across the EU marine data space. These include strategic partnerships at coordination and operational levels, spanning across the marine knowledge value chain from ocean observation, marine monitoring and data collection to data services and intermediate and end users (see image below for examples of key European partnerships with EMODnet in 2021).. The following section provides an overview and highlights from EMODnet’s partnership activities in Europe during 2021, with much more information available through the EMODnet Central Portal News and in the [monthly news digests](#) that are available on archive.

Credit image: EMODnet Secretariat



Copernicus Marine Service

EMODnet and Copernicus Marine Service have a long-standing collaboration at coordination and operational levels for some time, as two key, long-term marine data initiatives of the European Union. CMEMS is coordinated through EC DG DEFIS (formerly DG GROW) and its implementation is entrusted through Mercator Ocean International (MOI), EMODnet is funded through DG MARE with funding through the European Maritime Fisheries and Aquaculture Fund for the seven thematics, data ingestion, central portal and the Secretariat. As a focal point for *in situ* marine environmental and human activities data, EMODnet provides *in situ* marine data to Copernicus Marine Service which is used to validate satellite-derived data, models and as input to forecast modelling. In turn, some Copernicus Marine Service model outputs are used by EMODnet e.g., bottom-water current model outputs to help define EMODnet Seabed Habitats. Read more about the Memoranda of Understandings and partnerships [here](#).

In 2021, key collaborations and joint activities between EMODnet and Copernicus Marine Service include:

A joint EMODnet – Copernicus Marine Service marine data and data product catalogue for the Marine Strategy Framework Directive for the Baltic Sea. The complementarity of the Copernicus Marine Service and EMODnet portfolios led to the development of a joint data catalogue, combining all relevant marine data products from both services to support the evaluation of Good Environmental Status for the Marine Strategy Framework Directive in the Baltic Sea. This was a cross-thematic activity, engaging EMODnet Chemistry, Biology, Physics, Seabed Habitats and Human Activities have significantly contributed to the catalogue, which contains 132 data products covering 57 of the most relevant variables considered to evaluate the environmental status and its trend (e.g. concentration and distribution of oxygen, phosphate and nitrate; distribution of contaminants and marine litter).

Download the joint Copernicus Marine Service and EMODnet catalogue for MSFD [here](#).



MSFD D1, D2, D3, D5, D6, D7, D8, D9, D10, D11

Marine Data for Aquaculture in the Mediterranean and Black Seas save-the-date ©Copernicus Marine Service; *Joint data catalogue for the Baltic Sea on MSFD from Copernicus Marine and EMODnet* ©EMODnet and Copernicus Marine Service; *EMODnet and Copernicus Marine Service 5th coordination meeting* ©EC Maritime Forum.

A **coordination meeting** on 20 April 2021 which brought together all EMODnet thematic coordinators with Copernicus Marine Service INSTAC and the Secretariats and Management teams of EMODnet, Copernicus Marine Service, DG MARE, DG DEFIS and the European Climate, Infrastructure and Environment Executive Agency (CINEA);

A joint **workshop on “Marine Data to support Aquaculture in the Mediterranean and Black Sea”** on 24–25 March 2021, co-organised by EMODnet, Copernicus Marine Service, the European Aquaculture Technology and Innovation Platform (EATiP), and the European Commission DG MARE and DG DEFIS. The workshop focused on raising awareness about existing open access marine data and data products available through EMODnet and Copernicus Marine Service, exploring opportunities and applications for open source marine environmental data to support and innovate the aquaculture sector in the Mediterranean and Black seas regions, and discussing needs and requirements from the Aquaculture sector. Further reports are available on the EMODnet Central Portal. This event was the second in a series following a similar workshop **“Marine Data for Aquaculture in the North Atlantic Ocean”** held in Autumn 2020. These events were also able to pre-view the new [EMODnet video “EMODnet for Aquaculture”](#) released in Spring 2021

The **EMODnet Open Conference 2021** was an opportunity to celebrate key partnerships. Pierre-Yves Le Traon scientific director at Mercator Ocean International and Copernicus Marine Service gave a keynote presentation followed by a Panel discussion between EMODnet experts and Copernicus Marine Service, with further Copernicus experts engaged in other panels throughout the event.



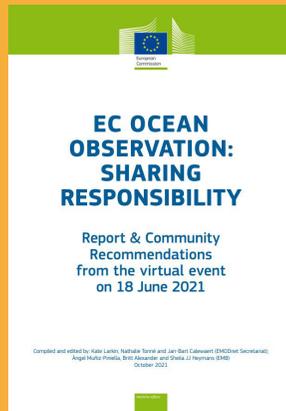
©EMODnet Secretariat

Close collaboration with Copernicus Marine Service has led to greater interoperability across services and cross-validation of satellite and *in situ* data sets, user-driven data products and complimentary developments to further add value to the user-experience. This continued partnership with Copernicus is also in many cases in collaboration with other key European initiatives including research infrastructures (e.g., EuroARGO, EMSO, EMBRC, Eurofleets, ICOS, JERICO, LifeWatch, DANUBIUS), ocean observing networks (e.g., the European Global Ocean Observing System, EuroGOOS), data infrastructures (e.g. SeaDataNet and SeaDataCloud), and wider organisations, networks and initiatives (e.g., European Marine Board, European Environment Agency), Regional Sea Conventions and EC services e.g., Joint Research Centre. In addition, EMODnet continues to actively engage in European funded international and basin-scale research projects (e.g., Horizon 2020 iAtlantic, Mission Atlantic, AtlantECO, TRI-ATLAS, ODYSSEA, ILIAD, EuroSea, Blue-Cloud and more), active contribution to basin-scale programs (AtlantOS) and partnerships with EU and other regional marine data repositories and services (e.g., Copernicus Marine Service, PANGAEA), international data initiatives (e.g., International Council for the Exploration of the Sea (ICES), OBIS, Seabed 2030) and more to maximise the EMODnet offer.

Such collaborations have been – and continue to be - crucial to move towards full interoperability and complementarity to the continued success, and evolution, of EMODnet.

