



EMODnet Thematic Lot n° 4/SI2.749773

EMODnet Phase III - Trimonthly Report

Reporting Period: 01/10/2017 - 31/12/2017

Date: 17/01/2018

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1. Highlights in this reporting period

The highlights for the period October-December 2017 are listed below:

- Closure of the 1st Robot data harvesting for nutrients, chlorophyll and oxygen, followed by start of data aggregation and validation by the regional leaders.
- Publication of the proposal for gathering and managing data sets on marine micro litter, including the micro-litter data format and vocabularies developed by EMODnet Chemistry network, and of the Guidelines and forms for gathering marine litter data.
- Organization of the first online workshop of the Board of MSFD experts focused on D5.
- Contacts with OSPAR to set-up the web service to share beach litter data. Internal release of the first centralized EMODnet Chemistry internet database for beach litter data, modelled after the OSPAR-MCS approach.
- Set-up and harvesting from ICES DATRAS (the Database of Trawl Surveys), which includes also Baltic International Trawl Surveys (BITS) data, and is used for national fish trawl litter.
- Further contribution to EEA thematic report on contaminants and eutrophication in Europe's seas. Signing of MoU between EMODnet Chemistry and EEA to formalize terms and conditions to use the regional aggregated data products.
- The EMODnet Chemistry portal has been upgraded to the new styling and is now available to the public.
- All data providers started the population of EMODnet Chemistry data infrastructure with contaminants and litter data.

2. Meetings held since last report

Date	Location	Topic	Short Description
27/11/2017	videoconference	MSFD board of experts for EMODnet Chemistry: Eutrophication online workshop	The first online workshop of the MSFD board of experts for EMODnet Chemistry was aimed to consolidate the cooperation with Regional Sea Conventions in order to tune EMODnet activities in support of MSFD implementation. This first workshop was focused on MSFD Descriptor 5 Eutrophication.
4-5/12/2017	Delft, Netherlands	2nd Technical Working Group Meeting	Meeting of the technical group to discuss the status of development and the next steps

3. Work package updates

The project officially started on the 6th of March, 2017 but the partnership activity has not ended after the closing of the 2nd phase, but continued until the starting of this 3rd phase. In the following, the updates per WP mainly focused to the period October-December 2017.

WP1 – Project Management

The coordination activity continued for the trimester in agreement with the planning discussed at the 2nd Steering Committee and the agreed action list. This includes the overall project progress monitoring towards planned deadlines and involvement of the partnership.

After signing the Consortium Agreement and the Subcontracts with 10 subcontractors, further contacts are on-going with 4 missing subcontractors (the two Crimean MHI and IMBR, UNEP/MEDPOL and BSCS).

The Memorandum of Understanding with EEA, setting terms and conditions to use the regional aggregated data products has been signed by both parties.

A series of additional Memorandum of Understanding covering different subjects are still under discussion and finalization, namely:

- the MoU with INFO-RAC to formalise the synergy between EMODnet Chemistry and INFO-RAC information platforms and improve marine data management in the Mediterranean region by adopting and adapting existing consolidated standards and tools and by encouraging data sharing from additional data centres. This will be beneficial for regional projects, MSFD implementation and MAP;
- the MoU with BSCS and UNEP/MAP, setting the cooperation framework needed to define the subcontracts;
- the MoU with OSPAR for the beach litter and with ICES for the seafloor litter data exchange.

Preparations have been made for the organisation of the next annual plenary meeting, which will take place in February 2018.

WP2 – Data collection and metadata population

WP2 activity was undertaken by the majority of the partnership and focused on gathering data concerning **eutrophication (nutrients, chlorophyll and oxygen)** and selected **contaminants**. This scope will be expanded with **riverine input of nutrients** where existing. An inventory on available riverine data on nutrient inputs has been prepared and is available at the portal (<http://www.emodnet-chemistry.eu/products/riverdatainventory>).

CDI metadata already included in the infrastructure have been enriched with additional information on monitoring/research purpose (with EDMERP references) and on Quality Assurance and Quality Control (QA/QC) procedures. Updated guidelines for dataset preparation and formatting have been circulated to the whole EMODnet Chemistry partnership to solve possible problems raised managing data collected in sediment and biota matrixes.

In parallel, IFREMER in collaboration with OGS, BODC, ICES, AWI, JRC and MARIS finalised the guideline for describing marine **micro litter** data sets using CDI and ODV files. These guidelines have been circulated to the EMODnet Chemistry partnership for implementation.

In addition, the Guideline for gathering **marine litter data**, concerning beach litter and seafloor litter, as earlier agreed with stakeholders, has been finalized and circulated. All guidelines are also published at the portal.

WP3 – Generation of data products

The regional data buffers for nutrients, chlorophyll and oxygen were finalised and released to the regional leaders to start data aggregation and validation. Following this first data harvest and transfer WP3 activities have started for validating and aggregating eutrophication data collections and preparing DIVA interpolated maps for the MSFD regions which should be ready by end April 2018. In addition work is ongoing for preparing a first version of concentration maps of **marine and beach litter**, using available data, which is planned for end February 2018.

WP4 – Technical development and operation

OGS in cooperation with the Technical Working Group (TWG) made very good progress with the development of the first central EMODnet database to store **beach litter** data. It was modelled following the OSPAR-MCS approach. The agreement with OSPAR about the set-up of a web service to share beach litter data is under finalisation. Further work is ongoing on the front-interface for search and publishing as well as for dealing with identified differences in classifications used by different parties. For the latter

there is cooperation with the TG-Marine Litter and also with JRC who are progressing with their analysis of baselines.

The terms of reference have been defined for the set-up of a regular harvesting from ICES DATRAS (the Database of Trawl Surveys), which includes also Baltic International Trawl Surveys (BITS) data and is used for national fish trawl litter. The web service to exchange data with ICES has been set up and tests for regular harvesting have been successfully done. The second central EMODnet database to store the seafloor litter data collected during the bottom trawls is under finalization by OGS.

In December 2017 a meeting of the Technical Working Group of EMODnet Chemistry took place and the progress of several technical activities has been discussed. Following the meeting extensive minutes and action list have been circulated. Items discussed included:

- Upgrading of the EMODnet Chemistry portal and included services: EMODnet Chemistry portal has been redesigned to give more emphasis to data and products. Special focus is given to the data themes managed by the Chemistry lot with reference to MSFD, namely **Eutrophication, Contaminants, Ocean Acidification** and **Marine Litter**. The new restyled and upgraded portal has been officially launched at the end of November 2017 and is constantly updated with revision from the Technical Working Group and new information.
- **CDI Data Discovery and Access Service**, have been updated giving more option for searching and retrieving chemistry source data sets per MSFD region;
- **OceanBrowser Viewing Service**, is under restyling following the new portal style templates and suggested improvements in viewing, browsing and downloading Chemistry data products;
- **Sextant Products catalogue service**, was moved to V6 and changed the grouping of available products (having together the 4 seasons). The link to DOIs has been added in the downloading facility.
- **Advanced viewing services for timeseries and profiles**, will be further developed with the addition of APIs for controlled access by users.
- **Implementing PIWIK for general statistics**: PIWIK is proposed by TRUST-IT as a standard web statistics application and all portals have been asked to include a script in their portals. This script will report web activity to the PIWIK account that is installed at the EMODnet Central Portal. MARIS undertook a successful test to see how the stats from a portal with distributed services, each provided with the PIWIK script, could be combined together in an overall stats whereby visitors are normalised between the portal and services. Further points for investigation are how PIWIK can track events in the services such as downloads or map requests. Following the test

MARIS will make an instruction for the operators of the portal and related services how to install and configure PIWIK for the different use cases.

- **Developing prototype VRE for EMODnet Chemistry:** the pilot concerns the workflow for generating a aggregated and harmonised data collection and DIVA maps for one region and to try out how this workflow can be implemented in a VRE in a controlled environment, only accessible for project partners. There is synergy with the SeaDataCloud VRE development which has recently delivered specifications for the VRE architecture and functions. SDC has focus on the use case for T&S climatology for which the workflow is quite comparable to the Chemistry use case for eutrophication. Use will be made of online versions of ODV and DIVA which are making progress and already have developed demonstrators. For ODV this concerns a **Data Extractor** and a **Prototype Data Editor**. For DIVA it concerns a Jupyter notebook application. This allows interactivity of the user with the DIVA process while at the same time documenting the process as a story, which can be reproduced and amended. As next step the EMODnet Chemistry workflow will be described in high detail in order to model the various steps. This will be done in interaction with Regional Coordinators.

