



## EMODnet Thematic Lot n° 4- Chemistry

EMODnet Phase 2 - Annual Report

Reporting Period: July 2013 – June 2014

Date: 31/07/2014

# 1. Highlights in this reporting period

---

- Good progress by all data providers with preparing and submitting new data entries for nutrients in the CDI service;
- Generation of the Regional data Buffers (with an internal Robot Harvesting providing particular support to the new connected centers) focused on nutrient data;
- Data aggregation and data quality check preparatory to the horizontal analysis with Diva software and dynamic visualizations;
- Technical developments for the new visualizations, including vocabulary extensions (P35, P36 and filtering), ... , sharing of OGC compliant services with EMODnet Physics;
- Diva maps production for nutrients in the 5 sea regions (Greater North Sea, Baltic Sea, Atlantic Sea, Mediterranean Sea and Black Sea);
- Test examples for dynamic visualizations on top of the aggregated and validated Data Buffers;
- Plenary meetings (kick-off meeting in Trieste from the 3rd to the 5th of June 2013 and first year meeting in Split from 17th to the 18th of June 2014);
- SC (Trieste, 6/6/2013, Rome, 20-21/1/2014 and Split, 20/6/2014);
- Technical Working Group (TWG) meetings (London from 10th to 11th of September 2013 and Barcelona from 19th to 20th of March 2014)
- External meetings (EEA in Copenhagen from 4th to 5th of July 2013 with MODEG and WG-DIKE members, 1st SC at JPI Oceans, Brussels from 16th to 17th of December 2013, 2nd SC in Oostende from 19th to 20th of February 2014 with MODEG group);
- Internal meetings (with Italian institutes in Rome the 27th of November 2013, in video-conference with the 5 Regional Leaders and with the TWG, in video-conference with EMODnet Physics to finalize the sharing of OGC compliant services).

## 2. Summary of the work done

---

The first year of activity was dedicated to set-up the workflow, including the development of the conceptual model and all technical elements. The general architecture includes the NODCs acting as data sources queried by the CDI User Interface (via EMODnet Chemistry web portal) and by the CDI Robot harvester (to generate the internal specific data buffers). All partners and subcontractors (acting as NODCs) were asked to submit their data to EMODnet infrastructure (i.e. submit the metadata as CDI files and keep copy of the data in Odv format) and the data are immediately available through EMODNet Chemistry CDI User Interface. For products generation, an automatic Robot Harvester, properly configured with predefined criteria of geographical and temporal coverage and parameters, was adopted to retrieve specific data sets from distributed data centers. It takes advantage of the CDI system and of SeaDataNet infrastructure to manage automatically the restricted and unrestricted data requests submitted to the involved data centers. MSFD boundaries were considered but larger areas were implemented for the data extraction in the 5 EMODnet regions:

- **Baltic Sea**
- **North Sea area** (including Norwegian Sea and Celtic Sea)
- **Atlantic Sea area** (including Atlantic Coast and Macaronesia)
- **Black Sea**
- **Mediterranean Sea.**

For the first year, we decided to focus the activity of data collection and products generation on nutrients, selecting the following set of parameters:

- **PO4** in umol/l
- **Total Phosphorus** in umol/l
- **NOx** (=NO<sub>2</sub>+NO<sub>3</sub> or NO<sub>3</sub> only in case NO<sub>2</sub> is missing) in umol/l
- **NO3** in umol/l
- **Total Nitrogen** in umol/l
- **NH4** in umol/l
- **SiO4** in umol/l

The regional leaders, accessing the data buffers, performed the data aggregation and the data validation. This included unit conversions, homogenization of parameters coding and meaning (taking into consideration the possible difference in the collection of new and historical data). Odv was used for the data quality check with homogeneous protocols in the 5 regions. Finally, Diva software was applied to generate the interpolated maps in the 5 regions.



## EMODnet Annual Report – Lot n° 4 – Chemistry – Annual Report

A dynamic visualization service, working on top of the aggregated and validated Data Buffers and producing plots of observation densities and maps with time evolution of selected observations, is under finalization as part of the new technical developments. SeaDataNet Common Vocabularies (NVS 2.0) are one of the core services adopted by the Chemistry Lot, under continuous evolution to fit them in the best way to the chemical data needs. In particular, the new P35 vocabulary was defined, providing scientifically aggregated definitions of parameters for products description. The P36 vocabulary manages the definition of categories of parameters as included in the Emodnet call.

Giordano Giorgi (ISPRA) and Neil Holdsworth (ICES) contributed to promote EMODNet pan-European infrastructure to the TG-DATA Workshop on nutrients (D5) and hazardous substances (D8) and both are reporting the updates from the MSFD reporting needs to keep the Chemistry Lot as compliant as possible to this task.

### 3. Challenges encountered during the reporting period

Provide an overview (preferably in table format) listing and short explanation of the main challenges encountered during the reporting period and the measures taken to address them.

Partner	Challenges encountered	Short description	Measures to address challenges
OGS, ITALY	Detection limits	Presence of data coded as “below detection limit” with different detection limits	Identification of expert group to find solutions according to a common and agreed approach
	Uncomplete metadata availability	Missing coordinates especially for sediment matrix	Contact with originator
	Data availability	Difficulties in getting locally identified data from specific organisations for inclusion in CDI data discovery and access service	Contact with local data holders trying to convince them to contribute
MARIS, NETHERLANDS	Challenges encountered	Short description	Measures to address challenges
	Development of the fully automatic robot harvester system	CDI service has been extended with a Buffer CMS to configure harvesting profiles, that steer a Robot harvester for discovery and retrieving of distributed data sets and storage in a central buffer with central user interface and API	Analysis of specifications and gradual development with thorough testing of system components because it is a critical service for making the data harvesting much more efficient and operational
	Formulating the geographic filters for MSFD regions	Data products must be generated for MSFD regions according to the contract, but these MSFD regions are not yet officially established	Approximation of MSFD regions, followed by schematising the regions with margings to act as geographic filters for the regional data harvesting
NERC-BODC, UK	Challenges encountered	Short description	Measures to address challenges
	Conversion from ICES data format to SeaDataNet.	Data stored with ICES reference codes which can be applied in many combinations and not all code types are applicable to each data type (water, sediment and biota).	Developed a vocabulary mapping to identify appropriate P01 terms and generate new codes as appropriate depending on the ICES code combinations.

	Number of P01 codes generated for the project that need to have a layer of aggregation developed.	The data that are being collated are not necessarily from standard methods. Therefore there is a need to aggregate parameters which the scientific user community consider as not being different for the purposes of the user community.	Development of the P35 vocabulary with more generic parameters which map back to the more specific P01 codes. This vocabulary will enable the ODV software to carry out the automatic aggregation of EMODnet Chemistry relevant datasets on behalf of the user.
	P35 governance	The data management community requires technical input from the scientific users as to which terms can be aggregated and which terms should not be aggregated.	Governance group has been set up from participants across the EMODnet scientific community.
<b>IFREMER, FRANCE</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Data Quality	Data series have been analysed and some of it have values which have been flagged to doubtful or false and needed further control by producers themselves. List of QC changes have been sent to data originators.	FeedBack with data producers, new data series generation
	Data availability	Difficulties in getting locally identified data from specific organisations for inclusion in CDI data discovery and access service	Contact with local data holders trying to convince them to contribute
	Products generation	The use of DIVA and how to parametrise the software were not clear enough to ensure a good products definition (for example, how to define a reasonable coverage for the products, how to use mask to maximize the modelisation).	Workshop planned in September in Paris on DIVA parameters.
	System technical coordination	It has been planned for a long time, that DIVA provides product description template to be ingested in Sextant product catalogue. The first version has been implemented in DIVA, but in the meantime the EMODNET product template has been upgraded at Sextant level, but not mature enough to be implemented. Now both are not compliant.	DIVA team is redevelopping the product description template with the upgraded version which is now mature and validated by the project.
<b>BSH DOD, GERMANY</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>

	CDI-generation and Data Submission	3256 CDIs and datasets were submitted from 5 different institutes	To add also contaminants in Biota in the 2 <sup>nd</sup> year
	Allocation of Cruise Summary Report links to CDIs	This allocation allows for more metadata over the monitoring cruises and programmes	Implement CSR Link
	QC Feedback	Spikes in T/S due to multiple probes	Datasets will be updated
	Mapping of biota parameters	Allocation of BSH parameter, species, tissues, size etc. to P01	Work in progress, delivery for second year
<b>IMR, NORWAY</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Internal database with chemistry data	Data was not in a database appropriate for publishing data	Write programs to extract data from the original database, and move the data to a database appropriate for publishing.
<b>AU-DCE, DENMARK</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Data file aggregation	SDN data files format compliance problems	SDN importer in ODV checked thoroughly
	Manual parameter aggregation	Common parameters (e.g., temperature, oxygen, phosphate, etc.) occur with widely varying names and P01 parameter codes	Overview of needed conversion in the North Sea dataset collected in Excel spreadsheet
	ODV reporting of hazardous substances in biota	Species, parameter selection in the different regional seas	Contact to regional leaders for updating list of species used in the different regions.
	P1 vocabulary for substances in biota	Necessary extensions to the P1 vocabulary to cover all species/substance combinations	Addition of species/substance combinations to the P1 list when all species and substances are known
<b>VLIZ, BELGIUM</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Parameter selection and creation	Long list of possible parameters; no tools for adding or requesting new parameters	Detailed searching for correct parameters; request via email for new parameters
<b>RBINS-MUMM, Belgium</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	System availability	We had to face a severe hardware failure that significantly hampered our work during several weeks	Hardware replaced, new procedures in place for recovery
<b>NIOZ, NETHERLANDS</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>

	At start of project: 1018 CDIs	Predominantly CTD casts: Temperature and Salinity profiles	Hired additional staff last September to make nutrient + other chemical data available
	Currently: 1187 CDIs; Increase: 169 CDIs; Predominantly CTD casts	Chemical parameters were measured, but not yet available	Chemical data (if measured) from all these 1100+ CTD casts will be made available in the coming year; Data from new cruises in the North Sea by NIOZ will be added
<b>SMHI, SWEDEN</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Import of dataset	Several local parameters were missing after import in ODV.	Consultation with Reiner Schlitzer. New alpha version of ODV solved the problem.
	Manual unit conversion	Some parameters needed to be converted before aggregation.	E-mail conversation with regional leaders to find joint conversion methods. Implementation using ODV built in tool.
	Manual parameter aggregation	A total of 208 local parameter names were included in the dataset mapping to different P01 codes.	Listing in Excel to group parameters manually. Implementation in ODV built in tool. Next time we will use automatic mapping to P02 to reduce time and human errors.
	Flag scheme	Flag scheme changes during aggregation. This was detected in a late stage and therefore flag information has been lost.	Clear guidelines are requested for how to handle different flags during aggregation.
<b>HCMR, GREECE</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	(WP1) Delays in receiving data from originators	Data not appropriate organised in scientists/data holders archives. More time than the expected needed to collect the complete datasets and their metadata.	Contacts with originators to assist them for delivering their data properly.
	(WP2) Validation of the quality of the Mediterranean data set	<ul style="list-style-type: none"> <li>-Formats errors</li> <li>- inconsistencies between quality flag schemas and observations since obviously "bad" data flagged as "good" e.g. negative values flagged as correct</li> <li>-management of zero values</li> </ul>	Preparation of report errors and contacts with the data originators to eliminate wherever possible the detected data errors. The use of ODV tool facilitated the QC processing of the data
	(WP2) Data homogenization	the diversity of instruments, analytical methods and units prevented the easy merging of data from different sources.	Visual inspections and grouping of similar data with the use of ODV tool
	(WP2) Poor data coverage	The low spatial and temporal data distribution resulted in products (interpolated maps) associated with high errors.	First DIVA products focused on areas and parameters of efficient coverage such as nutrients in selected areas of the MSFD regions.
<b>NIMRD, ROMANIA</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>



	(WP1) NIMRD as RoNODC (data provider): No significant challenges		
	NIMRD as Black Sea Leader: Black Sea data aggregation and data products: - errors at importing in ODV (wrong ODV format) – duplicates - high variability of parameters labeling -poor dataquality control	See Annex 2	See Annex 2
<b>ICES, DENMARK</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	MSFD marine regions and subregions not published	The MSFD marine regions and subregions has not been published for use by EMODnet	Support EEA and Commission in the publication-process of the MSFD regions and subregions
	Aligning EMODnet chemistry activities to the MSFD processes	There is a challenge in fitting the timescale and political dimension of the MSFD (the Directive) together with the outputs and infrastructural services that EMODnet Chem (as a project) can offer	Liaison with DG ENV, EEA
<b>AWI, GERMANY</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Data file aggregation	SDN data files not always comply to format	SDN importer in ODV required extensive safe-guarding and checking code extensions
	Manual parameter aggregation	Common parameters (e.g., temperature, oxygen, phosphate, etc.) occur with widely varying names and P01 parameter codes	ODV user interfaces simplified and range of automatic unit conversions extended to allow easy definition of aggregated parameters
<b>ULG, BELGIUM</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Visualization at given distance from coastline	Contours at a given distance from coastline are complex. They have to be extracted.	A web-service for contours at a given distance has been implemented.
	Error fields are computationally demanding	Computing the error fields can take a prohibitive large amount of CPU time	Approximate error computation method have been derived

<b>IEO, SPAIN</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Data availability	Difficulties in getting locally identified data from specific compounds/organisms for inclusion in CDI data discovery and access service	Contact with local data holders and R.Lowry. New codes added to P01 vocabularies
	Data availability	Local difficulties in getting historical data.	Contact with local data researchers.
<b>ISPRA, ITALY</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Usage of P01 and P02 vocabularies (WP2)	Difficulties on mapping analytical parameters and measurement methodologies with P01 and P02 entries	Consultation of analytical methodology guidelines and contact with expert
	Usage of Emodnet preferable unit of measure (WP2)	Unit of measurement in original data different from Emodnet preferable ones	Verification of analytical methodology used and conversion of unit of measure
	Collection and selection of relevant QA/QC documentation guidelines and technical specifications (WP3)	Difficulties in collection of relevant QA/QC documentation guidelines apart from EU Directives and ISO guide cited therein	Contact with Emodnet partners
	Identification and management of QA/QC information (WP3)	Problems on translation of QA/QC information in data fields of SeaDataNet standard	QA/QC info linked in CDIs in the Quality info block
<b>OC-UCY, CYPRUS</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Chemical parameters	Assigning some chemical parameters to the appropriate naming in the vocabularies (P02).	Solved after contacted Roy K.
	Missing Metadata	Some data collected from the Cyprus Fisheries Department where missing information about the methodology used for the analysis	Contacted the data provider (Cyprus Fisheries Department) and waiting for their respond.
<b>DELTAIRES, NETHERLANDS</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Requesting datasets	Since datasets are more or less confidential, agreement with data provider were necessary	Contacts via technical coordinator ensured sending data in time

	Parsing ODV files to information	ODV has been developed as a Web Processing Service for enhanced visualisation of dataproducts. Full description and resources can be found on <a href="https://publicwiki.deltares.nl/display/OET/pyodv">https://publicwiki.deltares.nl/display/OET/pyodv</a>	
<b>CNR ANCONA, ITALY</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Detection limits	Presence of data coded as “below detection limit” with different detection limits	In our data, we replaced all the data “below detection limit” with an empty field. It would be better to have a general project guideline.
	Parameter definition	Missing parameter definition in the current vocabularies	Introduction, by negotiation, of new parameter definition in the current vocabularies
<b>IHPT, PORTUGAL</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Detection limits	Presence of data coded as “below detection limit” with different detection limits	Define time periods of application of different methodologies/equipments to the same parameter
	Uncomplete metadata availability	Missing coordinates especially for sediment matrix	Trace all the information back to original records (mostly paper) to find the missing records
	Extensive Vocab lists	Difficulties in choosing the correct parameter to report in the Vocab lists	Contact analysts to fully detail the methodologies used
<b>IOF, CROATIA</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Data availability	Difficulties in getting permission for data delivery from other data holders	Communication with data holders encouraging them to contribute data for exchange
<b>IMGW, Poland</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Metadata files preparation	Mapping of the IMGW’s data database requires reformatting of all the data to be compliant with MIKADO software.	Preparation of a MS Excel spreadsheet file supplied with additional information according to required CDI schema.
	ODV files preparation	Production of ODV files to be stored at the local server ready for download.	Original data file splitting into a collection of single ODV files. Preparation of dedicated VB script to complete the task.
	ODV reporting of hazardous substances in various matrices	Preparation of the data to be reported for mapping and splitting.	Contact to regional leaders for resolving an issue of proper units for data compatibility.
<b>LHEI, LATVIA</b>	<b>LHEI</b>	<b>Short description</b>	<b>Measures to address challenges</b>

	Slow CDIs preparation	Decline in funding and therefore reduced work-load for data base manager – IT specialist	Data production manually by person not specifically trained as IT personnel
<b>Uni-HB, GERMANY</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Mapping to P02 vocabularies	P02 specifies the phase (dissolved, particulate, total) for heavy metals, but parameters in PANGAEA do not	Need to go back to dataset description to figure out the phase
	Duplicate analysis	We planned to use the methodology developed by Reiner Schlitzer in SDN to perform the check, but it was decided to look for a more sustainable approach that can be used routinely with minimum effort for the data centre.	We will submit all datasets to SDN and let the CDI filter identify and return to us the potential duplicates. PANGAEA will not serve potential duplicates, except when there is clear evidence that they are in fact false duplicates.
<b>MSI, ESTONIA</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Presentation of integrated chlorophyll sample data; depth problem	The method of having integrated samples came like a small surprise and it took time to explain it to be able to get right codes.	Group of people worked together and new codes were generated and metadata format agreed.
	Uncomplete metadata availability	Missing coordinates or dates especially for harmful substances in fish and zoobenthos matrix	Contact with originator, use of sea area coordinates (fish)
<b>FMI, FINLAND</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Uncomplete metadata availability	Missing cruise information	Contact with originator
	Missing SDN-parameter codes	P01 codes were missing for several parameters	Meeting with expert to fill the caps
	Missing quality codes of old data	Quality codes for older data were not in the database.	Process started to define quality of the old data
<b>IBMK, MONTENEGRO</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Mapping of chemical parameters	Assign of chemical data parameters to appropriate vocabularies	Work in progress (by using P01 - BODC Parameter Usage Vocabulary)
<b>RIHMI-WDC, RUSSIA</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>

Collection and compilation of data and metadata in marine areas	The data coverage on hydrochemical observations prepared in space and time (in years) for every hydrochemical parameter.	Catalogues of cruises for Black, Baltic and Atlantic Ocean
Data duplicates	The RIHMI-WDC are collecting the oceanographic data from all marine institutions in Russia and the former Soviet Union, some of them participated or participates in projects SeaDataNet, EMODNet, Black Sea Scene. To avoid duplicates of cruises RIHMI-WDC for EMODNet project developed directory cruises to organizations that do not participate in these projects.	Contact with originator
Data errors	The hydrochemical data of the former Odessa Branch State Oceanographic Institute (UkrNCEM) have values that are exceeding the accuracy of the method, for example, the values of silicates=<5mikromol/litre. There are also values of phosphate equal to zero for all oceanographic stations. These errors are related to the preparation of the cruises report by software. Silicates values <5mikromol/litre and phosphate=zero deleted.	Contact with local data holders
Creating of CDI and ODV files	In preparing the CDIs and ODV files RIHMI-IDC is using proprietary technology formation CDI and ODV files. CDI and ODV files produced for the selected cruises after 1990 with our software. CDI held control files using software tools MIKADO. The additional control data implemented for ODV format (view vertical distribution parameters) using the ODV. CDI files sent to MARIS. ODV files and the Coupling table included in DM RIHMI-WDC.	CDI files sending to MARIS
Editing of data for CDI and	The errors in data, transmitted by regional leaders of the project, analyzed. The decision took for every error and values edited (update QC or values). The original data on paper are used for analyzing errors.	The updating CDI and ODV files

SIO-RAS, RUSSIA	Challenges encountered	Short description	Measures to address challenges
	Detection limits	Presence of data coded as “below detection limit” with different detection limits	Accepted data should be validated according to method of collection and processing
	metadata availability	Coordinates were provided	
	Data availability	Meta data were provided, CDI indexes are preparing	
MHI, UKRAINE	Challenges encountered	Short description	Measures to address challenges
	Data availability	Difficulties in getting data from different organisations for inclusion in CDI data discovery and access service	Contact with data holders trying to convince them to contribute
TSU-DNA, GEORGIA	Challenges encountered	Short description	Measures to address challenges
	Data availability	Difficulties in getting locally identified data from specific organisations for inclusion in CDI data discovery and access service.	Communication with local data holders encouraging them to contribute.
MT CONSULTANCY, BULGARIA	Challenges encountered	Short description	Measures to address challenges
	Urge political leaders to turn words into action and encourage all stakeholders, including the private sector, to take the measures necessary to deliver “Good Environmental Status” for Europe’s seas and oceans by 2020.	We cannot achieve if we are working isolated – each person in its country. We only can do it when we work together. It is very important that people collaborate. No one individually or no country individually cannot achieve the challenge. We need to work together by the international level also connecting different research disciplines together.	We have to pull together and organise information about research in different countries. Cooperation is necessary to achieve goals as well as collaborative science research. Finding synergies will lead to large-scale and tangible outcomes.
NEA, GEORGIA	Challenges encountered	Short description	Measures to address challenges

	Data availability	NEA is responsible for observation, data collection and processing in the sphere of Marinameteorology, Environmental and fishery. Since 1992 the number of observation stations and points are significantly decreased, the data mainly are archived in paper based.	Collection all marine data and creation the data base.
<b>UHI-MB, UKRAINE</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Partial mismatch of chemical data species and their descriptors accepted in Ukraine and SeaDataNet	SDN vocabulary P01 does not contain some chemical parameters measured during Ukrainian coastal zone monitoring	Only those parameters which are in P01 vocabulary were included in CDI and ODV files
<b>IMS-METU, TURKEY</b>	<b>Challenges encountered</b>	<b>Short description</b>	<b>Measures to address challenges</b>
	Detection limits	Presence of data coded as “below detection limit”	Contacting originator to learn the value of detection limits and include it in data files. If DL is not known, 0 with respective QF is included in data files (database).
	Incomplete metadata availability	Missing or wrong coordinates Missing time Missing date (month name is present)	Contacting originator, searching in alternative sources (e.g. in cruise plan or cruise report, on map)
	Parameter naming	Difficulties with finding appropriate code in P01 and P02 vocabularies for local parameter name.	Contacting originator to learn more details about the parameter data obtained (e.g. sample preparation, analytical method etc). Contacting BODC (Roy Lowry) to get an advice regarding proper code.
	Data quality	Quality control of chemical and, especially, pollution data can't be performed just by data managers using computer tools. It requires involvement of experts.	Communicating with and involving appropriate experts.

### Next steps:

During the first year, all challenges faced by the 46 partners and the different solutions were collected. As a further step, particular effort will be dedicated in order to achieve commonly agreed solutions to address both old and new incoming difficulties.

