



EMODnet



European Marine
Observation and
Data Network

Chemistry



Experiences on Data Collection in IT Platforms for Marine Environment: EMODnet Chemistry

Maria Eugenia Molina Jack - mmolinajack@ogs.it

Matteo Vinci - mvinci@ogs.it

Elena Partescano - epartescano@ogs.it

Alexia Cociancich - acociancich@ogs.it

Alessandro Altemburger - aaltenburger@ogs.it

Alessandra Giorgetti - agiorgetti@ogs.it

OGS, Italy

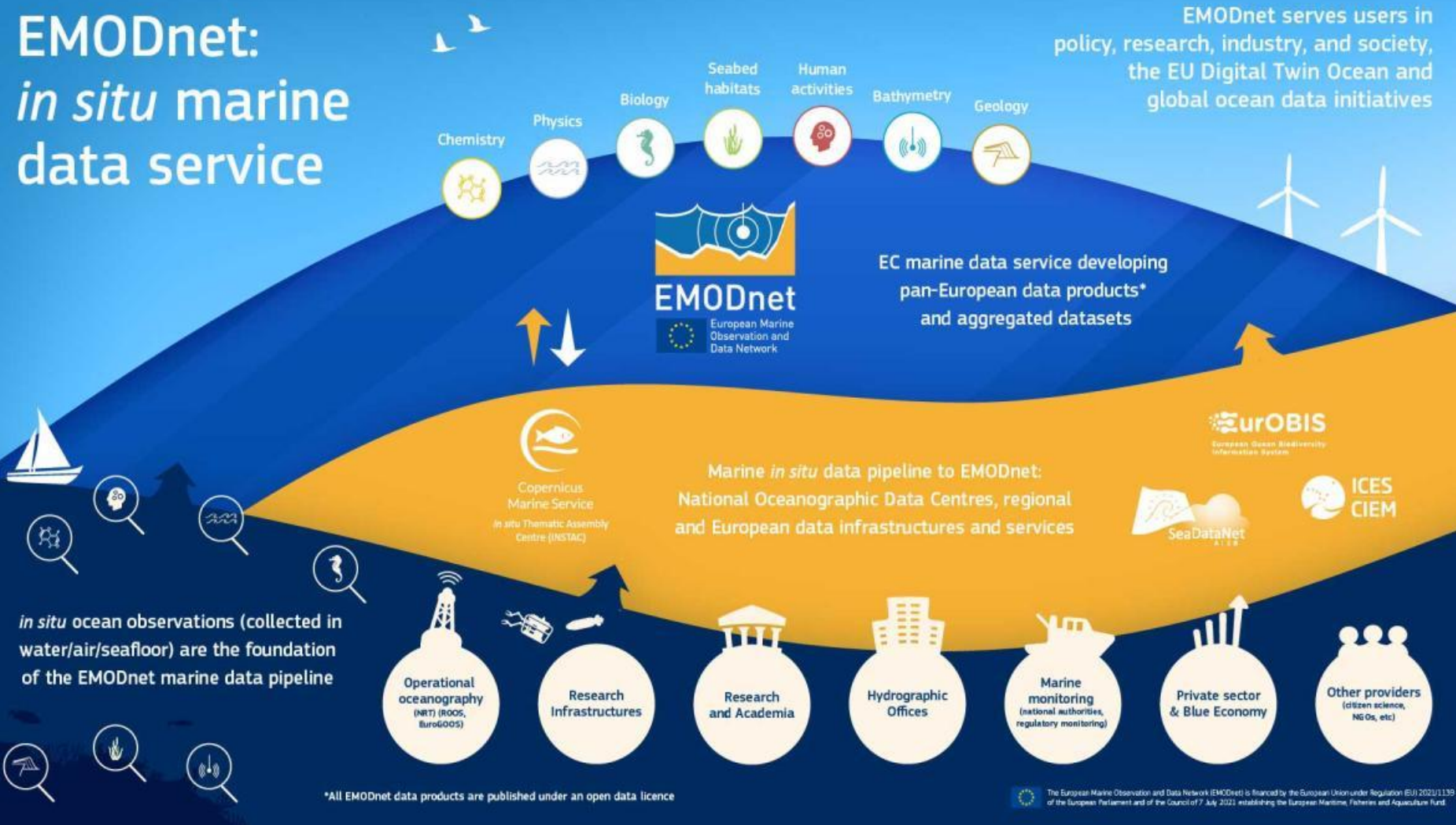
Interregional Meeting on the architecture and development of NUTEC
plastic database for marine microplastic monitoring”
29 Oct.-01 Nov 202, Vienna