WP5 – Uptake, outreach and interaction

The Board of MSFD experts has been composed and the dedicated mailing list has been used to organise a remote conference focused on D5 (end of November 2017). The questionnaire developed to illustrate EMODnet Chemistry objective and needs and to facilitate collection of feedbacks has been used to start the discussion and define the improvements highlighted by the Board. The following points were discussed:

Fitness of parameters for Eutrophication assessment

- Spatial Resolution (Extent) of data products
- Vertical resolution
- Temporal resolution (currently 10 year)
- Usefulness of Dynamic Time series
- Meta data/Discovery information
- Other ideas and comments

A detailed description of the event and the report (workshop summary) are available at the following link: http://www.emodnet-chemistry.eu/newsevents/events/MSFD_board_of_experts_for_EMODnet_Chemistry-Eutrophication_online-workshop

1.4.1. Tasks from Tender specifications

The progress on each of the tasks specified in Section 1.4.1 of the Tender Specifications is explicitly covered in the following section.

Task 1: Develop a common method of access to data held in repositories:

The CDI Data Access Service is regularly refined to meet the requirements of the users. In particular, during the trimester, the possibility to search data by MSFD region has been added and further improvements have been discussed during the TWG.

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

EMODnet Chemistry provides access to harmonized, aggregated and validated data collections and derived data products concerning eutrophication, contaminants. EMODnet Chemistry will soon provide data and products also for marine litter.

During the reporting period, controlled access to the regional data collection made available during the previous phase was given to EEA for their Quality Status Report. In addition, the tuning of the new products has been discussed taking into consideration user requirements as well as project tasks.

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

The development of API services for controlled access to the validated, aggregated and harmonised regional data collections have been discussed and agreed during the TWG.

Presently, only the central data buffers, harvesting metadata and datasets from the distributed network of NODCs with customised configuration, are equipped with a Central buffer CDI User Interface and an API (allowing full machine-to-machine interaction), to facilitate the extraction and delivery of regional data sets for the EMODnet Chemistry regional groups.

Furthermore there are the existing web services (WMS, WFS) as supported by the CDI service and OceanBrowser service.

Task 4: Develop a web portal allowing users to find, visualise and download data:

A new version of the Chemistry web portal has been recently released and is public available. EMODnet Chemistry portal has been redesigned to give more emphasis to data and products released. Special focus is given to the data themes managed by the Chemistry lot with reference to MSFD, namely **Eutrophication, Contaminants, Ocean Acidification and Marine Litter**. The restyled and upgraded portal is in operation since the end of November 2017. It has been updated after the revision done during last Technical Working Group.

Task 5: Ensure the involvement of regional sea conventions:

A specific Board of MSFD experts (including representatives of Regional Sea Conventions) has been finalised, with a dedicated mailing list, and a remote conference was organised (end of November 2017) to strengthen the interaction. In addition, EMODnet Chemistry coordination participated to 33rd BSC Regular Meeting to present the last results and strengthen the cooperation.

A presentation from EMODnet Chemistry was requested for the coming ICG-EUT meeting in Ghent, 22 – 24th January to evaluate the possible use of EMODnet products as a basis for the OSPAR Common Procedure for eutrophication assessment.

Continuous contacts are in place with OSPAR for beach litter data management.

Task 6: Facilitate interoperability with data distributed by non-EU organisations:

EMODnet Chemistry data, products and services were presented at the JCOMM-5 Marine Technical Conference, WMO headquarters, rising the interest from marine community worldwide to Chemistry platform and standards. A reference to EMODnet infrastructure is included to the Joint WMO-IOC Strategy for Data Management (2018-2021).

Task 7: Install a process to monitor performance and deal with user feedback:

The usage of the service is closely and continuously monitored through indicators defined jointly by the thematic lots themselves, the EMODnet secretariat and the services of the European Commission through the EMODnet Steering Committee. Feedback from users are monitored, analysed and answered rapidly (see Section 5).

Besides, the Chemistry portal volunteered to test the installation of the central monitoring system (PIWIK) on the Web Portal.

Task 8: Operate a help desk offering support to users:

The help-desk is available by online chat, email and telephone from 9:00 to 17:00 (Brussels time) from Monday to Friday. The online chat access icon is located at the right bottom of all pages and provides an immediate contact with a support agent. It is also possible to leave there a message while the service is offline. All contacts are recorded together with the reaction to them.

4. Specific challenges or difficulties encountered during the reporting period

- Evaluation of the fitness for use of EMODnet Chemistry data products for the assessment of Environmental Status according to MSFD. A first videoconference has been done, focused on D5 Eutrophication (end of November 2017) bringing some clarifications . A further dialogue will help to clarify the stakeholders' requests also for the other topics.
- Definition of dedicated MSFD relevant maps for contaminants in biota matrix .
- The development of the two European EMODnet Central ML databases, one for beach litter, modelled after the OSPAR-MCS approach, and one for seafloor litter, modelled after the ICES-DATRAS approach used for national fish trawl litter. Discussions are ongoing with the relevant regional systems, their responsible managers and related networks in order to get their support and to arrange formal cooperation and set up the data exchange mechanisms.
- Integration of litter categories lists from several relevant systems.
- Set up of PIWIK RECENTLY RENAMED "MATOMO"- software for EMODnet Chemistry services

5. User Feedback

The full Help service with telephone, online chat and email with answer in 2 working days is not operative yet. Nevertheless, we received a couple of contacts by the chat already working on the portal with some feedback as listed below:

Date	Name	Organization	Type of user feedback (e.g. <i>technical, case study etc</i>)	Response time to address user request
18/10/2017	Peter Herman	Deltares	Netcdf files not correctly created. The problem is due to some bug in the program that created the netcdf files. The issue will be solved when the new products are out (spring 2018).	<1 min.
10/11/2017	Eyglo Olafsdottir	MARINE AND FRESHWATER RESEARCH INSTITUTE	Some questions related the data submission.	<1 min.

6. Outreach and communication activities

Date	Media	Title	Short description and/or link to the activity
06/10/2017	presentation	33rd BSC Regular Meeting, Istanbul	EMODnet Chemistry presented the last results focused to Black Sea area. The BSC welcomed the cooperation with EMODNet Initiative and endorsed the draft MoU with OGS (Italy) representing the EMODNet Chemistry II
18-19/10/2017	presentation	SeaDataCloud annual meeting	EMODnet Chemistry was presented
23-24/10/2017	presentation	JCOMM-5 Marine Technical Conference, WMO headquarters	EMODnet Chemistry platform and its link to SeaDataNet have been presented
31/10/2017	poster	Romanian Research Salon	EMODnet Chemistry was presented at the Romanian Research Salon organized by the Romanian Ministry of Research and Innovation between 25-27 October 2017, in the Palace of Parliament, Bucharest (Romania).
7/10/2017	presentation	scientific meeting in Daugavpils University by Latvian Institute of Aquatic Ecology	EMODnet Chemistry was presented on the 6th of December, 2017 during a scientific meeting in Daugavpils University by Latvian Institute of Aquatic Ecology.
9-10/11/2017	presentation	5th meeting of the Technical Group on Marine Data (TG DATA)	EMODnet Chemistry presented and discussed for the possible use for MSFD data delivery and will participate to the action for the development of end-to-end examples on the use of INSPIRE data-models
15-17/11/2017	openday	Open Sea Lab	A three day open data bootcamp hackathon to ideate and co-create innovative solutions to unique problems using EMODnet's marine data and ocean observations

01/12/2017	article	EMODnet Chemistry Spatial Data Infrastructure for observations, data and information	Submitted the article to the Ocean & Coastal Management MaPSIS conference special issue
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7. Updates on Progress Indicators

Using the indicator as a header list the metrics collated and the time interval. If there was no activity to report leave the section under the indicator header blank.

