IV Foro Internacional sobre Basuras Marinas y Economía Circular

IV International Forum on Marine Litter and Circular Economy

MARLICE 2026

Soluciones circulares para unos océanos limpios

Circular solutions for clean oceans

EMODnet Chemistry, the experience of ten years of marine litter data management to support the Marine Strategy Framework Directive (MSFD) descriptor 10 and the fruitful interaction with the MSFD Technical Group on Marine Litter (TG ML)

Opening presentation

Speaker: Matteo Vinci, National Institute of Oceanography and Applied Geophysics - OGS

OGS Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

EMODnet

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Outline

- Where are we now?
- EMODnet intro
- EMODnet Chemistry marine litter data management details
  - consolidated workflows
  - data quality
- Objectives and results of the work done
- Seafloor macrolitter from visual methods
- Conclusions, perspectives and challenges

Where are we now?

Different points of view, possible approaches…

“Begin ocean garbage cleanup immediately” Long, in 2023 in Science, about ocean surface garbage patches

Moving from symptom management to upstream plastics prevention: The fallacy of plastic cleanup technology; Bergman M. et al, 2023, One Earth

…but what about litter legacy?!...

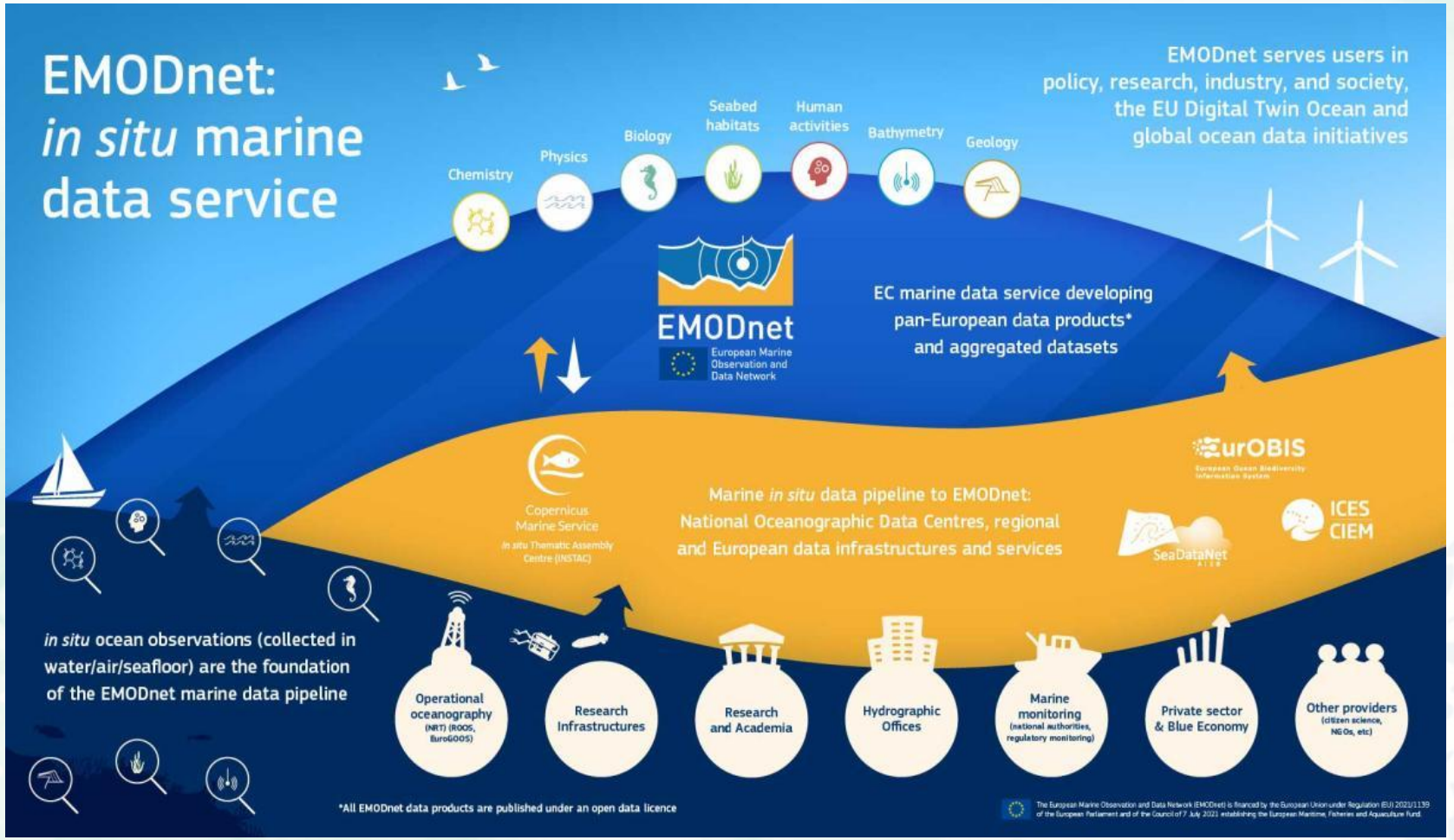
Where are we now?

