From Physics to Chemistry

The European marine data service

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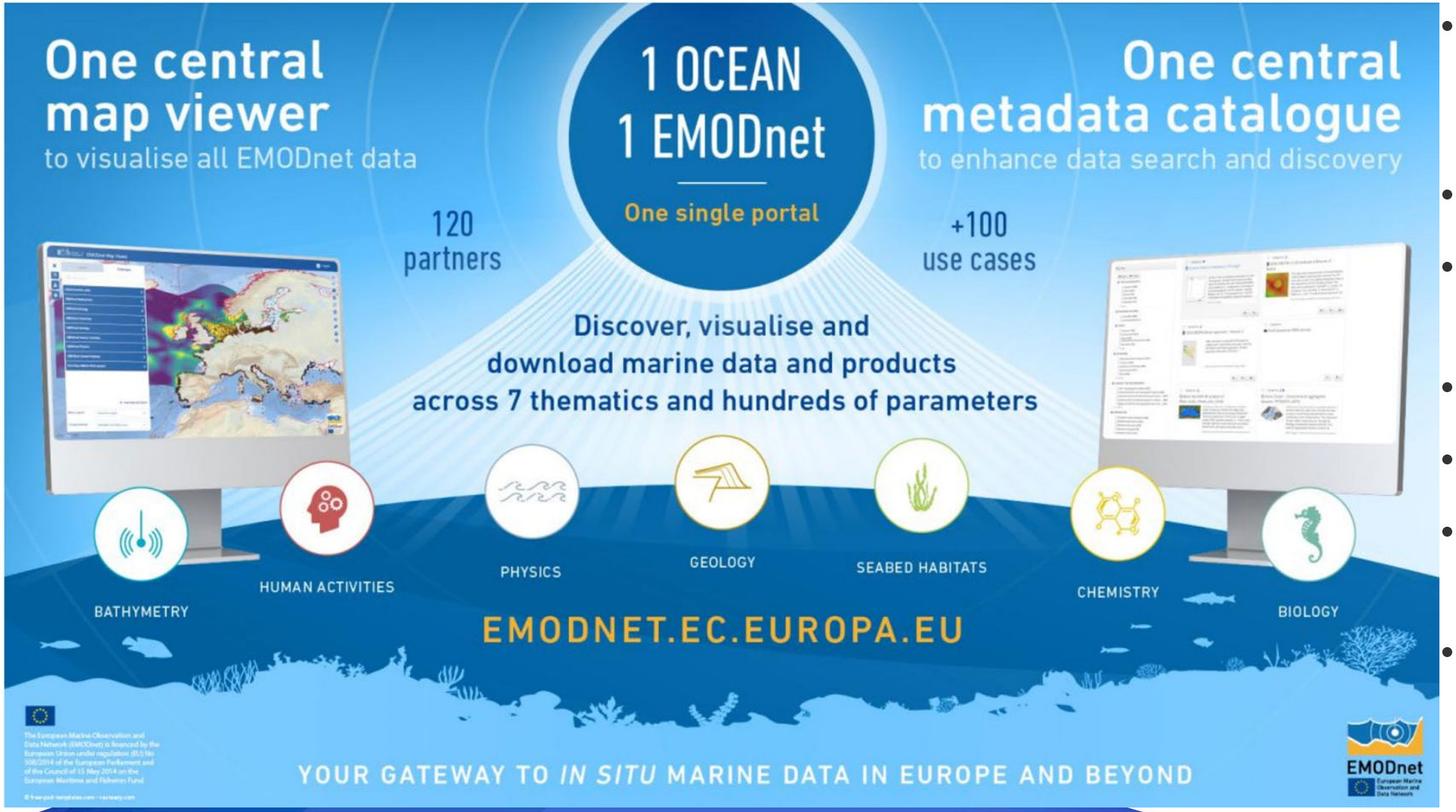
The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund.