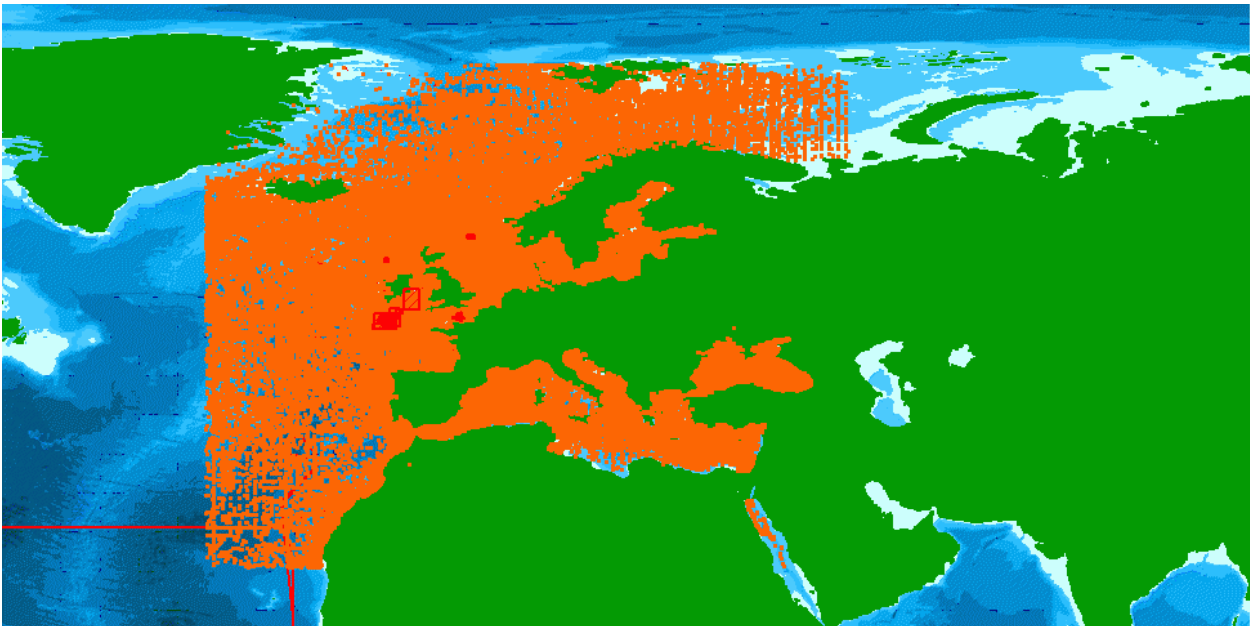
Indicator 1 - Volume of data made available through the portal

The total number of CDIs for chemistry data sets has increased from: **865281 to 935270**.

This covers the whole globe. Specifically relevant for European waters have increased from: **758232 to 816952**.

Lat Long box: **N80, W-30; N20, E45**

Of these **687669** are unrestricted (unrestricted and SeaDataNet license), while others (**129283**) require (possible) negotiation due to restrictions.



The division per **Discovery Parameter** at 31st December 2017 is as follows:

Parameter	No of CDIs	No restrictions	Restrictions
Dissolved oxygen parameters in the water column	520970	459309	61661
Salinity of the water column	510927	454671	56256
Temperature of the water column	501178	449138	52040
Phosphate concentration parameters in the water column	374026	319989	54037
Nitrate concentration parameters in the water column	313103	270065	43038
Silicate concentration parameters in the water column	301835	253368	48467
Vertical spatial coordinates	236339	176594	59745
Chlorophyll pigment concentrations in water bodies	234148	210464	23684
Nitrite concentration parameters in the water column	219860	180299	39561
Ammonium and ammonia concentration parameters in water bodies	217483	178073	39410
Alkalinity, acidity and pH of the water column	128573	96202	32371
Particulate total and organic nitrogen concentrations in the water column	110724	104299	6425
Particulate total and organic phosphorus concentrations in the water column	101233	97382	3851
Dissolved total or organic phosphorus concentration in the water column	94625	82241	12384
Density of the water column	76504	73052	3452
Dissolved total and organic nitrogen concentrations in the water column	72910	70270	2640
Phaeopigment concentrations in the water column	43772	37136	6636
Concentration of suspended particulate material in the water column	35033	23916	11117
Transmittance and attenuation of the water column	30241	27640	2601
Raw fluorometer output	25022	15004	10018
Particulate total and organic carbon concentrations in the water column	23791	20804	2987
Concentration of inorganic sulphur species in the water column	23518	21831	1687
Electrical conductivity of the water column	20956	19771	1185
Dissolved organic carbon concentration in the water column	20298	14714	5584
Inorganic chemical composition of sediment or rocks	18493	9669	8824
Pesticide concentrations in water bodies	15781	11185	4596
Concentration of other organic contaminants in the water column	15759	5160	10599
Concentration of other hydrocarbons in the water column	15189	14048	1141
Reference numbers	14804	13354	1450
Secchi disk depth	14310	10101	4209
Visible waveband radiance and irradiance measurements in the water column	13302	11322	1980
Moored instrument depth	13284	13178	106
Concentration of polycyclic aromatic hydrocarbons (PAHs) in sediment samples	11647	5573	6074
Redox potential in sediment	10204	0	10204
Dissolved metal concentrations in the water column	9518	7283	2235
Dissolved inorganic nitrogen concentration in the water column	9437	3779	5658
Concentration of polychlorobiphenyls (PCBs) in sediment samples	8776	3953	4823
Metal concentrations in biota	8676	3095	5581
Carbon concentrations in sediment	8241	1663	6578
Pollution events	8134	8134	0

Quality control flags	7622	6846	776
Sediment grain size parameters	7150	5281	1869
Nitrogen concentrations in suspended particulate material	6515	2854	3661
Concentration of polychlorobiphenyls (PCBs) in biota	6427	1356	5071
Variable fluorescence parameters	6420	5015	1405
Carbon concentrations in suspended particulate material	5941	2037	3904
Pesticide concentrations in sediment	5516	4106	1410
Raw temperature and/or salinity instrument output	5295	1803	3492
Raw oxygen sensor output	5250	1822	3428
Sound velocity and travel time in the water column	5180	5118	62
Concentration of other organic contaminants in sediment samples	5145	4698	447
Optical backscatter	4541	1963	2578
Pesticide concentrations in biota	4222	1887	2335
Date and time	4038	3719	319
Raw light meter output	3819	1155	2664
Carotenoid and flavenoid pigment concentrations in water bodies	3765	1538	2227
Sea level	3330	696	2634
Nitrogen concentrations in sediment	3316	2155	1161
Temperature variation in the water column	3308	3308	0
Metal concentrations in sediment pore waters	3239	2708	531
Unclassified pigment concentrations in the water column	3138	273	2865
Concentration of polycyclic aromatic hydrocarbons (PAHs) in the water column	3102	2359	743
Metadata parameters	3089	2305	784
Unspecified	3044	2652	392
Total metal concentrations in water bodies	2676	1350	1326
Concentration of polycyclic aromatic hydrocarbons (PAHs) in biota	2651	891	1760
Light absorption in the water column	2644	1624	1020
Radioactivity in water bodies	2609	1375	1234
Organometallic and organometalloid species concentration parameters in sediments	2339	2046	293
Light extinction and diffusion coefficients	2266	0	2266
Particulate metal concentrations in the water column	2229	1123	1106
Concentration of organic matter in sediments	2171	1126	1045
Raw suspended particulate material concentration sensor output	1979	1849	130
Concentration of other organic contaminants in biota	1797	113	1684
Organometallic species concentration parameters in biota	1673	1607	66
Horizontal spatial co-ordinates	1652	1574	78
Lithology	1619	599	1020
Concentration of carbohydrates, phenols, alkanols (alcohols), ethers, aldehydes and ketones in sediment	1616	704	912
Concentration of polychlorobiphenyls (PCBs) in the water column	1503	1139	364
Dissolved concentration parameters for other gases in the water column	1409	844	565
Concentration of polycyclic aromatic hydrocarbons (PAHs) in suspended particulate material	1051	1051	0
Primary production in the water column	1021	651	370
Urea concentration parameters in the water column	1013	704	309
Sedimentary structure	921	0	921

