EMODnet Thematic Lot n° 5 - Chemistry

EASME/EMFF/2020/3.1.11/Lot 5/SI2.846161

Start date of the project: 03/10/2021 (24 months)

Centralisation Phase

Interim Progress Report (1st)

Reporting Period: 03/10/2021 – 02/10/2022

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.

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1.Introduction

[Provide a short (max 2 pages) introduction to set the stage (start date, main goals, background, consortium, key components and characteristics of the lot). Max 2 pages.]

This report describes the activities and results achieved by EMODnet Chemistry during the first year of the Centralisation phase, undertaken in synergy by seven themes—bathymetry, biology, chemistry, geology, human activities, physics, and seabed habitats—with the aim of developing a more coherent, effective, efficient, integrated, and fit for purpose EMODnet, and to stimulate its use by industry, policy, and scientific data users.

As one of the seven themes, EMODnet Chemistry maintains the overall goal of facilitating the discovery and access to marine chemistry datasets and derived data products concerning **eutrophication**, **ocean acidification**, **contaminants,** and **marine litter** in three matrices: water, biota, and sediment. Focus is given to marine litter collected on beaches, in fishermen's nets, or in specific surveys. **All major European sea regions are covered**: the Norwegian Sea, Barents Sea, Baltic Sea, N.E. Atlantic Ocean (Celtic Seas, Iberian coast, and Bay of Biscay and Macaronesia), Greater North Sea, Mediterranean Sea, and Black Sea, adopting the geographical definitions of the Marine Strategy Framework Directive (MSFD) Directive.

It makes an essential contribution to the data and information sharing provisions in the MSFD by increasing the accessibility and interoperability of marine data. This is also ensured by the steady engagement with Regional Sea Conventions (RSCs) and the International Council for the Exploration of the Sea (ICES). EMODnet Chemistry provides additional sources of in-situ data to the Copernicus programme.

Building on the results of the last few years and having achieved confidence and acceptance in the databases, derived data products, and data services by the MSFD community, including EU services, RSCs, and Member States, this phase marks a major step in the implementation of the activities. EMODnet Chemistry has been adopted as **the European data platform** in support of the assessment of Descriptor 10 (marine litter) and is expanding to Descriptor 8 (contaminants in the environment).

The first objective of EMODnet Chemistry's contract is to expand and further improve the products and services developed in the previous phases, working towards complete interoperability with services developed by other thematic groups while following the INSPIRE Directive, and being open to receive data provided through the EMODnet data ingestion facility. The following aspects need to be developed and improved:

- a method for accessing data chemistry observations held in repositories;
- products constructed from one or more data sources that provide users with information about the distribution and quality of parameters in time and space;
- interaction with the EMODnet central portal to ensure that the data and data products can be found, viewed, and downloaded;
- content for the chemistry space within the EMODnet central portal;
- coherence with the efforts of the RSCs and other relevant local actors;
- engagement with the EU's reporting mechanisms (e.g. through participation in working groups TG-DATA);

- interoperability with data distributed by non-EU organisations;
- compliance with the INSPIRE Directive and Digital Earth processes;
- quality and performance in dealing with user feedback through a centralised help desk service;
- continuity with the thematic portals for a maximum of 6 months from the start of the contract.

High resolution digital map layers of litter on beaches and chemical concentrations in the open water, sediments, and coastal areas allow users to analyse changes over time and space, including higher resolution efforts at selected river mouths. All data, metadata and data products are made available for viewing and downloading free of charge and free of restrictions of use.

The EMODnet Chemistry consortium brings together a core group of **14 partners** and **2 subcontractors** from 13 countries along the European seas, mostly national marine monitoring agencies and major marine research institutes. The partners combine long-standing expertise and experience of collecting, processing, quality controlling, and managing marine chemistry data and data products. They also have expertise in distributed data infrastructure development and operation, and the provision of discovery, access, and viewing services following INSPIRE implementation rules and international standards (ISO, OGC). Furthermore, the consortium mobilised a group of **28 institutes** willing to provide support to the initiative, to give advice on planned activities and to contribute chemical observation datasets acquired in seawater, sediment, and biota compartments. For this reason, it was decided to set **an open Advisory Forum** that combines a wealth of national and regional expertise and knowledge about the EMODnet Chemistry data and their potential to contribute to GES indicators and the implementation of the MSFD. The contract is performed by (almost) the same partnership since it started in 2009 through an active cooperation with the SeaDataNet network of National Oceanographic Data Centres (NODCs).

EMODnet Chemistry has adopted and adapted several **SeaDataNet** standards, tools, and services for optimal marine data management. These have been adapted, where required, to improve the 'FAIRness' (Findable, Accessible, Interoperable, and Reusable) of metadata, data, and data products and fitness-for-purpose on behalf of EMODnet Chemistry's target user groups. This synergy allowed most effort to be dedicated to the chemistry data collection and the development of data products, taking advantage of a well-integrated network, well-consolidated standards for data, metadata, services, and efficient tools.

2.Update on the Tasks

*[**List progress for each of the tasks specified in Section 1.4.1 of the Tender Specifications** since the start of the project phase; provide an explanation for any tasks in which progress has not been noted. Provide in the table the complete list of **all** Milestones and Deliverables from the technical workplan in numerical order, the date due, status and date delivered. Max 2 pages]*

Task 1: Maintain and improve a common method of access to data held in repositories

EMODnet Chemistry gathers measurement datasets on seawater quality from many data sources and makes them findable, accessible, interoperable, and reusable. This is achieved by making use of the data discovery and access service of the SeaDataNet Common Data Index (CDI). In the reporting year, the number of datasets in the EMODnet Chemistry CDI service has steadily increased from circa 1,109,000 to circa 1,190,000 CDI entries of which currently circa 1,000,000 in the European seas, while major activities have taken place for checking and improving the quality of the metadata and data, both for syntax and content. These datasets have been brought together from 66 data providers in 32 countries, while 36 data providers have contributed to the latest annual increase. Many datasets have been enriched with new metadata fields to strengthen interoperability with EEA, CMEMS, and the EU's MSFD Technical Group on Contaminants. The existing data were completed with information related to the instrument, platform, and monitoring purpose etc., and amended according to the feedback received. The CDI service allows users to browse datasets in more detail, to narrow down their query, and to download a selection of datasets. It has been upgraded with a search feature on EDMERP (Projects) and EDMED (Data sets).

The network of NODCs has continued to involve with respect to managing beach data and micro-litter data collected by EU Member States as part of MSFD monitoring activities and solicited by the EC Joint Research Centre (EC-JRC). This effort underpins the increasing role of EMODnet Chemistry as a European data management hub for many kinds of marine litter data, which is accepted by the MSFD community of EU services, RSCs, and Member States. Marine litter data for beach litter and seafloor litter are managed in two central databases, involving considerable efforts for validation, classification, and metadata documenting. At the end of the reporting period, the Marine Litter databases contain data on 11,126 beach surveys, 7186 seafloor trawls and 1620 floating micro-litter datasets. These marine datasets have been populated into the CDI service allowing users to browse data sets in more detail, to narrow down their query and to download a selection of datasets.

Updated guidelines for gathering and describing Marine Litter have been drafted and published as D2.6.

The **Marine Litter Manager (MLM)** software has been made available with manual and video instructions. It can be used to generate data in 1) EMODnet beach litter format, and 2) EMODnet seafloor trawling litter format.

A training session and a series of meetings was organised with the participation of all EMODnet data centres to i) reactivate data population, following new and updated guidelines; ii) urge selected data providers; and iii) share the latest improvements of the different tools and services available for ingesting, harmonising, and validating data relating to eutrophication, ocean acidification, contaminants, and marine litter.

Task 2: Construct products from one or more data sources that provide users with information about the distribution and quality of parameters in time and space

EMODnet Chemistry undertakes activities for harmonising, standardising, and validating measurement data that are harvested from the CDI service and makes these available as data collections for i) eutrophication

(nutrients, chlorophyll, and oxygen) and ocean acidification (alkalinity and pH) in seawater; ii) contaminants in seawater, biota, and sediment; and iii) marine litter in seawater and sediment. These collections then provide the basis for generating interpolated maps of the distribution of selected eutrophication parameters on a regular grid at different temporal and spatial resolutions (annual climatologies for all European seas, 6-year analyses at the basin scale, and seasonal analyses on selected coastal areas), and dedicated maps with the distribution of contaminants and marine litter at measurement points.

During the first year, the Regional Coordinators have recently produced a harmonised and aggregated data collection for eutrophication and ocean acidification, using the datasets that were harvested from the CDI service early July 2022. The Regional Coordinators are also progressing with producing the associated DIVA maps. The release and publication of these will be planned and arranged in dialogue with the Central Portal team. Furthermore, the harvesting of contaminant data was completed at the end of September 2022 and the data packages have now been distributed to the Regional Coordinators for further processing into a harmonised and validated collection. In the short term, marine litter data will also be harvested and forwarded to OGS for producing the planned marine litter maps and associated tables.

EMODnet Chemistry works together with EMODnet Physics on river runoff products by considering outflow and chemistry. An inventory (Deliverable D2.1) has been made of existing geoportals, databases, projects, and publications on freshwater and riverine inputs for selected rivers. Moreover, with DIVAnd and the available validated eutrophication collection, a set of high-resolution eutrophication DIVAnd maps have been produced for coastal areas around major rivers in Europe. These have been documented in D3.5 and included in the Products catalogue and the maps are included in the OceanBrowser, both feeding into the Central Portal.

Task 3: Develop procedures for machine-to-machine connections to data and data products:

The EMODnet Chemistry portal operates a number of services for facilitating the discovery of and access to its data and data products, and for presenting and interacting with its map products. Further activities have taken place for optimising the INSPIRE compliance of these services, where needed, such as including descriptions for all products and map layers and including information about data and metadata services in each description. Furthermore, in dialogue with the Central Portal team, developments have been undertaken for making these Chemistry services and their contents fit for integration with the new Central Portal and its core services. For a major part, this will take place by operating and maintaining machine-to-machine services. The CP products portal is harvesting the descriptions of Chemistry products from the Chemistry Sextant catalogue service by means of the OGC CSW service protocol. Maps for marine litter and contaminants and maps with the distribution of locations of CDIs are served to the CP map viewer by OGC WMS-WFS services. Interpolated maps for the display and interrogation of eutrophication in time and space are being continued using the Chemistry OceanBrowser service feeding the CP Map Viewer, because it was not (yet) possible to integrate the extra analysis functionality directly in the CP map viewer. The functionality of the Chemistry WebODV explorer and extraction service for interacting with the harmonised and validated data collections for eutrophication, ocean acidification, and contaminants has been expanded to facilitate publishing maps as OGC WMS-WFS service, which will serve the CP map viewer.

Task 4: Contribute data, data products, and content to a central portal that allows users to find, view, and download data and data products:

The majority of activities under this task have focused on the migration of the content, data products, and services of the EMODnet Chemistry portal to the Central Portal and its services. Together with the CP team, an approach has been agreed for EMODnet Chemistry, whereby EMODnet Chemistry will remain responsible for its production workflows and operating services that feed CP services such as the CP products catalogue and CP map viewer by machine-to-machine services (see also Task 3). In the past year, very good progress has

been made with the implementation and actual integration of the Chemistry narrative, its products, and its services. However, there are still issues to overcome and/or to improve that are subject of JIRA tickets and further progressed in dialogue and cooperation between the CP team and the EMODnet Chemistry technical team. This should be solved before the planned launch of the new CP by end of 2022. Then, a structured procedure should also be established for maintaining and publishing new EMODnet Chemistry products.

Task 5: Contributing content to dedicated spaces in the Central Portal:

During the reporting year, the EMODnet Chemistry portal was kept up to date. In particular, the 'ABOUT' section has been extended with new Guidelines (6 additions), Reports (7 additions), and Project Meetings (11 additions). Moreover, News (17 additions), Events, and Presentations (18 additions); Posters and Flyers (1 addition); Use Cases (2 additions); Publications (8 additions); and 1 Cooperation Agreement were updated in the 'PROMOTION' section. The subsections 'Who' and 'When' were also updated, and a new page dedicated to the current phase was added. Content has also been regularly provided for the EMODnet news and use cases pages and for the monthly newsletters. There is contact with the CP Team to discuss how EMODnet Chemistry will be able to maintain items such as news, publications, and guidelines in the new situation with the Central Portal.

Task 6: Ensure the involvement of Regional Sea Conventions:

In line with the ongoing dialogue with EC-JRC, EMODnet Chemistry has continued to provide support to the RSCs by carrying out a centralised reporting strategy for marine litter, which is based on a data management plan that is well defined, agreed, and with a substantiated methodology.

In the reporting period, EMODnet Chemistry participated in the TG on ML (online), contributed to the discussion, and was also invited to the TG on Contaminants to present EMODnet Chemistry as a data platform for collecting monitoring data on contaminants. Links with other systems, such as the ICES database or IPChem, were also considered.

HELCOM confirmed its interest to use EMODnet Chemistry for the HELCOM HOLAS III beach litter assessment, with a request to collect new beach litter monitoring data in the HELCOM area for the period 2020–2021. As part of the data exchange, HELCOM provided positive feedback on the beach litter monitoring dataset in their area for the period 2020–2021, which was released in April 2022.

A close interaction was maintained with OSPAR regarding the collection, harmonisation, and validation of beach litter datasets. An invitation was received to OSPAR ECG-EUT, which will be held between 30 January and 1 February 2023.

As part of the interaction with UNEP-MAP, EMODnet Chemistry participated in CORMON meetings and planned contributions to the Quality Status Report (QSR2023) by providing an additional data source.

Task 7: Contribute to the implementation of EU legislation and broader initiatives for open data:

EMODnet Chemistry contributes to the implementation of the MSFD by providing the data management hub for many kinds of marine litter data (beach, seafloor, floating microlitter and in the sediment). A selected beach litter dataset 2015–2020 was released to the EU's MSFD Technical Group on Marine Litter for further processing and assessment. A close dialogue was established with the EC-JRC and D8/D9 Contaminant Working Group to evaluate MSFD reporting formats and how they fit with EMODnet Chemistry's metadata schemas. Moreover, EMODnet Chemistry was proposed by the EU-JRC and DG Environment as the European data infrastructure for gathering contaminant datasets provided by Member States as part of MSFD monitoring plans in a comparable way, as done for marine litter, for which it has become a structural activity.

During this reporting year, EMODnet Chemistry participated in the G20 MoEJ International Expert Meeting on Marine Plastic Litter Monitoring Data Sharing Project. The prototype system for microplastic data-sharing was discussed and tuned, together with the 'Data Entry Form Sheet' and 'Data List Sheet' to collect marine litter data on a global scale.

EMODnet Chemistry participated in activities for transparent and accessible seas and oceans (linked to the UN's Ocean Decade) and in the periodic meetings of groups of experts engaged in the implementation of global data platforms supporting the sea-related objectives of the UN's 2030 Agenda for Sustainable Development.

In particular, interactions have continued with the Global Partnership on Marine Litter Digital Platform (GPML) in order to tune EMODnet Chemistry's contribution to the global system, and with the Data Harmonization Community of Practice (CoP).

EMODnet Chemistry and SeaDataNet actively participate in the SDG 14.1 federated system and its working groups (on metadata and vocabularies) to share ocean acidification data.

Data sharing was discussed within the action 'SciNMeet - the Regional programme The Mediterranean Sea We Need for the Future We Want' of the UN's Ocean Decade, where EMODnet Chemistry facilitated the dialogue by providing expertise in managing consolidated data types.

Task 8: Monitor quality/performance and deal with user feedback:

Procedures are up and running based on the MSFD-region approach and extraction differences per data provider, per sea region, and per restricted or unrestricted. Download metrics for the map viewer, DOI landing pages, CDI data service, data products catalogue, and webODV Data Explorer and Extractor are collected when users access them through the EMODnet Chemistry portal. User activities are not recorded for the EMODnet Chemistry products that are described and made available through the Central Portal.

Task 9: Maintain the existing thematic web portal for a maximum of 6 months from the start of projects:

The EMODnet Chemistry portal is kept up to date as described under Task 5. The alignment with the Central Portal is ensured by the activities described in Task 4.

Status of the Milestones and Deliverables listed in the workplan					
Milestone/Deliverable in numerical order	WP	Date due	Status (To do/ Delivered/ Delayed)	Date delivered	If Delayed: reason for delay and expected delivery date
MS2 EMODnet Chemistry content contributed to the central portal	1	M3 (03/01/2022)-M24	Delivered	03/01/2022	
D1.1 Concise quarterly progress reports	1	M3 (15/01/2022), M6 15/04/2022), M9 (15/07/2022), M12 (15/10/2022), M15, M18, M21	Delivered	15/01/2022, 15/04/2922 15/07/2022 15/10/2022	

D1.2 Annual Interim report	1	M12 (03/10/2022)	Delivered	03/11/2022	
D1.3 Final report	1	M24 (03/10/ 2023)			
D1.4 Handover plan for service continuity	1	M24 (03/10/ 2023)			
D1.5*i* Consortium Agreement (plus Subcontracts and Advisory Agreements)	1	M2 (03/12/2021)	Delivered	May 2022	
D1.6*i* Short minutes/action list of project meetings	1	M1 (03/10/2021), M6 (03/04/2022), M12 (03/10/2022), M18, M23	Delivered	SC1 16/11/2021, PFG1 13-14/12/2021, SC2 30-31/03/2022, SC3 08-09/09/2022	
D1.7 Providing content to the central portal	1	Continuously	Delivered		
MS3 Chemistry (eutrophication, contaminants, and microlitter) CDI metadata and datasets available from the central portal	2	M6 (03/04/2022), M18	Delivered	Continuous inclusion of CDI metadata and datasets available from the CP	
MS4 Marine litter datasets included in the EMODnet databases and available from the central portal	2	M12 (03/10/2022), M24	Delivered	Continuous inclusion of new datasets available from the CP	
D2.1 List of major rivers with identified data sources	2	M3 (03/01/2022)	Delivered	18/05/2022	
D2.2 Training activity for DC	2	M3 (03/01/2022)	Delivered	13-14/12/2021	
D2.3i Data harvested for eutrophication, including rivers	2	M8 (03/06/2022), M17	Delivered	01/07/2022	
D2.4i Data harvested for contaminants	2	M9 (03/07/2022), M20	Delivered	10/10/2022	

D2.5i Data harvested for microlitter	2	M12 (03/10/ 2022)	Delivered	10/10/2022	
D2.6 Updates on marine litter guidelines	2	M6 (03/04/2022)	Delivered	11/05/2022	
MS5 High resolution DIVA maps near major river mouths available from the central portal	3	M14 (03/12/2022)	Delivered for Po River, but other river maps still to follow		
MS6 Dedicated maps for contaminants available from the central portal	3	M16 (03/02/2023)			
MS7 Pan-European maps for eutrophication available from the central portal	3	M18 (03/04/2023)			
MS8 Concentration maps of beach and seafloor litter available from the central portal	3	M20 (03/06/2023)			
D3.1 Validated pan-European collections for eutrophication, including rivers	3	M12 (03/10/2022), M21	Delivered	12/10/2022	
D3.2 Validated collections for contaminants	3	M13 (03/11/2022), M22			
D3.3 Validated collections for beach and seafloor litter	3	M19 (03/05/2023)			
D3.4 Validated collections for microlitter	3	M17 (03/03/2023)			
D3.5 High-resolution DIVA maps near river mouths	3	M16 (03/02/2023)	Delivered	29/11/2021	
D3.6 New maps for contaminants	3	M15 (03/01/2023), M24			
D3.7 New pan-European DIVA maps for eutrophication	3	M14 (03/12/2022), M23			

D3.8 New maps for microlitter	3	M23 (03/09/2023)			
D3.9 New maps for beach and seafloor litter	3	M23 (03/09/2023)			
MS1 EMODnet Chemistry data and data products available from the central portal	4	M6 (03/04/2022)	Delivered	03/04/2022	
D4.1 Standard machine-to-machine services delivered for common functionalities	4	M3 (03/01/2022)	Delivered See text under WP4.1	03/01/2022	
D4.2 Dedicated machine-to-machine services and APIs adapted / delivered for special functionalities	4	M6 (03/04/2022)	Delivered See text under WP4.1 and WP4.3	03/04/2022	
D4.3 Upgraded databases for new litter types	4	M12 (03/10/2022)	Ongoing		
D4.4 Improved services for eutrophication	4	M10 (03/08/2022)	Delivered See text under task 4	03/08/2022	
D4.5 Improved services for marine litter	4	M10 (03/08/2022)	Delivered See text under task 4	03/08/2022	
D4.6 Improved services for contaminants	4	M12 (03/10/2022)	Ongoing See text under WP4.4		
D4.7 ODV Extractor with expanded plots and integrated in central portal	4	M18 (03/04/2023)	Ongoing See text under WP4.3		
D4.8 Monitoring data about visits and usage	4	Continuously	Delivered		
D5.1 Operate the help-desk	5	Continuously	Delivered		
D5.2 Meetings of Board of MSFD experts	5	M6 (03/04/2022), M12 (03/10/2022), M18 (03/04/2022)	Delayed		January 2023 (Eutrophication), February 2023 (Contaminants), September 2023 (litter) to be in line with the release of

					EMODnet Chemistry products (M14-15-16-23)
D5.3 International cooperation and interoperability	5	Continuously	Delivered		
D5.4 Promotional material and an up-to-date thematic space in the central portal	5	Continuously	Delivered		
D5.5 Presentations at relevant conferences	5	Regularly	Delivered		

3.Work Package updates

[Using the Work Package as a header, list the activities that occurred since the start of the project phase. When describing each Work Package, please also refer to the corresponding Tender task(s) (specified in the relevant Tender Specifications). Max 2 pages per work package.]

WP1 – Project Management

Concerns Task 5: Contributing content to dedicated spaces in the Central Portal AND Task 9: Maintain the existing thematic web portal for a maximum of 6 months from the start of the projects.

As part of WP1, several management activities have been undertaken, which are reported under the related subWP.

WP1.1: Project coordination

The EMODnet Chemistry consortium is very wide, being represented by 16 participants (as partners and subcontractors) and receiving support and input from another 28 research institutes, who are willing to cooperate and to contribute chemical expertise and observation datasets. To manage and lead all project activities, ensuring timely delivery and high quality of results and products, a dedicated management structure has been established with the following bodies:

Project Coordinator, assisted by the Technical Coordinator;

Project Steering Committee, comprising all partners and subcontractors;

Project Full Group, comprising the project steering group and all 28 members of the advisory forum;

Regional Leaders and work package leaders;

Project office, for daily management and timely interaction with the EMODnet Secretariat;

Technical Working Group.

The coordination activities started on 1 July 2020 following the positive evaluation of the procurement procedure. On 16 July 2021, the service contract was signed by both parties, with the start date set to 3 October 2021. The first actions concerned the collection of all administrative documents, by integrating the evidence already provided in the submission phase, and then sending them to EASME. In November 2021, the draft of the Consortium Agreement (CA) was circulated. Feedbacks were subsequently collected in December 2021, and signing of the CA, bilateral subcontracts, and advisory contracts was initiated in January 2022.

To maintain communication, the Project Office defined several mailing lists:

- info@emodnet-chemistry.eu
- partners@emodnet-chemistry.eu
- subcontractors@emodnet-chemistry.eu
- advisory@emodnet-chemistry.eu (open Advisory Forum)
- all@emodnet-chemistry.eu (merging the three lists' partners + subcontractors + advisory)
- board-msfd@emodnet-chemistry.eu (board of MSFD experts)

The 1st Steering Committee meeting was held online on 16 November 2021, while the 1st Full Group meeting was held online on 13–14 December 2021, back-to-back with the training session: guidelines and tools for data management. Considering the planning of activities, it was decided to start with the involvement of the full network and by refreshing the tools and guidelines for eutrophication, contaminants, and marine litter.

The 1st meeting of the Task Force on contaminants took place on 14 January 2022.

In March 2022, the CA was signed by almost all partners, while subcontracts and Advisory contracts were sent to be countersigned.

The 2nd Steering Committee meeting was held online on 30–31 March 2022. As reported in the minutes, the SC recalled the project planning with the closing dates of the data harvesting set to 3 June 2022 (M8) for eutrophication, 3 July 2022 (M9) for contaminants, and 3 October 2022 for marine litter (M12). Furthermore, it was agreed to start planning the monthly videoconferences with the Regional Leaders in the summer period. This was to prepare the release of the validated pan-European collections for eutrophication, including rivers, in M12, and the new pan-European DIVA maps for eutrophication in M14. A major effort was dedicated to catching up with the population of eutrophication and contaminant data (where possible); the contractual data inventory served as extra motivation.

In the last week of May 2022, a series of virtual meetings was organised, each focusing on a sea basin and with the participation of all data providers in the area, in order to check the status of the data submission and stimulate new data delivery.

The 3rd SC meeting was held online on 8–9 September 2022.

WP1.2: Collaboration with other EMODnet Lots, Central portal group and larger EMODnet organisation

Throughout the reporting year, EMODnet Chemistry successfully collaborated with and promoted EMODnet Data Ingestion, as a powerful mechanism to involve external organisations willing to submit data. EMODnet Data Ingestion was heavily used by Member States providing Marine litter and other data, coming from MSFD official monitoring. Citizen science data were also merged.

The Project Coordinator and Deputy-Coordinator ensured convergence and synergy with all the other EMODnet Lots. By representation in the strategic groups developing EMODnet, such as the EMODnet Steering Committee, Technical Working Group, and EMODnet events organised by the European Commission, they guaranteed the timely transfer of information, commitments, and feedback.

EMODnet Chemistry management and technical teams consistently interacted with the Central Portal team to integrate Chemistry content, services, and tools in the Central Portal.

WP1.3: To draft, populate and maintain content and presence for EMODnet Chemistry in the Central Portal and maintain the existing web portal for a maximum of 6 months

The EMODnet Chemistry portal was kept up-to-date with the latest news and events, and acted as the reference point for gathering information on the ongoing activities. The transfer of all content is now well underway, as reported under Tasks 4 and 5. The EMODnet Chemistry portal, despite being the last to start the Centralisation phase, is ready to shift towards the Central Portal, as testified by the statistics of the number of views of the use cases (KPI number 6).

WP2 – Chemistry data collection and metadata compilation and arranging common access

Concerns Task 1: Maintain and improve a common method of access to data held in repositories.

As part of WP2, a number of subWP activities have been undertaken, which are reported.

WP2.1: Review of guidelines (CDI metadata and ODV data compilation, refined criteria for quality control of contaminants) and Training Activity

As part of SeaDataNet and previous EMODnet Chemistry projects, guideline documents have been prepared, including standards and software tools, to be used for preparing metadata and data for populating the CDI Data Discovery and Access service and the Marine Litter databases. During the project kick-off meeting on 13–14 December 2021 with all partners participating, presentations were given about the planned activities for the new Phase. Furthermore, back-to-back with the plenary part, an instruction and hands-on Training Workshop was held to refresh the knowledge of all participants about the various tools, services, and formats, and to refresh the rules to include the new attribute information (quality information about field and laboratory procedures, and about the origin of observations from monitoring or research).

Later in the project, a guideline was drafted with title 'Updated guidelines for SeaDataNet ODV production of Eutrophication and Contaminants'. This guideline is available at the Chemistry portal and by DOI: 10.13120/C1933032-9FA9-4678-8539-EFFA1560921C.

On 14 January 2022, the meeting entitled 'Task force on contaminants' took place. The discussion was centred on the requests indicated by the EU-JRC to evaluate data and information available through EMODnet for the Descriptor 8 - Contaminants of the Marine Strategy Framework Directive. The event was attended by 19 experts from 14 organisations. The meeting focused on data and metadata needs expressed by the EU-JRC for marine contaminants and on QA/QC concerns for adopting the MSFD. Participants agreed to proceed with the comparative analysis of the data/metadata templates used by the RSCs and WFD, respectively, and the EMODnet team agreed to verify if all relevant information is handled. This comparison was subsequently performed based on the data/metadata templates of UNEP/MAP MEDPOL (WG.467/8 2019), OSPAR & HELCOM, WISE6 (for WFD), JRC template (for WFD), and the NORMAN Network. It was concluded that almost all mandatory metadata are or can be directly made available within the EMODnet Chemistry dataset model (ODV) in combination with the metadata model (CDI). It is recommended that data providers should try to include more detailed information on the laboratory QA/QC procedures adopted, LoD, LoQ, and participation in intercalibration exercises etc. to improve the quality information. This was followed by a meeting of nine experts on 9 June 2022 regarding the vocabularies used for contaminants, in particular P01. The focus was on how to achieve consistency and completeness of information, when building P01 terms for describing contaminants. Actions were formulated for further refinement of the principles.