EMODnet: the EU marine data service

The European Marine Observation and Data Network



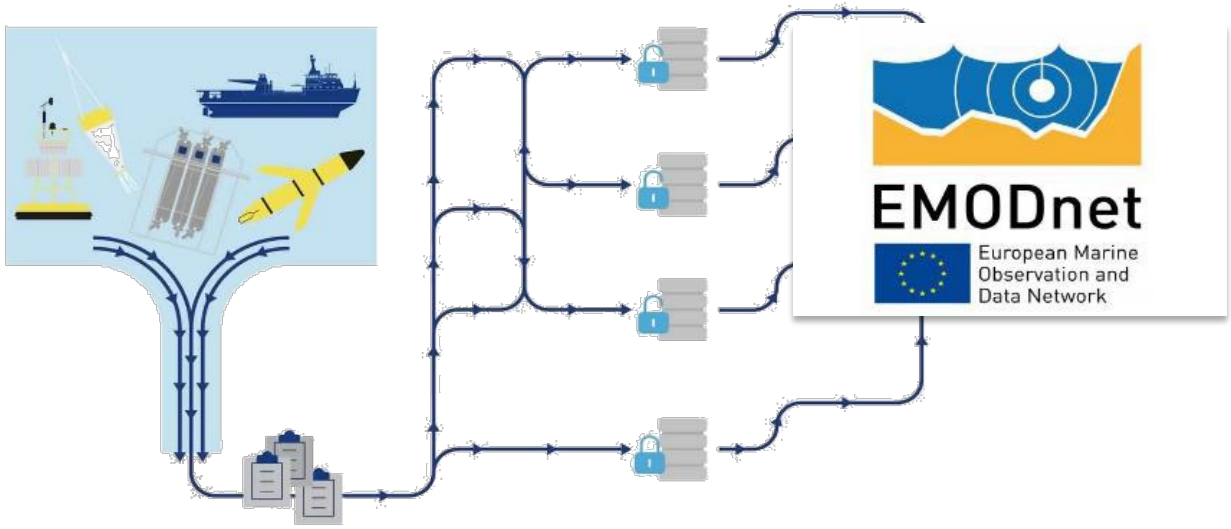
- Started in 2009 as the **long-term** marine data initiative of the EU
- **7** discipline-based themes
- Unified service since January 2023
- Now fully operational
- Running 2023-2025 phase
- Financially supported till 2029
- Vision 2035 Draft Document

EMODnet Chemistry

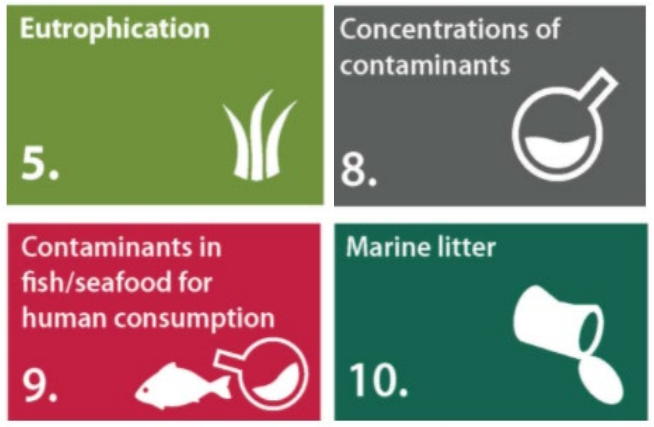
Providing access to **marine chemical data**, standardised, harmonised and validated **data collections** and **map products** of relevance for the European marine environmental policies

- **European thematic network of 42 organisations** (national oceanographic data centres, environmental monitoring agencies, expert institutes, international organisation)
- **Coordinated by OGS (Italy)**
- **Data contributed by 66 data centres**
- **500+ data originators**
- **32 countries around European seas**
- **Board of Experts for interaction with EU JRC, EEA, DG Env and Regional Sea Conventions for feedback and refining data products and metadata**

EMODnet Chemistry



- **C**ollection, **A**ggregation, **S**tandardization, **Q**uality **c**heck of EU marine water quality data relevant to the EU Marine Directives and to global climate change
- **D**elivery of standardised harmonized validated data collections and reliable data products