EMODnet: your gateway to *in situ* marine data in Europe and beyond

The European Marine Observation and Data Network

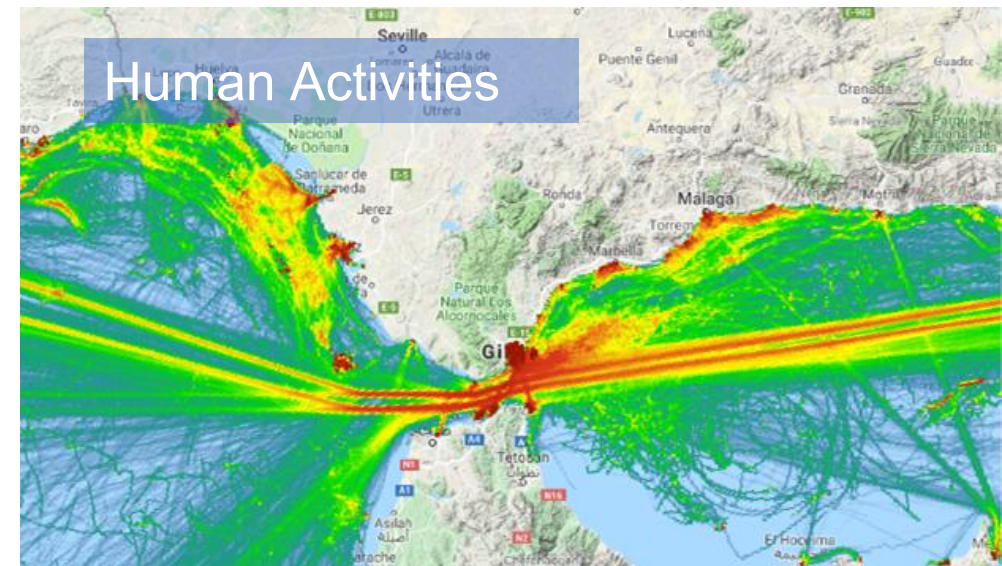
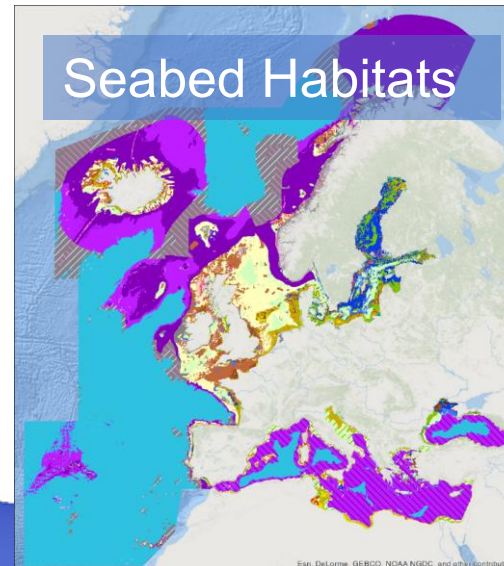
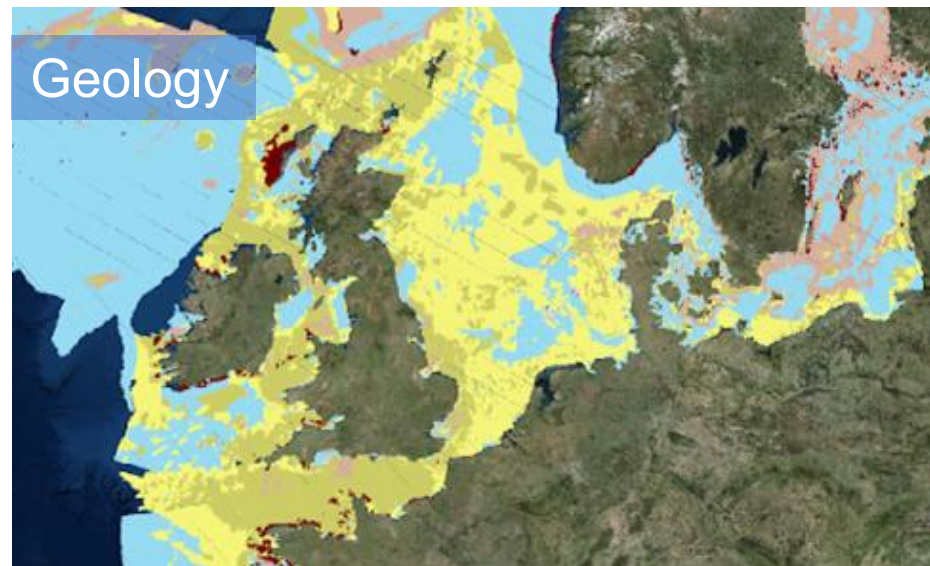
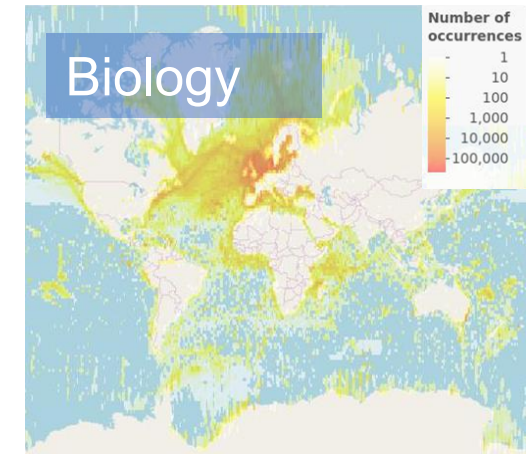
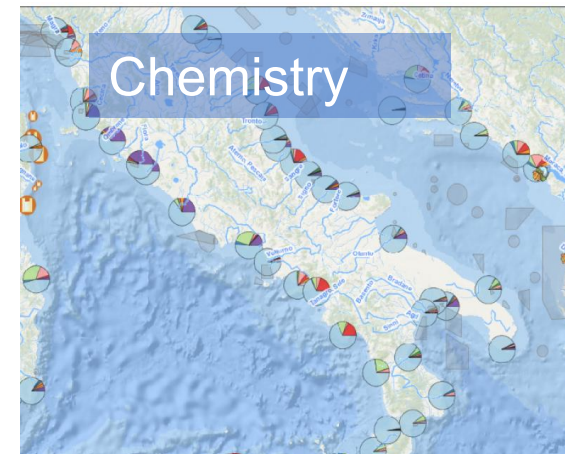
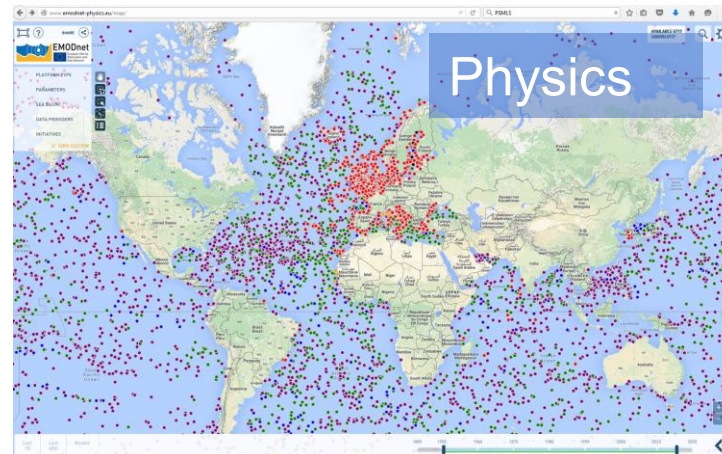
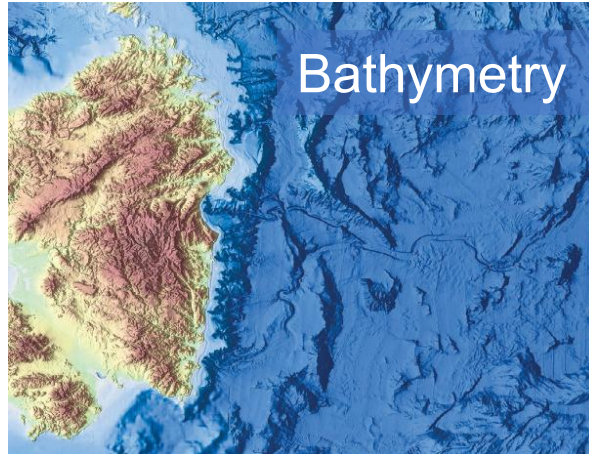


