EMODnet Lot 3 – Chemical data

FIRST INTERIM REPORT

Version 1.1

4/6/2009 to 4/6/2010

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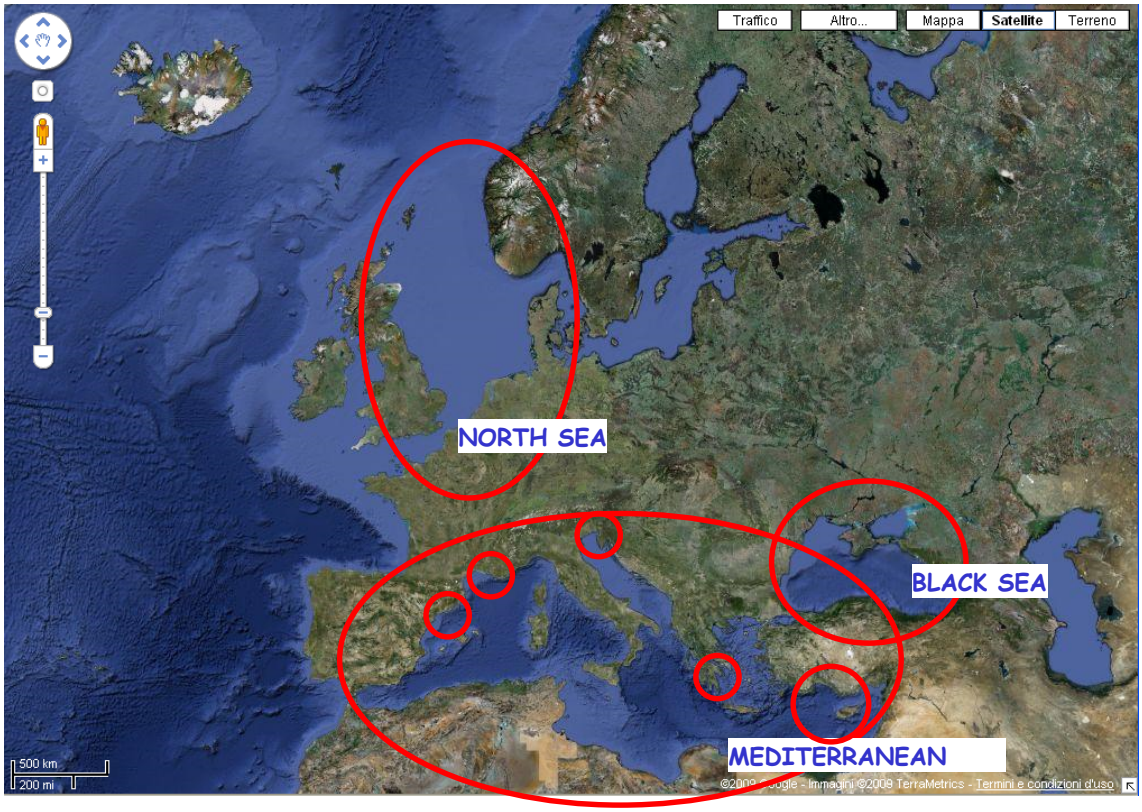
INTRODUCTION

EMODnet Chemical pilot is undertaken by **25 partners** representing the SeaDataNet network of Data Centres, selected on their geographical coverage and specific expertise. These Data Centres already manage a large volume of relevant data sets and can enlarge the available data collections with relevant data sets from a number of data holders in their country. Moreover the SeaDataNet partnership includes ICES, which acts as data centre for monitoring data for OSPAR, HELCOM and EIONET, and that brought in this volume of data sets.

The EMODnet Chemical tender asks for data sets from the **Greater North Sea** and the **Black Sea** region. However, we planned to expand the pilot regions with **five spots from the Mediterranean** (Balearic Sea, Gulf of Lion, North Adriatic Sea, Gulf of Athens and NE Levantine basin).



EMODnet Chemical pilot is focused on the **groups of chemicals** required for monitoring the Marine Strategy Directive:

1. synthetic compounds (i.e. pesticides, antifoulants, pharmaceuticals),
2. heavy metals,
3. radionuclides;
4. fertilisers and other nitrogen- and phosphorus-rich substances;
5. organic matter (e.g. from sewers or mariculture);
6. hydrocarbons including oil pollution.

This First Interim Report describes the activities carried out during the first year of EMODnet chemical pilot (4th of June 2009 – 3rd of June 2010), the deliverables produced by each work package as specified in the Technical Tender Form for Lot 3 – Chemical Data and any deviation from the project tender.

Based on SeaDataNet (SDN) experience, the following strategy was proposed as approach for the EMODnet pilots:

- Develop a high-end dedicated portal, outfitted with a powerful spatial database, that is complemented with WMS, WFS and WCS services (OGC) to serve users and to provide layers for e.g. the other EMODnet portals, the prototype European Atlas of the Seas, and the broad-scale European Marine Habitats map;
- Provide data sets for producing interpolated maps with specific resolution for each geographical region, that are loaded and integrated afterwards into the portals' spatial database;
- Include a metadata discovery service in the portal, by adopting the SeaDataNet Common Data Index (CDI) metadata standard, that inter alia gives clear information about the background data, the access restrictions and distributors; this also ensures the connection of the EMODnet portals with the SeaDataNet distributed infrastructure.

In fact, EMODnet Chemical lot has used SeaDataNet V1 infrastructure for the technical set-up. This means:

- SDN Standards for background data, metadata and product,
- CDI mechanism to access data with data policy,
- ODV format for background data exchange,
- SDN Security Services for users registrations, and SDN Delivery Services for data access and downloading,
- DIVA software tool to produce gridded data products and error maps as NetCDF files,
- SDN Products catalogue (CAMIOON system) and SDN Products viewing services for free unlimited discovery, access, visualization and downloading of data products.

This First Interim Report is organised into 5 sections, where the progress made in the 5 work packages according to the tender planning of activities is summarised. These are:

1 – Project management,

2 - Data collection and metadata compilation,

3 - QC/QA and products,

4 - Technical development and portal operation,

5 – Analysis and evaluation.

Some final remarks are given in the final section. The list of acronyms is given as an annex.

1. PROJECT MANAGEMENT (WP1)

The project organization, as described in the Technical Tender Form for Lot 3 – Chemical Data includes the following elements: the project coordinator (OGS), the technical coordinator (MARIS), the Coordination group (OGS, MARIS, NERC-BODC, NERI-MAR, MHI, HCMR, ICES and IFREMER) and the Partners.

The service contract was signed the 4th of June 2009, fixing the official starting date for the Lot 3 – Chemical Data

OGS prepared a Consortium Agreement, that was revised and signed by all partners, including the table with costs breakdown and the expected payments for each partner. In parallel, all partners sent to OGS the relevant invoice or debit note and were paid for the pre-financing portion.

During the first year of EMODnet chemical pilot (4th of June 2009 – 3rd of June 2010) the following meeting were organised:

- Kick-off meeting (with the Coordination group), 2-3 July 2009, Trieste (Italy),
- Joint EMODNet - SeaDataNet meeting (with SDN Technical Task Team and EMODNet Coordination group), September 2009, Antibes (France),
- 3rd Coordination group meeting, 21 January 2010, Paris (France),
- The first annual Partner group meeting was organised at the UNESCO Headquarters in Paris (France), soon after the SeaDataNet plenary meeting, April 2 2010. A total of 34 participants of partners institutes from 19 countries contributed to the event.

A report and/or action list is available in EMODnet Extranet for each event.

Moreover, OGS and representatives from the Chemical lot participated to:

- EMODnet Preparatory Actions Seminar and Kick-off meeting, 4 June 2009, Brussels,
- Progress meeting for ur-EMODnet Preparatory Actions, 24 November 2009, Brussels,
- Second six-monthly progress meeting for ur-EMODnet preparatory actions, 25 May 2010, Copenhagen.

The communication for the management activities is facilitated by the use of the following mailing lists:

emodnet-all@googlegroups.com

emodnet-coordination@googlegroups.com

Five bi-monthly progress reports were produced from August 2009, sent to EU and posted on Extranet.

A leaflet showing the project objectives and results was drafted.

All documents are included in EMODnet Extranet.

2. DATA COLLECTION AND METADATA COMPILATION (WP2)

The contribution to data collection and metadata compilation by each EMODnet partner was presented at the first annual meeting and extensively described in the meeting report (available on EMODnet Chemical portal under the section Meetings).

The overview of the progress on data collection and metadata compilation in the three regions is given here.

Based on MSFD requirement, on the data distribution in time and space (as time series geographically representative), a set of chemicals was selected from the 8 groups in the 3 matrices (water column, sediment, biota), to make a set of 17 selected parameters for product generation in the three regions. All these parameters were mapped to SeaDataNet vocabularies (mainly P021 - Parameter Discovery Vocabulary used for CDI generation, P061 - Data Storage Units used for units, and P011- Parameter Usage Vocabulary used for ODV files generation) as reported in the following tables.

	water column			
EMNC	Chemical group	Parameter	SDN P021 CODE	SDN PARAMETERS P021 TERM
C1	Pesticides	Dichlorodiphenyltrichloroethane (DDT)	PEWB	Pesticide concentrations in water bodies
C2	Pesticides	Hexachlorobenzene (HCB)	PEWB	Pesticide concentrations in water bodies
C3	Antifoulants	Tributyltin (TBT)	WCOC	Concentration of other organic contaminants in the water column
C4	Antifoulants	Triphenyltin (TPT)	WCOC	Concentration of other organic contaminants in the water column
C5	Pharmaceuticals	Oxytetracycline ($C_{22}H_{24}N_2O_9$)	PHWB	Pharmaceutical concentrations in water bodies
C6	Heavy metals	Mercury (Hg)	MTWD	Dissolved metal concentrations in the water column
C6	Heavy metals	Mercury (Hg)	MTWT	Total metal concentrations in the water column
C6	Heavy metals	Mercury (Hg)	MTWP	particulate metal concentrations in the water column
C7	Heavy metals	Cadmium (Cd)	MTWD	Dissolved metal concentrations in the water column
C7	Heavy metals	Cadmium (Cd)	MTWT	Total metal concentrations in the water column
C7	Heavy metals	Cadmium (Cd)	MTWP	particulate metal concentrations in the water column
C8	Heavy metals	Lead (Pb)	MTWD	Dissolved metal concentrations in the water column
C8	Heavy metals	Lead (Pb)	MTWT	Total metal concentrations in the water column
C8	Heavy metals	Lead (Pb)	MTWP	particulate metal concentrations in the water column
C9	Hydrocarbons	Anthracene ($C_{14}H_{10}$)	PCHW	column
C10	Hydrocarbons	Fluoranthene ($C_{16}H_{10}$)	PCHW	column
C11	Radionuclides	Tritium	WRAD	Radioactivity in the water column
C12	Radionuclides	Cesium 137	WRAD	Radioactivity in the water column
C13	Radionuclides	Plutonium 239	WRAD	Radioactivity in the water column
C14	Fertilisers/Nitrogen	Nitrate (NO_3)	NTRA	Nitrate concentration parameters in the water column
C15	Fertilisers/Phosphorus	Phosphate (PO_4)	PHOS	Phosphate concentration parameters in the water column
C16	Organic matter	Organic Carbon (C)	CORG	Particulate total and organic carbon concentrations in the water column
C17	Organic matter	Organic Nitrogen (N)	NTOT	Particulate total and organic nitrogen concentrations in the water column

	sediment			
EMNC	Chemical group	Parameter	SDN P021 CODE	SDN PARAMETERS P021 TERM
C1	Pesticides	Dichlorodiphenyltrichloroethane (DDT)	PESD	Pesticide concentrations in sediment
C2	Pesticides	Hexachlorobenzene (HCB)	PESD	Pesticide concentrations in sediment
C3	Antifoulants	Tributyltin (TBT)	SCOC	Concentration of other organic contaminants in sediment samples
C4	Antifoulants	Triphenyltin (TPT)	SCOC	Concentration of other organic contaminants in sediment samples
C5	Pharmaceuticals	Oxytetracycline ($C_{22}H_{24}N_2O_9$)	PHSE	Pharmaceutical concentrations in sediments
C6	Heavy metals	Mercury (Hg)	MTSD	Metal concentrations in sediment
C7	Heavy metals	Cadmium (Cd)	MTSD	Metal concentrations in sediment
C8	Heavy metals	Lead (Pb)	MTSD	Metal concentrations in sediment
C9	Hydrocarbons	Anthracene ($C_{14}H_{10}$)	SCAH	sediment samples
C10	Hydrocarbons	Fluoranthene ($C_{16}H_{10}$)	SCAH	sediment samples
C11	Radionuclides	Tritium	SRAD	Radioactivity in sediment
C12	Radionuclides	Cesium 137	SRAD	Radioactivity in sediment
C13	Radionuclides	Plutonium 239	SRAD	Radioactivity in sediment
C16	Organic matter	Organic Carbon (C)	CBSD	Carbon concentrations in sediment
C17	Organic matter	Organic Nitrogen (N)	NTSD	Nitrogen concentrations in sediment
C14	Fertilisers/Nitrogen			
C15	Fertilisers/Phosphorus			

	biota			
EMNC	Chemical group	Parameter	SDN P021 CODE	SDN PARAMETERS P021 TERM
C1	Pesticides	Dichlorodiphenyltrichloroethane (DDT)	PEBI	Pesticide concentrations in biota
C2	Pesticides	Hexachlorobenzene (HCB)	PEBI	Pesticide concentrations in biota
C3	Antifoulants	Tributyltin (TBT)	BCOC	Concentration of other organic contaminants in biota
C4	Antifoulants	Triphenyltin (TPT)	BCOC	Concentration of other organic contaminants in biota
C5	Pharmaceuticals	Oxytetracycline ($C_{22}H_{24}N_2O_9$)	PHBI	Pharmaceutical concentrations in biota
C6	Heavy metals	Mercury (Hg)	BCMT	Metal concentrations in biota
C7	Heavy metals	Cadmium (Cd)	BCMT	Metal concentrations in biota
C8	Heavy metals	Lead (Pb)	BCMT	Metal concentrations in biota
C9	Hydrocarbons	Anthracene ($C_{14}H_{10}$)	BCAH	Concentration of polycyclic aromatic hydrocarbons
C10	Hydrocarbons	Fluoranthene ($C_{16}H_{10}$)	BCAH	Concentration of polycyclic aromatic hydrocarbons
C11	Radionuclides	Tritium	BRAD	Radioactivity in biota
C12	Radionuclides	Cesium 137	BRAD	Radioactivity in biota
C13	Radionuclides	Plutonium 239	BRAD	Radioactivity in biota
C14	Fertilisers/Nitrogen			
C15	Fertilisers/Phosphorus			
C16	Organic matter			
C17	Organic matter			

Data collection started with nutrients in the water column, was then extended to all other selected chemicals in the water column (organic matter – DOC and TN, …), and to synthetic compounds, hydrocarbons and heavy metals in the sediments and biota (considering the target species MYTILUS). This was the target for 3 regions, but at the data distribution is very different. This is mainly depending by the historical background on the geographic area that has a strong impact on present data monitoring and data management activity.