…but there is a minimum common denominator…

In any case **we have to know as clear as possible what we are facing to plan suitable and feasible actions, we need reliable information about the phenomenon…**

…Here is where EMODnet Chemistry marine litter data management challenge started in 2016…

EMODnet - The European Marine Observation and Data Network



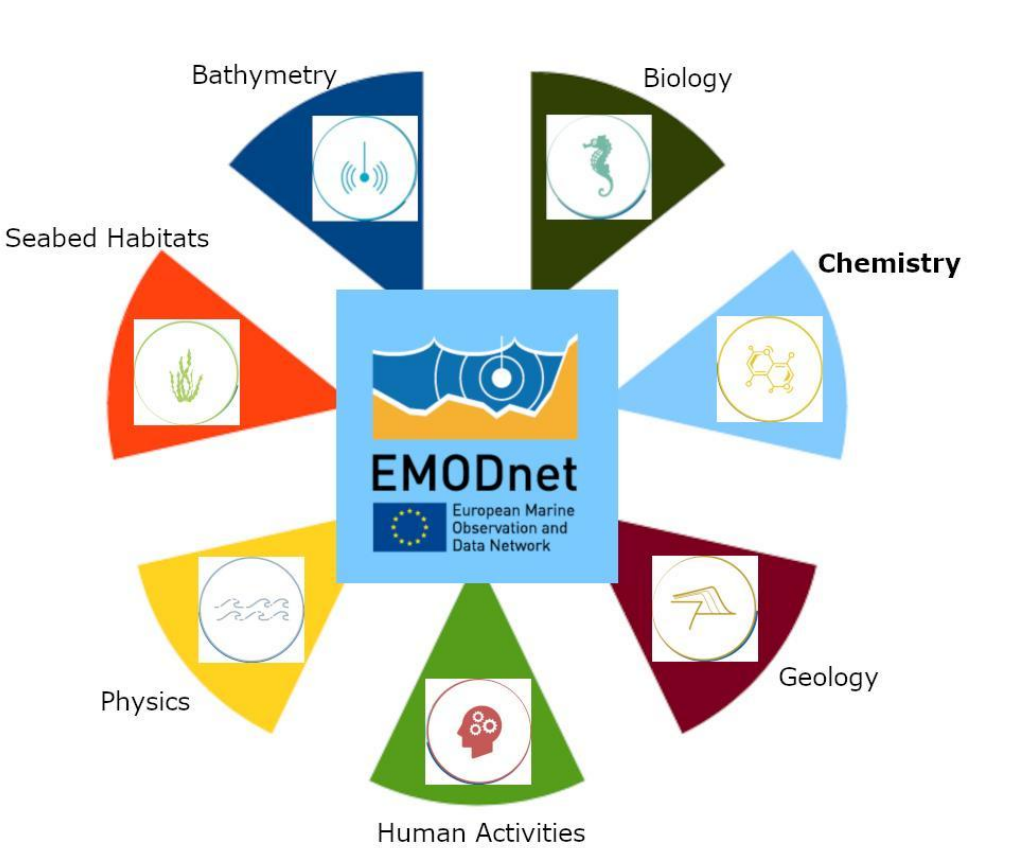
Funded by **Directorate-General for Maritime Affairs and Fisheries of the the European Commissio**n (EC DG MARE)

Initiated in **2009**, now with **vision to 2035**

Implemented by a network of > 120 **organisations working in synergy with national→regional→ and European marine data infrastructures**

to **provide easy and free access to marine data,** metadata and data products from **7 different domains**