EMODnet: *in situ* marine data service



- Funded by Directorate-General for Maritime Affairs and Fisheries of the the European Commission (**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
- Provides **easy and free access** to marine data, metadata and data products from 7 different domains

EMODnet – 7 thematic areas and networks

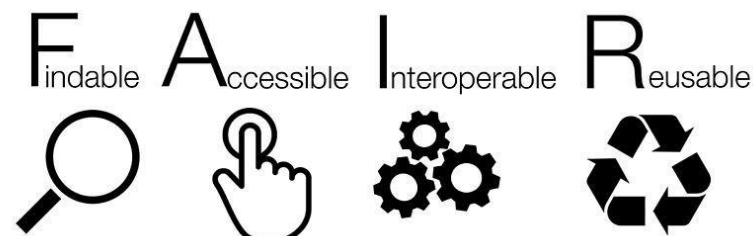
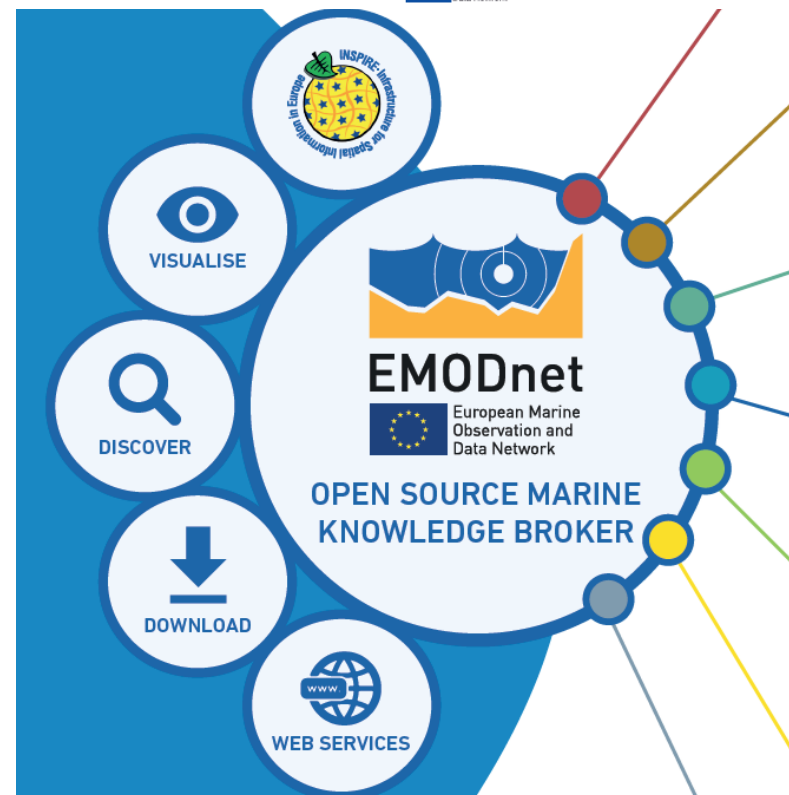


EMODnet added value

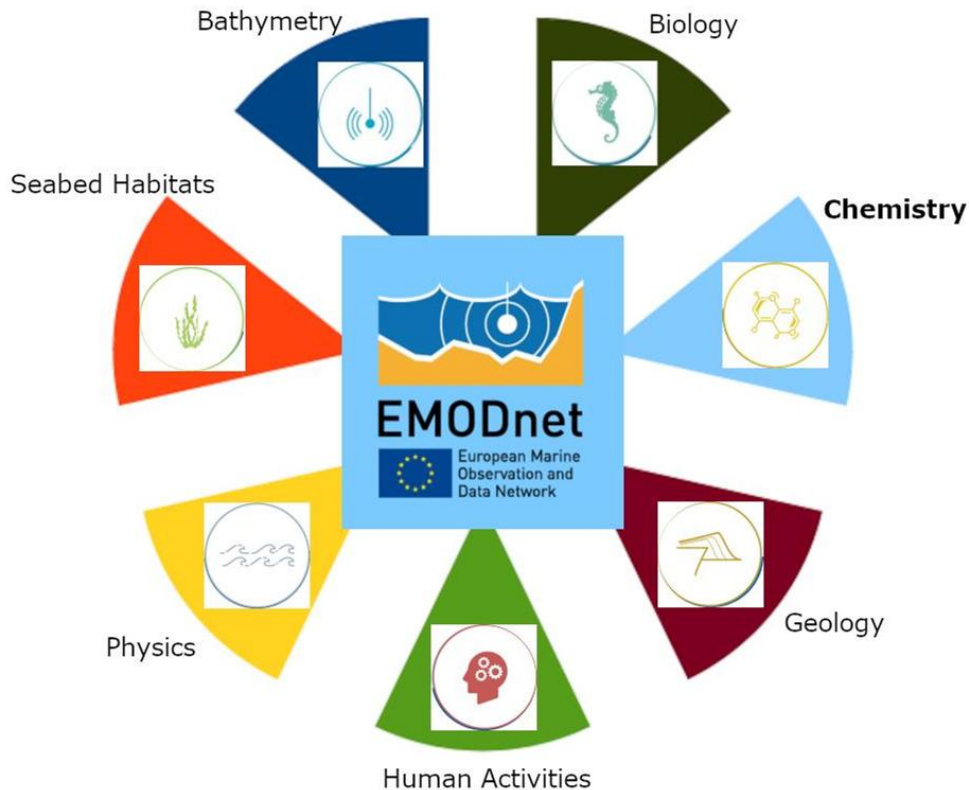
EMODnet provides **pan-European data layers and data products** with **standardised and harmonised data and metadata** offered via **data services and web services**

- In accordance with the European spatial data standards INSPIRE and the FAIR data principles
- Aggregated, harmonised multi-parameter data collections
- Integrated data products
- Centralised map viewer service
- Central catalogue for data products
- Open and free downloads with CC BY 4.0 licence
- Web services, e.g. OGC WMS, WFS, CSW services, ERDDAP and other APIs