EC Ocean Observation

In 2021, EMODnet also continued to play a pivotal role in supporting the European Commission to connect across European ocean observing, marine monitoring and data collection communities, responding to EC Ocean Observation – sharing responsibility stakeholder consultations and leading the organisation of the EC Ocean Observation event on 18 June 2021, in collaboration with EC DG MARE, the European Marine Board, EuroGOOS and Copernicus Marine Service. A full report and Summary with Community Recommendations area available (see link above) highlighting key areas for further collaboration and development in the areas of ocean observing technology and ocean observing gaps and requirements.



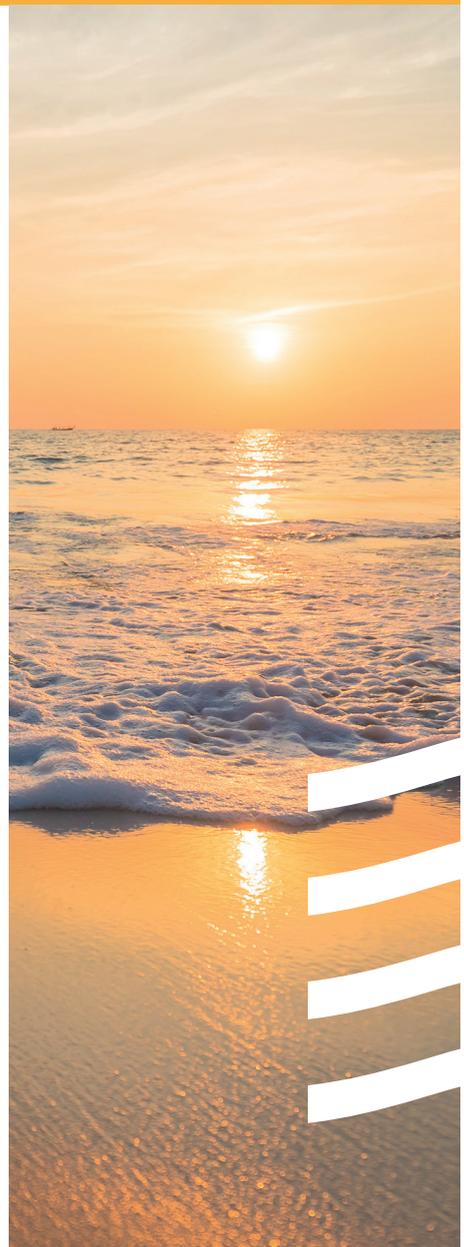
Community recommendations on marine technology and ocean observing gaps and requirements
EC Ocean observation: sharing responsibility virtual event on 18 June 2021

© EMODnet Secretariat

EMODnet global partnerships

2021 key highlights

EMODnet has an ever-expanding global outlook, with an increasing number of datasets available through the EMODnet services from seas and oceans beyond European waters. The international user base is also growing from Africa to China, together with increasing interest from international Blue Economy industries. EMODnet collaborates with other European and international data initiatives including the Copernicus Programme, in particular the Marine Environment Monitoring Service (Mercator Ocean International), the International Council for the Exploration of the Sea (ICES), the Global Earth Observation System of Systems (GEOSS), the International Oceanographic Data and Information Exchange (IODE) of the Intergovernmental Oceanographic Commission (IOC), and the National Marine Data and Information Service (China) through EMOD-PACE (EMODnet PARTnership for China and Europe). Partnerships are also increasingly global with EMODnet Physics providing a tailored SOOSmap interface for the Southern Ocean observing community to assemble and integrate their data in one place. EMODnet Bathymetry is a large European contribution to the international Seabed2030 initiative, having signed a MoU in 2019 to further strengthen collaboration.



- » All EMODnet thematic portals and the EMODnet Central Portal are registered on the [IODE Ocean Data and Information System \(ODIS\)](#) catalogue. Additional records will be added from the [EU-China EMOD-PACE marine data project](#);
- » EMODnet contributes as a European focal point and technical advisor to the IOC Ocean InfoHub (OIH) Project;
- » EMODnet is a contributor and expert to the Intersessional Working Group Strategy on Ocean Data and Information Stewardship (IWG-SODIS) for the United Nations Ocean Decade (UN OD);
- » EMODnet Secretariat is the co-chair of the UN Ocean Decade (OD) Data Coordination Group;
- » The EMODnet Secretariat is serving an advisory role to three UN Ocean Decade Actions: Steering partner in [Digital Twins of the Ocean \(DITTO\)](#); Advisor role in [CoastPredict](#); and partner in [Ocean Best Practices](#);
- » EMODnet Chemistry contributed to the [Sustainable Development Goal \(SDG\) Indicator 14.3.1 Data Portal](#), an online tool for the submission, collection, validation, storage and sharing of ocean acidification data and metadata. The SDG Indicator 14.3.1 (Average marine acidity (pH) measured at agreed suite of representative sampling stations) is associated to SDG Target 14.3 (Minimise and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels);
- » EMODnet Chemistry also contributed expert input as a co-author to a [White Paper](#) for a global ocean oxygen database and atlas for assessing and predicting deoxygenation and ocean health in the open and coastal Ocean;
- » EMODnet is extending its spatial coverage to neighbouring countries around the Caspian Sea and to the Caribbean Sea;
- » EMODnet Physics is a partner of the Polar Data Forum data group that is very active on Arctic Data;
- » EMODnet Physics were renewed as external member of the Deep Ocean Observing Strategy (DOOS), an officially endorsed UN Ocean Decade Programme. They are also member of the Advisory Board of the “implementing a Deep Ocean Observing Strategy” (iDOOS), which is a U.S.A. project to support DOOS, to work and facilitate international cooperation;
- » EMODnet Biology is a major contributor to OBIS. In 2021, the thematic lot published 1,475,223 occurrence records from 127 datasets (representing about 8.6% of the number of new records that were added in OBIS in 2021), which are all available in OBIS as well;
- » EMODnet is the third largest contributor of bathymetry to Seabed 2030, worldwide, and EMODnet is also within the top three data contributors to GEBCO data grid.

EMOD-PACE

As a concrete outcome of the Blue Partnership signed between the EU and China in 2018, the EMOD-PACE project 'EMODnet Partnership for China and Europe' was launched in February 2020. This ambitious 30-month European Union's Partnership Instrument funded project has brought together a '19' member-strong European collective, most of whom also actively lead and coordinate the thematic EMODnet services. EMOD-PACE has a counterpart project CEMDnet, i.e. the 'China European Union Marine Data Network', which is coordinated by the Chinese National Marine Data and Information Service (NMDIS).