Biota lipid concentrations	884	577	307
SeaDataNet biological format biotic parameters	759	641	118
Concentration of organic matter in water bodies	755	711	44
Sediment water content, porosity and surface area	735	648	87
Suspended particulate material grain size parameters	669	114	555
Horizontal velocity of the water column (currents)	660	660	0
Concentration of other organic contaminants in suspended particulate material	648	648	0
Dissolved trace metalloid and inorganic selenium concentrations in water bodies	531	339	192
Geological sample radioactivity	523	459	64
Total dissolved inorganic carbon (TCO ₂) concentration in the water column	514	366	148
Stable isotopes in sediment	459	0	459
Phosphorus concentrations in suspended particulate material	399	83	316
Visible waveband radiance and irradiance measurements in the atmosphere	339	205	134
Bacteria taxonomic abundance in water bodies	333	0	333
Terrestrial detritus in the water column suspended particulate material	322	322	0
Phytoplankton taxonomic abundance in water bodies	317	317	0
Concentration of alkanes in the water column	316	316	0
Trace metalloid concentrations in biota	307	260	47
Surfactant concentrations in water bodies	297	297	0
Bacteria generic abundance in water bodies	293	257	36
Carbonate chemistry in sediment pore waters	285	120	165
Acoustic backscatter in the water column	283	283	0
Mineralogical composition	254	0	254
Phaeopigment concentrations in sediment	244	228	16
Water body redox potential	231	231	0
Concentration of carbohydrates, phenols, alkanols (alcohols), aldehydes and ketones in water bodies	194	194	0
Concentration of proteins in the water column	194	194	0
Zooplankton and zoobenthos morphological parameters	185	185	0
Concentration of inorganic halogens in water bodies	168	168	0
Concentration of polychlorobiphenyls (PCBs) in suspended particulate material	163	163	0
Other halocarbon concentrations in water bodies	156	83	73
Nutrient concentrations in sediment pore waters	151	120	31
Shellfish morphology, age and physiology	148	82	66
Regenerated production in water bodies	144	144	0
Raw in-situ nutrient analyser output	143	143	0
New production in water bodies	142	142	0
Sediment lipid concentrations	137	121	16
Chlorophyll pigment concentrations in sediment	136	120	16
Dissolved organic carbon concentrations in sediment pore waters	136	120	16
Oxygen production and respiration in the water column	136	136	0
Concentration of aliphatic hydrocarbons in sediment samples	133	13	120
Other physical and chemical properties of suspended particulate material	132	132	0
Concentration of inorganic sulphur species in sediment	131	46	85
Colloidal organic carbon concentration in the water column	100	100	0

Geological sample density	80	0	80
Organosulphur and organoselenium species concentration parameters in water bodies	76	76	0
Radioactivity in biota	64	64	0
Bacteria non taxonomy-related biomass expressed as carbon per unit volume of the water column	63	0	63
Excretion rate parameters in the water column	58	58	0
Nitrification rate in the water column	57	57	0
Organometallic and organometalloid species concentration parameters in water bodies	55	42	13
Atmospheric humidity	51	4	47
Stable isotopes in water bodies	46	20	26
Phytoplankton generic abundance in water bodies	41	5	36
Concentration of adenylates in the water column	38	38	0
Fish morphology, age and physiology	38	38	0
Bacterial production in the water column	36	0	36
Phytoplankton generic biomass in water bodies	36	0	36
Geotechnics	32	32	0
Water body lipid concentrations	32	32	0
Air pressure	28	28	0
Air temperature	27	27	0
Plankton biomass expressed as carbon per unit volume of the water column	27	0	27
Wind strength and direction	27	27	0
Concentration of silicon species in the water column	24	9	15
Horizontal platform movement	24	24	0
Wave direction	23	23	0
Wave height and period statistics	23	23	0
Geological sample magnetic, electrical and acoustic properties	22	0	22
Sediment accumulation rate	22	0	22
Phytoplankton taxonomic biomass in water bodies	20	20	0
Chlorofluorocarbon concentrations in the water column	16	16	0
Experiment state variables	15	0	15
Vertical platform movement	11	11	0
Water body released tracers	11	11	0
Bathymetry and Elevation	10	10	0
Solar Radiation	6	6	0
Concentration of inorganic halogens in sediment pore waters	5	0	5
Concentration of inorganic sulphur species in sediment pore water	5	0	5
Platform or instrument orientation	4	4	0
Dissolved oxygen parameters for sediments	1	1	0
Engineering parameters	1	1	0
Partial pressure (pCO ₂) and fugacity (fCO ₂) of carbon dioxide in the water column	1	1	0
Sediment age	1	0	1

Indicator 2 - Organisations supplying each type of data based on (formal) sharing agreements and broken down into country and organisation type (e.g. government, industry, science)

Data provider	Country	No of CDIs	No restrictions	Restrictions
British Oceanographic Data Centre	United Kingdom	65741	39543	26198
German Oceanographic Datacentre (NODC)	Germany	18444	14637	3807
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	Italy	49969	24215	25754
Institute of Marine Science S.S. of Lerici (SP)	Italy	484	1	483
CNR, Institute of Marine Science (ISMAR) - Ancona	Italy	4368	50	4318
CNR, Institute of Atmospheric Sciences and Climate (ISAC) (Rome)	Italy	552	552	0
Institute of Fishery Resources (IFR)	Bulgaria	257	257	0
Institute of Meteorology and Water Management National Research Institute, Maritime Branch in Gdynia (IMWM MB)	Poland	2726	0	2726
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	11120	6829	4291
IEO/Spanish Oceanographic Institute	Spain	18170	6961	11209
Marine Institute	Ireland	6631	6631	0
Flanders Marine Institute	Belgium	3645	2847	798
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	France	35795	35572	223
Swedish Meteorological and Hydrological Institute	Sweden	67107	67037	70
IHPT, Hydrographic Institute	Portugal	3974	3037	937
Polish Geological Institute - National Research Institute, Branch of Marine Geology (PGI BMG)	Poland	326	0	326
Institute of Marine Research - Norwegian Marine Data Centre (NMD)	Norway	42186	42186	0
NIOZ Royal Netherlands Institute for Sea Research	Netherlands	3900	3886	14
Netherlands Institute for Ecology, Centre for Estuarine and Marine Ecology	Netherlands	12894	2145	10749
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)	Russian Federation	52011	52011	0
P.P.Shirshov Institute of Oceanology, RAS	Russian Federation	876	876	0
National Institute of Fisheries Research (INRH)	Morocco	552	0	552

Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	1209	1158	51
Iv.Javakhishvili Tbilisi State University, Centre of Relations with UNESCO Oceanological Research Centre and GeoDNA (UNESCO)	Georgia	539	539	0
Institute of Marine Sciences, Middle East Technical University	Turkey	7641	1304	6337
National Institute for Marine Research and Development Grigore Antipa""	Romania	8042	3000	5042
Latvian Institute of Aquatic Ecology	Latvia	3734	3734	0
Institute of Oceanography and Fisheries	Croatia	2320	2320	0
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	168	168	0
Cyprus Oceanography Center	Cyprus	580	580	0
Marine Systems Institute at Tallinn University of Technology	Estonia	18264	17753	511
State Oceanographic Institute (SOI)	Russian Federation	11243	0	11243
Marine Hydrophysical Institute	Ukraine	4652	2058	2594
Aarhus University, Department of Bioscience, Marine Ecology Roskilde	Denmark	200451	200451	0
International Council for the Exploration of the Sea (ICES)	Denmark	32814	32814	0
Karadeniz Technical University, Faculty of Marine Sciences	Turkey	246	29	217
Sinop University, Fisheries Faculty	Turkey	343	343	0
Dokuz Eylul University, Institute of Marine Science and Technology	Turkey	1603	0	1603
Istanbul University, Institute of Marine Science and Management	Turkey	339	171	168
Institute of Biology of the Southern Seas, NAS of Ukraine	Ukraine	998	998	0
Ukrainian Hydrometeorological Institute - Marine Branch	Ukraine	26089	26089	0
Russian State Hydrometeorological University, St-Petersburg	Russian Federation	172	172	0
National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences	Bulgaria	839	602	237
Israel Oceanographic and Limnological Research (IOLR)	Israel	3956	3623	333
BRGM / Office of Geological and Mining Resources	France	1087	0	1087
Finnish Environment Institute	Finland	11535	11535	0
Ukrainian scientific center of Ecology of Sea (UkrSCES)	Ukraine	5512	5512	0
Odessa National I.I.Mechnikov University	Ukraine	889	25	864
National Institute of Biology - NIBMarine Biology Station	Slovenia	7765	3745	4020

Institut National des Sciences et Technologies de la Mer "INSTM"	Tunisia	868	21	847
Scientific - Research Firm GAMMA"	Georgia	1194	1194	0
Rijkswaterstaat Water, Traffic and Environment	Netherlands	13197	13197	0
Institute of Geology and Geography of Nature Research Centre	Lithuania	212	212	0
Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre	Belgium	9760	9760	0
Geological Survey of Estonia	Estonia	542	542	0
Finnish Meteorological Institute	Finland	25064	25064	0
Ankara University	Turkey	24	24	0
Danube Hydro-meteorological Observatory	Ukraine	44	0	44
Faculty of Geography and Earth Sciences, University of Latvia (LU)	Latvia	721	0	721
National Environmental Agency of the Ministry of Environment Protection and Natural Resources	Georgia	62	62	0
Institute of Marine Biology (IMBK)	Montenegro	805	758	47
ISPRA-Institute for Environmental Protection and Research	Italy	4540	4540	0
PANGAEA - Data Publisher for Earth & Environmental Science	Germany	4242	4242	0
Portuguese Institute of Ocean and Atmosphere	Portugal	919	57	862

These centres are government and research institutes. No industry.