3 regional background data pools were defined at NERI-MAR for the Greater North Sea, at HCMR for the Mediterranean and MHI for the Black Sea. These regional pools are set-up for internal efficiency reasons for the data analyses and the generation of (foreground) data products. External users will not communicate with the regional pools, because these are only set up for streamlining the data products generation process. However the discovery and access to the distributed background data sources will be provided to users using the SeaDataNet CDI Service.

All partners produced ODV files and sent them to the regional task leaders (NERI, MHI, HCMR). Besides, all partners produced the CDI entries and sent them to MARIS, to link the collected data to EMODnet CDI User interface.

The information used in EMODNET Chemistry related to the three selected matrixes are obtained from two main data sources:

- datasets already managed by the NODCs and made available for the project purposes (mainly nutrients in the water column);
- new datasets obtained from the EMODNET Chemistry harvesting activity coming from additional sources (mainly parameters in biota and sediment matrix).

Specifically for the second kind of data source a preliminary step of analysis has to be done. This because the information are provided in different formats (xls, access, pdf, mysql databases, etc.). Before reading the data, the second time consuming step is represented by the analysis of metadata, provided that these are not always enough descriptive of the dataset. The description of the collected data with all the metadata is essential to understand the data structure and to develop the tools (query or generic extraction) to handle the information and include them in the regional data pools, where common formats and codes are adopted. For this purpose, a necessary step is to check the existence of parameter's codes and units in the dedicated SDN common vocabularies maintained by BODC and updated in collaboration with EMODNET Chemistry partners. The vocabularies considered in this step are:

P021: Parameter Discovery Vocabulary necessary to produce CDI for metadata

P011: Parameter Usage Vocabulary necessary to produce ODV4 format for data

P061: Data Storage Units necessary to produce ODV4 format for data

To produce the CDI XML metadata files it was recommended to use the MIKADO software tool and the SeaDataNet Common Vocabulary (in particular the P021 Parameter Discovery Vocabulary). For this purpose a small core group has evaluated and extended the SDN P021 Vocabulary to cover all 17 chemical parameter selected for the three matrices (water column, sediment, biota). The complete mapping was included in a dedicated Excel file circulated to all partners (here reported in the previous tables).

The data files have to be converted to SDN ODV4 format, e.g. using the NEMO software tool and the SDN P011 vocabulary. The SeaDataNet Parameter Usage Vocabulary (SDN P011 vocabulary) contains over 20,000 entries of which only several hundred are of interest to the EMODNET pilot. To help all partners with the mapping, all the parameters in the current P011 that are of interest to EMODNET were extracted and included in a dedicated Excel file. The complete SeaDataNet Parameter Usage Vocabulary (SDN P011 vocabulary) can be found from SDN Web interface. A navigation strategy is required and was recommended to all partners. In fact, the P011 vocabulary is very analytical and covers a huge number of parameters but not all the new terms that came from the EMODNET harvesting phase, specially for biota and sediment matrix.

The collaboration with BODC is helping to fill the gaps of terms and to extend the P011 coverage. IFREMER is keeping updated the link between Medar-Medatlas codes and P011 terms that at the moment is necessary to use the NEMO format conversion tool.

Specifically in this phase the analysis highlights the complexity of EMODNET Chemical data. The related metadata are a key issue to define the new parameters, if needed, and to discriminate from the already existing ones. A number of variables have to be considered to have a good definition for new terms (to balance generic/analytical definition). For example, for biota matrix the key issues are:

- target species considered,
- measurement basis: dry/wet,
- depth of measurement: information included or not,
- tissues lipid contents (where available).

A selection of new terms from SDN P011 vocabulary that have been added to handle EMODNET data is given in Annex II.

The MIKADO and NEMO software tools, developed within SeaDataNet project, are freely available from SeaDataNet portal under the section Standards & Software, http://www.seadatanet.org/standards_software/software.

2.1 DATA COLLECTION IN THE NORTH SEA – REGIONAL DATA POOL

A lot of the data concerning the EMODnet chemical parameters are also available in the ICES database DOME. Therefore an extraction from DOME to the regional data pool (EMODnet Chemical Buffer Database) has been done. The Greater North Sea partners only have to report additional datasets (except nutrients, that were not collected at ICES). For this purpose ICES distributed to all partners in the region a worksheet with the content of the database per parameter and per matrix. The boundaries for the area covered are the following:

Name	Language Name	Source
	English North Sea (preferred)	ICES (http://www.ices.dk/aboutus/icesareas.asp)

PlaceType ICES Ecoregion

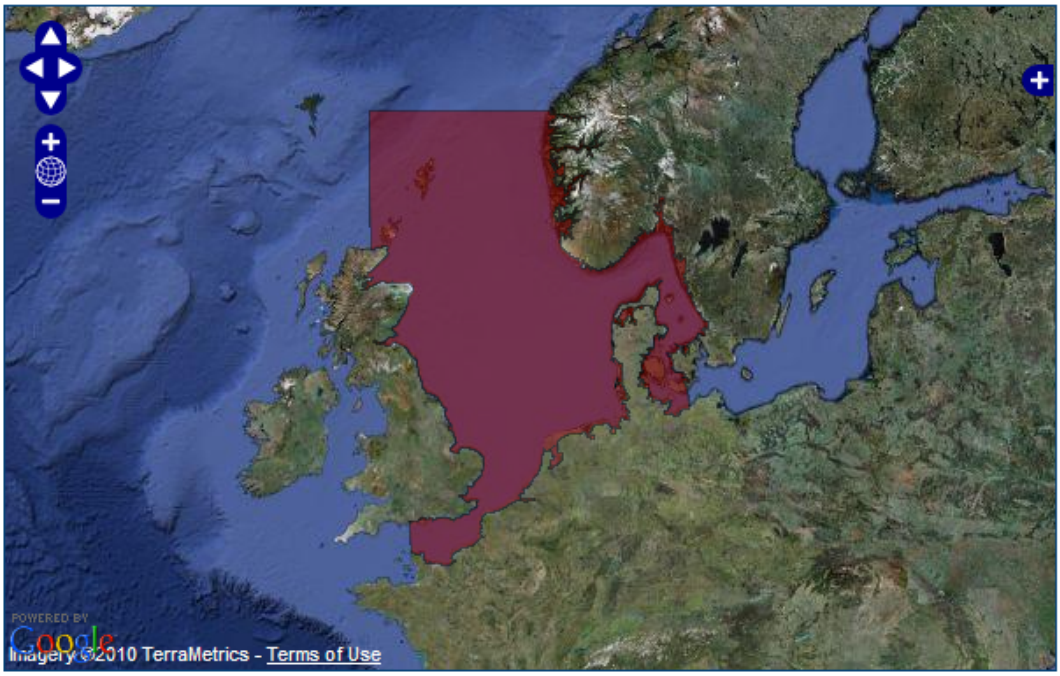
Latitude 56° 56' 47.5" N (56.9465°)

Longitude 3° 2' 35.3" E (3.0431°)

Source ICES (http://www.ices.dk/aboutus/icesareas.asp)

Relation Part of ICES Ecoregions (General Region) [View Hierarchy]

Map



The EMODnet Chemical Buffer database (North Sea regional data pool) was initially created from ICES database (DOME). The input to the initial buffer is all the selected EMODnet parameters except the nutrients phosphate and nitrate. The partners in the Greater North Sea have now submitted their data on the nutrients phosphate and nitrate to the regional data pool (as ODV files). The initial buffer dataset creation has been scripted, and can therefore be recreated at any given time. The individual datasets (belonging to each NODC) and the data in the buffer are the same, as no additional processing has been done. The buffer aggregates all the data from the regional partners. All the data will be used to produce

the products, even restricted data. However these will be treated as restricted in case of user requests. All metadata will be included in SeaDataNet infrastructure (CDI User Interface).

A short overview of the content of the EMODnet Chemical Buffer database in the Greater North Sea with collected samples per parameter per matrix is shown in the table (status mid May 2010):

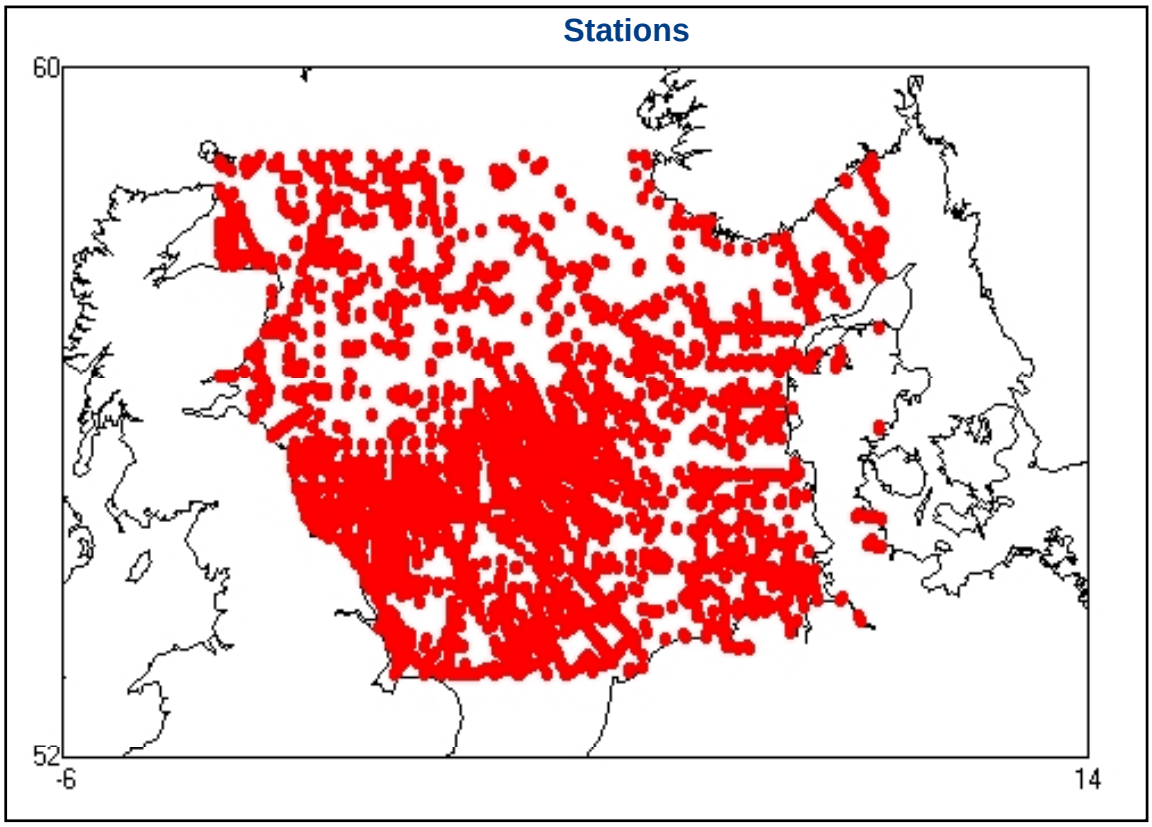
EMNC	Chemical group	Parameter	Water column	Sediment	Biota
C1	Pesticides	Dichlorodiphenyltrichloroethane (DDT)	321	1260	8264
C2	Pesticides	Hexachlorobenzene (HCB)	225	1311	10129
C3	Antifoulants	Tributyltin (TBT)		951	657
C4	Antifoulants	Triphenyltin (TPT)		400	
C5	Pharmaceuticals	Oxytetracycline ($C_{22}H_{24}N_2O_9$)			
C6	Heavy metals	Mercury (Hg)	517	4722	14110
C7	Heavy metals	Cadmium (Cd)	978	4726	12495
C8	Heavy metals	Lead (Pb)	664	5235	11211
C9	Hydrocarbons	Anthracene ($C_{14}H_{10}$)	53	5210	1949
C10	Hydrocarbons	Fluoranthene ($C_{16}H_{10}$)	88	5375	2092
C11	Radionuclides	Tritium			
C12	Radionuclides	Cesium 137	68		
C13	Radionuclides	Plutonium 239			
C14	Fertilisers/Nitrogen	Nitrate (NO_3)	49178		
C15	Fertilisers/Nitrogen	Phosphate (PO_4)	48734		
C16	Organic matter	Organic Carbon (C)	52	5744	
C17	Organic matter	Organic Nitrogen (N)		280	

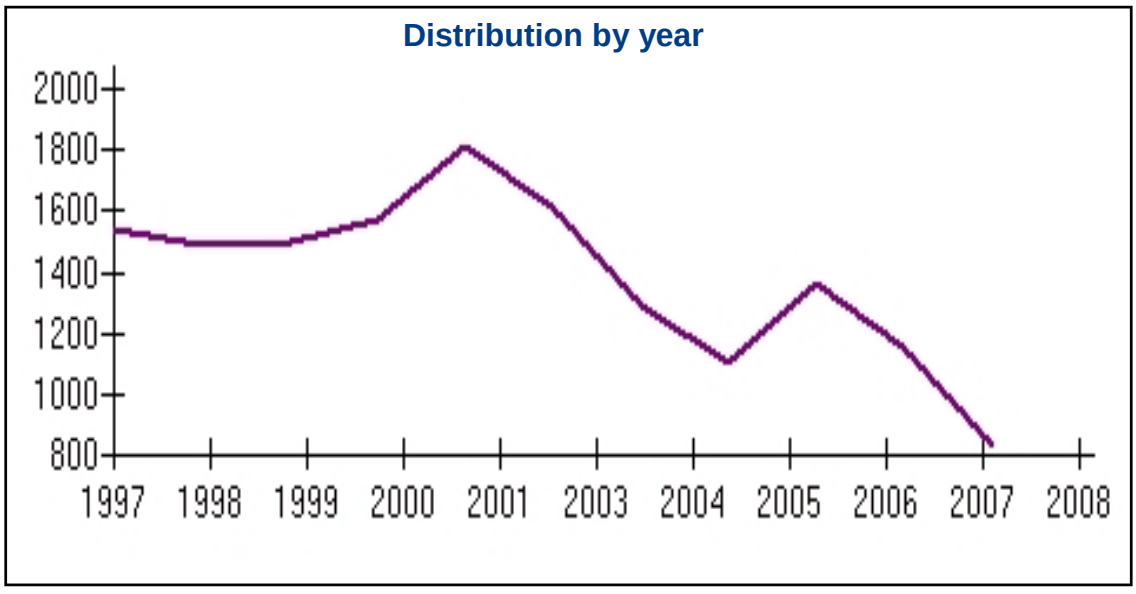
In order to give a good visibility on the EMODnet chemical CDI user interface (the EMODnet chemical portal) it was decided to make a first attempt at CDI's for the chemicals in the regional data pool in the Greater North Sea, with the exception of nutrients. ICES have made this attempt at CDI's for a 'cut-off' date in the middle of May 2010 for entries to the regional data pool. However, this XML metadata files were not included in the on-line user interface to avoid possible duplication with direct partners submissions so at the moment the CDI metadata files are not complete. We are working to get all CDI entries in the system and synchronise metadata with data.