WP2.2: Chemistry data gathering and metadata population in the CDI Data Discovery and Access service

EMODnet Chemistry makes use of a large pan-European network of data centres from marine research institutes and governmental monitoring agencies for gathering measurement datasets on seawater quality from many data sources and to make these findable, accessible, interoperable and reusable (FAIR). This is achieved by making use of the SeaDataNet Common Data Index (CDI) data discovery and access service. From the start of the new EMODnet Chemistry V contract, all data providers were encouraged by MARIS (WP2 leader) to i) actively check the formats of existing CDI datasets by using the SeaDataNet OCTOPUS software,

and ii) follow up issues identified earlier by the Regional Coordinators and in the overall SeaDataNet checks for existing CDI datasets. Moreover, all data providers were encouraged and supported to proceed with new data submissions, thereby making use of the latest SeaDataNet tools: MIKADO for CDI metadata entries, NEMO for converting local data files to ODV formats, Vocabularies for mapping local terms to common terms, OCTOPUS for checking the formats of data files before submission. They were also encouraged to install and configure the latest version of the new Replication Manager for arranging automatic connectivity between Data Centres and the CDI service.

In addition, a series of meetings were organised with the Regional Coordinators (RCs) and data providers for the relevant regions to discuss i) the findings of the RCs with respect to previously harvested data collections, ii) the required corrections, and iii) refining their data population activities. Moreover, MARIS has been 'chasing' data providers to ensure that all of them contributed to the population of the Chemistry CDI service with new and updated entries in time to meet the deadlines set for harvesting. This has been successful and, in the reporting year, the number of datasets in the EMODnet Chemistry CDI service has increased from circa 1,109,000 to circa 1,190,000 CDI entries, of which currently circa 1,000,000 are in the European seas, while major activities have been undertaken to check and improve the quality of metadata and data, both for syntax and content. These datasets have been brought together from 66 data providers in 32 countries, while 36 data providers have contributed to the latest annual increase.

Marine litter data for beach litter and seafloor litter, also coming from different sources, are managed in two central databases, involving considerable efforts for validation, classification, and metadata documenting. At the end of the reporting period, the Marine Litter databases contained data on 11,126 beach surveys, 7186 seafloor trawls, and 1620 floating micro-litter datasets. These marine datasets have been populated by OGS into the CDI service, allowing users to browse datasets in more detail, narrow down their query, and download a selection of datasets.

WP2.3: Formulating formats and vocabularies for reporting marine litter and gathering data in EMODnet databases

In cooperation with the MSFD Technical Subgroup on Marine Litter, Regional Sea Conventions (OSPAR, HELCOM, UNEP/MAP Barcelona Convention, and BSCS Black Sea Commission), ICES, ARPA FVG, and CEFAS, and inspired by the following EU projects: BASEMAN, PERSEUS, MEDITS, DeFishGear, and EMBLAS, EMODnet Chemistry has drafted updated guidelines for gathering marine litter. These are titled: D2.6 'EMODnet Thematic Lot n° 4 - Chemistry Guidelines and forms for gathering marine litter data: beach and seafloor trawlings. Version 7'. This D2.6 Documentation has been published in the Chemistry portal and is available with DOI: 10.6092/15C0D34C-A01A-4091-91AC-7C4F561AB508. The guidelines provide background information about the EMODnet strategy for marine litter (beach and seafloor) data collection, its synergy with existing information systems, and the achievements of EMODnet Chemistry so far. The guidelines also provide detailed information on how to deal with marine litter data from beaches and seafloor trawlings and, in particular, the formats to be used by EMODnet Chemistry participants for gathering and describing this type dataset of marine litter on a European scale.

The **Marine Litter Manager (MLM)** Python data formatting tool has been made available and it can be used to generate:

- EMODnet beach litter format
- EMODnet seafloor trawlings litter format

This is done following the specifications of the official guidelines published by EMODnet Chemistry and it is available for Linux and Windows. Video tutorials are provided to facilitate its use. The software and video are available from the EMODnet Chemistry portal. The use of the tool is further explained in the 'Marine Litter Manager manual' available at the portal and with DOI: 10.13120/21ADDF37-7E82-4A55-B040-3D3D87115AC0.

WP2.4: Nutrient loads by major rivers

Rivers are the major pathways for material fluxes from the land to the sea. River runoff exerts a strong influence in its neighboring coastal area in several ways: by modifying water stratification, introducing significant fluctuations in circulation patterns, and modulating the impact of upwelling events. Via the supply of nutrients and sediment (e.g. nitrogen, phosphorus, and silica) to marine ecosystems, runoff contributes to the maintenance of biological productivity in coastal waters and hence to the renewal of living resources that will be available for exploitation by local populations.

Currently, the EMODnet Chemistry portal provides an exhaustive list of existing geoportals, databases, projects, and publications on freshwater and riverine inputs to the sea. It acts as a reference on the available data sources for nutrients loads from major rivers: OSPAR has estimates of nutrients and metals loads from major rivers; the local authority has made a report for the Black Sea; EEA collects data for the Danube River; UNEP has published river-related data. The need for more inflow river data has been addressed by several technical working groups (EMODnet, Copernicus Marine Service, and EEA) and there is an increasing interest in developing harmonised actions to jointly tackle this. It is worth mention that the latest publication from the Expert Team on Operational Ocean Forecast Systems (ETOOFS) is giving even more attention to the importance of rivers as an input for modelling and services.

A joint effort between EMODnet Physics and EMODnet Chemistry is being undertaken to release a series of river proxy runoff products (based on a simple MOHID Water model) that progressively include freshwater outflow, total suspended matter outflow, and chemical (nitrogen and phosphorous) outflow. This Proxy product will be configured and calibrated by river runoff (or river water level) data as gathered by EMODnet Physics, river Biogeochemical data (nutrients) as gathered by EMODnet Chemistry, and the EMODnet Total Suspended Matter (TSM) product.

Estuarine model

The methodology applies and extends the methodology described in Sotillo et al. 2020. A simple and scalable MOHID Water application is designed to represent estuaries schematically and to export the methodology where high-resolution estuary model is not available. The estuarine model proxy consists of a regular domain of 12x3 cells, the estuary is represented by 10 grid cells aligned in any cardinal direction plus a cell for the ocean open boundary conditions and the land boundary. To configure each estuarine proxy, some basic geometry properties and the geographical location of its mouth must be configured. Four basic proxy configurations are defined with its mouth oriented towards the four cardinal directions: North, South, East and West. The mouth orientation serves to obtain the corresponding velocity component (u or v) and its sense (positive or negative). The basic inputs needed to configure any estuary proxy domain are:

- Average estuary depth (maximum and minimum depth would be required if the end user want to implement variable depth along the estuary) – to populate the bathymetry grid cells depth;
- Estuary extension (length between ocean waters and saltwater intrusion up in the estuary) – to configure the along-estuary grid cell size;

- Total area of the estuary – to be used in the across-estuary cells size. The area covered by the sum of the grid cells will be similar to the total area of the estuary;
- Geospatial location of a point close to the mouth of the estuary – to be used as the bathymetry grid origin;
- Water properties in the near ocean: salinity, temperature and biochemical properties of the receiving waters to force the open boundary conditions.

In the open ocean boundary, the model receives water levels and properties such as salinity, temperature, etc. from time series (e.g., in situ data) or models. The modeling outputs consist of timeseries of computed water properties: temperature, salinity, flow and velocity (u or v according to the estuary mouth orientation) and the other identified biochemical properties estimated at the last cell of the channel near the open ocean.

In situ data

Data are already available within the EMODnet services: the river outflow product[1] is now offering inflow data from more than 600 stations in Europe. EMODnet Chemistry, in collaboration with EMODnet Physics and Ingestion, is working on making more in-situ data available for the physical and chemical components as close as possible to mouths of major rivers.

As a first action of the process major rivers have been selected, considering the geographical distribution, data existence and water discharge levels. This selection together with a detailed inventory of the existing geoportals, databases, projects and publications of freshwater and riverine inputs to the sea is documented in an EMODnet Chemistry D2.1[2] documentation 'EMODnet Thematic Lot n°5 - Chemistry - EASME/2020/OP/0006 - Deliverable D2.1: List of major rivers with identified data sources', which can be found at the Chemistry portal and with DOI: 10.13120/DE86FD11-3DCB-4BCA-B35C-25D8FD93D5F3.

Name	Basin	EMODnet id
Douro	Atlantic Ocean	32628
Elbe	Atlantic Ocean	32684
Guadalquivir	Atlantic Ocean	32629
Guadiana	Atlantic Ocean	32612
Loire	Atlantic Ocean	32616
Rhine	Atlantic Ocean	32678
Seine	Atlantic Ocean	32615
Tagus	Atlantic Ocean	32608
Kemijoki	Baltic Sea	32866
Nemunas	Baltic Sea	
Odra	Baltic Sea	32722
Vistula	Baltic Sea	32723
Zap. Dvina (Daugava)	Baltic Sea	
Danube	Black Sea	32850

[1] https://prod-erddap.emodnet-physics.eu/erddap/tabledap/ERD_EP_RVFL_NRT.html

[2] https://www.emodnet-chemistry.eu/products/riverdatainventory

Ebro	Mediterranean Sea	32638
Po	Mediterranean Sea	32686 (1054108)
Rhone	Mediterranean Sea	(3130570)
Sava*		*Flows into the Danube
Tisa*		*Flows into the Danube
Vuoksa**		**Flows into Lake Ladoga

Based on the outcome of D2.1, a first subset of the historical (monthly) outflow river data from the Global Runoff Data Center DB has been developed and published: https://erddap.emodnet-physics.eu/erddap/tabledap/GRDC_MEAN_MONTHLY_DISCHARGE.html.

The team is now working on complementary sources (e.g. UNEP GEMS/Water Programme Directory) that host BGC data.

The final goal is hence to have a MOHID model output providing operational data about river outflow, physical properties and BGC properties. To achieve this goal, it is necessary to collect in situ data and calibrate the model. This action is ongoing – the first version of the proxy product is planned by the end of 2022.

In parallel, as part of WP3.3, the influence of major rivers has been studied, using DIVAnd and the existing EMODnet Chemistry eutrophication data collection, to generate a set of high-resolution eutrophication DIVAnd maps for coastal areas with rivers. This is further detailed under WP3.3.

WP3 – Generation of data products, including collections

Concerns Task 2: Construct products from one or more data sources that provide users with information about the distribution and quality of parameters in time and space

As part of WP3, a number of subWP activities have been undertaken, which are reported.

WP 3.1: Generating aggregated and validated data collections in the North Sea– AU DCE

The first year contribution of AU DCE – the regional leader for North Sea was focused on data aggregation, harmonisation and quality control of the first harvesting of the Eutrophication & Ocean Acidification dataset.

Results for the Contaminant dataset received in October 2022 will be presented in the next report.

The number of measurements and the percentage of Good/Bad data of the QCed aggregated North Sea Eutrophication & Ocean acidification dataset are presented in Table 1. The Profiles dataset has more than 94% of good data (QF=1, 2, 5, 6, 8 and Q) in average The Time series dataset has more than 99% of good data in average.

P35 Parameters	Nb meas. Profiles	Nb meas. Time series	% Good (QF=1,2,5,6,8,Q) Profiles	% Good (QF=1,2,5,6,8,Q) Time series	% Bad (QF=3,4) Profiles	% Bad (QF=3,4) Time series
dissolved oxygen concentration		2523		100.00		0.00
phosphate	928766	8436	93.14	99.93	6.86	0.07
total phosphorus	288896	22	99.94	100.00	0.06	0.00
silicate	638765	6478	92.57	100.00	7.43	0.00

nitrate	329246	3494	99.74	100.00	0.26	0.00
nitrite	552379	3818	89.41	100.00	10.59	0.00
nitrate plus nitrite_origin	281317	6808	80.73	100.00	19.27	0.00
ammonium	421344	5867	98.88	99.97	1.12	0.03
dissolved inorganic nitrogen (DIN)	327416	481	98.31	100.00	1.69	0.00
total nitrogen	236625	280	99.87	100.00	0.13	0.00
pH		14		100.00		0.00
total alkalinity		14		100.00		0.00
chlorophyll-a		41835		99.83		0.17
phaeopigments		814		100.00		0.00

WP 3.1: Generating aggregated and validated data collections in the Baltic Sea – SMHI

In the first year, the work was focused on aggregation, quality control and validation of data concerning eutrophication and ocean acidification. The contaminant datasets files were recently received and the QC checks will be started.

The detailed description of the activities performed is given in Appendix, while the following table summarises the total number of CDIs and values and total number and % of good/bad flagged data per P35 variable for vertical profiles. Good data is the sum of data with QF=1, 2, 5, 6, 7, 8, Q and bad data is the sum of data with QF=3, 4. Timeseries are only a minor amount of data and is not presented here, however, all timeseries data were considered good.

P35 Variable	# CDI	# Values	# Good	% Good	# Bad	% Bad
Depth [m]	202055	4597465	4596456	99,98	1009	0,02
Water body dissolved oxygen conc	161618	4237014	4032577	95,17	204437	4,83
Water body dissolved oxygen sat	2437	9565	9375	98,01	190	1,99
Water body phosphate	110532	492715	492020	99,86	695	0,14
Water body total phosphorus	93107	403446	403146	99,93	300	0,07
Water body silicate	82487	373684	373376	99,92	308	0,08
Water body nitrate	38419	231471	231285	99,92	186	0,08
Water body nitrate plus nitrite_ORIGIN	67000	209113	208851	99,87	262	0,13
Water body nitrite	42393	280115	279871	99,91	244	0,09
Water body total nitrogen	93954	396336	396084	99,94	252	0,06
Water body ammonium	88131	392550	392186	99,91	364	0,09
Water body pH	32449	350079	348188	99,46	1891	0,54
Water body total alkalinity	7481	61567	61271	99,52	296	0,48
Water body chlorophyll-a	79191	344409	338157	98,18	6252	1,82
Water body nitrate plus nitrite	102112	430102	429644	99,89	458	0,11
Water body dissolved inorganic nitrogen	84322	375497	374913	99,8	584	0,16

WP 3.1: Generating aggregated and validated data collections in the Arctic region – IMR

The first-year contribution to WP3 from IMR as regional leader for the Arctic, was focused on data aggregation, quality control and validation of the first harvesting of eutrophication and ocean acidification data.

The following table shows the total number of profiles and measurements in the merged collection, and the number and percentage of good and bad data values. The parameters where a large part of the data is from ARGO floats, have a lower percentage of good data than earlier because of data not validated yet (with QF=3). Some parameters with very few profiles have a low percentage of good data, particularly DIN.

P35 parameter	Profiles	Values	No. Good	% Good	No. Bad	% Bad
Depth	134 698	10 183 568	10 181 526	99.98	2 042	0.02
Water body dissolved oxygen concentr.	33 374	3 534 242	3 169 826	89.7	364 416	10.3
Water body dissolved oxygen saturation	1 305	293 482	258 855	88.2	34 627	11.8
Water body nitrate	30 540	424 033	373 973	88.2	50 060	11.8
Water body nitrate + nitrite (original)	256	2 870	2 413	84.1	457	15.9
Water body nitrite	29 239	314 218	313 163	99.7	1 055	0.3
Water body phosphate	40 867	446 403	436 131	97.7	10 272	2.3
Water body total phosphorus	60	233	212	91.0	21	9.0
Water body silicate	36 356	407 797	393 682	96.5	14 115	3.5
Water body ammonium	612	2 221	2 218	99.9	3	0.1
Water body chlorophyll-a	98 237	2 865 109	2 091 827	73.0	773 282	27.0
Water body phaeopigments	19 821	145 674	145 019	99.5	655	0.5
Water body dissolved inorganic carbon	249	249	248	99.6	1	0.4
Water body total alkalinity	473	2 898	2 288	79.0	610	21.0
Water body pH	7 187	352 290	311 613	88.5	40 677	11.5
Water body nitrate plus nitrite	30 796	426 903	386 797	90.6	40 106	9.4
Water body dissolved inorg. nitrogen	48	395	244	61.8	151	38.2

WP 3.1: Generating harmonised, aggregated and validated data collections in the N.E Atlantic – IFREMER

The first-year contribution of IFREMER – the regional leader for NE Atlantic was focused on data aggregation, harmonisation and quality control of the first harvesting of the Eutrophication & Ocean Acidification dataset.

Results for the Contaminant dataset received in October 2022 will be presented in the next report.

The detailed description of the activities performed and of the resulting dataset is given in Appendix, while the following table summarises the number of measurements and the percentage of Good/Bad data of the QCed aggregated NE Atlantic Eutrophication & Ocean acidification dataset

P35 Parameters	Nb meas. Profiles	Nb meas. Time series	% Good (QF=1,2,5,6,8,Q) Profiles	% Good (QF=1,2,5,6,8,Q) Time series	% Bad (QF=3,4) Profiles	% Bad (QF=3,4) Time series

dissolved oxygen concentration	8912132	116652	97	94.74	3	5.26
dissolved oxygen saturation	1111198	171180	99.76	98.75	0.24	1.25
phosphate	181893	31598	95.05	84.91	4.95	15.09
total phosphorus	880	NS	93.98	NS	6.02	NS
silicate	95569	29886	95.39	89.44	4.61	10.56
nitrate	73897	NS	97.88	NS	2.12	NS
nitrite	56099	NS	98.06	NS	1.94	NS
nitrate plus nitrite_origin	27434	20714	98.22	99.53	1.78	0.47
nitrate plus nitrite	100863	NS	97.59	NS	2.41	NS
ammonium	32087	37996	97.74	87.41	2.26	12.59
dissolved inorganic nitrogen (DIN)	31158	20128	96.39	99.48	3.61	0.52
urea	1045	NS	99.14	NS	0.86	NS
total nitrogen	611	NS	98.69	NS	1.31	NS
pH	209737	NS	72.35	NS	27.65	NS
dissolved inorganic carbon	704	NS	99.57	NS	0.43	NS
total alkalinity	5779	NS	98.53	NS	1.47	NS
chlorophyll-a	2602195	38214	73.95	92.89	26.05	7.11
chlorophyll-b	3334	NS	99.73	NS	0.27	NS
phaeopigments	3277	NS	99.66	NS	0.34	NS

WP 3.1: Generating aggregated and validated data collections in the Mediterranean – HCMR

In the first year, contribution of HCMR- regional leader of Mediterranean Sea was focused on aggregation, quality control and validation of data concerning eutrophication and ocean acidification. The process is described analytically in the Appendix.

Also, in current days, HCMR received the harvested contaminant datasets files and the QC checks has also started. The result of these checks will be presented in the next report.

Total numbers of observations and percentage of "Good" (QF=1,2,5,6,8,Q) and "Bad" (QF=3,4) flagged data in the final merged QCed aggregated Eutrophication and ocean acidification data collections in the Mediterranean Sea are given below.

Parameters	T. Profile measurement	T. Timeseries measurement	Good data (%)		Bad data (%)	
			Profiles	Timeseries	Profiles	Timeseries
DO	14,550,542	937,943	90.76	93.89	9.24	6.11
DO Saturation	685,357	77,812	56.88	87.50	43.12	12.50
NO2	178,392	43,035	80.50	96.00	19.50	4.00
NO3	405,432	43,147	84.32	95.46	15.68	4.54
N02+NO3 Orig.	55,173	15,740	99.13	98.75	0.87	1.25
NH4	100,847	60,797	77.00	98.46	23.00	1.54
PO4	232,375	63,054	89.07	97.48	10.93	2.52
SiO2	214,917	53,219	88.87	98.87	11.13	1.13
CHL-a	10,984,871	543,437	88.67	87.73	11.33	12.27
T. Phosphorus	14,055	39,032	96.07	99.45	3.93	0.55

T. Nitrogen	12,285	8,689	90.13	98.35	9.87	1.65
DIN Orig.	1,363	227	48.54	100.00	51.46	0.00
pH	594,075	464,757	81.08	95.10	18.92	4.90
T. Alkalinity	9,373	8,115	96.30	100.00	3.70	0.00
NO3 + NO2 Cal.	451,642	48,740	85.16	96.46	14.84	3.54
DIN Cal.	107,442	47,421	73.42	96.33	26.58	3.67
Average			**82.87**	**96.24**	**17.13**	**3.76**

WP 3.1: Generating aggregated and validated data collections in the Black Sea - NIMRD

In the first year, contribution of NIMRD to the WP3 for the Black Sea activities was focused on data aggregation, quality control (QC) and validation of data concerning eutrophication and ocean acidification and starting the harmonization, quality control and validation of data concerning contaminants.

The detailed description of the activities performed is given in Appendix, while the following table summarises the total number of vertical profiles with number and percentage of “Good” and “Bad” flagged data in the Black Sea data collection.

Parameter	No. of VP	Total no. of values	Good	% Good	Bad	% Bad
Depth [m]	73493	3539911	3539309	99.98	602	0.02
Water body dissolved oxygen concentration	61342	1094966	1026763	93.77	68203	6.23
Water body dissolved oxygen saturation [%]	7906	55951	55944	99.99	7	0.01
Water body phosphate	29348	106036	102258	96.44	3778	3.56
Water body total phosphorus	10888	24457	23145	94.64	1312	5.36
Water body silicate	25663	85653	85098	99.35	555	0.65
Water body nitrate	17284	51327	47936	93.39	3391	6.61
Water body nitrate plus nitrite original	2630	20717	20408	98.51	309	1.49
Water body nitrite	26146	76514	71679	93.68	4835	6.32
Water body total nitrogen	10967	24323	23671	97.32	652	2.68
Water body ammonium	21075	55526	54586	98.31	940	1.69
Water body pH	30689	110939	110156	99.29	783	0.71
Water body total alkalinity	12769	30592	28537	93.28	2055	6.72
Water body chlorophyll-a	20880	42988	41218	95.88	1770	4.12
Water body nitrate plus nitrite	19672	71007	66977	94.32	4030	5.68
Water body DIN)	15999	45615	43386	95.11	2229	4.89
Water body DIN original	38	121	120	99.17	1	0.83
				98.24		1.76

WP 3.1: Generating aggregated and validated data collections – upgrading ODV software by AWI

The Ocean Data View (ODV) software as developed and maintained by AWI, is an important tool for the QA-QC activities as undertaken by the Regional Coordinators (RCs). Upon request of the RCs, AWI has added several new features to the ODV software to support the validation and harmonisation process in an improved way:

- The code for identification and resolution of duplicate stations was completely rewritten resulting in massive efficiency gains. Applications to large collections with millions of stations that previously required several days are now processed in one or two hours;
- GeoTIFF support was added. Tif images of the station map and map data plots (e.g., isosurface plots) now have geo-reference information embedded, which allows using such images as layers in GIS software. In addition, new plotting modes were implemented that allow creation of gif and png images for use as WMS layers (see webODV in WP4.3).
- ODV derived variables now routinely use the quality flag schema of the input variables. For EMODnet Chemistry eutrophication and contaminants data collections this means that the SeaDataNet scheme is used for expression and aggregated derived variables as for the other basic variables.

WP 3.2: Generating DIVA maps of eutrophication

Using the latest available aggregated, harmonized and validated data collection for eutrophication from 2021, spatially interpolated concentration basin maps were generated, with the DIVA (Data-Interpolating Variational Analysis) software tool. This production by RCs together with ULg is detailed in an EMODnet Chemistry D3.5 documentation: 'EMODnet Chemistry Regional climatologies produced with Data-Interpolating Variational Analysis (DIVA). Release 2021' which can be found at the Chemistry portal and with DOI: 10.13120/FA5C704A-A5EA-4F60-91B5-2BF6A7ADED45

DIVA stands for Data-Interpolating Variational Analysis. It has been developed in the frame of SeaDataNet projects and is designed to perform spatial interpolation in two dimensions, typically on a horizontal plane (longitudes and latitudes). The DIVA code is available from GitHub (https://github.com/gher-ulg/dIVA). DIVAnd is the generalisation of DIVA in n dimension, meaning that depth and time dimensions can be considered in the analysis as well. DIVAnd performs an n-dimensional variational analysis/gridding of arbitrarily located observations. Both DIVA and DIVAnd provide error maps associated with the analysis. These error fields reflect the accuracy of the gridded field and depend specifically on the data coverage (regions with few or no observations will have a high error) as well as the uncertainties on the observations. DIVAnd is written in Julia, a fast, dynamic programming language (https://julialang.org), particularly well adapted to the processing of large matrices and vectors. A set of Jupyter-notebooks (https://jupyter.org/) is provided as guidelines for creation of a climatology.

Three types of climatologies were produced:

- All European Seas – monthly maps on a domain covering all the regional seas
- Sea region – at seasonal scale and for periods of 6 years, using a moving 6-year window seasonal maps
- Coastal area maps - at seasonal scale

The EMODnet Chemistry Regional climatologies have been produced at seasonal scale and for periods of 6 years, using a moving 6-year window. The season definitions used are defined specifically for each basin. These have been produced for Chlorophyll, Dissolved inorganic nitrogen, Dissolved oxygen, Phosphate, and Silicate. For each of the following sea basins: Arctic region, Atlantic Sea, Baltic Sea, Black Sea, Mediterranean Sea and North Sea, seasonal climatological maps built as 6-year running averages are available. These (animated) maps are included in the Chemistry OceanBrowser viewer and fed to the Central Portal Map Viewer by means of the OGC WMS service protocol.

The All-European Seas product is a new product designed to cover all the domains. In the past, such a product was built by merging individual regional climatologies. Now the approach has been different: the product was

created directly using all the data (profiles and time series) covering the region of interest. The interpolation grid extends from 45°W to 70°E and from 24°N to 83°N, with a spatial resolution of 0.25° X 0.25°. The vertical levels were selected at 102 standard depths identical to those of Boyer et al. (2018) for the World Ocean Atlas. The considered data period ranges from 1960 to 2020. Monthly fields were created for that period. Due to the large amount of data points (up to 26 million) and the grid size (237 X 461 X 109), the analyses were all performed on a virtual machine provided in the frame of the PHIDIAS (https://www.phidias-hpc.eu/) project, dedicated to high-performance computing. This machine is provided with 84G of RAM and 20 threads. The results consist of 5 netCDF files, one per variable, storing the monthly climatologies. The size of one file is about 300 Mb.

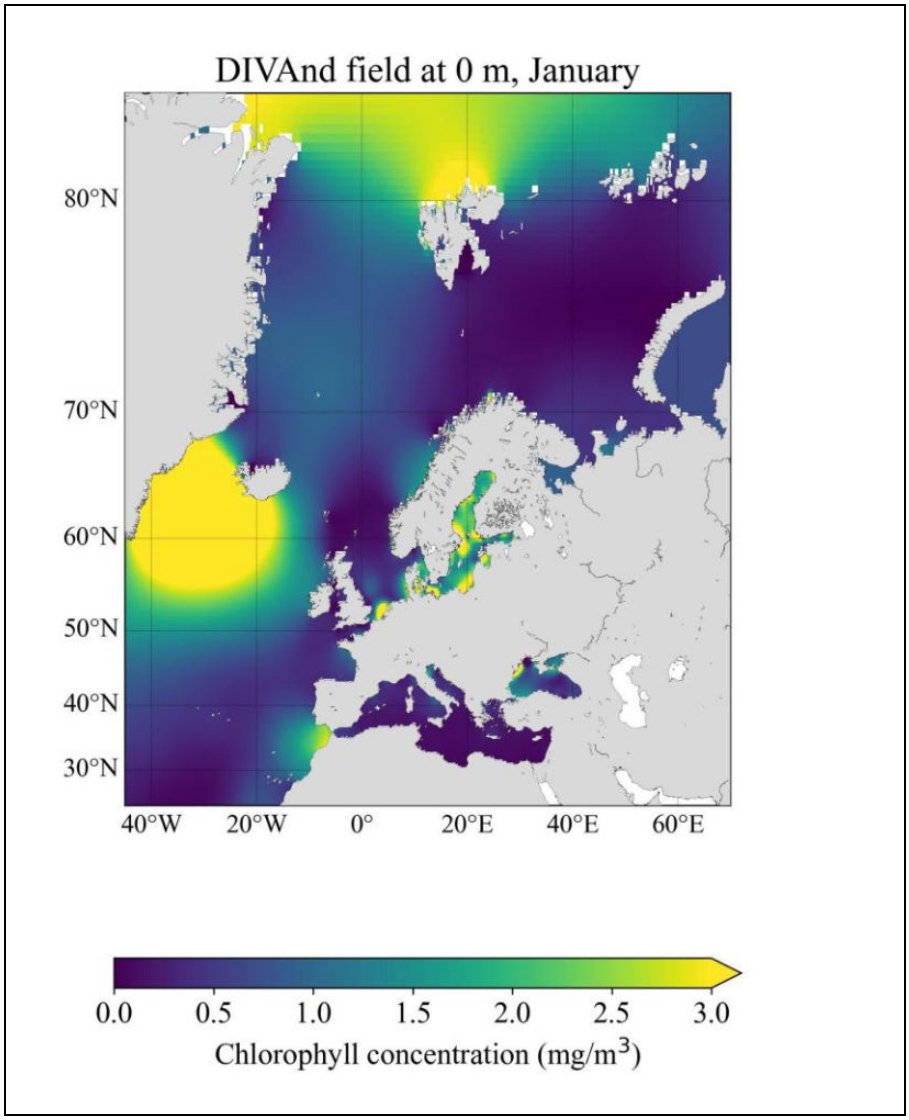

Figure: Example of monthly fields at different depths obtained by DIVAnd.