## 4. Allocation of project resources

*Please provide information about the effort (percentage of project resources) spent during the reporting period on the main objectives such as preparing and providing access to data within a country; access data from international sources; providing the data infrastructure to access and make data available across countries; develop standards (INSPIRE, EMODnet, MSFD).*

### OGS, ITALY

Main activities	Man months spent	Man month % of total project
Project Management (WP0)	11	2,63
Data collection and metadata compilation (WP1)	2,5	0,60
QA/QC - Validation - MSFD interaction (WP3)	1,5	0,36
Technical development and operation (WP4)	3,5	0,84
Analyses and Recommendations (WP5)	0,5	0,12
Total effort this period	16,0	3,83

### MARIS, NETHERLANDS

Main activities	Man months spent	Man month % of total project
Project Management (WP0)	1,0	0,24
Data collection and metadata compilation (WP1)	3,97	0,95
QA/QC - Validation - MSFD interaction (WP3)	0,4	0,09
Portal development and operation (WP4)	4,96	1,19
Total effort this period	10,33	2,48

### NERC-BODC, UK

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	3.8	0.009
Total effort this period	3.8	0.009

### IFREMER, France

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	3,4	0.81
Data products (WP2)	3,5	0,84
Technical development and operation (WP4)	1,7	0.41
Total effort this period	8.6 MM	2.05



BSH-DOD, Germany

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2,0	0,48
Total effort this period	2,0	0,48

IMR, NORWAY

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2,23	0,534
Total effort this period	2,23	0,534

AU-DCE, DENMARK

Main activities	Man months spent	Man month % of total project
Data Collection and metadata compilation (WP1)	0,5	0,12
Data Products generation in sea regions (WP2)	1,0	0,24
QC/QA and products (WP3)	0,1	0,02
Technical development and operation (WP4)	0,1	0,02
Analyses and Recommendations (WP5)	0,1	0,02
Total effort this period	1,8	0,04

VLIZ, BELGIUM

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1.7	0,41
Total effort this period	1.7	0,41

RBINS MUMM, Belgium

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,00	0,24
Data Products generation in sea regions in sea regions (WP2)	0,25	0,06
Total effort this period	1,25	0,30

NIOZ, NETHERLANDS

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,1	0.26
Total effort this period	1,1	0.26

SMHI, Sweden

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2.8	0,67
Data Products generation in sea regions in sea regions (WP2)	1.9	0,45
Total effort this period	4,7	1,12

HCMR, GREECE

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2,8	0,67
Data Products generation in sea regions (WP2)	1.8	0.43
QC/QA (WP3)	0.3	0,07
Analysis and evaluation (WP5)	0,3	0,07
Total effort this period	5,2	1,24

IO-BAS, BULGARIA

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1.5	0.359
Data Products generation in sea regions (WP2)	0.70	0.167
Total effort this period	2.2	0.526

NIMRD, ROMANIA

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2,3	0,55
Data Products generation in sea regions in sea regions (WP2)	1,7	0.40
QA/QC - Validation - MSFD interaction (WP3)	0,3	
Total effort this period	4,3	1,03

ICES, DENMARK

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	0,11	0,03
QA/QC - Validation - MSFD interaction (WP3)	0,31	0,07
Analysis and evaluation (WP5)	0,77	0,18
Total effort this period	1,19	0,28

AWI Germany

Main activities	Man months spent	Man month % of total project
Data Products generation in sea regions (WP2)	0,5	0.12
QA/QC - Validation - MSFD interaction (WP3)	0,5	0.12
Technical development and operation (WP4)	3,0	0,72
Analyses and Recommendations (WP5)	0,5	0,12
Total effort this period	4,5	1,08

ULG Gher

Main activities	Man months spent	Man month % of total project
QA/QC - Validation - MSFD interaction (WP3)	0,5	0.12
Technical development and operation (WP4)	4	0.957
Total effort this period	4.5	1.07

IEO, Spain

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	7.0	1,67
Data Products generation in sea regions in sea regions (WP2)	0.5	0,12
Total effort this period	7.5	1,79

ISPRA Italy

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,6	0.38
Data products in sea regions (WP2)	0,4	0.09
QA/QC - Validation - MSFD interaction (WP3)	1	0,24
Analyses and Recommendations (WP5)	0,4	0,09
Total effort this period	3,4	0,81

OC-UCY CYPRUS

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2	0,47
Data Products generation in sea regions (WP2)	2	0,47
QC/QA and products (WP3)	1,12	0,26
Total effort this period	5,12	1,2

DELTARES, NETHERLANDS

Main activities	Man months spent	Man month % of total project
Technical development and operation (WP4)	5.2	1.2
Total effort this period	5.2	1.2

CNR, Italy

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2.1	0,33
Data Products generation in sea regions (WP2)	1.0	0,15
Total effort this period	3,1	0,48

IHPT Portugal

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,8	0,43
QA/QC - Validation - MSFD interaction (WP3)	0,4	0,10
Total effort this period	2,2	0,53

IOF Croatia

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,0	0.24
Data Products generation in sea regions (WP2)	0.4	0.096
Total effort this period	1.4	0.336

IMGW Poland

Main activities	Man months spent	Man month % of total project
Data Collection and Metadata Compilation (WP1)	0.75	0.18
Data Products generation in sea regions (WP2)	0.50	0.12
Total effort this period	1.00	0.30

LHEI, LATVIA

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,6	38,10
Data Production (WP2)	0,8	19,05
Total effort this period	2,4	57,15

Uni-HB Germany

Main activities	Man months spent	Man month % of total project
	0	0
Data collection and metadata compilation (WP1)	1,05	0,25
Total effort this period	1,05	0,25 %

MSI, ESTONIA

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,8	0,43
Data Products generation in sea regions in sea regions (WP2)	1,1	0,26
Total effort this period	2,9	0,69

FMI, Finland

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	0,6	0,14
Data Products generation in sea regions (WP2)	0,6	0,14
Total effort this period	1,2	0,28

IMBK Montenegro

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	0,8	0,19
Total effort this period	0,8	0,19

NIB, Slovenia

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	0.55	0.13
Data products generations in Sea Regions (WP2)	0.00	0.0
Total effort this period	0.55 MM	0.13

RIHMI-WDC Russia

Main activities	Man months spent	Man month % of total project
WP2 The preparation of catalogues for Black, Baltic Seas, NE Atlantic ocean.	0,5	0,12
WP2 The development of applications for creating CDI and ODV for version ISO 19139.	0,5	0,12

WP2 The creation of CDIs and ODV files.	0,5	0,12
WP3 The data check for CDI and ODV.	0,3	0,06
WP3 The check and editing of data for parameters for production.	0,3	0,06
Total effort this period	2,1	0.5

### SIO-RAS, RUSSIA

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	0,7	0.17
Data Products generation in sea regions (WP2)	0,7	0.17
Total effort this period	1.4	0.34

### MHI, UKRAINE

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,5	0,36
Data Products generation in sea regions in sea regions (WP2)	0,2	0.05
QA/QC - Validation - MSFD interaction (WP3)	0,2	0.05
Total effort this period	1,9	0,46

### TSU/DNA, Georgia

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,20	0.287
Data Products generation in sea regions (WP2)	0.30	0.071
Total effort this period	1.5	0.359

### MT COSNULTANCY, BULGARIA

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,25	0,30
Total effort this period	1,25	0,30

### UkrSCES, UKRAINE

Main activities	Man months spent	Man month % of total project
Data Collection and Metadata Compilation (WP1)	4.99	1.194
Data Products generation in sea regions (WP2)	3.34	0.796
Total effort this period	8.33	1.99

### IU-IMSM, TURKEY

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1.20	0.287
Data Products generation in sea regions (WP2)	0.20	0.048
Total effort this period	1.4	0.335

### NEA, GEORGIA

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1,20	0.287
Data Products generation in sea regions (WP2)	0.30	0.071
Total effort this period	1.5	0.359

### UHI-MB, Ukraine

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	1.1	0.263
Data Products generation in sea regions in sea regions (WP2)	0.3	0.072
Total effort this period	1.4	0.335

### IMS METU Turkey

Main activities	Man months spent	Man month % of total project
Data collection and metadata compilation (WP1)	2	0.48
QA/QC - Validation - MSFD interaction (WP3)	0.5	0.12
Total effort this period	2.5	0.6

The following table provides the percentage of the effort spent per partners during the first year:

Partner	Country	TOTAL EFFORT YEAR 1	TOTAL EMODnet effort	Percentage effort for year 1
OGS	IT	19	51,6	<b>37</b>
MARIS	NL	10,33	26,2	<b>39</b>
NERC-BODC	UK	3,8	10,5	<b>36</b>
IFREMER	FR	8,6	17,4	<b>49</b>
BSH-DOD	DE	2	8,4	<b>24</b>
IMR	NO	2,23	8,4	<b>27</b>
AU-DCE	DK	1,8	18,4	<b>10</b>
VLIZ	BE	1,7	5,3	<b>32</b>
RBINS-MUMM	BE	1,25	9,5	<b>13</b>

NIOZ / RWS	NL	1,1	6,3	<b>17</b>
SMHI	SE	4,7	14,7	<b>32</b>
HCMR	GR	5,2	14,7	<b>35</b>
IO-BAS	BG	2,2	5,3	<b>42</b>
NIMRD	RO	4,3	11,6	<b>37</b>
ICES	INT	1,19	11,6	<b>10</b>
AWI	DE	4,5	11,6	<b>39</b>
ULg	BE	4,5	14,7	<b>31</b>
IEO	ES	3	8,4	<b>36</b>
ISPRA	IT	4,8	13,7	<b>35</b>
MI	IE	1,8	5,3	<b>34</b>
OC-UCY	CY	3,62	8,4	<b>43</b>
Deltares	NL	5,2	9,5	<b>55</b>
CNR	IT	3,1	6,3	<b>49</b>
IHPT	PT	2,2	5,3	<b>42</b>
IOF	HR	1,4	4,2	<b>33</b>
IMGW	PO	1,25	4,2	<b>30</b>
LHEI	LV	2,4	4,2	<b>57</b>
UniHB	DE	1,05	6,3	<b>17</b>
MSI	EE	2,1	4,2	<b>50</b>
FMI	FI	1,2	5,3	<b>23</b>
IMBK	MN	0,8	4,2	<b>19</b>
NIB	SI	0,55	4,2	<b>13</b>
SAHFOS	UK	1,8	5,3	<b>34</b>
SYKE	FI	2,1	6,3	<b>33</b>
RIHMI-WDC	RU	2,1	6,3	<b>33</b>
SIO-RAS	RU	1,4	4,2	<b>33</b>
MHI	UA	1,9	5,3	<b>36</b>
TSU-DNA	GE	1,5	4,2	<b>36</b>
MT CONSULTANCY	NL	1,25	3,2	<b>39</b>
UkrSCES	UA	2,7	5,3	<b>51</b>
SOI	RU	1,4	4,2	<b>33</b>
Istanbul University	TU	1,4	4,2	<b>33</b>
IBSS	UA	1,4	4,2	<b>33</b>
NEA	GE	1,5	4,2	<b>36</b>
UHI-MB	UA	1,4	4,2	<b>33</b>
YugNIRO	UA	2,1	6,3	<b>33</b>
IOLR	IL	1,4	4,2	<b>33</b>
IMS-METU	TU	2,5	6,3	<b>40</b>



The following table provides the percentage of the effort spent per WP during the first year:

	<b>EFFORT YEAR1 (M/M)</b>	<b>TOTAL EMODNET (M/M)</b>	<b>Percentage effort for year 1</b>
Project Management	12	35,7	34
Data Collection and Metadata Compilation	68,51	173,6	39
Data Products Generation	19,9	111,6	18
QA/QC - Validation - MSFD interaction	15,28	33,7	45
Portal Development and Operation	22,46	46,3	49
Analysis and Recommndation	2,57	18,4	14
<b>TOTAL for all WPs</b>	<b>140,72</b>	<b>417,8</b>	<b>34</b>

## 5. User Feedback

---

*Provide a complete record of feedback received from user (formal and informal) on your portal, your activities or those of other EMODnet projects/activities. Also provide any suggestions you have received for EMODnet case studies and/or future products/activities/events.*

*[Provide information in table - attach the documentation/full user feedback to the report]*

Date	Name	Organization	Type of user feedback (e.g. technical, case study etc)	Response time to address user request

## 6. Work package updates

---

*Using the work package as a header list here the activities that occurred since the last report. If there was no activity to report leave the section blank.*

*[Provide information - Maximum 2 pages per workpackage]*

### ***WP0 – Project Management***

EMODnet Chemistry consortium consists of 32 partners and 14 subcontractors. The main contract is between EU and OGS as coordinator on behalf of the full consortium. Following the EU contract, OGS has drafted and circulated for discussion a Consortium Agreement for all partners and a Subcontract for bilateral contracting of individual subcontractors. During this first year, some of the initial conditions are changed. Peter Davis from EU Consult died after a long illness; his colleague Maria Teochareva that participated to the kick-off meeting, took over the activities under her own company named MT Consultancy. Jesper H. Andersen terminated his activities at AU/BIOS. Martin Larsen has been identified as task leader for the North Sea and he has an interest in continuing the collaboration with Jesper whenever he will be affiliated. Peter Henriksen, Head of department AU/BIOS (Aarhus University, Institut for Bioscience), has ensured that they can fulfill EMODNet Chemistry commitments. Boris Trotsenko from YugNIRO suddenly died. Sergey Smirnov is the new contact person. Crimean crisis has affected EMODNet partnership In fact, only two subcontractors (MHI and UHI-MB) from Sevastopol and one subcontractor (UkrSCES) from Odessa have signed the subcontract. Two subcontractors from previous Ukraine are still missing (IBSS, YugNIRO). Since Crimea has become a part of the Russian Federation also the research institutes are under a deep transformation. The coordination decided to wait the evolving of the political issues.

During the kick-off meeting, the Technical Working Group was established, including the official SC members with BODC, AWI, ULg, Deltares and IFREMER. A series of mailing lists involving the management boards: SC, PO, Technical WG were defined to encourage communication. In addition, a number of physical and virtual meetings were organized to mobilize all participants and all project bodies (Steering Committee, Regional Leaders, Technical Working Group) and to review the project milestones. The EMODnet Chemistry portal was restyled and continuously updated, both in the public and in the private working area.

### ***WP1- Data collection and metadata compilation in sea regions***

### Introduction:

The objectives of WP1 are that EMODnet Chemistry data providers gather relevant chemical data sets from their centres and possible other relevant data centres and populate these into the CDI Data Discovery and Access service so that regional data set collections can be compiled and delivered to the EMODNet Chemistry regional groups.

### Activities:

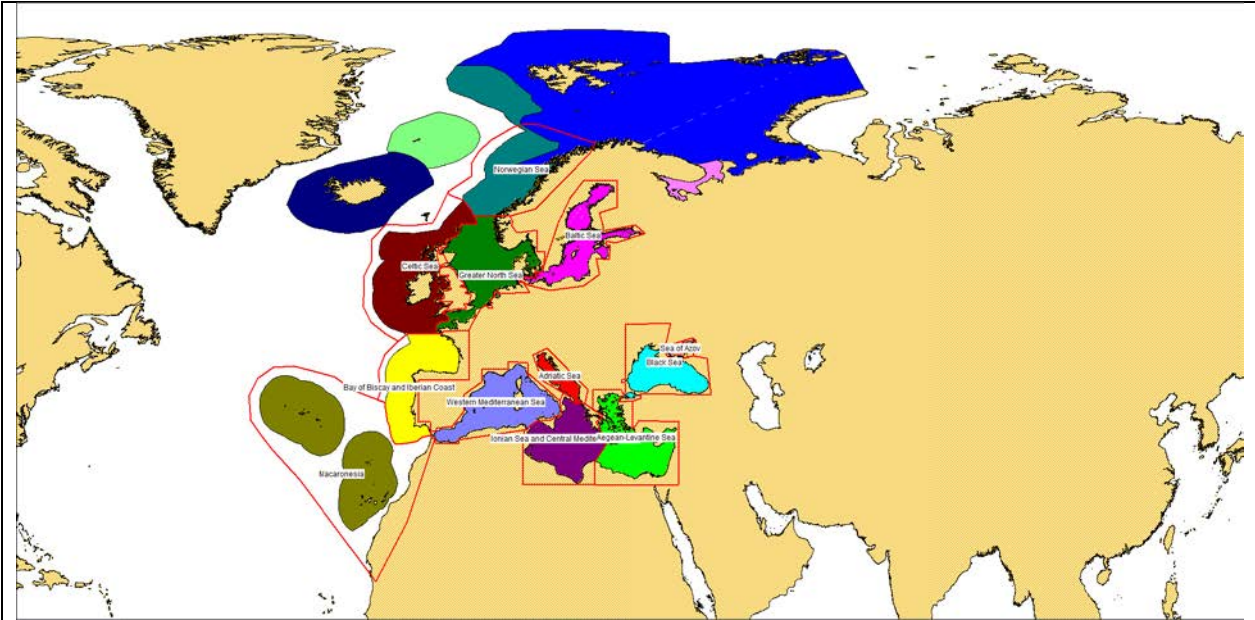
From the start of the project all partners and subcontractors in EMODNet Chemistry were asked to prepare and submit their data to the CDI Data Discovery and Access service, taking into account the EMODNet Chemistry scope of chemical data, starting with nutrient data. All were tasked to describe their identified and gathered data with metadata in CDI format and to make the data available for downloading through the CDI service in the SeaDataNet ODV format. Therefore, most data providers made use of the MIKADO XML editor tool for preparing CDI XML files, and of the NEMO tool for converting local data files to SeaDataNet ODV format, in case the data were not part of a local database. Moreover a number of data providers were new to the CDI infrastructure and had to be connected by installing and configuring locally the Download Manager software component. This was successfully done for new data providers SYKE (Finland), ISPRA (Italy), CNR-ISMAR Ancona (Italy), and SOI (Russia).

All entries become part of the SeaDataNet CDI collection, but for EMODNet Chemistry a dedicated subset is dynamically generated by filtering on Parameter Discovery Vocabulary (P02) terms that map to the extended scope of chemical substances for EMODNet Chemistry 2. This subset can be queried through the dedicated EMODNet Chemistry CDI User Interfaces.

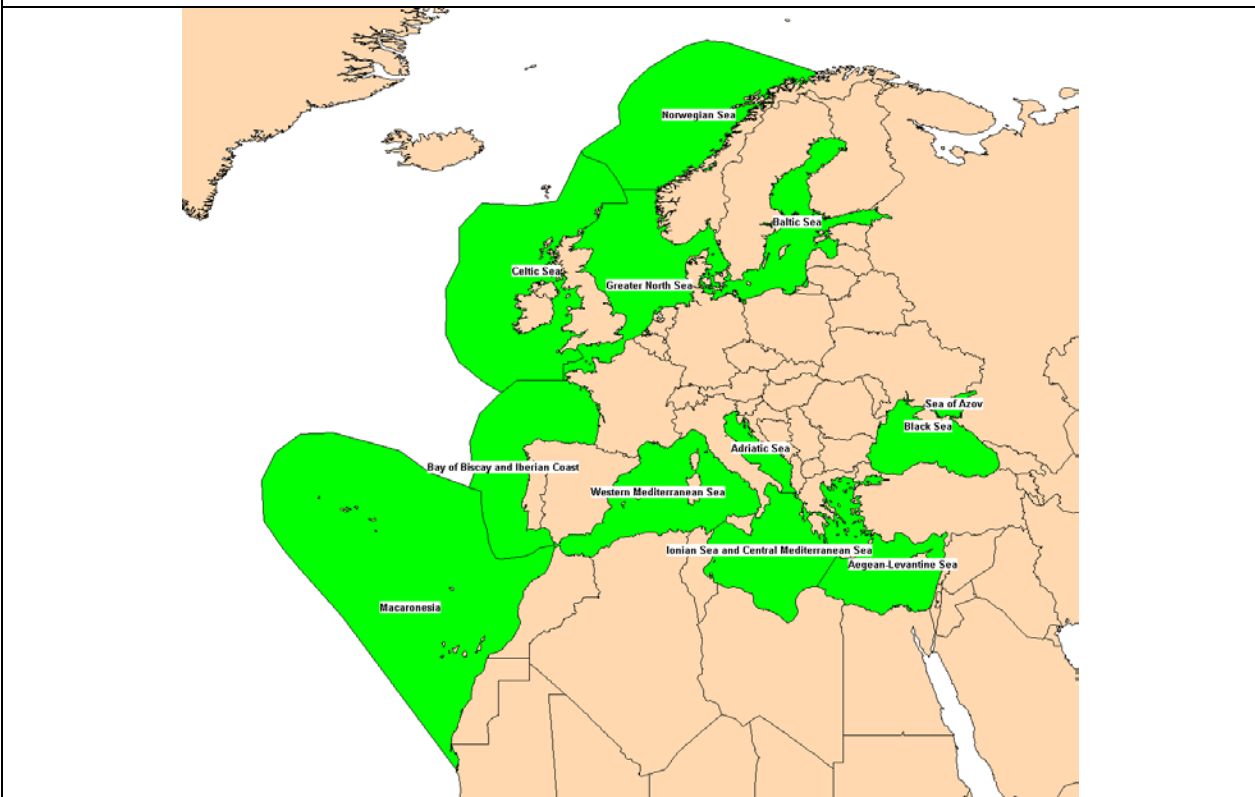
Over the 1<sup>st</sup> year the data providers have done a great job, which can be seen from the considerable increase in volume and types of data. At 1<sup>st</sup> June 2013, at the start of the project, the total number of CDIs for chemistry data sets was: **382554**. These cover the whole globe. Specifically relevant for European waters (defined by Lat Long box: N80, W-30; N20, E45) at 1<sup>st</sup> June: **312098**. Thirteen months later, end June 2014, these numbers have increased to **661820** resp. **588177** entries. More detail about the increase in population and the division of entries over discovery parameter groups and data providers per country can be found in Chapter 9 concerning Indicators.

The EMODNet Chemistry regional groups in WP2 will generate data products based upon the gathered data sets. Data products are to be generated per sea region (as defined by MSFD), which requires also discovery and harvesting of data sets per MSFD region for specific chemical parameters. However, at the time of harvesting the regional data sets, and also at present, there is no official agreement on the boundaries of the MSFD regions. Therefore, an approximation was prepared by VLIZ and a

schematization thereof was made by MARIS with extra margins. This was done to provide a geographical filter for harvesting of data sets from the EMODNet Chemistry CDI service.



Approximated MSFD regions by VLIZ



Schematized MSFD regions as geo filter for data harvesting by MARIS

In the previous project, the data harvesting was done on a manual basis using the CDI Discovery and Shopping mechanism. In EMODNet Chemistry 2 this procedure has been improved with the use of a Robot harvester via the shopping mechanism, to discover and retrieve specific data sets from distributed data centres. Initially, this has been done in a semi-automatic way, but for the next harvesting use it will consist in an almost full automatic method using the Robot harvester to compile and maintain specific aggregate data sets as internal central data buffers that can be transferred to regional groups for further processing and products generation. This technical development is explained in more detail in the chapter of reporting on WP4.

The initial robot harvesting took place for the geofilter of schematised MSFD regions and with a focus on nutrient data. In this way, approximately 440.000 CDI records and data sets for nutrients in the given regions were harvested and divided by region, transferred to their regional leader around end April 2014. The geocoverage of the harvested data set is illustrated below.