From most countries in the Greater North Sea the NODC's are the monitoring agencies, there are no additional data sources and the data set is complete.

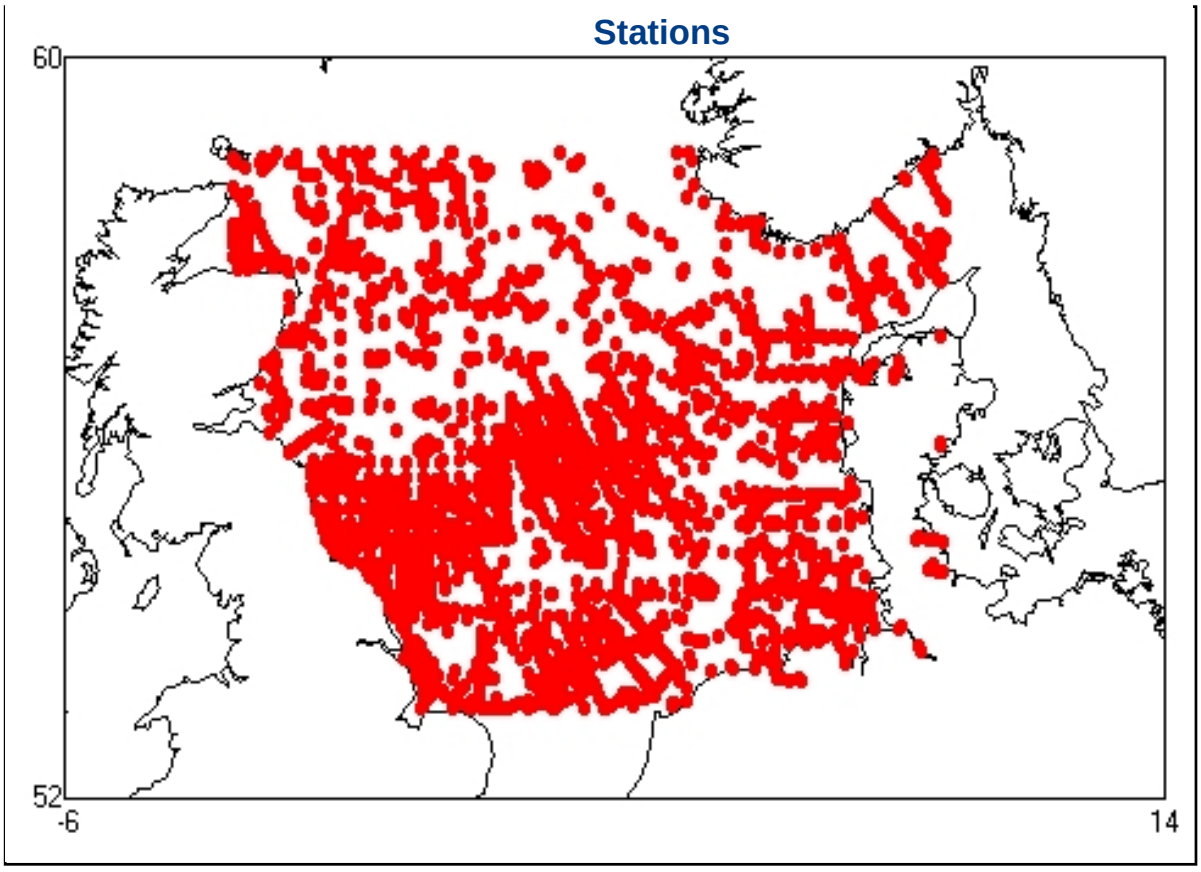
It is important to emphasis that there will be a continuous and ongoing CDI-generation for the selected parameters to EMODnet chemical CDI user interface (the EMODnet portal) from each partner in the Greater North Sea.

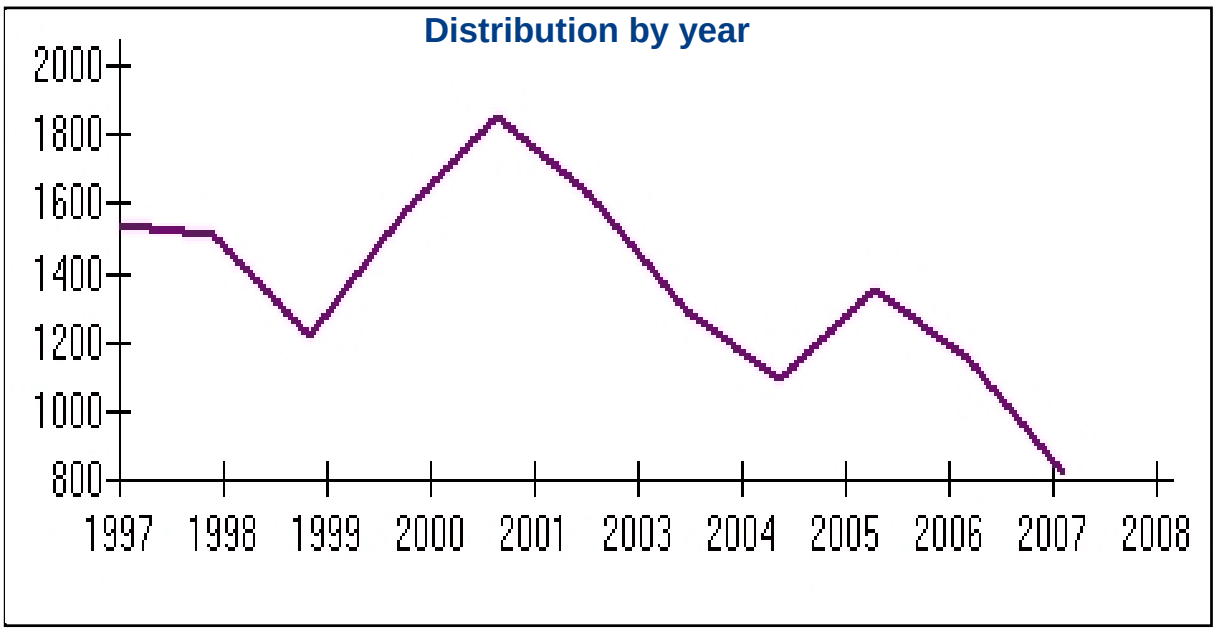
Data distribution - Nitrate (NO3) in the water column



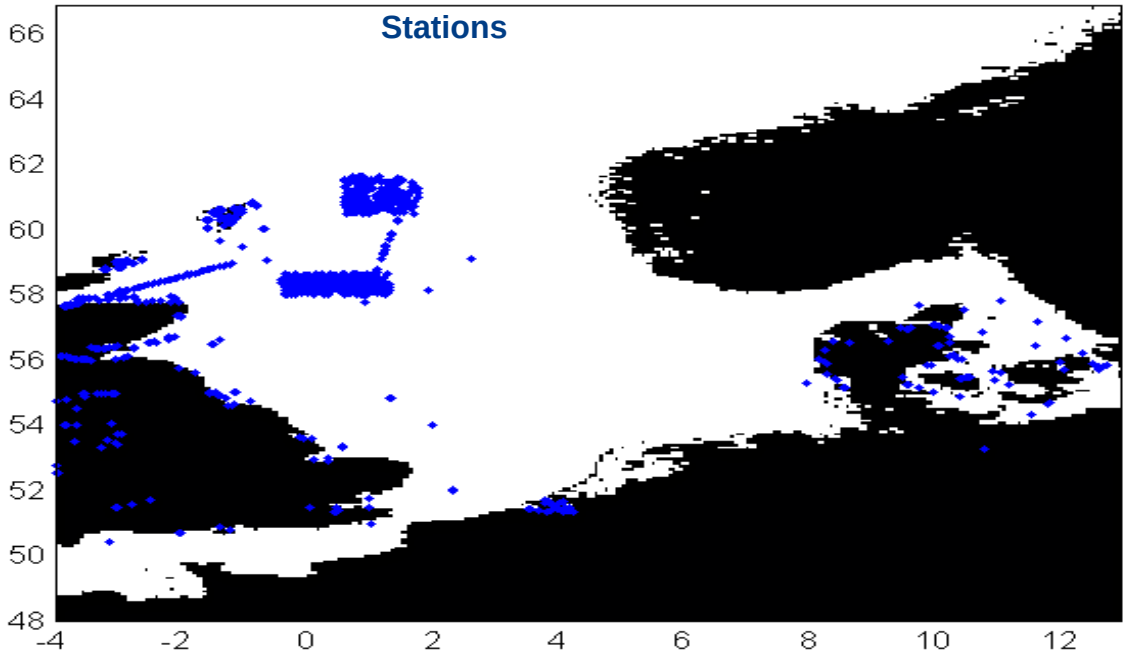


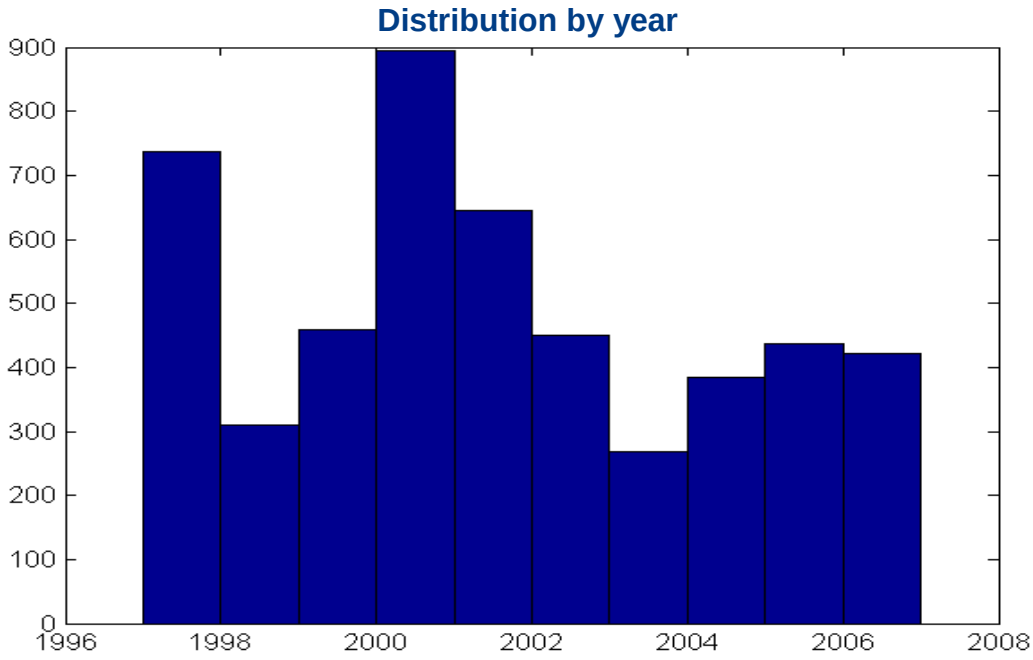
Data distribution - Phosphate (PO4) in water column