WP 3.3: Higher resolution maps at river mouths

Using DIVAnd, a set of high-resolution eutrophication DIVAnd maps were produced for coastal areas and with river influences:

- Coastal Mediterranean Sea – Po River
- Coastal Black Sea – Danube River
- Coastal Baltic Sea - Gulf of Riga
- Coastal NE Atlantic Ocean – Loire River

Accurate bathymetry information is very important for these high-resolution data products. Therefore, use was made of the latest bathymetry from EMODnet Bathymetry for accurate representation of the coastline. All these DIVAnd maps have been included in the Chemistry OceanBrowser viewing service, while the corresponding method and metadata descriptions are available for download from the EMODnet Chemistry Sextant Catalogue Service. The production is detailed in the EMODnet Chemistry D3.5 documentation: 'EMODnet Chemistry Regional climatologies produced with Data-Interpolating Variational Analysis (DIVA). Release 2021' which can be found at the Chemistry portal and with DOI: 10.13120/FA5C704A-A5EA-4F60-91B5-2BF6A7ADED45.

WP 3.4: Tuning data collection and dedicated maps on contaminants

The first steps of this workflow for contaminants will be performed again by the regional coordinators, up to the delivery of harmonised, aggregated and validated regional data collections for selected parameters as well as feedback to the data providers. Recently, 30 September 2022, the harvesting of **contaminants** data has been completed and the data packages have been distributed to the Regional Coordinators for further processing into a harmonised and validated collection. Further processing into a harmonised and validated collection and derived maps are starting and will take place in the second year.

WP3.5: Generating validated data collections and maps for marine litter and microliter

So far, the focus has been in WP2 on gathering more entries for beach litter, seafloor litter, and micro litter in water, sediment, and biota. Early October 2022, a harvest of all Marine Litter data sets to date has been performed and the data packages have been handed to OGS who together with IFREMER will work on the planned data products.

WP4 – Technical development for interoperability, services and tools

Concerns Task 3: Develop procedures for machine-to-machine connections to data and data products AND Task 4: Contribute data, data products and content to a central portal that allows users to find, view and download data and data products.

Technical developments are discussed and monitored in the Technical Working Group with MARIS (Technical Coordinator), OGS, IFREMER, ICES, AWI, ULiège, ISPRA, NOC-BODC, MI and VLIZ. The Technical Coordinator also participates to meetings of the EMODnet Steering Committee and EMODnet Technical Working Group for tuning technical specifications and developments.

WP4.1: Transforming the functionality of the existing EMODnet Chemistry portal services into machine-to-machine services for use by the EMODnet Central portal and contributing to their deployment as user interfaces for the users of the Central portal

A major activity is working on the migration planned from thematic portals to one central EMODnet portal, which will become the one-stop-shop for EMODnet products and services. While, thematic groups will continue to be responsible for the gathering of data sets, generation of their products and the provision of machine-to-machine services which will feed the EMODnet central portal. To find a suitable solution for this migration challenge, there is regular contact between the EMODnet Central Portal team (CP team) and a technical team from EMODnet Chemistry. Overall, agreement has been reached between the teams, also shared by CINEA and DG-MARE, on the approach for the migration of EMODnet Chemistry.
The current Chemistry Portal services are:

- **CDI Data Discovery and Access service** giving facilities for searching and retrieving chemistry source data sets
- **Sextant Products Catalogue service** giving facilities for searching and downloading of Chemistry data products and viewing through the link with the OceanBrowser viewing service
- **OceanBrowser Viewing service** giving facilities for viewing, browsing and downloading of Chemistry data products (collections, DIVA maps, Marine Litter maps, Contaminants maps, CDI coverage maps)
- **WebODV explorer and extractor service** giving facilities for querying and extracting subsets from Chemistry aggregated data collections (eutrophication and contaminants), and generating and viewing dynamic plots of selected parameters.

These Chemistry services have been mapped to the concept of the Central Portal and its services, following the principle that use should be made of machine-to-machine connections, where useful and feasible.

- The new Central Portal (CP) has online CMS for describing and maintaining the 'narrative' of each thematic site. This 'narrative' is a composite and extract of the free texts that were included in the original thematic sites. The 'narrative' for Chemistry is nearly finished, but needs further refining, such as including more links to the CP services. Also, the thematics are waiting for the moment that they can enter new and update existing content themselves as it is currently a 'tedious' process through JIRA with annotated documents;
- The Chemistry User Interfaces for the CDI service and WebODV service are continued and considered as 'External Services', which can be reached from the site 'narrative', from maps in the CP map viewer, and from related metadata descriptions in the CP Products catalogue service. The web addresses of both services have been amended to no longer using www.emodnet-chemistry.eu as root. WebODV is in the process of defining and producing some attractive maps, which will be integrated in the CP Map Viewer and CP Products Catalogue. For the CDI service this is already the case;
- The Chemistry Sextant Products Catalogue service will be continued as an 'internal' service to prepare and maintain metadata entries for Chemistry products. The content will be regularly harvested by the CP Products Catalogue by means of the OGC CSW service protocol. This exchange has already been done, but there are still differences in the number of records that have been successfully imported into the CP Catalogue. This requires further analysis, because the harvesting should be complete and be able to function autonomously. It was also decided that the DOI landing page of several Chemistry products will continue to be hosted by EMODnet Chemistry as they are responsible for the contents;
- The CP Product Catalogue entries should include viewing links to the CP Viewer service, where relevant, and download links. Currently, there are not yet 'deep links' to specific maps possible, which

is being researched by the CP Team. The downloading of Chemistry products is being served from EMODnet-Chemistry, but still needs URL refinement;

- All map layers of Chemistry will be included in CP Viewer:
    - Marine Litter maps by OGC WMS-WFS services from IFREMER: this is operational;
    - Contaminants maps by OGC WMS-WFS services from ISPRA; this is operational, but from OGS, and will be taken over later by ISPRAdone => DONE now via OGS, later via ISPRA;
    - P36 CDI coverage maps from the CDI service by OGC WMS-WFS services from MARIS: this is operational;
    - Attractive maps for the aggregated data collections for eutrophication and contaminants from WebODV service by OGC WMS-WFS services from AWI: the service protocol is working; production of maps is underway;
    - DIVA interpolated maps for eutrophication are fed by OGC WMS-WFS by the Chemistry OceanBrowser, operated by ULg, ensuring specific analytical functions to feed by OGC WMS-WFS services: this is operational.
- All Chemistry documents (guidelines and manuals, reports) should be populated and maintained in the CP Reports catalogue with Chemistry and Type tags: this is not done yet;
- All Chemistry news items should be populated and maintained in the CP News service with Chemistry tags: this is not done yet;
- Finally, EMODnet Chemistry is interested how the various services can be maintained, in particular considering the release of new Chemistry products which require a synchronization between different services and the site narrative.

So overall, it can be concluded, that the migration is well underway. But that there are still several open issues which need to be tackled on short term and there are refinements needed, before the CP could go live.

WP4.2: Further developing the EMODnet database system for marine litter and dynamic generation of Marine Litter maps

Currently, EMODnet Chemistry has procedures and protocols for gathering and processing of three types of Marine Litter, namely beach litter, seafloor litter, and floating micro litter. For formats, classifications, and gathering procedures, cooperation and tuning takes place with TG-ML and EU-JRC. For the first two ML types, two central databases have been set-up at OGS, while for floating micro litter use is made of CDI and amended ODV formats. For access, use is made of the CDI service for all three ML types, whereby OGS generates the CDIs from the two central databases, acknowledging the data curators in the CDI metadata. While, in addition mapping products are generated and published as map layers.

Marine Litter data are used to produce **Aggregated Collections**: for **beach** respectively **seafloor** litter, in EMODnet Beach litter data format Version 1.0 (spreadsheet file composed of 4 sheets: beach metadata, survey metadata, animals and litter) respectively in EMODnet Sea-floor litter data format Version 1.0 (csv format, tab separated values). These products are included in the EMODnet Chemistry Products catalogue with metadata and DOI. While **ML maps** are generated at intervals for beach litter and seafloor litter data collections, and these are published through the Map Viewer while documented in the Products cCatalogue.

The production of validated data collections and derived maps for Marine Litter will be done in a cooperation between OGS and IFREMER, whereby IFREMER will include the publishing of the derived maps and related features by means of OGC WMS-WFS services. This process for the new products will start soon, following the Marine Litter data harvest. During the process, also attention will be given to streamlining further the production and publishing process.

WP4.3: Improving the advanced viewing services

Earlier, the Chemistry Map Viewer had advanced services for displaying dynamic location maps of the collection products and plots of profiles and timeseries of stations in those collections. These advanced services have been replaced and expanded in functionality by integrating and further expanding the **WebODV Explorer and Extractor** service, developed by AWI. The online webODV service, available at https://emodnet-chemistry.webodv.awi.de/, provides powerful functionality for MSFD users and the research community. It offers MSFD users easy options for browsing, sub-setting, and exporting data sets from the EMODnet Chemistry aggregated validated data collections into a number of formats, e.g. for use in environmental assessments. WebODV offers scientists easy options for exploring these data collections as a 'treasure box', allowing them to do fundamental science and prepare graphics, like ocean sections of specific parameters. These can include interpolations using the integrated DIVA tool, which adds to making graphics, ready for scientific abstracts and papers. The webODV has been made operational for the eutrophication collections, as well as for handling the contaminants data collections. The latter was quite challenging due to the complexity of many different contaminants variables and how to make meaningful extractions and graphics.

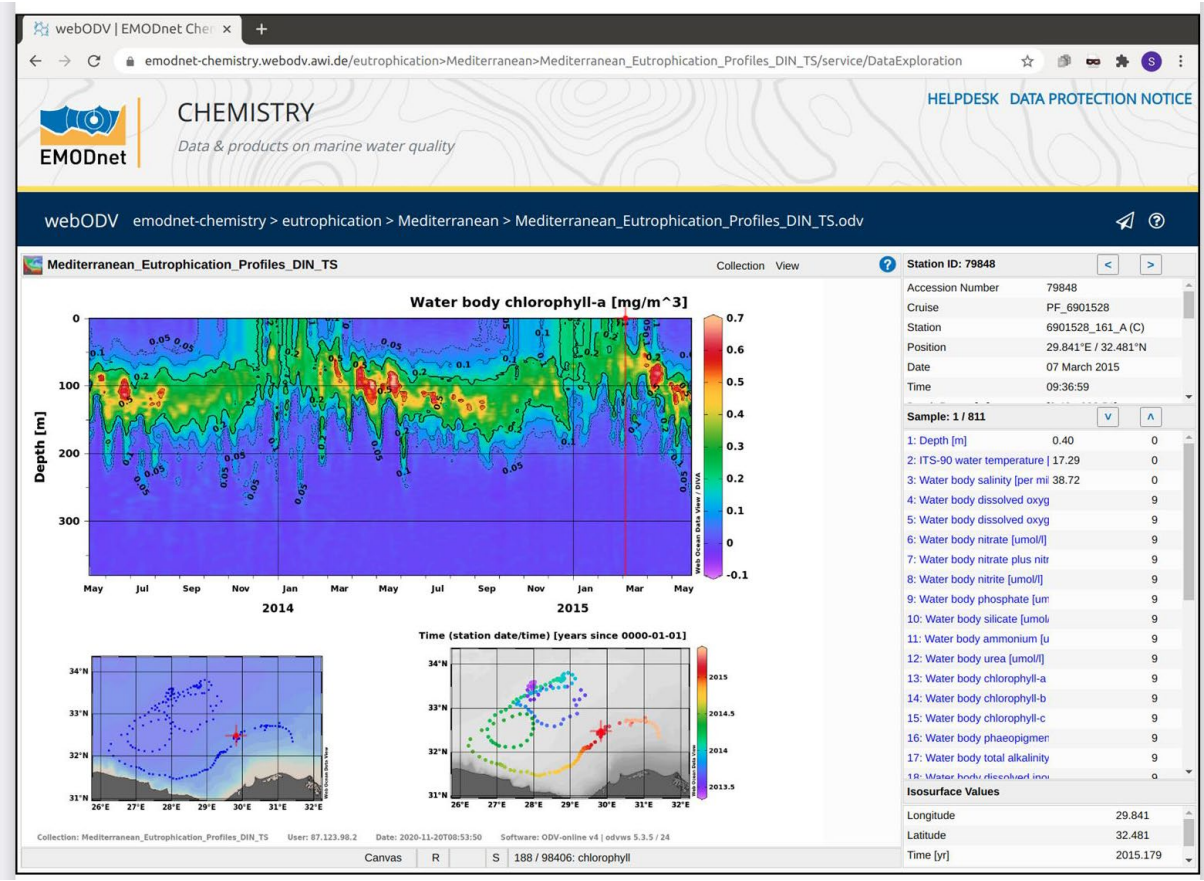

Figure: WebODV illustration of a graphics with interpolation

Recently, WebODV has successfully implemented GetCapabilities and GetMap functionalities to be able to serve maps as produced in WebODV by means of the OGC WMS – WFS service protocol. The GetCapabilities can be retrieved via:
https://emodnet-chemistry.webodv.awi.de/api/wms?service=WMS&request=GetCapabilities.

The idea is now to prepare a few very attractive WebODV maps that will be exposed to the Central Portal Viewer service and described in product metadata entries in the CP Products Catalogue which will make users interested and will allow them to go to the WebODV service for trying out.

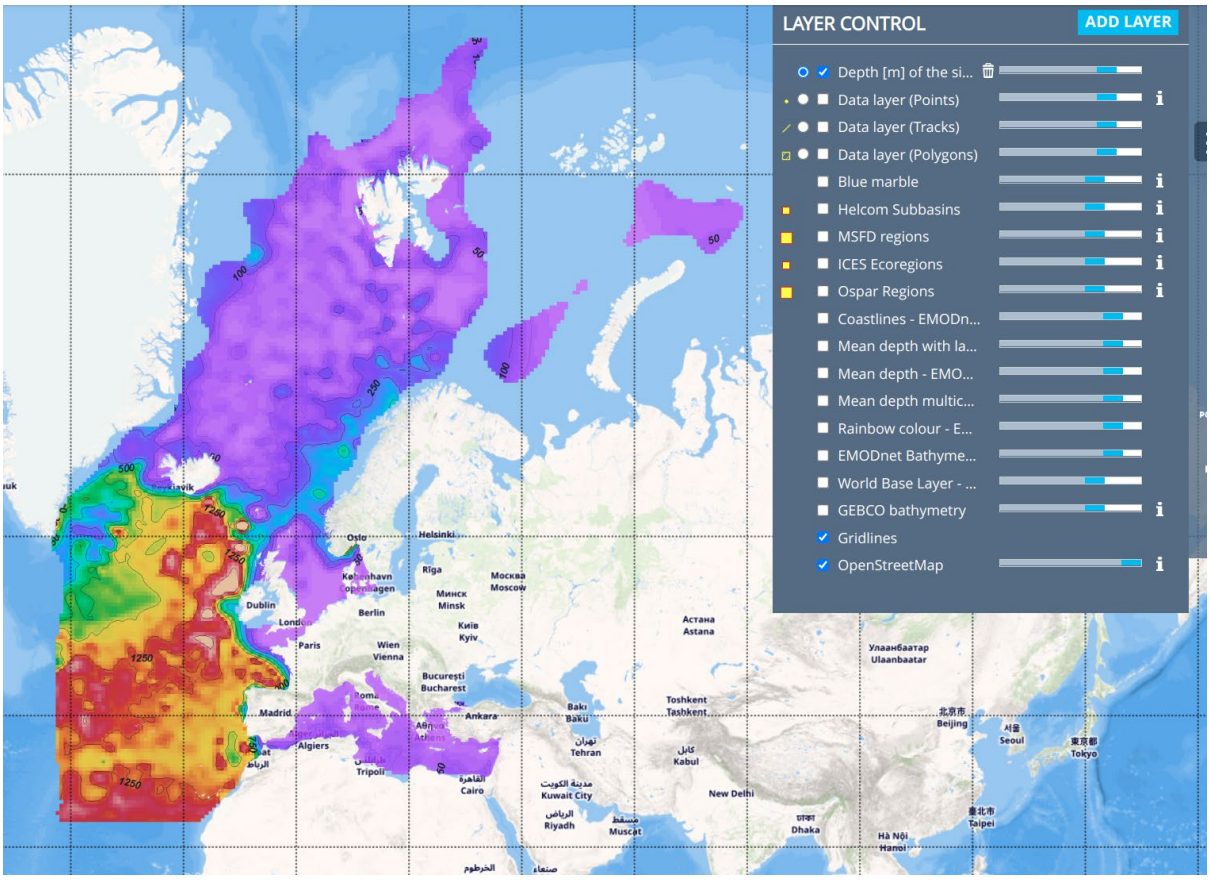

Figure: webODV WMS service accessed by the CDI portal (https://cdi.seadatanet.org/search)

To support users and to make it even more attractive, video tutorials have been made by AWI which sit at the WebODV landing page.

The webODV service has been running operationally since November 2020. From the beginning, user authentication was needed for downloading. However, recently, it was decided to ease the access to webODV and to ask for an email address when users want to download data extracts. This makes the access easier. Currently, webODV provides access to 37 subdatasets of the EMODnet Chemistry harmonised and validated data collections. A powerful treeview functionality allows a user-friendly access to the datasets by grouping the data into several categories.

WP4.4: Streamlining the process for generating and publishing Contaminants maps

Dedicated maps are made and more will be designed for contaminants along the coasts that are a useful tool in environmental impact assessment analysis (see also WP3). The following image gives an overview of the plan for streamlining the production process.

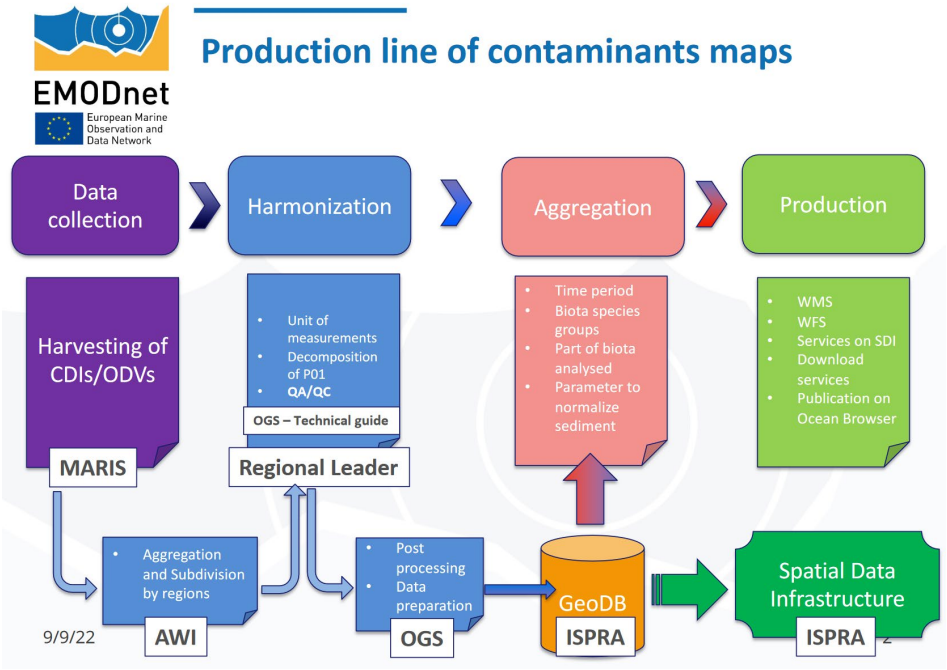

Figure: Planned streamlining of the contaminants maps production process

As part of the implementation, ISPRA is making good progress with setting up and configuring a dedicated infrastructure for managing the contaminants data collections as provided through the QA-QC and harmonization activities of the Regional Coordinators in a GeoDB and for a producing and publishing derived maps and features by means of OGC WMS-WFS services.

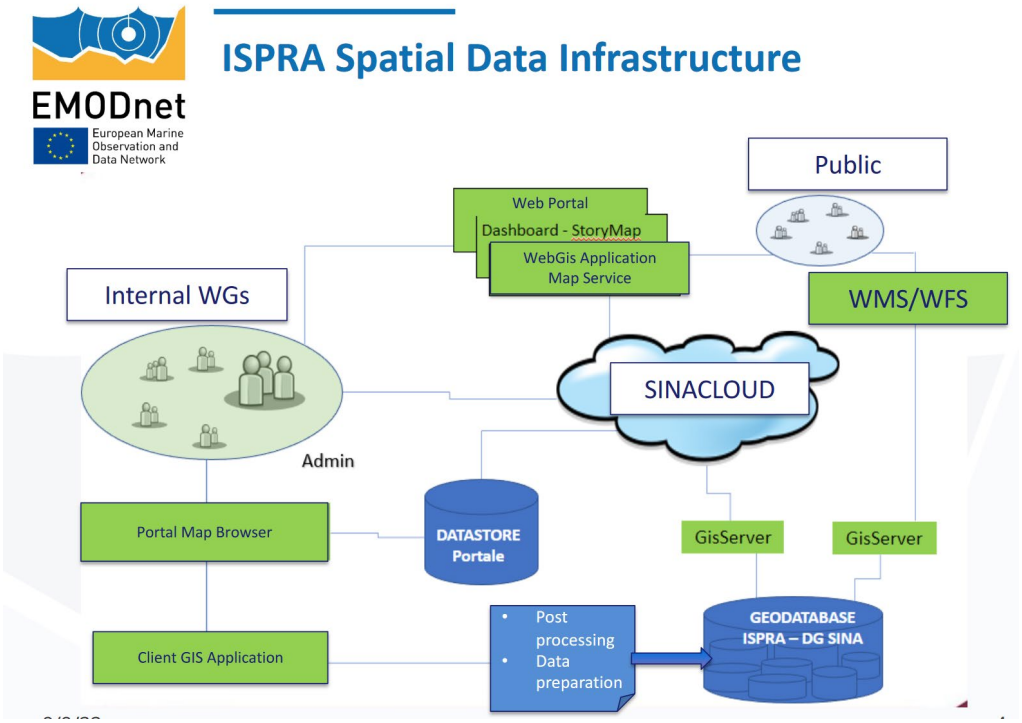

Figure: Infrastructure under development at ISPRA for contaminants products

It is planned that the ISPRA infrastructure will be operational in a few months. In the meantime, the Regional Coordinators have just received the contaminants harvest, and will be busy the coming months with the QA-QC and harmonization actions to come to a harmonized, aggregated, and validated contaminants data collection.

WP4.5: Operation and monitoring of well functioning of services and gathering indicators

Procedures are up and running for gathering monitoring results for the existing and upgraded EMODnet Chemistry portal and its services. The COVID-19 emergency did not affect the functionality. In the first quarter, OGS has developed a new web service that collects download metrics for the map viewer and the DOI landing page for the indicators. This has been expanded with indicators for the data products catalogue and webODV Data Explorer and Extractor.

WP5 – Uptake, outreach and interaction

Concerns Task 6: Ensure the involvement of regional sea conventions, Task 7: Contribute to the implementation of EU legislation and broader initiatives for open data AND Task 8: Monitor quality/performance and deal with user feedback.

As part of WP5, a number of subWP activities have been undertaken, which are reported.

WP5.1: Maintain and operate a Help service – led by OGS

The help service consists of a helpdesk and help information published at different sections of the portal, in the descriptive part, in the data explorer and extractor, and in the viewing and downloading service. The helpdesk is easily accessible by email and telephone. The telephone service operates during European working hours, while e-mails get answered within two working days. During the reporting period, further use is made of functionality to be provided by the Central portal for feedback. All queries are tracked, and a record is kept of all queries received, by OGS system and in the Central portal system. According to ISO 9001 quality procedures, recorded queries are analysed to elaborate Frequently Asked Questions for publishing on the portal and to provide indicators (response time of the helpdesk, …). The questions have different grades, like answer immediately, forward to internal experts for answering, and forward to consortium experts for answering. For the reporting period, 25 requests for support were received by the helpdesk (recording an average of two requests per month).

WP5.2: Interaction and regular dialogue with MSFD stakeholders - led by ICES

This task links to the objective to "maintain interaction with Regional Sea Conventions, EEA, EU-JRC and other MSFD stakeholders". The MSFD board of experts was utilised in the last phase of EMODnet Chemistry (2019-2021) and proved an effective way to interact and receive feedback with regional experts linked to the thematic assessment areas (Eutrophication, Hazardous Substances and Marine Litter). The board also worked as a platform for introducing new data products and tuning them before their final release to ensure alignment and adequate annotation, meta data and quality assurance of the published datasets and map visualisations.

The new phase of EMODnet Chemistry started at a time when the regional sea conventions were in the final stages of preparing the implementation of their 6-10 year assessments of the marine environment (OSPAR QSR 2023, HELCOM HOLAS3 2023, Barcelona Convention MED QSR 2023). In addition, the interaction with the European Environment Agency – a key partner in thematic European assessments and the utilisation of EMODnet datasets to fulfil these, was challenged by both an internal restructure of the EEA units dealing with marine data and assessments, and the change in the consortium of the European Topic Centre (ETC) that supports the EEA action plan. The new ETC has a broader remit covering all marine, freshwater systems and all biodiversity. As highlighted in the technical proposal, a risk was identified of "aligning the timings of data collection, preparation and product generation, to that of the RSC and EEA needs". To this end, it was deemed difficult to honour the timings of the deliverables (D5.2 M6, M12 and M18) as these were arbitrary and did not fit the generation of new products in EMODnet Chemistry, nor was it probable that the RSC's would have had time to engage at a time when their focus was on the regional assessments.

The current membership of the board of experts have been contacted in October 2022, and calls for new members or for changes in status have been initiated. At the same time, EMODnet Chemistry have outlined a timetable for MSFD board of experts meetings in 2023 that will follow the preparation of updated data products:

- January 2023 (Eutrophication)
- February 2023 (contaminants)
- September 2023 (Litter)

This has already resulted in an invitation from the OSPAR Inter-sessional correspondence group on Eutrophication (ICG-EUT) to present at their meeting at the end of January.

The consolidated use of EMODnet Chemistry for the regular ingestion of the MSFD monitoring marine litter data (beach litter, seafloor litter and micro-litter) has opened the floor to extend the use to other descriptors. A stronger cooperation with EC-JRC and the MSFD group of experts on contaminants was established while the management of oil spill data is still under evaluation.

On Regional Sea Conventions, EMODnet Chemistry has been managing HELCOM data into the beach litter database and has been contributing to the 2023 UNEP/MAP Mediterranean Quality Status Report .

WP5.3: Maintain international cooperation and interoperability – led by OGS + MARIS

The EMODnet Chemistry aims at international interoperability and several efforts are undertaken to connect EMODnet chemistry datasets and data products on eutrophication, ocean acidification, contaminants, and marine litter to relevant international networks and to positioning EMODnet as a significant contribution of the EU to the upcoming United Nations Decade of Ocean Science for Sustainable Development.

The UN Global Ocean Oxygen Database and Atlas (GO2DAT), the UN Global Ocean Acidification (SDG14.3.1) Data Portal, the UN Global Partnership on Marine Litter Digital Platform (GPML) and the NOAA/NCEI – World Ocean Atlas received contributions from EMODnet Chemistry for their implementation.

EMODnet Chemistry participated in the realization of the Sulitest module (a set of questions) for literacy on the Goal 14 of the UN 2030 Agenda for Sustainable Development.

With the G20 International Experts on Marine Plastic Litter Monitoring Data Sharing Project, EMODnet Chemistry has been discussing the prototype 'Microplastics Data-sharing System' to collect and give free access to microplastic data on a global scale, and the proposals for a 'Data Entry Form Sheet' and a 'Data List Sheet'. The partnership has been also participating in the Global Marine Litter and Plastic Pollution Ontology peer review process.

The existing close relationship with the Copernicus Marine Services (CMEMS) has been enhanced and made more operational. Copernicus started using EMODnet Chemistry data collections and a first joint data product portfolio for the MSFD was released.

EMODnet Chemistry data products are indexed and made available via the Blue-Cloud Data Discovery and Access service, the European marine thematic platform of the European Open Science Cloud (EOSC).