Group of Parameters		Parameters
Marine Litter	Beach macrolitter, Seafloor macrolitter, Floating microlitter	Composition, Abundance, etc.
Ocean acidification	Acidity	pH, PCO_2, etc.
Contaminants	Antifoulants, Hydrocarbons, Heavy metals, Pesticides, Polychlorobiphenyls (PCBs), Radionuclides	Anthracene, Fluoranthene, Me, Cd, Pb, TBT, DDTs, etc.
Eutrophication	Nutrients, dissolved gases, etc.	N, P, Si, Chl-a, O_2, C, etc.

EMODnet Chemistry

The challenge

High heterogeneity and complexity of data, given by:

- 14 groups of variables (e.g. fertilisers, marine litter, acidity) each containing multiple parameters, measurement and laboratory methods, instruments etc.;
- 3 matrices - water, sediment and biota;
- different temporal and spatial distributions of data;
- A great variety of EU organisations leading monitoring and research data;
- Heterogeneous data access policies.

The solution

The adoption of **SeaDataNet** services and standards as:

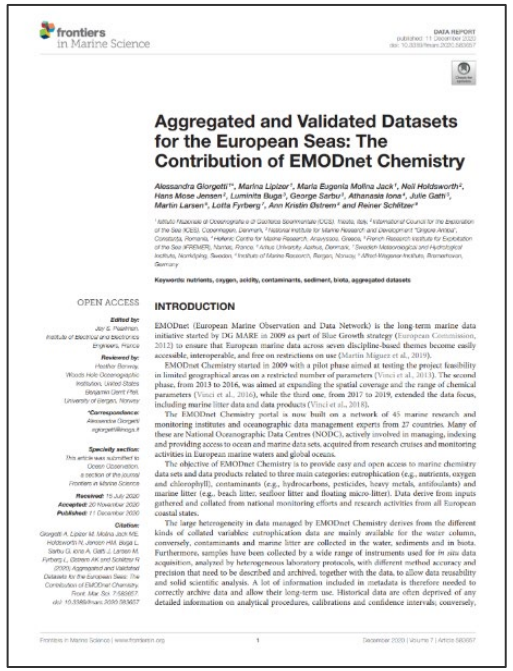
- Common Data Index (CDI) **metadata format** for data access;
- Common **Vocabularies** used in metadata and data formats;
- Common **data formats** used for delivering datasets (ODV and NetCDF);
- Common protocols for **data QC** and flag scales.

SeaDataNet
PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT

Extension of SeaDataNet standards to agreed needs such as:

- Testing the ability to handle more complex methodologies, e.g. protocols, algorithms, equations, etc.

EMODnet Chemistry data “Quality Control loop”



frontiers in Marine Science

DATA REPORT

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Aggregated and Validated Datasets for the European Seas: The Contribution of EMODnet Chemistry

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INTRODUCTION

EMODnet (European Marine Observation and Data Network) is the long-term marine data initiative started by DG MARE in 2009 as part of Blue Growth strategy (European Commission, 2012) to ensure that European marine data across seven discipline-based themes become easily accessible, interoperable, and free on restrictions on use (Martin Miguez et al., 2019).

EMODnet Chemistry started in 2009 with a pilot phase aimed at testing the project feasibility in limited geographical areas on a restricted number of parameters (Vinci et al., 2013). The second phase, from 2013 to 2016, was aimed at expanding the spatial coverage and the range of chemical parameters (Vinci et al., 2016), while the third one, from 2017 to 2019, extended the data focus, including marine litter data and data products (Vinci et al., 2018).

The EMODnet Chemistry portal is now built on a network of 45 marine research and monitoring institutes and oceanographic data management experts from 27 countries. Many of these are National Oceanographic Data Centres (NODC), actively involved in managing, indexing and providing access to ocean and marine data sets, acquired from research cruises and monitoring activities in European marine waters and global oceans.