In 2021, plans were formulated to open-up and broaden the Partnership to other relevant and interested stakeholders in the Asia region. The prime aim is to constructively include others with a view to identifying accessible data and information through interested stakeholders which include the **WESTPAC** network. It is also a positive result through the project that already existing relationships have been strengthened, e.g. these efforts have been guided and supported by the UNESCO International Data and Information Exchange (IODE) programme.

For the purpose of expansion, during 2021 both EMOD-PACE and CEMDnet colleagues have been actively building on the efforts made in the first project year (2020) to bolster the impact of the project deliverables and milestones. The Partnership further supported the endeavors by signing a land-mark Memorandum of Understanding¹, to facilitate and enable the experts to undertake supporting joint activities. The promotion of these efforts has been ongoing during 2021 and further outreach is planned for 2022 to ensure the optimal awareness of the data and products available for application by other interested stakeholders.

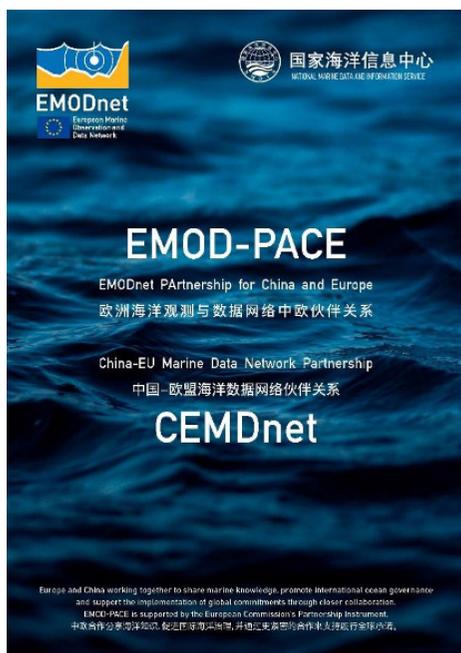
Together, EMOD-PACE and CEMDnet have proven to be two very dynamic projects which have worked hard during 2021 in achieving the ultimate objectives which are to enhance cooperation in international ocean governance, as well as collaboration for marine data products. These efforts have relied upon the good bilateral relations which exist and which have been enhanced through ongoing dialogue and cooperation in the field of maritime science, primarily through the:

- » Assessment of similarities and differences between the methods used by European and Chinese research scientists for ocean circulation models and reanalysis products;
- » Comparison of the types of European and Chinese numerical models used for seabed habitats and ecological carrying capacity (achieved by analysing the applicability of the respective models in different areas);
- » Delivering data and information products for the " on sea level changes, coastal erosion, wetland degradation and vessel traffic density;
- » Creation of an interoperable marine data information system between the EU and China, i.e. the development of a Brokerage Service for access to available data for 29 parameters (and counting), as well as the associated metadata and data products between EMODnet and NMDIS, not to mention the various reports which have been developed

¹ Further information on the MoU signing event during the EMOD-PACE Mid-term meeting held 25-29th January 2021 can be found here: EMOD-PACE: https://www.emodnet.eu/sites/emodnet.eu/files/public/press/EMOD-PACE-press_release_20210129.pdf; <https://www.linkedin.com/feed/update/urn:li:activity:6760859344151150592>; CEMDnet: <https://mp.weixin.qq.com/s/IEVOgZEbYMsEDjNXXK2AXQ>

in draft so far during the project with a view to their online publication in September 2022;

- » Development and updating of an active project webpage with a map viewer and contact/user facility, including an online survey for users to directly inform the progress of the project.
- » In 2021 the webpage saw the development and hosting of digital maps covering: absolute sea level changes; relative sea level change; satellite-based coastal erosion; wetland degradation; and maritime traffic routes. The 29 downloadable and interoperable OGC compliant data parameters include:
 - » Biology: Abundance of biological entity specified elsewhere per unit volume of the water body, Abundance of biological entity specified elsewhere per unit area of the bed, Area sampled of the bed, Volume sampled of sediment, mean depth below sea surface (during sampling event) by profiling pressure sensor and conversion to depth using unspecified algorithm, Sea-floor depth (below instantaneous sea level) {bathymetric depth} in the water body;
 - » Physics: Depth, Height relative to sea level, Air pressure, Wind direction, Wind speed, Air temperature, Relative humidity of the atmosphere, temperature of the water body, Salinity of the water body, Speed of water current, Direction of water current in the water body, Speed of the water current by shipborne acoustic doppler current profiler, Direction of water current by shipborne acoustic doppler current profiler, upward velocity of water current in the water body;
 - » Chemistry: Depth, Concentration of Oxygen, Concentration of Nitrite, Concentration of Nitrate, Concentration of phosphate, Concentration of Silicate, pH, Concentration of Chlorophyll-a;
 - » Bathymetry: Sea-floor depth (below Lowest Astronomical Tide datum) {bathymetric depth} in the water body.



Front and back cover of the EMOD-PACE CEMDnet leaflet.