EMODnet Chemistry

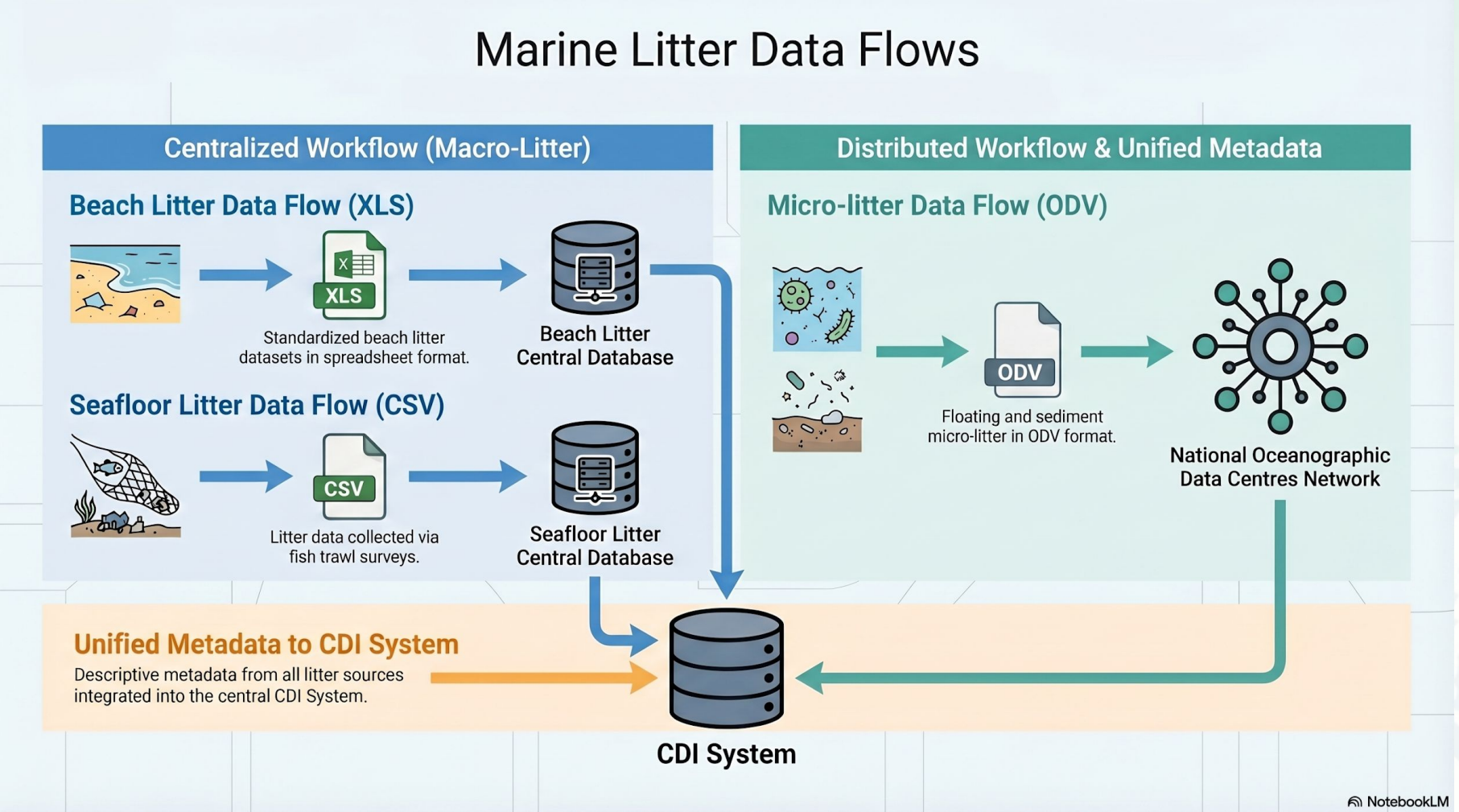


https://emodnet.ec.europa.eu/en/chemistry

	Group of Parameters	Parameters
Marine Litter	Beach macrolitter, Seafloor macrolitter, Floating and sediment microlitter	Composition, Abundance, etc.
Eutrophication	Nutrients, dissolved gases, etc.	N, P, Si, O_2, Chl-a, etc.
Contaminants	Hydrocarbons, Heavy metals, Pesticides, etc.	Anthracene, Fluoranthene, Me, Cd, Pb, TBT, DDTs, etc.

- **European thematic network of 41 organisations** (national oceanographic data centres, environmental monitoring agencies, expert institutes, international organisation)
- **Coordinated by OGS (Italy)**
- **500+ data originators**
- **Board of Experts** for interaction with EU JRC, EEA, DG Env and Regional Sea Conventions for feedback and refining data products and metadata
- **SeaDataNet** is used for managing and structuring metadata and data

Marine litter data consolidated workflows, agreed formats and their sources



Beach litter consolidated protocols (**OSPAR, UNEP, UNEP – Marlin, TG ML**)

Seafloor trawling consolidated protocols (**ICES, MEDITS, DeFishGear**)

Microlitter ascii format (Litter ODV)

Pillar/Lesson Learned: Agreed and harmonized formats and guidelines, based on: **consolidated communities, their best practices** and protocols **when available!**