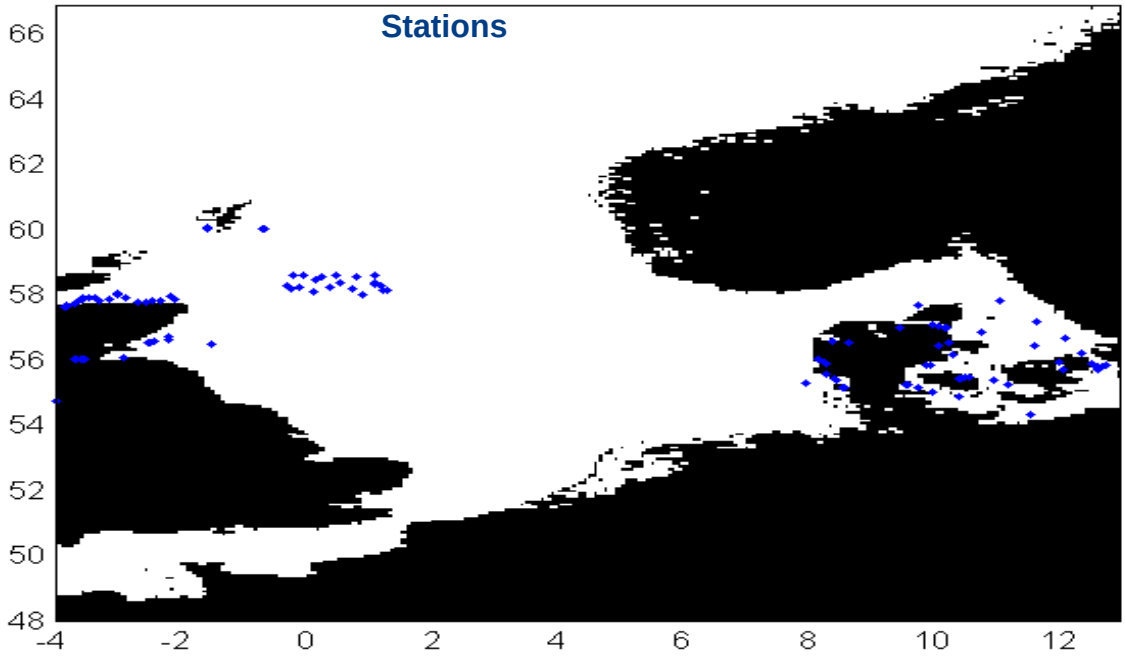


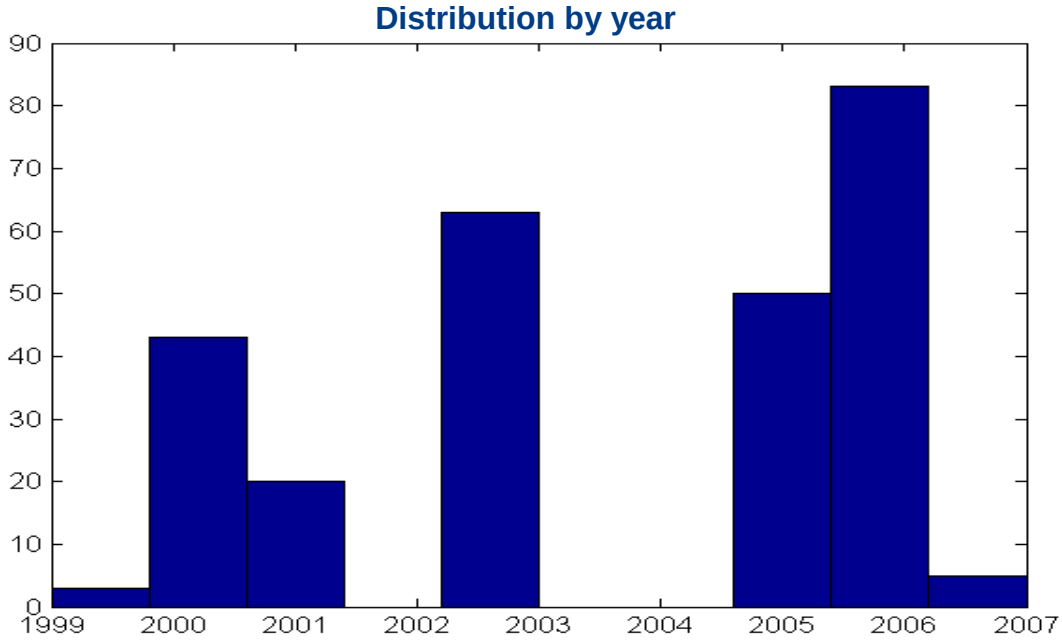
Data distribution - Total Organic Carbon (%TOC) in sediment



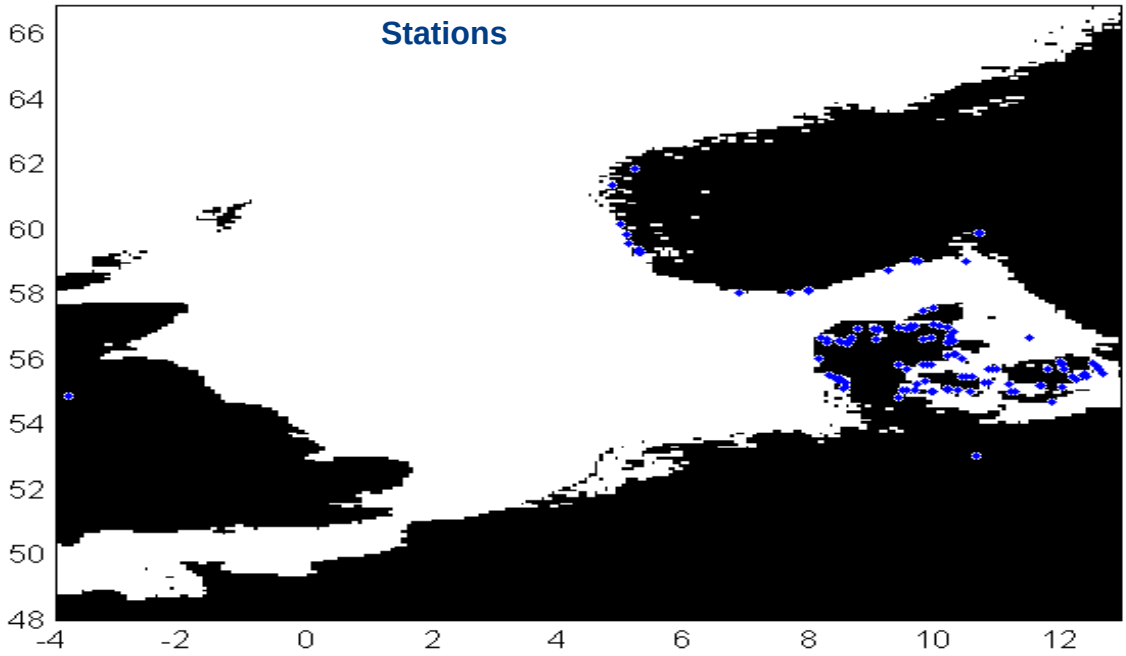


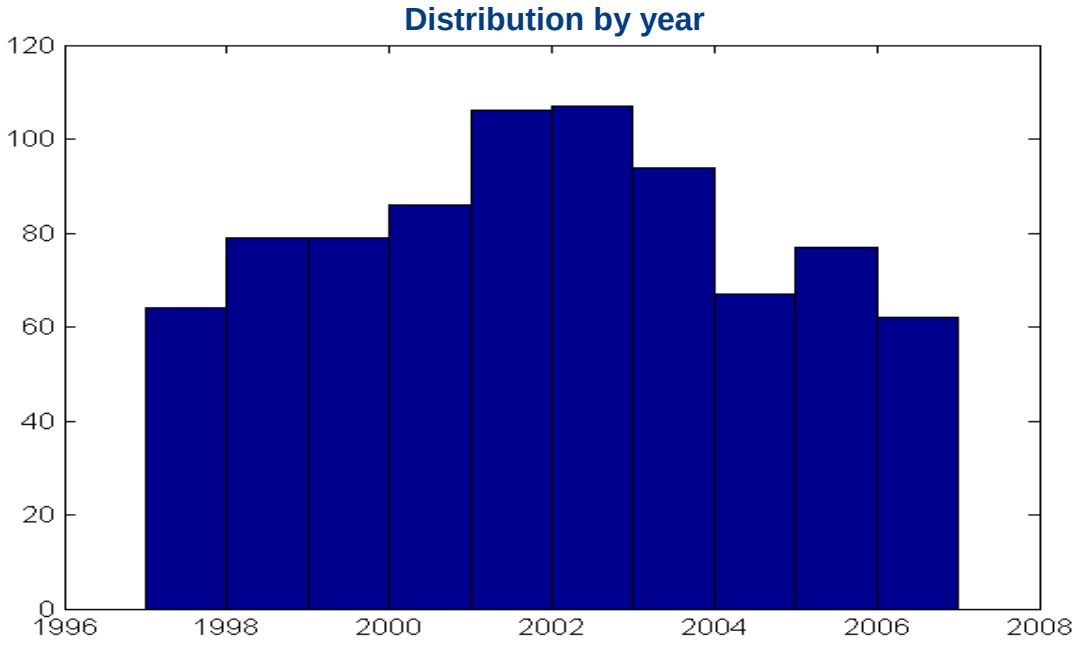
Data distribution – Tributyltin (TBT) in sediment referred to Total Organic Carbon (%TOC) in the sediment





Data distribution - Tributyltin (TBT) in biota (species Mytilus Edulys)





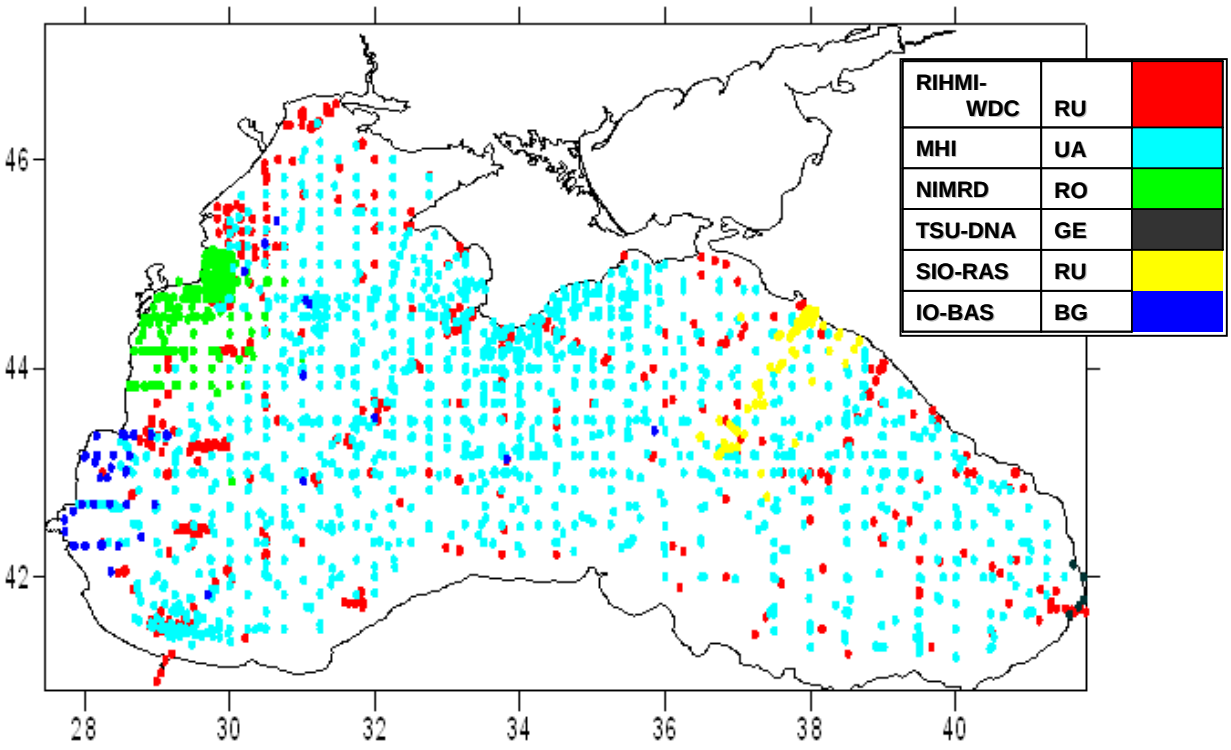
2.2 DATA COLLECTION IN THE BLACK SEA

The data collected in Black Sea are summarised in the following table:

Nr	Partner	Country	Total profiles	Measurements									
				O2	PO4	Total P	PH	Alk	SIO3	NO2	NO3	NH4	Total N
13	RIHMI-WDC	RU	904	5343	3680	3	3404	635	2469	1654	280	33	14
14	SIO-RAS	RU	147	888	837	249	226	286	855	311	361	876	152
15	MHI	UA	2500	16946	877	306	127	839	379	2361	2601	436	488
16	IO-BAS	BG	124	865	277	703	248	0	0	0	0	0	0
17	NIMRD	RO	2268	9995	6548	0	0	0	10207	6892	7729	5275	0
18	TSU-DNA	GE	10	20	25	0	0	0	0	27	30	29	27
	TOTAL		5953	34057	12244	1261	4005	1760	13910	11245	11001	6649	681

Additional data collected by NIMRD (heavy metal), RIHMI – WDC (DDT) and MHI (radionuclides) in the water column were reported and have to be included in the table.

Spatial distribution of the profiles:



The data included in the Black Sea regional buffer were subjected to the following series of steps to ensure a correct data set and correct maps:

1. Download of ODV files to MySQL database.

2. Export of the prepared database into ODV format again (one file).

3. Primary QC using ODV software.

4. Passing data to the MHI Chemical Department for Conversion of units and expert QC.

5. Estimation of the possible (regions, times etc.) products preparation.

6. Preparation of products using ODV-DIVA software.

At present, all the data have been passed for expert QC analysis and the process of DIVA maps preparation started.

For the Black Sea regional buffer the metadata are complete, all CDI were included in the on-line user interface, but the data collection process is on-going and we expect several additional inputs.