4.Identified issues: status and actions taken

*[Provide an **overview of issues** identified by CINEA (Table A) - new as well as pending ones, the status of those issues, and actions taken to address them and/or roadmap with remaining actions planned to resolve the issues, since the start of the project phase. In Table B, provide information about any issues and challenges identified by yourself.]*

A. Priority issue(s) identified and communicated by CINEA/ DG MARE/ SECRETARIAT				
Priority issue	Status (Pending/ Resolved)	Action(s) taken/ remaining actions planned	Date due	Date resolved
Chemistry to report on number and volume of downloaded data and data products by 29th of October 2021 (EM-359)	Resolved	Uploaded	29/10/21	05/11/21
Chemistry Quality of Service Monitoring (EM-144)	Resolved	The problem was corrected by Ifremer's IT department.	December 2021	14/01/22
Several JIRA tickets are open to prepare the centralisation	Ongoing	Interaction with Chemistry network to rationalise the content (static and data products)		
Chemistry - EMODnet Catalogue Tags (EM-533)	Pending	The list has been posted by Chemistry. Now waiting for implementation by CP	26/04/22	n.a.
Log4Jshell Update from Chemistry (EM-450)	Resolved	Done also the last step: upgrade to version 4 of GeoNetwork.	n.a.	25/01/22
Chemistry - Web Services MetadataUrl and DataUrl fields (EM-84)	Pending	Checking OGS GeoServer INSPIRE extension	n.a.	n.a.
TWG7 - Action 10: Chemistry to follow up on the updates to the Data products for the European Atlas of the Seas (EM-55)	Resolved	Revised draft	n.a.	15/03/22
Fix the problem with spaces in file names in THREDDS (EM-653)	In review	Changes are made by Chemistry as requested by CP. Now waiting for review by CP	15/10/2022	n.a.
Chemistry to review layer legends and add units where they are missing (EM-648)	Done	Information was added as requested	11/10/2022	
Create "NEW' Chemistry page on CP (dev) (EM 506)	Done	Input provided	24/10/2022	

Chemistry to provide input to the Tools & Guidelines section (EM- 640)	Done	Input provided	24/10/22 (See priority issue relating to EM506)	
Standardise the navigation menu on left hand side of page (EM-633)	To do	Input provided	24/10/22 (See priority issue relating to EM506)	
Centralisation Checklist for review (EM-607)	To do	Review content		

B. Issues / challenges identified by the thematic assembly group itself				
Priority issue / challenge	Status (Pending/ Resolved)	Action(s) taken / remaining actions planned	Date due	Date resolved
Trust-IT uptime graph for Chemistry is wrong. It should be always 100% for Q4. It happened also in the past	Pending	We are waiting, but for now we've fixed the graph before including it in the indicator's spreadsheet	January 2022	
Wrong uptime metrics in Grafana (EM-438)	Resolved	Jira EM-385 was created. Closed after action by TRUST-IT	December 2021	
Web Services MetadataUrl and DataUrl fields	Resolved	Extension reinstalled	October 2021	
Insert new Q1-2022 Chemistry use cases to Grafana (EM-548)	Pending	Still waiting for a solution from TRUST-IT.	14/03/22	n.a.
Non harvested data products from Chemistry CSW (EM-551)	Pending	To be handled if still relevant once the Central Portal GeoNetwork update goes live (thus pending ticket EM-44)	n.a.	n.a.
Filtering in the Product Catalogue: from default fields to more user-friendly items (Geographic area, Matrix, Theme, …)	Pending	Ticket open		

5.Allocation of project resources

[Provide information about the efforts spent since the start of the project phase (provide the date) on achieving the main objectives and tasks of the project. Provide an overview of resource usage (percentage of project resources) divided into the following categories (if no precise information is available, provide estimate indication instead).]

Information on the allocation of project resources	
Categories	Resource usage[3] (%)
Making data and metadata interoperable and available	42.08
Preparing data products	27.31
Preparing web-pages, viewing or search facilities	15.80
Managing user feedback	3.24
Project management	6.71
Outreach and communication activities	4.86
Others	

[3] Provide the workings of your calculations, *i.e*. percentage allocation of the total amount awarded.

6.User feedback

[Provide a list of all user feedback received since the start of the project phase in chronological order. Indicate the type of the feedback received, a clear description of the query, and the actions undertaken to resolve the issue (e.g. update of metadata, fixing a particular issue with the map viewer). Indicate the status of the query, and if not provide an explanation why. List any feedback you received on the portal that can be used to build EMODnet use cases.]

Overview of user feedback and/or requests received in this quarter							
Date	contact	Type of user feedback (e.g. technical, case study, etc.) and short description of the feedback received	Means of contact	Response time	Status of user query (Resolved/Pending)	Measures taken to resolve the query	Status: if not (yet) resolved/pending, explain reason why and expected timeline
04/10/2021	University ofMalta	Technical	e-mail	2 hours	resolved	Sea Floor Litter Data is now correctly validated	n/a
5/10/2021	JRC	Asked progress in collecting 2020 coastline beach litter	e-mail	3hours & 1day	Resolved	Extract informationfrom the database in the given format	
28/10/2021	Marevivo NGO	Request to collectmarine litter data on coastal benthic waters	e-mail	1 day	Resolved	The tool and support in its usage will be provided	
16/11/2021	Ifremer	Request to collaborateon microplastic in biota	Personalcontact	Prompt	Resolved	Positive feedbackwith the suggestion to face the task in the next contract phase	
10/12/2021	JRC	Asked overview of microlitter datacollection	e-mail	1 day	Resolved	Extract information from the CDI service in the given format	
10/12/2021	Niva	Request to join potential EMODnet chemistryevent	e-mail	3 days	Resolved	Positive feedback to collaborate with the delivery of a list of events	

11-12/2021	JRC	Information on EMODnet metadata andformat for contaminants	e-mail	continuous	On-going	Personal contactand info exchange	Dialogue to consolidate interactions and collaboration is ongoing
23/12/2021	IEO	Visualisation of microlitter data withODV	e-mail	12 days	Resolved	An alternative tool to plot microlitterdata was given	
13/1/2022	University of Victoria in Canada	Request for information: I am wondering if there are any documents that outline the framework or policies being used on the EMODnet data platform that have contributed to the harmonization of data and their collection methods	Indirect email since the user contacted both SeaDataNet and EMODnet, not directly EMODnet Chemistry	2:50 working hours	Resolved	Email response.	n.a.
17/2/2022	n.a.	Technical: Unfortunately, when I download the following netcdf file, I get as title variable "Water_body_dissolved_oxygen_concentration_L2". So, I think there is a mistake here.	Email	6 working hours	Resolved	Email response: Unfortunately, as a project we don't produce products for organic Carbon.	n.a.
17/2/2022	n.a.	Technical: Is there a possibility to get Dissolved Organic Carbon as a product?	Email	11 working hours	Resolved	Updating the product and email response.	n.a.
30/3/2022	TechnopolisGroup	Technical: error in webODV	Email	1 workinghour	Resolved	Email response, resolving the issue and another email response for	n.a.

						notifying that all is fine.	
31/3/2022	University ofHelsinki	Technical: Marine-ID question regarding downloading of an aggregated dataset.	Email	6 minutes	Resolved	Email response: explanation.	n.a.
14/4/2022	Researcher1	Technical: support request to extract data	EMODnet Chemistrycontact form	5 hours	Pending	Email exchange: OGS contacted ULiege and AWI, who proposed some possible solutions.	The researcher wasdeda date for a virtualmeeting but was on vacation and could notconfirm her availability. Back to work, she contacted EMODnet Chemistry on 2/05/2022,as reported hereafter, andthe issue was solved.
20/4/2022	UNESCO	Global networking: What and howEMODnet Chemistry is involved in UN Ocean Decade actions.	Mail OGS)	1 month	Resolved	Email exchange: Provided the list of actions and the role played by EMODnet Chemistry	
25/4/2022	GEOMAR	Technical:GO2DAT-Hackathon (2-5 May 2022), request to share/provide access to EMODnet Chemistry O2 data base	Mail to EMODnetSecretariat	4 days	Resolved	Email exchange: EMODnet Secretariat suggested to follow up with OGS and Secretariat IT team. OGS provided details onhow to access the required data	

2/5/2022	Researcher1	Technical: support request to extract data	EMODnet Chemistry contact form	5 hours	Resolved	Email exchange: AWI fully explained what had caused the issue and suggested verifying the climatologies and contacting OGS or ULiege for any clarifications on the matter	
6/5/2022	UN Global Partnership on Marine Litter	Technical: support request to solve problems on wms get capabilities	Mail to OGS	2 hours	Resolved	Email exchange: OGS forwarded the email to sextant@ifremer.fr, that fixed the problem	
5/6/2022	Student doing an undergraduate bachelor study calledCoastal and Marine Management in theNetherlands	Collaboration: internship request for 20 weeks starting from September 2022	emodnet+form@inogs.it	2 days	Resolved	Email response: Confirmed the availability to welcome her for an internship dealing with EMODnet Chemistry and maybe other projects in which NODC-OGS is involved.	
9/6/2022	CNR	Technical: asking if data availableon SEANOE DOI service areavailable in theSeaDataNet and EMODnet infrastructures	Mail addresses of IFREMER team	30 minutes	Resolved	Email response: Informed thatthe dataset has just beenassigned to OGS data centre in EMODnet ingestion. OGS will upload the data into SeaDataNet and EMODnet Chemistry data infrastructures.	
20/6/2022	SOCIB	Technical: Info on how to upload biogeochemical data from fixedstations	Mail address of OGS team	3 days	Resolved	Email response: Explained how to upload biogeochemical data from fixed stations	

22/6/2022	State Department ofAgriculture, Environment and Rural Areas	Technical: confirmation request concerning data submission (beach litterdata of 2020 and 2021 from the German Baltic Sea beaches of Schleswig-Holstein)	Mail addresses of OGS Team	3 hours	Resolved	Email response: Confirmed that data were well received, re-validated and uploaded into thedatabase.	
April to June 2022	HELCOM member states	Technical: regular requests for information to optimize the standardisation and validation of beach litter 2016-2021 data, according to the methodology followed byEMODnet Chemistry.	Mail addresses of OGS team	A few hours	Resolved	Mail exchange: provided theinformation requested	
21/06/2022	Adriatic Rowing Society (Italy)	Collaboration: The Adriatic Rowing Society has asked the OGS to help manage marine litter data collected through the tool called Seabin. This was installed thanks to the agreement with Lifegate.	email to OGS	26/09/2022	Pending	Email response from OGS	
07/07/2022	ISPRA	Requested a copy of a publication	EMODnet Chemistrycontact form (emodnet+form@inogs.it)	10/10/2022	Resolved	Email response: the publication was sent and OGS explained that they are open andeasily accessible through the DOI.	

20/07/2022	AArhus University, Institute of Ecoscience (Denmark)	Technical: information to fill out metadata for the Danish beaches	EMODnet Chemistry contact form (emodnet+form@inogs.it)	5 hours	Resolved	Email response from OGS	
25/08/2022	ISPRA (Italy)	Technical: request of confirmation that submitted beach litter data were correct	Mail to NODC (OGS)	12 hours	Resolved	Email exchange to check, validate and load the data set into the database	
05/09/2022	CNR-ISMAR	Technical: support request to submit beach litter data collected with a new App	Mail to info@emodnet-chemistry.eu	12 hours	Resolved	Email: OGS gave full information on how to submit the data	
05/09/2022	JRC	Litter data 2015-2020 survey availability table	Mail to OGS	2.5 hours	Resolved	Table provided by email	
05/09/2022	JRC	Beach litter data extraction 2015-2020	Phone call to OGS	2 days	Resolved	Data file provided by email	
13/09/2022	ULiege	Technical: support request to download EMODnet Chemistry data for specific parameters in the Black Sea.	EMODnet Chemistry contact form (emodnet+form@inogs.it)	6 hours (first reply)	Resolved (3/10/2022)	Email exchange: OGS provided full information to download the data via the CDI data Discovery and Access Service and the webODV data Explorer and Extractor	

7.Meetings/events held/attended & planned

[List organisational meetings/events held/participated (incl. presentations, lectures, trainings, demonstrations, workshops, etc.) since the start of the project phase and planned in the future. Please add a short description on the meeting as well as the nature and volume of the audience.

When listing a meeting, please indicate whether it was an internal (i.e. within your partnership/lot) or external meeting (i.e. outside your partnership/lot).]

A. Meetings/events organised and attended in this project phase					
Date	Location	Type event (internal or external meeting; training/ workshop)	Was a presentation given? (yes/no + short description)	Meeting attended (A) / organised (O)	Short description and main results (# participants, agreements made, etc.)
25-29/10/2021	Virtual	Training session	No	A	Implementing the Ocean Data and Information System (ODIS) architecture Participants: digital stakeholders interested in reliably sharing and discovering key ocean data through the ODIS network The training session allowed attendees to understand or stay up-to-date on the Ocean InfoHub project and the Ocean Data and Information System.
12/11/2021	Virtual	External meeting	No	A	ICES WGML meeting Participants (9): data managers involved in the reportingof micro-litter to ICES. EMODnet Chemistry standards and the harvesting of the EMODnet portal were discussed.
16/11/2021	Virtual	Internal meeting	Yes, 11 ppt: EMODnet Chemistrynew phase tasks and objectives per WP	O	5th Phase Steering Committee meeting Participants: EMODnet Chemistry phase V partners andsubcontractors. Recalled EMODnet Chemistry major achievements and future challenges. Minutes available

17-19/11/2021	Virtual	External meeting	Yes, Poster 'Marine Litter Database and associatedproducts'	A	Virtual exhibition 'One Integrated Marine Debris ObservingSystem (IMDOS) for a Clean Ocean' Participants: 197 international marine litter experts involved in evaluating ways forward for implementing theIntegrated Marine Debris Observing System (IMDOS). The UN Decade of Ocean Science for Sustainable Development called for action to establish the IMDOS.
23-25/11/2021	Virtual	External meeting	Yes, 'EMODnet Chemistrymarine litter data management'	A	EUROSEA macroalgal workshop Participants: experts in macroalgae, associated ecosystems and pollutants that are threatening theirsurvival Set out priorities for data standards and sharing, integration, and operating procedures for observations inthis ecosystem and economic area.
29/11/2021	Virtual	External meeting	No	A	G20 MoEJ International Expert Meeting on Marine PlasticLitter Monitoring Data Sharing Project Participants: international experts engaged in the G20Marine Plastic Litter Monitoring Data Sharing Project. Presented the prototype 'Microplastics Data-sharing System', the 'Data Entry Form Sheet' and the 'Data ListSheet' to collect marine litter data on a global scale.
13-14/12/2021	Virtual	Internal meeting	Yes, 10 ppt on Data management and data products generation Guidelines and tools for data management (trainingsession)	O	EMODnet Chemistry portal: 5th Phase Project Full Groupmeeting Participants: EMODnet Chemistry V partners, subcontractors and advisories. Recalled EMODnet Chemistry major achievements and future challenges. Organized a training session to smooth the new data

					population and data product generation.Minutes available
15-16/12/2021	Virtual	External meeting	Yes, 2 presentations on micro and macro litter data management	A	MSFD Technical Group on Marine Litter meeting Participants: MSFD TG ML Described EMODnet Chemistry marine litter data management
16/12/2021	Virtual	External meeting	Yes, ' EMODnet Chemistry 4 Black Sea Eutrophication & contaminants Data products'	A	Tenth Session of the IODE Steering Group for the ODINBlackSea Project Participants: representatives of all Black Sea countries The main results of EMODnet Chemistry 4 for the BlackSea were presented.
17/12/2021	Virtual	Workshop	No	A	EC workshop 'Future of our seas' Participants: diverse group of stakeholders, from scientiststo EC representatives, able to confront their views on the future of the MSFD. The MSFD was considered a valid instrument to protectthe marine environment. Political enforcements and/or incentives were urgently advised to guarantee its implementation.
21/12/2021	Virtual	External meeting	No	A	ICES WGML meeting Participants (13): WGML and EMODnet Chemistry datamanagers It was discussed how WGML work can be of help for alignment of ICES and EMODnet standards and reporting format.
13/01/2022	Online	Internalmeeting	No	A	EMODnet Central Portal technical team meeting withChemistry Participants: representatives of EMODnet Chemistrypartnership (e.g. OGS, IFREMER, MARIS, AWI, ULg) VLIZ, EMODnet Secretariat. Made steps forward to the EMODnet Chemistry centralization
14/01/2022	Online	Internalmeeting	Yes	O	Task force on contaminants to discuss marine

					contaminants: data & metadata needs expressed by JRC; QA/QC concerns for MSFD adoption. Participants: AU-DCE, AWI, HCMR, ICES, IFREMER, IMR, ISPRA, MARIS, MI, NIMRD, NOC, OGS, SMHI, ULg.
17/01/2022	Online	Externalmeeting	No	A	Arctic Regional Climate Centre Network ArcRCC – Nordicsession, Participants: approx. 12 Introduced EMODnet
17/01, 04/02, 7-9/02/2022	Online	Hackathon competition + Trainingworkshop	Yes, EutroWarn, the Early Warning System for Severe Eutrophication using EMODnet Chemistrydata	A	Blue-Cloud Hackathon 2022 Innovation & ideation Workshops. 3-Day - Hacking time, coaching sessions, delivery proof of concepts, winners announcement Participants: 149, marine scientists & researchers, data scientists, ICT experts, innovators, and students Promoted the development of new technologies in line with the EU marine strategies and by using Blue-Cloud data and services (used EMODnet Chemistry eutrophication data)
24/01/2022	Online	Externalmeeting	No	A	CMEMS INS TAC KOM - EMODnet Chemistry is attending the Advisory Board of CMEMS INSTAC
28/01/2022	Online	Internalmeeting	No	A	Meeting between EMODnet Chemistry and Datras team todiscuss seafloor litter data management. Participants: OGS and ICES Agreement on Datras metadata provided to ease alignmentwith EMODnet
01/02/2022	Online	Internal	Yes, state of the art of EMODnet rivers service	A	EUROGOOS - Coastal Working Group

14-16/02/2022	Online	Conference	Yes (2) 1. How the marine data management at European scale can provide quality datasets to evaluate marine litter issues and contribute to the improvement of the existing monitoring processes 2. Harmonising and consolidating in Europe for a global engagement	A	IODE International Ocean Data Conference Participants: 590 online and 60 on-site marine data providers and managers Actionable recommendations aimed at realising the implementation of the ocean data and information "global commons" in the next future.
17/02/2022	Online	Webinar	No	A	Global Partnership on Marine Litter Action Track 5 and DigitalPlatform phase 3 release: Environmental Justice, DigitalTransformation and Accessibility https://www.gpmarinelitter.org/events/conference/release- global-partnership-marine-litter-gpml-digital-platform-phase-3
17-18/02/2022	Online	Conference	No	A	Copernicus Marine 2021-2028 Kick Off meeting
22/02/03	Online	External	Yes Leveraging Existing Marine Platforms for Ocean Observing	A	Session at Ocean Science 2022, OT04 Leveraging Existing Marine Platforms for Ocean Observing: Engaging Commercial and Professional Sectors on Local, Regional, and Global Scales. Participants: approx. 25 participants (commercial and professional sectors from local to global scale) Promoted EMODnet as a consolidate open data platform
28/02/2022	Online	External meeting with organisations involved in	Yes	O (by CEDRE)	About 50 french partners

		beach litter monitoring in France			
02/03/2022	Online	External	Yes	A	H2020 - ARICE project General Assembly - to brief up theAssembly about on going collaboration and future data interoperability goals
03/032022	Online	Conference	Yes	A	Ocean Science Meeting - EMODnet presented on its activitiesto engage industries and citizen scientists https://www.aslo.org/osm2022/scientific-sessions/
04/03/2022	Online	External technicalmeeting	Yes, EMODnet Chemistry: microlitter data management, formats, current use and future perspectives	A	G20 MoEJ International Expert Meeting on microplastics Participants: members of the G20 International Experts onMarine Plastic Litter Monitoring Data Sharing Project. The exercise using EMODnet data on the prototype of MOEJdatabase have provided interesting outcomes for a further development of the cooperation and data linkage
14/03/2022	Online	Internalmeeting	No	A	EMODnet Central Portal Technical Team meeting with EMODnet Chemistry Participants: representatives of EMODnet Chemistry partnership (e.g. OGS, IFREMER, MARIS, AWI, ULg) VLIZ, EMODnet Secretariat made steps forward to the EMODnet Chemistry centralization
15/03/2022	Online	External	Yes	O	Meeting with Orsted on Offshore Wind and Ocean Data - EMODnet ingestion
22/03/2022	Online	External technical meeting	No	A	MarineLitterWatch use for MS Beach Litter dataParticipants: JRC, EEA and OGS Agreement on data sharing
23/03/2022	Online	Lecture	Yes	A	Advanced Master in Sustainable Blue Growth

			the importance of sharing data, information and best practices		jointly organised by the University of Trieste and OGS. Participants: 24 international students of European management studies, political sciences, environmental sciences The Master is contributing to the EU sustainable blue economyby offering concrete, high-level solutions to train new generations of scientists, technicians and operators in the marine and maritime sectors.
28/03/2022	Online	External	No	A	EuroGOOS - DATAMEQ - periodic meeting.
29/03/2022	Online	Internal meeting	Yes	A	EMODnet meet and greet - Introducing MARE A1 Deputy Headof Unit Participants: DG MARE, OGS, MARIS
30-31/03/2022	Online	Internal meeting	Yes	O	2nd EMODnet Chemistry V Steering Committee Participants: EMODnet Chemistry partners and subcontractors Made a list of actions concerning all the WPs and planned the timeline to get them done
04/04/2022	online	Internal technical meeting	No	O	Meeting on Microlitter vocabularies Participants: OGS and BODC. Explained the need of TG ML in reviewing microlitter vocabularies. First actions to agree on a few modification in H01, H03, H04 andH05 vocabs.
5-7 April 2022	New York and Online	International workshop on plastic pollution	Yes	A	Presentation of beach litter monitoring in Europe with a mention of EMODnet tools. Participants: About 50 participants attending and more following online.
06/04/2022	online	Internal technical meeting	No	A	EMODnet CP meeting to discuss the integration of EMODnetChemistry contents Participants: CP and EMODnet Chemistry Technical Teams Make steps toward to carry out the Centralization

27-28-29/04/2022	Trondheim (Norway)	External technicalmeeting	No	A	ICES Working Group on Marine Litter – sessions on MicrolittersParticipants: 15 Discussion on the revised format of micro-litter of ICES data center and possible alignment on EMODnet Chemistry format for microliter. Discussion also on automated harvest from ICES data center to EMODnet Chemistry.
29/4/2022	online	Externalmeeting	Yes	A	Meeting organised by DG MARE to introducing MARE A1 DeputyHead of Unit
09/05/2022	online	Externalmeeting	No	A	FAIR data solutions to support a global observing system of marine ecological time series Participants: members of the oceanographic, data science, and informatics communities Learning more about a new EarthCube-funded Research Coordination Network for Marine Ecological Time Series (METS- RCN). It is funded by the National Science Foundation: an independent US government agency supporting research and education in non-medical fields of science and engineering. METS- RCN is tasked with building consensus on key components of a FAIR data model for METS.
09-10/05/2022	Sweden,Malmö	External	Yes	O	International Ocean Literacy Conference organised in Sweden, OneOcean – One Planet: Ocean Literacy Action 2022. Participants: ~25 attendees Organised a parallel session on Citizen Science and Ocean Literacy.
11/05/2022	Sweden,Malmö	External	No	O	National marine infrastructure and data mapping workshop.Participants: ~45 attendees

17-18 **-** **31/05/2022**	online	External training and workshop	No	A	CMEMS Marine Data for the Mediterranean - training and workshop Participants: scientists, universities, researchers, national institutes,private companies, state authorities. Engaging with the marine communities of the Med Sea, and sharingits regional marine data products and knowledge.
19/05/2022	Sweden, Gothenburg	External	Yes	A	National Marine citizen Science workshop. Participants: ~25 attendees. Presenting on national CS initiatives, cooperation and data flows
07/06/2022	Sweden, Norrköping	External	Yes	A	RV Svea open day for SMHI employees.General EMODnet presentation given
23,27,30/05 /2022	online	Internalmeeting	Yes 17 presentations from data providers MARIS overview of the status of the data submissionper Region and type of data (Eutrophication, contaminants and marine litter)	O	EMODnet Chemistry regional meetings on data collections Participants: EMODnet Chemistry Steering Committee and most of the data providers (48 members of the EMODnet Chemistry network) Discussed the status of new/updated data submission and taken action to get as many data as possible within the deadline for first data collection (minutes available)
27/05/2022	online	External meeting	No	A	Meeting of the Ecosystem Approach Correspondence Group onPollution Monitoring of UNEP/MAP Participants: circa 40 Involved all contracting parties of theBarcelona Convention: experts on pollution, chemists, scientists and data managers of INFO RAC
31/05/2022	online	Externalmeeting	No	A	Correspondence Group on Marine litter Monitoring of UNEP/MAP

					Participants: Involved all contracting parties of the Barcelona Convention: experts on marine litter, scientists and data managers of INFO RAC
01/06/2022	online	Internal technicalmeeting	No	A	EMODnet CP meeting to discuss the integration of EMODnetChemistry contents Participants: CP and EMODnet Chemistry Technical Teams Make steps toward to carry out the Centralization
09/06/2022	online	Internal technicalmeeting	Yes EMODnet Chemistry:priorities for P01 creation and selection guidelines	O	Meeting on vocabularies Participants: OGS, HCMR, IMR, IFREMER, ICES, SMHI, NIMRD, BODC. Explained why consistency and prioritisation is relevant to reportinformation inside the P01. First actions to agree on guidelines for building new P01 and to manage new data. (minutes available)
10/06/2022	online	Internal technicalmeeting	No	O	Meeting to plan the next DIVA products Participants and main follow-ups in the minutes It was discussed what the user-driven expected changes andimprovements in DIVA maps for eutrophication and how to manage them.
21/06/2022	online	Externalwebinar	No	A	CMEMS marine data for policies Participants (around 50): Marine Policy stakeholders and open toanyone involved in marine policy Learning more about the Copernicus Marine products and successful user case stories; improving the dialogue with scientists and other experts dealing with the implementation of EU marine and maritime policies; Making Copernicus Marine more fruitful for EU

					Directives.
27/06/2022-01/07/2022	Portugal, Lisbon	Conference	Yes (SMHI)	A	UN Ocean Conference
28-29-30/06/2022	online	External technicalmeeting	No	A	TG ML Participants: TG ML and invited experts on marine litter and datamanagement Open discussion on the status of marine litter monitoring and datamanagement at EU level
28 June2022	online	Externalmeeting	No	O	SciNMeet meeting to form Task team 6: data sharingParticipants: UNEP/MAP, OGS, IMS-METU Participated in a high level team as the team facilitator and EMODnet expert, aimed at carrying out the action SciNMeet in the framework of the UN Ocean Decade.
29/06/2022	Portugal,Lisbon	Conference	Yes (Kate Larkin, EMODnet Secretariat, see the programme)	A	UN Ocean Conference Side Event: Marine Data Interoperability Participants: 128 in person registrations with a further 158registrations for remote connection EMODnet Chemistry was presented as an example of EU regional interoperability with global impact.
27/06-01/07/2022	Online Lisbon (Portugal)	Summerschool	Yes	A	INTERREG Med SHAREMED project Summer school Lecture by OGS entitled “Main environmental threats in the Mediterranean Sea, data and information needs: lessons from SHAREMED stakeholder consultation”. Participants: 20 from ten different nationalities.
2-8/07/2022	Trieste(Italy)	Summer school		A	Blue Growth Summer School at OGS entitled “Copernicus Marine Service as a supporting tool to foster Sustainable Blue Economy”

					Lecture by OGS: "Where to find data: EMODnet data discovery and access" At the hands-on session and working groups OGS explained how to use EMODnet Chemistry webODV data Explorer and Extractor Participants: circa 30
4/07/2022	online	Internal meeting	No	O	Opening meeting on the first data harvest for eutrophication and contaminants: 4 July 2022
05/07/2022	web	workshop	Yes EMODnet status and activities for glider network	A	European Glider Data Management Workshop - https://www.groom-ri.eu/european-glider-data-management-workshop-agenda-2/- https://docs.google.com/document/d/1hQSNbznH6sm5Eo1KjrkK1og1vQDOjRtwGa0xryANe54/e dit#
06/07/2022	Batumi,Georgia	National event	Yes (video material of EMODnet Ingestion and EMODnet Chemistry projects.)	O	The national event was organized under the auspice of government of Georgia dedicated to theBlack Sea affairs, problems, achievements etc. TSU was one of the organisers. The computer accessories made from the plastic waste with the logos of the projects were presented and distributed among attendees during the sessions. Participants: circa 200
06/07/2022	online	Intern al technical meeting	No	A	EMODnet CP meeting to discuss the integration of EMODnet Chemistry contents Participants: CP and EMODnet Chemistry Technical Teams Make steps toward to carry out the Centralization
07/07/2022	online	Externalmeeting	Yes (info to structure the task team 6 and achieve its objectives)	O	UN SciNMeet (the Science We Need for the Mediterranean Sea We Want (SciNMeet) Programme): building up the Task Team 6 "Data sharing" Participants: OGS (Task Team 6 facilitator and representative of EMODnet Chemistry and EMODnet), UNEP/MAP, IMS-METU, IOC/IODE