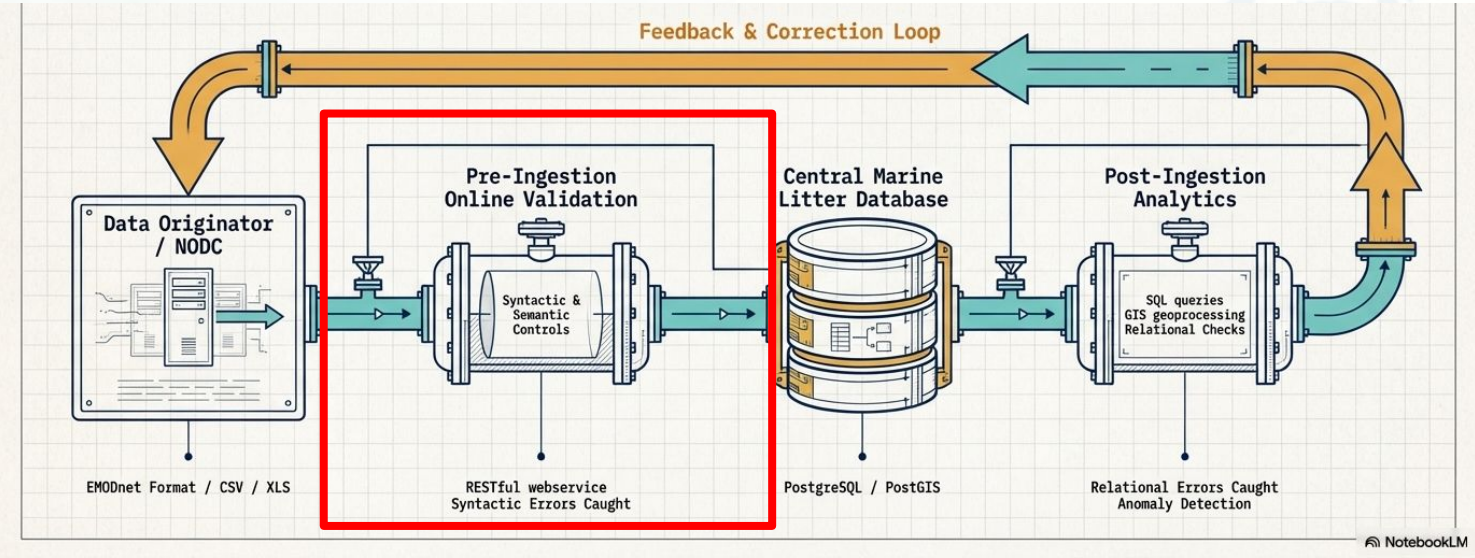
Beach, Seafloor and micro-Litter quality workflows (pre and post ingestion)

Pillar/Lesson Learned:

data validation to ensure the best possible data quality and reliability over time

- **pre-ingestion phase: streamlining** the data management workflow (**pre**- is **more efficient & safe** than **post**-)

- **Post-ingestion quality:**
  - ad hoc specific queries, Gis geo-processing
  - **data-products generation** workflow
  - **aggregated collections** generation