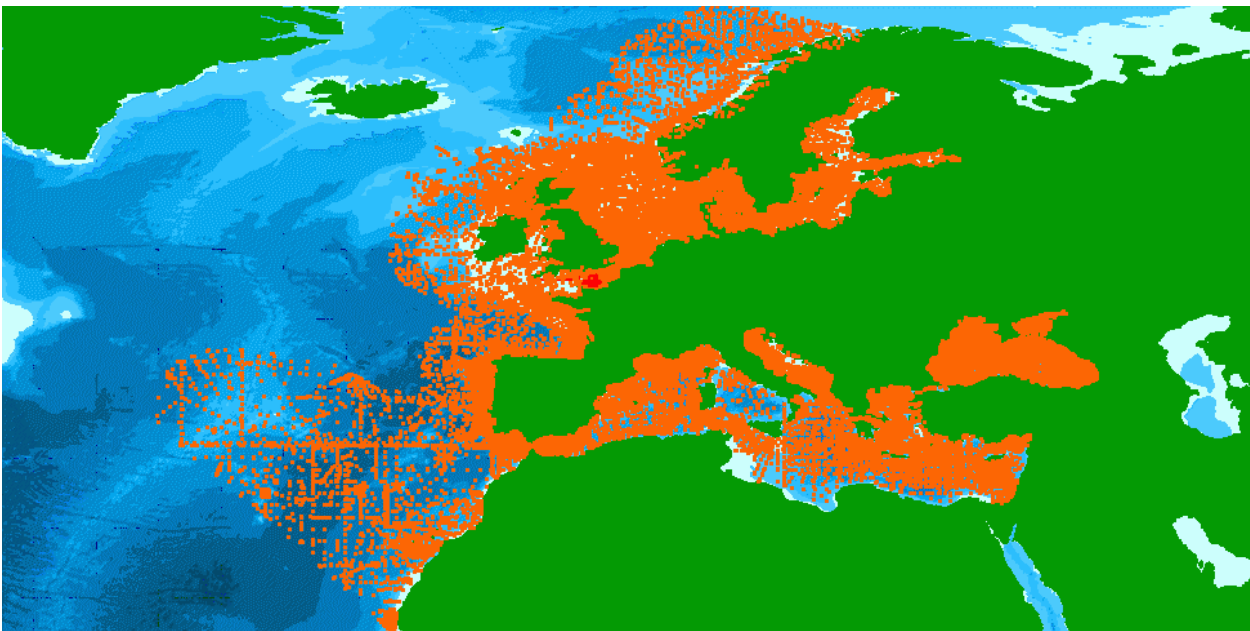


Image: Harvested data sets for nutrients in the schematised MSFD regions

To produce the DIVA maps the Lot decided to focus initially on nutrients in the water column in terms of compounds of: Phosphorus, Nitrogen and Silicon. The following table gives an overview of the decision taken in the compilation of the ODV aggregated dataset:

	Code	Unit	P01 code	Comment	For map of
<b>P</b>	PHOS	umol/l	PHOSZZXX	PO4 unknown phase	PO4 in umol/l
	Phosphate	umol/l	PHOSZZXX	PO4 unknown phase	PO4 in umol/l
	PHOW	umol/kg	MDMAP906	PO4 unknown phase	PO4 in umol/l
	Phosphate	ug/l	PHOSZZXX	PO4 unknown phase	PO4 in umol/l
	PP1P	umol/l	OPHSVLPT	Organic phosphorus (particulate)	
	TPHS	umol/l	TPHSZZXX	Total Phosphorus (dissolved+particulate)	Total Phosphorus in umol/l
	DOPW	umol/l	ORGPDSZZ	Organic phosphorus (dissolved+particulate)	
<b>N</b>	NTRZ	umol/l	NTRZZZXX	NO2+NO3	NOx in umol/l
	NTRI	umol/l	NTRIZZXX	NO2	NOx in umol/l
	NTRA	umol/l	NTRAZZXX	NO3	
				NO2+NO3	NOx in umol/l
	Nitrite	umol/l	NTRIZZXX	NO2	NOx in umol/l
	Nitrate	umol/l	NTRAZZXX	NO3	NOx in umol/l
				NO2+NO3	
	PN1P	umol/l	NTOTZZZZ	Nitrogen total [particulate]	
	PONP	mg/m3	NTOTZZZZ	Nitrogen total [particulate]	
	NTOT	umol/l	NTOTZZXX	Nitrogen total [dissolved+particulate]	Total Nitrogen in umol/l
	NORG	umol/l	MDMAP009	Organic Nitrogen [dissolved + particulate]	
	NTIW	umol/kg	MDMAP007	NO2	NOx in umol/l
				NO3	
	NTAW	umol/kg	MDMAP005	NO2+NO3	NOx in umol/l
	Nitrite	ug/l	NTRIZZXX	NO2	NOx in umol/l
				NO3	
Nitrate	ug/l	NTRAZZXX	NO2+NO3	NOx in umol/l	
Ntotal	ug/l	NTOTCN10	Nitrogen total [particulate]		
AMON	umol/l	AMONZZXX	NH4 unknown phase	NH4 in umol/l	
AMOW	umol/kg	MDMAP004	NH4 unknown phase	NH4 in umol/l	
Ammonium	ug/l	AMONZZXX	NH4 unknown phase	NH4 in umol/l	
<b>Si</b>	SLCA	umol/l	SLCAZZXX	SiO4 unknown phase	SiO4 in umol/l
	Silicate	umol/l	SLCAZZXX	SiO4 unknown phase	SiO4 in umol/l
	Silicate	ug/l	SLCAZZXX	SiO4 unknown phase	SiO4 in umol/l
	SLCW	umol/kg	MDMAP012	SiO4 unknown phase	SiO4 in umol/l

### Conclusion and next steps:

The data population activities by EMODNet Chemistry partners and subcontractors has been very fruitful and has resulted in a steady increase of data in the CDI service, also including more recent data

sets. The initial round of harvesting of nutrients data was successfully performed by using a semi-automatic robot harvester and has resulted in circa 440.000 data records that have been delivered to the regional coordinators. Considering the feedback received since then and to take into account additional data sets from a few partners added recently, it was decided to repeat the same harvesting operation again in September 2014. This time use will be made of a nearly full automatic harvesting system including central buffers for extracting the regional data deliveries, as explained in more detail in the Chapter on WP4. In the meantime data providers have been asked to continue their data identification and population, thereby considering the full scope of chemicals in EMODNet Chemistry.

### ***WP2 – Data Products generation in sea regions: Baltic Sea***

#### **Introduction**

The objective of WP2 is to generate integrated and high quality map products for selected parameters for selected sea regions as they are defined by the MSFD. The data sets are collected under WP1 activities by project partners who gather data, compile metadata and populate the central CDI portal. During the first year of the project priority was given on collection of nutrients in the water column and the first regional data sets, harvested by robot/MARIS, were sent to the regional leaders for the products generation using DIVA software.

This document is the first year's contribution of SMHI's WP2 activities for the Baltic Sea and includes:

- A. **Actions performed** so far in WP2.
- B. The **Regional aggregation and quality controls** of the first harvest of nutrients in the Baltic Sea area.
- C. The first **DIVA maps for nutrients in the water column**.
- D. A list containing the **Next Steps** and activities to perform in WP2.

#### **A. Actions performed**

Before the EMODnet kick-off meeting in Trieste 2013 SMHI/SE, as the Regional leader for the Baltic Sea, contacted the project partners (Denmark, Estonia, Finland Germany, Latvia, Poland and Russia) to get information about the datasets (including contaminants) that were going to be available for the project. The information should include a description of the datasets, the parameters measured and the number of records with their temporal coverage.

As the Baltic Sea was not part of the Pilot Project, no previous DIVA products had been done on the data.



The data distribution was presented during the kick-off meeting. As suggested during the meeting SMHI contacted Baltic Nest Institute, to get information about the data they hold. It turned out that the member states have much more data and that the database was not of interest for the project.

During the autumn 2013 SMHI participated in the DIVA training course in Corse, France and attended the STG and TTG meetings on boundaries, vocabularies, standards etc.

In April 2014, SMHI received the 1<sup>st</sup> harvest of nutrient data from MARIS. In May, conversion and aggregations of variables were performed followed by QC in ODV and the making of DIVA products (see procedure below).

On the 20<sup>th</sup>-22<sup>th</sup> of May SMHI participated in the 2<sup>nd</sup> SeaDataNet training session in Oostende, Belgium to learn more about the SeaDataNet/EMODnet procedures and software used within the projects.

On May 26<sup>th</sup> 2014 SMHI asked the partners surrounding the Baltic Sea to identify maximum 5 coastal monitoring stations with long time series and good seasonal distribution. The data was supposed to be used by Deltares for generating graphics of time series on the fly. Station information was received from Estonia, Latvia and Denmark and forwarded to MARIS.

In June SMHI had a dialog with AWI to sort out problems encountered in ODV. Problems seem to be solved using the new alpha version of ODV (4.6.3).

In June feedback was given to the data providers in the Baltic Sea area. The response has been satisfying and work is currently being done to correct the data before the new harvest.

### **B. Regional aggregation and quality controls**

In April 2014, SMHI - the task leader for the Baltic Sea Area, received the 1<sup>st</sup> harvested nutrients data for the region which contained 39 372 vertical profiles in SDN ODV Spreadsheet format. In addition 1 717 profiles with missing depth information and therefore by default excluded from the data set during import to ODV, were received. The vertical profiles originated from 8 countries distributed over 14 organizations, including 208 variables in total. Manual sorting of variables were made in Excel and conversions and aggregations were made using ODV to create an aggregated data collection. Quality Control was made on the aggregated variables before creating DIVA products.

10 regional data sets were prepared in the water column (Ammonium, Silicate, Phosphate, Nitrate + Nitrite, Nitrate, Chlorophyll, Total Nitrogen, Total Phosphorus, Oxygen and pH). Their stations distribution (a), vertical plots (b), annual distributions (c), data density maps (d), data histograms (e) and seasonal distributions (f) are illustrated in Figures 1 - 10 below.

**Figure 1: Ammonium (NH<sub>4</sub>)**

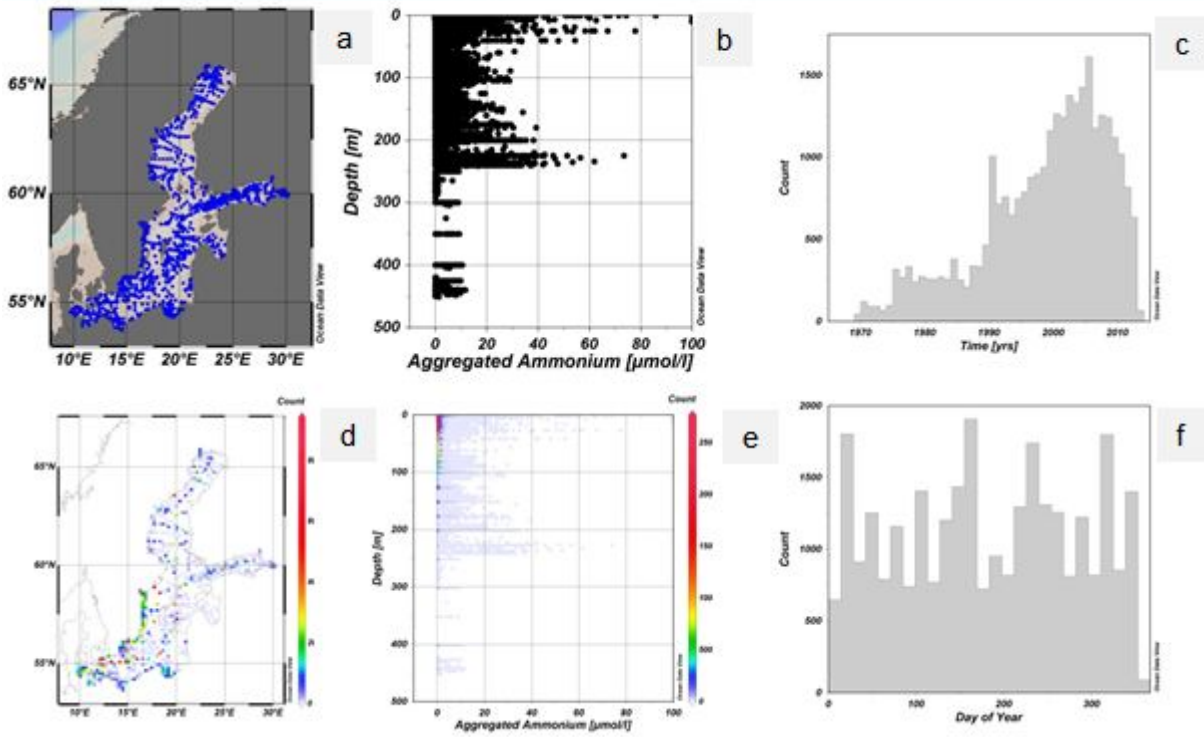


Figure 2: Silicate (SiO<sub>4</sub>)

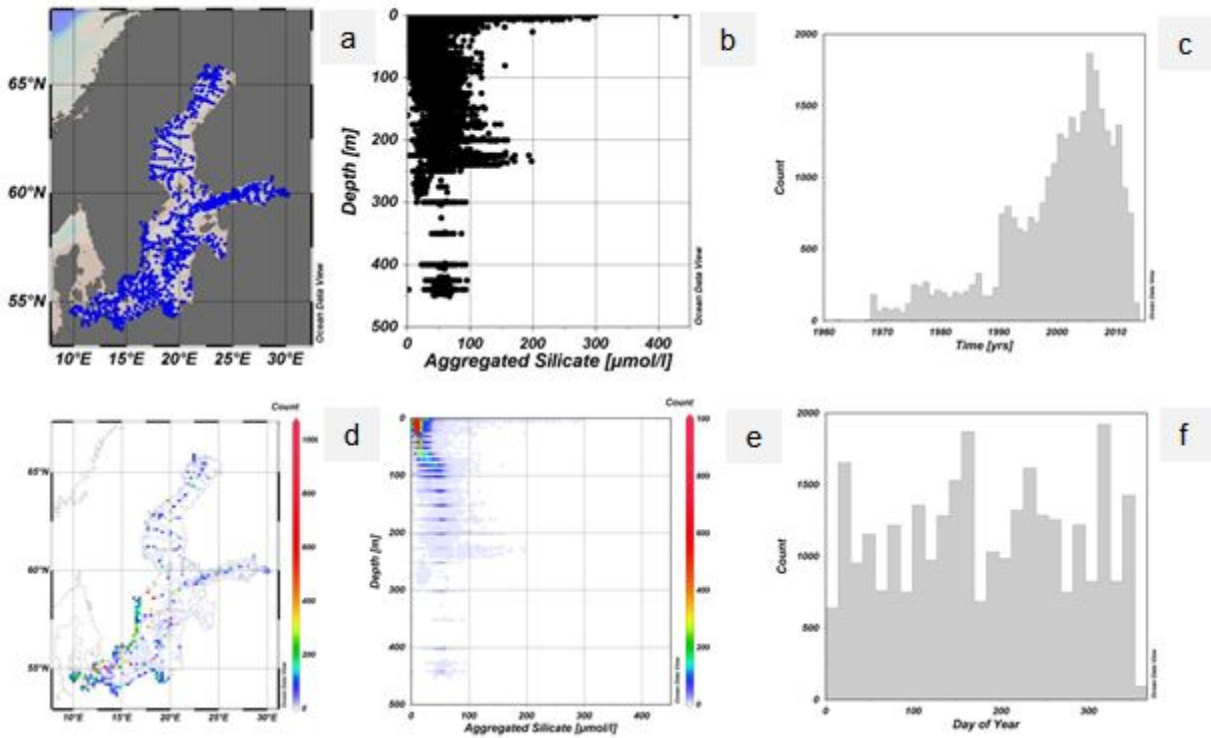
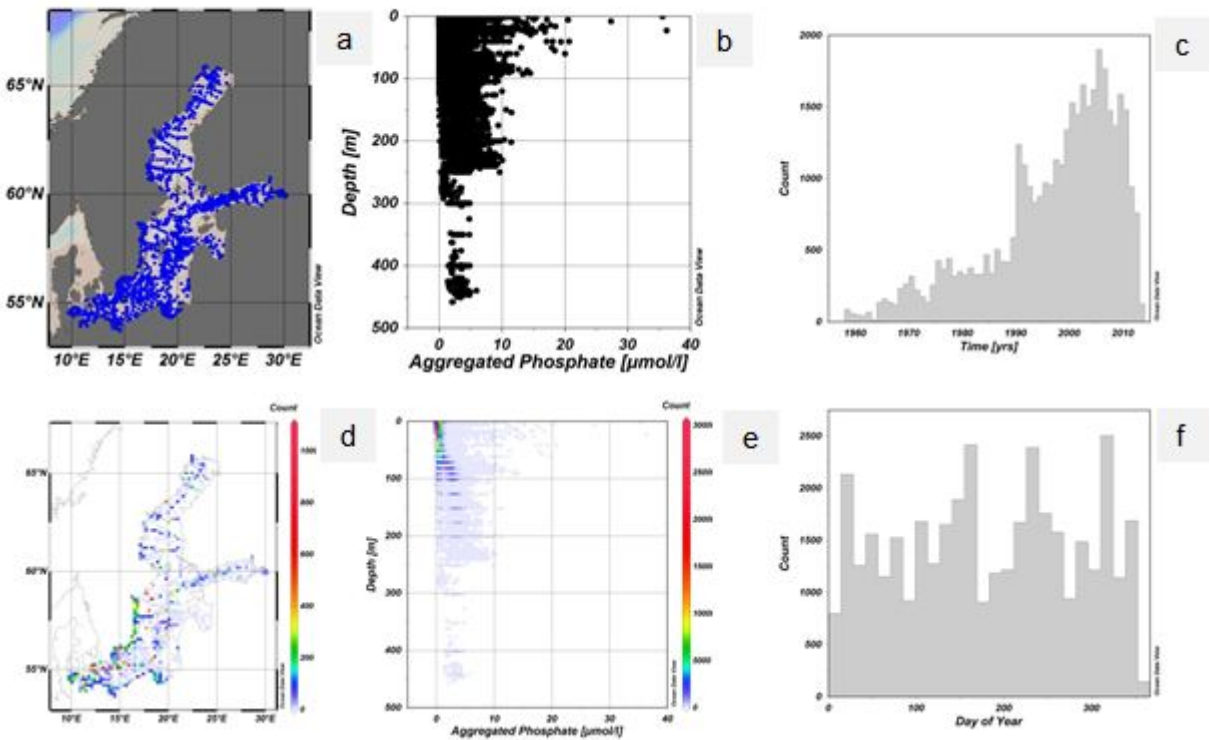
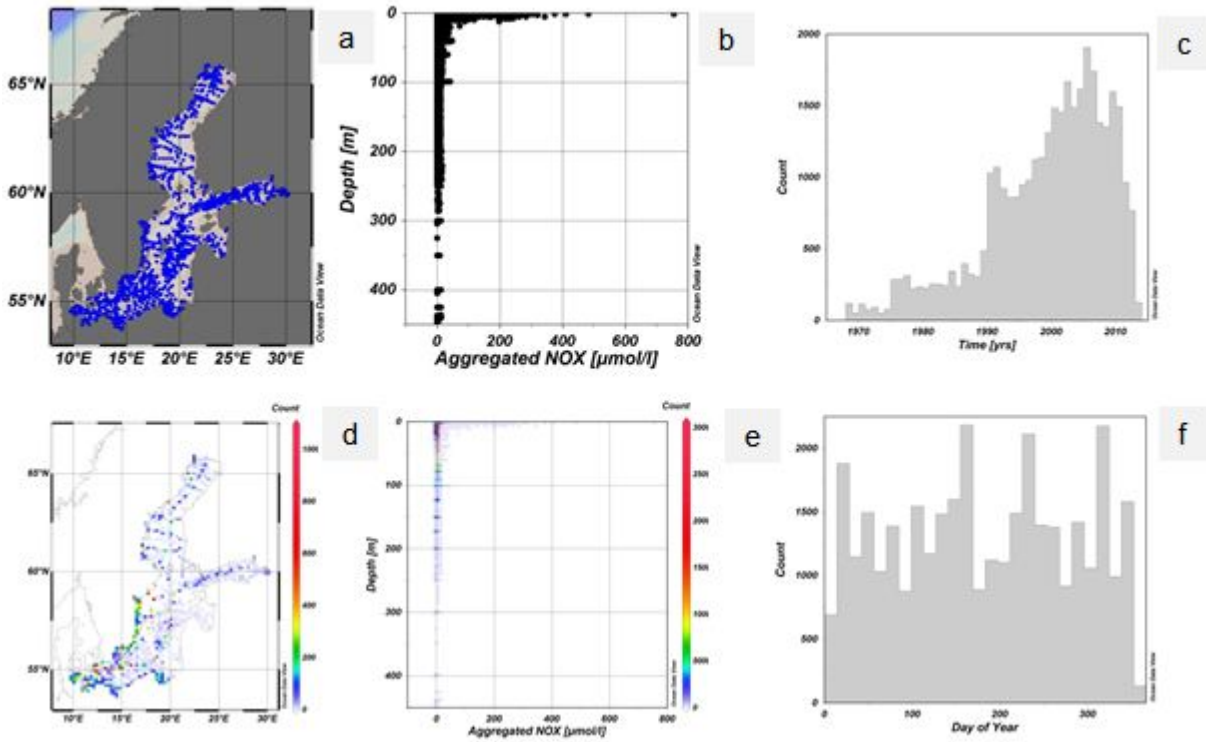


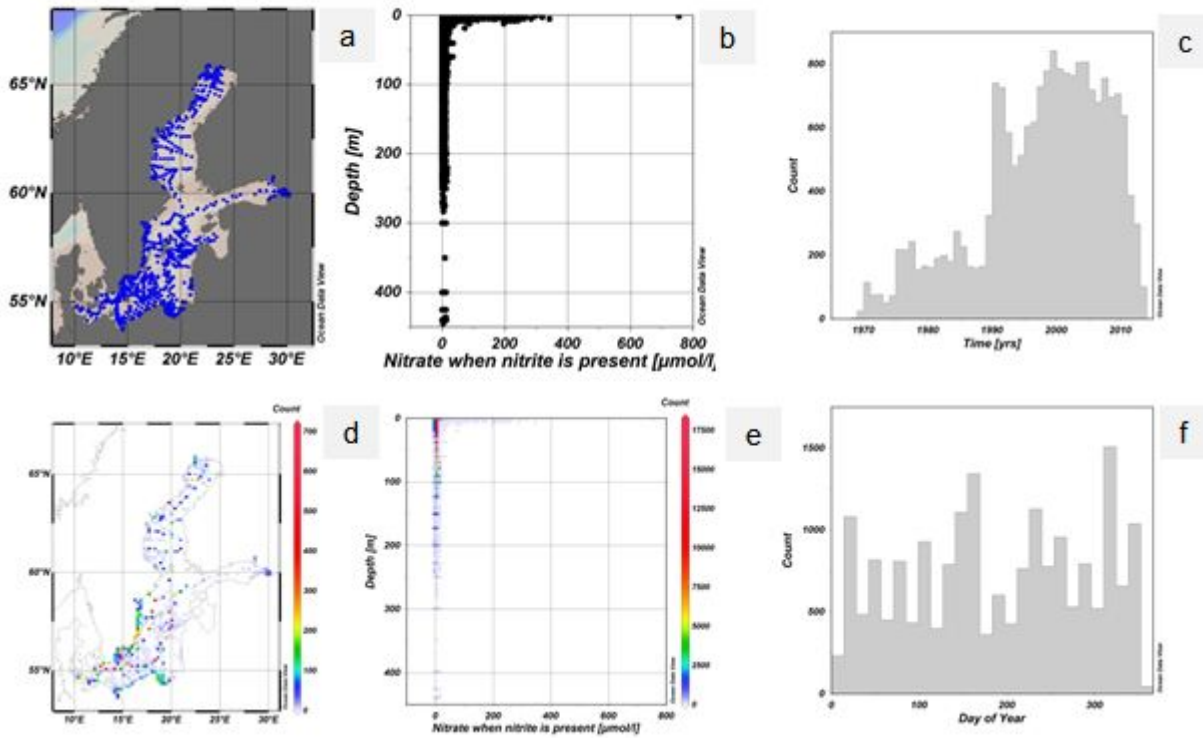
Figure 3: Phosphate (PO<sub>4</sub>)