Difference between 1 October 2017 and 31 December 2017:

Data provider	Country	No of CDIs	No restrictions	Restrictions
British Oceanographic Data Centre	United Kingdom	18	18	0
German Oceanographic Datacentre (NODC)	Germany	0	0	0
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	Italy	34	0	34
Institute of Marine Science S.S. of Lerici (SP)	Italy	0	0	0
CNR, Institute of Marine Science (ISMAR) - Ancona	Italy	1291	0	1291
CNR, Institute of Atmospheric Sciences and Climate (ISAC) (Rome)	Italy	0	0	0
Institute of Fishery Resources (IFR)	Bulgaria	0	0	0
Institute of Meteorology and Water Management National Research Institute, Maritime Branch in Gdynia (IMWM MB)	Poland	0	0	0
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	0	0	0
IEO/Spanish Oceanographic Institute	Spain	2069	275	1794

Marine Institute	Ireland	6307	6307	0
Flanders Marine Institute	Belgium	111	111	0
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	France	991	991	0
Swedish Meteorological and Hydrological Institute	Sweden	3850	3850	0
IHPT, Hydrographic Institute	Portugal	0	0	0
Polish Geological Institute - National Research Institute, Branch of Marine Geology (PGI BMG)	Poland	0	0	0
Institute of Marine Research - Norwegian Marine Data Centre (NMD)	Norway	7608	7608	0
NIOZ Royal Netherlands Institute for Sea Research	Netherlands	-58	-58	0
Netherlands Institute for Ecology, Centre for Estuarine and Marine Ecology	Netherlands	0	0	0
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)	Russian Federation	126	126	0
P.P.Shirshov Institute of Oceanology, RAS	Russian Federation	0	0	0
National Institute of Fisheries Research (INRH)	Morocco	0	0	0
Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	0	0	0
Iv.Javakhishvili Tbilisi State University, Centre of Relations with UNESCO Oceanological Research Centre and GeoDNA (UNESCO)	Georgia	12	12	0
Institute of Marine Sciences, Middle East Technical University	Turkey	0	0	0
National Institute for Marine Research and Development Grigore Antipa""	Romania	0	0	0
Latvian Institute of Aquatic Ecology	Latvia	142	142	0
Institute of Oceanography and Fisheries	Croatia	87	87	0
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	40	40	0
Cyprus Oceanography Center	Cyprus	0	0	0
Marine Systems Institute at Tallinn University of Technology	Estonia	625	114	511
State Oceanographic Institute (SOI)	Russian Federation	4055	0	4055
Marine Hydrophysical Institute	Ukraine	0	0	0
Aarhus University, Department of Bioscience, Marine Ecology Roskilde	Denmark	7331	7331	0
International Council for the Exploration of the Sea (ICES)	Denmark	5053	5053	0
Karadeniz Technical University, Faculty of Marine Sciences	Turkey	0	0	0
Sinop University, Fisheries Faculty	Turkey	0	0	0
Dokuz Eylul University, Institute of Marine Science and Technology	Turkey	0	0	0

Istanbul University, Institute of Marine Science and Management	Turkey	0	0	0
Institute of Biology of the Southern Seas, NAS of Ukraine	Ukraine	0	0	0
Ukrainian Hydrometeorological Institute - Marine Branch	Ukraine	0	0	0
Russian State Hydrometeorological University, St-Petersburg	Russian Federation	0	0	0
National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences	Bulgaria	0	0	0
Israel Oceanographic and Limnological Research (IOLR)	Israel	0	0	0
BRGM / Office of Geological and Mining Resources	France	0	0	0
Finnish Environment Institute	Finland	37	37	0
Ukrainian scientific center of Ecology of Sea (UkrSCES)	Ukraine	167	167	0
Odessa National I.I.Mechnikov University	Ukraine	0	0	0
National Institute of Biology - NIBMarine Biology Station	Slovenia	305	176	129
Institut National des Sciences et Technologies de la Mer "INSTM"	Tunisia	8	0	8
Scientific - Research Firm GAMMA"	Georgia	0	0	0
Rijkswaterstaat Water, Traffic and Environment	Netherlands	0	0	0
Institute of Geology and Geography of Nature Research Centre	Lithuania	0	0	0
Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre	Belgium	492	492	0
Geological Survey of Estonia	Estonia	0	0	0
Finnish Meteorological Institute	Finland	17079	17079	0
Ankara University	Turkey	0	0	0
Danube Hydro-meteorological Observatory	Ukraine	0	0	0
Faculty of Geography and Earth Sciences, University of Latvia (LU)	Latvia	0	0	0
National Environmental Agency of the Ministry of Environment Protection and Natural Resources	Georgia	0	0	0
Institute of Marine Biology (IMBK)	Montenegro	161	161	0
ISPRA-Institute for Environmental Protection and Research	Italy	779	779	0
PANGAEA - Data Publisher for Earth & Environmental Science	Germany	0	0	0
Portuguese Institute of Ocean and Atmosphere	Portugal	0	0	0
		58720	50898	7822

Indicator 3 - Organisations that have been approached to supply data with no result, including type of data sought and reason why it has not been supplied

Nothing to report

Indicator 4 - Volume of each type of data and of each data product downloaded from the portal

Time period 1 October 2017 – 31 December 2017:

RSM => EMODNet Chemistry portal

No of CDI basket transactions: 39

No of CDIs requested: 86900

Different users: 18

Different data centres: 42

RSM => Chemistry data sets ordered through SeaDataNet portal

No of CDI basket transactions: 98

No of CDIs requested: 66205

Different users: 49

Different data centres: 35

	Atlantic Sea	Baltic Sea	Black Sea	Mediterranean Sea	North Sea
water body ammonium	6646	6750	824	3122	199
water body chlorophyll-a	1609	579	1616	6824	536
water body dissolved oxygen	2109	7446	365	2882	1018
water body nitrate	0	498	199	3221	1462
water body nitrate plus nitrite	523	392	589	2	0
water body nitrite	0	0	0	647	0
water body ph	0	0	0	2416	0
water body phosphate	1032	963	700	4085	808
water body silicate	252	48	48	315	110
water body total nitrogen	0	132	0	1579	67
water body total phosphorus	0	111	0	3615	48

DIVA maps visualization via the WMS server.

	Atlantic Sea	Baltic Sea	Black Sea	Mediterranean Sea	North Sea
water body ammonium	6	3	0	3	0
water body chlorophyll-a	0	2	1	17	0
water body dissolved oxygen	0	18	1	12	5
water body nitrate	0	0	0	5	0
water body nitrate plus nitrite	2	1	0	0	0
water body nitrite	0	0	0	1	0
water body ph	0	0	0	15	0
water body phosphate	1	2	0	1	0
water body silicate	0	0	0	2	0
water body total nitrogen	0	0	0	1	0
water body total phosphorus	0	0	0	2	0

Download of the DIVA products

Dynamic views using WPS via Oceanbrowser				
P35 description	P35label	Month	Year	Number of requests
Water body phosphate	EPC00007	Oct	2017	715
Water body nitrate plus nitrite	EPC00005	Oct	2017	279
Water body ammonium	EPC00009	Oct	2017	80
Water body silicate	EPC00008	Oct	2017	0
Water body nitrite	EPC00006	Oct	2017	43
Water body total phosphorus	EPC00135	Oct	2017	0
Water body total nitrogen	EPC00134	Oct	2017	12
Water body nitrate	EPC00004	Oct	2017	762
Water body phosphate	EPC00007	Nov	2017	7
Water body nitrate plus nitrite	EPC00005	Nov	2017	56
Water body ammonium	EPC00009	Nov	2017	0
Water body silicate	EPC00008	Nov	2017	71
Water body nitrite	EPC00006	Nov	2017	8
Water body total phosphorus	EPC00135	Nov	2017	0
Water body total nitrogen	EPC00134	Nov	2017	0
Water body nitrate	EPC00004	Nov	2017	89
Water body phosphate	EPC00007	Dec	2017	161
Water body nitrate plus nitrite	EPC00005	Dec	2017	72
Water body ammonium	EPC00009	Dec	2017	0
Water body silicate	EPC00008	Dec	2017	28