Post-ingestion quality workflows: products and aggregated collections

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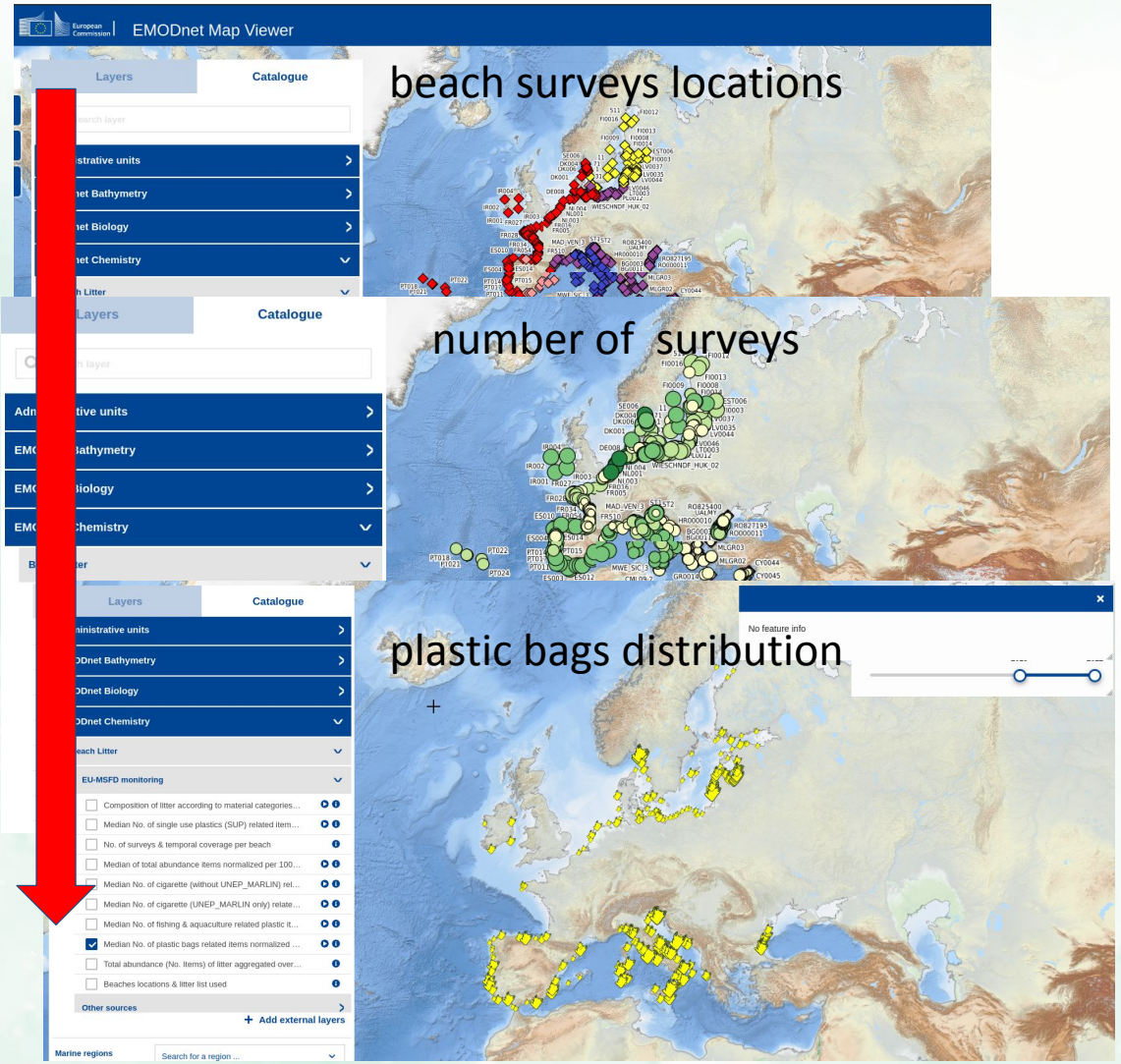
Beach macrolitter products



Aggregated data collections

EMODnet
European Marine Observation and Data Network

EMODnet Chemistry ERDDAP
Easier access to scientific data

EMODnet Chemistry ERDDAP

ERDDAP is a data server that gives you a simple, consistent way to download subsets of scientific datasets in common file formats and make graphs and maps. This particular ERDDAP installation has oceanographic data (for example, data from satellites and buoys).

Easier Access to Scientific Data

Our focus is on making it easier for you to get scientific data.

Different scientific communities have developed different types of data servers.

For example, OPeNDAP, WCS, SOS, OBIS, and countless custom web pages with forms. Each is great on its own. But without ERDDAP, it is difficult to get data from different types of servers:

- Different data servers make you format your data request in different ways.
- Different data servers return data in different formats, usually not the common file format that you want.
- Different datasets use different formats for time data, so the results are hard to compare.

ERDDAP unifies the different types of data servers so you have a consistent way to get the data you want, in the format you want.

- ERDDAP acts as a middleman between you and various remote data servers. When you request data from ERDDAP, ERDDAP reformats the request into the format required by the remote server, sends the request to the remote server, gets the data, reformats the data into the format that you requested, and sends the data to you. You no longer have to go to different data servers to get data from different datasets.
- ERDDAP offers an easy-to-use, consistent way to request data: via the OPeNDAP standard.
  Many datasets can also be accessed via ERDDAP's Web Map Service (WMS).
- ERDDAP returns data in the common file format of your choice. ERDDAP offers all data as .html table, ESRI .asc and .csv, Google Earth .kml, OPeNDAP binary, .mat, .nc, ODV .txt, .csv, .tsv, .json, and .xhtml. So you no longer have to waste time and effort reformatting data.
- ERDDAP can also return a .png or .pdf image with a customized graph or map.
- ERDDAP standardizes the dates+times in the results. Data from other data servers is hard to compare because the dates+times often are expressed in different formats (for example, "Jan 2, 2018", 02-JAN-2018, 1/2/18, 2/1/18, 2018-01-02, "days since Jan 1, 1900"). For string times, ERDDAP always uses the ISO 8601:2004(E) standard format, for example, 2018-01-02T00:00:00Z. For numeric times, ERDDAP always uses "seconds since 1970-01-01T00:00:00Z". ERDDAP always uses the Zulu (UTC, GMT) time zone to remove the difficulties of working with different time zones and standard time versus daylight saving time. ERDDAP has a service to convert a string time to/from a numeric time.
- ERDDAP has web pages (for humans with browsers) and RESTful web services (for computer programs). You can bypass ERDDAP's web pages and use ERDDAP's RESTful web services (for example, for searching for datasets, for downloading data, for making maps) directly from any computer program (for example, Matlab, R, or a program that you write) and even from web pages (via HTML image tags or JavaScript). You can also build other useful and interesting things on top of ERDDAP's web services — see the Awesome ERDDAP list of Awesome ERDDAP-related projects.