					The project is among the actions that will contribute to facing the UN Ocean Decade challenges
11/07/2022	online	Summerschool	Yes	A	EMODnet program, goals, projects and actions were introduced before digging into in situ data management and sharing (with EMODnet provided tools such ERDDAP docker)
12/07/2022	online	Internal technicalmeeting	No	A	EMODnet CP meeting to discuss the integration of EMODnet Chemistry contentsParticipants: CP and EMODnet Chemistry Technical Teams Make steps toward to carry out the Centralization
12-13/07/2022	Rome (Italy)	Externalmeeting	Yes (TT6 follow up)	A	SciNMeet kick off meeting Participants (for task team 6 (TT6)): Representatives of UNEP/MAP, Info/RAC, IOC/IODE, INGV,OGS, IEO and HCMR - for EMODnet and MONGOOS Discussed objectives and activities of the TT6 -data sharing
04/08/2022	web	Conference	Yes – Role of EMODnet asopen and freedata hub	A	Open Science Conference - SCAR OSC data session: Sharing science data FAIRly to supportinterdisciplinary research collaborations. Participants: About 70
08/08/2022	Rome(Italy)	Externalworkshop	No	A	INTERREG Med SHAREMED project meeting Participants: project partners and key stakeholders Emphasise the role that EMODnet Chemistry plays in the project
30/08/2022	online	External technical meeting	No	A	UNESCO Working Group on Vocabulary for ocean acidification data Participants: representatives of IOC/UNESCO, NOC-BODC, OGS, ICOS, SOCAT, NOAA

					Regular meetings with UNESCO for SDG 14.3.1. to discuss vocabulary for ocean acidification data. Vocabulary is fundamental to define the SDG 14.3.1 Indicator Methodology describing how to measure and report the key carbonate chemistry variables for ocean acidification to enable the global comparison of ocean acidification. IOC-UNESCO, with support from GOA-ON (Global Ocean Acidification Observing Network), reports on ocean acidification for the Global Climate Indicators and the yearly Statement on the State of the Global climate.
02/09/2022	online	External technical meeting	No	A	UNESCO Working Group on Metadata for ocean acidification data Participants: representatives of IOC/UNESCO, NOC_BODC, OGS, ICOS, SOCAT, NOAA Regular meetings with UNESCO for SDG 14.3.1. to discuss metadata for ocean acidification data. Metadata are fundamental to define the SDG 14.3.1 Indicator Methodology describing The SDG 14.3.1 Indicator Methodology describes how to measure and report the key carbonate chemistry variables for ocean acidification to enable the global comparison of ocean acidification. IOC-UNESCO, with support from GOA-ON (Global Ocean Acidification Observing Network), reports on ocean acidification for the Global Climate Indicators and the yearly Statement on the State of the Global climate.
8-9/09/2022	online	Internal meeting	Yes (available here)	O	5th Phase Steering Committee meeting: 08-09 September 2022Participants: EMODnet Chemistry partners and subcontractors

					Discuss upcoming activities planned for the current phase per each WP and evaluate the statusof the actions defined during the previous SC meeting that occurred on 30-31 March 2022
13-14/09/2022	Malta	External workshop	No	A	INTERREG Med SHAREMED project Participants: project partners + key stakeholders Emphasise the role that EMODnet Chemistry plays in the project
16/09/2022	online	Internal meeting	No	O	EMODnet Chemistry Centralization: static content (Jira ticket EM-506)Participants: OGS, MARIS, AWI Discuss link to external services and webODV data products
18-23/09/2022	online	External conference	Yes (Coastline Litter in Europe - Datafor policy)	A	7th International Marine Debris Conference The EC JRC gave an oral presentation on the general topic of the conference "Stories and lessons from around the world: how monitoring can contribute to the development of marine litter policies". The OGS is among the authors of the abstract and pptx presentation submittedby EC JRC, which also include a good description of EMODnet Chemistry.
21-22/09/2022	Brussels (Belgium)	Internalmeeting	Yes (Technicalupdates EMODnet Chemistry)	A	EMODnet 12th Technical Working Group Participants: EMODnet TWG's representatives
21-22/09/2022	Brussels (Belgium)	Internalmeeting	Yes (Technicalupdates EMODnet Chemistry)	A	EMODnet 12th Technical Working Group Participants: EMODnet TWG's representatives
22/09/2022	online	Workshop	Yes (Gathering insitu marine environmental data - Chemistry)	A	The second EMODnet-Copernicus Marine Thematic workshop on Coastal issues Participants: EMODnet: Secretariat, thematic and data ingestion Coordinators, technical experts & Sea-basin Checkpoint Coordinators, Copernicus

					Marine Service (Mercator Ocean International and Copernicus Marine Service INSTAC), European Commission (DG MARE, DGDEFIS, CINEA) Production of key messages on joint/aligned coastal activities of EMODnet and Copernicus Marine Service
25/09/2022	Genova,Italy	Workshop	Yes (overview of EMODnet program, EMODnet Physics and Ingestion, Chemistry to enable new services and sustainable developments)	A	Salone Nautico 2022 – International Boat Show – The sustainability comes from the sea: living experiences according to the One Health Approach Workshop. The theatre of the sea, at the heart of the event, hosted the workshop to discuss sustainability and oceans. Participants: more than 150 people on site. The event had a big hype on local newspapers and social channels.
27-28/09/2022	Online Brest (France)	General assembly	No	A	Copernicus Marine Service In Situ Thematic Centre General Assembly (27-29 Sept 2022) Participants: INSTAC members and INSTAC stakeholders Share the same understanding of INSTAC and agree on 2023-2024 planned upgrades and evolutions Plan and agree on communication activities related to in situ products Discuss data stewardship (Differences in in situ data in the common areas of the regions, Metadata, Service KPI, Data flow).
29/09/2022	online	External Technicalmeeting	No	A	Third meeting of the Marine In situ Collaboration TWG: (part of the Copernicus Marine ServiceIn Situ Thematic Centre General Assembly, 27-29 Sept 2022)

					Participants: EMODnet Ingestion, Physics, Chemistry, Copernicus Marine Service In Situ TAC, EuroGOOS Office and EuroGOOS Task Teams, SeaDataNet/SeaDataCloud Work together on further harmonisation of standards, procedures and workflows for theingestion and exchange of operational data
29/09/2022	web	Workshop	Yes – updateson EMODnet and available features fromthe CP.	A	EuroGOOS FerryBox Annual Workshop[1]. Coordination with the FB TT is important for both Physics, Chemistry and Ingestion themes. The importance of working on a clear data licence(CC-BY) was largely discussed.
30/09/2022	online	Internal technical meeting	No	O	Status of data validation to produce regional data collections for eutrophication Participants: OGS, Regional Coordinators (HCMR, NIMRD, SMHI, IMR, Au-DCE, IFREMER), AWI, Uliege, ICES Review the progress of the new eutrophication data collection, discuss and solve possible problems and determine the next steps and the corresponding deadlines.
30/09/2022	online	Internal technicalmeeting	No	O	Meeting to discuss Sextant records [Jira ticket EM-653] Participants: OGS, IFREMER, ULiege
30/09/2022	online	Externalmeeting	Yes (EMODnet Data Management of contaminantsin the marine environment: Current approach andneeds for MSFD community)	A	Meeting on MSFD contaminants data from member statesParticipants: OGS, DG MARE, EC JRC Discuss the actions needed to respond to the request from EC JRC to improve the harmonisation, comparability and accessibility of data collected by MS and reported under the MSFD. EC JRC requested that the work already done by EMODnet Chemistry be leveraged and

					that the data infrastructure be made the basis for further data collection and compilation.
SUM				**O**	**Total # of meetings organised = 20**
SUM				**A**	**Total # of meetings attended = 63**

B. Meetings/events planned in the future				
Date	Location	Type event (meeting, training (workshop), etc.)	Meeting to be attended (A) / organised (O)	Short description and main expected outcomes
October/2022	Tbilisi, Georgia	International Scientific conference	A	Title of the event: The Development of mining and geology is the precondition for the revival of economy TSU submitted a presentation on ML and a paper in the proceedings of the conference (using data from the EMODnet database).
3-4/10/2022	Bruxelles	Forum	A	The 1st Ocean Partnership Forum between the EU and Canada on ocean data collaboration. Representatives of the partnership, namely, Canada and the European Union will hold the forum. The lead bodies for the Partnership are the Department of Fisheries
03-05/10/2022	Milazzo, Italy	Workshop	O	https://www.metrosea.org/special-sessions
5-19/10/2022	Online	Workshop	O (by VLIZ organised the session on marine litter) A (by OGS)	Ocean Practices, OBPS Workshop VI
06/10/2022	Online	Webinar	A	GPML webinar "Advancing science-policy linkages to tackle plastic pollution"
10/10/2022	Online	External meeting	A	Community of Practice (CoP) meeting on data harmonisation of the Global Partnership for Marine Litter (GPML)

10-11/10/2022	Taranto	workshop	A	Green Blue Days
11-13/10/2022	Brussels Online	Workshop	A	Euro Argo Workshop Information on the MOU between Argo and EMODnet
13/10/2022	Online Trieste	Webinar	O	Webinar on EMODnet Chemistry: Development, validation and use of EMODnet chemistry datasets and climatologies
14/10/2022	Online	meeting	A	EuroGOOS DATAMEQ
16-17/10/2022	Batumi (Georgia)	Conference	A	International scientific conference "Modern problems of ecology"
19-20/10/2022	Web	workshop	A	Offshore Energy Mediterranean Sea (by ETT)
20-21/10/2022	Online	Workshop	A	EMODnet for Business, Offshore Renewable Energy workshops
20/10/2022	Online	Webinar	A	GPML webinar: Plastic Additives and Circularity & Human Health and Environmental Impacts Across the Lifecycle of Plastics GPML
21/10/2022	Online	Internal meeting	O	Meeting on data collections for contaminants
24/10/2022	Nantes	External technical meeting	A	MSFD Technical Group on contaminants
26-28/10/2022	Constanta	Conference	A	1st International Joint Conference MARBLUE 2022 "BLUE GROWTH: CHALLENGES AND OPPORTUNITIES FOR THE BLACK SEA"
Oct-Nov 2022	Online	External meeting	A	SciNMeet SC
7-8 Nov	Online	Internal meeting	A	EMODnet SC
15 Nov	Online	Internal meeting	O	Meeting on vocabulary for contaminants data
Mid November	Online	Internal meeting	O	Second meeting on validation of contaminants data for regional data collections
20-21/11/2022	Florence, Italy	Workshop	A	HFR TT – MONGOOS WS and GA
Nov 2022				Meeting on vocabulary for contaminants data
End Nov 2022	Online	Internal meeting	O	Eutrophication data: meeting on criteria to mapping new P01 codes into P35

Dec 2022				Meeting on data products for contaminants and eutrophication
Jan 2022	Online	Internal meeting	O	Meeting with MSFD board of experts on eutrophication
Feb 2023	Online	Internal meeting	O	Meeting with MSFD board of experts on contaminants
Feb-March 2023	Hybrid	Hackathon	O	EMODnet Open Sea Lab Hackathon 3.0
9-10/03 2022	Trieste	Internal meeting + users consultation meeting	O	EMODnet Chemistry SC + back to back Project full group meeting + main stakeholders (e.g. JRC, EEA, RSCs, Copernicus INSITU TAC, PANGAEA) + EMODnet lots
20-24/03/2022	Paris	Conference	A	IODE-XXVII and preceding Conference
17-21/04/2022	Bergen	Symposium	A	Symposium Effects of the climate change on the world's ocean https://meetings.pices.int/meetings/international/2023/eccwo-5/program#S1
May 2023	Brest	Conference	A	European Maritime Day
2023 (TBD)	Trieste	Training course	O	NODC will support the University of Turin in organising a course on open science and its applications at OGS
2023 (TBD)	Online	Webinar	A	OGS Invited to give a lecture at the Open café on open science organised by GARR and the Italian Computing and Data Infrastructure

8.Communication assets

[List all the relevant communication and dissemination products and assets you have developed since the start of the project phase (e.g. brochures, videos, press releases, newsletters, blogs) and are planning to do. At the bottom of the table, provide a summary from the actions on Twitter from (e.g. Twitter Analytics: number of Tweets and followers of Twitter account).]

A. Communication products developed				
Date	Communication material	Short description (of the material, title, …) of the asset	Main results	Name of event at which material was disseminated (if applicable)
October 2021	web news / central portal	EMODnet news digest: Data collections even more accessible and user friendlywith webODV	Briefly inform EMODnet partnership and users on main EMODnet Chemistry monthly achievements	
October 2021	Subtitles for the YouTube promotionvideo	Promotion Video on YouTube with the help of EMODnet Chemistry partners, subtitles inother UN languages RU/ ES + Chinese and further European languages (IT / DE / NL) will beadded. Facilitated access to thework done by EMODnet Chemistry in five U.N. languages (EN / FR / RU / ES + Chinese) and additional European languages (IT / DE /NL).	Increase the usability of the promotion video	
02/10/2021	web news	EMODnet Chemistry portal news section: Read the new EMODnet Chemistry-based paper: Data quality and FAIR principles applied to marine litter data in Europe	Inform on the latest scientific publications based on EMODnet Chemistry data	
04/10/2021	web news	EMODnet Chemistry portal news section: EMODnet Chemistry regional data collections linked to webODV Data Explorer and Extractor	inform on the improved accessibility to the webODV tool	
06/10/2021	web news	EMODnet Chemistry portal publications section: Marine Pollution Bulletin: Data quality and FAIR principles applied to marine litter data in Europe	Inform on the latest scientific publications focused on EMODnet Chemistry activities	
12/10/2021	web news	EMODnet Chemistry portal news section: EMODnet Chemistry video for all with the new multi-language subtitles	Inform on the improved usability of the new promotion video	

15/10/2021	web news	EMODnet Chemistry portal reports to EU section: 4th Phase: 2021Q3 Trimonthly Report, Jul-Sept	Inform on the periodic upgrade delivered to the EC.	
22/10/2021	web news	EMODnet Chemistry portal news section: Q&A: How can the work of EMODnet Chemistry have global relevance?	Inform on the increasing importance of the project on a global scale	
22/10/21	Flyer	A4 description of marine litter data collected through EMODnet Ingestion portal	Provide an informative, which can be printed as a small poster or flyer, and posted on a website.	
22/10/21	post on Twitter	Promotion of the Marine Litter Use Case in EMODnet Ingestion.	Impressions: 1666 Likes: 18 Retweets: 8	Account @MarianneBiodiv (154 followers). Retweets by OGS, NODC-IT, Lifewatch ERIC, DOORS BlackSea, TUDAV, C.Troupin and others.
Nov/ 2021	web news	EMODnet news digest: Marine litter database system from EU to global perspective	Briefly inform EMODnet partnership and users on main EMODnet Chemistry monthly achievements	
16/11/2021	presentation	11 presentations	Show and discuss the main tasks and objectives of the current phase	EMODnet Chemistry 5th Phase Steering Committee meeting
17/11/2021	web news	EMODnet Chemistry portal project meetings section: 5th Phase Steering Committee meeting: 16 November 2021	Inform the partnership and users on the main topic discussed during a specific meeting and the resulting agreements	
17-19/11/2021	poster	'Marine Litter Database and associated products'	Increase the visibility of the Marine Litter Database and associated products	Virtual exhibition "One Integrated Marine Debris Observing System (IMDOS) for a Clean Ocean"
22/11/2021	web news	EMODnet Chemistry portal event section: One Integrated Marine Debris Observing System for a Clean Ocean: 17- 19 November 2021	Inform on EMODnet Chemistry involvement in the implementation of the Integrated Marine Debris Observing System (IMDOS) for a Clean Ocean	
23-25/11/2021	presentation	EMODnet Chemistry marine litter data management experience: seafloor litter focus	Share EMODnet Chemistry marine litter data management experience	EUROSEA Macroalgal workshop

27/11/2021	web news	EMODnet Chemistry portal event section: EUROSEA macroalgal workshop: 23-25 November 2021	Share EMODnet Chemistry marine litter data management experience	
01/12/2021	web news	EMODnet Chemistry portal guidelines section: EMODnet Chemistry Regional climatologies produced with Data-Interpolating Variational Analysis (DIVA). Release 2021	Notify that new guidelines are available	
02/12/2021	web news	EMODnet Chemistry portal event section: G20 MoEJ International Expert Meeting on Marine Plastic Litter Monitoring Data Sharing Project: 29 November 2021	Inform on the latest meeting attended on a global scale	
2/12/2021	presentation	1 presentation: EMODnet current status and needs from the expert community	Share EMODnet Chemistry contaminants data management experience	MSFD Group of experts on contaminants meeting
02/12/2021	EC web campaign	A pledge for the EC 'Make Europe Blue' campaign	Participate in EC dissemination actions toward environmental protection	EC 'Make Europe Blue' campaign
02/12/2021	web news	EMODnet Chemistry portal publications section: Frontiers: High-Resolution Reanalysis of the Mediterranean Sea Biogeochemistry (1999–2019)	inform on the latest publications based also on EMODnet Chemistry data	
04/12/2021	web news	EMODnet Chemistry portal event section: MSFD Group of experts on contaminants meeting: 2 December 2021	Inform on the latest meeting attended on a European scale	
05/12/2021	web news	EMODnet Chemistry portal news section: Les Etoiles de l'Europe trophy goes to SeaDataCloud	Inform on relevant achievements of infrastructures adopted by the project	
07/12/2021	web news	EMODnet Chemistry portal news section: EMODnet Chemistry pledges to Make Europe Blue	Inform on the participation in the EC campaign	
13-14/12/2021	presentation	10 presentations	Show and discuss the main tasks and objectives of the current phase	5th Phase Project Full Group meeting
15/12/2021	web news	EMODnet Chemistry portal project meeting section: 5th	Inform the partnership and users on the main topic discussed during a	

		Phase Project Full Group meeting: 13-14 December 2021	specific meeting and the resulting agree	
15-16/12/2021	presentation	2 presentations: EU coastline litter data 2015-2020: data collection; Microlitter baselines: collection of floating microlitter data	Discuss EMODnet Chemistry marine litter data management	MSFD Technical Group on Marine Litter meeting
16/12/2021	web news	EMODnet Chemistry portal news section: Q&A: How does the EMODnet Chemistry machine work? Read the first steps!	Raise interest in the EMODnet Chemistry work	
16/12/2021	presentation	EMODnet Chemistry 4 Black Sea Eutrophication & contaminants Data products	Present the main results of EMODnet Chemistry 4 for the Black Sea	Tenth Session of the IODE Steering Group for the ODINBlackSea Project
18/12/2021	web news	EMODnet Chemistry portal event section: MSFD Technical Group on Marine Litter meeting: 15-16 December 2021	Inform on the involvement in the MSFD TG ML activities	
22/12/2021	web news	EMODnet Chemistry portal event section: Future of our seas: 17 December 2021	Inform on the participation in this EC workshop on the MSFD review	
23/12/2021	web news	EMODnet Chemistry portal publications section: A Global Ocean Oxygen Database and Atlas for Assessing and Predicting Deoxygenation and Ocean Health in the Open and Coastal Ocean.	inform on the latest paper based also on EMODnet Chemistry data	
28/12/2021	web news	EMODnet Chemistry portal news section: EMODnet Chemistry Marine Litter data: an EMODnet Ingestion success story	Inform on the fruitful interaction among EMODnet Ingestion and Chemistry to collect marine litter data	
28/12/2021	web news	EMODnet Chemistry posters and flyers section: EMODnet Chemistry Marine litter: a new successful story for EMODnet Ingestion	Inform on the fruitful interaction among EMODnet Ingestion and Chemistry to collect marine litter data	
28/12/2021	web news (in Georgian)	TSU website: Ivane Javakhishvili Tbilisi State University (TSU) participated in the tender announced by the European Commission (EASME / 2020 / OP / 0006 "European Marine Observation and Data Network (EMODnet)" - Lot 5 "Chemistry"	Inform on the Georgian University participation in the latest phase of EMODnet Chemistry project	

		(EASME / EMFF / 2020 / 3.1)		
28/12/2021	web news	EMODnet Chemistry portal publications section: ESECR: Data Sharing, Public Engagement and Innovation: the Open Science Pillars to Support Knowledge Based Marine Strategies	Inform on the latest scientific publications	
29/12/2021	Web news	EMODnet Chemistry portal publications section: Marine Pollution Bulletin: Scientific knowledge on marine beach litter: A bibliometric analysis	Inform on the latest scientific publications	
January 2022	Chemistry portal web news	Creation of the new page 'Fifth phase'	Add detailed information concerning the current EMODnet Chemistry phase	
January 2022	Chemistry portal web news	Update of the web pages 'Who' and 'When'	Adjust the existing web contents according to the ongoing phase	
10/01/2022	Chemistry portal web news	EMODnet Chemistry portal guidelines section: Updated guidelines for SeaDataNet ODV production. Eutrophication & Contaminants	Publish new guidelines	
10/01/2022	Chemistry portal web news	EMODnet Chemistry portal news section: Eutrophication and contaminants data: new guidelines are online	Notify that new guidelines are available	
11/01/2022	Chemistry portal web news	EMODnet Chemistry portal news section: Happy new year from EMODnet Chemistry: 2021 top 5	Inform on the 2021 main achievements	
17/01/2022	Chemistry portal web news	EMODnet Chemistry portal project meeting section: 5th Phase Task force on contaminants: 14 January 2022	Inform the partnership and users on the main topic discussed during a specific internal meeting and the resulting agreements	
17/01/2022	Chemistry portal web news	EMODnet Chemistry portal reports to EU section: 5th Phase: 2021Q4 Trimonthly Report, Oct-Dec	Inform on the periodic upgrade delivered to the EC	
07/02/2022	Abstract	Blue-Cloud Hackathon 2022 - deliverable 1: EutroWarn, the Early Warning System for Severe Eutrophication using EMODnet Chemistry data	Hand over the first deliverable of the Blue-Cloud Hackathon 2022	Blue-Cloud Hackathon 2022

08/02/2022	Chemistry portal web news	EMODnet Chemistry portal reports to EU section: Final Report, 2019-2021	Inform on the periodic upgrade delivered to the EC	
08/02/2022	Presentation	Blue-Cloud Hackathon 2022-deliverable 2: EutroWarn, the Early Warning System for Severe Eutrophication using EMODnet Chemistry data	Hand over the second deliverable of the Blue-Cloud Hackathon 2022	Blue-Cloud Hackathon 2022
09/02/2022	Video	Blue-Cloud Hackathon 2022-deliverable 3: EutroWarn, the Early Warning System for Severe Eutrophication using EMODnet Chemistry data	Hand over the third deliverable of the Blue-Cloud Hackathon 2022	Blue-Cloud Hackathon 2022
11/02/2022	Chemistry portal web news	EMODnet Chemistry portal news section: Blue-Cloud Hackathon: 7-9 February 2022	Inform on the promotional events attended by the partnership	
Feb/2022	EMODnet newsletter	EMODnet Chemistry at the Blue-Cloud Hackathon 2022	Provide an informative on the latest news/events on a monthly basis	
Feb/2022	EMODnet web news	Blue-Cloud Hackathon: EMODnet Chemistry for 'Early Warning System for Severe Eutrophication'	Provide an informative on the latest news/events	
10/02/2022	OGS/NODC web news	OGS at the Blue-Cloud Hackathon 2022	Provide an informative on the latest news/events	
15/02/2022	presentation	How the marine data management at European scale can provide quality datasets to evaluate marine litter issues and contribute to the improvement of the existing monitoring processes	Participate in the IODE International Ocean Data Conference, sub session 2.3 'Data Science: scientific insight through data management'	IODE International Ocean Data Conference: 14-16 February 2022
15/02/2022	presentation	Harmonising and consolidating in Europe for a global engagement	Participate in the IODE International Ocean Data Conference, sub session 3.3 'Expanding the pool: new partnerships (private sector, other digital stakeholder groups'	IODE International OceanData Conference: 14-16 February 2022
17/02/2022	Chemistry portal web news	EMODnet Chemistry portal news section: IODE International Ocean Data Conference: 14-16 February 2022	Inform on the international events attended by the partnership	

03/03/2022	Chemistry portal web news	EMODnet Chemistry portal guidelines section: Marine Litter Manager: user manual 2022	Publish new guidelines	
04/03/2022	web news	EMODnet Chemistry portal news section: Read the new User Manual for Marine LitterManager	Notify that new guidelines are available	
18/03/2022	Chemistry portal web news	Q&A: Why are data collections quite challenging?	Draw the attention on specific activities of EMODnet Chemistry by interviewing partners dealing with the topic	
18/03/2022	Chemistry portal web news	EMODnet Chemistry use case section: The Global Partnership on Marine Litter platform integrates EMODnet Chemistry data products	Inform on the latest use cases	
March 2022	EMODnet newsletter	The Manual for the Marine Litter Manager tool is online	Provide an informative on the latest news/events on a monthly basis	
March 2022	EMODnet web news	The Manual for the Marine Litter Manager tool is online	Provide an informative on the latest news/events on a monthly basis	
March 2022	EMODnet web news, section use cases	EMODnet Chemistry enriches the Global Partnership on Marine Litter platform	Inform on the latest use cases	
25 March 2022	Chemistry portal web news	Master in Sustainable Blue Growth: lecture on sharing data, information and best practices	Inform on the latest events where EMODnet was extensively presented	
25 March 2022	Short video (included in the above mentioned Chemistry portal web news)	Lecture on sharing data, information and best practices	Give exhaustive information on the importance of sharing data and the main EU data platforms	
28 March 2022	OGS/NODC portal Web news	Master in Sustainable Blue Growth: lecture on sharing data, information and best practices	Inform on the latest events where EMODnet was extensively presented	
28 March 2022	Short video (included in the above mentioned OGS/NODC Portal web news)	Lecture on sharing data, information and best practices	Give exhaustive information on the importance of sharing data and the main EU data platforms	

01/04/2022	Chemistry portal web contents	EMODnet Chemistry portal project meeting section: 5th Phase Steering Committee meeting, 30-31 March 2022	Informed the partnership and users on the main topic discussed during a specific internal meeting and the resulting agreements	
12/04/2022	EMODnet CP web news article	EMODnet Chemistry at the Master in Sustainable Blue Growth	Provided an informative on the latest news/events	
29/04/2022	EMODnet newsletter	EMOD-network pledges to #MakeEUBlue!	Provided an informative on the latest news/events on a monthly basis	
29/04/2022	EMODnet newsletter	EMODnet Chemistry at the Master in Sustainable Blue Growth	Provided an informative on the latest news/events on a monthly basis	
22/04/2022	Chemistry portal web contents	EMODnet Chemistry portal reports to EU section: 5th Phase: 2022Q1 Trimonthly Report, Jan-March	Made the EMODnet Chemistry documentation for the EC open and transparent	
29/04/2022	EMODnet CP web news article	EMOD-network pledges to #MakeEUBlue!	Provided an informative on the latest news/events	
11/05/2022	Chemistry portal web contents	EMODnet Chemistry portal guidelines section: Guidelines and forms for gathering marine litter data: beach and seafloor trawlings. Version 7, 2022	Made the new guidelines easily and freely available	
16/05/2022	EMODnet CP web news article	Marine Strategy Framework Directive: up-to-date marine litter data from EMODnet Chemistry	Provided an informative on the latest news/events	
18/05/2022	Chemistry portal web contents	EMODnet Chemistry portal guidelines section: List of major rivers with identified data sources. Version 0, May 2022	Made the new guidelines easily and freely available	
20/05/2022	Chemistry portal web contents	EMODnet Chemistry portal events section: European Maritime Day, 19-20 May, 2022	Periodically information on the main events attended	
31/05/2022	EMODnet newsletter	Marine Strategy Framework Directive: up-to-date marine litter data from EMODnet Chemistry	Provided an informative on the latest news/events on a monthly basis	