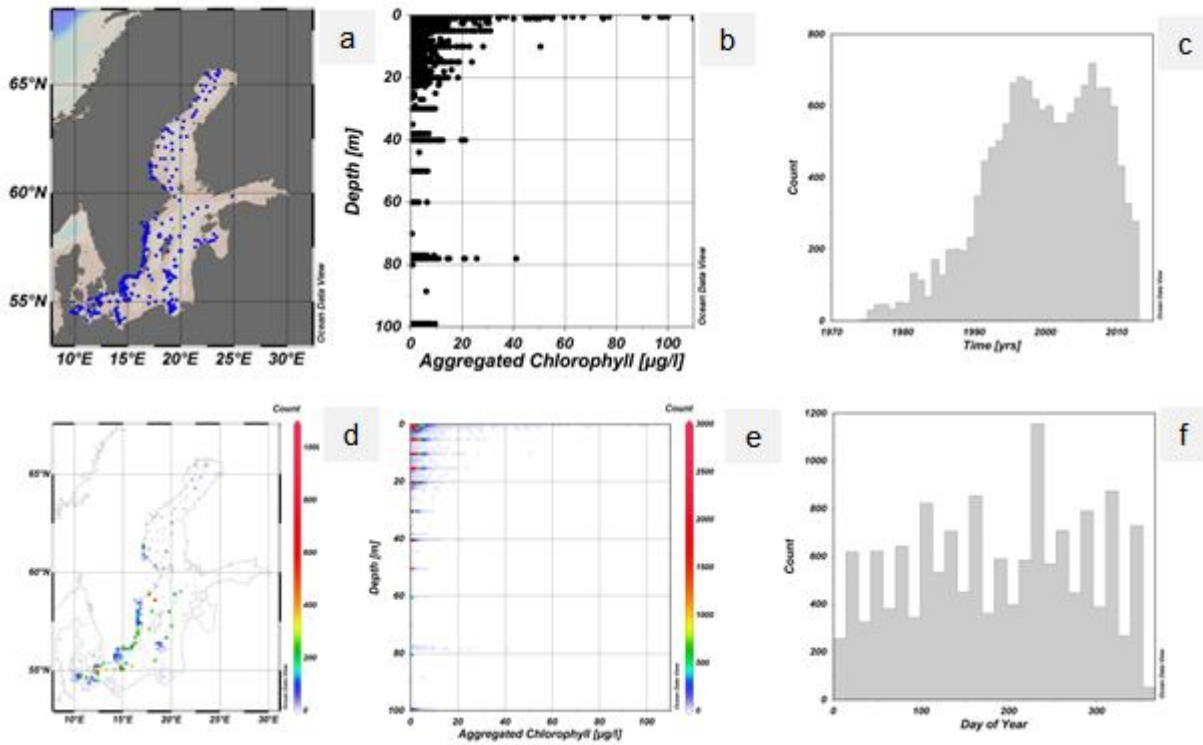
**Figure 4: Nitrate+Nitrite (NOX)**



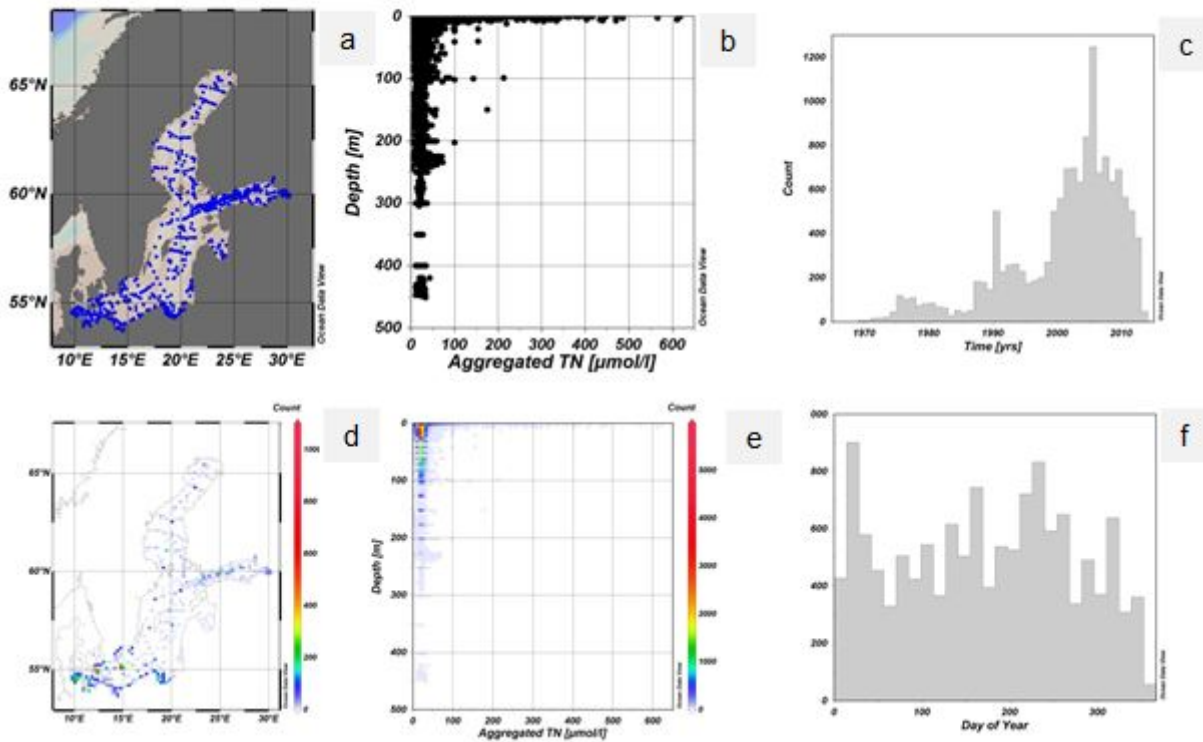
**Figure 5: Nitrate (NO<sub>3</sub>)**



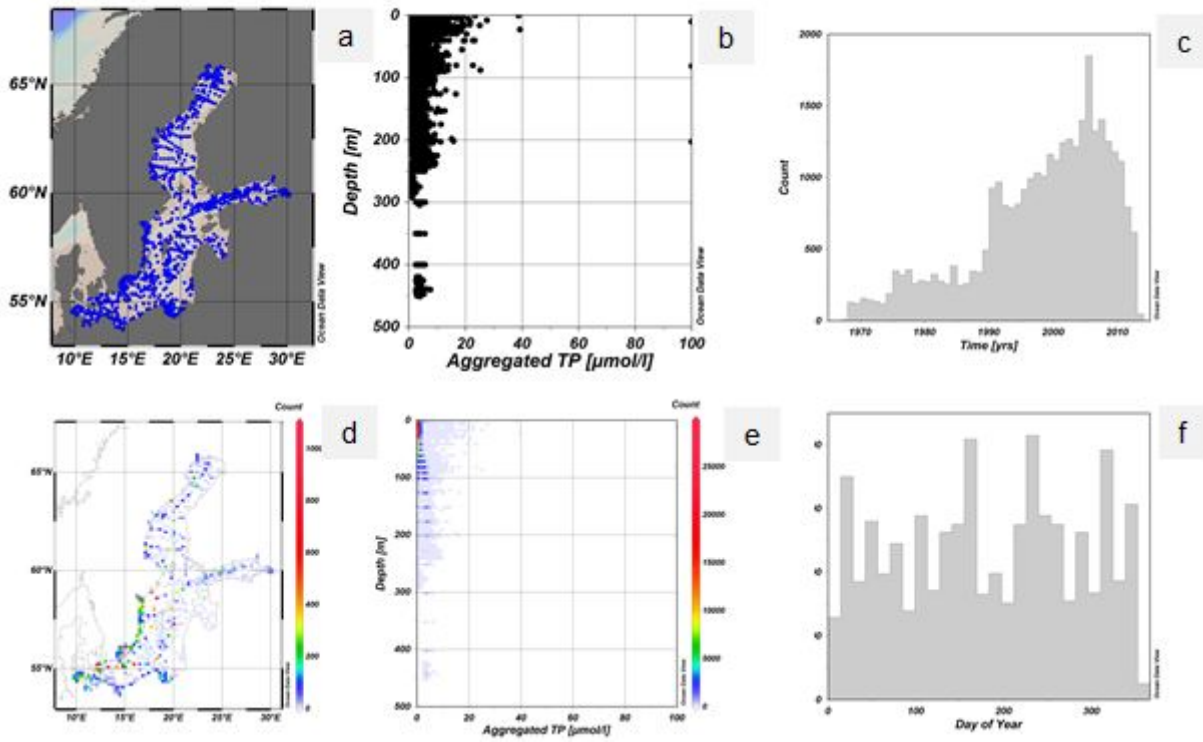
**Figure 6: Chlorophyll**



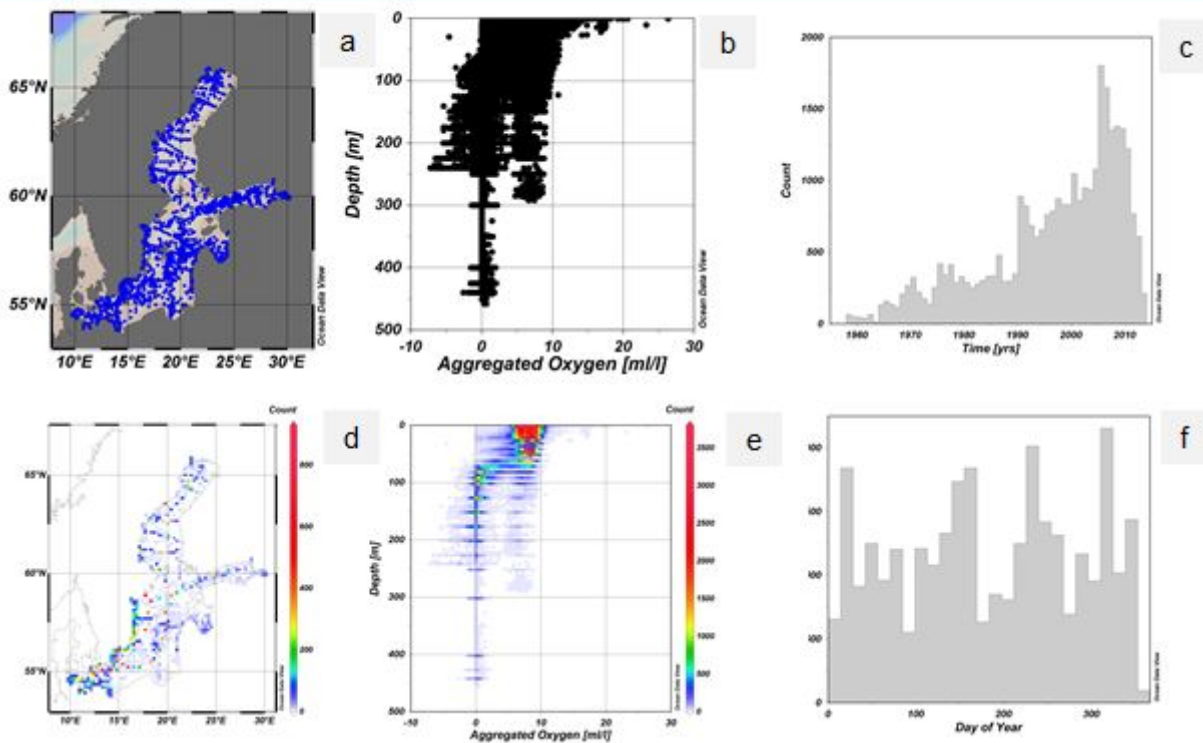
**Figure 7: Total Nitrogen (TN)**



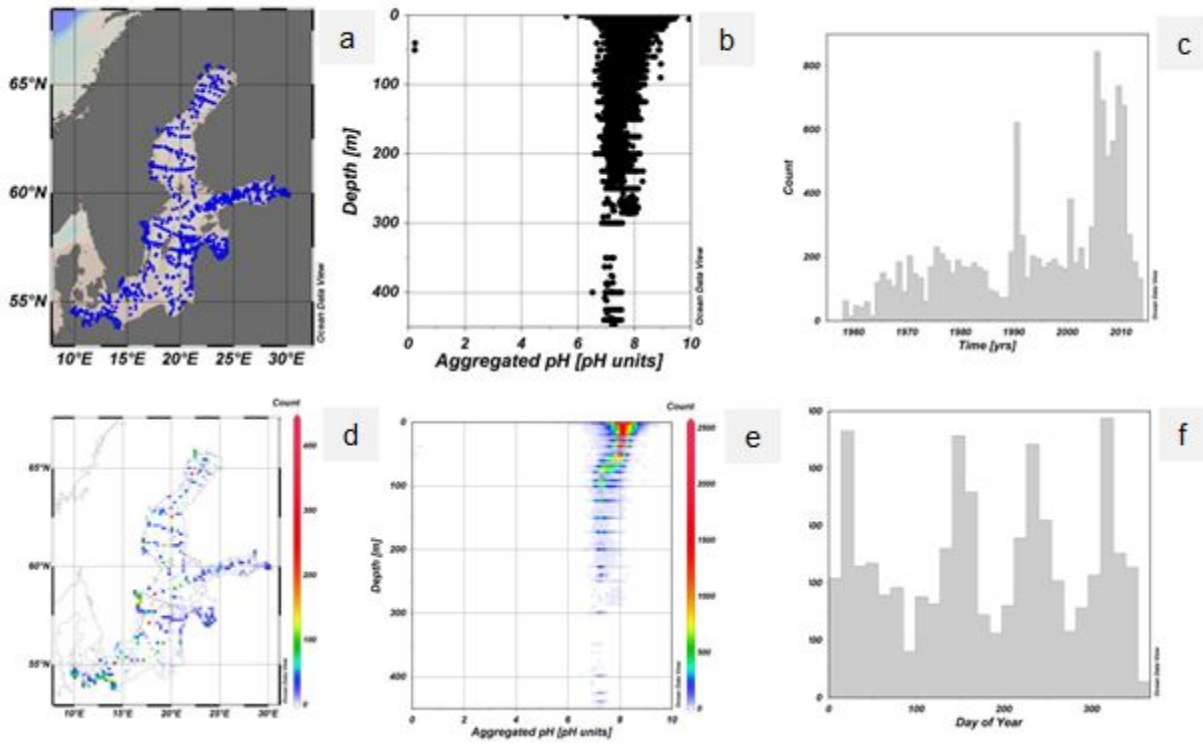
**Figure 8: Total Phosphorus (TP)**



**Figure 9: Oxygen (O<sub>2</sub>)**



**Figure 10: Acidity (pH)**





**C. DIVA maps for nutrients in the water column**

DIVA products were made for nutrients listed in Figure 1-9 using data from between 1990 and 2012 (most data in Figure 1-9 is from this period). For seasonal overview gridded products were made using winter values (January-February) and summer values (July-August). Figure 11 shows examples of DIVA gridded products at different depths. All products were made using default settings in DIVA. Some issues occurred regarding masked data and error fields.

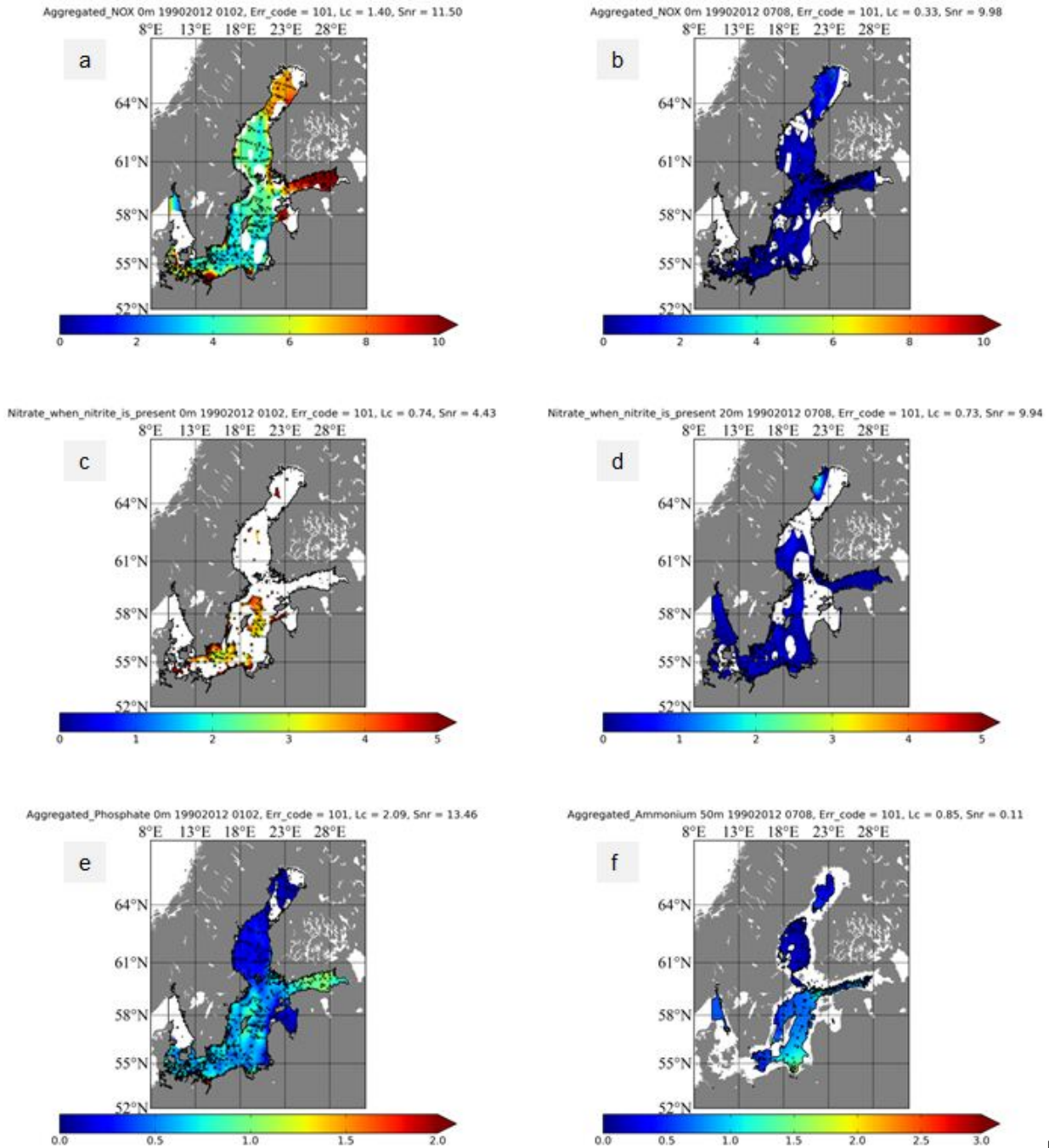


Figure 11:

Examples of DIVA gridded fields of the Baltic Sea Area. a) NOX 0m winter, b) NOX 0m summer, c) NO3 0m winter, d) NO3 20m summer, e) PO4 0m winter, f) NH4 50m summer.

#### **D. Next Steps**

The next activities within WP2 include:

- Work on Common procedures/methodologies for QA/QC and DIVA settings during the meeting in September on ODV QC and DIVA products.
- Update methods and procedures for aggregation of variables.
- Perform new QA/QC on the entire dataset after receiving the new data harvest from MARIS, applying the new procedures taking into consideration regional characteristics.
- Generate new DIVA maps on existing data (fertilizers and silicate), applying the common rules/settings taking into consideration regional characteristics.
- Generate DIVA maps for new parameters such as organic matter, chlorophyll, dissolved gases, acidity and contaminants.

### ***WP2 – Data Products generation in sea regions: North Sea area***

**Input missing**

### ***WP2 – Data Products generation in sea regions: Atlantic Sea area***

The results of first year's activity of Ifremer to the WP2 for the Atlantic Sea area is included in Annex 1, where the quality checks on nutrients and the data aggregation is described for each parameter.

### ***WP2 – Data Products generation in sea regions: Black Sea***

The results of first year's activity of NIMRD to the WP2 for the Black Sea is included in Annex 2, where the quality checks on nutrients and the data aggregation is described for each parameter.

### ***WP2 – Data Products generation in sea regions: Mediterranean Sea***

**Introduction**

The objective of WP2 is to generate integrated and high quality map products for selected parameters at selected sea regions as they are defined by the MSFD. The data sets are collected under WP1 activities by project partners who gather data and compile metadata and populate the central CDI portal. During the first year of the project priority was given on collection of nutrients in water column and the first regional data sets harvested by robot/MARIS and sent to the regional leaders for the products preparation using DIVA software.

This document is the first year contribution of HCMR/HNODC WP2 activities for the Mediterranean Area and includes:

- A. the **regional aggregation, quality control and validation** of the first harvested nutrients data for the Mediterranean Region
- B. the first **regional data products** by means of:
  - horizontal interpolated maps, observations distributions and the related error maps to reflect the confidence to the results.
  - trends identification

### A. Regional aggregation and quality controls

On 24 April 2014, HCMR/HNODC -the task leader for the Mediterranean Sea Area, received the 1st harvested nutrients data for the region which included 29805 stations in SDN ODV Spreadsheet format. ODV tool was used for the processing, aggregation and the quality control of the regional data sets. Three different data types were encountered: vertical profiles, time series and sediment data, originated from 25 NODCs and Marine Centers, and distributed by 14 Organizations from 12 countries. In total, the data set included 209 different variables for 141 parameters and 22 different units that were mapped manually to nutrient products codes and units (P35 vocabulary) and merged manually with ODV into aggregated data collections. The harvested data have been already QCed by their originators but additional QC checks were applied to the aggregations before the analysis by DIVA tool.

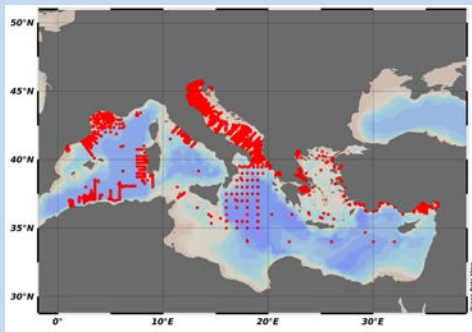
The time series data as well as additional identified time series from repeated vertical profiles at fixed positions were sent to MARIS/DELTARES for the development of the dynamic series plots under WP4.

All the processing steps, the methodology followed for the preparation of the aggregated data sets, and the QC/QA results are available in a separate document "QC\_Nutrients\_Report\_Mediterr-HCMR", prepared by HCMR/HNODC and reported back to data originators for confirmation and updating if necessary (Annex 3).

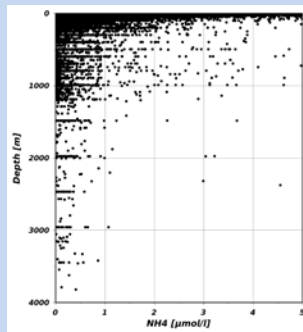
Following the document "**Specifications for products development-V1**", six regional data sets were prepared in the water column (Ammonium, Silicate, Phosphate, Nitrate and Nitrite, Nitrate, and

Nitrite). Their stations distribution, vertical plots, annual distributions, data density maps, data histograms and seasonal distributions are illustrated from Figures 1 to 6 below.

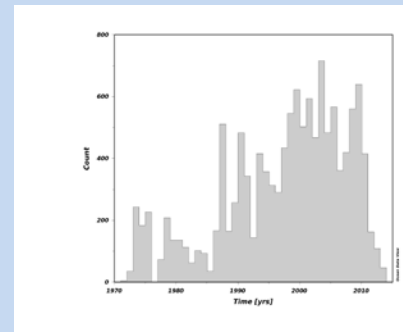
**Figure 1: Aggregated Ammonium data (NH<sub>4</sub>)**



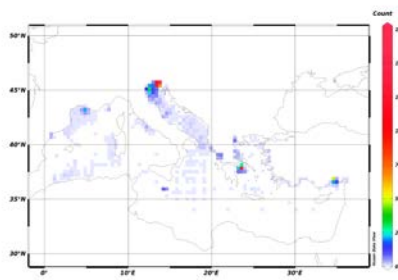
**a. Station Map**



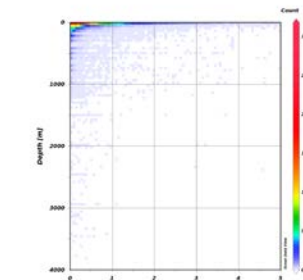
**b. Vertical plot**



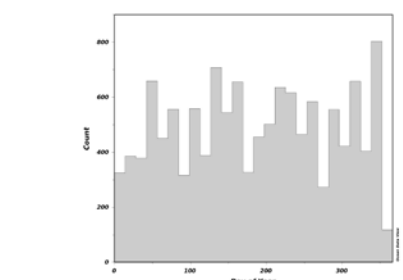
**c. Time histogram**



**d. Data bins**

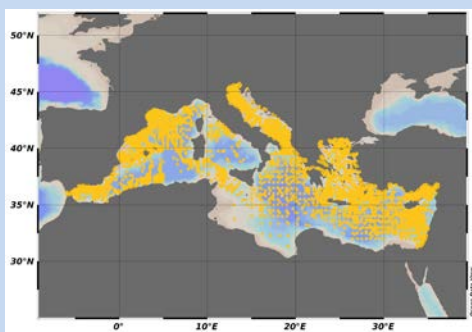


**e. X/Y distribution**

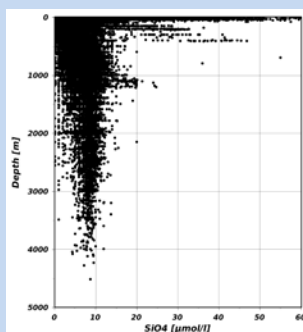


**f. Season histogram**

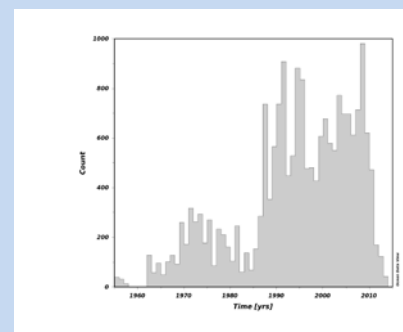
**Figure 2: Aggregated Silicate data (SiO<sub>4</sub>)**



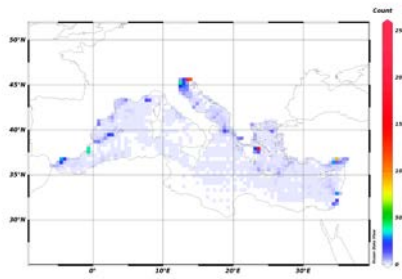
**a. Station Map**



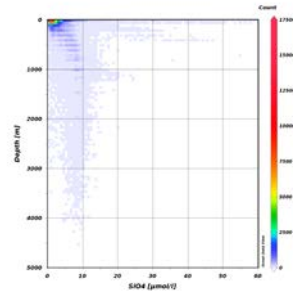
**b. Vertical plot**



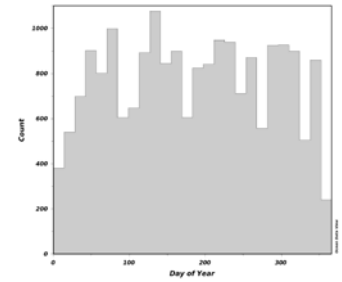
**c. Time histogram**



**d. Data bins**

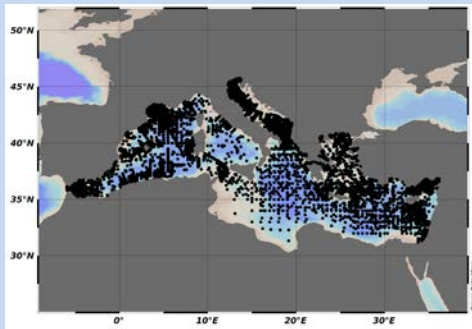


**e. X/Y distribution**

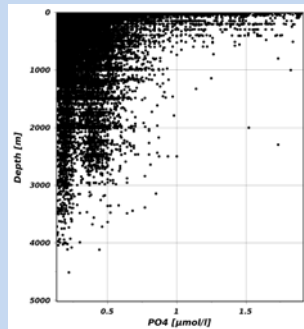


**f. Season histogram**

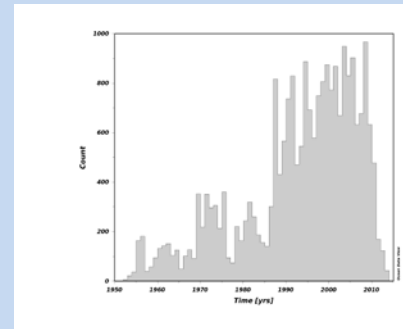
**Figure 3: Aggregated Phosphate data (PO4)**