For a quick introduction to ERDDAP, watch the first half of this video. (5 minutes) In it, a scientist downloads ocean currents forecast data from ERDDAP to model a toxic spill in the ocean using NOAA's GNOME software (in 5 minutes!). Thanks to Rich Signell. (One tiny error in the video: when searching for datasets, don't use AND between search terms. It is implicit.)

Find out more about ERDDAP.

Data Providers: You can set up your own ERDDAP server and serve your own data.

Start Using ERDDAP: Search for Interesting Datasets

- **Do a Full Text Search for Datasets**

  Search

- **View a List of All 44 Datasets**
- **Search for Datasets by Category**

  Datasets can be categorized in different ways by the values of various metadata attributes. Click on an attribute (cdm_data_type, institution, ioos_category, keywords, long_name, standard_name, variableName) to see a list of categories (values) for that attribute. Then, you can click on a category to see a list of relevant datasets.
- **Search for Datasets with Advanced Search**
- **Search for Datasets by Protocol**

  Protocols are the standards which specify how to request data. Different protocols are appropriate for different types of data and for different client applications.

Protocol	Description
griddap datasets	Griddap lets you use the OPeNDAP hyperslab protocol to request data subsets, graphs, and maps from gridded datasets (for example, satellite data and climate model data). griddap documentation
tabledap datasets	Tabledap lets you use the OPeNDAP constraint/selection protocol to request data subsets, graphs, and maps from tabular datasets (for example, buoy data). tabledap documentation
"files" datasets	ERDDAP's "files" system lets you browse a virtual file system and download source data files. WARNING! The dataset's metadata and variable names in these source files may be different than elsewhere in ERDDAP! You might prefer using the dataset's Data Access Form instead. "files" documentation
WMS datasets	The Web Map Service (WMS) lets you request an image with data plotted on a map. WMS documentation

- **Developers of computer programs and JavaScripted web pages can search for datasets via**
  - ERDDAP's RESTful search services
  - ERDDAP's allDatasets tabular dataset that has a row of information for each dataset
  - ERDDAP's OpenSearch 1.1 Service

The data curation workflow and its results:

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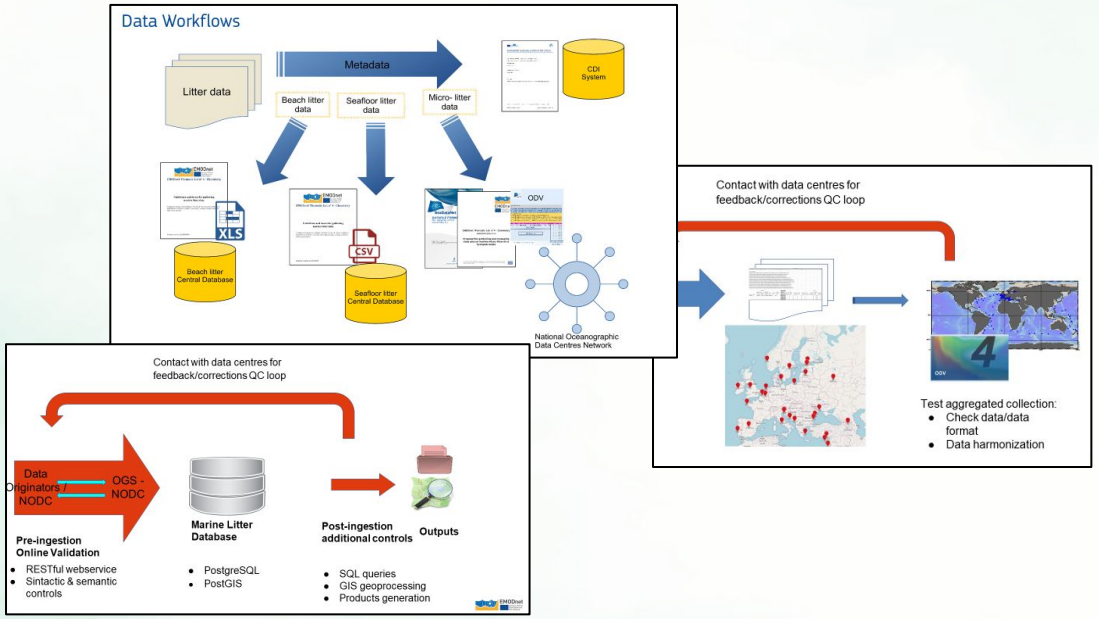
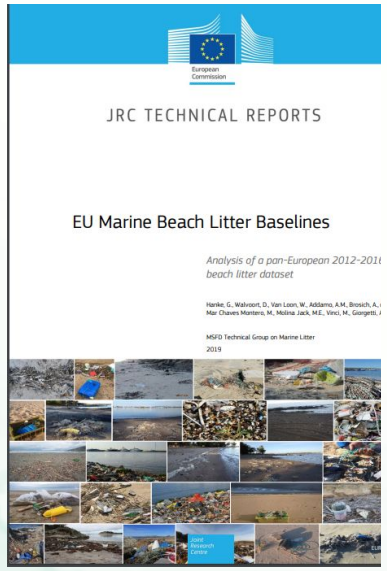
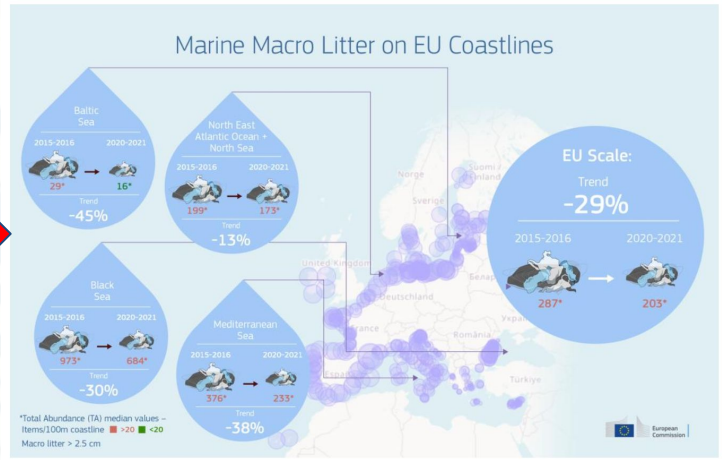