01/06/2022	Chemistry portal web contents	EMODnet Chemistry portal project meeting section: 5th Phase Regional meetings on data population, 23-27-30 May 2022	Inform the partnership and users on the main topic discussed during a specific internal meeting and the resulting agreements	
07/06/2022	Post on OGS Facebook account	20 years of the NODC: main projects and achievements.	19 likes 6 shares	Festival "Maredirefare" 2022, World days of the oceans.
07/06/2022	Mail to targeted OGS researchers on marine sciences	Reminding the Streaming interview with NODC on OGS YouTube channel: celebrating 20 years of achievements and projects.	Informed 117 researchers	
08/06/2022	Streaming interview on OGS YouTube Channel	Streaming interview on OGS YouTube channel 20 years of the NODC: main projects and achievements	50 participants	Festival "Maredirefare" 2022, World days of the oceans.
08/06/2022	Presentation (in Italian) for the Streaming interview on OGS YouTube Channel	Streaming interview on OGS YouTube channel 20 years of the NODC: main projects and achievements	Explained through images the NODC history, its main achievements and projects	Festival "Maredirefare" 2022, World days of the oceans.
08/06/2022	YouTube video	Video of the abovementioned streaming interview on OGS YouTube channel for the 20 years of the NODC: main projects and achievements.	112 views (updated as of June 23, 2022)	
08/06/2022	Post on OGS Facebook account	20 years of the NODC: main projects and achievements	22 likes	Festival "Maredirefare" 2022, World days of the oceans.
08/06/2022	Post on OGS LinkedIn	20 years of the NODC: main projects and achievements	9 likes	Festival "Maredirefare" 2022, World days of the oceans.
08/06/2022	Post on OGS LinkedIn account	20 years of the NODC: main projects and achievements	8 likes	Festival "Maredirefare" 2022, World days of the oceans.
09/06/2022	Mail to targeted OGS researchers	Available YouTube video of the NODC 20 years: main projects and achievements.	Informed 117 researchers	
09/06/2022	OGS-NODC website contents	News (in IT and EN) on the abovementioned streaming interview on OGS YouTube channel for the 20 years of the NODC: main projects and achievements. The news	Increased the views of the YouTube video of the NODC streaming interview	

		includes the presentation in IT and EN.		
16/06/2022	EMODnet CP Use cases	EMODnet Chemistry datasets integrated in the Copernicus Marine Service In Situ Thematic Assembly Centre products	Promoted the latest use case and collaboration to increase the interoperability	
17/06/2022	Chemistry portal web contents	EMODnet Chemistry portal use cases: EMODnet Chemistry data collections for BGC variables included in Copernicus Marine Service products	Promoted the latest use case and collaboration to increase the interoperability	
June 2022	Mail to EMODnet Chemistry network	EMODnet Chemistry use case: EMODnet Chemistry data collections for BGC variables included in Copernicus Marine Service products.	Promoted the latest use case and collaboration to increase the interoperability	
10/06/2022	Chemistry portal web contents	EMODnet Chemistry portal project meeting section: 5th Phase meeting on vocabulary, 9 June 2022	Inform the partnership and users on the main topic discussed during a specific internal meeting and the resulting agreements	
14/06/2022	Chemistry portal webcontents	EMODnet Chemistry portal project meeting section: 5th Phase meeting to plan the new DIVA products, 10 June 2022	Inform the partnership and users on the main topic discussed during a specific internal meeting and the resulting agreements	
17/06/2022	Chemistry portal web contents	EMODnet Chemistry use case: EMODnet Chemistry data collections for BGC variables included in Copernicus Marine Service products	Promoted the latest use case and collaboration to increase the interoperability	
19/06/2022	Chemistry portal web contents	EMODnet Chemistry publications: Impact of Depuration Plants on Nutrient Levels in the North Adriatic Sea	Inform on the new scientific articles published also using EMODnet Chemistry data and/or products	
24/06/2022	Training session	Hands-on practice with EMODnet Chemistry webODV tool	Promoted the webODV explorer and extractor tool	SHAREMED training course (20-24 June 2022, Trieste - Italy)
25/06/2022	Scientific publication	EMODnet Chemistry publications: Spatio-temporal Variability of Microplastics in the Eastern Baltic Sea.	Inform on the new scientific articles published also using EMODnet Chemistry data and/or products	

27/06/2022	Chemistry portal web contents	EMODnet Chemistry portal events section - SHAREMED training course: hands-on practice with EMODnet Chemistry webODV tool	Inform on the main training and promotional activities held by the partnership	SHAREMED training course
27/06/2022	OGS website contents	News (in IT and EN): hands-on practice with EMODnet Chemistry webODV tool	Inform on the main NODC activities relating to different projects and their connections	SHAREMED training course
27/06/2022	Chemistry portal web contents	EMODnet Chemistry publications: Meta-Analysis of a New Georeferenced Database on Polycyclic Aromatic Hydrocarbons in Western and Central Mediterranean	Inform on the new scientific articles published also using EMODnet Chemistry data and/or products	
5/07/2022	EMODnet newsletter	EMODnet Chemistry Datasets provide high quality harmonised and integrated data to the Copernicus Marine Service Thematic Assembly Centre products	Promoted the latest use case and collaboration to increase the interoperability	
05/07/2022	Chemistry portal web contents	EMODnet Chemistry portal events section: SHAREMED Summer School: 27 June - 1 July 2022	information on the main training course attended	
07/07/2022	Chemistry portal web contents	EMODnet Chemistry portal project meeting section: Opening meeting on the first data harvest for eutrophication and contaminants: 4 July 2022	Informed the partnership and users on the main topic discussed during a specific internal meeting and the resulting agreements	
10/07/2022	Chemistry portal web contents	EMODnet Chemistry portal events section: Blue Growth Summer School at OGS: 2-8 July 2022	information on the main training course attended	
15/07/2022	Chemistry portal web contents	EMODnet Chemistry portal events section: SciNMeet kick off meeting: 12-13 July 2022	information on the main scientific events attended	
15/07/2022	OGS website contents	SciNMeet kick off meeting: 12-13 July 2022 (also in Italian)	information on the main scientific events attended	
18/07/2022	EMODnet CP web news article	EMODnet presented at the SciNMeet kick off meeting	information on the main scientific events attended	

18/07/2022	Chemistry portal web contents	EMODnet Chemistry portal reports to EU section: 5th Phase: 2022Q2 Trimonthly Report, Apr-June	Made the EMODnet Chemistry documentation for the EC open and transparent	
08/08/2022	EMODnet CP web news article	EMODnet Chemistry teaches PhD students and young scientists	Provided an informative on the latest news/events	
16/08/2022	EC initiative	EMODnet Chemistry supports the EC initiative for chemical safety (The European Commission calls for evidence relating to a proposal for a regulation to improve access to chemical data by removing technical and administrative barriers.)	Support EC initiatives for chemical safety by an effective regulation	
24/08/2022	Chemistry web news	EMODnet Chemistry supports the EC initiative for chemical safety	Inform on the latest synergies with EC	
30/08/2022	EMODnet CP web news article	EMODnet Chemistry responds to EC survey on chemical data for safety assessments	Provide an informative on the latest synergies with EC	
31/08/2022	EMODnet Summer newsletter	EMODnet presented at SciNMeet kick off meeting	Provide an informative on the latest news/events on a monthly basis	
31/08/2022	EMODnet Summer newsletter	EMODnet Chemistry teaches PhD students and young scientists	Provided an informative on the latest news/events on a monthly basis	
31/08/2022	EMODnet Summer newsletter	EMODnet Chemistry responds to EC survey on chemical data for safety assessments	Provided an informative on the latest news/events on a monthly basis	
06/09/2022	Chemistry portal web contents	EMODnet Chemistry portal cooperation agreements section: MOU with Euro-Argo ERIC	Make the EMODnet Chemistry document regarding cooperation open and transparent	
12/09/2022	Chemistry portal web contents	EMODnet Chemistry portal project meeting section: 5th Phase Steering Committee meeting: 08-09 September 2022	Informed the partnership and users on the main topic discussed during a specific internal meeting and the resulting agreements	

14/09/2022	OGS website contents	Trieste Next 2022 (also in Italian)	Promote upcoming events	
19/09/2022	Chemistry portal web contents	EMODnet Chemistry portal guidelines section: Updated guidelines for SeaDataNet ODV production Eutrophication Contaminants, Rev 16 Sept 22	Make the new guidelines easily and freely available	
19 and 22/09/2022	Mail to OGS researchers targeted on marine sciences	Trieste Next 2022: the value of Open Science	Informed 117 researchers	
20/09/2022	Chemistry portal web contents	EMODnet Chemistry news: Q&A: What about Euro-ARGO ERIC and its interaction with EMODnet Chemistry?	Provide an informative on the latest news/events	
21/09/2022	Post on OGS Facebook account	Trieste Next 2022: the value of Open Science	13 likes	
21/09/2022	EMODnet CP web news article	EMODnet Chemistry publishes recommendations for ocean acidification data management	Provide an informative on the latest technical material published	
24/09/2022	Public event	Trieste Next 2022: the value of Open Science	Information on the main events organized 50 participants	
24/09/2022	Video	Video recording (in Italian) of Trieste Next event dedicated to Open Science (see row above) available on Trieste Next website and on YouTube	74 views (updated as of 05/10/2022)	
24/09/2022	Presentation	Trieste Next 2022: the value of Open Science	Shown at the event and published on the NODC website in IT and EN)	Trieste Next 2022 Science Festival
25/09/2022	Post on OGS Twitter account	European Researchers' Night 2022	11 likes 8 Retweet or Quote Tweet	
26/09/2022	Post on OGS Twitter account	European Researchers' Night 2022	22 likes 16 Retweet or Quote Tweet	
26/09/2022	Mail to targeted OGS researchers on marine sciences	European Researchers' Night 2022	Informed 117 researchers	

26/09/2022	Chemistry portal web contents	EMODnet Chemistry portal events section: 7th International Marine Debris Conference: 18-23 September 2022	Inform on the latest scientific events attended	
26/09/2022	OGS website contents	European Researchers' Night 2022: Quiz on Sea and Ocean	Promote upcoming events	
26//2022	Post on OGS Facebook account	European Researchers' Night 2022: Quiz on Sea and Ocean	17 likes 5 shares	
27//2022	Post on OGS Facebook account	Trieste Next 2022: the value of Open Science	12 likes 2 shares	
27/09/2022	Chemistry portal web contents	EMODnet Chemistry portal events section: Trieste Next 2022, the value of Open Science: 24 September 2022	Promote the event and spread the presentation and the YouTube video	
30/09/2022	EMODnet September newsletter	EMODnet Chemistry publishes recommendations for ocean acidification data management	Provided an informative on the latest news/events on a monthly basis	
30/09/2022	Public event	European Researchers' Night 2022: Quiz on sea and ocean	Interactive quiz online in English to find out about the main themes of SDG14 of the UN 2030 Agenda for Sustainable Development through the special SULITEST quiz. Explain that the EMODnet Secretariat and Chemistry were part of the expert group that developed the quiz and the extended awareness test on SDG 14. Explain what EMODnet has done to improve knowledge about the state of the seas and oceans	SHARPER project "European Researchers' Night 2022" (Trieste, Italy)
30/09/2022	Presentation	European Researchers' Night 2022: Quiz on sea and ocean	Provide insight into the quiz expert group, EMODnet Chemistry, marine litter, and the impact of climate change.	SHARPER project (Trieste, Italy)

30/09/2022	Informative material	European Researchers' Night 2022: Quiz on sea and ocean	Provide the complete quiz in Italian and the informative feedback for each question. The informative material was sent to 20 participants via email.	SHARPER project (Trieste, Italy)
30/09/2022	Chemistry portal web contents	EMODnet Chemistry portal events section: Third meeting of the Marine In situ Collaboration TWG	Inform on the latest scientific and technical meetings attended	
30/09/2022	Post on OGS Twitter account	European Researchers' Night 2022: Quiz on Sea and Ocean	4 Retweet or Quote Tweet 5 likes	

B. Planned communication products			
Date	Communication material	Short description (of the material, title, …) and/or link to the asset	Main results expected
12 Oct 2022	Web content	Interview with the OGS responsible for marine litter data for the Back to Blue initiative	
26/10/2022	Poster	Poster presenting EMODnet, EMODnet Ingestion and three success stories collected from around the Black Sea, among which: Long term monitoring data from Georgia shared with EMODnet Chemistry; ONG Mare Nostrum from Romania, who submitted marine litter data to Data	Raise interest and awareness on EMODnet activities, and in particular contributions from around the Black Sea to EMODnet Chemistry
October 2022	Video	Promotional video on the NODC	Promote the NODC and its activities including EMODnet Chemistry
4 Nov 2022	Public event	Participation in the Science + Fiction Festival in Trieste	Show the NODC video for the first time to a wide audience
8 June 2023	Public Event (TBD)	Open science: what and why	Promote Open Science at the Festival "Maredirefare" 2022, World days of the oceans.
June 2023	Public Event (TBD)	The importance of citizens involvement	Promote scientific communication through multimedia technologies at the Festival "Maredirefare" 2022, World days of the oceans.
Continuously	Contents on NODC and OGS websites, social media accounts, and invitation and information via email to targeted mailing list)	Short contents on interesting news and past and upcoming events regarding EMODnet Chemistry	Promote any EMODnet Chemistry outputs and activities
Until operational	Chemistry portal web contents	Short contents on interesting news and past and upcoming events regarding EMODnet Chemistry	Promote any EMODnet Chemistry outputs and activities
Monthly	EMODnet newsletter	Short contents on interesting news and past and upcoming events regarding EMODnet Chemistry	Promote relevant EMODnet Chemistry outputs and activities
Monthly	CP web contents	More detailed contents on interesting news and past and upcoming events regarding EMODnet Chemistry	Promoterelevant EMODnet Chemistry outputs and activities

[In Table A, list peer reviewed publications directly (co-)authored by consortium and project partners since the start of the project phase. In Table B, list all non-peer reviewed publications (co-)authored. In all cases, indicate the type of publication, provide the full reference incl. title, volume and issue etc., and whether the publication is open or closed access.]

A. (Co-)Authored peer-reviewed publications in this project phase					
Date of publication	Type of publication	Full reference	ISBN	DOI	Is it open access? Yes/No
November 2021	paper	Altobelli, C., Giorgetti, A., Diviacco, P., Salon, S., Saraò, A., & Tirelli, V. (2021). Data Sharing, Public Engagement and Innovation: the Open Science Pillars to Support Knowledge-Based Marine Strategies. ENVIRONMENTAL SCIENCES AND ECOLOGY: CURRENT RESEARCH, 2(6).			
November 2021	paper	Cossarini, G., Feudale, L., Teruzzi, A., Bolzon, G., Coidessa, G., Solidoro, C., ... & Salon, S. (2021). High-Resolution Reanalysis of the Mediterranean Sea Biogeochemistry (1999–2019). Frontiers in Marine Science, 8, 741486.		https://doi.org/10.3389/fmars.2021.741486	yes
December 2021 (paper version)	paper	Partescano, E., Jack, M. E. M., Vinci, M., Cociancich, A., Altenburger, A., Giorgetti, A., & Galgani, F. (2021). Data quality and FAIR principles applied to marine litter data in Europe. Marine Pollution Bulletin, 173, 112965.		https://doi.org/10.1016/j.marpolbul.2021.112965	yes
December 2021	paper	Grégoire, M., Garçon, V., Garcia, H., Breitburg, D., Isensee, K., Oschlies, A., ... & Yasuhara, M. (2021). 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, 1638.		https://doi.org/10.3389/fmars.2021.724913	yes
January 2022	paper	Demetrashvili, D., Bilashvili, K., Machitadze, N., Tsintsadze, N., Gvakharia, V., Gelashvili, N., ... & Kuzanova, I. (2022). NUMERICAL MODELLING OF MARINE LITTER DISTRIBUTION IN GEORGIAN COASTAL WATERS OF THE BLACK SEA. Journal of Environmental Protection and Ecology, 23(2), 531-541.			
03/05/2022	Guidelines	F. Galgani, A. Giorgetti, M. Le Moigne, A. Brosich, M. Vinci, M. Lipizer, M. E.Molina Jack, N. Holdsworth, R. Schlitzer, G. Hanke, G. Moncoiffe,		https://doi.org/10.6092/15c0d34c-	Yes

		D. Schaap, G. Giorgi, A. Addamo, M.D.M. Chaves Montero, A. Cociancich, 2021, Guidelines and forms for gathering marine litter data: beach and seafloor trawlings. Version 7, 03/05/2022, 65 pp., DOI: https://doi.org/10.6092/15c0d34c-a01a-4091-91ac7c4f561ab508		a01a-4091-91ac7c4f561ab508	
18/05/2022	Guidelines	M.E. Molina Jack, A. Novellino, A. Giorgetti, M. Lipizer, L. Buga, L. Fyrberg, J. Gatti, S. Iona, M.M. Larsen, A.K. Østrem, M. Tsompanou, K. Wesslander,2022. List of major rivers with identified data sources. Version 0, 13/05/2022, 17 pp. DOI: https://doi.org/10.13120/de86fd11-3dcb-4bca- b35c-25d8fd93d5f3		https://doi.org/10.13120/de86fd11-3dcb-4bca-b35c-25d8fd93d5f3	Yes
23/05/2022	paper	Mishra A, Lips I, Buhhalko N, Liblik T, Väli G and Lind K, Lips U (2022) Spatiotemporal Variability of Microplastics in the Eastern Baltic Sea. Front.Mar. Sci. 9:875984. doi: 10.3389/fmars.2022.875984		https://doi.org/10.3389/fmars.2022.875984	Yes
in review	paper	Di Biagio, V., Salon, S., Feudale, L., and Cossarini, G.: Subsurface oxygen maximum in oligotrophic marine ecosystems: mapping the interaction between physical and biogeochemical processes, Biogeosciences Discuss.[preprint], https://doi.org/10.5194/bg-2022-70, in review, 2022.		https://doi.org/10.5194/bg-2022-70	Yes
10/01/2022	Guidelines	M. Lipizer, M.E. Molina Jack, L. Buga, L. Fyrberg, J. Gatti, A. Iona, G. Moncoiffe, A. K. Østrem, R. Schlitzer, K. Wesslander, A. Giorgetti 2022 EMODnet Phase V - Updated guidelines for SeaDataNet ODV production. Eutrophication & Contaminants, 10/01/2022		https://doi.org/10.13120/c1933032-9fa9-4678-8539-effa1560921c	Yes
08/03/2022	Manual	M. Vinci, A. Altenburger, M. E. Molina Jack, E. C. Partescano, A.Giorgetti, Marine Litter Manager Manual. 08/03/2022		https://doi.org/10.13120/21addf37-7e82-4a55-b040-3d3d87115ac0	Yes
October 2022 (online version) **Dec 2022 (paper version)**	paper	M. Lipizer, D. Berto, B. Cermelj, M. Fafandjel, M. Formalewicz,I. Hatzianetsis, N. Ilijanić, H. Kaberi, M. Kralj, S. Matijevic, M.E. Molina Jack, C. Parinos, J. Tronczynski, M. Giani 2022 "Trace metals and polycyclic aromatic hydrocarbons in the Eastern Mediterranean sediments: concentration ranges as a tool for quality control of large data collections". Marine Pollution Bulletin Volume 185, Part A, December 2022, 114181		https://doi.org/10.1016/j.marpolbul.2022.114181	Yes

19/09/2022	guidelines	M. Lipizer, M.E. Molina Jack, E. Kubin, L. Buga, L. Fyrberg, J. Gatti, A. Iona, G. Moncoiffe, A. K. Østrem, R. Schlitzer, K. Wesslander, A. Giorgetti 2022EMODnet Phase V - Updated guidelines for SeaDataNet ODV production.Eutrophication & Contaminants, 16/09/2022, 28 pp., doi: 10.13120/c1933032-9fa9-4678-8539-effa1560921c		https://doi.org/10.13120/c1933032-9fa9-4678-8539-effa1560921c	Yes

B. Other/non-peer reviewed types of publications (co-)authored in this project phase					
Date of publication	Type of publication	Full reference	ISBN	DOI	Is it open access? Yes/No
October 2022	conference proceedings	Kukhalashvili V., Demetrashvili D., Kvaratskhelia D., 2022. The history of the study of the circulation of the Black Sea, the peculiarities of the circulation and their influence on the spread of oil pollution. Conference proceedings of the International scientific conference "Modern problems of ecology" Batumi (Georgia). 16-17 October 2022.			

For a compressive overview of publications referring to/making use of EMODnet data and/or data products, please consult Google Scholar.

9.Monitoring indicators

[Refer to the standardised monitoring tool, i.e. Matomo/ Europa Analytics, to complete the indicators excel template, and provide a short explanation in the table below on the numbers and trends for each indicator when possible/applicable. ***Indicate clearly if monitoring was carried out using tools other than Matomo/Europa Analytics.****]*

Comments on the progress indicators in the indicators spreadsheet		
Progress indicator	Means of collecting figures	Comment
1. Current status and coverage of total available thematic data A) Volume and coverage of available data	CDI catalogue service	In the first year more than 80.000 new data sets have been entered, following the WP activity for populating new data sets in order to provide new input for the products generation. All seas see good increase, except Caspian and Caribbean, as expected.
What is your opinion on the data coverage within EMODnet for your thematic?	Sea regions in CDI service have been reformulated to follow latest EEA regional polygons. Was considerable effort but now in place.	
B) Usage of data since the start of the project phase	CDI RSM shopping ledger service and personal requests	The number of requested CDIs has decreased considerably in comparison to previous year. However, this reduction was compensated by the manual delivery of Beach Litter data to HELCOM and EU-JRC and Seafloor litter to EU MSFD TG ML.
2. Current status and coverage of total number of data products A) Volume and coverage of available data products	Sextant Product Catalogue	Three new map litter maps were added in the reported period.
B) Usage of data products since the start of the project phase	Download Tracking service for data products	There is a general decrease in number of maps downloads and visualisations. This is more evident in eutrophication, where there is a huge increase in the total volume downloaded (almost 3 times for Chlorophyll).

3. Internal and external organisations supplying/approached to supply data and data products since start of the project phase	CDI catalogue service	Over the whole year circa 81.000 new data sets have been added for eutrophication, ocean acidification, contamination, and marine litter by 34 direct data providers while ICES also brought in data from 2 more national data providers, in total representing data centres from 32 countries.
4. Online 'Web' interfaces to access or view data	N.A.	No changes in this period.
6. Statistics on information volunteered through download forms	CDI RSM shopping ledger service for users of CDI service	The number of users providing information in the CDI interface increased, whilst the Map viewer, the DOIs and Sextant products catalogue show a marked decrease. For all forms, the percentage of Government/Public administration has increased. webODV tripled the number of users
7. Published use cases	Matomo	The number of views of all use cases shows a huge increase, especially in the Central portal. Last year the highest number (84) was registered in the Chemistry portal. This time, the external collaborations (CMEMS and GPML) register 396 and 460 users, respectively.
9. Technical monitoring	Matomo – Grafana	100% uptime and good response time.
10. Visibility & Analytics for web pages	Matomo – Grafana	The daily and quarterly pageview numbers are quite stable over the full year with most attention for the data and data products pages
11. Visibility & Analytics for web sections	Matomo – Grafana	The daily and quarterly pageview numbers are quite stable over the full year with most attention for the data and data products pages
12. Average visit duration for web pages	Matomo – Grafana	Data and data products pages have the longest visiting times

The monitoring numbers reported as part of the progress monitoring of EMODnet performance are collected through Matomo and/or Europa Analytics, unless reported otherwise.

10. Recommendations for follow-up actions by the EU

[Give a list of recommendations and suggestions for the EU to consider and take action. Max 1 page.]

EMODnet Chemistry provides an essential contribution to the data and information sharing provisions in the MSFD. It has confirmed its role as a European data platform for beach litter, microlitter, and seafloor litter, with the perspective to manage litter data from images. Citizen Science efforts are also considered with the attempt to standardise and integrate this wide amount of information. Several requests have been made to gather data on the impact of litter on marine fauna. Although very interesting, this would require consistent efforts that are not currently foreseen in the theme.

Thanks to the positive experience gained with marine litter, the EU-JRC has requested support for the MSFD TG on Contaminants with respect to the collection of contaminant data at the European scale. EMODnet Chemistry's data infrastructure can manage all required information on data collection methodology and data quality. The metadata fields have been extended so that they can clearly identify the subset of official MSFD monitoring data. The network of National Oceanographic Data Centres (NODCs) is mobilised to face this new challenge. The network of these specialised data centres, active since the early '80s, covers all countries, not only in Europe. It has tight links worldwide thanks to a series of EU RTD projects, which also involve Canada, the USA, and Australia. Unfortunately, SeaDataCloud was the last EU H2020 project driving the maintenance and further development of the SeaDataNet infrastructure, and it officially ended in October 2020. Using appropriate RTD funding, it is essential to sustain and expand the further running of this expert network, which connects the observing systems and monitoring agencies with overarching infrastructures such as EMODnet, CMEMS, Blue-Cloud, and the European Open Science Cloud; thus, providing a major aggregator service in the European marine data management landscape.

EMODnet Chemistry continues to share in-situ data with the Copernicus programme, thereby promoting joint working groups that deal together with data integration, standardisation/harmonisation, and validation assets.

Despite all these cooperations, research data remain hidden and not all of them are safeguarded in the long term. The situation would improve with the introduction of the obligation to share data with EMODnet and SeaDataNet services, making use of and mobilising the network of NODCs to handle scientific datasets at the national scale in active and delayed modes.

11. Annex: Other documentation attached

Generating aggregated and validated data collections in the North Sea– AU DCE

The first year contribution of AU DCE – the regional leader for North Sea was focused on data aggregation, harmonisation and quality control of the first harvesting of the Eutrophication & Ocean Acidification dataset.

Results for the Contaminant dataset received in October 2022 will be presented in the next report.

Eutrophication & Ocean Acidification dataset description

As decided during the EMODnet Chemistry phase 4, only new and updated datasets from the new harvesting are aggregated and checked. They are then merged with the collection v2021 from the previous phase of the project.

After file format errors/warnings, duplicates and QC checks, the QCed aggregated North Sea Eutrophication & Ocean acidification dataset extends from 48°N to 62°N and from 44°W to 13°E and contains 286792 vertical profiles (with 146 restricted datasets) and 3147 time series (none restricted) from 4 CDI-partners. Further indicators can be found in Table 1 below.

	Profiles	Timeseries
CDI partners	9	4
Originators		11
Countries		4
Time period	1929-2021	1963-2021
CDIs	286792	3147
Restricted data (%)	0.05%	0

Table 1 - Total numbers of CDI partners, Originators, Countries, CDIs, Percentage of restricted data and time period of the final QCed aggregated data collections in the North Sea.

The spatio-temporal distribution of the QCed aggregated datasets is shown on Figure 1. Vertical profiles spread from the coast to the open sea while time series are mainly concentrated at the French, Belgian and Netherland coast with few networks on the British coast. French coastal monitoring stations from WFD and MSFD are indeed submitted into the EMODnet infrastructure as time series. Most of the data were measured between mid-1990's and 2020 with peaks in 2010's for vertical profiles due to high frequency trajectory data. The decrease of data in recent years is due to the delay of scientific analysis/validation of chemicals before distribution to the National Data Centers.

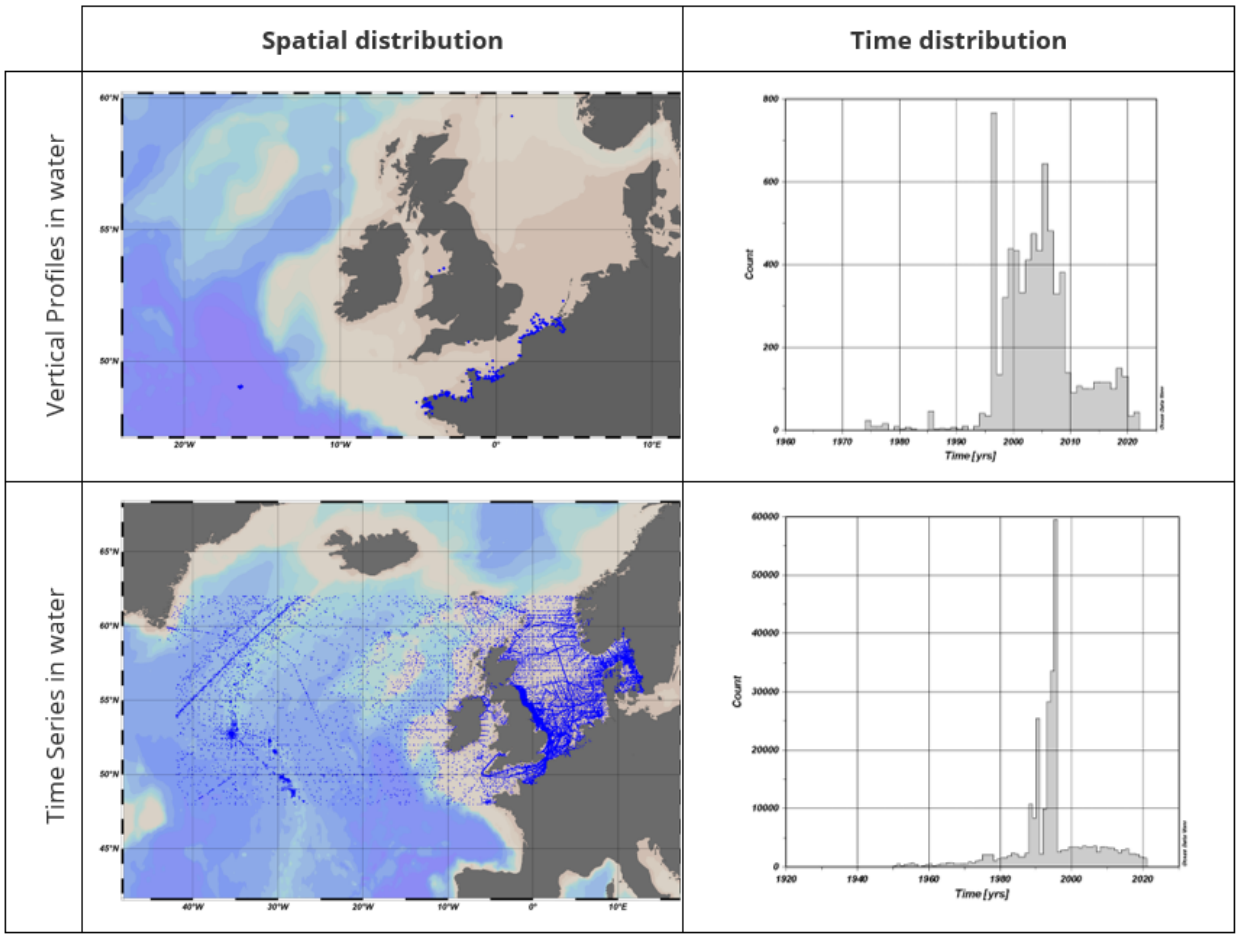

Figure 1 - Spatial (left) and temporal (right) distribution of CDIs/measurements for the vertical profiles (up) and time series (down) in the North Sea Eutrophication & Ocean acidifciation dataset

Quality Control

The latest version of ODV software (5.6.2) and the common project procedure were used for the quality checks of measurements and aggregation/harmonisation at regional scale (https://doi.org/10.6092/4e85717a-a2c9-454d-ba0d-30b89f742713). The main QC steps were: apply P35 aggregation, check format/file errors (inconsistencies between ODV txt file and CDI, wrong P02 in CDI, wrong primary variable P01 in ODV txt file), check duplicates, check missing values encoding, check mixed P01 into P35 codes, check broad range, check for nutrients inorganic/total ratio for N and P, checks values under detection limit and zero values.