2.3 DATA COLLECTION IN THE MEDITERRANEAN SEA

In the Mediterranean Sea 5 spots were identified:

- Balearic Sea
- Gulf of Lion
- North Adriatic Sea
- Gulf of Athens
- NE Levantine basin

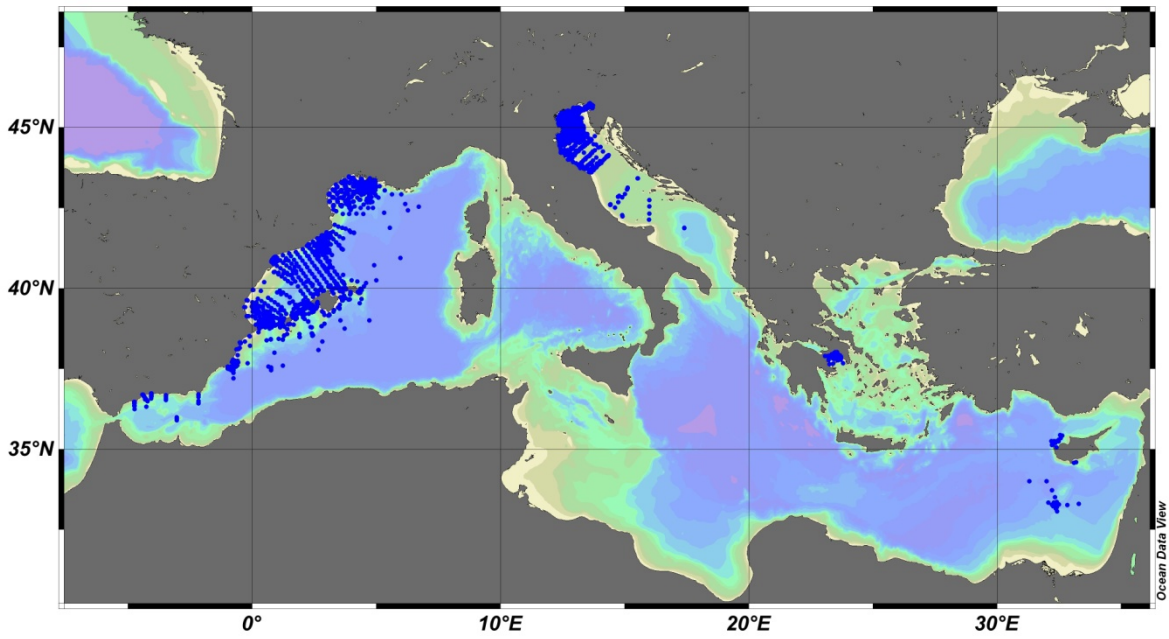
The nutrient data in the water column collected in 5 spots of the Mediterranean Sea are summarized in the following table, were the columns indicate the number of samples per parameter while the number of stations per country is mentioned within the brackets:

Parameters	Cyprus (36 st)	Greece (1543 st)	France (826 st)	Italy (2482 st)	Spain (3099 st)
Oxygen	40	8604		11539	9940
Phosphate	64	8506	2617	6552	12117
Silicate	79	8492	1824	7553	12860
Nitrite	39	8498	2101	6946	12986
Nitrate	39	8493	1085	7139	11100
Ammonium	244	8505	1496	6756	1223
Nitrate+Nitrite Content	72		925		4251
Total Nitrogen			925	94	
Particulate Organic Carbon		2701			
Total Organic Carbon		1203			
Total particulate Nitrogen		625			
Total particulate Phosphate		482			
Total Particulate Phosphorus				68	
Choropyll-A Total			869		7509
Choropyll-B			225		608
Choropyll-C Total			225		608
Choropyll- Total			475		2444
PH					832
Total Phosphate					437
Cs 137	14				

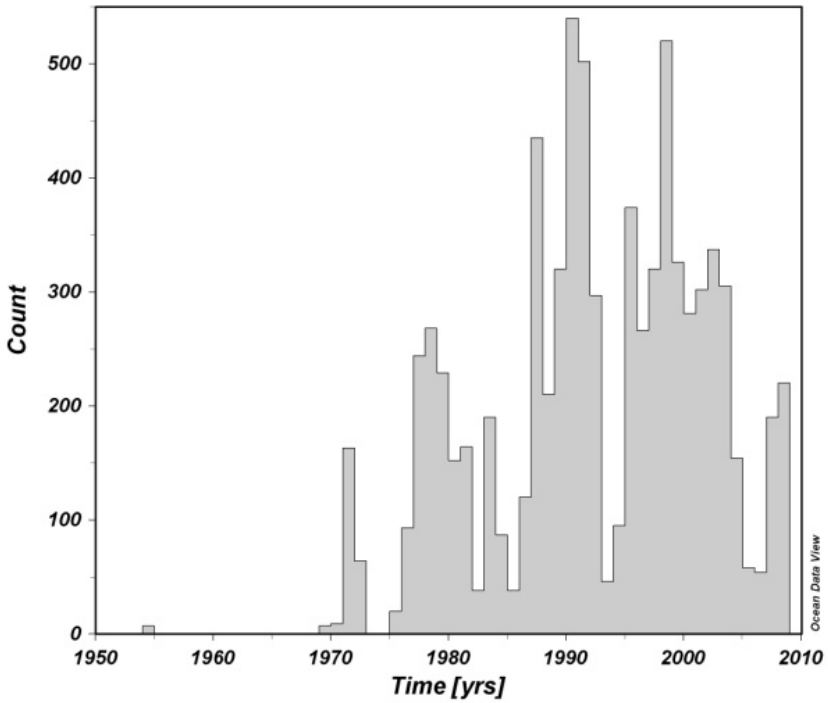
The Mediterranean regional buffer consists of data files in SDN ODV4 format. With the use of ODV software the regional data sets are processed and prepared for the DIVA maps production and subjected to QC visualizations without however changing the originator's flag scale which has been assigned by the NODC of each country.

For the Mediterranean regional buffer the metadata are complete, all CDI were included in the on-line user interface, but the data collection process is on-going and we expect several additional inputs.

Spatial data distribution for nutrient stations:



Data distribution in time:



2.4 METADATA COMPILATION

The total CDI inventory for the EMODnet Chemical P021 terms and target areas gives an overview on the data availability through the EMODnet CDI User Interface (as each data profile is identified by a CDI entry).

Partner	Country	Records Nb
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC)	Russia	38757
British Oceanographic Data Centre (BODC)	United Kingdom	1629
Centre for Estuarine and Marine Ecology (NIOO-CEME)	Netherlands	6817
Cyprus Oceanographic Data Center, Oceanography Center	Cyprus	499
Finnish Meteorological Institute (FMI)	Finland	2084
Flanders Marine Institute	Belgium	478
German Oceanographic Datacentre (NODC)	Germany	11098
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	19110
IFREMER / IDM/SISMER	France	34848
Institute of Oceanography and Fisheries	Croatia	1477
Institute of Oceanology, Bulgarian Academy of Sciences (IO-BAS)	Bulgaria	40
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	128
Israel Oceanographic and Limnological Research (IOLR)	Israel	3120
Latvian Institute of Aquatic Ecology	Latvia	134
Management Unit of the North Sea and Scheldt estuary Mathematical Models, Belgian Marine Data Centre (MUMM-BMDC)	Belgium	3048
Marine Hydrophysical Institute	Ukraine	2050
National Environmental Research Institute, University of Aarhus, Department of Marine Ecology	Denmark	116439
National Institute for Marine Research and Development Grigore Antipa	Romania	2948
National Institute of Biology - NIBMarine Biology Station	Slovenia	3096
OGS, National Institute of Oceanography and Experimental Geophysics, Department of Oceanography	Italy	38526
P.P.Shirshov Institute of Oceanology, RAS	Russia	122
Rijkswaterstaat Waterdienst	Netherlands	11132
Spanish Oceanographic Institute	Spain	9563
Swedish Meteorological and Hydrological Institute, SMHI	Sweden	45368
	TOTAL RECORDS	**352511**

Table 1: Overview of CDI records for EMODNET chemistry - 6th July 2010

The following table gives a statistics on the data availability. In fact, the dataset access restriction code, included on each CDI records, is reported. For a total of 352.511 records, 305.811 can be freely downloaded from EMODNET CDI User Interface.

Partner	Access	Access	Records Nb
Centre for Estuarine and Marine Ecology (NIOO-CEME)	CC	collection cost charge	6817
German Oceanographic Datacentre (NODC)	LI	licence	489
German Oceanographic Datacentre (NODC)	RS	restricted	2714
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	RS	restricted	1547
IFREMER / IDM/SISMER	RS	restricted	2176
National Institute for Marine Research and Development Grigore Antipa	RS	restricted	460
National Institute of Biology - NIBMarine Biology Station	RS	restricted	3096
OGS, National Institute of Oceanography and Experimental Geophysics, Department of Oceanography	RS	restricted	25529
P.P.Shirshov Institute of Oceanology, RAS	RS	restricted	122
Spanish Oceanographic Institute	RS	restricted	3750
British Oceanographic Data Centre (BODC)	LS	SeaDataNet licence	1629
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	LS	SeaDataNet licence	4075
IFREMER / IDM/SISMER	LS	SeaDataNet licence	32052
Institute of Oceanography and Fisheries	LS	SeaDataNet licence	1477
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	LS	SeaDataNet licence	128
Latvian Institute of Aquatic Ecology	LS	SeaDataNet licence	134
Management Unit of the North Sea and Scheldt estuary Mathematical Models, Belgian Marine Data Centre (	LS	SeaDataNet licence	3048
Marine Hydrophysical Institute	LS	SeaDataNet licence	2050
National Environmental Research Institute, University of Aarhus, Department of Marine Ecology	LS	SeaDataNet licence	116439
National Institute for Marine Research and Development Grigore Antipa	LS	SeaDataNet licence	2488
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) Nationa	UN	unrestricted	38757
Cyprus Oceanographic Data Center, Oceanography Center	UN	unrestricted	499
Finnish Meteorological Institute (FMI)	UN	unrestricted	2084
Flanders Marine Institute	UN	unrestricted	478
German Oceanographic Datacentre (NODC)	UN	unrestricted	7895
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	UN	unrestricted	13488
IFREMER / IDM/SISMER	UN	unrestricted	620
Institute of Oceanology, Bulgarian Academy of Sciences (IO-BAS)	UN	unrestricted	40
Israel Oceanographic and Limnological Research (IOLR)	UN	unrestricted	3120
OGS, National Institute of Oceanography and Experimental Geophysics, Department of Oceanography	UN	unrestricted	12997
Rijkswaterstaat Waterdienst	UN	unrestricted	11132
Spanish Oceanographic Institute	UN	unrestricted	5813
Swedish Meteorological and Hydrological Institute, SMHI	UN	unrestricted	45368
		TOTAL RECORDS	**352511**
		FREE ACCESS	**305811**

Table 2: Overview of CDI records for EMODNET chemistry including the Dataset Access Restriction code - 6th July 2010

3. QC/QA AND PRODUCTS (WP3)

3.1 QUALITY ASSURANCE AND QUALITY CONTROL STANDARDS

Ultimately, the usefulness of the data that is collated and distributed through the EMODnet Chemical portal will be largely due to the uniform quality and reliability of these data. The work package is divided into a number of distinct activities, all of which contribute to the overall quality control and assurance of the data in the portal.

3.2 ADOPTING STANDARDS AND PROTOCOLS

At the outset of the EMODnet Chemical pilot it was stated that existing international standards and best practices would be adopted for the transport and display of data in the portal. By doing this, the partners ensure that they are following the best available knowledge and will most likely contribute to the further refinement of the adopted standards. EMODnet Chemical is using the data formats and vocabularies employed by the established data project “SeaDataNet”.

One of the key areas, from a chemical perspective, has been ensuring the correct mapping and populating of the parameters and methods that make up the SeaDataNet vocabularies. This involves a lot of work and many experts input, as they key to inter-operability is the ability to point to a parameter from 2 distinct places and be confident that it is the same parameter, collected in a comparable way and measured in an acceptable fashion.

In addition, the standards and guidelines from relevant marine conventions (the Black Sea Commission, MEDPOL, Ospar and HELCOM) have been consulted when establishing baseline procedures when choosing matrices, chemical units, methods and other supporting information.

3.3 GUIDELINE DOCUMENTATION

A basic QC/QA guidance document has been produced for the regional partners http://www.emodnet-chemistry.eu/portal/content/default/documents/QC_Guidelines_EMD-Chemical_version1.2.doc.

This should be seen as a first working version, which will be amended and enhanced as the project develops. To many marine chemists this document will appear rudimentary and broad in scope.This is because the guideline is designed to be applicable across 3 marine regions and understandable to non-chemists, as the national data centres that co-ordinate the data collection need to be able to follow the QC process.

The guidelines have been extracted from the ICES working procedures for chemical data, which in turn draws from HELCOM COMBINE manual, OSPAR MON recommendations and specific input from ICES working groups that regularly use the data in assessments. However, it should be noted that in a broader EMODnet setting, many of the checks and criteria are not relevant as the guidelines were largely developed from a northern European perspective.

At this stage there are no 'automated' checks in place for the data, beyond what the national data centres already perform, however with the documentation in place and with the use of standard formats and vocabularies it is intended to explore how the Ocean Data View (ODV) software may be able to perform some of these functions.

3.4 DIVA MAPS PRODUCTION

Data products are generated by the three regional task leaders, carried in NetCDF (CF) files, and made available on the web by means of a data products catalogue and a WMS viewing services. The latter shows interpolated chemical maps and error maps, also downloadable as GIS layers.

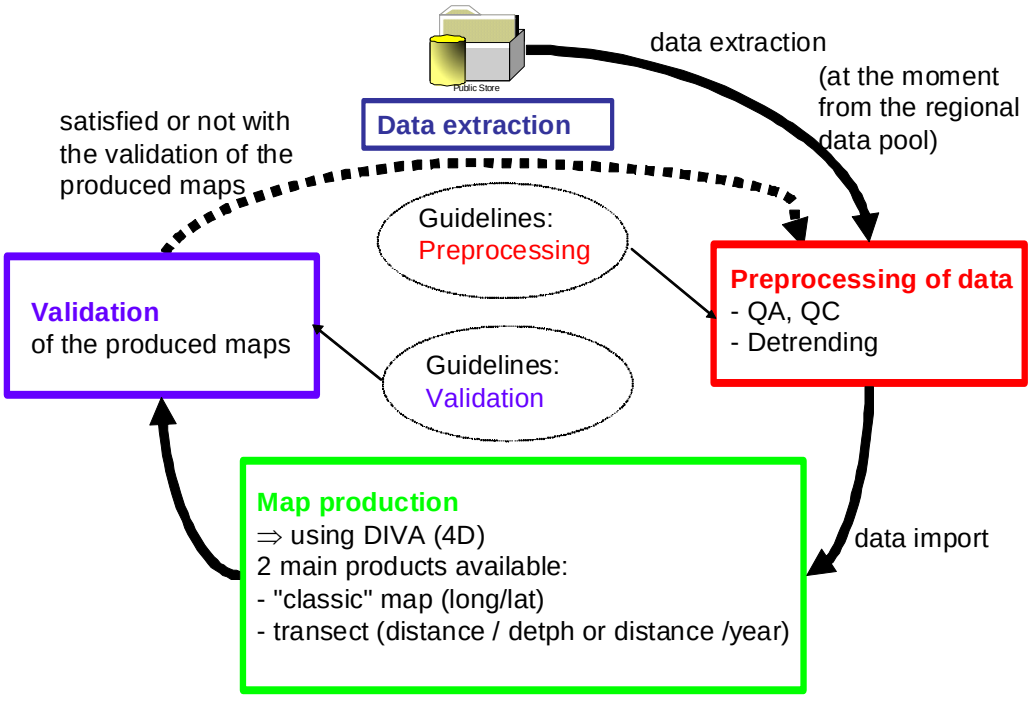
Maps generation started with nutrients in the water column (for the 3 regions), then extended to other chemicals in the water column, and to synthetic compounds, hydrocarbons and heavy metals in the sediments and biota (considering the target species MYTILUS).