Key achievements/facts in 2021

26
map Atlas
categories



19
predefined maps



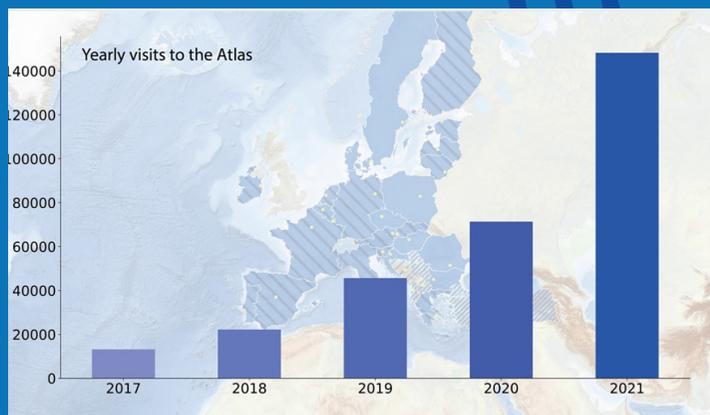
19
map stories



Over 2,300
Twitter followers by the end of 2021



- » The Atlas catalogue content underpins its use for education. In December 2021, the Atlas catalogue contained 277 map layers. In 2021, 13 map layers were added, including maps on first sales of fish (from EMODnet), on sea level and sea surface temperature trends (from Copernicus Marine Service), on EMD In My Country Events of 2021 (from DG MARE), the Atlas Ambassadors map mentioned above as well as on members of the Network of European Blue Schools and projects of Young Ocean Advocates (EU4Ocean communities). Furthermore, 83 map layers were updated with the latest data from across the EMODnet thematic portals as well as EUROSTAT, JRC, DG MARE and EU4Ocean.
- » Exciting partnerships with the Directorate-General for Maritime Policy (DGPM) in Portugal, driving the project Escola Azul, the aquarium Nausicaá in France and collaborations with the EU4Ocean Coalition for Ocean Literacy and other education initiatives led to various activities to demonstrate the value of the Atlas as an education tool, nurturing a more ocean literate society. This included the organisation of the online workshop 'On an amazing journey with the European Atlas of the Seas' in June 2021, which brought together the Atlas technical and communication teams, representatives from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE), the Atlas partners, data providers, members of the EU4Ocean Coalition, scientists, ocean advocates, teachers and professionals in the blue economy. It also included contributions of the EMODnet Secretariat to teachers' trainings and the development by Escola Azul teachers of a series of exercises in Portuguese that are now available on the Teachers' Corner.
- » Promotion efforts have increasingly strengthened the visibility of the Atlas. These include the participation at several webinars and workshops, contributions to EU4Ocean Ocean Literacy festivals, participation in an educational television programme, the development of a video tutorial as well as the significant increase in activity of the Atlas Twitter account with more content related to EU policies, relevant events and, of course, the Map of the Week.
- » The European Atlas of the Seas was featured in the virtual exhibition launched at the EMODnet Open Conference in June 2021.

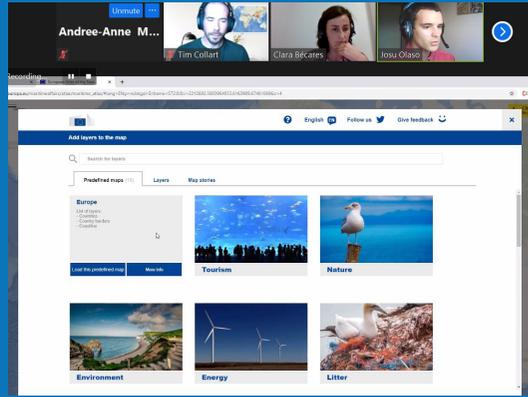


European Atlas of the Seas - Substantial increase in yearly visits in the past five years (©Europa Analytics)

- » The Teachers' Corner was updated with new educational resources including a Treasure Hunt, a quiz, and the exercises in Portuguese mentioned above reflecting and supporting an increased emphasis on furthering the ocean literacy and education content and use of the Atlas.
- » These new developments accompanied by structured promotion and outreach activities have led to an increasing number and diversity of Atlas users with a total of more than 148,000 visits in 2021, further exposing EMODnet data and products to a growing audience across Europe and the World.

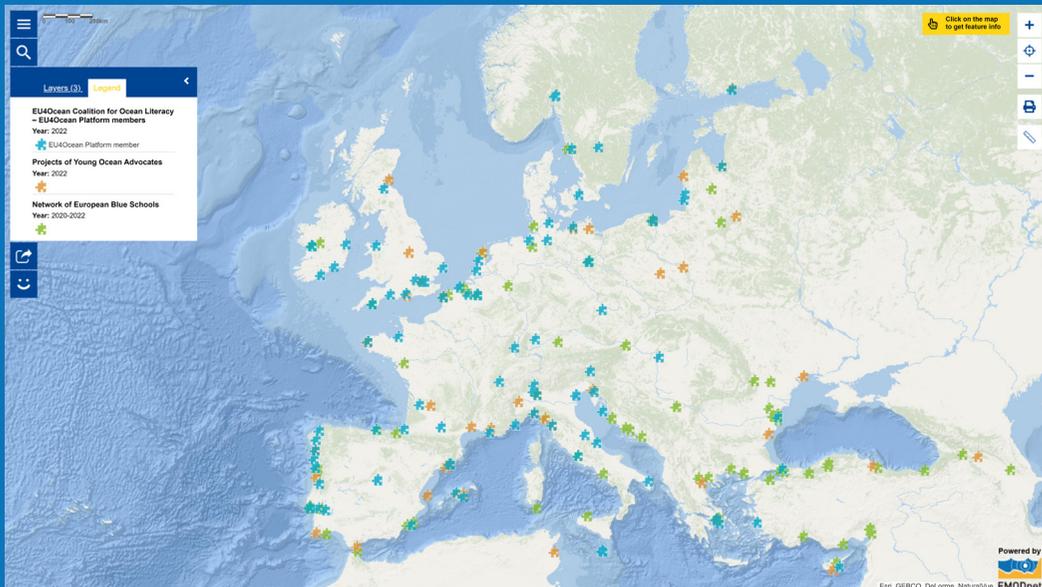


European Atlas of the Seas' virtual room at the EMODnet virtual exhibition, launched at the second EMODnet Open Conference in June 2021.
©Charles Henniker-Heaton and Jodi Philips (Virtual Exhibition 3D model); Content: EMODnet Secretariat and EC