Water body nitrite	EPC00006	Dec	2017	0
Water body total phosphorus	EPC00135	Dec	2017	0
Water body total nitrogen	EPC00134	Dec	2017	0
Water body nitrate	EPC00004	Dec	2017	56

Indicator 5 - Organisations that have downloaded each data type

From CDI service, directly through the EMODnet Chemistry portal:

Name	Organisation	Country
Dr Alexander Barth	UNIVERSITY OF LIEGE	Belgium
Aysun Koroglu Dogan	UN-IHE Delft	Netherlands
Ms Ann Kristin Ostrem	IMR	Norway
Bryn Boothby	University of Ulster	United Kingdom
Marco Rusmini	ERM Italy	Italy
Camilla Moore	University of Southampton	United Kingdom
Dag Hjermand	Norwegian Institute of Water Research	Norway
Diana Pabon Figueroa	University of St Andrews	United Kingdom
Mr D.M.A. SCHAAP	MARIENE INFORMATIE SERVICE MARIS B.V.	Netherlands
Gianpiero Cossarini	OGS Ist. Naz. di Oceanografia e Geofisica	Italy
Ilja Mal	MSI	Estonia
Meral	?	Turkey
Mrs Marina Lipizer	OGS	Italy
Niels jacob CARSTENSEN	NATIONAL ENVIRONMENTAL RESEARCH INSTITUTE (NERI)	Denmark
Dr Peter Bowyer	seamode oceanographic	United Kingdom
peter bowyer	marine institute	Ireland
Serge VAN DER HORST	MARIS B.V.	Netherlands
Thierry Carval	Ifremer	France

From CDI service, chemistry data sets ordered through SeaDataNet portal:

Name	Organisation	Country
Ana CASTELLI	INSTITUTE OF MARINE BIOLOGY	Montenegro
Arjun Adhikari	Goa University	India
Dr Alessandra GIORGETTI	IN-OGS	Italy
Mr Aleksandar Jovicic	Institute of Marine Biology	Serbia and Montenegro
Aikaterini Kikaki	?	Greece
Aysun Koroglu Dogan	UN-IHE Delft	Netherlands
Alexander Haumann	?	United Kingdom
Antonis Koutroumpas	?	Greece
Dr Asen Iakimov STEFANOV	IO/BAS	Bulgaria
Dr Branko CERMEJ	NATIONAL INSTITUTE OF BIOLOGY	Slovenia
Mr Dezeljin Damir	Marine biology station of Slovenia	Slovenia
Daniel Neumann	Leibniz Institute for Baltic Sea Research (IOW)	Germany
Daniel Tosal	?	Spain
Elena Guijarro Garcia	Instituto Español de Oceanografía	Spain
Dr Evgeny Vyazilov	RIHMI-WDC	Russian Federation
Eygló Ólafsdóttir	Marine and Freshwater Research Institute (MFRI)	Iceland
Francis Stobbe	Belgian Marine Data Centre	Belgium
Jessica Valenti	?	Italy
Mr Jón Ingvar Jónsson	Marine Research Institute	Iceland
Mr Jonas Mortelmans	VLIZ	Belgium
kanwal shahzadi	University of Bologna	Pakistan
Mr Kimmo Tikka	FMI	Finland
Laura Herraiz	?	United Kingdom
Mrs Luminita BUGA	NIMRD	Romania
leonne van der weegen	NIOZ	Netherlands
Livia Ermakova	VNIIOkeangeologiya named after I.S.Gramberg	Russian Federation
Mrs Liesbeth Lyssens	Flanders Marine Institute (VLIZ)	Belgium
Margarita Markina	P.Shirshov Institute of Oceanology	Russian Federation
Matthew Carter	Plymouth University	United Kingdom
Mr Mia Devolder	MUMM	Belgium
svetla miladinova	European Commission Joint Research Centre Director	Italy
Dr Madis-Jaak LILOVER	Tallinn Technical University	Estonia
Matteo Morgantini	CORILA	Italy
Mr Marten Tacoma	NIOZ	Netherlands

Natalia Oblomkova	?	Russian Federation
Niels Bleij	Oceans of Energy	Netherlands
Sergey Norin	IWP RAS	Russian Federation
Mr Pelopidas Karagevrekis	HCMR/HNODC	Greece
Richard Brink	Royal Netherlands Institute for Sea Research	Netherlands
Ms Ruth Lagring	MUMM	Belgium
Dr Reiner SCHLITZER	ALFRED WEGENER INSTITUT (AWI)	Germany
Mrs Stéfane Gouzien	ALTRAN	France
Mr Sjur Ringheim Lid	Institute of Marine Research	Norway
Mr Serge SCORY	Royal Belgian Institute of Natural Sciences - BMDC	Belgium
Susana García-Monteiro	Universidad de Valencia	Spain
Tetiana Pavlik	Odessa National University	Ukraine
Torben Schmith	DMI	Denmark
Dr Willem Stolte	Deltares	Netherlands
Xavier Desmit	RBINS	Belgium

Indicator 6 - Using user statistics to determine the main pages utilised and to identify preferred user navigations routes

Time period 1 October 2017 – 31 December 2017:

Chemistry main portal: <http://www.emodnet-chemistry.eu/>

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Oct 2017	426	1067	2612	10336	4.82 GB
Nov 2017	520	1176	4263	18961	4.15 GB
Dec 2017	450	1128	6100	28178	5.01 GB

Chemistry CDI data discovery and access service:

http://emodnet-Chemistry.maris2.nl/v_cdi_v3/search.asp

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Oct 2017	218	485	6,126	18,980	532.60 MB
Nov 2017	278	586	10,768	44,617	679.74 MB
Dec 2017	145	306	6,021	18,757	255.34 MB

Chemistry Products – Ocean Browser service: <http://oceanbrowser.net/emodnet/>

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Oct 2017	11	72	264	385	2.16 GB
Nov 2017	9	72	271	387	1.48 GB
Dec 2017	9	68	325	445	42.77 GB

Sextant- Products metadata catalogue:

http://sextant.ifremer.fr/en/web/emodnet_chemistry/catalogue#/search?sortBy=popularity&from=1&to=20

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Oct 2017	40	89	6252	7371	361.62 MB
Nov 2017	63	114	10040	12802	311.03 MB
Dec 2017	54	130	27159	34600	885.72 MB

Indicator 7 - List of what the downloaded data has been used for (divided into categories e.g. Government planning, pollution assessment and (commercial) environmental assessment, etc.)

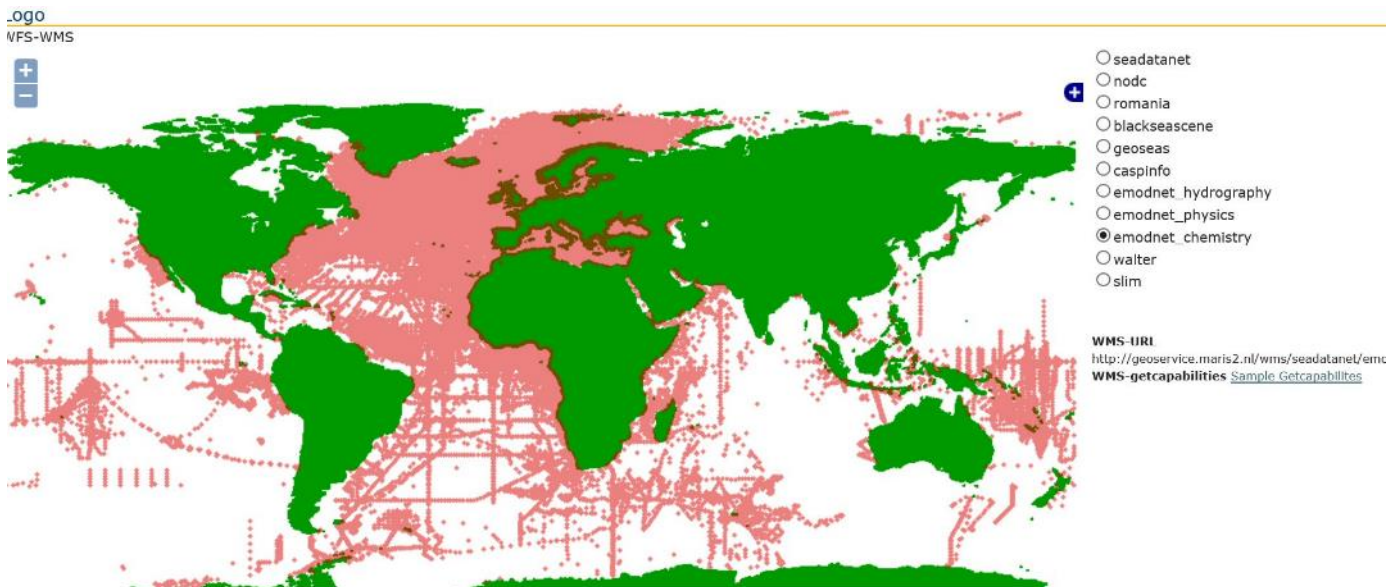
The regional aggregated, harmonized and validated data collection produced by EMODnet Chemistry have been used for EEA Thematic reports.