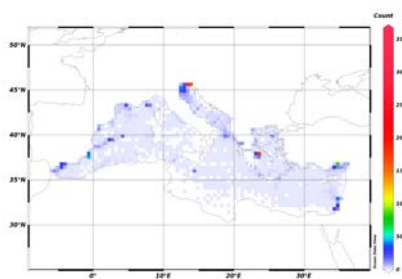
**a. Station Map**



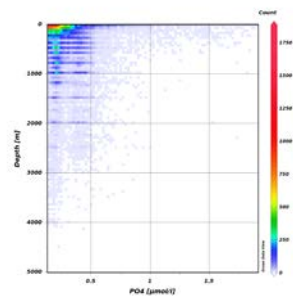
**b. Vertical plot**



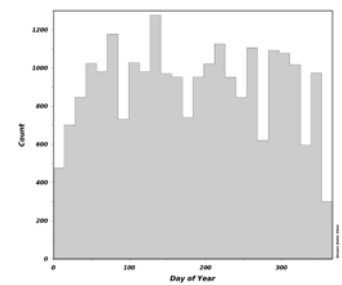
**c. Time histogram**



**d. Data bins**

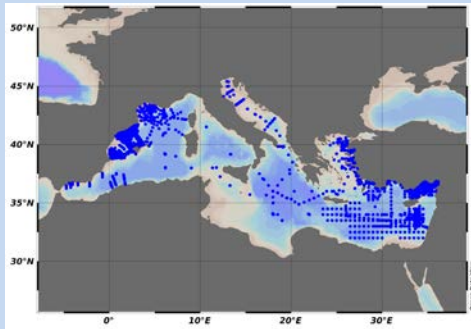


**e. X/Y distribution**

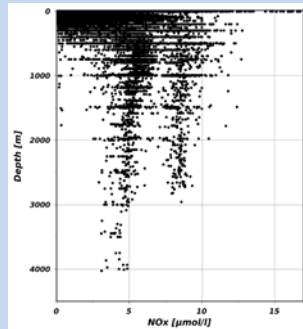


**f. Season histogram**

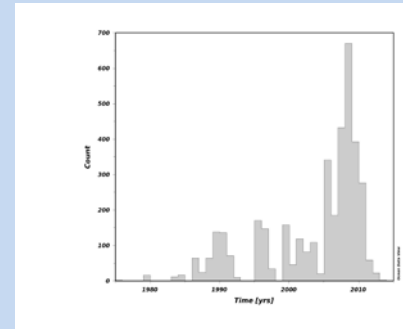
Figure 4: Aggregated Nitrate and Nitrate data (NOx)



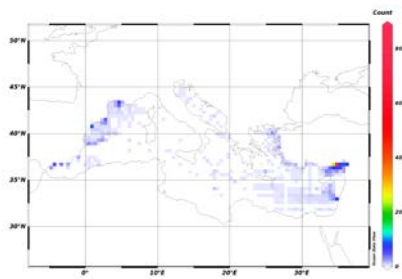
a. Station Map



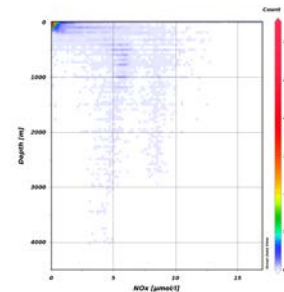
b. Vertical plot



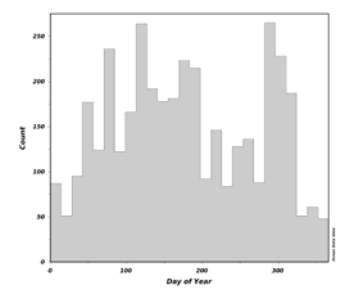
c. Time histogram



d. Data bins

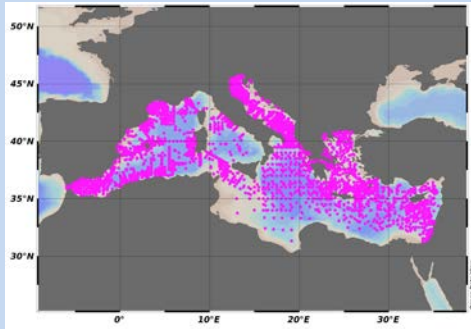


e. X/Y distribution

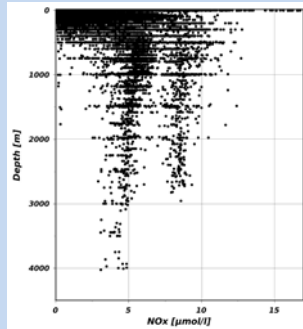


f. Season histogram

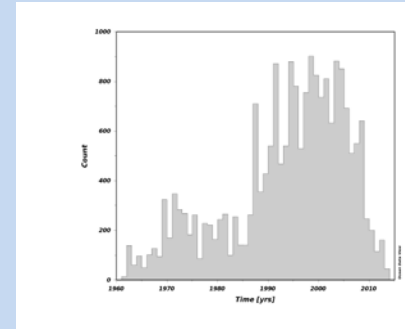
Figure 5: Nitrate data (NO<sub>3</sub>)



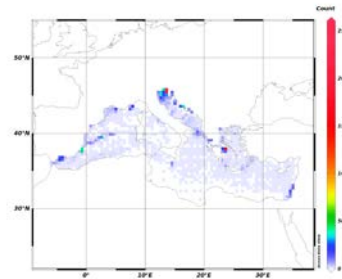
a) Station Map



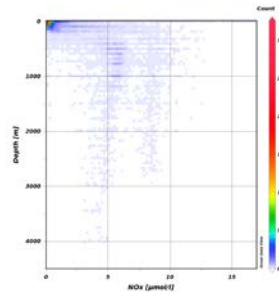
b) Vertical plot



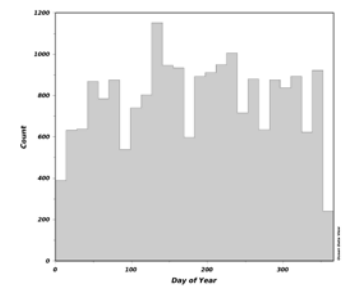
c) Time histogram



d) Data bins

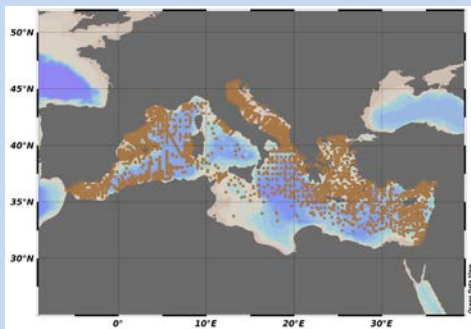


e) X/Y distribution

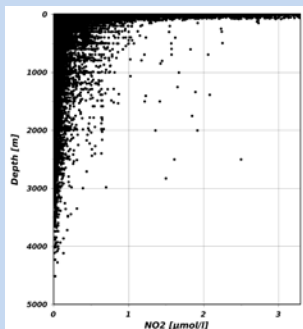


f) Season histogram

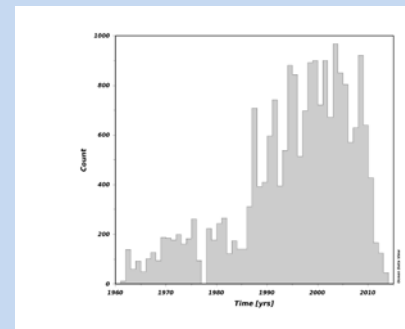
Figure 6: Nitrite data (NO<sub>2</sub>)



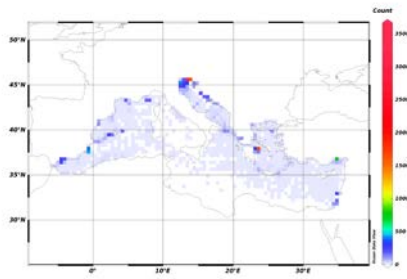
a) Station Map



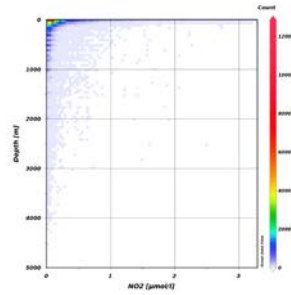
b) Vertical plot



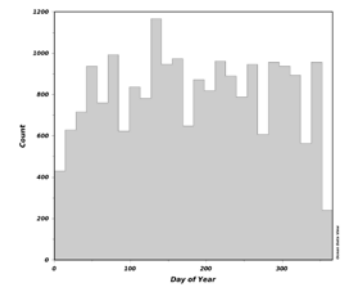
c) Time histogram



d) Data bins



e) X/Y distribution



f) Season histogram

## B. DIVA maps for nutrients in the water column

The first Diva gridded products for two of the four Mediterranean MSFD regions have been analyzed. A separate document is under preparation including the description and the numerical application such as data preparation and optimization of parameters that control the analysis.

The surface (0 meters) seasonal fields of Nitrate data (in  $\mu\text{mol/l}$ ) for Adriatic Sea are illustrated in the first column of Figure (7). The second and third columns are the masked field and the observations distributions maps. As winter are considered months January-February-March, spring as April-May-June, etc. At areas with no data such as (a-3, b-3), the analysis (a-2, b-2) is masked by the error field.

Some similar results for phosphate at 10 meters in the Western Mediterranean are illustrated in Figure (8).

In an effort to identify trends, moving temporal running windows were used to reveal temporal variability and detect trends. A 10-years running window at each standard level and month was applied in DIVA and the results for the Northern Adriatic (N43.5-46, E12-15) are presented in this report. Figure 9 shows the decadal variability of summer averages of nitrate data for the upper 10 meters, from 1970-1979 to 2005-2014. Each decadal estimate is plotted in the center of the 10 years period. As reference, a climatic summer field, for all July to September data, from 1970 to 2014, was used. Detrending was applied to the reference field in order to remove non uniform spatial distribution in time.

## Next Steps

The next activities within WP2 include:



- improving of the regional aggregated collections by updating the climatological range values in several Mediterranean areas,
- improving the regional QC/QA results according to the originators feedback for possible outliers and zero values
- Perform duplicates detections checks
- Improve the DIVA analysis results by further optimization of the analysis parameters
- 

Figure 7: Surface (0m) seasonal nitrate fields (a-1, b-1, c-1), masked fields (a-2, b-2, c-2) and observations distributions (a-3, b-3, c-3), Adriatic Sea

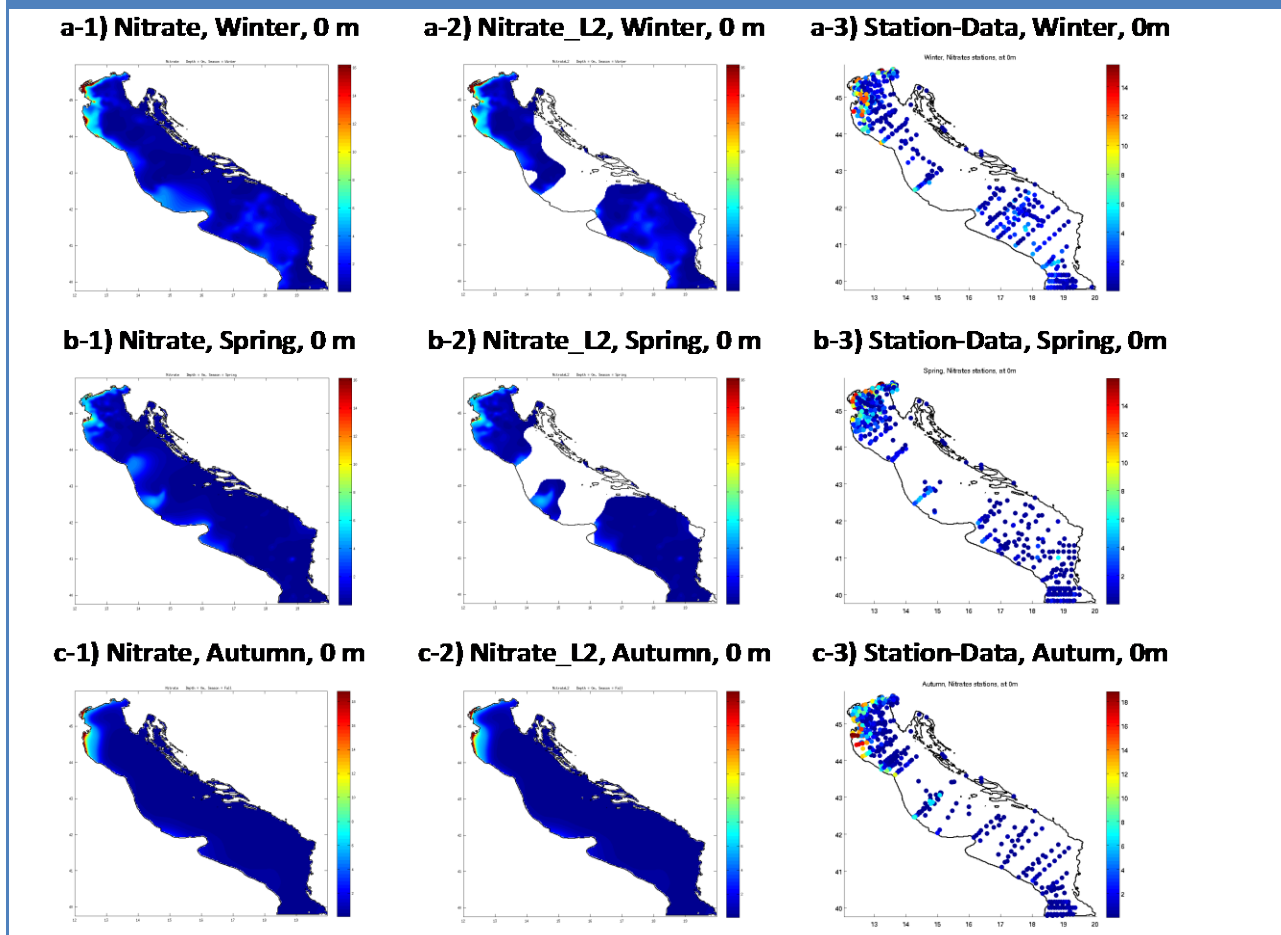


Figure 8: Seasonal phosphate fields at 10m (a-1, b-1, c-1), masked fields (a-2, b-2, c-2) and observations distributions (a-3, b-3, c-3), Western Mediterranean

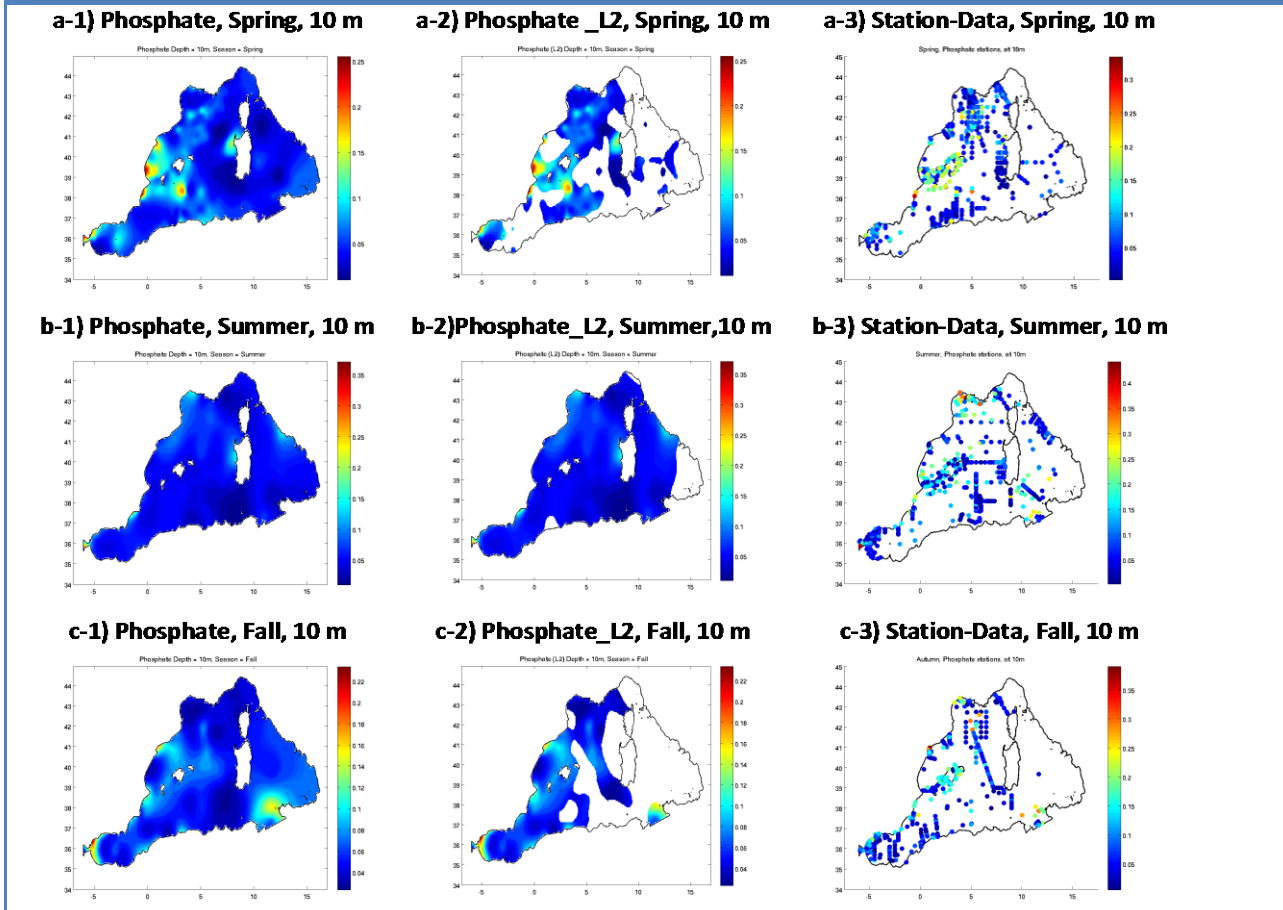
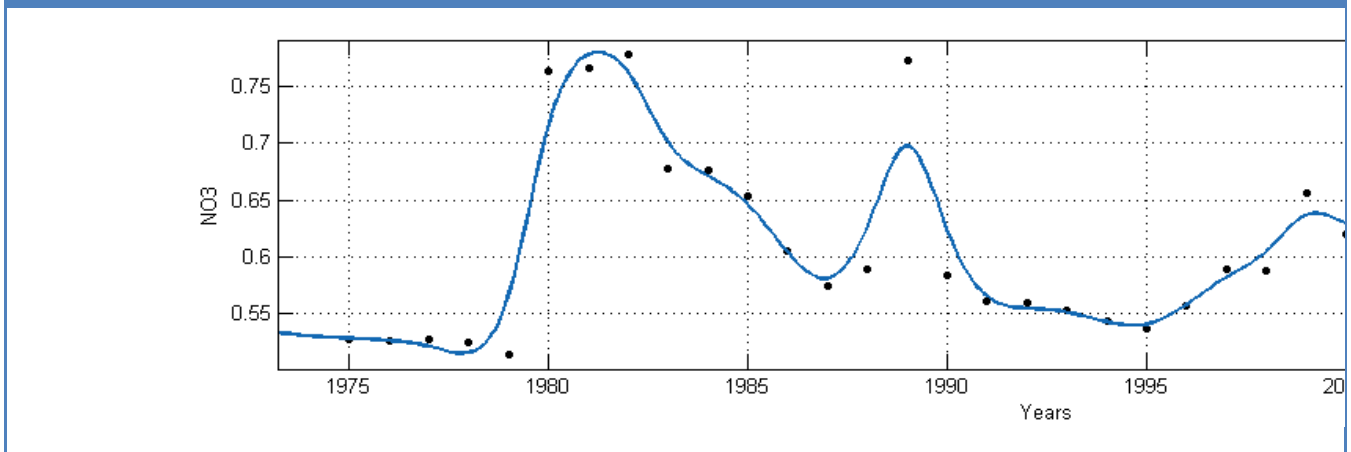


Figure 9: Time series of the summer averages of nitrate data, North Adriatic (N43.5-46, E12-15), for 0-10 m



### ***WP3 – QA/QC - Validation - MSFD interaction***

A list of best practice for data Quality Control (QC) and data Quality Assurance (QA) on EMODNet Chemical Parameters has been selected starting from European Union specific legislation, i.e. Directive 2009/90/EC, and ISO guide requested therein as ISO 17025:2005 for laboratory accreditation. Documents with short descriptions have been made available on EMODNet portal for discussion. In order to collect information on QA/QC procedures followed by data provider for data production and collection, a draft Questionnaire has been proposed consisting of general questions on laboratory QA/QC, valid for all matrices (water, sediment and biota) and specific for single matrices.

Regarding MSFD interactions, European Commission, in agreement with Member States, has recently established a Technical Group on DATA chaired by EEA with the purpose to establish a common framework for collection and sharing of MSFD monitoring data and data products. ISPRA is participating to TG DATA in order to promote EMODNet Chemistry as a common platform for implementation of indicators on Descriptor 5 (Eutrophication) 8 and 9 (Contaminants). Specific attention will be given to the relation between DIVA interpolation procedure and methods based on biogeochemical models.

### ***WP4 – Portal development and operation***

#### **Introduction:**

The objectives of WP4 are to develop the EMODNet portal and its services further for meeting the new requirements, and to keep the portal services operational, including monitoring and reporting. The EMODNet Chemistry portal makes use of the SeaDataNet services and standards, that are adapted and further developed for specific EMODNet Chemistry needs. The primary SeaDataNet services used are:

- **CDI Data Discovery and Access Service** giving facilities for searching and retrieving chemistry data sets, but also for further populating new gathered data sets;
- **OceanBrowser Viewing Service** giving facilities for viewing, browsing and downloading of Chemistry data products;
- **Sextant Products metadata catalogue** giving facilities for searching Chemistry data products and linking to the viewing service.

#### **Technical developments:**

The technical developments are undertaken by the EMODNet Chemistry Technical Working Group (TWG) in cooperation and tuning with the SeaDataNet Technical Task Group (TTG). In the first year

there were 2 joint TWG-TTG meetings (Sept 2013; March 2014) to support the coordination process. The focus of activities has been on:

**1) Upgrading the CDI User Interface and developing machine-to-machine capabilities for the CDI system to ease queries and to support the data harvesting as part of WP1 (data collection and metadata compilation in sea regions)**

The SeaDataNet CDI system (INSPIRE compliant) is used for giving overview and access by means of a shopping mechanism to the distributed data sets that are managed by connected data centres. For EMODNet Chemistry a dedicated subset of metadata – data is dynamically generated by filtering on Parameter Discovery Vocabulary (P02) terms that map to the extended scope of chemical substances for EMODNet Chemistry 2. This CDI collection can be queried through the EMODNet Chemistry CDI Quick Search and Extended Search interfaces. These interfaces have been upgraded by MARIS with extra search options for sea regions, data access restrictions, duration of observations, and P02 for discovery parameters. The shopping basket for human users has been extended from 500 to 10.000 CDI's requests per transaction.

A robot harvesting system has been developed by MARIS for automatic and more efficient discovery and harvesting of metadata and data sets that will be transferred to the regional groups in WP2 for generating EMODnet Chemistry data products. Therefore a new online Buffer Content Management System (CMS) has been developed which allows to configure specific group profiles (specify group, involved users, query criteria). The Buffer CMS works together with the upgraded Request Status Manager (RSM) service, an existing component of the CDI shopping mechanism, to perform and administer robot shopping transactions and to store the harvested data sets in central buffers. This also includes maintenance, whereby new and updated CDI entries are identified and used to trigger additional harvesting for the central data buffers. Furthermore the central buffers have been equipped with a Central buffer CDI User Interface and an API (allowing full machine-to-machine interaction), both including shopping mechanism, to facilitate the extraction and delivery of regional data sets for the EMODNet Chemistry regional groups. All central shopping transactions on the central buffers are administered in a new section of the RSM so that data providers can fully oversee all transactions. Remark: this buffering system is exclusive for specific applications and access is secured via AAA service only for authorised users as defined in the buffer CMS. It does not replace the distributed CDI infrastructure and its shopping process for regular users. The image below gives an illustration of the new system.