The objective of EMODnet Chemistry is to provide easy and open access to marine chemistry data sets and data products related to three main categories: eutrophication (e.g., nutrients, oxygen and chlorophyll), contaminants (e.g., hydrocarbons, pesticides, heavy metals, antifoulants) and marine litter (e.g., beach litter, seafloor litter and floating micro-litter). Data derive from inputs gathered and collated from national monitoring efforts and research activities from all European coastal states.

The large heterogeneity in data managed by EMODnet Chemistry derives from the different kinds of collated variables: eutrophication data are mainly available for the water column, conversely, contaminants and marine litter are collected in the water, sediments and in biota. Furthermore, samples have been collected by a wide range of instruments used for *in situ* data acquisition, analyzed by heterogeneous laboratory protocols, with different method accuracy and precision that need to be described and archived, together with the data, to allow data reusability and solid scientific analysis. A lot of information included in metadata is therefore needed to correctly archive data and allow their long-term use. Historical data are often deprived of any detailed information on analytical procedures, calibrations and confidence intervals; conversely,

Data originators

Data managers (e.g. NODCs)

Data collection

Source data

Standardization

DOWNLOAD NEMO 1.7.0

Data standardization

Standardized datasets

Ocean Data View

https://odv.awi.de

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DOWNLOAD MIKADO

Standard metadata collection

DOWNLOAD OCTOPUS

Standardized formal quality control

Data aggregation & validation

Correction and update of official copy of data

Validation

Regional aggregated datasets

Feedbacks to data originators

- Data aggregation
- Parameter and units harmonization
- Regional Quality Control
- Harmonized Quality Flagging

Regional data products

Harmonized and QC Regional dataset

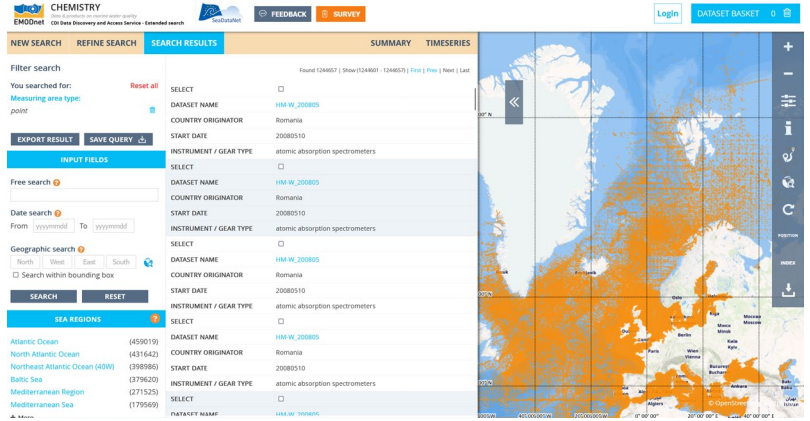
Data visualizations at regional scale

Regional Seas coordinators

EMODnet Chemistry: access to data and data products

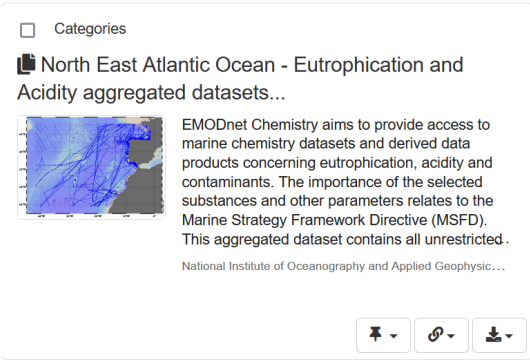
Data Discovery and access service

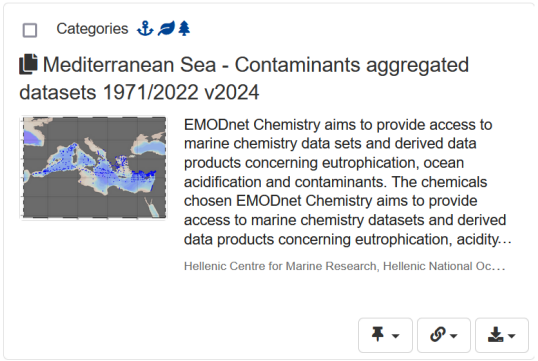
to browse measurement data sets, **as delivered by the originators**, in more detail, to narrow down queries and to download a selection of data sets.