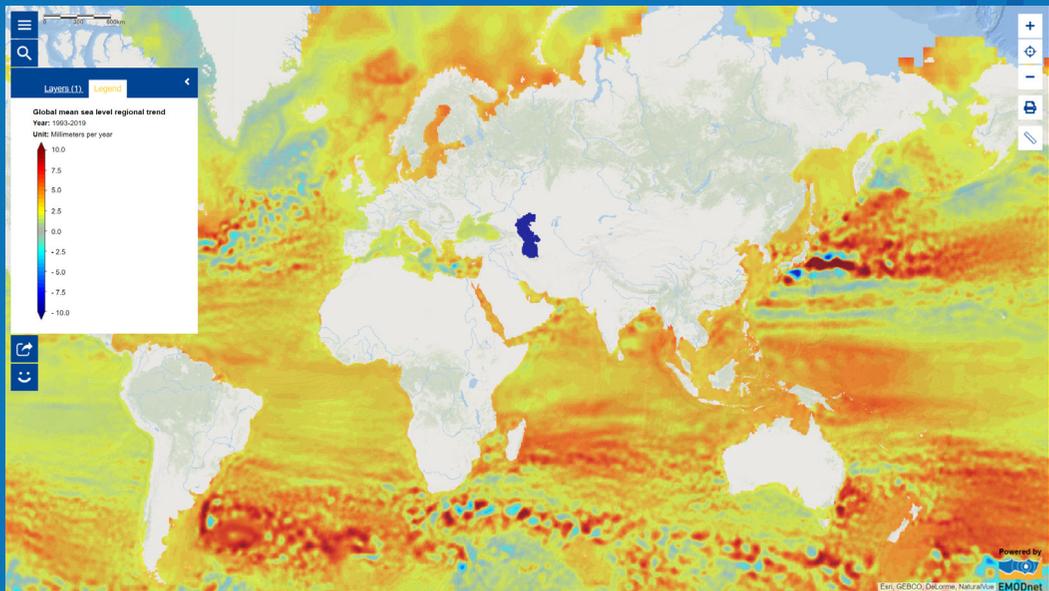


Presentation of the European Atlas of the Seas by the EMODnet Secretariat and Bilbomática at the online workshop on 16 June 2021.
©EMODnet Secretariat

- » On 16 June 2021, the EMODnet Secretariat organised an online European Atlas of the Seas workshop which brought together the Atlas technical and communication teams, representatives from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE), the Atlas partners Nausicaá and Escola Azul, data providers, members of the EU4Ocean Coalition - amongst which two Young Ocean Advocates and a representative of the Network of European Blue Schools - scientists, ocean advocates, teachers and professionals in the blue economy. Overall, 18 speakers and panelists shared their experiences and information about their work. A total of 90 participants from across Europe and beyond connected to the workshop with a peak of 54 participants at the same time.



Map showing the location of the EU4Ocean Coalition members, the Young Ocean Advocates project locations and the European Blue Schools network members. ©European Atlas of the Seas



Map showing global mean sea level regional trend (data layer source: Copernicus Marine Service) ©European Atlas of the Seas.

The European Atlas of the Seas was presented at several events, including:

- » European Schoolnet Scientix webinar, 14 January 2021, online webinar
- » EU4Ocean webinars, 26 February, 25 March and 21 April 2021, online webinar
- » Workshop with DGPM (Directorate General for Maritime Policy under the Portuguese Ministry of the Sea) and Escola Azul, 8 May 2021, online workshop
- » European Maritime Day 2021, 20 May 2021, online workshop
- » EU4Ocean Ocean Literacy Festival for the Atlantic and North Sea, 22 May 2021, online workshop
- » EMODnet Open Conference, 16 June 2021, online workshop
- » EU4Ocean Supporting Ocean Literacy in the Baltic – “Let’s make the Baltic Sea Blue”, 27 August 2021, online workshop
- » EU4Ocean Mediterranean Ocean Literacy Festival, 25 September 2021, online festival
- » EU4Ocean Med Sea Basin Event – workshop “Bringing Ocean and Climate to the classroom”, 27 September 2021, online workshop
- » Flemish Association of Geography teachers conference ‘Scarce Space’, 9 October 2021, Antwerp (Belgium)
- » EU4Ocean Black Sea Basin Event – workshop “Bringing the sea to the classrooms in the Black Sea countries”, 5 November 2021, online workshop
- » Sealogy, 18 November 2021, Ferrara (Italy)
- » CINEA lunch conference on Ocean Literacy, 26 November 2021, online conference

On 16 June 2021, back-to-back with the EMODnet Open Conference 2021 (see section below), the EMODnet Secretariat organised the **European Atlas of the Seas (EAS) Ocean Literacy workshop**. The interactive workshop brought together around 90 participants, and 18 speakers and panelists. The event provided participants with the opportunity to share their experiences, learn about the many different aspects of the Atlas, from the story behind map layers to how the Atlas can be used in education and ocean literacy. The presentations from the European Atlas of the Seas workshop are available for download on the EMODnet Central Portal [here](#).

EMODnet Open Conference and Jamboree



The EMODnet Open Conference 2021 was organised by the EMODnet Secretariat and wider partnership, together with the European Commission (DG MARE), in collaboration with the Flanders Marine Institute (VLIZ).

From 14 to 16 June 2021, more than 400 participants from 50 countries and over 70 speakers and panelists gathered online for the 3-day European Marine Observation and Data Network (EMODnet) Open Conference to discuss EMODnet achievements, partnerships and vision for the coming decade. With **more than 45 presentations and panels**, the event was divided in six sessions, in addition to breakout group discussions and the presentation of about **55 community posters and pitches**. A **virtual exhibition** was also an integral part of the event, with its rich content and information on the diverse activities of EMODnet, resources and services, as well as those from related initiatives.

The event was ably moderated by Paul Rose - National Geographic Pristine Seas Expedition leader, Broadcaster and a well-known public figure in the field of environment and exploration.

The timing for this event could not have been better, with 2021 as 'super year' for ocean, biodiversity, ecosystem, environment and climate with the official kick-off of the UN Decade of Ocean Science for Sustainable Development, the recent 47th G7 Leaders' Summit, related Climate & Environment Ministers meetings and Science & Technology dialogues.

The Conference was kicked-off by European Commissioner for Environment, Oceans and Fisheries. He explained that *"EMODnet has become a reference - not just in the EU but globally - and its importance will only grow in the future as marine knowledge is at the core of our fight against climate change [...], at the centre of conserving the invaluable marine biodiversity [...] and is the key to unlocking the potential of the Blue Economy in line with the European Green Deal and the digital transition"*.