[Data products]:

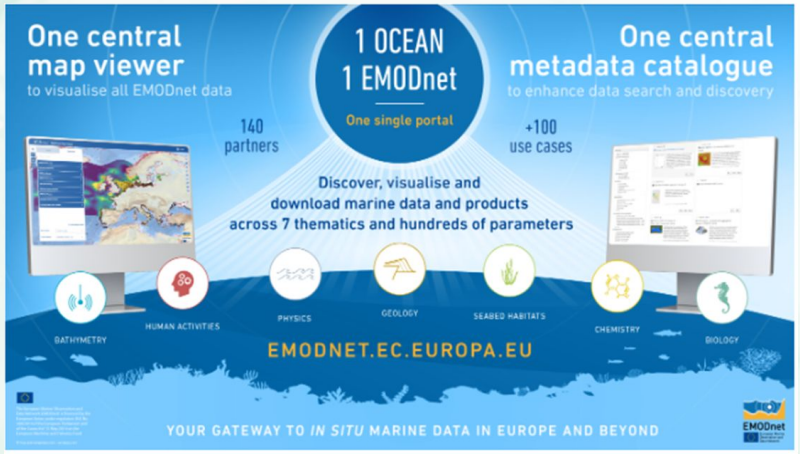
- [Harmonized and validated datasets]

with JRC and TGML from baselines to trends:





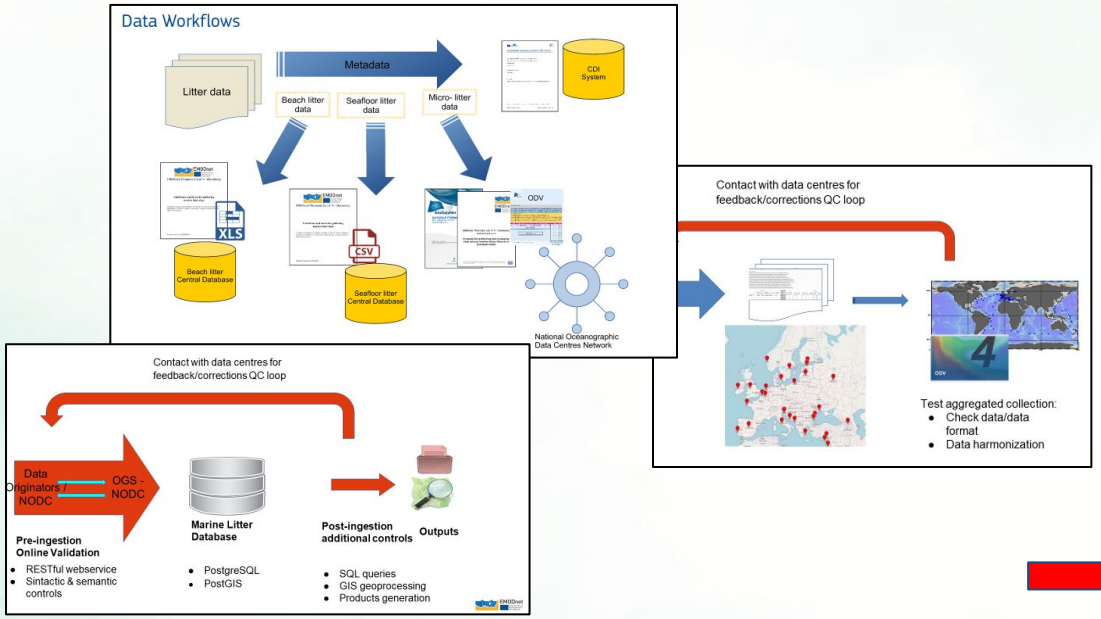
[European Coastline Macro Litter Trends 2015 - 2021]