Regional data collections

Data are harmonized, standardized, validated and made available **as regional** and global data **collections**.

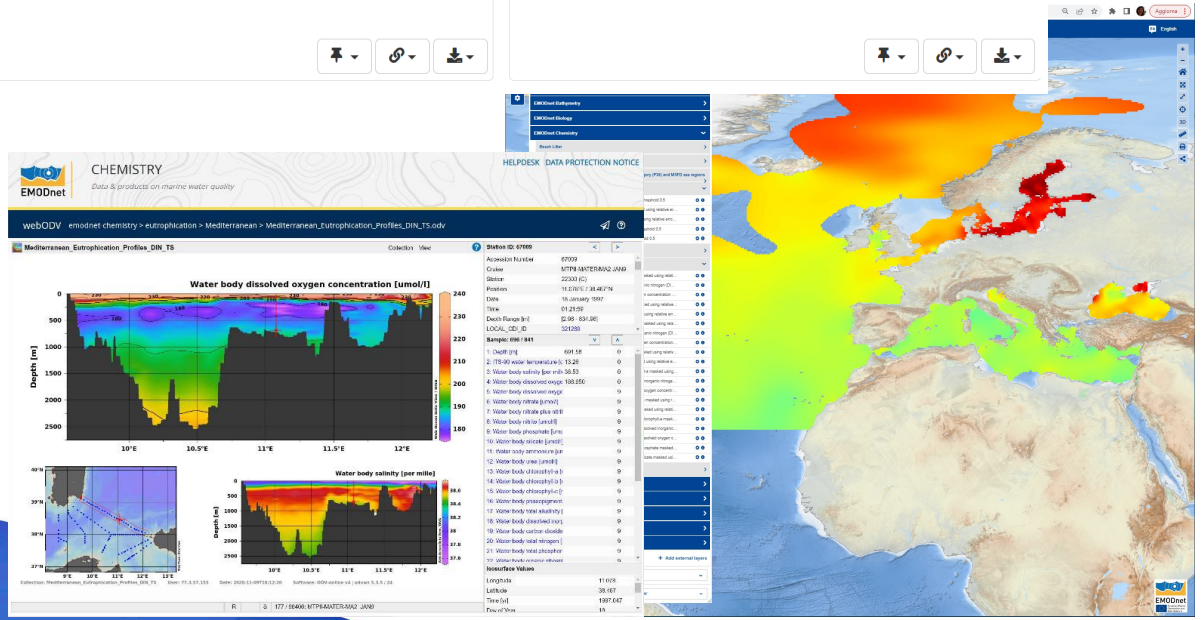




webODV Data Explorer and Extractor to create subsets, perform analyses, generate graphs, and download data

Map Viewer service

Multiple interactive thematic maps for contaminants and marine litter and gridded climatologies of eutrophication animated over 6 year classes