Jan-Bart Calewaert, Head of the EMODnet Secretariat, added that *"The EMODnet Open Conference 2021 comes at a good time as - in several ways - we are at the end of an era and the beginning of a new one. We have largely met our Marine Knowledge 2020 vision targets producing a multi-resolution map of European seas. And now we have moved into a phase with EMODnet as a fully operational user-driven service."*

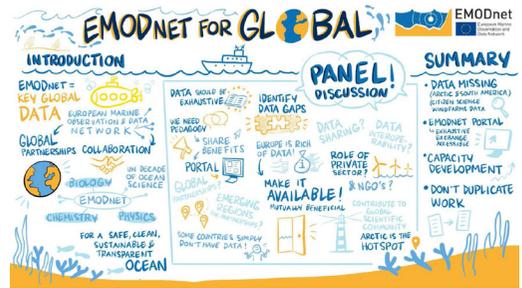
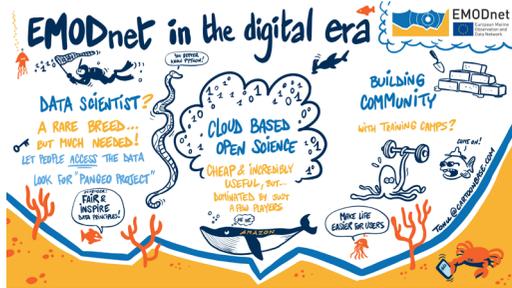


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Bringing together many EMODnet partners, data providers, users and stakeholders from Europe and beyond, the Conference was all about celebrating existing EMODnet partnerships, connecting with new and emerging marine and maritime sectors stakeholders, highlighting the added value of EMODnet for society and looking ahead to co-design EMODnet's next phase.



Graphic illustration summaries from the EMODnet Open Conference Breakout Session prepared by graphic illustrators: Frederic Thonar, Silvia Robertelli and Alix Garin



In her closing speech, Charlina Vitcheva, Director-General for Maritime Affairs and Fisheries of the European Commission, noted that “We now need to consolidate all the achievements and new ideas, all the valuable input received and move forward, pursuing higher goals. [...] The future that the Commission envisages is bringing forward innovative technological tools like the Digital Twin of the Ocean and the elaborate system models of Destination Earth. [...] EMODnet together with Copernicus Marine and other European Commission assets will be at the forefront of these developments”.



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Rediscover the EMODnet Open Conference 2021 and Jamboree resources!

- » Download the EMODnet Conference 2021 Report [here](#).
- » Relive the moment and watch the short EMODnet Open Conference 2021 [video](#).
- » Read the full news article on the EMODnet Central Portal [here](#).
- » More information on the programme, speakers and panelists can be found on the EMODnet Central Portal [website](#).
- » For more information on the EMODnet Open Conference 2021, you can also consult Twitter with the hashtag #EMODnetConference.



Virtual Exhibition
©Charles Henniker-Heaton and Jodi Philips (3D model), Initial Design (EMODnet Secretariat), Content (EMODnet network)



Open source screenshots taken during EMODnet Open Conference 2021
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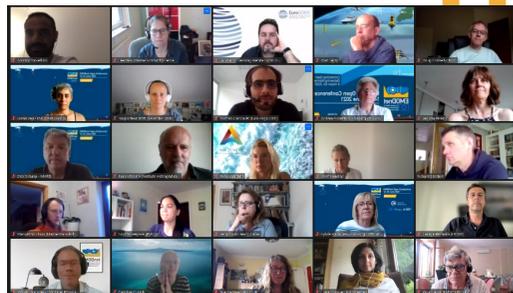


Paul Rose (Host), Kate Larkin (Deputy Head, EMODnet Secretariat) and Jan Mees (Director, VLIZ)
©Dirk Leemans



Zoi Konstantinou (EC DG MARE)
©Dirk Leemans

Back-to-back with the EMODnet Open Conference (14-16 June 2021) several initiatives took place including, the European Atlas of the Seas workshop (16 June; see below), the **EC Ocean Observation Initiative** (18 June; see below) and the EMODnet Jamboree (16-18 June) which included individual thematic meetings, cross-thematic meetings and two topical workshops on **ocean best practice** and on **citizen science**. A short summary of each of these related events is available in the EMODnet Open Conference 2021 [Report](#) and on the EC Maritime Forum for [ocean best practices](#) and [citizen science](#) respectively.



© EMODnet Secretariat

EC Ocean Observation event

On 18 June 2021, the EMODnet Secretariat, European Marine Board Secretariat, EuroGOOS and Copernicus Marine Service co-organised an **EC Ocean Observation event** in close collaboration with EC Directorate-General for Maritime Affairs and Fisheries (DG MARE).

The event consisted of two sessions: 1. Ocean observing technology, and 2. Ocean observing gaps and requirements. The event was invitation only, bringing together over 80 Ocean Observing and Marine Technology experts, including representatives from the research community, marine/maritime industry, policy, European organisations and networks, International initiatives, and more.



The banner features a blue background with white and yellow text. At the top center is the European Commission logo. Below it, the event title 'EC Ocean Observation event' is written in a large, white, serif font. Underneath the title, the date '18 June 2021' is displayed in a smaller white font. The organizing body is listed as 'Organised by the EC, Directorate-General for Maritime Affairs and Fisheries Maritime Innovation, Marine Knowledge and Investment' in yellow text. Below this, 'Co-organised by:' is written in yellow. At the bottom, there is a row of logos for the co-organizing entities: EMODnet (European Marine Observation and Data Network), European Marine Board (Advancing Seas & Ocean Science), EuroGOOS (European Global Ocean Observing System), Copernicus Marine Service, Copernicus, and MERICATOR OCEAN.

©EMODnet Secretariat

The agenda and presentations from the online event are available on the Maritime Forum [here](#).

Download the full event report from the EC Ocean Observation Initiative from the Central Portal [here](#).

Download the EC Ocean Observation Community Recommendations [here](#).

The figures below represent the money committed to signed contracts in thousands of Euro. All of these, except the grant for Argo floats, were implemented through procurement procedures awarded following open calls for tender.