From raw data to real-life applications



EMODnet Chemistry



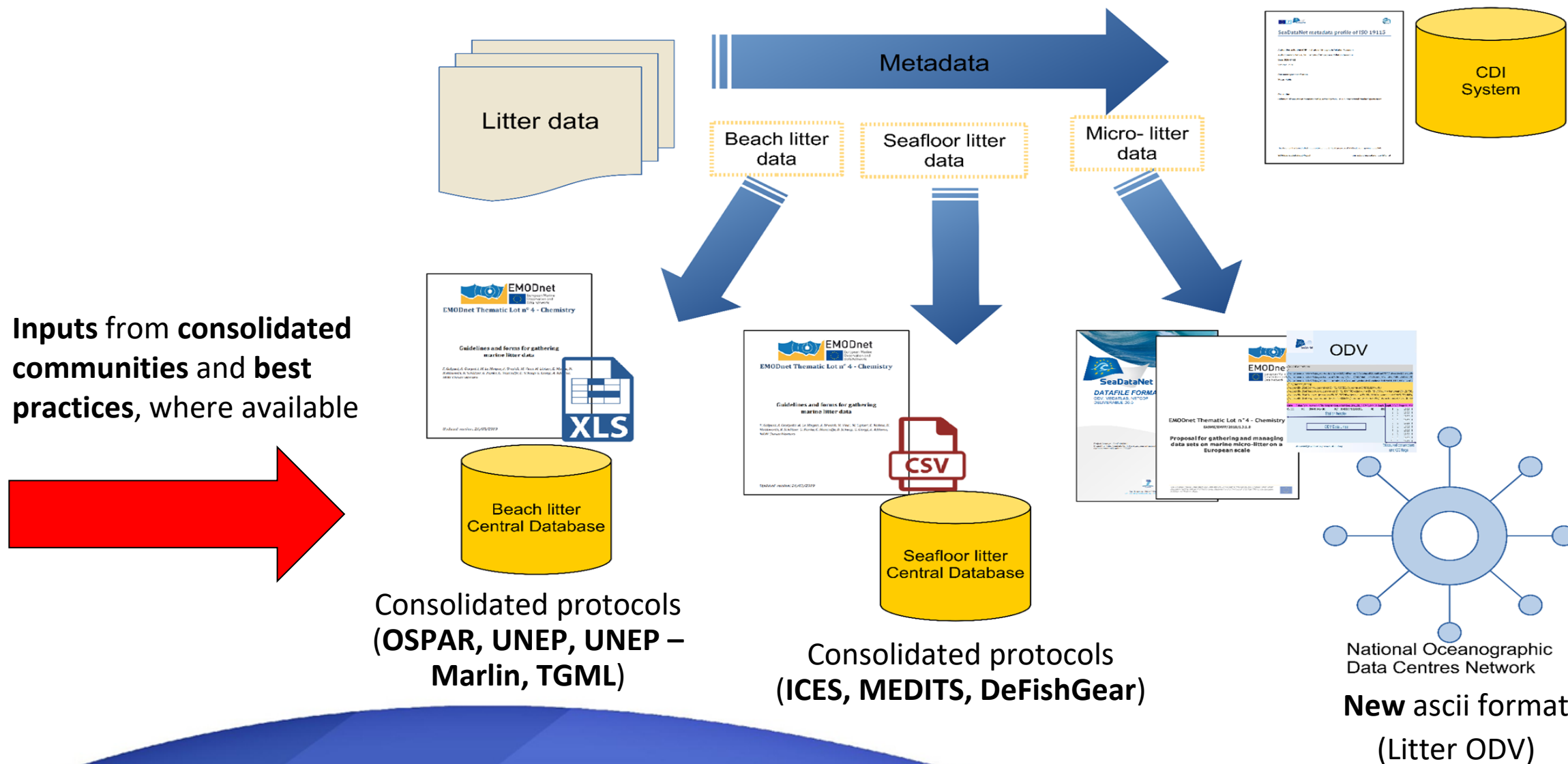
- **European thematic network of 44 organisations** (national oceanographic data centres, environmental monitoring agencies, expert institutes, international organisation)
- **Coordinated by OGS (Italy)**
- Data contributed by **66 data centres**
- **500+ data originators**
- **32 countries** around 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
- **SeaDataNet** is used for managing and structuring metadata and data

<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.