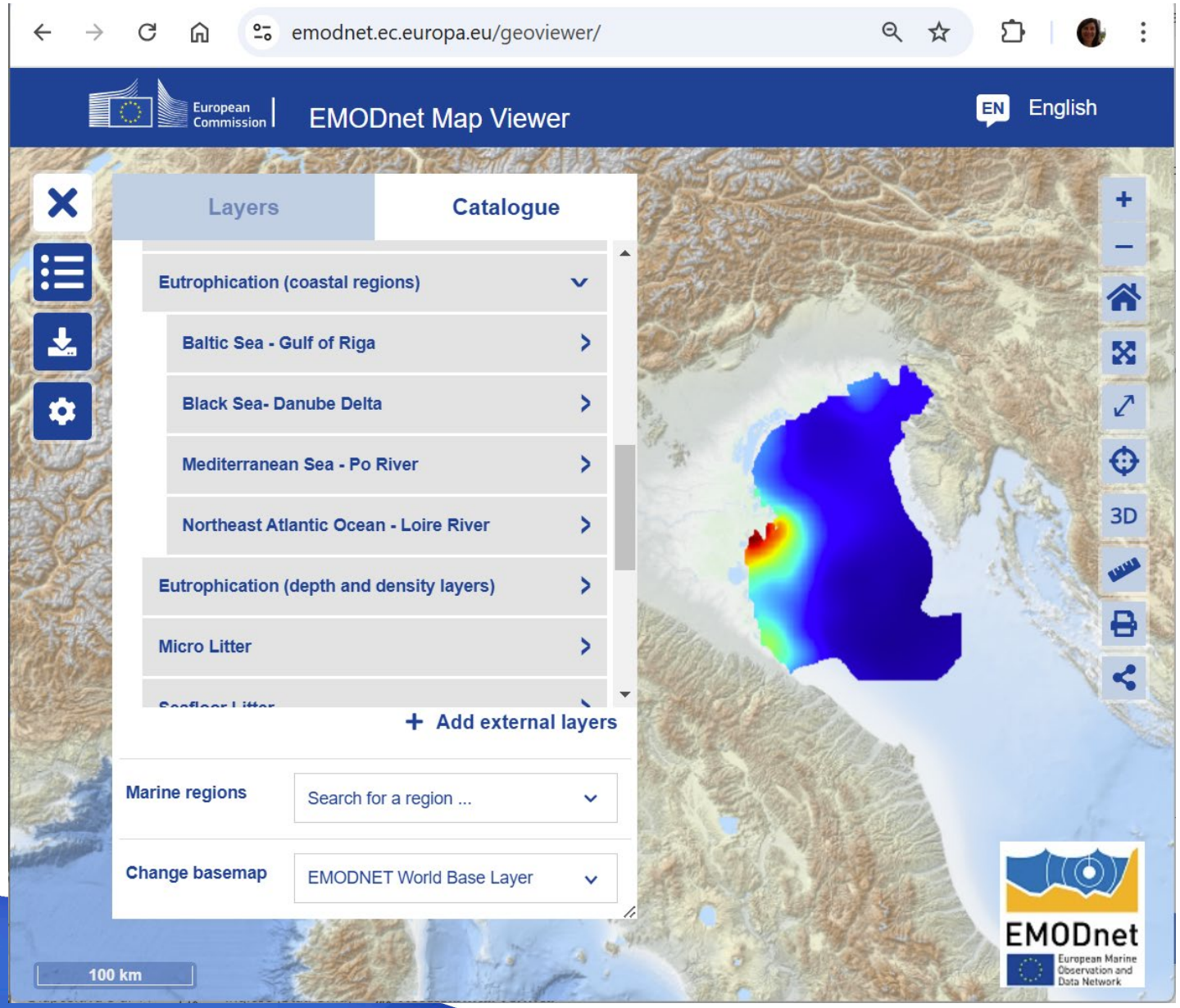
Products for river & requirements from the call

The synergy with Physics

- **Nutrient loads** (nitrates, phosphorus, others if available) to regional seas by major rivers (combined with river flows), whenever possible
- Special **higher resolution** efforts and **mass flows** at river mouths

- High-resolution **DIVA maps** for nutrients in the coastal zone / along the coast at mouths of major rivers are generated.
- The synergy with EMODnet Physics to strengthen data and information exchange

- The tender requests **mass flows at river mouth** (for major rivers) combining nutrients concentrations with river flows



Conclusion

Future perspective

EMODnet Physics provides operational (near real-time) in-situ river outflow data from European river stations

Portugal's good example of data delivery can be widely publicized

Can we extend data collection to chemical measurements when they are available?

How can real-time data be linked to EMODnet Chemistry?

What role can IH play?

EMODnet

European Marine Observation and Data Network

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Stay up-to-date with the latest news

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