The number of measurements and the percentage of Good/Bad data of the QCed aggregated North Sea Eutrophication & Ocean acidification dataset are presented in Table 1. The Profiles dataset has more than 94% of good data (QF=1, 2, 5, 6, 8 and Q) in average The Time series dataset has more than 99% of good data in average.

P35 Parameters	Nb meas. Profiles	Nb meas. Time series	% Good (QF=1,2,5,6,8,Q) Profiles	% Good (QF=1,2,5,6,8,Q) Time series	% Bad (QF=3,4) Profiles	% Bad (QF=3,4) Time series
dissolved oxygen concentration		2523		100.00		0.00
phosphate	928766	8436	93.14	99.93	6.86	0.07
total phosphorus	288896	22	99.94	100.00	0.06	0.00
silicate	638765	6478	92.57	100.00	7.43	0.00
nitrate	329246	3494	99.74	100.00	0.26	0.00
nitrite	552379	3818	89.41	100.00	10.59	0.00
nitrate plus nitrite_origin	281317	6808	80.73	100.00	19.27	0.00
ammonium	421344	5867	98.88	99.97	1.12	0.03
dissolved inorganic nitrogen (DIN)	327416	481	98.31	100.00	1.69	0.00
total nitrogen	236625	280	99.87	100.00	0.13	0.00
pH		14		100.00		0.00
total alkalinity		14		100.00		0.00
chlorophyll-a		41835		99.83		0.17
phaeopigments		814		100.00		0.00

Table 2 – Total number of CDIs and measurements and total number and % of Good/bad flagged data per P35 parameter for both vertical profiles and time series collections after QC. NS stands for Not Sampled.

Key issues

Duplicate checks is based on metadata and efficiently performed thanks to ODV software, but for time trends all top and bottom samples was flagged as duplicate until data set name was included in metadata description. After this addition, no duplicates for time trends, and only few for profiles.

In general data looked very convincing,although several providers still does not set QA flag (it comes as 0), The main QA effort was on DIP/TP and DIN/TN checking in the profile datasets, as very few Total-N and Total-P was available in the time trend dataset. With an acceptance of up to 20% higher Dissolved to total P and N, only 7 stations of 64 947 datasets with DIN and TN was marked as “probably bad”. For P it was around 130 stations of 72 169 results (<0,2%)

Compared to last dataset, it seems like the French data in the Channel now are included, after time trends this time is reported separately for the North Sea. Previously they were attempted included in the profiles, but something didn’t go right in the last round of data aggregation, so they were lost.

Generating aggregated and validated data collections in the Baltic Sea – SMHI

In the first year, the work was focused on aggregation, quality control and validation of data concerning eutrophication and ocean acidification. The contaminant datasets files were recently received and the QC checks will be started.

Eutrophication and Ocean Acidification data collection

In July 2022 SMHI received the harvested data related to eutrophication and acidification for the Baltic Sea region separated in zip files containing 'new and updated' and 'old' data.

As a first step, the QC was done only on new and updated data which resulted in 34412 vertical profiles from 10 CDI partners and 59 data originators and 28 timeseries from 1 CDI partner and 1 data originator. After aggregation and quality control the 'new and updated' collection was merged with the Baltic Sea - Eutrophication and Acidity aggregated datasets v2021 collection. This finally resulted in 202055 vertical profiles from 18 CDI partners and 84 data originators and 84 timeseries from 1 CDI partner and 1 data originator. See Figure 1 and 2 for spatial and temporal distribution of data.

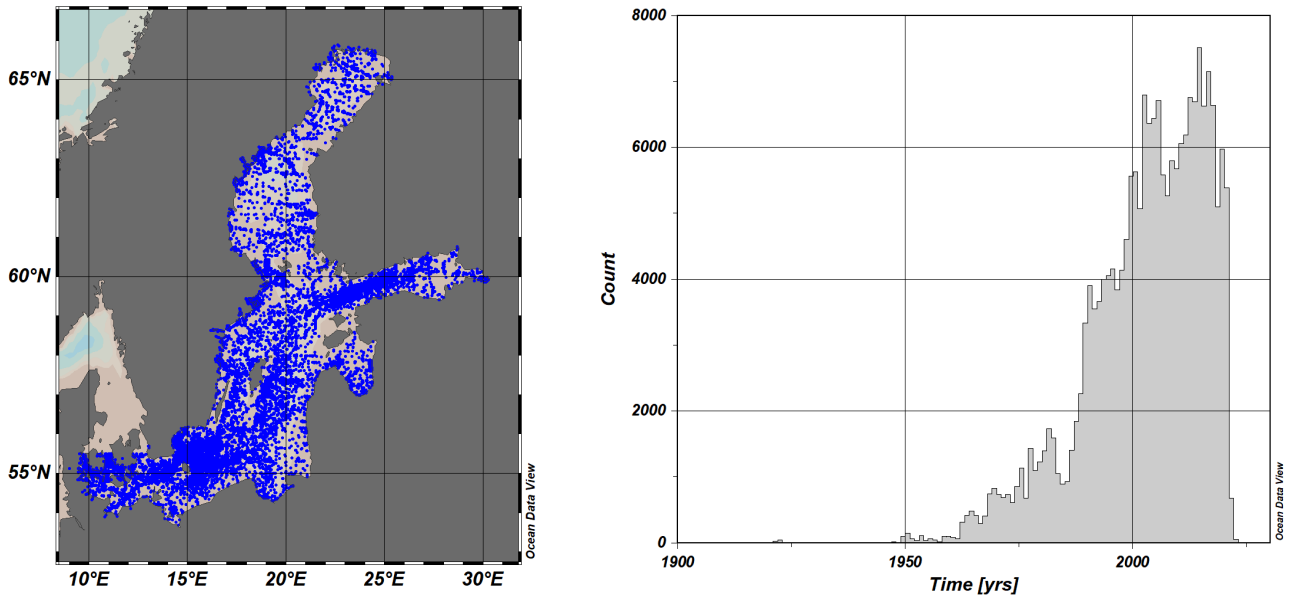

Figure 1. Spatial (to the left) and temporal (to the right) distribution of eutrophication and acidification vertical profile data in the Baltic Sea region.

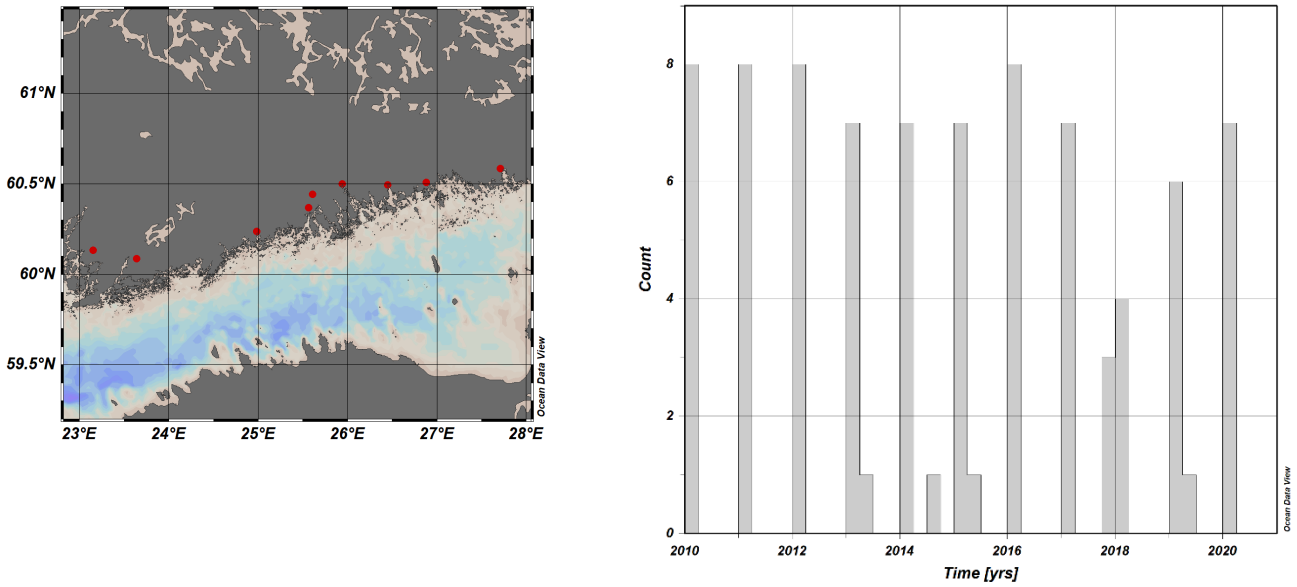

Figure 2. Spatial (to the left) and temporal (to the right) distribution of eutrophication and acidification time series data in the Baltic Sea region.

Quality control

The ODV version 5.6.2 was used for aggregation of data and for the quality controls according to the document Quality Control steps for EMODnet Chemistry Eutrophication aggregated datasets - v2021 (https://doi.org/10.6092/4e85717a-a2c9-454d-ba0d-30b89f742713). The main QC steps were: apply P35 aggregation, check format/file errors, check duplicates, check broad range, check for nutrients inorganic/total ratio for N and P, checks values under detection limit and zero values.

When not present in original data, Water body nitrate plus nitrite was calculated by summing up the Nitrates and Nitrites. Same procedure was applied for Water body dissolved inorganic nitrogen (DIN) which was calculated by summing up the Nitrates, Nitrites and Ammonium. Water body nitrate plus nitrite and DIN calculation was done with the help of ODV Software tool (Derived variables).

The number of total number of vertical profiles, total number of values and total numbers of Good/Bad flagged data per P35 variable is presented in Table 1.

Table 1. Total number of CDIs and values and total number and % of good/bad flagged data per P35 variable for vertical profiles. Good data is the sum of data with QF=1, 2, 5, 6, 7, 8, Q and bad data is the sum of data with QF=3, 4. Timeseries are only a minor amount of data and is not presented here, however, all timeseries data were considered good.

P35 Variable	# CDI	# Values	# Good	% Good	# Bad	% Bad
Depth [m]	202055	4597465	4596456	99,98	1009	0,02
Water body dissolved oxygen conc	161618	4237014	4032577	95,17	204437	4,83
Water body dissolved oxygen sat	2437	9565	9375	98,01	190	1,99
Water body phosphate	110532	492715	492020	99,86	695	0,14
Water body total phosphorus	93107	403446	403146	99,93	300	0,07
Water body silicate	82487	373684	373376	99,92	308	0,08
Water body nitrate	38419	231471	231285	99,92	186	0,08

Water body nitrate plus nitrite_ORIGIN	67000	209113	208851	99,87	262	0,13
Water body nitrite	42393	280115	279871	99,91	244	0,09
Water body total nitrogen	93954	396336	396084	99,94	252	0,06
Water body ammonium	88131	392550	392186	99,91	364	0,09
Water body pH	32449	350079	348188	99,46	1891	0,54
Water body total alkalinity	7481	61567	61271	99,52	296	0,48
Water body chlorophyll-a	79191	344409	338157	98,18	6252	1,82
Water body nitrate plus nitrite	102112	430102	429644	99,89	458	0,11
Water body dissolved inorganic nitrogen	84322	375497	374913	99,8	584	0,16

Key issues

There are still data being submitted without any quality control (QF=0). There were also profiles submitted in separated CDIs (one CDI per depth for the same station/profiles). This makes the quality control more difficult to carry through. There were some issues where the wrong P01 code had been used by the data provider.

All ARGO profiles had to be removed because of further processing needed from the data provider. However, these ARGO data will be updated and available in the next harvesting.

Generating aggregated and validated data collections in the Arctic region – IMR

The first year contribution to WP3 from IMR as regional leader for the Arctic, was focused on data aggregation, quality control and validation of the first harvesting of eutrophication and ocean acidification data.

Eutrophication and ocean acidification data collection

In July 2022 IMR received the harvested data related to eutrophication and ocean acidification for the Arctic region.

QC was done only on new and updated data, which resulted in 7707 CDIs and 20056 vertical profiles from 5 CDI partners and 20 data originators. After aggregation and quality control the “new and updated” ODV collection was merged with the Arctic Ocean – Eutrophication and Acidity aggregated datasets v2021 collection. The merged collection contains 55632 CDIs and 134698 vertical profiles from 9 CDI partners and 47 data originators. 99.3 % of the data is unrestricted.

Figure 1 shows the spatial and temporal distribution of the merged data collection. The spatial coverage is good in most of the region from 62°N to 82°N, with less data along the East Greenland coast and in the eastern Barents Sea. The main part of the data was collected between 1965 and 2022, with peaks in 2004, 2012 and 2018 due to high frequency trajectory data.

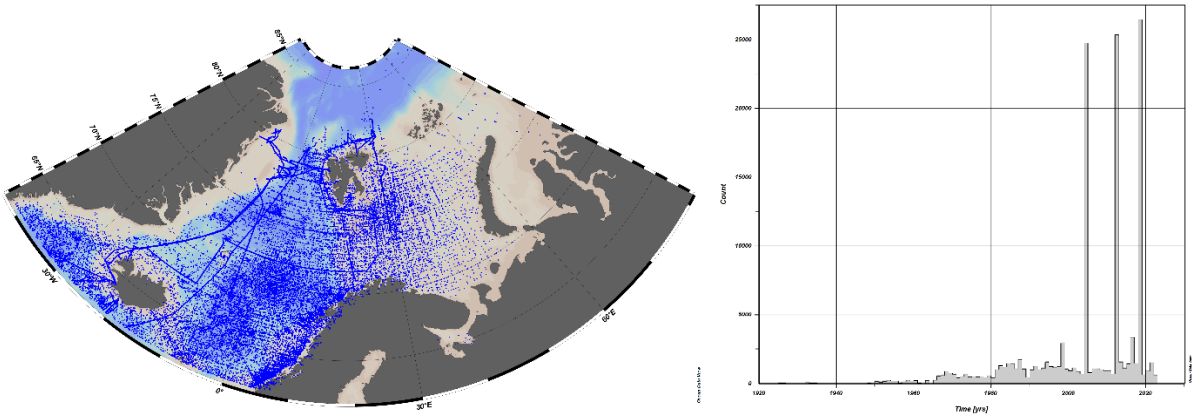

Figure 1. Spatial (left) and temporal (right) distribution of Eutrophication and acidification vertical profiles in the Arctic region.

Quality control

ODV version 5.6.2 was used for aggregation of the data and for the quality control according to the document Quality Control steps for EMODnet Chemistry Eutrophication aggregated datasets - v2021 (https://dx.doi.org/10.6092/4e85717a-a2c9-454d-ba0d-30b89f742713).

The main QC steps were: P35 aggregation, check for format errors and duplicates, broad range checks, and checks for negative values, values under detection limit and zero values. Profiles with only temperature and salinity were removed from the collection. ARGO profiles where none of the parameters were validated yet were also removed, unless the profiles were obviously good. If any of the ARGO parameters in a profile were validated, the profile was kept in the collection, and unvalidated parameters got QF = 3 (if not done already).

Water body nitrate plus nitrite was calculated by summing up nitrate and nitrite, and Water body dissolved inorganic nitrogen (DIN) was calculated by summing up nitrate, nitrite and ammonium.

Table 1 shows the total number of profiles and measurements in the merged collection, and the number and percentage of good and bad data values. The parameters where a large part of the data is from ARGO floats, have a lower percentage of good data than earlier because of data not validated yet (with QF=3). Some parameters with very few profiles have a low percentage of good data, particularly DIN.

P35 parameter	Profiles	Values	No. Good	% Good	No. Bad	% Bad
Depth	134 698	10 183 568	10 181 526	99.98	2 042	0.02
Water body dissolved oxygen concentr.	33 374	3 534 242	3 169 826	89.7	364 416	10.3
Water body dissolved oxygen saturation	1 305	293 482	258 855	88.2	34 627	11.8
Water body nitrate	30 540	424 033	373 973	88.2	50 060	11.8
Water body nitrate + nitrite (original)	256	2 870	2 413	84.1	457	15.9
Water body nitrite	29 239	314 218	313 163	99.7	1 055	0.3
Water body phosphate	40 867	446 403	436 131	97.7	10 272	2.3
Water body total phosphorus	60	233	212	91.0	21	9.0
Water body silicate	36 356	407 797	393 682	96.5	14 115	3.5
Water body ammonium	612	2 221	2 218	99.9	3	0.1

Water body chlorophyll-a	98 237	2 865 109	2 091 827	73.0	773 282	27.0
Water body phaeopigments	19 821	145 674	145 019	99.5	655	0.5
Water body dissolved inorganic carbon	249	249	248	99.6	1	0.4
Water body total alkalinity	473	2 898	2 288	79.0	610	21.0
Water body pH	7 187	352 290	311 613	88.5	40 677	11.5
Water body nitrate plus nitrite	30 796	426 903	386 797	90.6	40 106	9.4
Water body dissolved inorg. nitrogen	48	395	244	61.8	151	38.2

Table 1. Total number of profiles and measurements, and total number and % of good (QF=1,2,5,6,8,Q) and bad (QF=3,4) values.

Key issues

In the 2022 harvesting almost all new and updated data were ARGO profiles. For many of the profiles some or all parameters are not calibrated or validated yet. This gives a lower percentage of good data for those parameters than in earlier collections. The profiles were kept in the collection if at least one parameter had data with QF = 1; otherwise there would be very little new or updated data left in the collection.

Generating harmonised, aggregated and validated data collections in the N.E Atlantic – IFREMER

The first year contribution of IFREMER – the regional leader for NE Atlantic was focused on data aggregation, harmonisation and quality control of the first harvesting of the Eutrophication & Ocean Acidification dataset.

Results for the Contaminant dataset received in October 2022 will be presented in the next report.

Eutrophication & Ocean Acidification dataset description

As decided during the EMODnet Chemistry phase 4, only new and updated datasets from the new harvesting are aggregated and checked. They are then merged with the collection v2021 from the previous phase of the project.

After file format errors/warnings, duplicates and QC checks, the QCed aggregated NE Atlantic Eutrophication & Ocean acidification dataset extends from 24°N to 48°N and from 42°W to 0°W and contains 40.662 vertical profiles (with 23% of restricted data) and 561 unrestricted time series from 14 CDI-partners. Further indicators can be found in Table 1 below.

	Profiles	Timeseries
CDI partners	14	2
Originators	104	5
Countries	15	2
Time period	1921 - 2021	1974 - 2022
CDIs	40662	561
Restricted data (%)	23	0

Table 3 - *Total numbers of CDI partners, Originators, Countries, CDIs, Percentage of restricted data and time period of the final QCed aggregated data collections in the NE Atlantic.*

The spatio-temporal distribution of the QCed aggregated datasets is shown on

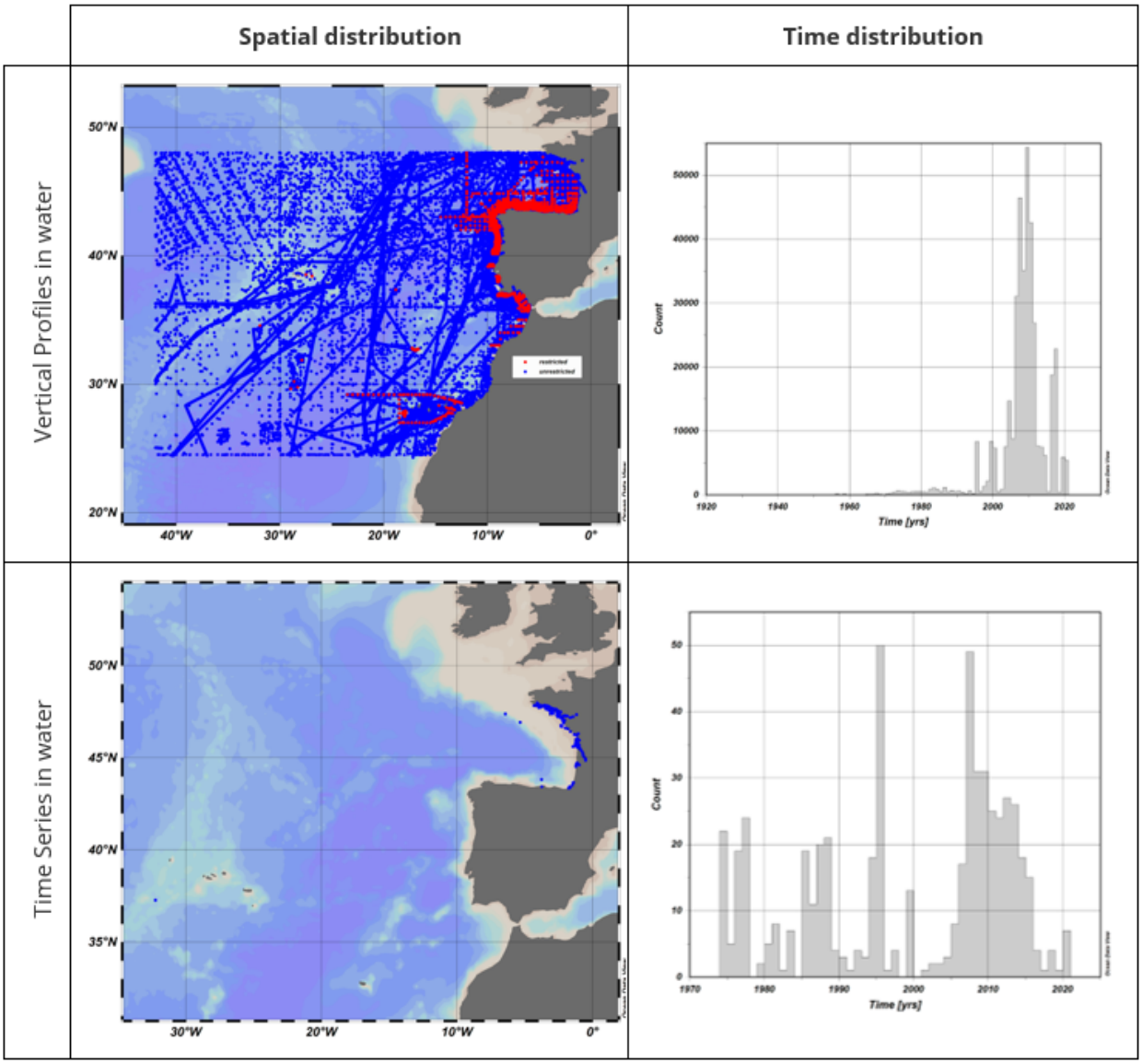

Figure 1. Vertical profiles spread from the coast to the open sea while time series are mainly concentrated at the French coast with few networks on the Iberian coast. French coastal monitoring stations from WFD and MSFD are indeed submitted into the EMODnet infrastructure as time series. Most of the data were measured between 1990's and 2020 with peaks in 2010's for vertical profiles due to high frequency trajectory data. The decrease of data in recent years is due to the delay of scientific analysis/validation of chemicals before distribution to the National Data Centers.

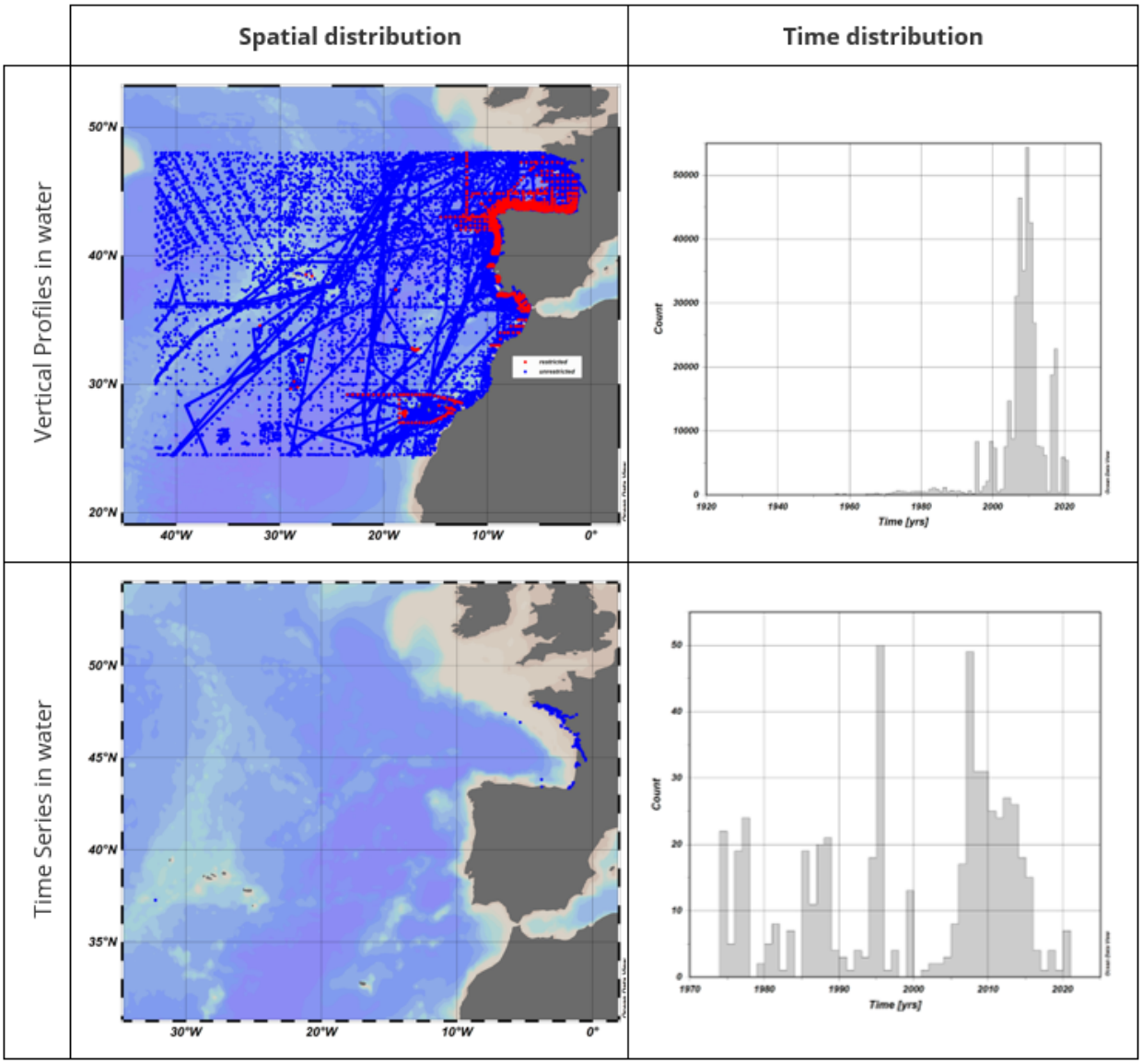

Figure 2 - Spatial (left) and temporal (right) distribution of CDIs/measurements for the vertical profiles (up) and time series (down) in the NE Atlantic Eutrophication & Ocean acidification dataset

Quality Control

The latest version of ODV software (5.6.2) and the common project procedure were used for the quality checks of measurements and aggregation/harmonisation at regional scale (https://doi.org/10.6092/4e85717a-a2c9-454d-ba0d-30b89f742713). The main QC steps were: apply P35 aggregation, check format/file errors (inconsistencies between ODV txt file and CDI, wrong P02 in CDI, wrong primary variable P01 in ODV txt file), check duplicates, check missing values encoding, check mixed P01 into P35 codes, check broad range, check for nutrients inorganic/total ratio for N and P, checks values under detection limit and zero values.