As agreed on the first annual meeting for EMODnet Chemical Lot a small working group have interact with domain experts at their institutes to ask them which products could be useful and how to create them (data and map processing). The guidelines for products was shortly presented at the ur-EMODnet meeting in Copenhagen (25th may 2010) and is available at EMODnet chemical portal.

The aim for the guidelines for the DIVA maps production is to establish a common and documented basis for the maps production with focus on the pre-processing of data and the validation of the produced maps. The guidelines are divided into four steps:

1. Data extraction
2. Pre-processing of data
3. Maps production
4. Validation of the produced maps

The regional task leaders, which are responsible for the regional data pools are recommended to work through the listed processes. The following figure describes the overall concept for the DIVA maps production and is recommended as the working process for the maps production.



Besides, we have to be careful in which map we decide to make, on how to validate the gridded field before showing products, because very strong gradients can appear for a lot of this parameters. Probably we have to consider the data availability, and analyse the data distribution in space and time (gap analysis). At the same time, DIVA computes the error field that can be used to mask interpolated fields over a fixed threshold.

DIVA provides a lot of tools to optimize products and we can use it. In parallel is important to ask the experts opinion to understand which kind of maps that make sense. This is to focus on a number of basic products that we must make available at the EMODnet portal.

It should also be noticed that many data are time series of coastal monitoring. How to show and manage these data? We have to consider time evolution and spatial evolution. Usually we have a small number of stations for a long time period. Spatial interpolation is not the best way to present this information, but we will visualise the progression of parameter in time.

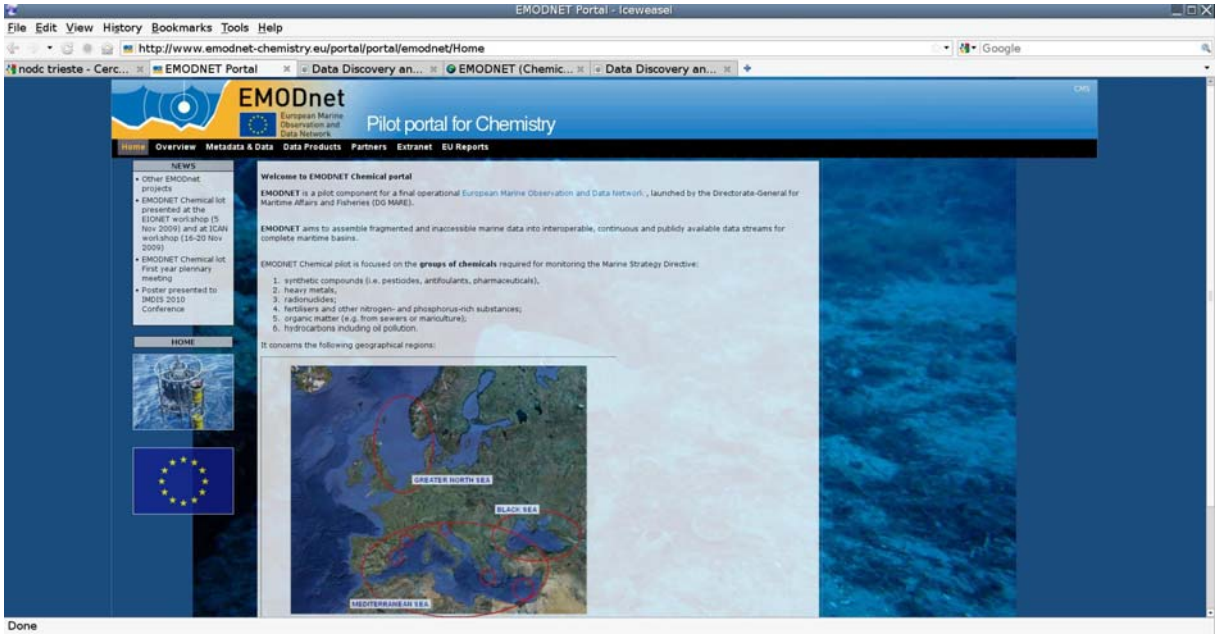
As the data coverage is highly different from one chemical parameter to the other, we will not be able to visualise all data collected. A workshop with the expert group is planned for September with the objective to review which kind of products we can do for each compartment (matrix) based on the data distribution.

The EMODnet Chemical portal give access to all the integrated maps of selected parameters produced at regional level, through the EMODnet Data Products Viewing and Downloading Service and the EMODnet Data Products Discovery Service, based upon CAMIOON Catalogue.

4. TECHNICAL DEVELOPMENT AND PORTAL OPERATION (WP4)

EMODnet Chemical pilot project technical developments included several actions in the first year of activities.

First of them was to set-up the web portal, centrally operated by OGS and giving link to a set of decentralised core services. A draft map of this portal was presented and discussed during one of the coordination-group meeting. The web portal is available from March 2010 at web site http://www.emodnet-chemistry.eu/portal/portal/. EMODnet Chemical portal provides to give a general overview about the European Marine Observation and Data Network and its four lots. There is available a section giving information about partners involved and another about the Chemical lot focus .There are also two separated sections with restricted access for the Extranet, that let partners to share project documents, and for the EU-reports.

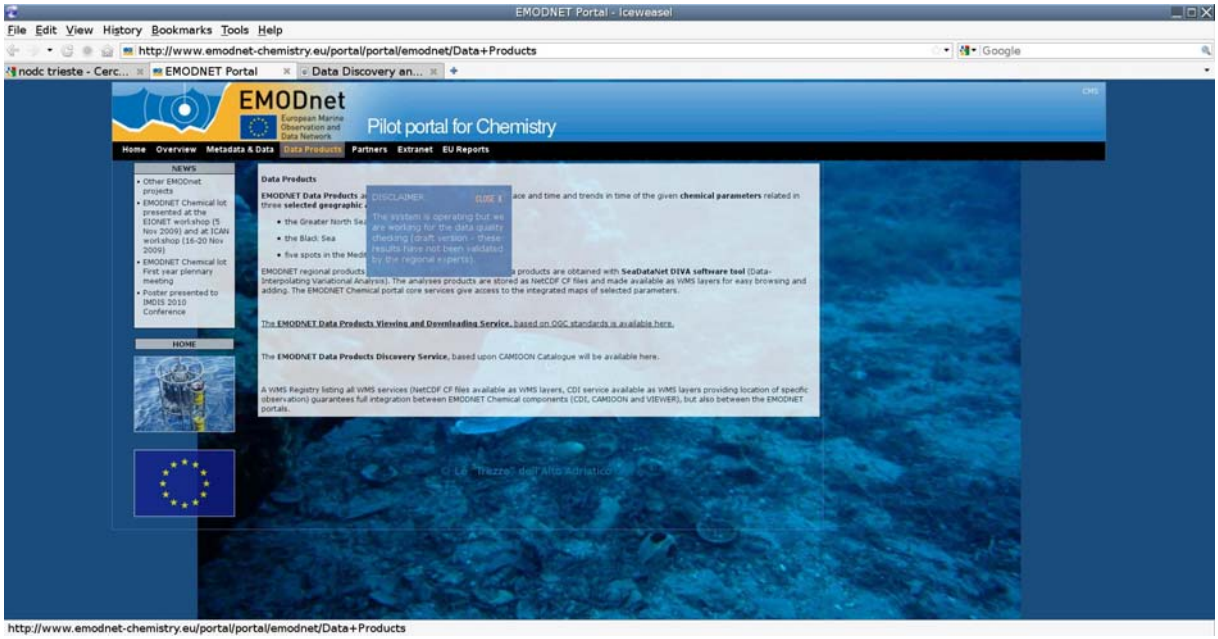


EMODNET Pilot portal for Chemistry available at http:// www.emodnet-chemistry.eu

Within May 2010 the portal was filled with the Metadata and Data Discovery and Downloading service. This was developed by Maris and adapted for EMODnet Chemical lot needs adapting the infrastructure coming from the SeaDataNet CDI mechanism. A quick and an extended search mask are provided thought the ***Metadata&Data*** section of the portal. The masks, as for the SeaDataNet CDI mechanism infrastructure, let to registered users to query with different criteria the available datasets. Data can be flagged as unrestricted, in this case a registered user can immediately download them, or restricted, in this case the user needs to wait the originators decision to share data or not.

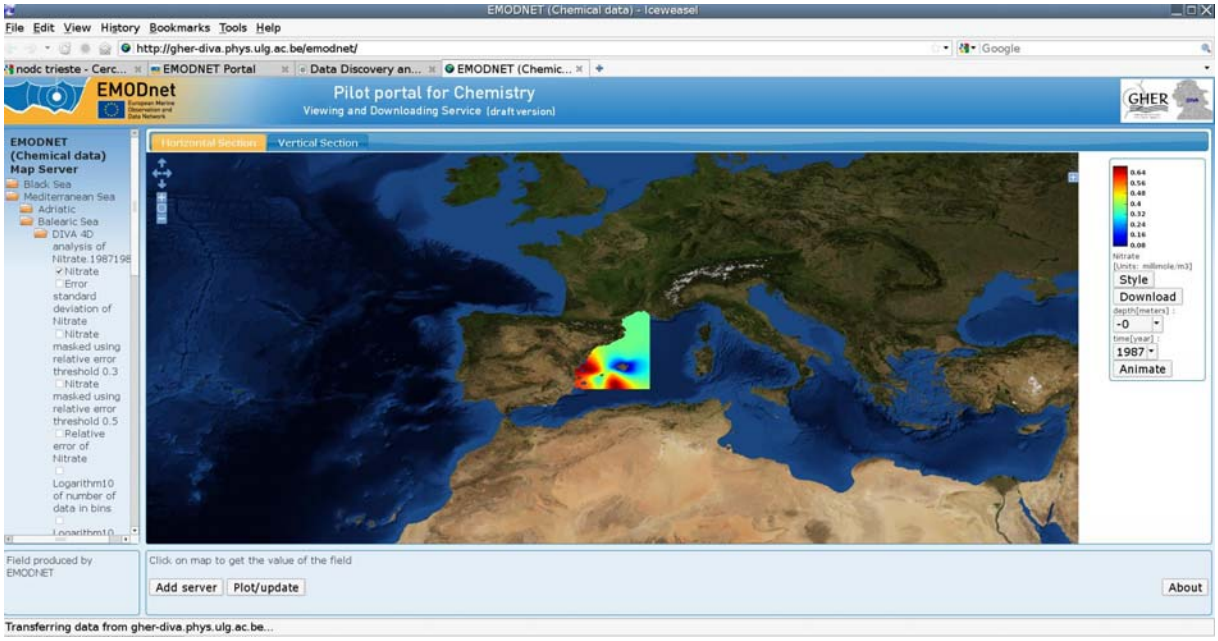
List of CDI's obtained from the EMODNET Common Data Index (CDI) User Interface

Within May 2010 the portal was completed with the core services giving access to the integrated maps of selected parameters. Thought the ***DataProducts*** section of the portal the EMODnet Data Products Viewing and Downloading Service, based on OGC standards is available. This web based viewer of climatologies called *OceanBrowser* was developed by GHER group of Liege University. The service based on OGC Open Geospatial Consortium standards (WMS,WFS) is implemented on the server side with a Python code running on an Apache web server. Those components works on a hierarchy of NetCDF files organized in folders that can be easily updated by copying a file in the data folder of the WMS server.



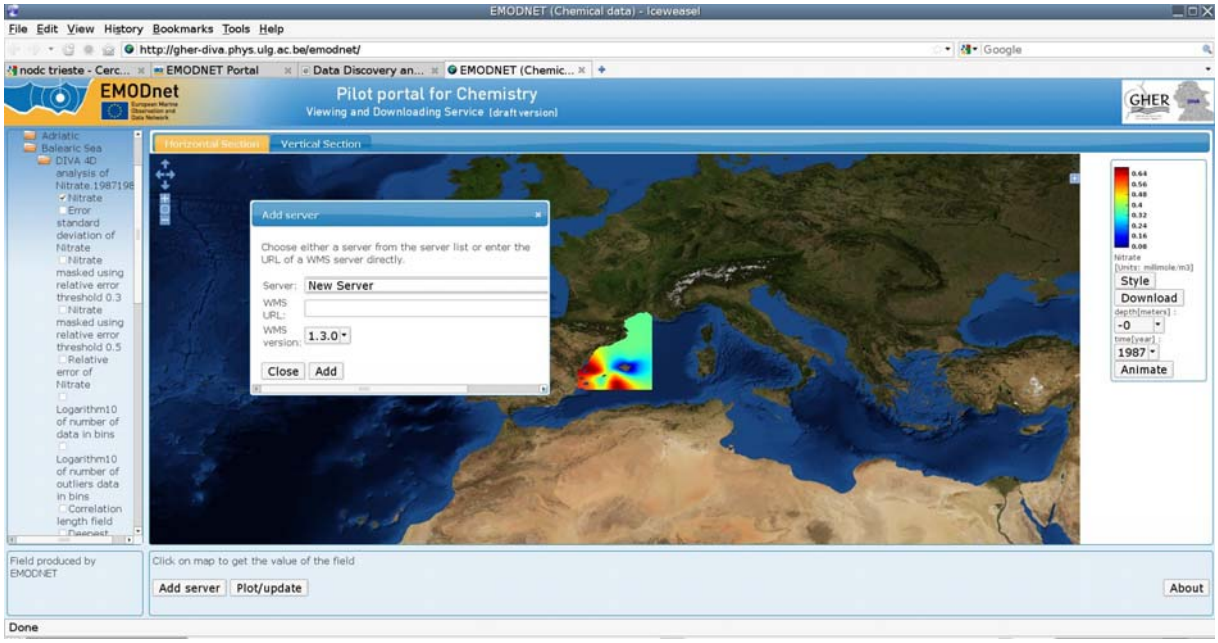
Data products access from the portal and disclaimer.

The viewer provides output images available as horizontal sections and vertical sections can be drawn by the selection of an appropriate transept. Available outputs are images that can be exported in: png, svg, kml and eps formats. The service let the user to customize the products by choosing some available graphic styles.