Indicator 8 - List of web-services made available and user organisations connected through these web-services

CDI Data Discovery and Access service:

The CDI service has WMS and WFS services which are used primarily internally and by the OceanBrowser service for providing a layer of CDI entries and option for retrieving CDI metadata:

WMS and WFS service: http://geoservice.maris2.nl/wms/seadatanet/EMODnet_chemistry



Example of EMODnet Chemistry WMS layer for points

GetCapabilities:

http://geoservice.maris2.nl/wms/seadatanet/EMODnet_chemistry?service=WMS&request=GetCapabilities

Note: Getcapabilities indicates what is available. In CDI case it is both WMS and WFS. Implementing WFS is depending on the client and needs programming. We provide WFS request through WMS:

http://geoservice.maris2.nl/wms/seadatanet/EMODnet_chemistry/?LAYERS=points&QUERY_LAYERS=points&STYLES=&SERVICE=WMS&VERSION=1.1.1&REQUEST=GetFeatureInfo&BBOX=-25.168107%2C39.506018%2C25.808455%2C64.994299&FEATURE_COUNT=10&HEIGHT=290&WIDTH=580&FORMAT=image%2Fpng&INFO_FORMAT=text%2Fhtml&SRS=EPSG%3A4326&X=296&Y=129

with BBox as LON,LAT,LON,LAT for the layer points.

Data product Viewing and Downloading service:

The analysed field generated by DIVA (Data-Interpolating Variational Analysis) can be visualised using the WMS protocol which supports the following requests:

- GetCapabilities

This request is used to provide all layers of the map server. To every parameter and to every region corresponds a different WMS layer. An example of such a request would be:

<http://ec.oceanbrowser.net/EMODnet/Python/web/wms?request=GetCapabilities&service=WMS&version=1.3.0>

- GetMap

This request allows to extract a horizontal section of the 4D NetCDF file at the specified depth and time ([Example URL](#)). Per default, the axis are not displayed on a map. This can be activated by setting the parameter DECORATED to true ([Example URL](#)).

The GetMap can also be used to extract a vertical section ([Example URL](#)). The path of the section is encoded in the SECTION parameter: the longitude and latitude are separated by a comma and the coordinates by the pipe-symbol (|). The x-axis corresponds to the distance in arc degrees along the section (the first point is the origin) and the y-axis in the depth in meters. The parameter RATIO defines the aspect ratio of the vertical section.

Images can be returned in raster (PNG) and vector image formats (SVG, EPS, PDF). They can also be saved as a KML file so that the current layer can be visualized in programs like Google Earth and combined with other information imported in such programs.

By providing multiple time instances, the web map server can also return animation in the WebM or MP4 format using this GetMap request ([Example URL](#)). As the animation are generated dynamically, it usually takes a couple of minutes to create them. The frame rate of the animation is controlled through the parameter rate.

- GetFeatureInfo

This request returns a simple XML file with the underlying value of the analysed field ([Example URL](#)).

However, the WMS standards (in version 1.1.1 and 1.3.0) is not completely adequate for ocean analyses. A WMS allows to represent a data set according a list of different styles. A legend is attributed to each style which for scalar is colorbar. The legend for a given style is represented by a link to an image.

A single legend is used for entire data set (for all depth layers and time instances in particular). However, the ocean is strongly stratified and unique legend does not provide sufficient contrast because the ocean

properties at depth are often very different from the properties near the surface. The solution is to make the legend dynamic so that it can be adjusted based on a range of value at a specified depth and time

Dynamic Timeseries visualizations and requests for graphs:

Oceanbrowser uses three different services to enable end users to select, display and evaluate time series and profiles of data of a certain kind of parameter. Oceanbrowser uses the OGC web services WFS and WPS for this purpose. These three services are:

1. WFS get parameters request
2. WFS get locations and features
3. WPS get time series and plot in graph

Basic requests

OGC web services WFS consists of various requests, for WFS these are:

- GetCapabilities
- DescribeFeatureType
- GetFeature

<http://EMODnet02.cineca.it/geoserver/wfs?service=WFS&request=GetCapabilities> yields a capabilities document from the web feature service, or in other words all functionality provided by the services.

DescribeFeatureType describes all features described. In this case 2 services are available. The result of <http://EMODnet02.cineca.it/geoserver/wfs?service=WFS&request=DescribeFeatureType> is displayed in the figure below.

This information can be used to get a certain feature via the GetFeature statement. This GetFeature statement can be completed with a query to filter on geometry and all other available entities (columns in a database) of the type names available.

For instance

http://EMODnet02.cineca.it/geoserver/EMODnet/ows?service=WFS&version=1.0.0&request=GetFeature&typeName=EMODnet:p35_used&filter=<PropertyIsEqualTo><PropertyName>EMODnet:p35_id</PropertyName><Literal>EPC00005</Literal></PropertyIsEqualTo> gives the contents of P35_ID EPC00005

Above is used for the first 2 services used by OceanBrowser

1. Getting parameters

The first WFS is a very basic process that returns a table in xml with the list of available parameters. This table is used by OceanBrowser.

and displayed as follows:

✕

Select data products

Search:

Layer

- Fertilisers
 - Water body phosphate
 - Water body nitrate plus nitrite
 - Water body ammonium
 - Water body nitrite
 - Water body total phosphorus
 - Water body total nitrogen
 - Water body nitrate
- Silicates
 - Water body silicate

EMODNET Chemistry - Static Plots [✕]



OceanBrowser: distribution density of monitoring stations.

2. Get locations and features

The Add layer button lets Oceanbrowser constructs a GetFeature request on the second WFS (observed_cindex) layer made available as a service.

OceanBrowser extents the filter with Datetime and BoundingBox. Especially the boundingbox takes care of a limited amount of data transferred. For EMODnet the entire Water body phosphate locations for the link above is visualised through next image.

Image: OceanBrowser

3. Plot time series of certain location

This is done by the OGC WPS that Deltares created to be able to extract data directly from the database. WPS stands for Web Processing Service and acts as middle ware between client side software and server side software. In this case, WPS acts between OceanBrowser and a database with all observations. The above described WFS processes are used to extract information end-users are interested in. By selecting a location, data and metadata extracted from the database can be visualised in the form of a graph. WPS also makes use of:

- getCapabilities (what can you do for me, what processes are available)
- DescribeProcess (how does a process work)
- Execute (execute a process)

getCapabilities

Gives the list of processes available.

<http://EMODnet02.cineca.it/wps?service=wps&version=1.0.0&request=getCapabilities> returns the list of processes.