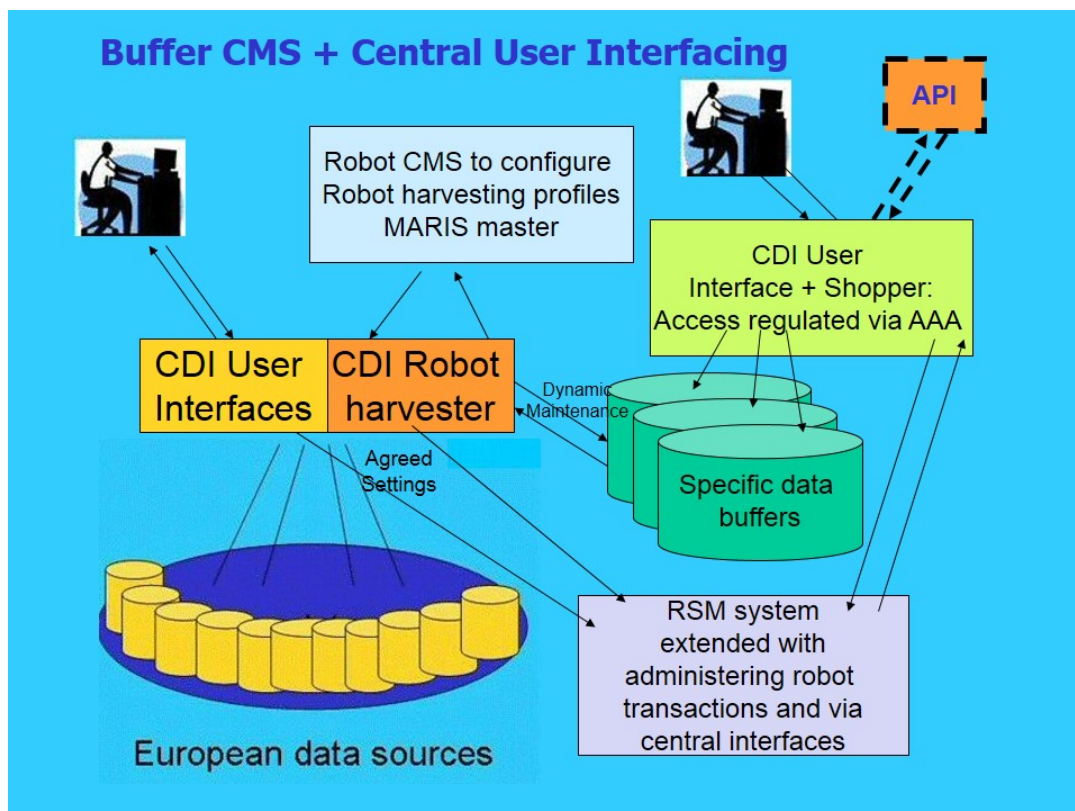


Image: expansion of the CDI service with buffer CMS, robot harvesting and central buffer access services

This system has already partially been used by MARIS for the 1<sup>st</sup> run of harvesting of nutrients data sets for the regional groups. On short term it will be finalised and fully used by MARIS for the 2<sup>nd</sup> run of nutrients harvesting; this time including the central buffer User Interface for compiling automatically the regional metadata – data packages.

In the coming year it is also planned to expand the query criteria of the CDI service with the MSFD regions (once officially established) and options for searching in sections along the coast. Furthermore work is ongoing for upgrading the CDI matrix interface of P02 terms versus sea regions. This will be modified to all regions and to groups of chemicals as relevant for EMODNet Chemistry and upgraded to give portal visitors a direct insight in available data, encouraging more use of the CDI service.

- 2) **Upgrading the SeaDataNet Common Vocabularies (NVS 2.0) as in use for EMODNet CDI and related data sets and data products to support WP1 (data collection and metadata compilation in sea regions) and WP2 (data products generation in sea regions)**

SeaDataNet common vocabularies (NVS 2.0) are maintained and served by NERC BODC as web services for marking up all metadata and data entries. The Parameter Usage vocabulary list P01 is used for data sets while the Parameter Discovery vocabulary P02 is used for the CDI metadata. P01 are narrower terms of P02. At present P01 already contains more than 30.000 concepts. In the 1<sup>st</sup> year BODC has added new entries because of the extended scope of substances in EMODNet Chemistry and following suggestions and requests by data providers.

Each P01 concept is built up of a number of elements following a model, that is maintained by BODC inside its vocabs database, but it is so far largely hidden and not known or understood by many outside BODC. As an implication data providers have to undertake great effort when mapping their internal data holdings and parameters against the P01 vocabulary, especially in case of complex P01 concepts such as for Chemistry. Therefore work is ongoing by BODC for exposing the semantic model behind P01 and making it retrievable by components which will make mapping to P01 much easier for data providers. Example of P01 term: ‘Concentration of tributyltin cation {tributylstannyl TBT+ CAS 36643-28-4} per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}’. The semantic model is illustrated below.

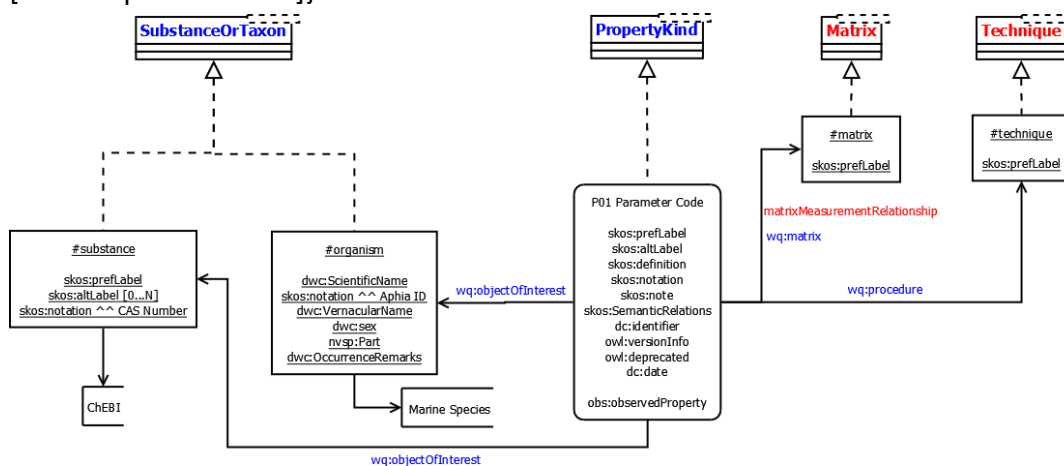


Image: semantic model of Parameter Usage vocabulary P01

BODC will deliver the P01 vocab with its semantic model by means of JSON (Javascripting) and as SPARQL endpoint with RDF for machine-to-machine interaction, while MARIS will extend the SeaDataNet vocabularies client user interface. This will allow filtering and searching on each of the fields of the semantic model to more easily find the relevant P01 concepts.

P01 concepts are used within the data files to indicate parameters. The ODV software has an effective solution for aggregating individual files into so-called multi files for more effective analysis. However data providers in practice make use of many different P01 concepts for scientifically comparable parameters. As a consequence an ODV multi file for parameters such as e.g. temperature or salinity

might look like "swiss cheese" because every P01 concept has its own column which then is partially filled over the vertical water column. For that purpose BODC has initiated and launched the P35 vocabulary list and is making good progress with its population. P35 is a controlled vocab of aggregated parameters that act as classes, each class bringing together scientifically conform P01 concepts, as well as preferred P06 unit concepts. This will solve the "swiss cheese" problem in ODV multi files and will allow ODV software to aggregate imported data in a more automated way.

The P35 vocabulary is already well populated for the 1<sup>st</sup> group of nutrients and further activities are underway by BODC with input from data providers and chemical experts to populate for the full scope of chemistry parameters in EMODNet Chemistry. BODC also initiated the P36 vocabulary with concepts for EMODNet Chemistry groups of chemicals, that will be mapped to P35 concepts. This P36 vocabulary will be very useful for labelling EMODNet Chemistry data products.

### **3) Upgrading the Ocean Data View (ODV) software that is used for validating and aggregating the harvested data sets as part of WP2 (data products generation in sea regions)**

The ODV software is used by regional groups in EMODNet Chemistry for quality checking, validation and aggregation of the chemistry data sets as harvested for the MSFD sea regions. The ODV software provides a quite extensive suite of build-in visual and automatic data quality control (QC) procedures and tests. Regularly new versions of the ODV software are developed and published by AWI via the SeaDataNet portal, following requests from users and the EMODNet Chemistry requirements.

For EMODNet Chemistry AWI is working on a number of extra functionalities. One concerns the integration of the new P35 Vocabulary which will facilitate efficient and systematic aggregation of P01 variables in the ODV files, including P06 units. The principle is somewhat straight forward, but the actual implementation requires agreement on how to handle issues like unit conversions, multiple columns for the same P01 terms but with possibly different quality flags etc. This is part of an ongoing discussion of which the resulting rules and P35 will be implemented in a new ODV software release around September 2014.

Another element is that ODV has been made fit to import both SeaDataNet ODV data files and the CDI metadata that accompany ODV data sets that are downloaded by users through the CDI service. The CDI metadata has been expanded in the last year under influence of the migration to ISO 19139 and full INSPIRE compliance. Therefore it has been agreed that MARIS will amend on short term the CDI metadata csv structure for the public CDI service, and will also include this in the Central Buffer CDI interface so that downloaded ODV data sets will always be accompanied by their CDI metadata. AWI is working now on ODV to adopt to the new csv export format and to merge both the ODV data and CDI metadata during ODV import, thereby creating metadata enriched ODV multifiles inside the ODV software. This will allow for better insight by users. Moreover AWI is arranging that the so-called ODV collections export files will contain the full collection of metadata enriched ODV files.

These ODV upgrades with P35 and metadata merging will allow ODV users and in particular the EMODNet Chemistry regional groups to export from ODV and deliver the results of their regional quality control and aggregation activities as regional collections of validated and aggregated data sets. These collections will then provide the input for the planned data products generation, using the DIVA software for sea basin interpolated maps, and for additional visualisations at data level.

The ODV collection export files are ASCII files in more or less the SeaDataNet ODV format albeit with extra metadata attributes and with P35 concepts. ODV internally makes use of an ODV binary format, that alternatively could also be exposed to support add-on services. For that purpose AWI has made progress with the ODV Application Programming Interface (API) that gives its users full access to the data in an ODV data collection and will allow development of procedures for all kinds of data processing. The ODV API is currently in beta state. This API might provide another way to build additional services on top of the aggregated ODV data sets. Therefore IFREMER as part of SeaDataNet is analysing and evaluating the ODV API for its Oceanotron server.

#### **4) Upgrading the User Interface of the OceanBrowser Viewing Service for visualising data products and developing and integrating additional services for data visualisation**

As mentioned above the results of the workflow of data harvesting and consecutive QA – QC and aggregation by the regional groups using ODV software will be regional aggregated and validated ODV data collections. These collections will then be used as input for the generation and publication of EMODNet Chemistry data products, such as DIVA interpolated maps, time series graphs of selected stations, and maps of spatial and temporal data distribution. This is illustrated in the image below.



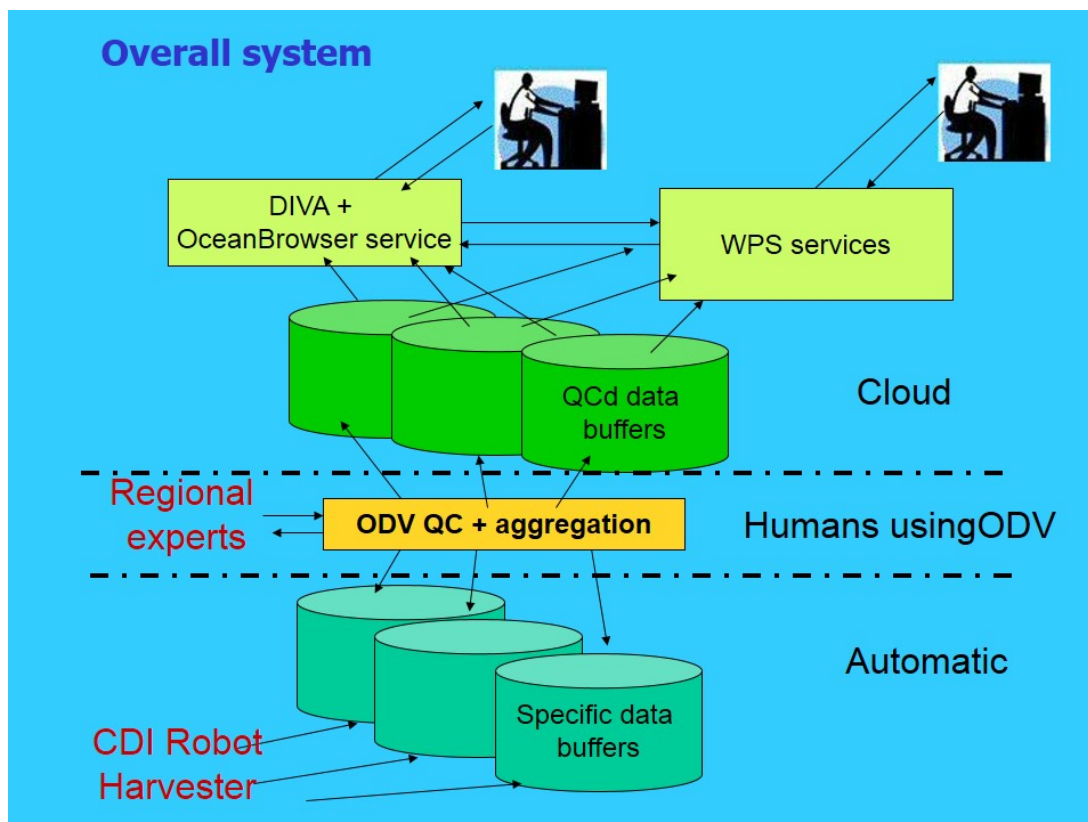


Image: providing regional aggregated and validated data collections to applications for generating and publishing data products

The **OceanBrowser Viewing service**, developed by ULg, will provide access to the DIVA interpolated maps. Output images are available as horizontal sections and vertical sections. The latter can be selected by drawing an appropriate transect. ULg has included in the interface predefined coastal sections which allow a user to visualise as vertical sections. ULg is working together with IFREMER on the integration with the **Sextant data products metadata catalogue**. This is aiming at giving users the option to select EMODNet Chemistry data products in the Sextant catalogue and then to visualise and browse those in the OceanBrowser. Alternative to visualise data products in the OceanBrowser and then to look up their description from the Sextant Catalogue. As part of this process ULg has also developed a DIVA2XML application that facilitates the generation of an Sextant XML entry for each data product as generated by the regional groups using the DIVA software for interpolated sea basin maps. ULg is also working on improving the support for the CDI WMS – WFS services in the OceanBrowser Viewing service so that users can easily see which data sets overall are available in EMODNet Chemistry and their metadata for further information and possible shopping requests.

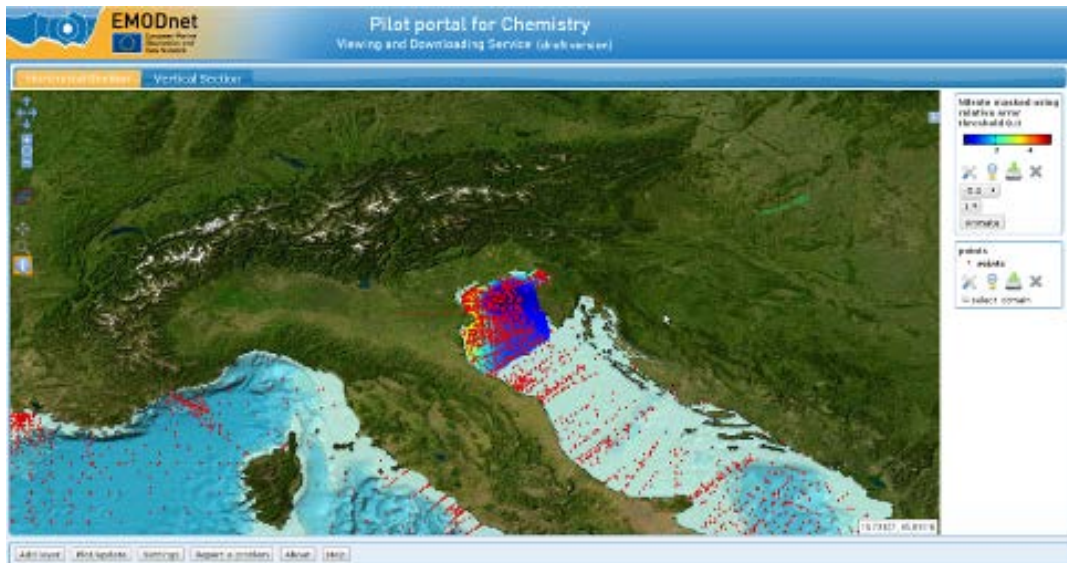


Image: OceanBrowser Viewing service for visualising DIVA interpolated maps and including WMS-WFS overlays of e.g. observation points via CDI service

Next to the DIVA interpolated sea basin maps for specific parameters, developments are also well underway by DELTARES to provide additional visualisations for the aggregated and validated data collections. These visualisations are produced by Web Processing Services (WPS) in a Python framework. The WPS are so far set up as a prototype for generating:

- Plots of time series of parameters from data sets of selected stations
- Maps of regional data collections displaying spatial resolution in time and values of selected parameters
- Plots of profiles of individual data sets

Further developments are planned for elaborating the prototype services to operational services that will work upon the ODV collection export files (note: DELTARES has prepared the prototype services so far upon the ODV format and a further refinement to the new fully enriched ODV collections export format will be made) and in a cloud hosting configuration. The principle is that the data collections will be accessible for the WPS services while users will be presented visualisations by means of graphics.

The maps of regional data collections will make use of the regional aggregated and validated collections and further work is planned for defining classes incl colours for parameter values ranges, like OSPAR and HELCOM are applying. The maps must also take into account depth of observation in order to present justified maps. Also an optimal solution is being sought between DELTARES and Ulg for providing the maps as WMS layers for easy integration in the OceanBrowser Viewing service.

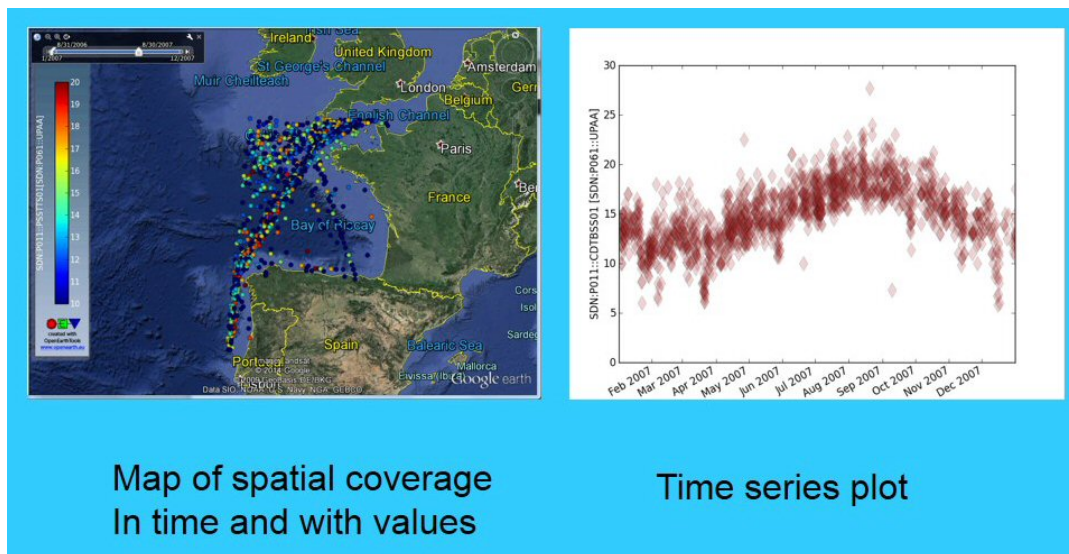


Image: Prototypes of WPS visualisations by DELTARES

The plots of time series will be based upon time series data sets as selected beforehand and indicated in lists by the regional groups as subsets in the regional data collections. The stations itself will be included in WMS – WFS services for supporting the integration in the OceanBrowser Viewing service. Complexities encountered are that the geographical coordinates of a Station with time series might vary in time due to the observation by means of vessels and in practice might be a point cloud, which needs to be schematised.

## 5) Upgrading the Sextant Products metadata catalogue and integration with the Ocean Browser Viewing Service

The Sextant Products metadata catalogue as developed by IFREMER is used to describe the Chemistry data products such as DIVA maps. This facilitates searching for specific data products and the exchange and use of the Chemistry data products in other services, such as the Chemistry OceanBrowser, and other portals with OGC WMS support. In the 1<sup>st</sup> year IFREMER has worked on improving the metadata format for EMODNet Chemistry, on the basis of ISO 19115 – 19139 and adopting SeaDataNet vocabularies, where possible. Moreover IFREMER has upgraded the online CMS for entering product descriptions and improved the user interface. In addition it is cooperating with Ulg for finetuning the direct export of Sextant entries via the DIVA software (DIVA2XML) and the required mutual integration with the OceanBrowser Viewing service as explained earlier.

## 6) Exploring cloud hosting and computing

It is planned that the regional aggregated and validated data collections (incl the identified station subsets) will be hosted in a cloud hosting and computing environment and there will be made accessible for the WPS processes, that will drive the visualisation services. Therefore OGS and MARIS

are exploring options and are in dialogue with **Cineca** about options and possible way forward. Cineca is a non profit Consortium, made up of **69 Italian universities, and 3 Institutions**, including OGS and CNR. It is the largest Italian computing centre. Cineca is also partner in **EUDAT**, an FP7 project towards a pan-European Collaborative Data Infrastructure which will allow researchers to share data within and between communities and enable them to carry out their research effectively. So far OGS-MARIS and CINECA have reached agreement on specifications and CINECA will provide a cloud work space for EMODNet Chemistry by September 2014.

### **Conclusions:**

WP4 is well underway. The activities are making good progress and there are a number of interesting developments. The overall time planning is aiming for having the CDI buffer system and the ODV software upgrade fully functioning by September 2014 in order to support the 2<sup>nd</sup> harvesting and validation of the nutrients data collections for the MSFD regions. While the regional groups then will continue with generating the DIVA maps and selecting the station data sets, the technical group will work on finalising and integrating the visualisation components, the Sextant catalogue, and operationalising the services in the cloud environment in the period from September to end December 2014.

## ***WP5– Analysis and Recommendations***

### **Background**

The activity focusses on building a continuous dialogue, feedback and iteration loop throughout the lifetime of the project with the stakeholders and users. The main aim of this work is to identify the key users and use cases, and ensure that a dialogue is in place that allows feedback to be collected from these groups and that this feedback is fed into the specific tasks in the project.

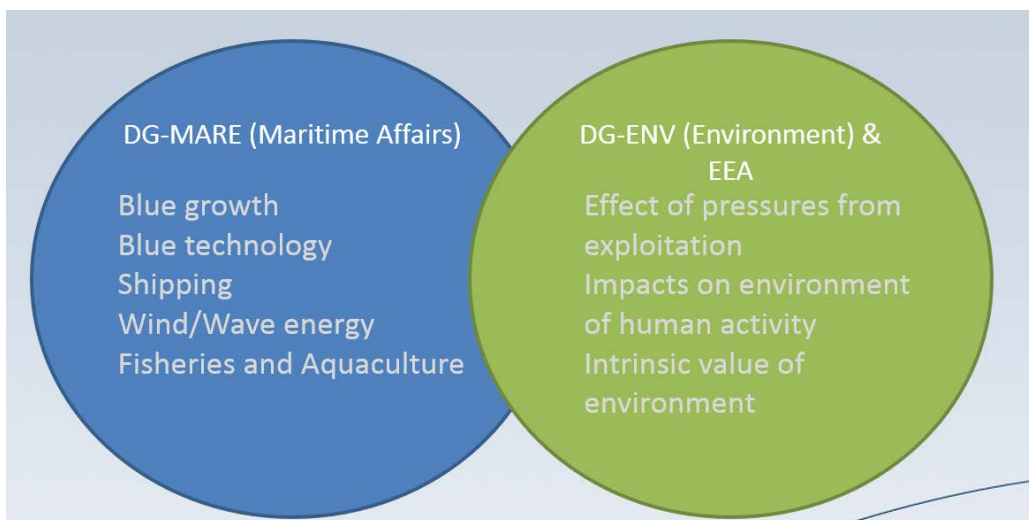
Feedback and interaction will be achieved through a number of methods, including directly surveying the end-users, engaging with specific working groups, analysing the business intelligence gathered through the web portal.