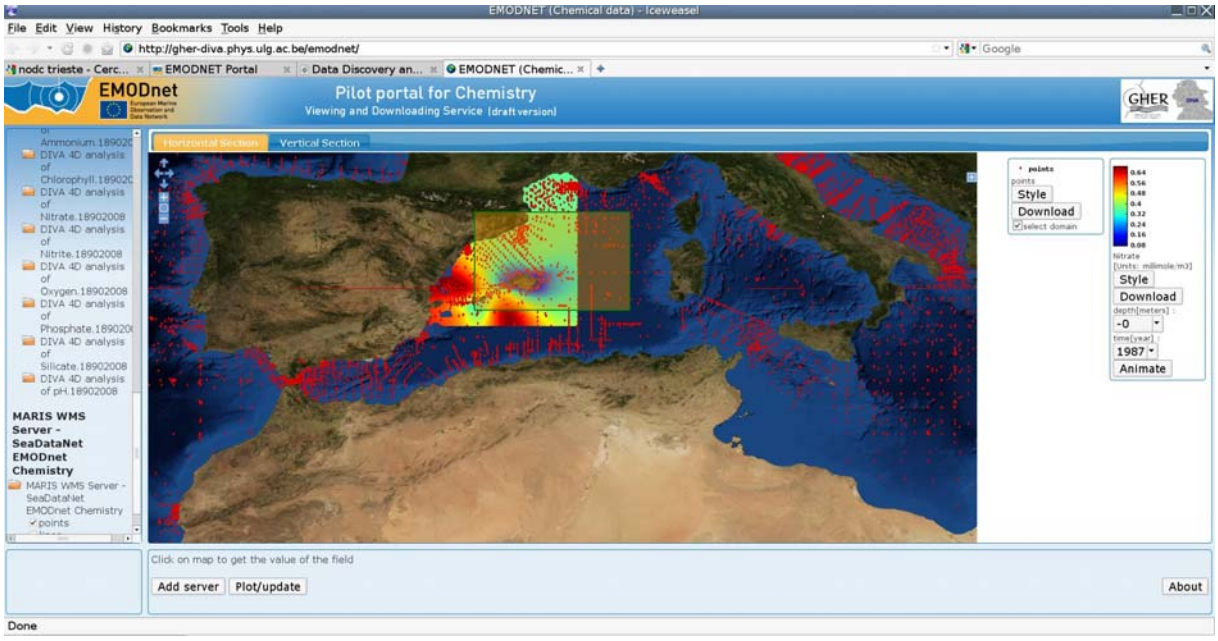
Nitrate distribution in the Balearic spot.

The integration with other Web Map Servicers is possible thanks to the OGC standards compliance. For this reason is possible to query an inventory of layers from other WMS servers and visualize them in the EMODnet Chemical portal together with the chemical data products.



Adding WMS server

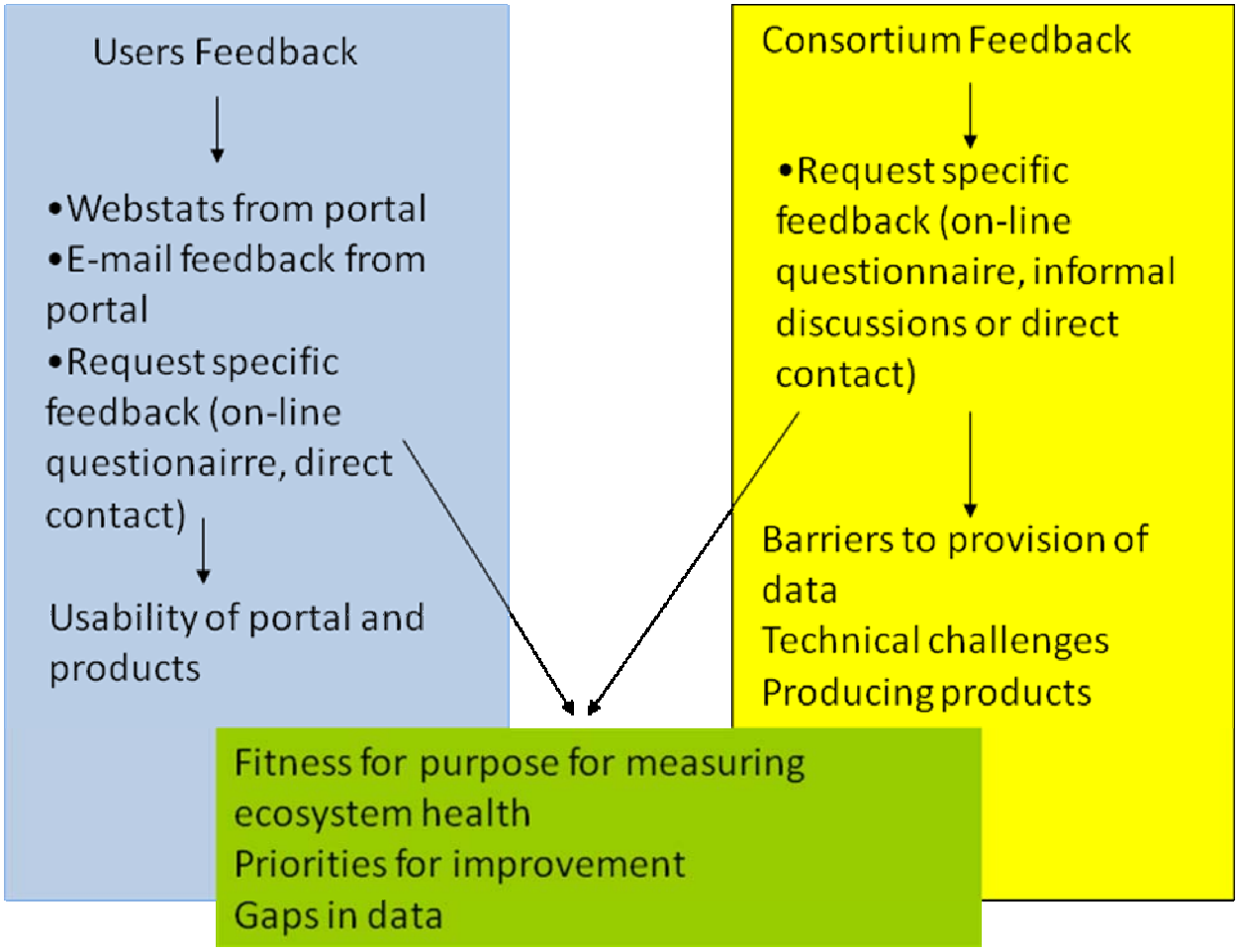
The WMS link to the Maris Server guarantees to visualize and overlap the data (CDI) layer and to access directly to data download mechanism developed by Maris.



EMODnet Chemistry CDI layer overlapping the Nitrate distribution in the Balearic spot with a selection of data domain

5. ANALYSIS AND EVALUATION (WP5)

This work package is primarily focused in the later half of the project, however work has already started. Evaluation is primarily from two sources. Firstly from the consortium on data access and provision of data to the EMODNET framework. Secondly, from users on the usability of the portal, products and potential gaps in data.



User and consortium feedback to detail the evaluation and analysis of the EMODNET Chemistry project.

Specifically these aims will be achieved by:

1) Collation of web stats from EMODnet portal, from EMODnet CDI User interface and from EMODNET Data Products Viewing and Downloading Service using the AW Stats software from the beginning of Phase 2 (June 2010).
2) Provision of a feedback button on main website which opens e-mail window to provide feedback.
3) For data users a short on-line form will be derived and sent to registered users.
4) For product users ask a series of brief questions will be requested at the expert workshop and again at the end of the project to track progress.

5) For consortium feedback in the short term a report will be provided on current experiences then towards the end of the project a questionnaire will be provided for partners.

The types of questions that will be asked to the users of the portal are:

- Was the portal easy to use without the need for instruction?
- Was the portal fast enough? (PC characteristics?)
- Was there enough information on the available data? ()What else?)
- Did you find data suitable for your need?
- Were their any gaps (spatially or temporally) in the available data that you would like to see filled? – For what requirement?
- Was the data easy to use?
- Are there any other formats you would like to receive the data in?
- Was the data sent to you within a reasonable time period?
- Was the QC applied to the data clear?

To date web statistics from the EMODNET website and portal are being collated, questionnaires have been drafted and informal feedback received from the consortium.

6. CONCLUSIONS

The EMODnet Chemical pilot represent a great challenge. In fact:

- It is undertaken by a large partnership, that on one side needs coordination but on the other side brings long-term expertise in collecting, processing, management and giving access to datasets and products;
- The complexity of the measurements covering 8 groups (pesticides, antifoulants, pharmaceuticals, heavy metals , hydrocarbons, radionuclides, fertilisers, organic matter) on 3 matrices (sediment, water column and biota)

To face this last point, data collection was approached with a priority list to get a first release ready (as a proof of concepts).

Besides, the cooperation with EEA and Marine Conventions (OSPAR, HELCOM and BSC) is crucial for data assembling, products definition and QC/QA.

The main difficulties faced during the first year of activities are represented by:

- complexity of the measurements, which are related to different environment;
- heterogeneity of the sampling (coastal points in time), which makes it critical the use of DIVA standard interpolation.

Experts and potential users opinion is expected to define the final set of product from chemical data.

This first year of activities was dedicated to set up the system components (that is to say the regional pools, the SDN vocabs which were extended for chemical parameters mapping, the EMODnet portal core services – CDI, discovery, viewing).

The second year is planned to be focused on:

- Continuing with data population and products generation,
- Increase portal functionalities (in the viewing and harmonisation),
- Finalise QC/QA and ask expert opinions (with ICES support),
- Finalise products validation based on feedback from experts and potential users.

ANNEX I – LIST OF ACRONYMS

BSC	Black Sea Commission
CAMIOON	CAtalogue and Management of products of operatIOnal OceaNography
CDI	Common Data Index (SeaDataNet metadata format)
DIVA	Data Interpolating Variational Analysis
DOC	Dissolved Organic Carbon
DOME	Database on Oceanography and Marine Ecosystems
EEA	European Environmental Agency
EU	European Union
GHER	GeoHydrodynamics and Environment Research, University of Liège
HCMR	Hellenic Centre for Marine Research
HELCOM	Helsinki Commission (for Baltic marine protection)
ICES	International Council for the Exploitation of the Sea
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IO-BAS	Institute of Oceanology - Bulgarian Academy of Science
MARIS	Mariene Informatie Service ‘MARIS’ BV
MEDPOL	Mediterranean Pollution Monitoring and Research Programme
MHI	Marine Hydrophysical Institute, Ukraine
MSFD	Marine Strategy Framework Directive
NERC-BODC	National Environmental Research Council – British Oceanographic Data Centre
NERI-MAR	National Environmental Research Institute
NetCDF	Network Common Data Format
NIMRD	National Institute for Marine Research and Development “Grigore Antipa”
ODV	Ocean Data View
OGC	Open Geospatial Consortium
OGS	Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
OSPAR	Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)
QA/ QC	Quality Assurance/ Quality Control
RIHMI-WDC	All Russian Research Institute of Hydro-meteorological Information – WDC B
SDN	FP7 EU SeaDataNet project
SIO-RAS	P.P. Shirshov Institute of Oceanology - Russian Academy of Science
TN	Total Nitrogen

TSU-DNA	Iv. Javakhishvili Tbilisi State University
WCS	Web Coverage Service
WFS	Web Feature Service
WMS	Web Map Service
XML	eXtensible Markup Language

ANNEX II – NEW SEADATANET P011 PARAMETER USAGE VOCABULARY TERMS ADDED FOR BIOTA IN EMODNET

The following list gives an example on new SeaDataNet P011 Parameters Usage Vocabulary terms (with Key Code and the related Code Description) added to include new collected data related to biota matrix into EMODNET infrastructure. In particular, these terms are needed to convert the new collected data into the common ODV4 data format, merge the information in the regional data pools and make them available through EMODNET CDI User Interface.

Key Code	Description
MMUSDDTP	Concentration of 1-chloro-4-[2,2,2-trichloro-1-(4-chlorophenyl)ethyl]benzene (pDDT CAS 50-29-3) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSPBXX	Concentration of lead (Pb) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSANTH	Concentration of anthracene (CAS 120-12-7) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSTTBT	Concentration of tributyltin (TBT) per unit wet weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSHCBX	Concentration of hexachlorobenzene (HCB CAS 118-74-1) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSCDXX	Concentration of cadmium (Cd) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSHGXX	Concentration of mercury (Hg) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSDDTO	Concentration of 1-chloro-4-[2,2,2-trichloro-1-(2-chlorophenyl)ethyl]benzene (oDDT CAS 789-02-6) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}
MMUSDTBT	Concentration of tributyltin (TBT) per unit dry weight of biota {Mytilus galloprovincialis (ITIS: 79456: WoRMS 140481) [Subcomponent: flesh]}

ANNEX III – OVERVIEW OF CDI RECORDS INCLUDED IN EMODNET CDI USER INTERFACE

The following table gives an overview of CDI records for EMODNET Chemistry per Data Centre giving the source of data (Originator), the principal activity of the organization and the related legal status. The following codes are used:

Activity Type

REC	Research	organisations only or mainly established for research purposes
EDU	Education	organisations only or mainly established for education/training, e. g. universities, colleges, schools
IND	Industry	industrial organisations private and public, both manufacturing and industrial services – such as industrial software, design, control, repair, maintenance
OTH	Others	

Legal Status

GOV	Governmental	local, regional or national public or governmental organisations e. g. libraries, hospitals, schools
INO	International Organisation	an international organisation established by national governments
EUB	European Body	A European organisation
PUC	Public Commercial Organisation	commercial organisation established and owned by a public authority
PRC	Private Commercial Organisation including Consultant	any commercial organisations owned by individuals either directly or by shares
EEI	European Economic Interest Group	
PNP	Private Organisation, Non Profit	Any privately owned non profit organisation

The following CDI table is updated to 6th July 2010.