DescribeProcess

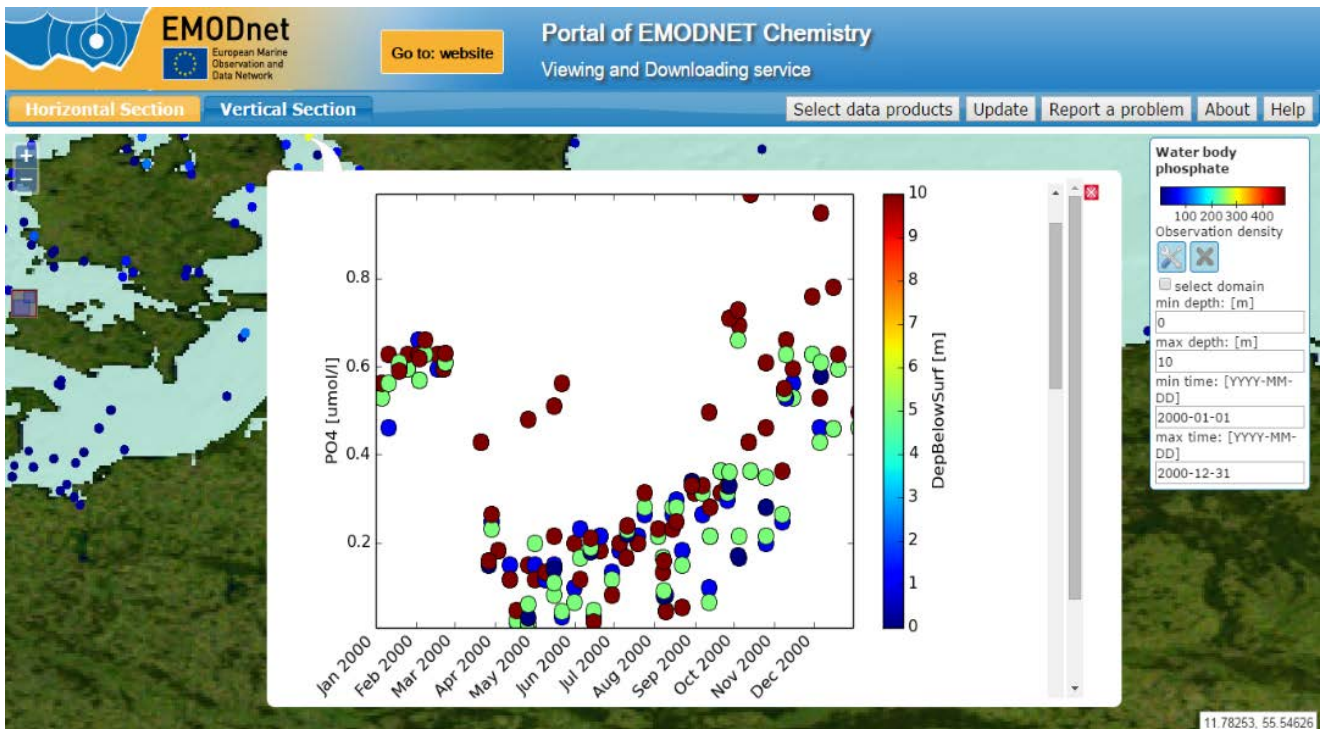
This describes the available processes of the WPS, including the inputs required, their allowable formats, and the outputs that can be produced.

http://EMODnet02.cineca.it/wps?service=wps&version=1.0.0&request=describeProcess&identifier=bbox_plot_timeseries

ExecuteProcess

The execute process is build-up on the user choice which can be found on the right hand side of the OceanBrowser portal. OceanBrowser constructs the entire HTML including the ExecuteProcess statement which triggers the WPS.

Figure 59. Ocean Browser: time series.



[http://ec.oceanbrowser.net/EMODnet/proxy?url=http://EMODnet02.cineca.it/wps?DataInputs=\[z=ADEPZZ01;zlim1=10;bbox=11.8750340184,11.9848973101,57.6323448275,57.742208087;starttime=2000-01-01T00:00:00Z;endtime=2001-01-01T00:00:00Z;parameter=EPC00007;zlim0=0;log10=0;markersize=12.0;alpha=1\]&service=wps&request=Execute&Identifier=bbox_plot_timeseries&version=1.0.0](http://ec.oceanbrowser.net/EMODnet/proxy?url=http://EMODnet02.cineca.it/wps?DataInputs=[z=ADEPZZ01;zlim1=10;bbox=11.8750340184,11.9848973101,57.6323448275,57.742208087;starttime=2000-01-01T00:00:00Z;endtime=2001-01-01T00:00:00Z;parameter=EPC00007;zlim0=0;log10=0;markersize=12.0;alpha=1]&service=wps&request=Execute&Identifier=bbox_plot_timeseries&version=1.0.0)

Eventually, end-users would like to gain insight in observation distribution for a certain location. OceanBrowser executes the process like the above example and retrieves a timeseries like the next picture.

For the same observation, different flavours can be given (from OceanBrowser). The following is a profile call, triggered from the OceanBrowser:

[http://ec.oceanbrowser.net/EMODnet/proxy?url=http://EMODnet02.cineca.it/wps?DataInputs=\[z=ADEPZZ01;zlim1=10;bbox=11.8750340184,11.9848973101,57.6323448275,57.742208087;starttime=2000-01-01T00:00:00Z;endtime=2001-01-01T00:00:00Z;parameter=EPC00007;zlim0=0;log10=0;markersize=12.0;alpha=1\]&service=wps&request=Execute&Identifier=bbox_plot_profile&version=1.0.0](http://ec.oceanbrowser.net/EMODnet/proxy?url=http://EMODnet02.cineca.it/wps?DataInputs=[z=ADEPZZ01;zlim1=10;bbox=11.8750340184,11.9848973101,57.6323448275,57.742208087;starttime=2000-01-01T00:00:00Z;endtime=2001-01-01T00:00:00Z;parameter=EPC00007;zlim0=0;log10=0;markersize=12.0;alpha=1]&service=wps&request=Execute&Identifier=bbox_plot_profile&version=1.0.0)

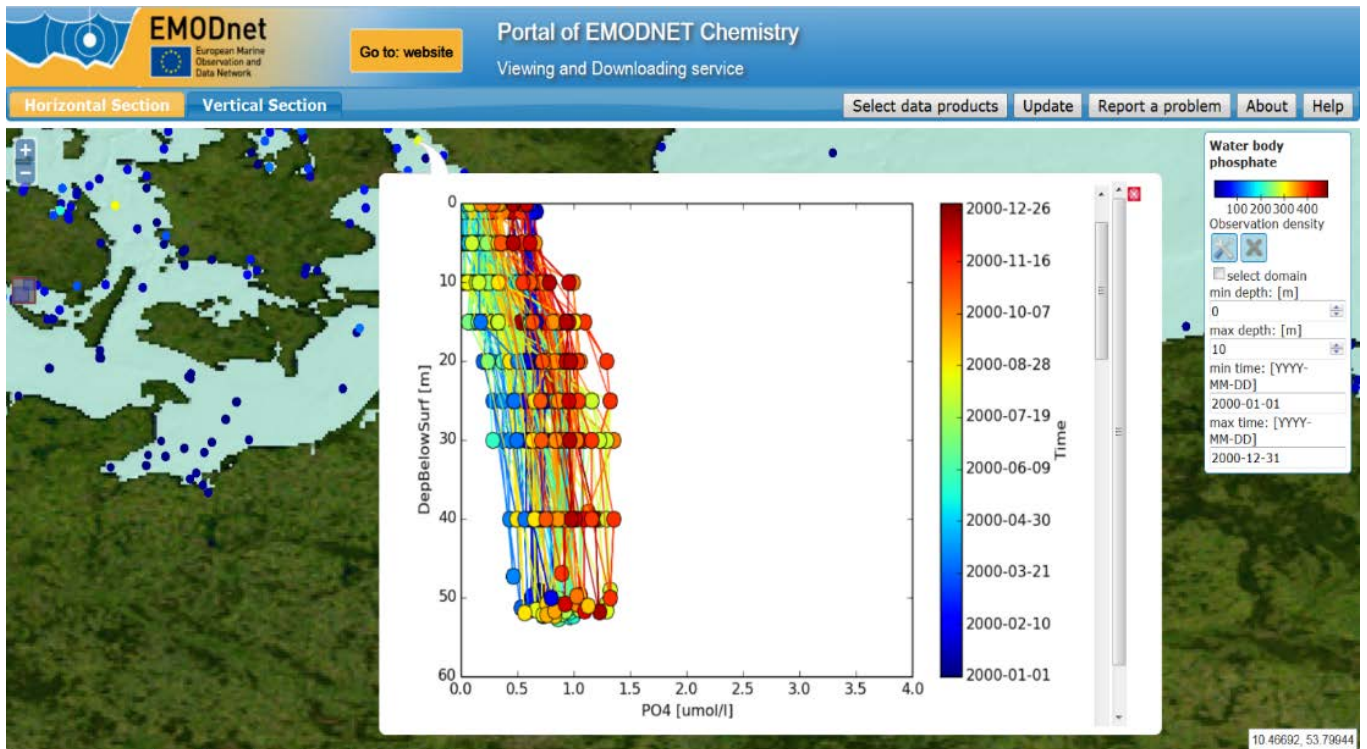


Figure 60. Ocean Browser: temporal profiles.

The output is:

Together with a picture, a list of EDMO codes, LOCAL_CDI's and links to the data shopping of the used observation is provided. For instance, this is a part of the list generated in OceanBrowser for the profile above:

- 🔍 EDMO code: 729 - local CDI: [Vand 111095](#)
- 🔍 EDMO code: 729 - local CDI: [Vand 111096](#)
 - 🔍 EDMO code: 729 - local CDI: [Vand 111097](#)
 - ...
 - 🔍 EDMO code: 729 - local CDI: [Vand 111121](#)
 - ...