In relation to the MSFD There will be the need to analyse, find and implement efficient tools to obtain users feedback. This can be achieved by ensuring the project receives input from the Commission working groups (WG-DIKE and WG-GES) and that a clear means of feedback is established. Similarly, a specific feedback interaction would be beneficial to establish for the SeaBasin checkpoint project, as

they will have a specific need to address and which can provide valuable knowledge to how the portal and its products can be used in a large scale distributed workflow.

### Year 1 activities

The setting of EMODnet Chemistry against the background of the political processes related especially to the marine Directives is an important linkage to make, and for the consortium to comprehend. The contrast between the aims and interests of the Commission Directorates with regard to EMODnet are sketched out in the diagram below.



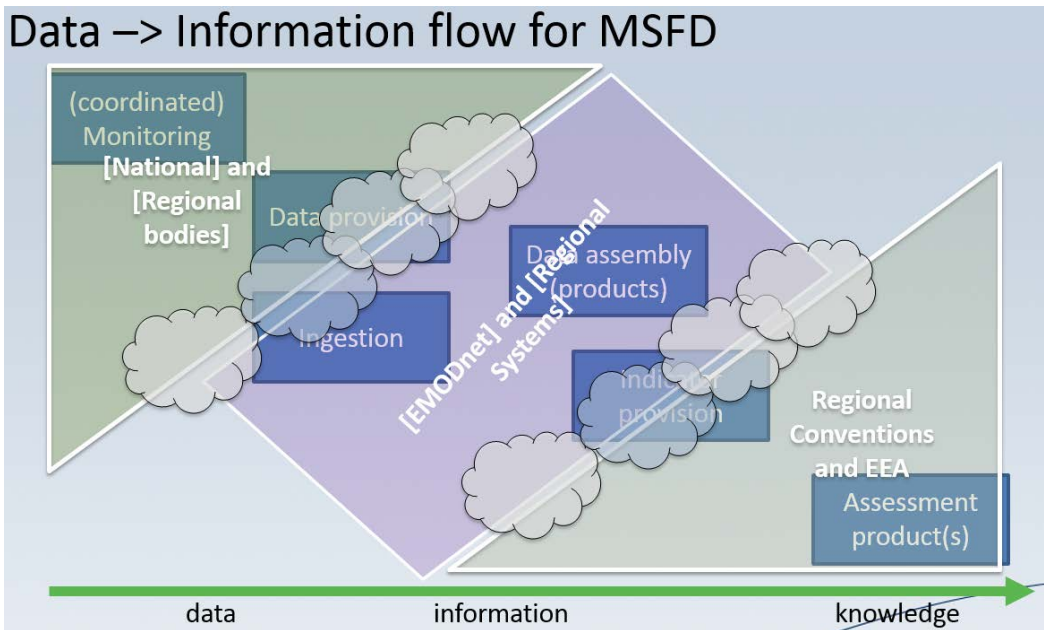
More specifically, phase II of EMODnet Chemistry has been challenged with providing specific products directly relevant to the Marine Strategy Framework Directive (MSFD), see below from DOW:

*calculate spatially distributed data products specifically relevant for Marine Strategy Framework Directive Descriptors 5 (eutrophication), 8 (chemical pollution) and 9 (contaminants in seafood)<sup>1</sup> based on guidance provided by the Marine Strategy Framework Directive Common Implementation Strategy*

Therefore the main focus of year 1 activities in WP5 has been to build the relationship between the MSFD process through WGDIKE and TGDATA and align this to what EMODnet Chemistry can offer. This is a challenging task as the conditions and infrastructure vary from one regional sea to the next, and the capacity of the Regional Sea Conventions (RSC's) varies in what they are able to facilitate themselves, and what additional help they may require.

One of the key starting aims is to establish where EMODnet Chemistry 'fits in' to these processes, so it will then be clearer where efforts should be targeted towards specific stakeholders and users. Through the TGDATA meetings it has become clearer in the chain of data-information-knowledge management where the different systems and projects have a role to play and that there will always be a degree of overlap and interplay between them (diagram below).

## Data → Information flow for MSFD



At the TGDATA meetings (July 2013, April 2014) EMODnet was successfully introduced in the agenda. The 2013 presentation concentrated in introducing the project and its aims, whereas the 2014 intervention started demonstrated a member state utilisation of the infrastructure and also previewed some of the products that EMODnet would be discussing in the June 2014 product workshop. A more general discussion was initiated on the way that TGDATA could, going forward, interact with EMODnet Chemistry. From the **draft** summary of the TGDATA D5 and D8 workshop in April a specific conclusion was reached on EMODnet Chemistry:

*“EMODnet Chemistry... could play a role in providing informational ‘state’ products, and as a reference point for understanding the general availability and distribution of data.”*

In addition, from the work presented at the workshop in terms of the availability of operational systems/data for the D5 and D8 MSFD indicators it was highlighted that particularly in the Mediterranean and Black Sea that there were opportunities for EMODnet Chemistry to provide infrastructure and products to support the MS/RSC’s.

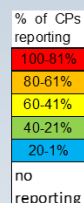
## MSFD key interactions (2014)

MSFD 8.1.1 : Concentration of the contaminants mentioned above, measured in the relevant matrix (such as biota, sediment and water) in a way that ensures comparability with the assessments under Directive 2000/60/EC

### Hazardous substances in biota

WFD priority substances (2008/105/EC, 2013/39/EC)	OSPAR	HELCOM	UNEP /MAP	BSC	WFD priority substances (2008/105/EC, 2013/39/EC)	OSPAR	HELCOM	UNEP /MAP	BSC
Alachlor					Polyaromatic hydrocarbons (PAH)	x	x	x	x
Anthracene	x	x	x	x	Simazine				
Atrazine					Tributyltin compounds	x	x		
Benzene					Trichlorobenzenes				
Brominated diphenylethers	x	x			Trichloromethane (chloroform)				
Cadmium and its compounds	x	x	x	x	Trifluralin				
Chloroalkanes, C 10-13		x			Dicofol				
Chlorfenvinphos					Perfluorooctane sulfonic acid and	x	x		
Chlorpyrifos (Chlorpyrifos-ethyl)	x				Quinoxifen				
1,2-dichloroethane					Dioxins and dioxin-like compound	x	x		x
Dichloromethane					Adonifen				
Dij(2-ethylhexyl)phthalate (DEHP)					Bifenox				
Diuron					Cybutryne				
Endosulfan	x	x			Cypermethrin ( 10 )				
Fluoranthene	x	x	x	x	Dichlorvos				
Hexachlorobenzene	x	x	x		Hexabromocyclododecanes (HBCDD)				
Hexachlorobutadiene	x	x			Heptachlor and heptachlor epoxide				
Hexachlorocyclohexane	x	x	x	x	Terbutryn				
Isoproturon					Carbon-tetrachloride				
Lead and its compounds	x	x	x	x	DDT total				
Mercury and its compounds	x	x	x		para-para-DDT	x	x		x
Naphthalene	x	x		x	Aldrin	x	x		x
Nickel and its compounds	x	x		x	Dieldrin	x	x		x
Nonylphenols					Endrin	x	x		x
Octylphenols ( 6 )					Isodrin	x	x		
Pentachlorobenzene	x				Tetrachloro-ethylene				
Pentachlorophenol					Trichloro-ethylene				

X denotes reporting



A specific EEA/DGENV workshop is planned for September with EMODnet Chemistry to look more closely into the type of products that the project can offer, and the specifics of decentralised reporting, and for the stakeholders to understand how this could be taken forward in TGDATA and other activities.

The next phase of WP5 will build on this promising start and the activity will also broaden out to include the related user feedback WP in the SeaDataNet II project. It is expected a new end user questionnaire will be developed to cover both of these projects as the user base, and the technology behind it are inter-linked.

## 7. Meetings held since last report

Date	Location	Topic	Short Description
3rd to the 5th of June 2013	Trieste, Italy	The EMODNet Chemistry 2 kick-off meeting	kick-off meeting
04-05 July 2013	hosted at EEA in Copenhagen	The meeting with Marine Observation and Data Expert Group (MODEG), WG-DIKE members and EMODNET	This session was intended to clarify existing working arrangements and a model for incorporating new ways of working towards 2018 MSFD reporting in a more regional setting.
10th and 11th September 2013	hosted by BODC at MRC Head office, London - United Kingdom	The 1st EMODNet Chemistry Technical Working Group TWG	The 1st meeting EMODNet Chemistry Technical Working starting to face the Chemistry Lot second phase challenges
17-20 September, 2013	Varna, Bulgaria	MARES2020, International Conference "Marine Research Horizon 2020	Chemistry Lot was presented with the communication "HOW CAN EMODNET ENGAGE IN SUPPORT TO THE MARINE ENVIRONMENT ASSESSMENT"
23-25 September 2013	Lucca, Italy	IMDIS 2013, International Conference on Marine Data and Information Systems	The Chemistry Lot activity and infrastructure was presented
28th - 31th October 2013	Constanta, Romania	BS-GES 2013, 4th Bi-annual Black Sea Scientific Conference Challenges Towards Good Environmental Status	Chemistry Lot was presented at Session 1: Pollution and Eutrophication presented
27 November 2013	CNR offices, Piazzale Aldo Moro 7	Meeting of the EMODNet Chemistry Italian institutes	Meeting held to coordinate the Italian participants
16 and 17 December 2013,	JPI Oceans office - Rue du Trône 130, B-1050 Brussels, Belgium.	The 1st EMODnet Lots Steering Committee Meeting	1st EMODnet Lots meeting with the Secretariat



20-21/1/2014	Rome	EMODNet Chemistry Steering Committee	Meeting of the Work Package Leaders and Regional Leaders
19-20/2/2014	Oostende	21 <sup>st</sup> MODEG	Meeting with DG-MARE, MODEG group, EMODnet Secretariat, EMODnet and Sea Basins check points coordinators
3-4/3/2014	Bruxelles	Healthy Oceans – Productive Ecosystems (HOPE) Conference	Meeting focused on the status of MSFD implementation and future steps
19-20/3/2014	Barcelona	Technical Working Group	Joint meeting between SeaDataNet and EMODNet Chemistry Technical Working groups
29-30/04/2014	Denmark	TG-DATA Workshop on nutrients (D5) and hazardous substances (D8)	EMODNet Chemistry has been presented by the national delegates to seek cooperation with RSC
17-18/06/2014	Split, Croatia	1 <sup>st</sup> Annual Meeting	The first Annual Meeting for the whole partnership of the Emodnet Chemistry Lot
19/06/2014	Split, Croatia	Expert Workshop	Workshop with the Steering Committee, technical partners and invited experts from Marine Conventions, other ongoing thematic projects and stakeholders
20/06/2014	Split, Croatia	3 <sup>rd</sup> Emodnet Chemistry Steering Committee	Emodnet Chemistry Steering Committee

## 8. Outreach and communication activities

Place & Date	Media	Title	Short description and/or link to the activity
Copenhagen (Denmark), 4-5/07/2013	Short oral presentation	EMODnet Chemistry support to MSFD data reporting. Examples from IT and Black Sea	Presentation at TG DIKE and Marine Data and Observation Export Group (MODEG)
Varna (Bulgaria), 17-19/9/2013	International Congress	How can EMODnet engage in support to the marine environmental assessment	Participation at MARES2020, Varna, September 2013
Lucca (Italy), September 2013	International congress	Modular Information Content for Ocean Data Systems	Presentation at IMDIS Conference
Lucca (Italy), September 2013	International congress	A new API for accessing ODV data collections from C++ and Java	Presentation at IMDIS Conference
Lucca (Italy), September 2013	International congress	Variational data analysis for generating ocean climatologies (DIVA) and web-based distribution of data products (OceanBrowser)	Presentation at IMDIS Conference
Lucca (Italy), September 2013	Poster in IMDIS2013	Near real-time quality data from ships to land	In the poster we described how the automatic dataflow from the research vessel to the land based systems helps the quality assurance of marine data.
Lucca (Italy), September 2013	International congress	On-line quality control service of MHI NASU	Poster at IMDIS Conference
Lucca (Italy), September 2013	International congress	Integration of oceanographic databases into the Geographic Information System (GIS) as support for Marine Spatial Planning. Case of Romanian Littoral	Presentation at IMDIS Conference

Lucca (Italy), September 2013	International congress	The Wadden Sea Long Term Ecosystem Research (WaLTER) project: Using the SeaDataNet infrastructure to provide access to integrated environmental and socio-economic data from the Dutch Wadden Sea	Poster at IMDIS Conference
DIVA course November 4-8 November 2013 (Corse, France)	Training course	Discussions with trainees	Training course in DIVA tool
Istanbul (Turkey) 3-4 December 2013	International Black Sea Club	EMODnet Chemistry Presentation	Introduction of EMODNET Chemistry project and EMODNET Chemical portal
January 2014	Journal: Geosci. Model Dev	divand-1.0: n-dimensional variational data analysis for ocean observations	<a href="http://dx.doi.org/10.5194/gmd-7-225-2014">Extension to higher dimensions for DIVA: http://dx.doi.org/10.5194/gm d-7-225-2014</a>
Jan 22, 2014	Presentation slide; discussion	BALSAM work package 2	Discussing how BALSAM project could leverage the work of EMD Chem in relation to Baltic region
February 2014	Journal: Journal of Atmospheric & Oceanic Technology	Approximate and Efficient Methods to Assess Error Fields in Spatial Gridding with Data Interpolating Variational Analysis (DIVA)	New and more efficient methods for computing the error field in DIVA have been derived.
Honolulu (USA) February 2014	International congress	The GEOTRACES Intermediate Data Product	Presentation at AGU Ocean Sciences Meeting
March 4-5, 2014, Istanbul, Turkey.	Seminar to the data holder groups	“The importance of sharing the data to build the whole photograph”	The presentations on the data collection, data production and data quality management were made in the light of EMODnet Chemistry 2 project.
Ukrainian Scientific Centre of Ecology of the Sea Ministry of	Scientific Council meeting	“Data exchange and sharing” Emodnet Chemistry 2 Project according to EU approaches	UkrSES presented Emodnet Chemistry 2 project within the Scientific Council meeting for the development of the National Strategy for Data

Ecology and Natural Resources of Ukraine, March 2014			collection and exchange in Ukraine
Varna (Bulgaria), 01-02/04/2014	Meeting of Black sea Local and Regional Authorities (Bulgaria, Romania, Georgia)	EMODnet Chemistry Presentation	- To improve the governance of the seas, in particular through the Regional Sea Conventions and effective implementation of the Marine Strategy Framework Directive and other relevant EU environmental legislation;
Odessa (Ukraine) 15-16 April 2014	Black sea Municipalities network meeting	EMODnet Chemistry Presentation	Introduction of EMODNET Chemistry project and EMODNET Chemical portal
April 16 2014, Nantes, France	VALOR'IG days	Time series transmission to EMODnet with a SURVAL product	General information for French marine scientific community on the project
Copenhagen (Denmark), 29-30/04/2014	Short oral presentation	EMODnet Chemistry	Presentation at TG DATA, for presentation of Chemistry Lot for MSFD implementation and cooperation with Regional Sea Conventions
29-30 April, 2014	Presentation slide	EMODnet Chem products workshop	Invitation to TGDATA participants for June workshop
01/04/2014	Internet	DIVA release 4.6.5	<a href="http://modb.oce.ulg.ac.be/mediawiki/index.php/DIVA">New version of DIVA http://modb.oce.ulg.ac.be/mediawiki/index.php/DIVA</a>
15. April 2014	3d Workshop, Program: "Monitoring and Observation System for an ongoing assessment of the Adriatic Sea"	Presentation of EMODNET project	One hour presentation of objectives and activities performed in the EMODNET Project with special attention on Chemistry Lot

Vienna, 27 April - 2 May 2014	European Geosciences Union General Assembly 2014	Data-Interpolating Variational Analysis (DIVA) software : recent development and application	<a href="http://hdl.handle.net/2268/165681">Presentation of DIVA: http://hdl.handle.net/2268/165681</a>
Vienna, 27 April - 2 May 2014	EGU General Assembly	Using metadata attributes for choice a template of data visualization	<a href="http://meetingorganizer.copernicus.org/EGU2014/EGU2014-2543.pdf">http://meetingorganizer.copernicus.org/EGU2014/EGU2014-2543.pdf</a>
Seadatanet Second training course 20-22 May 2014 (Ostend, Belgium)	Technical meeting	Contribution in discussions with trainees	Training course in ODV and DIVA products
Tirana (Albania) 27-28 May 2014	Adriatic-Danube-Black Sea multimodal platform	Introduction of EMODNET Chemistry project and EMODNET Chemical portal.	Protecting environment of South East European area.
Oostende (Belgium) May 2014	Training Course	Using ODV for quality control and data aggregation	2 <sup>nd</sup> SDN Training Course
May 27, Ankara, MFA, Turkey	2 <sup>nd</sup> meeting of Turkey-EU Maritime Dialogue	Involvement in seabed habitat mapping and marine data networking (EMODNET)	Presentation of IMS-METU activities within the EUSeaMap and EMODNET-Chemistry projects.
June 10 2014, Brest, France	Sextant catalogue and service managers day	SeaDataNet and EMODNET in Sextant (T Loubrieu)	As a Sextant use case, the projects SeaDataNet and EMODNET are presented to the community of catalogue managers.
June 2014	Internet	DIVAnd release 1.1.2	<a href="http://octave.sourceforge.net/divand/">New version of DIVAnd http://octave.sourceforge.net/divand/</a>
June 2014	Internet	DIVAnd release 1.1.2	<a href="http://modb.oce.ulg.ac.be/mediawiki/index.php/Divand">http://modb.oce.ulg.ac.be/mediawiki/index.php/Divand</a>
01/06/2014	Pdf file	Atlantic area, quality checks of nutrients data	Description of all QC performed on the aggregated dataset of nutrients in the Atlantic region

Las Palmas de Gran Canaria (Spain), 11-13/6/2014	IV Simposio Internacional de Ciencias del Mar.	Recovery and Homogenization of marine chemical data from IEO systematic monitoring programs. Tel, E., García, M.J., de Armas, D., Bellas, J., Bode, A., Cabanas, J.M., García Martínez, M.C., León, V.M., Campillo, J.A., Rodríguez, M.C., Sánchez Leal, R., Vélez, P., Viñas, L.	Oral Presentation at IV-ISMS (*)
Las Palmas de Gran Canaria (Spain), 11-13/6/2014	XVII Seminario Ibérico de Química Marina	Phytoplankton and nutrient trends in different areas of the western Mediterranean Sea. Garcia-Martinez, M.C., Moya, F. Vargas-Yanez, M. Lopez-Jurado, J.L. Serra, M. Tel, E. Balbín, R. Aparicio, A. Amengual, B.	Poster at XVII SIQUIMAR (*)
Las Palmas de Gran Canaria (Spain), 11-13/6/2014	XVII Seminario Ibérico de Química Marina	Carbon dioxide. Spatial and seasonal variability in the southwestern Spanish mediterranean	Oral Presentation. at XVII SIQUIMAR (*)
Las Palmas de Gran Canaria (Spain), 11-13/6/2014	IV Simposio Internacional de Ciencias del Mar.	European initiatives to disseminate the Geo-information of marine environment: EMODNET. Marine Knowledge 2020. IEO contributions	Oral Presentation at IV-ISMS (*)
Ministry of Sustainable Development and Tourism, Podgorica, 24 of June 2014	Work shop	“Institutional and legislative framework for integrated coastal zone management in Montenegro”	IBMK presented Emodnet Chemistry 2 project within the consulting meeting for the development of the National Strategy for Integrated Coastal Zone Management (NS ICZM) in Montenegro
June 2013-today	Meetings/Disussions	Internal Institutional meetings	For introduction and familiarization with EMODnet
Various dates	Powerpoint	various	EMODNet Chemistry is usually shown as one means to disseminate data archived at PANGAEA

## 9. Updates on Progress Indicators

---

### *Indicator 1 - Volume of data made available through the portal*

The total number of CDIs for chemistry data sets has increased in the last bi-month (may-June 2014) from: **654440 to 661820**

This covers the whole globe. Specifically relevant for European waters has increased in the same period from: **581300 to 588177**. Lat Long box: **N80, W-30 ; N20, E45**

Of these **481178** are unrestricted (unrestricted and SeaDataNet license) , while others (**106999**) require (possible) negotiation due to restrictions.



Note: a division per MSFD region will be provided in future progress reports, once the boundaries of the MSFD regions have been cleared by EEA and DG Environment, and integrated into the CDI User Interface.

Comparing these numbers with the situation at the end of the Pilot Project, June 2013 we find **an overall increase of 279266 CDIs (from 382554 to 661820)**. **For the bounding box** specifically relevant for European waters we find an increase of **276079 (from 312098 to 588177)**.