Theme & Project	Preparatory Actions ¹	Maritime Policy Fund ²	European Maritime and Fisheries Fund ³							European Maritime, Fisheries and Aquaculture Fund ⁴	Grand Total (k€)
			2014 (k€)	2015 (k€)	2016 (k€)	2017 (k€)	2018 (k€)	2019 (k€)	2020 (k€)		
Central services		520		4,565	155	1,420	1,000	1,420	138	2,665	11,883
Data Ingestion				4,045			1,000			1,340*	6,385
Office and Infrastructure											
Secretariat		520		520		1,420		1,420	138	1,325	5,343
Secretariat Support					155						155
Sea-basin Checkpoints		1,695	4,175								5,870
Arctic			906								906
Atlantic			1,590								1,590
Baltic Sea			784								784
Black Sea			895								895
Mediterranean		1,095									1,095
North Sea		600									600
Observation				4,000							4,000
Argo				4,000							4,000
Studies	230	450			52	250					982
Costs and benefits		450									450

¹ As defined in article 54 of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union

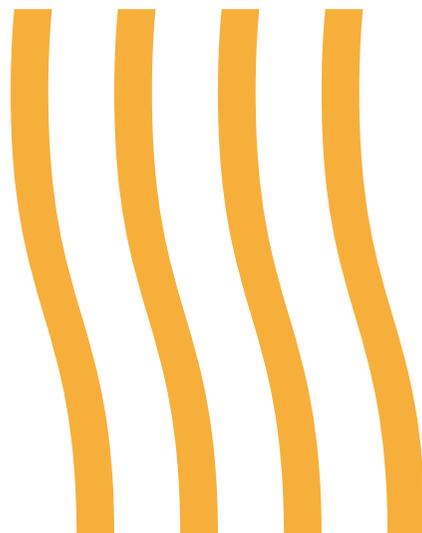
² Regulation (EU) No 1255/2011 of the European Parliament and of the Council of 30 November 2011 establishing a Programme to support the further development of an Integrated Maritime Policy

³ Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund

⁴ Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund

	Prepara- tory Actions ¹	Maritime Policy Fund ²	European Maritime and Fisheries Fund ³							European Maritime, Fisheries and Aquaculture Fund ⁴	
Theme & Project	2008- 2010 (k€)	2011- 2013 (k€)	2014 (k€)	2015 (k€)	2016 (k€)	2017 (k€)	2018 (k€)	2019 (k€)	2020 (k€)	2021 (k€)	Grand Total (k€)
Current status	230										230
Evaluation						250					250
Observation benefits					52						52
Thematic Groups	6,350	16,350	1,194	4,917	13,483	7,098	4,671	5,737	7,074	4,237	71,111
Bathymetry	2,175	2,000		4,917		3,720		2,800		2,800*	18,412
Biology	750	1,700			1,770	1,770		1,500			7,490
Chemistry	700	4,000			2,805		1,399		2,234		11,138
Coastal mapping			1,194								1,194
Geology	925	4,200			4,500		1,770		2,420		13,815
Human Activities		2,060			1,608	1,608		1,437		1,437*	8,150
Physics	1,000	1,000			1,400		950		1,050		5,400
Seabed Habitats	800	1,390			1,400		552		1,370		5,512
Grand Total (k€)	6,580	19,015	5,369	13,482	13,690	8,768	5,671	7,157	7,212	6,902	93,846

* Budget corresponds to budget that has not yet been committed.





EMODnet 2030: a new decade for ocean data and marine knowledge

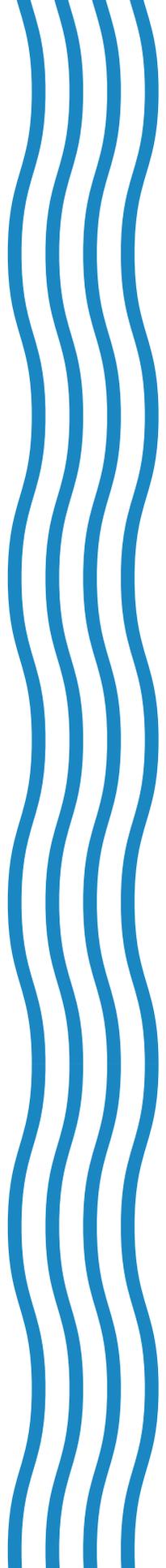
The **vision for the next phase** of EMODnet is clear: to (i) consolidate EMODnet as the EU operational service for open and FAIR access to *in situ* observations, data and products and as key contributor to the marine data space in Europe and beyond; and (ii) focus further developments to serve the future needs of all marine and maritime sectors as a critical marine service supporting the EU Green Deal and Digital Agenda envisaged transitions in Europe and globally. This also means underpinning the development of the EU Public Infrastructure for a European Digital Twin of the Ocean, as a key component towards Destination Earth (DestinE), and contributing to the UN Decade of Ocean Science by offering EMODnet as a resource for co-developing and co-implementation of a global digital ecosystem in support of the Ocean Decades objectives.

As a first step towards this, access to **EMODnet data resources and services are being centralised** and all thematic websites and portals will be incorporated into the EMODnet Central Portal. This will create economies of scale and allow us to work more efficiently, and most importantly will further simplify the user experience. EMODnet will remain a distributed infrastructure and the EMODnet thematic nodes will become even more important to underpin the service by identifying, assembling and harmonising data sets, executing quality control and data adequacy analysis, facilitating the data ingestion process and creating data products and services which will be increasingly demand driven. These developments will take time and considerable efforts, but will make EMODnet more user-friendly and fit-for-purpose, adapting to the needs and requirements of tomorrow's data and information consumers, be it from science, public services, policy, civil society or other. The work to move the thematic data services to the EMODnet Central Portal as a single point of access for searching and downloading data and products from the EMODnet network started in 2021 and is expected to be completed within 2022.

The centralisation and technical developments will go in parallel with **continued efforts to increase the visibility and use of EMODnet resources**, provision of trainings and dedicated workshops for selected blue growth sectors which heavily rely on fast access to reliable ocean data. We are particularly excited to announce that, later this year, we will kick-off the **third edition of the EMODnet Open Sea Lab**, with the main event to take place in early 2023! On the agenda will be new and exciting challenges, new collaborations and attractive prizes. [Watch this space](#) to stay informed and get involved!

And before that, in 2022 EMODnet takes part in key external events including the launch of the new phase of Copernicus Marine, the One Planet Summit for the Ocean, the International Ocean Data Conference, European Maritime Day 2022, the UN Ocean Conference 2022 and much more.