Marine litter data management

Consolidated workflows and data sources, agreed formats and guidelines

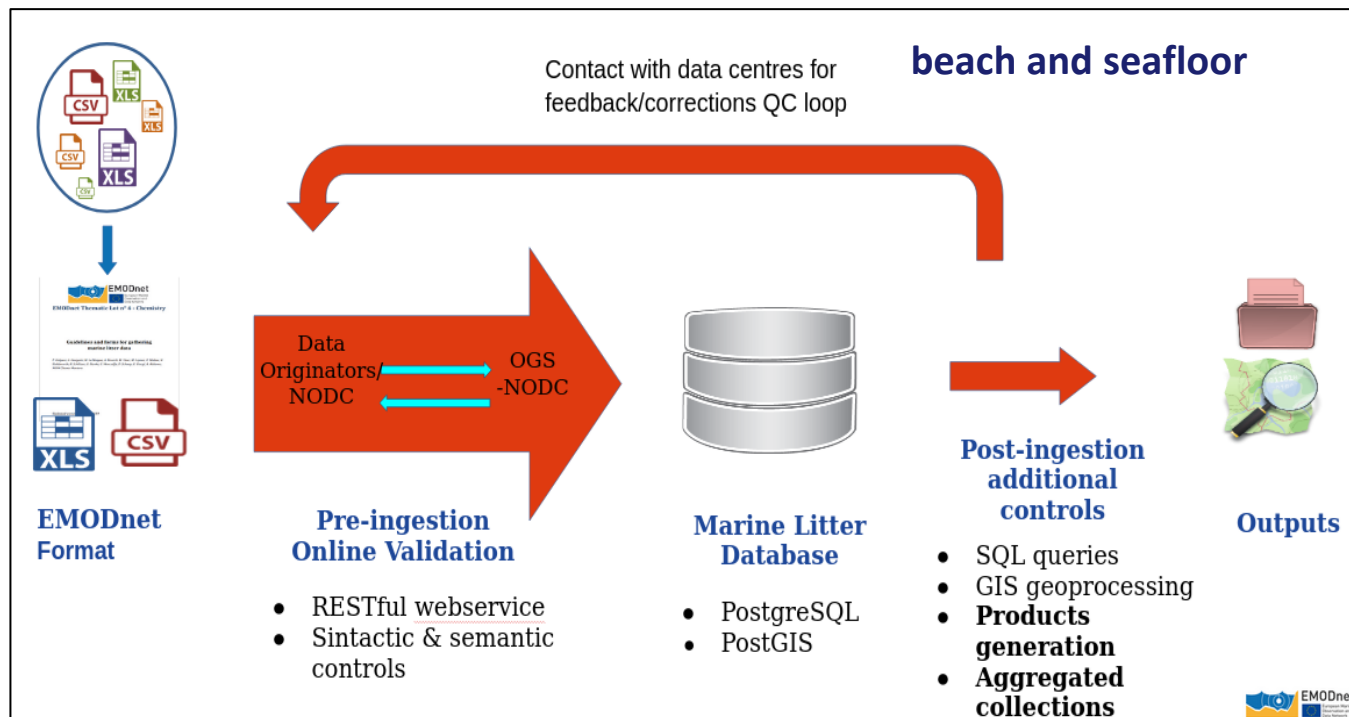


Adapted from Partescano et al., 2021.

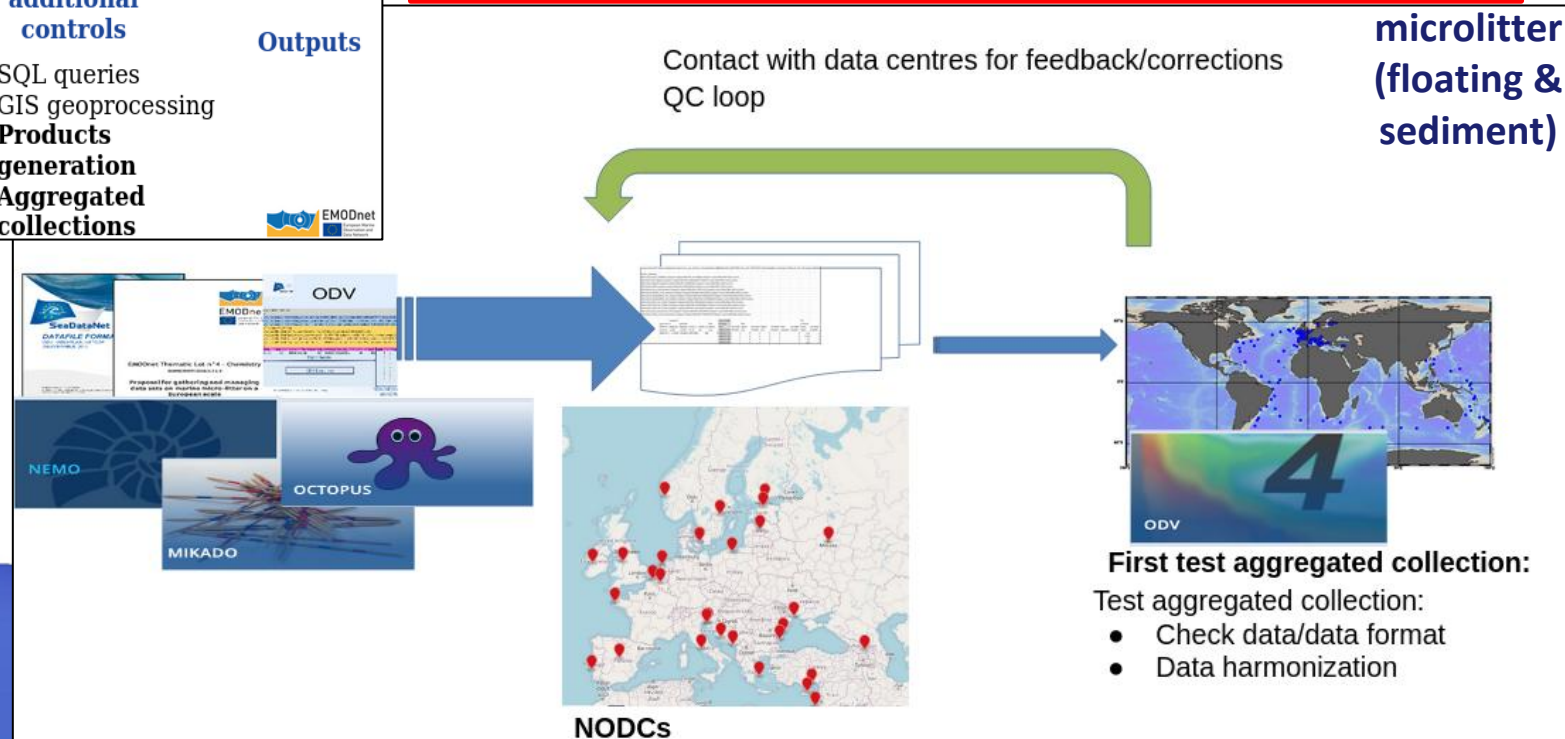
<https://doi.org/10.1016/j.marpolbul.2021.112965>

Loop for the quality of marine litter data

Quality checks before and after ingestion

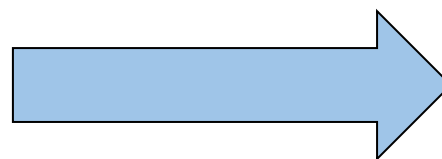


- **formatting** through **agreed guidelines**, formats and tools,
- strong **focus on the pre-ingestion validation** phase to streamline the workflow,
- continuous **updating** of validation tools,
- database **ingestion**,
- **post-ingestion** analysis and **additional QC**.

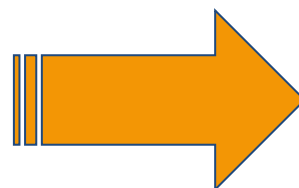


Marine litter data management

Consolidated data workflows from recognised organisations into EMODnet



OSPAR (beach litter) and ICES (seafloor litter from trawlings and micro-litter) maintain the data collection in their communities and **periodically** there is an **alignment** between the data in their systems and EMODnet



This avoids **duplication** of **efforts**

Loop for the quality of marine litter data

Focus on post-ingestion phase

Beach litter

beach surveys locations

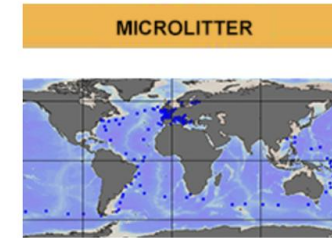
number of surveys

plastic bags distribution

Data Products Access



[Marine litter data collections of Beach Litter](#)



[Marine litter data collections of Micro Litter](#)



[Marine litter data collections of Seafloor Litter](#)

Access to aggregated datasets

- Using **SQL**, **Python**, **QGIS** as languages and tools
- **Correction of errors, gaps or anomalies** found in agreement with **data originators**
- **Improvement** of data products following **stakeholders feedback**
- Working on the **automatic delivery** of aggregated datasets through ERDDAP

Micro-litter data formats

Background

- In 2017, micro-litter data management was fragmented and heterogeneous
- Background formats and templates:
 - Strongly based on MSFD Technical Group on Marine Litter
 - Regional Sea Conventions formats and templates (UNEP)
 - Additional formats and existing examples (e.g. CEFAS, DeFishGear...)