EMODNET Partner	Originator	Activity_type	Legal_status	Record Nb.
NERC-BODC	Fisheries Research Services, Aberdeen Marine Laboratory	REC	GOV	196
NERC-BODC	Institute of Oceanographic Sciences Deacon Laboratory	REC	GOV	128
NERC-BODC	Institute of Oceanographic Sciences Wormley Laboratory	REC	GOV	303
NERC-BODC	Proudman Oceanographic Laboratory (POL)	REC	GOV	4
NERC-BODC	Scottish Association for Marine Science (SAMS)/Dunstaffnage Marine Laborator	REC	GOV	642
NERC-BODC	Scottish Office Agriculture and Fisheries Department (SOAFD) - Aberdeen Marir	REC	GOV	96
NERC-BODC	Scottish Office Agriculture Environment and Fisheries Department (SOAEFD) - A	REC	GOV	48
NERC-BODC	University of Wales, School of Ocean Sciences	EDU	GOV	212
BSH-DOD	Alfred Wegener Institute for Polar and Marine Research (AWI), Geophysics Dep	REC	GOV	3775
BSH-DOD	Baltic Sea Research Institute Warnemuende (IOW)	REC	GOV	681
BSH-DOD	Elbe River Water Authority	REC	GOV	715
BSH-DOD	Federal Institute of Hydrology (BFG)	REC	GOV	10
BSH-DOD	Federal Maritime and Hydrographic Agency	REC	GOV	2284
BSH-DOD	Federal Research Centre for Fisheries (Cuxhaven)	REC	GOV	57
BSH-DOD	Federal Research Centre for Fisheries (Hemburg)	REC	GOV	212
BSH-DOD	Finnish Institute of Marine Research (FIMR)	REC	GOV	20
BSH-DOD	German Hydrographic Institute	REC	GOV	26
BSH-DOD	GKSS Research Center	REC	GOV	122
BSH-DOD	Institute of Biochemistry and Food Chemistry, University Hamburg	EDU	GOV	27
BSH-DOD	Institute of Biogeochemistry and Marine Chemistry (IfBM), University of Hamburg	EDU	GOV	80
BSH-DOD	Landesamt für Wasserhaushalt und Küsten, Schleswig-Holstein, Kiel	REC	GOV	36
BSH-DOD	Lower Saxony Water Management, Coastal Defense and Nature Conservation A	REC	GOV	188
BSH-DOD	Senckenberg by the Sea, Marine Science Department	REC	GOV	157
BSH-DOD	State Agency for Environment, Nature and Geology, Mecklenburg-Vorpommern	REC	GOV	552
BSH-DOD	State Agency for Nature and Environment of Schleswig Holstein (LANU)	REC	GOV	1675
BSH-DOD	State Office of Ecology of Lower Saxony	REC	GOV	473
BSH-DOD	Weser River Management Bureau	REC	GOV	8
OGS	ARPA Emilia-Romagna - Struttura Oceanografica Daphne	REC	GOV	4512
OGS	ARPA Toscana, Area tutela ambiente marino	REC	GOV	246
OGS	CNR, Istituto di Scienze Marine (Sezione di Ancona)	REC	GOV	2277
OGS	CNR, Istituto di Scienze Marine (Sezione di Bologna)	REC	GOV	49
OGS	CNR, Istituto di Scienze Marine (Sezione di La Spezia)	REC	GOV	573
OGS	CNR, Istituto di Scienze Marine (Sezione di Trieste)	REC	GOV	1853
OGS	CNR, Istituto di Scienze Marine (Sezione di Venezia - ex IBM)	REC	GOV	3746
OGS	CNR, Istituto per lo Studio della Dinamica delle Grandi Masse	REC	GOV	900
OGS	Commissione Permanente per lo Studio dell'Adriatico, Venezia	REC	GOV	106
OGS	ICRAM, Chioggia	REC	GOV	283
OGS	ICRAM, Palermo	REC	GOV	753
OGS	Istituto Idrografico della Marina, Genova	REC	GOV	599
OGS	Marine Biology Laboratory of Trieste	REC	GOV	643
OGS	OGS	REC	GOV	21142
OGS	Zoological Station 'A. Dohrn' - Laboratory of Biological Oceanography	REC	GOV	844
HNODC-HCMR	Hellenic Centre for Marine Research, Institute of Oceanography (HCMR/IO)	REC	GOV	19110
HNODC-HCMR	University of Athens, Department of Chemistry, Division of Inorganic and Enviror	EDU	GOV	
IEO	Baleares Islands University. Environmental Biology Department. UIB	REC	GOV	223
IEO	Centre for Advanced Studies of Blanes (CEAB-CSIC)	REC	GOV	256
IEO	IEO/ Murcia Oceanographic Centre	REC	GOV	1225
IEO	IEO/ Balearic Islands Oceanographic Centre	REC	GOV	670
IEO	IEO/ La Coruna Oceanographic Centre	REC	GOV	658
IEO	IEO/ Malaga Oceanographic Centre	REC	GOV	1129
IEO	IEO/ Santander Oceanographic Centre	REC	GOV	1746
IEO	IEO/ Vigo Oeanographic Centre	REC	GOV	1111
IEO	Institute of Marine Sciences. Mediterranean Marine and Environmental Researcl	REC	GOV	509
IEO	IEO	REC	GOV	2036
VLIZ	Flanders Marine Institute	REC	GOV	478
IFREMER	CEA / INSTITUT DE RADIOPROTECTION ET DE SURETE NUCLEAIRE	REC	GOV	221
IFREMER	CEA / LABORATOIRE DES SCIENCES DU CLIMAT ET DE L' ENVIRONNEME	REC	GOV	282
IFREMER	CEREGE	REC	GOV	15
IFREMER	CNRS / Center of Oceanology of Marseille (COM) La-Seyne-Sur-Mer	REC	GOV	92
IFREMER	CNRS / COM - LAB. D' OCEANOGRAPHIE & DE BIOGEOCHIMIE -ENDO	REC	GOV	507
IFREMER	CNRS / COM - LAb. D'OCEANOGPHIE ET DE BIOGEOCHIMIE - TOULON	REC	GOV	152
IFREMER	CNRS / LABORATOIRE DE MICROBIOLOGIE MARINE	REC	GOV	137
IFREMER	CNRS / LEGOS	REC	GOV	57
IFREMER	CNRS / STATION BIOLOGIQUE DE ROSCOFF	REC	GOV	3
IFREMER	DEPARTEMENT DE GEOLOGIE ET OCEANOGRAPHIE (UNIV. BORDEAUX 1	EDU	GOV	268
IFREMER	IFREMER	REC	GOV	823
IFREMER	IFREMER / BE-DPT CHEMICAL POLLUTENTS, BIOGEOCHEMISTRY & B	REC	GOV	72
IFREMER	IFREMER / CENTRE DE BREST	REC	GOV	333

IFREMER	IFREMER / CENTRE MANCHE - MER DU NORD	REC	GOV	81
IFREMER	Ifremer / Crela	REC	GOV	172
IFREMER	IFREMER / DYNECO-DPT DYNAMIQUES DE L'ENVIRONNEMENT COTIER	REC	GOV	368
IFREMER	IFREMER / EEP/LEP-DEEP ENVIRONMENT LABORATORY	REC	GOV	14
IFREMER	IFREMER / EMH-DEPARTEMENT ECOLOGIE ET MODELES POUR L'HALIEU	REC	GOV	388
IFREMER	IFREMER / GM-MARINE GEOSCIENCES	REC	GOV	5
IFREMER	IFREMER / STATION DE LA TREMBLADE	REC	GOV	273
IFREMER	IFREMER / STATION DE LA TRINITE	REC	GOV	26
IFREMER	IFREMER / STATION DE SETE	REC	GOV	45
IFREMER	IFREMER / STH-DEPARTEMENT SCIENCES ET TECHNOLOGIES HALIEUTI(	REC	GOV	72
IFREMER	Ifremer / Tahiti Centre COP	REC	GOV	105
IFREMER	INSTITUT DE PHYSIQUE DU GLOBE DE PARIS / OBSERVATORIES - IPGP	REC	GOV	131
IFREMER	IRD / CENTRE DE CAYENNE- GUYANE	REC	GOV	477
IFREMER	IRD / CENTRE DE LA REUNION	REC	GOV	1549
IFREMER	IRD / CENTRE DE MONTPELLIER	REC	GOV	840
IFREMER	IRD / CENTRE DE PAPEETE	REC	GOV	863
IFREMER	IRD / CENTRE OF ABIDJAN	REC	GOV	2958
IFREMER	IRD / CENTRE OF HANN	REC	GOV	153
IFREMER	IRD / CENTRE OF JAKARTA	REC	GOV	81
IFREMER	IRD / CENTRE OF MADAGASCAR	REC	GOV	1
IFREMER	IRD / CENTRE OF POINTE NOIRE	REC	GOV	725
IFREMER	IRD / CENTRE TOGA LE HAVRE	REC	GOV	48
IFREMER	IRD /CENTRE DE BRETAGNE	REC	GOV	1815
IFREMER	IRD ANTENNE INSTITUT OCEANOGRAPHIQUE (IRD)	REC	GOV	601
IFREMER	IRD CENTRE DE NOUMEA	REC	GOV	4839
IFREMER	LABORATOIRE DE PHYSIQUE DES OCEANS/UBO (UNIVERSITE DE BRETA(	EDU	GOV	1026
IFREMER	LABORATORY of OCEANOGRAPHY and CLIMATE (LOCEAN)	EDU	GOV	3241
IFREMER	LABORATORY OF OCEANOGRAPHY of VILLEFRANCHE (LOV)	REC	GOV	1940
IFREMER	LABORATORY of PHYSICAL OCEANOGRAPHY (LPO) UMR 6523 CNRS-IFRE	EDU	GOV	1864
IFREMER	METEO FRANCE / CENTRE METEOROLOGIQUE NEVERS	REC	GOV	65
IFREMER	MUSEUM NATIONAL D'HISTOIRE NATURELLE / DEPARTEMENT MILIEUX P	REC	GOV	31
IFREMER	MUSEUM NATIONAL D'HISTOIRE NATURELLE / LABORATOIRE D'OCEANO(	REC	GOV	760
IFREMER	Observatoire Oceanologique De Banyuls (Université de Paris VI)	EDU	GOV	655
IFREMER	SHOM (SERVICE HYDROGRAPHIQUE ET OCEANOGRAPHIQUE DE LA MAR	REC	GOV	401
IFREMER	Universite D'Angers / Laboratoire Des Bio-Indicateurs Actuels Et Fossiles (Biaf)	EDU	GOV	26
IFREMER	UNIVERSITE DE BORDEAUX I / IGBA TALENCE	EDU	GOV	19
IFREMER	UNIVERSITE DE BORDEAUX I / INSTITUT DE BIOLOGIE MARINE	EDU	GOV	27
IFREMER	Universite de Bordeaux I / Laboratoire De Physico Et Toxico-Chimie Ism	EDU	GOV	19
IFREMER	UNIVERSITE DE BRETAGNE OCCIDENTALE (UBO) / LAB. D'OCEANO. CHIM	EDU	GOV	150
IFREMER	UNIVERSITE DE LA MEDITERRANNEE (U2) / CENTRE D'OCEANOLOGIE DE	EDU	GOV	100
IFREMER	UNIVERSITE DE LA MEDITERRANNEE (U2) / COM - LAB. OCEANOG. &	EDU	GOV	1469
IFREMER	UNIVERSITE DE MONTPELLIER II / LABORATOIRE DYNAMIQUE DE LA LITH	EDU	GOV	73
IFREMER	UNIVERSITE DE PERPIGNAN / CEFREM	EDU	GOV	31
IFREMER	UNKNOWN			3359
SMHI	Swedish Meteorological and Hydrological Institute, SMHI	REC	GOV	45368
Centre for Estuarine and	Centre for Estuarine and Marine Ecology (NIOO-CEME)	REC	GOV	6817
RIHMI-WDC	Atlantic Scientific Research Institute for Marine Fishery and Oceanography	REC	GOV	48
RIHMI-WDC	Far Eastern Regional Hydrometeorological Research Institute	REC	GOV	49
RIHMI-WDC	Institute of Biology of the Southern Seas, NAS of Ukraine	REC	GOV	334
RIHMI-WDC	Marine branch of Ukrainian Hydrometeorological Institute	REC	GOV	98
RIHMI-WDC	Odessa Branch of SOI (State Oceanographic Institute)	REC	GOV	37742
RIHMI-WDC	P.P.Shirshov Institute of Oceanology, RAS	REC	GOV	382
RIHMI-WDC	Ukrainian scientific center of Ecology of Sea (UkrSCES)	REC	GOV	104
SIO-RAS	P.P.Shirshov Institute of Oceanology, RAS	REC	GOV	122
IO-BAS	Institute of Oceanology, Bulgarian Academy of Sciences (IO-BAS)	REC	GOV	40
NIMRD	National Institute for Marine Research and Development Grigore Antipa	REC	GOV	2948
Latvian Institute of Aqua	Latvian Institute of Aquatic Ecology	REC	GOV	134
Institute of Oceanograph	Center for marine research - Rudjer Boskovic Institute	REC	GOV	578
Institute of Oceanograph	Institute of Oceanography and Fisheries	REC	GOV	899
University Of Malta / Phy	Malta Centre for Fisheries Sciences	REC	GOV	128
OC-UCY	Cyprus Oceanographic Data Center, Oceanography Center	EDU	GOV	499
MHI	Marine Hydrophysical Institute	REC	GOV	2050
NERI-MAR	National Environmental Research Institute, Department of Marine Ecology	REC	GOV	116439
Israel Oceanographic ar	Israel Oceanographic and Limnological Research (IOLR)	REC	GOV	3120
National Institute of Biol	National Institute of Biology - NIBMarine Biology Station	REC	GOV	3096
Rijkswaterstaat Waterdi	Rijkswaterstaat Waterdienst	REC	GOV	11132
RBINS-MUMM	Management Unit of the North Sea and Scheldt Estuary Mathematical Models	REC	GOV	2779
RBINS-MUMM	Université Libre de Bruxelles, Ecology of Aquatic systems	EDU	GOV	230
RBINS-MUMM	Vrije Universiteit Brussel, Laboratory of Ecology and Systematics	REC	GOV	39
Finnish Meteorological I	Finnish Institute of Marine Research (FIMR)	REC	GOV	2084
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