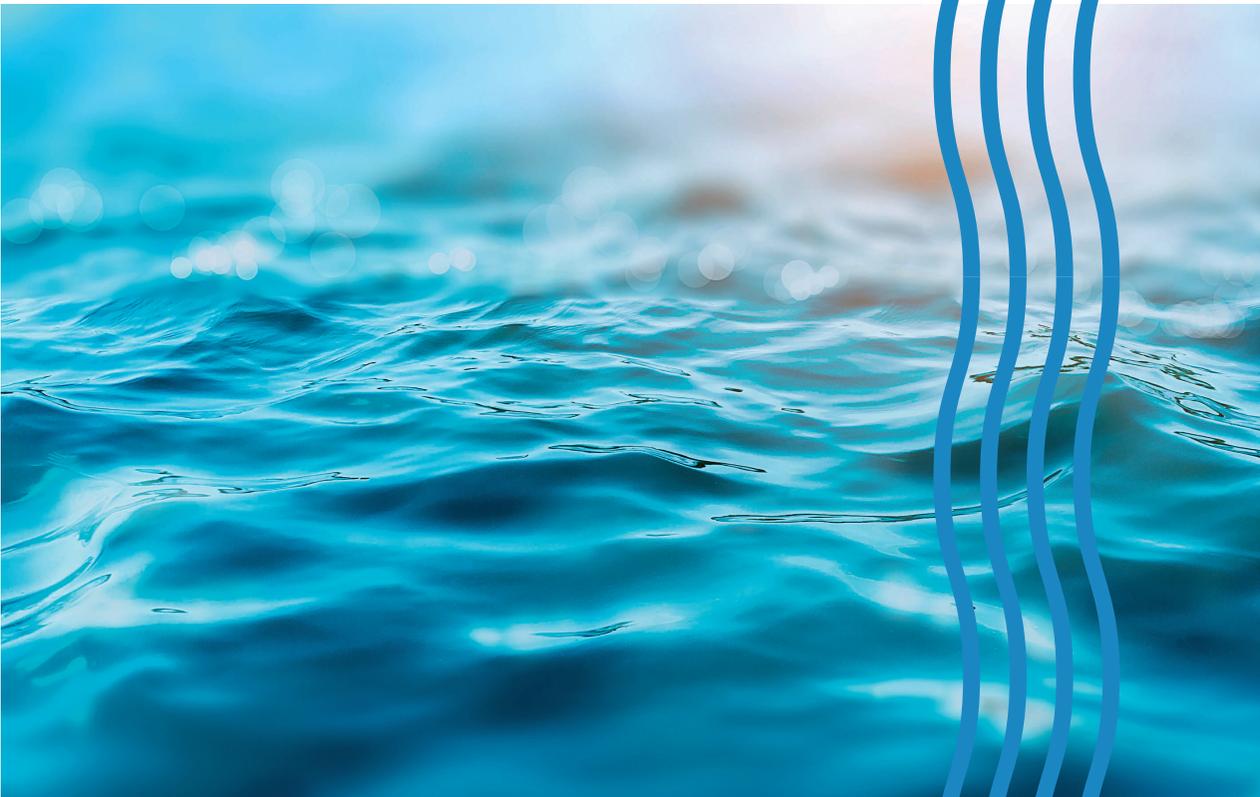
In 2022, the EMODnet Secretariat will also continue to provide support to EC DG MARE's activities related to ocean observation, and in particular the EC Ocean Observation – sharing responsibility initiative which was launched in 2020 to explore the options, viability and usefulness of using the instruments at the disposal of the European Commission to strengthened coordination at national level across marine and coastal data collection efforts.



EMODnet will also further strengthen our collaboration with other key marine data infrastructures in Europe including the Copernicus Marine Service, Marine Research Infrastructures, Regional Sea Conventions and many others, further connecting the community, upgrading the infrastructure and developing the interoperability between services as key contributions to the EU marine data space and developing European Digital Twin Ocean.

At the onset of 2022 marks the beginning of the second year of the UN Ocean Decade for Ocean Science. EMODnet is collectively stepping up the coordination of the network's involvement in the various UN Ocean Decade Actions ranging from Digital Twins (DITTO) to Coastal zones (COASTPREDICT), Collaborative Centres e.g., on Ocean Prediction, and as co-Chair and contributors to the Ocean Decade Data Coordination Platform which will develop and implement a strategy towards a global digital ecosystem underpinning the Ocean Decade's objectives. The EMODnet community is also active in the UN Ocean Decade Laboratories, with satellite events proposed for the Laboratory on an "Accessible Ocean" firstly for EU-China partnership EMOD-PACE and secondly for the EU marine data services EMODnet and Copernicus Marine Service, in collaboration with the All-Atlantic Ocean Research Alliance (AANCHOR CSA).

In conclusion, EMODnet is at a pivotal point in time. Over the past decade it has transitioned from its development phases, evolving from a series of prototype thematic data portals into a mature data service that has achieved its Marine Knowledge 2020 Vision Objectives. It now provides a fully operational and user-driven data service embedded in the Europa.eu domain. This advancement comes with new responsibilities, more stringent performance and quality requirements and a set of new challenges. What is clear is that while all thematic data, products and services will remain and even be further expanded in terms of coverage, resolution and functionalities, EMODnet will change considerably over the coming years: it will look, feel and operate differently. This is a necessary evolution if we want to remain relevant and useful. This is the beginning of a new Chapter which we can only successfully navigate if we continue working together as a partnership with shared objectives, in collaboration with you all!



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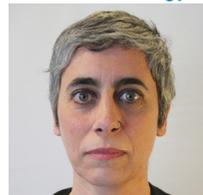
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Coordinators of the EMODnet Partnership in 2021.

EMODnet Publications

A list of publications, (co-)authored by the EMODnet thematic lots or mentioning the EMODnet thematic in question, can be consulted at <https://emodnet.ec.europa.eu/en/reports/publications-list-2021>.

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Publications List 2021

This page gives an overview of all publications published in 2021 by or mentioning the EMODnet Thematic Assembly Groups.

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Publications

EMODnet Bathymetry

Date	Type and name of journal, conference, ...	Publication title including DOI (if known)	Author(s)	Organisation(s)







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