Size	Record size of each item. Minimum resolution is to allocate in to bin sizes of 100 µm
Type	Plastic fragments, pellets, filaments, plastic films, foamed plastic, granules, and styrofoam
Shape	For pellets: cylindrical, disks, flat, ovoid, spheruloids; For fragments: rounded, subrounded, subangular, angular; For general- irregular, elongated, degraded, rough, and broken edges
Colour	Transparent, crystalline, white, clear-white-cream, red, orange, blue, opaque, black, grey, brown, green, pink, tan, yellow

Table 9: Categories used to describe microplastics appearance

CATEGORIES FOR MICROPARTICLES	
Material	Description
Plastic	Plastic fragments rounded
	Plastic fragments subrounded
	Plastic fragments subangular
	Plastic fragments angular
	cylindrical pellets
	disks pellets
	flat pellets
	ovoid pellets
	spheruloids pellets
	filaments
	plastic films
	foamed plastic
	granules
	styrofoam

Micro-litter data formats

Floating and sediment microlitter data

Metadata description:

Common Data Index

- xml profile
- who, where, when, what, ...?)

Data (litter-ODV)

- Specific ODV format (ascii)
- Specific data formatting guidelines



Mandatory: crucial for monitoring and assessment purposes



Optional: useful to describe datasets but not fundamental

Metadata and data are both described by lists of internationally agreed and regularly reviewed terms managed in Common Vocabularies

Micro-litter metadata

Common Data Index: who, where, when, what, how

- Data originator institution
- Collator institution
- Project
- Parameters measured
- Instrument used
- Data policy
- Spatial and temporal coordinates



DISCOVERY PARAMETER ?	
Micro-litter in water bodies	(1842)
Micro-litter in sediments	(76)

DATA ORIGINATOR COUNTRY
Estonia
Finland
France
Germany
Greece
Italy
Latvia
Slovenia
Spain
Sweden
Switzerland
Turkey

Per Year	Datasets
2023	12
2022	55
2021	50
2020	89
2019	401
2018	429
2017	374
2016	330
2015	174
2014	65
2013	25
2012	5
2011	4



Micro-litter data format

Floating micro-litter

- **Mandatory data** (min-max depth, start coordinates, distance, net-opening, mesh-size, type, size & count)
- **Additional information:** end coordinates, weight, color, meteorological conditions...

Label/column header in datafile	Conceptid	Use	Comments
Cruise		mandatory (ODV Default)	The suggestion is to use type "B". From manual: 'B' for bottle profile data. For time series and trajectories set to 'B' for small (<250) row groups Start date/time. Format must be adapted to the date value (for example YYYY-MM-DDThh:mm is second are not available) start point coordinates. start point coordinates. EDMO_CODE of the data centre distributing the data (the one connected to the CDI service) Field empty if no data
Station		mandatory (ODV Default)	
Type		mandatory (ODV Default)	
YYYY-MM-DDThh:mm:ss.sss		mandatory (ODV Default)	
Longitude [degrees_east]		mandatory (ODV Default)	
Latitude [degrees_north]		mandatory (ODV Default)	
LOCAL_CDI_ID		mandatory (ODV Default)	
EDMO_code		mandatory (ODV Default)	The amount of effort expended during an Event. It can be the survey distance from the beginning point in kilometres or a filtered volume in litres Net opening of the instruments used. This information is needed for the calculation of the covered surface in cm. (e.g. diameter of the Ocean Pack RACE filtering "cakes" or bongo/manta net opening) Mesh size of the filtering surface (e.g. manta or bongo net, filtering "cakes" of OceanPack RACE,...) in micrometres Type of the item (H01 SDN vocabulary) Size classes (H03 SDN vocabulary) Number of items collected. It's the official mandate from MSFD to provide the count of collected microplastics
Bot. Depth [m]		mandatory (ODV Default)	
MinimumObservationDepth [m]	MINWDIST	mandatory in ODV microlitter	
MaximumObservationDepth [m]	MAXWDIST	mandatory in ODV microlitter	
SampleID:INDEXED_TEXT	SAMPID01	mandatory in ODV microlitter	
SamplingEffort [Km or L]	LENTACK/ VOLWBSMP	mandatory in ODV microlitter	
Net_opening [cm]	MTHWDTH1	mandatory in ODV microlitter	
Mesh_size [micrometres]	MSHSIZE1	mandatory in ODV microlitter	
Microlitter_Type:INDEXED_TEXT	MLITTPW	mandatory in ODV microlitter	
Microlitter_Size:INDEXED_TEXT	MLITSIZW	mandatory in ODV microlitter	
Microlitter_Count [Dimensionless]	MLITCNTW	mandatory in ODV microlitter	
EventEndDateTime [YYYY-MM-DDThh:mm:ss.sss]	ENDX8601	additional/optionnal	End date/time
EventEndLongitude [degrees_east]	ENDXXLON	additional/optionnal	End point coordinates. Either End Lat/Lon or SamplingEffort are mandatory.
EventEndLatitude [degrees_north]	ENDXXLAT	additional/optionnal	End point coordinates. Either End Lat/Lon or distance are mandatory.
Microlitter_Weight [g]	MLDWWD01	additional/optionnal	Weight of the collected items, not mandatory Information in grams
Microlitter_Shape:INDEXED_TEXT	MLITSHPW	additional/optionnal	Shape of the item (H02 SDN vocabulary)
Microlitter_Color:INDEXED_TEXT	MLITCOLW	additional/optionnal	Colour classes (H04 SDN vocabulary)
Microlitter_Polymer_type:INDEXED_TEXT	MLITPOLW	additional/optionnal	Polymer type of the micro-litter (H05 SDN vocabulary)
WMO_Sea_State [Dimensionless]	WMOCSSXX	additional/optionnal	Sea conditions following the Douglas scale
Wind_direction [degT]	EWDAZZ01	additional/optionnal	Direction relative to true north from which the wind is blowing
Wind_speed [m/s]	EWSBZZ01	additional/optionnal	Sustained speed of the wind (distance moved per unit time by a parcel of air) parallel to the ground at a given place and time.