https://emodnet.ec.europa.eu/

…ongoing work for seafloor trawls and microlitter

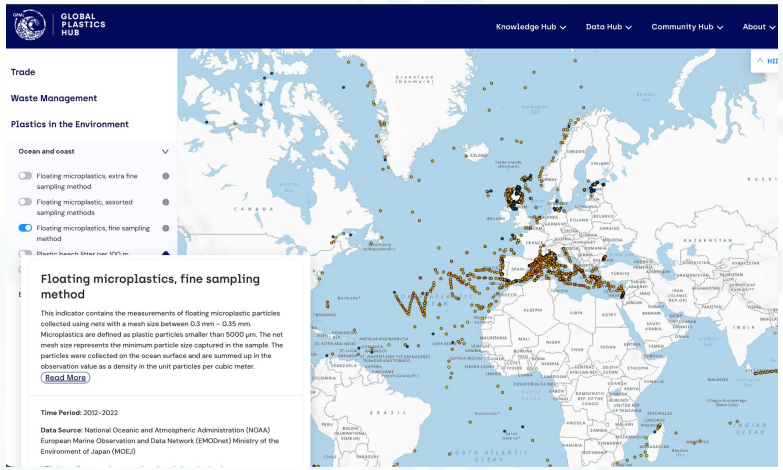
The data curation workflow and its results:



AOMI

Data products:

- Harmonized and validated datasets
- Visualization products at global scale



https://globalplasticshub.org/data/maps

Seafloor macrolitter from visual methods (images, videos and other observations [scuba])

- Thanks to **AWI international experts workshop 2018 and Oceanobs ‘19** conference

- **1st EMODnet Chemistry data management proposal, 2021**. Presented and accepted by the experts an stakeholders group (https://doi.org/10.6092/0de4df9b-0589-48bb-b620-8ebd70a40159)

- Several expert workshops organized by JRC: Catania WS 2023, Valencia TGML 2024, Shanghai WS 2024, further revisions in 2024 and 2025...last workshop Athens april 2026 **young and evolving topic**

- **Integrated monitoring approach** at **EU** but also **Global level** (visual methods + trawlings)

Seafloor macrolitter from visual methods (images, videos and other observations [scuba])

Present status:

- Data management proposal with **70 fields** (almost **+ 50** from 1st proposal!)
  - **Mandatory**: 34
  - **Not mandatory**:36
  - **CSV** data format recommended

- Data model based on **hierarchical levels propaedeutic for database implementation**:
  - Cruise⟶ Dive⟶ Transect⟶ Litter item/s

- Draft of **Database**, **validation** and **ingestion service**, **guidelines** and **data template to be further tested and upgraded**

- **Bottleneck: lack of annotated dataset to test the draft system**

- Proposal **initially tailored to Imaging method to be tested, updated and integrated with other visual methods as scuba divers**

Conclusions, perspectives and challenges

- Continue the **productive collaborations with JRC, EU-TGML and global stakeholders**
- Euroqcharm project experience and outcomes: “data management can **provide a harmonized common framework for data reporting but it cannot alone address the imbalance or heterogeneity due to non-comparable monitoring methods**”
- Working in **close connection with agreed official monitoring guidances**
- **Maintenance** and **improvement of** consolidated **workflows** (tools and guidelines)
- **Improving** the **automatic metadata/data** exchange **from and to** EMODnet Chemistry
- **Testing and upgrading the draft management system for seafloor macrolitter from images and videos and integrate it with other visual methods (scuba divers)**

"Everyone wants to save the world,
but no one wants to help mom do the dishes."
—P.J. O'Rourke

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European Marine Observation and Data Network

emodnet.ec.europa.eu

Stay up-to-date with the latest news

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.