The division per **Discovery Parameter** at the end of June 2014 is as follows:

Per Discovery Parameter	Datasets
Dissolved oxygen parameters in the water column	391086
Salinity of the water column	368071
Temperature of the water column	362738
Phosphate concentration parameters in the water column	240598
Nitrate concentration parameters in the water column	209775
Silicate concentration parameters in the water column	190472
Chlorophyll pigment concentrations in the water column	162454
Ammonium concentration parameters in the water column	162236
Nitrite concentration parameters in the water column	131104
Vertical spatial coordinates	118622
Particulate total and organic nitrogen concentrations in the water column	86311
Particulate total and organic phosphorus concentrations in the water column	79671
Alkalinity, acidity and pH of the water column	78012
Density of the water column	74244
Dissolved total or organic phosphorus concentration in the water column	67179
Dissolved total and organic nitrogen concentrations in the water column	49989
Phaeopigment concentrations in the water column	26304
Concentration of suspended particulate material in the water column	22384
Particulate total and organic carbon concentrations in the water column	21521
Electrical conductivity of the water column	20185
Raw fluorometer output	19887
Transmittance and attenuation of the water column	19399
Dissolved organic carbon concentration in the water column	18316
Moored instrument depth	13260
Redox potential in sediment	10092
Inorganic chemical composition of sediment or rocks	9956
Temperature variation in the water column	9935
Concentration of inorganic sulphur species in the water column	9501
Secchi disk depth	8760
Dissolved inorganic nitrogen concentration in the water column	8471
Date and time	8304
Visible waveband radiance and irradiance measurements in the water column	7593
Concentration of polycyclic aromatic hydrocarbons (PAHs) in sediment samples	6647
Nitrogen concentrations in suspended particulate material	6249
Carbon concentrations in sediment	5977
Metal concentrations in biota	5936
Carbon concentrations in suspended particulate material	5915
Dissolved metal concentrations in the water column	5655



Raw temperature and/or salinity instrument output	5295
Raw oxygen sensor output	5185
Concentration of polychlorobiphenyls (PCBs) in sediment samples	5135
Unspecified	4601
Concentration of polychlorobiphenyls (PCBs) in biota	4593
Optical backscatter	4221
Concentration of other organic contaminants in the water column	4131
Sound velocity and travel time in the water column	3986
Variable fluorescence parameters	3774
Raw light meter output	3724
Sediment grain size parameters	3650
Sea level	3335
Pesticide concentrations in biota	2697
Concentration of other hydrocarbons in the water column	2695
Carotenoid pigment concentrations in the water column	2676
Unclassified pigment concentrations in the water column	2676
Concentration of other organic contaminants in sediment samples	2268
Radioactivity in the water column	2080
Reference numbers	1966
Raw suspended particulate material concentration sensor output	1792
Concentration of polycyclic aromatic hydrocarbons (PAHs) in biota	1655
Pesticide concentrations in water bodies	1564
Concentration of other organic contaminants in biota	1479
Total metal concentrations in water bodies	1451
Pesticide concentrations in sediment	1382
Particulate metal concentrations in the water column	1199
Lithology	1090
Dissolved concentration parameters for other gases in the water column	1059
Concentration of polycyclic aromatic hydrocarbons (PAHs) in suspended particulate material	1051
Primary production in the water column	1018
Organometallic species concentration parameters in sediments	990
Light absorption in the water column	941
Concentration of organic matter in sediments	922
Concentration of polychlorobiphenyls (PCBs) in the water column	867
Nitrogen concentrations in sediment	798
Urea concentration parameters in the water column	776
Sea level expressed as pressure	734
Sediment water content, porosity and surface area	694
Horizontal velocity of the water column (currents)	655
Suspended particulate material grain size parameters	653

Concentration of carbohydrates, phenols, alkanols (alcohols), ethers, aldehydes and ketones in sediment	648
Concentration of other organic contaminants in suspended particulate material	648
Concentration of polycyclic aromatic hydrocarbons (PAHs) in the water column	473
Geological sample radioactivity	397
Phosphorus concentrations in suspended particulate material	333
Phytoplankton taxonomic abundance in water bodies	332
Terrestrial detritus in the water column suspended particulate material	322
Total dissolved inorganic carbon (TCO <sub>2</sub> ) concentration in the water column	320
Organometallic species concentration parameters in biota	318
Bacteria generic abundance in water bodies	293
Acoustic backscatter in the water column	283
Metadata parameters	220
Zooplankton and zoobenthos morphological parameters	220
Concentration of carbohydrates, phenols, alkanols (alcohols), aldehydes and ketones in water bodies	194
Concentration of proteins in the water column	194
Suspended particulate material aggregates	176
Concentration of inorganic halogens in water bodies	168
Concentration of polychlorobiphenyls (PCBs) in suspended particulate material	163
Shellfish morphology, age and physiology	163
Other halocarbon concentrations in water bodies	156
Regenerated production in water bodies	141
New production in water bodies	139
Oxygen production and respiration in the water column	136
Other physical and chemical properties of suspended particulate material	132
Concentration of alkanes in the water column	122
Dissolved trace metalloid concentrations in the water column	118
Fish morphology, age and physiology	117
Phaeopigment concentrations in sediment	108
Raw in-situ nutrient analyser output	105
Visible waveband radiance and irradiance measurements in the atmosphere	100
Geological sample density	79
Organosulphur species concentration parameters in the water column	76
Concentration of inorganic sulphur species in sediment	66
Bacteria non taxonomy-related biomass expressed as carbon per unit volume of the water column	63
Colloidal organic carbon concentration in the water column	60
Excretion rate parameters in the water column	55

Nitrification rate in the water column	54
Mineralogical composition	47
Concentration of dissolved organic matter in the water column	44
Concentration of adenylates in the water column	38
Bacterial production in the water column	36
Phytoplankton generic abundance in water bodies	36
Phytoplankton generic biomass in water bodies	36
Trace metalloid concentrations in biota	33
Water body lipid concentrations	32
Phytoplankton taxonomic biomass in water bodies	30
Plankton biomass expressed as carbon per unit volume of the water column	27
Air temperature	25
Air pressure	24
Wave direction	23
Wave height and period statistics	23
Wind strength and direction	23
Concentration of silicon species in the water column	21
Geological sample magnetic, electrical and acoustic properties	21
Stable isotope enrichment in the water column	20
Zoobenthos taxonomic abundance	17
Dissolved organic carbon concentrations in sediment pore waters	16
Nutrient concentrations in sediment pore waters	16
Zoobenthos taxonomy-related wet weight biomass per unit area of the bed	16
Chlorofluorocarbon concentrations in the water column	15
Zoobenthos dry weight biomass	14
Zooplankton taxonomy-related abundance per unit volume of the water column	14
Organometallic species concentration parameters in water bodies	13
Metal concentrations in sediment pore waters	3
Horizontal spatial co-ordinates	2
Platform or instrument orientation	2
Zooplankton taxonomy-related biomass expressed as carbon per unit volume of the water column	2
Dissolved oxygen concentration parameters in sediment pore waters	1
Engineering parameters	1
Sediment lipid concentrations	1

The following table summarizes the increase of CDIs in the last year:

Per Discovery Parameter	increase
Dissolved oxygen parameters in the water column	201249
Salinity of the water column	148871
Temperature of the water column	144040
Phosphate concentration parameters in the water column	115989
Nitrate concentration parameters in the water column	111443
Silicate concentration parameters in the water column	101137
Chlorophyll pigment concentrations in the water column	96823
Ammonium concentration parameters in the water column	87189
Particulate total and organic phosphorus concentrations in the water column	73010
Particulate total and organic nitrogen concentrations in the water column	67645
Nitrite concentration parameters in the water column	46700
Vertical spatial coordinates	24168
Density of the water column	16416
Phaeopigment concentrations in the water column	12830
Alkalinity, acidity and pH of the water column	10515
Dissolved total or organic phosphorus concentration in the water column	9837
Dissolved total and organic nitrogen concentrations in the water column	8391
Dissolved inorganic nitrogen concentration in the water column	6390
Electrical conductivity of the water column	4426
Concentration of suspended particulate material in the water column	4099
Transmittance and attenuation of the water column	2914
Variable fluorescence parameters	2786
Raw fluorometer output	2713
Secchi disk depth	2703
Temperature variation in the water column	2702
Date and time	2576
Metal concentrations in biota	1804
Concentration of polychlorobiphenyls (PCBs) in biota	1780
Visible waveband radiance and irradiance measurements in the water column	1780
Dissolved metal concentrations in the water column	1628
Inorganic chemical composition of sediment or rocks	1330
Concentration of polycyclic aromatic hydrocarbons (PAHs) in sediment samples	1256
Carbon concentrations in sediment	1027
Light absorption in the water column	917
Concentration of other organic contaminants in biota	910
Pesticide concentrations in biota	869
Concentration of polychlorobiphenyls (PCBs) in sediment samples	798
Particulate total and organic carbon concentrations in the water column	698
Concentration of other hydrocarbons in the water column	684
Concentration of polycyclic aromatic hydrocarbons (PAHs) in biota	617

Dissolved organic carbon concentration in the water column	575
Concentration of inorganic sulphur species in the water column	570
Concentration of carbohydrates, phenols, alkanols (alcohols), ethers, aldehydes and ketones in sediment	420
Pesticide concentrations in water bodies	352
Unspecified	331
Concentration of other organic contaminants in the water column	304
Optical backscatter	280
Carbon concentrations in suspended particulate material	258
Raw suspended particulate material concentration sensor output	254
Particulate metal concentrations in the water column	218
Total metal concentrations in water bodies	205
Nitrogen concentrations in sediment	180
Carotenoid pigment concentrations in the water column	176
Suspended particulate material aggregates	176
Unclassified pigment concentrations in the water column	176
Dissolved concentration parameters for other gases in the water column	171
Concentration of polychlorobiphenyls (PCBs) in the water column	168
Organometallic species concentration parameters in sediments	167
Concentration of polycyclic aromatic hydrocarbons (PAHs) in the water column	140
Pesticide concentrations in sediment	86
Raw in-situ nutrient analyser output	69
Colloidal organic carbon concentration in the water column	60
Concentration of other organic contaminants in sediment samples	35
Dissolved trace metalloid concentrations in the water column	35
Sound velocity and travel time in the water column	33
Other halocarbon concentrations in water bodies	32
Raw light meter output	29
Radioactivity in the water column	21
Concentration of silicon species in the water column	18
Chlorofluorocarbon concentrations in the water column	15
Phosphorus concentrations in suspended particulate material	15
Total dissolved inorganic carbon (TCO <sub>2</sub> ) concentration in the water column	9
Air temperature	5
Air pressure	3
Horizontal velocity of the water column (currents)	3
Wave direction	3
Wave height and period statistics	3
Wind strength and direction	3
Visible waveband radiance and irradiance measurements in the atmosphere	2

***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).***

Per CDI Partner	Country	Datasets
Aarhus University, Department of Bioscience, Marine Ecology Roskilde	Denmark	184783
Swedish Meteorological and Hydrological Institute	Sweden	61749
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	Italy	48718
British Oceanographic Data Centre	United Kingdom	42432
IFREMER / IDM/SISMER	France	18547
Southern Scientific Research Institute of Marine Fisheries and Oceanography	Ukraine	18228
German Oceanographic Datacentre (NODC)	Germany	17210
Marine Systems Institute at Tallinn University of Technology	Estonia	16828
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)	Russian Federation	16101
IEO/Spanish Oceanographic Institute	Spain	14190
Institute of Marine Research - Norwegian Marine Data Centre (NMD)	Norway	13968
Rijkswaterstaat Waterdienst	Netherlands	13197
Netherlands Institute for Ecology, Centre for Estuarine and Marine Ecology	Netherlands	12894
P.P.Shirshov Institute of Oceanology, RAS	Russian Federation	11892
Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre	Belgium	9184
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	8681
Finnish Meteorological Institute	Finland	7985
Institute of Marine Sciences, Middle East Technical University	Turkey	7890
Marine Institute	Ireland	6893
Ukrainian scientific center of Ecology of Sea (UkrSCES)	Ukraine	6240
National Institute for Marine Research and Development Grigore Antipa	Romania	5208
National Institute of Biology - NIBMarine Biology Station	Slovenia	4237
Marine Hydrophysical Institute	Ukraine	3708
NIOZ Royal Netherlands Institute for Sea Research	Netherlands	3673
Israel Oceanographic and Limnological Research (IOLR)	Israel	3623
Institute of Meteorology and Water Management, Maritime Branch in Gdynia (IMWM MB)	Poland	2672
PANGAEA - Data Publisher for Earth & Environmental Science	Germany	2594

Flanders Marine Institute	Belgium	1967
Marine branch of Ukrainian Hydrometeorological Institute	Ukraine	1936
Institute of Oceanography and Fisheries	Croatia	1625
Dokuz Eylul University, Institute of Marine Science and Technology	Turkey	1603
Institute of Marine Science (ISMAR) - Ancona	Italy	1574
IHPT, Hydrographic Institute	Portugal	1387
Latvian Institute of Aquatic Ecology	Latvia	1369
BRGM / Office of Geological and Mining Resources	France	1087
Scientific - Research Firm GAMMA	Georgia	1030
Institute of Biology of the Southern Seas, NAS of Ukraine	Ukraine	998
International Council for the Exploration of the Sea (ICES)	Denmark	934
National Laboratory of Energy and Geology	Portugal	919
Odessa National I.I.Mechnikov University	Ukraine	888
National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences	Bulgaria	837
Institut National des Sciences et Technologies de la Mer – INSTM	Tunisia	783
Faculty of Geography and Earth Sciences, University of Latvia (LU)	Latvia	721
ISPRA-Institute for Environmental Protection and Research	Italy	711
Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	623
Geological Survey of Estonia	Estonia	542
Cyprus Oceanography Center	Cyprus	518
Iv.Javakhishvili Tbilisi State University, Centre of Relations with UNESCO Oceanological Research Centre and GeoDNA (UNESCO)	Georgia	404
Sinop University, Fisheries Faculty	Turkey	343
National Institute of Fisheries Research (INRH)	Morocco	326
Polish Geological Institute - National Research Institute, Branch of Marine Geology (PGI BMG)	Poland	326
Institute of Fishery Resources (IFR)	Bulgaria	257
Istanbul University, Institute of Marine Science and Management	Turkey	256
Karadeniz Technical University, Faculty of Marine Sciences	Turkey	245
Russian State Hydrometeorological University, St-Petersburg	Russian Federation	139
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	128
CNR, Institute of Marine Science U.O.S. of Pozzuolo di Lerici (SP)	Italy	118
Institute of Geology and Geography of Nature Research Centre	Lithuania	118
Taurida V.I. Vernadsky National University	Ukraine	55
Danube Hydro-meteorological Observatory	Ukraine	44
Ankara University	Turkey	24
Institute of Marine Biology (IMBK)	Montenegro	13
Scientific Research Institute of Ecological Problems (USRIP)	Ukraine	4

These centres are government and research institutes. No industry.

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

Time period 1 May 2014 – 30 June 2014:

RSM => EMODNET Chemistry portal

No of CDI basket transactions: 14

No of CDIs requested: 101727

Different users: 4

Different data centres: 15

#### **OceanBrowser Reporting**

<b>DIVA data product (direct download or OPENDAP)</b>	
Data product	Downloads
Arctic->S19973352004334_CLIM_CHL_BARS	2
Arctic->Salinity.19702008	2
Arctic->Temperature.19702008	2
Atlantic->Salinity.19752008	2
Atlantic->Temperature.19752008	17
Baltic->AMON.19752005	2
Baltic->H2SX.19752005	2
Baltic->NTOT.19752005	2
Baltic->S19973352004334_CLIM_CHL_BALT	2
Baltic->SLCA.19752005	2
Baltic->Salinity.19752005	2
Baltic->Temperature.19752005	2
Baltic->season_CPHL.19752005	2
Baltic->season_SLCA.19752005	2



Baltic->season_TPHS.19752005	2
Black Sea->Annual distribution->Alk_annual	1
Black Sea->Annual distribution->Alkalinity_annual	2
Black Sea->Annual distribution->Annual_Cs134_BlackSea	2
Black Sea->Annual distribution->Annual_Cs137_BlackSea	2
Black Sea->Annual distribution->As_annual	2
Black Sea->Annual distribution->Co_annual	2
Black Sea->Annual distribution->Cr_annual	2
Black Sea->Annual distribution->Cu_annual	2
Black Sea->Annual distribution->NH4_annual	2
Black Sea->Annual distribution->NO2_NO3_annual	2
Black Sea->Annual distribution->NO2_annual	1
Black Sea->Annual distribution->NO3_annual	2
Black Sea->Annual distribution->Ni_annual	2
Black Sea->Annual distribution->Oxygen_annual	2
Black Sea->Annual distribution->PO4_annual	1
Black Sea->Annual distribution->Pb_annual	2
Black Sea->Annual distribution->SiO3_annual	1
Black Sea->Annual distribution->Sr_annual	2
Black Sea->Annual distribution->V_annual	2
Black Sea->Annual distribution->Zn_annual	7
Black Sea->Monthly distribution->NO2_monthly	1
Black Sea->Monthly distribution->Oxygen_monthly	1
Black Sea->Monthly distribution->PH_monthly	1
Black Sea->Monthly distribution->PO4_monthly	2
Black Sea->Monthly distribution->SiO3_monthly	1
Black Sea->Seasonal distribution->Alkalinity.19202011	2
Black Sea->Seasonal distribution->Alkalinity_seasonal	2
Black Sea->Seasonal distribution->NH4.19202011	2
Black Sea->Seasonal distribution->NH4_seasonal	2
Black Sea->Seasonal distribution->NO2.19202011	2
Black Sea->Seasonal distribution->NO2_NO3_seasonal	2
Black Sea->Seasonal distribution->NO2_seasonal	2
Black Sea->Seasonal distribution->NO3.19202011	13
Black Sea->Seasonal distribution->NO3_seasonal	2
Black Sea->Seasonal distribution->PH_seasonal	2
Black Sea->Seasonal distribution->PO4_seasonal	3
Black Sea->Seasonal distribution->SiO3_seasonal	2
Black Sea->Seasonal distribution->o2.19202011	2
Black Sea->Seasonal distribution->pH.19242011	2
Black Sea->Seasonal distribution->po4.19202011	2

Black Sea->Seasonal distribution->sio3.19202011	2
Black Sea->seasonal_clim_dt_ref_mno_merged_msla_y1993_2008	4
Global->monthly_clim_dt_ref_global_merged_msla_y1993_2008	5
Global->seasonal_clim_dt_ref_global_merged_msla_y1993_2008	2
Mediterranean Se->JRA5_Temperature.19002009-2	1
Mediterranean Sea->Balearic Sea->Winter->Nitrite	1
Mediterranean Sea->GOS-ChIHR-MED_monthlyCLIMv2_1	1
Mediterranean Sea->GOS-L4HRfnd-MED_monthlyCLIMv2_1	6
Mediterranean Sea->Gulf of Athens->Annual distribution (1987-1994)->NTRA	1
Mediterranean Sea->Gulf of Athens->Annual distribution (1987-1994)->PHOS	1
Mediterranean Sea->Gulf of Athens->Annual distribution (1995-2007)->PHOS	1
Mediterranean Sea->Gulf of Athens->Mean distribution (1990-1999)->Dissolved_Cd	1
Mediterranean Sea->Gulf of Athens->Mean distribution (1990-1999)->Dissolved_Pb	1
Mediterranean Sea->Gulf of Athens->Mean distribution (2000-2010)->Dissolved_Cd	2
Mediterranean Sea->Gulf of Athens->Mean distribution (2000-2010)->Dissolved_Pb	2
Mediterranean Sea->Gulf of Athens->Seasonal distribution (1987-1994)->NTRA	1
Mediterranean Sea->Gulf of Athens->Seasonal distribution (1987-1994)->PHOS	1
Mediterranean Sea->Gulf of Athens->Seasonal distribution (1995-2007)->NTRA	2
Mediterranean Sea->Gulf of Athens->Seasonal distribution (1995-2007)->PHOS	2
Mediterranean Sea->Gulf of Lions->Phosphate.19712003	2
Mediterranean Sea->JRA5_Ammonium.18902008	2
Mediterranean Sea->JRA5_Salinity.19002009	2
Mediterranean Sea->JRA5_Temperature.19002009-2	5
Mediterranean Sea->Nitrate.18902008	1
Mediterranean Sea->North Adriatic->Nitrate	1
Mediterranean Sea->North Adriatic->Phosphate	1
Mediterranean Sea->Phosphate.18902008	1
North Sea->NTRA.19702009	2
Total	188
<b>DIVA data product (Web Map Service)</b>	
Region	Downloads
Black Sea->Annual distribution->Alk_annual	16825
Black Sea->Annual distribution->Alkalinity_annual	12
Black Sea->Annual distribution->NH4_annual	2
Black Sea->Annual distribution->NO2_NO3_annual	79
Black Sea->Annual distribution->NO2_annual	316
Black Sea->Annual distribution->NO3_annual	75
Black Sea->Annual distribution->PO4_annual	21
Black Sea->Annual distribution->SiO3_annual	24

Black Sea->Annual distribution->V_annual	2
Black Sea->Annual distribution->Zn_annual	14
Black Sea->Monthly distribution->NO2_monthly	159
Black Sea->Monthly distribution->Oxygen_monthly	74
Black Sea->Monthly distribution->PO4_monthly	2502
Black Sea->Monthly distribution->SiO3_monthly	83
Black Sea->Seasonal distribution->NO2.19202011	88
Black Sea->Seasonal distribution->NO2_NO3_seasonal	27
Black Sea->Seasonal distribution->NO3.19202011	231
Mediterranean Sea->Balearic Sea->Fall->Nitrite	120
Mediterranean Sea->Balearic Sea->Spring->Nitrite	50
Mediterranean Sea->GOS-ChIHR-MED_monthlyCLIMv2_1	1307
Mediterranean Sea->GOS-ChIHR-MED_monthlyCLIMv2_1_chl_climatology	4
Mediterranean Sea->Gulf of Athens->Annual distribution (1987-1994)->NTRA	100
Mediterranean Sea->Gulf of Athens->Annual distribution (1987-1994)->PHOS	24
Mediterranean Sea->Gulf of Athens->Annual distribution (1995-2007)->NTRA	12
Mediterranean Sea->Gulf of Athens->Mean distribution (2000-2010)->Dissolved_Cd	12
Mediterranean Sea->Gulf of Athens->Seasonal distribution (1995-2007)->PHOS	142
Mediterranean Sea->JRA5_Ammonium.18902008	1581
Mediterranean Sea->JRA5_Chlorophyll.18902008	1804
Mediterranean Sea->Levantine Basin->NTRA	58
Mediterranean Sea->Nitrate.18902008	134
Mediterranean Sea->Nitrite.18902008	50
Mediterranean Sea->North Adriatic->Nitrate	1944
Mediterranean Sea->North Adriatic->Phosphate	83
Mediterranean Sea->Oxygen.18902008	1149
Mediterranean Sea->Phosphate.18902008	164
Mediterranean Sea->Silicate.18902008	60
Mediterranean Sea->pH.18902008	33
North Sea->NTRA.19702009	8510
North Sea->NTRI.19702009	55
North Sea->PHOS.19702009	658
Total	38588
Note: The download count represent the individual WMS tiles.	
Time series	
Region	Downloads
Adriatic	8
Aegean Sea	2

Baltic	50
Black Sea	187
Greater North Sea	132
Western Mediterranean Sea	30
Total	409

### ***Indicator 5 - Organisations that have downloaded each data type***

From CDI service:

DMU, Denmark  
MSI, Estonia  
OC-UCY - Cyprus  
ZMAW, Germany

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

Statistics of use of CDI service:

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2013	34	37	510	1,532	41.20 MB
Feb 2013	65	90	569	1,364	579.12 KB
Mar 2013	97	157	1,436	3,658	11.07 MB
Apr 2013	44	67	798	2,440	17.68 MB
May 2013	38	74	7,034	9,540	95.41 MB
Jun 2013	61	79	1,728	3,480	28.36 MB
Jul 2013	40	50	1,267	3,419	23.41 MB
Aug 2013	58	66	828	2,209	98.95 MB
Sep 2013	50	52	425	1,371	12.82 MB
Oct 2013	112	160	2,654	10,347	57.58 MB
Nov 2013	57	94	2,584	5,965	66.85 MB

Dec 2013	88	136	2,853	5,559	95.76 MB
<b>Total</b>	<b>744</b>	<b>1,062</b>	<b>22,686</b>	<b>50,884</b>	<b>549.65 MB</b>

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2014	119	252	15,734	23,892	320.19 MB
Feb 2014	100	236	4,185	8,008	104.66 MB
Mar 2014	97	209	5,479	11,620	127.09 MB
Apr 2014	98	160	3,531	10,093	104.99 MB
May 2014	68	109	2,542	5,467	572.57 MB
Jun 2014	102	218	4,756	10,415	113.42 MB

### Statistics of use of Ocean Browser service:

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2013	40	55	8,182	10,783	191.84 MB
Feb 2013	29	41	259	1,254	69.31 MB
Mar 2013	28	45	45,784	48,049	257.28 MB
Apr 2013	41	82	23,382	25,784	250.89 MB
May 2013	47	87	6,491	10,233	258.95 MB
Jun 2013	47	95	37,321	40,437	281.21 MB
Jul 2013	41	90	15,003	18,076	3.04 GB
Aug 2013	45	96	13,274	16,806	12.04 GB
Sep 2013	59	126	37,954	41,620	872.66 MB
Oct 2013	79	127	14,887	18,925	415.31 MB
Nov 2013	59	132	13,835	18,275	347.49 MB
Dec 2013	68	136	34,004	38,379	451.47 MB
<b>Total</b>	<b>583</b>	<b>1,112</b>	<b>250,376</b>	<b>288,621</b>	<b>18.39 GB</b>

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2014	76	160	29,327	33,702	354.25 MB
Feb 2014	78	153	13,052	18,108	608.02 MB
Mar 2014	77	162	38,086	44,153	760.29 MB
Apr 2014	73	164	20,507	25,222	897.50 MB
May 2014	64	98	6,144	10,807	183.24 MB
Jun 2014	107	162	20,483	28,974	2.85 GB

### Statistics of use of Chemistry Lot web site:

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2013	19	21	22	22	359.46 KB
Feb 2013	11	11	16	16	285.60 KB
Mar 2013	6	6	7	7	104.56 KB
Apr 2013	17	19	24	24	450.24 KB
May 2013	28	58	78	78	106.72 MB
Jun 2013	57	104	406	406	1.15 GB
Jul 2013	26	42	70	81	49.73 MB
Aug 2013	20	29	49	49	47.28 MB
Sep 2013	35	51	84	84	78.95 MB
Oct 2013	85	136	199	199	98.67 MB
Nov 2013	44	68	109	129	120.90 MB
Dec 2013	37	51	75	75	67.68 MB
<b>Total</b>	<b>385</b>	<b>596</b>	<b>1139</b>	<b>1170</b>	<b>1.70 GB</b>

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2014	54	103	201	201	191.62 MB
Feb 2014	38	52	97	218	82.03 MB
Mar 2014	31	60	135	524	43.49 MB
Apr 2014	24	42	60	290	46.11 MB
May 2014	24	52	92	504	5.39 MB
Jun 2014	167	255	367	791	43.98 MB

## 10. Additional User Statistics

---

*Please provide an overview of all user-statistics for your website and portal which have not been already provided in the section on progress indicators.*



## ***Annex 1***

*Atlantic area: Quality checks of nutrients data by N. Debray ODE-DYNECO-VIGIES and M. Fichaut IMN-IDM-SISMER*

## ***Annex 2***

*Black Sea: Data Collection and Metadata Compilation - nutrients data by Luminita Buga and George Sarbu - NIMRD*

## ***Annex 3***

*Mediterranean Sea: Quality Checks of Nutrients Data by Sissy Iona, HCMR/HNODC*