Micro-litter data format

Micro-litter in sediment

- **Mandatory data:** sampling depth, sampling effort, type, size & count)
- **Additional information:** sediment characteristics, sample id, weight, color, transparency...

Label/column header in datafile	Conceptid	Use	Comments
Cruise		metadata/mandatory (ODV Default)	
Station		metadata/mandatory (ODV Default)	
Type		metadata/mandatory (ODV Default)	The suggestion is to use type "B". From manual: 'B' for bottle profile data. For time series and trajectories set to 'B' for small (<250) row groups
YYYY-MM-DDThh:mm:ss.sss		metadata/mandatory (ODV Default)	Start date/time. Format must be adapted to the date value (for example YYYY-MM-DDThh:mm is second are not available)
Longitude [degrees_east]		metadata/mandatory (ODV Default)	point coordinates.
Latitude [degrees_north]		metadata/mandatory (ODV Default)	point coordinates.
LOCAL_CDI_ID		metadata/mandatory (ODV Default)	
EDMO_code		metadata/mandatory (ODV Default)	EDMO_CODE of the data centre distributing the data (the one connected to the CDI service)
Bot. Depth [m]		metadata/mandatory (ODV Default)	Field empty if no data
COREDIST [m]	COREDIST	primary variable/mandatory (ODV default)	The depth of the sampling point below the seafloor
MINCDIST [m]	MINCDIST	strongly recommended	The distance between the top of a core sample and the seabed.
MAXCDIST [m]	MAXCDIST	strongly recommended	The distance between the base of a core sample and the seabed. For an unsegmented core with its top coincident with the bed this is equivalent to the core length.
SampleID:INDEXED_TEXT	SAMPLEID01	strongly recommended when available	Sample identification
SamplingEffort [m² or kg...]	AREABEDS NEWCXX02 PEWCXX02 VOLSEDSM	mandatory	The amount of sampled sediment. It can be the survey area in m², the wet weight (ww) of the sample in kg, the dry weight (dw) of sediment in kg or the volume in litres
Proportion_sand_size_particles [%]	SANDZZZZ	additional/optional	The proportion of sand-size particles in the sample
Proportion_clay_size_particles [%]	CLAYZZZZ	additional/optional	The proportion of clay-size particles in the sample
Proportion_organic_mater [%]	STTMUBS	additional/optional	Concentration of total organic matter in the sample
Proportion_silt_size_particles [%]	SYLTZZZZ	additional/optional	The proportion of silt-size particles in the sample
Water_sample_content [%]	WCWTDPRXX	additional/optional	Water content in the sample. Allows comparability between dw/ww samples
ML_Type:INDEXED_TEXT	MLUTTPS	mandatory	Type of microlitter (H01)
Microlitter_Count [Dimensionless]	MLUTCNTS	mandatory	Number of items collected. It's the official mandate from MSFD to provide the count of collected microplastics
Microlitter_Weight [g]	MLDWSD01	additional/optional	Weight of the collected items, not mandatory Information in grams
Microlitter_Size:INDEXED_TEXT	MLUTSIZS	mandatory	Size classes (H03 SDN vocabulary)
Microlitter_Shape:INDEXED_TEXT	MLUTSHPS	additional/optional	Shape of the item (H02 SDN vocabulary)
Microlitter_Color:INDEXED_TEXT	MLUTCOLS	additional/optional	Colour classes (H04 SDN vocabulary)
Microlitter_Transparency:INDEXED_TEXT	MLUTROPS	additional/optional	Transparency classes (H06 SDN vocabulary)
Microlitter_Polymer_type:INDEXED_TEXT	MLUTPOLS	additional/optional	Polymer type of the micro-litter (H05 SDN vocabulary)