Thanks to the collaboration with CMEMS INSITU-TAC, broad range checks were refined in some regions for Oxygen and Chlorophyll-a data (https://doi.org/10.13155/54846) and additional QC steps were performed on DM/A/NRT ARGO profiles and using oxygen supersaturation thresholds.

The number of measurements and the percentage of Good/Bad data of the QCed aggregated NE Atlantic Eutrophication & Ocean acidification dataset are presented in Table 2. The Profiles dataset has more than 95% of good data (QF=1, 2, 5, 6, 8 and Q) in average. Chlorophyll-a and PH data have the worst % of good data because of a higher number of data from uncalibrated instrument. The Time series dataset has more than 93% of good data in average.

P35 Parameters	Nb meas. Profiles	Nb meas. Time series	% Good (QF=1,2,5,6,8, Q) Profiles	% Good (QF=1,2,5,6,8,Q) Time series	% Bad (QF=3,4) Profiles	% Bad (QF=3,4) Time series
dissolved oxygen concentration	8912132	116652	97	94.74	3	5.26
dissolved oxygen saturation	1111198	171180	99.76	98.75	0.24	1.25
phosphate	181893	31598	95.05	84.91	4.95	15.09
total phosphorus	880	NS	93.98	NS	6.02	NS
silicate	95569	29886	95.39	89.44	4.61	10.56
nitrate	73897	NS	97.88	NS	2.12	NS
nitrite	56099	NS	98.06	NS	1.94	NS
nitrate plus nitrite_origin	27434	20714	98.22	99.53	1.78	0.47
nitrate plus nitrite	100863	NS	97.59	NS	2.41	NS
ammonium	32087	37996	97.74	87.41	2.26	12.59
dissolved inorganic nitrogen (DIN)	31158	20128	96.39	99.48	3.61	0.52
urea	1045	NS	99.14	NS	0.86	NS
total nitrogen	611	NS	98.69	NS	1.31	NS
pH	209737	NS	72.35	NS	27.65	NS
dissolved inorganic carbon	704	NS	99.57	NS	0.43	NS
total alkalinity	5779	NS	98.53	NS	1.47	NS
chlorophyll-a	2602195	38214	73.95	92.89	26.05	7.11
chlorophyll-b	3334	NS	99.73	NS	0.27	NS
phaeopigments	3277	NS	99.66	NS	0.34	NS

Table 4 – Total number of CDIs and measurements and total number and % of Good/bad flagged data per P35 parameter for both vertical profiles and time series collections after QC. NS stands for Not Sampled.

Key issues

Duplicate checks is based on metadata and efficiently performed thanks to ODV software. The duplicates regarding the data themselves are still undetected by this check, and difficult to identify manually and reported back to the data provider. An algorithm developed by the University of Liège in DIVAnd notebooks will be tested in the next harvesting to detect them automatically.

A focus on vocabularies revealed that, in rare cases, the P35 aggregation step could result in losing accuracy from the original data, especially when data come from the same parameters but with different units or with different levels of calibration. Indeed, when two or more P01 codes are aggregated, following the vocabularies rules, in a unique P35 codes from the same CDI, the P35 aggregation algorithm computes the median of data. Depending on the applications, this feature might impact the quality of the aggregated collections but thanks to the new functionality of ODV that keeps track of the original P01 codes and corresponding units, the user can go back to the original data. During the next Vocabulary working group (end of 2022), particular attention

will be paid to refine the P35 aggregation vocabulary and define additional vocabulary checks during QC to avoid mixing of data during P35 aggregation step.

Generating aggregated and validated data collections in the Mediterranean – HCMR

In the first year, contribution of HCMR- regional leader of Mediterranean Sea was focused on aggregation, quality control and validation of data concerning eutrophication and ocean acidification. The process is described analytically below.

Also, in current days, HCMR received the harvested contaminant datasets files and the QC checks has also started. The result of these checks will be presented in the next report.

Eutrophication & Ocean Acidification dataset description

In July 2021, HCMR received the dataset files resulted from the harvest conducted by MARIS for the Mediterranean Sea. It was decided by the regional leaders, like the previous phase of the project, to process only with the new and updated datasets.

After correction of some format errors and elimination of some CDIs due to various causes (duplicates, lack of essential for the project needs parameters and wrong position) and running the QC checks, the QCed aggregated Mediterranean collections were combined with the QCed datasets from the previous project (EMODnet Chemistry IV). The final merged collections contained data analyzed in the table below.

	Profiles	Timeseries
CDI partners	24	10
Originators	127	18
Countries	18	7
Time period	1800-2022	1974-2020
N. CDIs	241,096	13,635
Restricted data (%)	20.64 %	6.79 %

Table 1: Total numbers of CDIs, percentage of restricted data and time period of the final QCed aggregated data collections in the Mediterranean Sea.

The spatial and temporal distribution of the combined QCed aggregated datasets were shown in Figure 1. Mediterranean is characterized by a sufficient geological coverage of vertical profiles spread from the coast to the open sea. While a significant data gap exists off the coast of North Africa and particularly off the coasts of Egypt, Libya and Tunisia. On the other hand, timeseries data are mainly concentrated at the French and Italian coasts and few stations off the coasts of Greece, Cyprus and Turkey. The temporal distribution on both timeseries and profile data shows that the majority of data were measured after 2000. While in profile data there were also new harvested datasets which concerned historical data from 1800-1802 located in the coastal area of Spain.

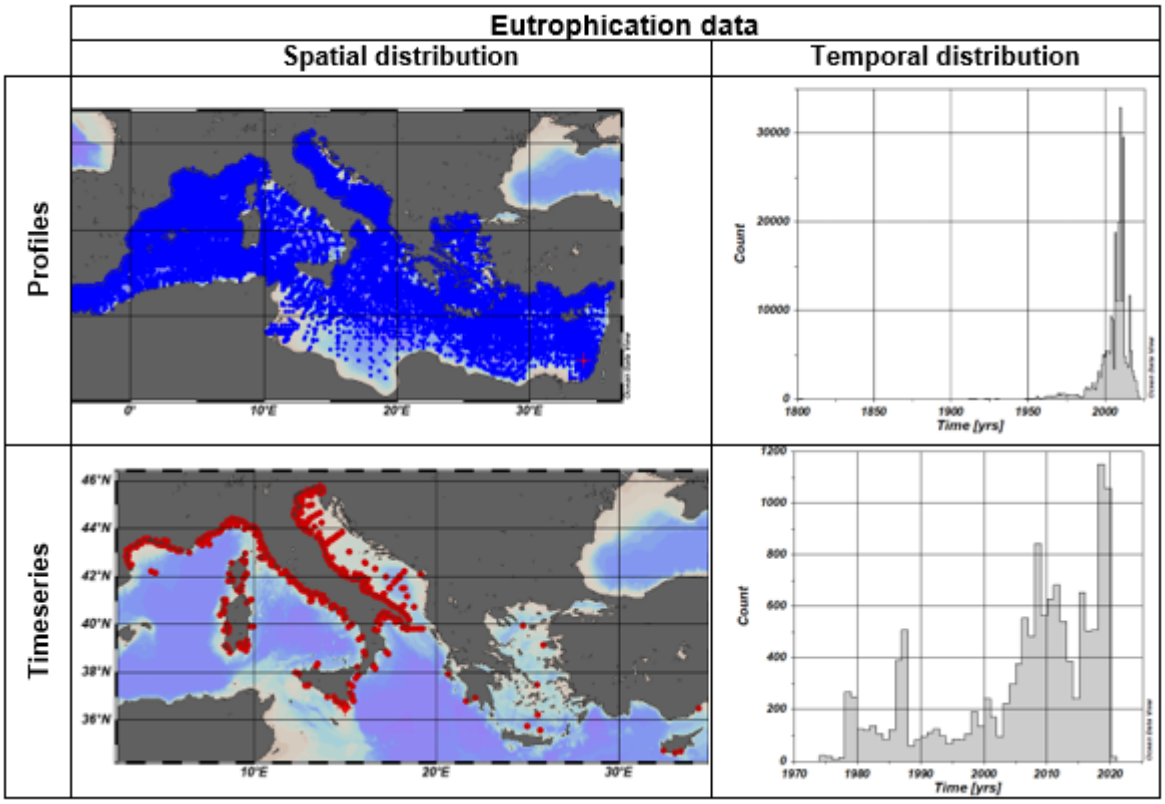

Figure 1 : Spatial (left) and temporal (right) distribution for vertical profiles (up) and timeseries (down) of QCed aggregated Eutrophication & Ocean acidification data in the Mediterranean Sea.

Quality control

From the total 51,643 new and updated CDIs (profiles and timeseries) MARIS sent to HCMR, 7,293 CDI in total were removed from the collections. Most of them (6,555 CDIs) concerns ARGO data as they are not in adjusted mode status and consider as wrong. Furthermore, 205 CDIs were removed from the Mediterranean region and were sent to Black Sea region because they were located in Marmara Sea, and 27 CDIs were sent to Baltic Sea region, which were located in land of Italy due to wrong coordinates. All the other, concerns CDIs that were not contains Eutrophication data and duplicate records.

The version of ODV software (5.6.2) and the common project methodology (https://www.emodnet-chemistry.eu/doi/documents/EMD2chem_QCreport_V8-072015.pdf) were used for the quality checks of measurements and aggregation at regional scale. The main QC steps were: apply P35 aggregation, check format errors, check duplicates, spike detection, check broad ranges, checks for nutrient data were carried out using the ratios NO2 /NO3 and NO3 /NO2 +NO3, additional checks for nutrients inorganic/total ratio for N and P, checks values under detection limit, negative and zero values. Finally, two parameters, DIN (Water body dissolved inorganic nitrogen) and Nitrate plus Nitrite, were also calculated following the methodology defined within the project.

In the harvested data (new and update) more than 300,000 measurement underwent corrections to their flags in eutrophication timeseries data. Around 99.4% of them were flagged as “Good” (QF=1,2,6) and around 0.6% as “Bad” data (QF=3,4). In profile data, the number of measurements that underwent changes to their flags amounted to more than 3,500,000 values with an amount 79% flagged as “Good” data (QF=1,6) and about 21% as “Bad” data (QF=3,4).

After the combination of the harvested data (new and updated) with the old data collections, the numbers of values and the percentages of "Good" and "Bad" data per parameter of the QCed aggregated Mediterranean Eutrophication & Ocean acidification dataset are presented in Table 2. The profile data contains a total of 241,096 CDIs with an average of 82.87% "Good" flagged data (QF=1,2,5,6,8 and Q) and an average of 17.13% "Bad" flagged data (GF=3,4), While the timeseries data contains a total of 13,635 CDIs with an average of 96.24% "Good" flagged data and an average of 3.76% "Bad" data. The percentages of "Good" data in the profiles are lower in relation to those of the timeseries. The lowest percentage in the timeseries is up to 87.5% in DO saturation while in profile data to 48.5% in DIN original. These increased percentages of "Bad" values in the profiles data were due to the fact that were a series of more than 2,200 CDIs from one EDMO which contain more than 22,000 measurements depths with stuck values in all parameters. More specifically, there was the same value in all parameters along the entire profile like the one shown in the figure 2.

Parameters	T. Profile measurement	T. Timeseries measurement	Good data (%)		Bad data (%)	
			Profiles	Timeseries	Profiles	Timeseries
DO	14,550,542	937,943	90.76	93.89	9.24	6.11
DO Saturation	685,357	77,812	56.88	87.50	43.12	12.50
NO2	178,392	43,035	80.50	96.00	19.50	4.00
NO3	405,432	43,147	84.32	95.46	15.68	4.54
N02+NO3 Orig.	55,173	15,740	99.13	98.75	0.87	1.25
NH4	100,847	60,797	77.00	98.46	23.00	1.54
PO4	232,375	63,054	89.07	97.48	10.93	2.52
SiO2	214,917	53,219	88.87	98.87	11.13	1.13
CHL-a	10,984,871	543,437	88.67	87.73	11.33	12.27
T. Phosphorus	14,055	39,032	96.07	99.45	3.93	0.55
T. Nitrogen	12,285	8,689	90.13	98.35	9.87	1.65
DIN Orig.	1,363	227	48.54	100.00	51.46	0.00
pH	594,075	464,757	81.08	95.10	18.92	4.90
T. Alkalinity	9,373	8,115	96.30	100.00	3.70	0.00
NO3 + NO2 Cal.	451,642	48,740	85.16	96.46	14.84	3.54
DIN Cal.	107,442	47,421	73.42	96.33	26.58	3.67
Average			**82.87**	**96.24**	**17.13**	**3.76**

Table 2: Total numbers of observations and percentage of "Good" (QF=1,2,5,6,8,Q) and "Bad" (QF=3,4) flagged data in the final merged QCed aggregated Eutrophication and ocean acidification data collections in the Mediterranean Sea.

2: ITS-90 water temperature [degrees C]	40146.00	4
3: Water body salinity [per mille]	40146.00	4
4: Water body dissolved oxygen concentration [u...	40146.00	4
5: Water body dissolved oxygen saturation [%]		9
6: Water body phosphate [umol/l]	40146.00	4
7: Water body total phosphorus [umol/l]		9
8: Water body silicate [umol/l]	40146.00	4
9: Water body nitrate [umol/l]	40146.00	4
10: Water body nitrate plus nitrite-Original [umol/l]		9
11: Water body dissolved inorganic nitrogen (DIN)-...	40146.00	4
12: Water body nitrite [umol/l]	40146.00	4
13: Water body total nitrogen [umol/l]		9
14: Water body ammonium [umol/l]	40146.00	4

Figure 2 : Sample of stuck values which flagged as bad in profile QCed aggregated Eutrophication & Ocean acidification data in the Mediterranean Sea.

Key issues

From the analysis of the harvested datasets, it appears that the format of the data files has started to become more and more understandable by the data providers. This is due to two facts. First, the continuous reporting procedure according to the validation loop of the project that offers a continuous and meaningful communication with the providers. And second, to the analytical presentations during the regional meetings where strengthen the importance of following the updated guidelines documents. The main issue that still seems to exist in the formats of the files is that the providers are still combining eutrophication with contaminant data under the same CDI.

This improvement does not seem to apply to the issues related to data flags, since there is quite a bit amount of data that seems to be uploaded in the portal without any quality control from the providers. As a result, there are many data with QF=0, stuck values and negative or really enormous values. Also, another issue that should be understood and clarified by the data providers is 0 values and what they represent (real value, missing value or value below detection limit).

Generating aggregated and validated data collections in the Black Sea - NIMRD

In the first year, contribution of NIMRD to the WP3 for the Black Sea activities was focused on data aggregation, quality control (QC) and validation of data concerning eutrophication and ocean acidification and starting the harmonization, quality control and validation of data concerning contaminants.

Eutrophication and ocean acidification data collection

In July 2022 NIMRD, the Regional Leader for the Black Sea, received the harvested data related to eutrophication and acidity, new and updated and old, as zip files (containing ODV and metadata csv files).

As a first step, the QC was done only on new and updated data, and then merged with Black Sea - Eutrophication and Acidity aggregated datasets v2021

The MSFD Black Sea area (Black Sea, Sea of Azov, and Sea of Marmara) new and updated data collection contained 4377 files (from which 205 in Sea of Marmara received from Mediterranean Regional leader) in ODV Spreadsheet format and the corresponding extended CDI metadata file (data.csv). The data originated from 12 CDI partners and 20 data originators.

After aggregation and Quality Control, the new and updated ODV collection was merged with Black Sea - Eutrophication and Acidity aggregated datasets_v2021 ODV collection. The merged collection was check again for duplicates.

The final merged quality controlled Black Sea aggregated data set for eutrophication and ocean acidification v2022 contains a total of 73493 vertical profiles and one Time Series, from which 88% are unrestricted while 12% are restricted. The data originates from 29 CDI partners, 45 originators and 8 countries. The temporal span for vertical profiles is from 1935 to 2022 for vertical profiles and 2013 to 2021 for the time series.

The spatial distribution and the data density of the aggregated data (vertical profiles) are shown in **Figure 1** and Temporal distributions of data are shown in **Figure 2**.

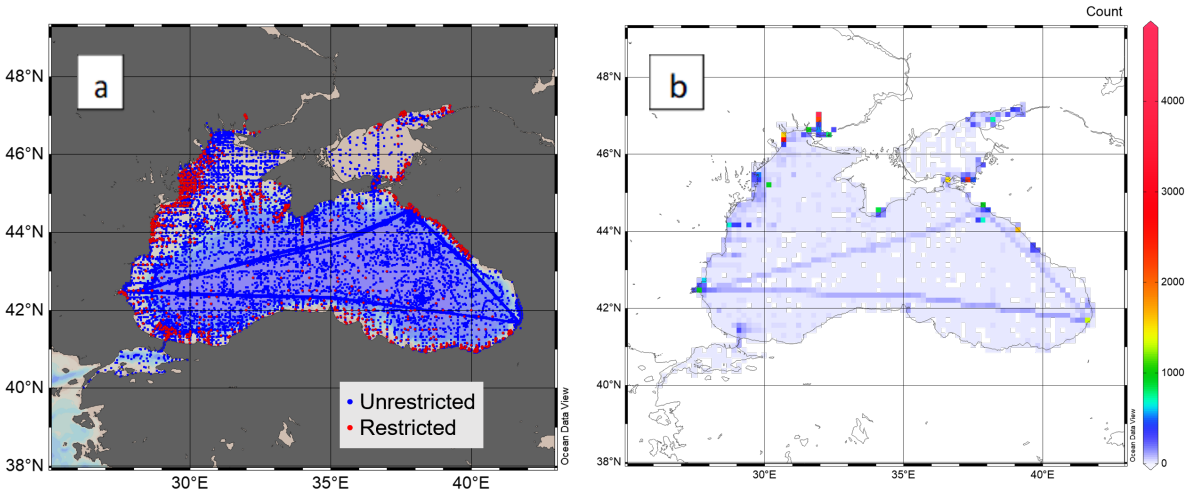

Figure 1. Eutrophication and acidity data collection for the Black Sea:
(a) Data distribution map; (b) Data density map

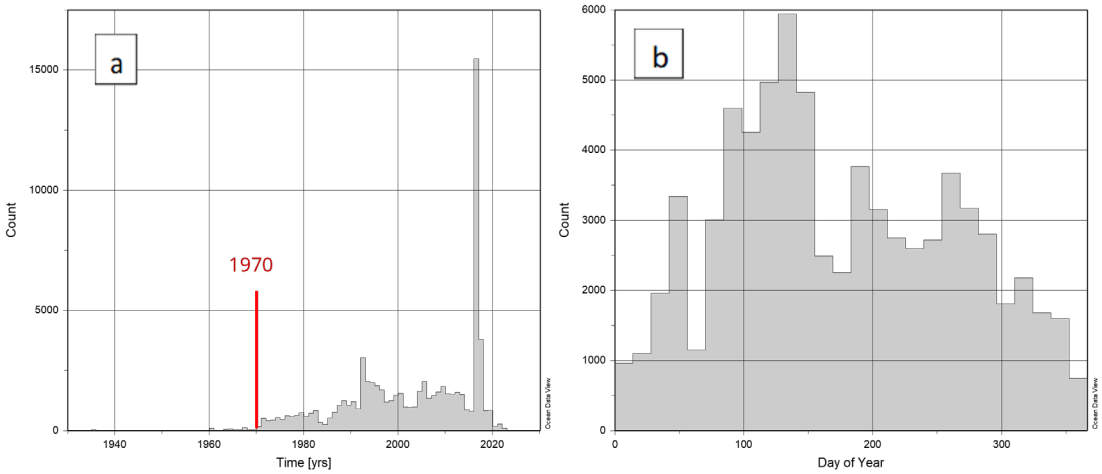

Figure 2. Annual (a) and seasonal (b) data distribution in the Black Sea

The spatial distribution and density maps (Figure 1 a, b) show a good data coverage in the Black Sea basin while in Azov and Marmara Seas data are sparse. The measurement stations are concentrated along the coastal areas, in special in North-Weastern part of Black sea and in Bosforus and Kerch straits areas.

Quality control

The ODV 5.6.2 (developed by AWI) was used to merge “New and Updated” CDI metadata and ODV files into a metadata enriched ODV collection and to aggregate variables codes from P01 to P35, while keeping the P01 and P06 codes information inside the data collection.

The applied quality controls checks were done on regional data set for: format checks, check for stations with Temperature and Salinity data only/ only with parameters not eutrophication/acidification related, check for stations with no metadata, check for sampling depths > Bot. depth, wrong P01/P06 codes, unit conversions, broad range control checks to exclude erroneous high values, negatives, identification of zero values, duplication eliminations and comparison of interpolated data with spatially averaged profiles, etc

For values out of range, spikes and negative values QC flags were changed to 3 or 4. High values (out of range) in the coastal areas or in front of river mouths are known to be high and therefore not flagged as bad. The cases where PO4>TP and N02>N03 were identified and flag accordingly.

The Argo floats profiles in Near Real Time (NRT)/Delayed Mode (DM) not adjusted and/or not validated were removed from collection, unless the profiles were obviously good (in the broad range and conform with open sea Black Sea characteristics).

When not present in original data, Water body nitrate plus nitrite was calculated by summing up the Nitrates and Nitrites. Same procedure was applied for Water body dissolved inorganic nitrogen (DIN) which was calculated by summing up the Nitrates, Nitrites and Ammonium. Water body nitrate plus nitrite and DIN calculation was done with the help of ODV Software tool (Derived variables).

In case all NO2 and NO3 and NH4 were present, cases where (NO2+NO3+NH4)>TN were identified and flag accordingly

All errors encountered during aggregation and quality control were documented and corrected (using ODV software and in house developed scripts) in close collaboration with data originators (for confirmation and updating of the local data sets).

The complete Quality Control is described in Quality Control steps for EMODnet Chemistry Eutrophication aggregated datasets - v2021 (https://dx.doi.org/10.6092/4e85717a-a2c9-454d-ba0d-30b89f742713).

The quality controlled Black Sea aggregated data set for eutrophication and ocean acidification contains 94% "Good" flagged data (QF=1, 2, 5, 6, 8, and Q) and an average of 5% "Bad" flagged data (QF=3, 4). In **Table 1** are presented the number of total number of vertical profiles (VP), total number of values and total numbers of Good/Bad flagged data per parameters. The spatial, vertical and temporal distributions of some parameters of the quality controlled eutrophication profile data are illustrated in **Figure 3**.

Table 1: Number of vertical profiles and number and percentage of "Good" and "Bad" flagged data in the Black Sea data collection

Parameter	No. of VP	Total no. of values	Good	% Good	Bad	% Bad
Depth [m]	73493	3539911	3539309	99.98	602	0.02
Water body dissolved oxygen concentration	61342	1094966	1026763	93.77	68203	6.23
Water body dissolved oxygen saturation [%]	7906	55951	55944	99.99	7	0.01
Water body phosphate	29348	106036	102258	96.44	3778	3.56
Water body total phosphorus	10888	24457	23145	94.64	1312	5.36
Water body silicate	25663	85653	85098	99.35	555	0.65
Water body nitrate	17284	51327	47936	93.39	3391	6.61
Water body nitrate plus nitrite original	2630	20717	20408	98.51	309	1.49
Water body nitrite	26146	76514	71679	93.68	4835	6.32
Water body total nitrogen	10967	24323	23671	97.32	652	2.68
Water body ammonium	21075	55526	54586	98.31	940	1.69

Water body pH	30689	110939	110156	99.29	783	0.71
Water body total alkalinity	12769	30592	28537	93.28	2055	6.72
Water body chlorophyll-a	20880	42988	41218	95.88	1770	4.12
Water body nitrate plus nitrite	19672	71007	66977	94.32	4030	5.68
Water body DIN)	15999	45615	43386	95.11	2229	4.89
Water body DIN original	38	121	120	99.17	1	0.83
				98.24		1.76

Key issues

Most of the work has been spent finding and flagging bad and questionable values. The main issues, and the most time consuming work, has been to handle format errors in the ODV files. Most of these errors have been obvious and actions have been taken to correct them.

During the EMODNET Chemistry Phase IV all the issues were reported separately to each EDMO for corrections at local servers. Nevertheless, not all the CDIs / ODVs Files were not correctly updated or not updated at all.

The low number of new and updated datasets submitted in this phase is most likely due to the geo-political situation in the Black Sea which prevented some partners from submitting their data.

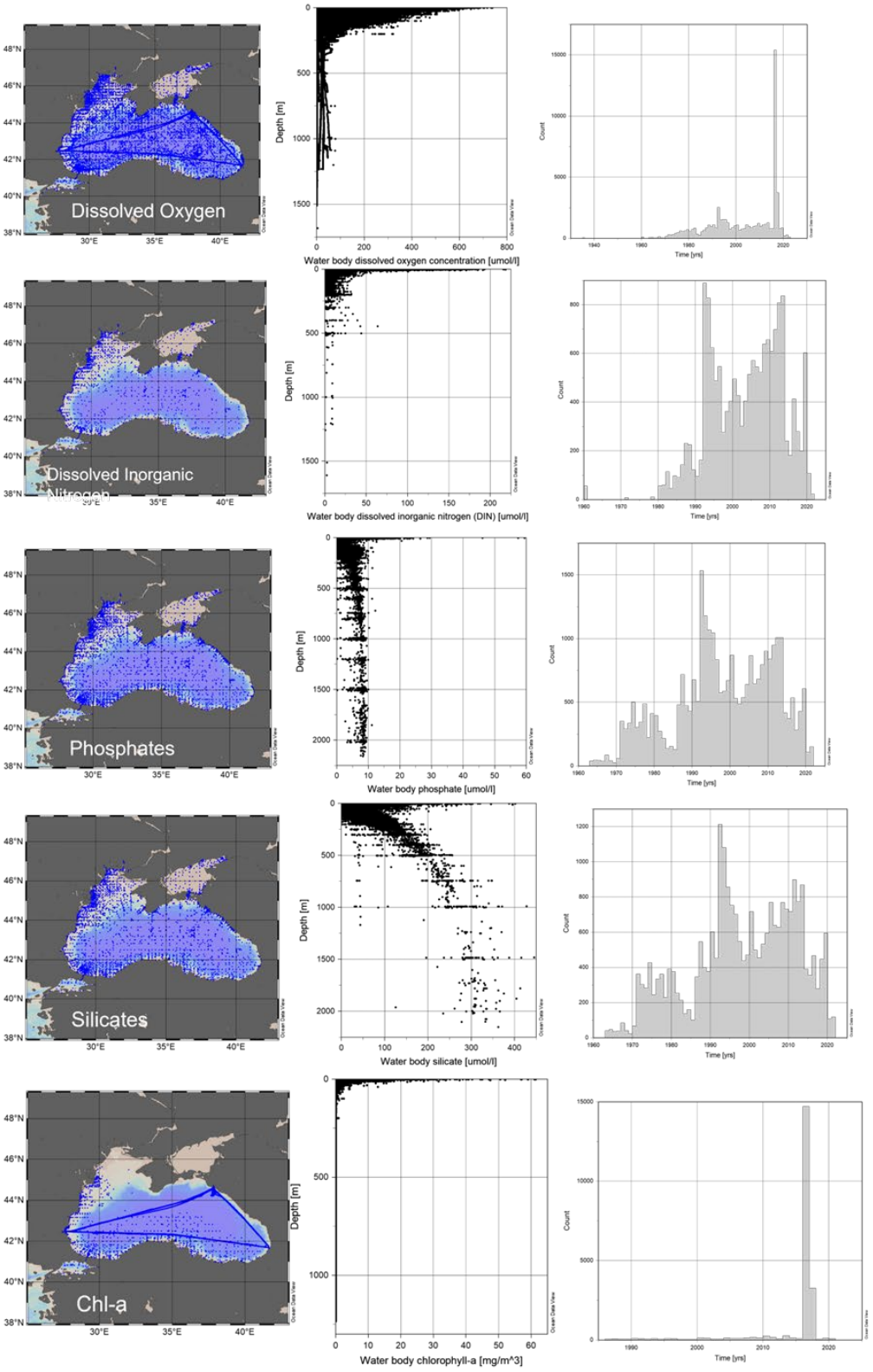

Figure 3. Spatial, vertical and temporal distributions per parameter of the Black Sea quality controlled eutrophication and ocean acidification profile data