Micro-litter data format

03448169_ODV_V0.txt

```
//<sdn_reference xlink:href="https://cdi.seadatanet.org/report/edmo/713/MLS2021_125/v0/xml" xlink:role="isDescribedBy" xlink:type="SDN:L23::CDI" sdn:scope="713:MLS2021_125" />
//Reported microlitter type of microplastic items includes any shapes and types of microplastic fragments/particles e.g. pellets, films, foams etc., it does not include any kind of thread-like particles. Reported microlitter
type of filaments includes any kind of thread-like microplastic particles.
//
//SDN_parameter_mapping
//<subject>SDN:LOCAL:COREDIST</subject><object>SDN:P01::COREDIST</object><units>SDN:P06::ULCM</units>
//<subject>SDN:LOCAL:MINCDIST</subject><object>SDN:P01::MINCDIST</object><units>SDN:P06::ULCM</units>
//<subject>SDN:LOCAL:MAXCDIST</subject><object>SDN:P01::MAXCDIST</object><units>SDN:P06::ULCM</units>
//<subject>SDN:LOCAL:SampleID</subject><object>SDN:P01::SAMPID01</object><units>SDN:P06::XXXX</units>
//<subject>SDN:LOCAL:SamplingEffort</subject><object>SDN:P01::VOLSEDSM</object><units>SDN:P06::UGRM</units>
//<subject>SDN:LOCAL:Microlitter_Type</subject><object>SDN:P01::MLITTYPS</object><units>SDN:P06::XXXX</units><instrument>SDN:L22::TOOL1285</instrument>
//<subject>SDN:LOCAL:Microlitter_Count</subject><object>SDN:P01::MLITCNTS</object><units>SDN:P06::UUUU</units><instrument>SDN:L22::TOOL1285</instrument>
//<subject>SDN:LOCAL:Microlitter_Size</subject><object>SDN:P01::MLITSIZS</object><units>SDN:P06::XXXX</units><instrument>SDN:L22::TOOL1285</instrument>
//<subject>SDN:LOCAL:Microlitter_Color</subject><object>SDN:P01::MLITCOLS</object><units>SDN:P06::XXXX</units><instrument>SDN:L22::TOOL1285</instrument>
//
Cruise Station Type yyyymm-ddThh:mm:ss.sss Longitude [degrees_east] Latitude [degrees_north] LOCAL_CDI_ID EDMO_code Bot. Depth [m] COREDIST [cm] QV:SEADATANET MINCDIST [cm] QV:SEADATANET
MAXCDIST [cm] QV:SEADATANET SampleID:INDEXED_TEXT QV:SEADATANET SamplingEffort [g] QV:SEADATANET Microlitter_Type:INDEXED_TEXT QV:SEADATANET Microlitter_Count [Dimensionless] QV:SEADATANET
Microlitter Size:INDEXED_TEXT QV:SEADATANET Microlitter_Color:INDEXED_TEXT QV:SEADATANET
2021_009 125 8 2021-09-01T00:00:00.000 23.3999 58.1978 MLS2021_125 713 25 5 1 0 1 5 1 MPS202105 1 100 1 SDN:H01::H0100001 (microplastic
items) 1 1 1 SDN:H03::H0300018 (100-299um) 1 SDN:H04::H0400001 (black/grey) 1
SDN:H03::H0300018 (100-299um) 1 SDN:H04::H0400004 (white/cream) 1
SDN:H03::H0300018 (100-299um) 1 SDN:H04::H0400002 (blue/green) 1
SDN:H03::H0300018 (100-299um) 1 SDN:H04::H0400006 (orange/pink/red) 1
SDN:H03::H0300018 (100-299um) 1 SDN:H04::H0400005 (yellow) 1
SDN:H03::H0300018 (100-299um) 1 SDN:H04::H0400003 (brown/tan) 1
SDN:H03::H0300018 (100-299um) 1 SDN:H04::H06AA001 (transparent/translucent) 1
SDN:H03::H0300018 (100-299um) 1 SDN:H04::H0400008 (multicolour/gold/silver) 1
SDN:H03::H0300005 (300um-1mm) 1 SDN:H04::H0400001 (black/grey) 1
SDN:H03::H0300005 (300um-1mm) 1 SDN:H04::H0400004 (white/cream) 1
SDN:H03::H0300005 (300um-1mm) 1 SDN:H04::H0400002 (blue/green) 1
```

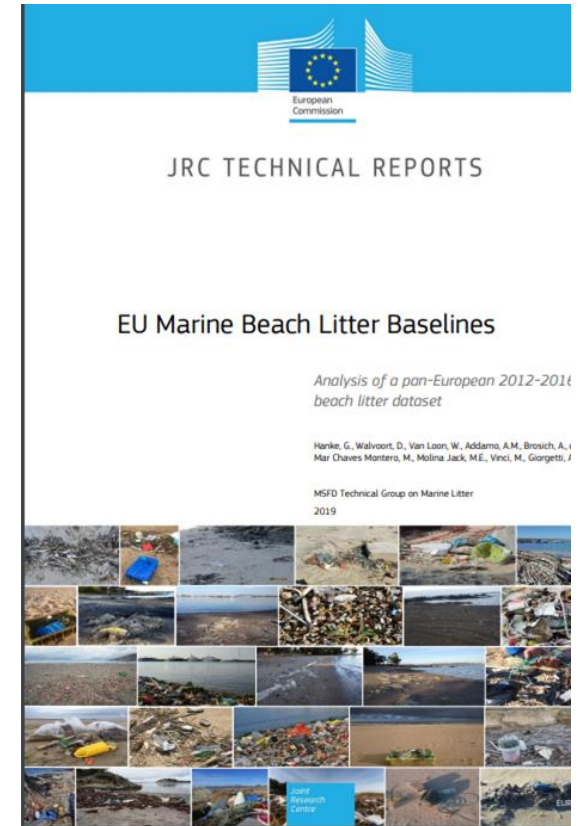
Standard vocabularies

- All **information coded** through internationally accepted **standard vocabularies** (governance groups)
- **Vocabulary services** are technically managed and hosted by the **British Oceanographic Data Centre** through the **NERC Vocabulary Server** (NVS2.0)
- Specific vocabularies to describe **micro-litter properties and its sampling parameters**:
 - Type of micro-litter particles
 - Count of micro-litter particles
 - Size class of micro-litter particles
 - Shape of micro-litter particles
 - Colour class of micro-litter particles
 - Transparency class of micro-litter particles
 - Micro-litter polymer types
 - Weight of micro-litter particles
 - Width of sample collector
 - Size of sample collector (mesh)
 - WMO Sea State

Interactions and feedback from expert groups

The European MSFD Technical Group on Marine Litter

- The MSFD Technical Group on Marine Litter identified EMODnet as the **European platform for marine litter data**
- **National Oceanographic Data Centres** supporting EU Member States in data standardization and quality control
- **Harmonized datasets** for the **assessment** of litter abundance, **baselines, trends** and distribution:
 - Baselines: beach litter published in 2019, ongoing work for seafloor and micro-litter
 - Trends: ongoing for beach litter
- Work towards a methodology to obtain quantitative and comparable data and metadata of **marine macrolitter from seafloor images**, to complement data from trawling worldwide :
 - Development of data management system



Interactions and feedback from expert groups

Global initiatives

Global Partnership on Plastic Pollution and Marine Litter (GPML):

- Data and products sharing (Digital Platform)
- Revision/alignment of glossary and ontologies/vocabularies (Community of Practice on Data Harmonization)

G20 Actions against Marine Plastic Litter lead by the Ministry of the Environment Japan (MOEJ):

- **Guidelines** for Harmonizing Ocean Surface Microplastic Monitoring Methods (May 2019)
- Developing an **Atlas of Ocean Microplastic** (AOMI)

Under the umbrella of the **Integrated Marine Debris Observing System** (IMDOS)

Relevant dialogs to **promote/facilitate** different levels of **harmonization** to allow **usage and compatibility** on the **global scale**



Terms of use



Perspectives and challenges

Perspectives:

- Progress and improvement of the consolidated workflows
- Implementation of the data management system for data from seafloor images
- Automation of existing data workflows (from and into EMODnet)

Challenges:

- QA/QC info management improvement for better data comparability (micro-litter)
- Technical maintenance and upgrade of tools for data formatting and quality control
- Automation of existing data workflows (from and into EMODnet)

"Everyone wants to save the world (...we would say the planet..), but no one wants to help mom do the dishes."

—P.J. O'Rourke



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European Marine
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