

**Design document for an EMODnet Central Portal, to visualize
and provide access to the thematic data products**

**Objectives and
Technical description**

Background Proposal

The Flemish Government approved on 23 December 2011 to expand the International Cooperation of the Flanders Marine Institute, by supporting the European Marine Observation and Data Network (EMODNET). The offer included, besides the installation of the Secretariat offices, the technical and scientific support to (1) construct and operate a single EMODnet Portal to visualize and provide access to the thematic data products, that are being built and managed in the individual thematic EMODnet projects and to (2) organize user services to facilitate and increase access to and usage of the EMODnet portal.

This proposal was accepted by the European Commission, Directorate General for Maritime Affairs and Fisheries on 18 October 2012. A meeting was organised on 23 November 2012 between the European Commission, the coordinators of the different EMODnet lots, and the Flanders Marine Institute to discuss the design of the EMODnet Central Portal. It was decided that a draft design document would be drafted by the Flanders Marine Institute as a discussion note and distributed amongst the EMODnet coordinators and presented to the MODEG group. The Lots coordinators and members of MODEG gave their feedback, which is summarised below:

1. Identify common use cases as a roadmap for developing the Portal. These use cases should be targeting different EMODnet end-users, highlighting the added value of common analysis amongst different thematic data products.
2. It was highlighted that different existing thematic data product portals have different tools, should be maintained and cannot be replaced by one central portal
3. There is a need for a strong central portal, which attracts more end-users to EMODnet and EMODnet thematic portals (including the use of different social media...)
4. The Central Portal should give clear overview of available products
5. The Central Portal webpage should include a section on different vocabularies used within the different thematic portals and should include a section on the data policies of EMODnet and its subcomponent data systems.
6. The Central Portal should be user friendly.
7. The Central Portal should include a section or a use case dealing with Coastal data

This is the design document which describes the technical setup and main functionalities of the EMODnet Central Portal. This document will remain open for comments, suggestions and modifications.

1. GENERAL OBJECTIVE

The overall objective of the EMODnet Central Portal is to provide the user with an accessible and user friendly web interface providing access to the main EMODnet data products and links to the data that were used to compile these data products and are available in the different thematic portals. The EMODnet Central Portal needs to have high performance, providing fast access to chemical, physical, geological, biological, habitat and bathymetric data products at sea basin scale, produced within the different EMODnet lots. The EMODnet Central Portal will also

provide general information on all EMODnet thematic projects, promoting the project as one integrated network.

In order to achieve this, we propose to i) create and populate a website to disseminate information about the EMODnet project, using also different social media, and ii) build a GIS-based web portal embedded in the website providing access to the different thematic data products.

1.1 Interaction with EMODnet thematic portals & product catalogues

The hosting and development of the thematic EMODnet data portals are managed by the different EMODnet lots. Data management, data access and data downloading will be performed through the thematic portals. The links between the data products, hosted at the lots' IT infrastructures, and the data that were used to compile these products can be made available through the SEXTANT infrastructure.

The SEXTANT infrastructure is maintained by IFREMER, an EMODnet partner, and provides a catalogue which conforms to the Inspire directive, ISO standards and the OGC's CSW interface giving detailed information about the data product, and links to more information about the product within the thematic portals.

The links between the data products and the data (CDI records) that were used to compile these products will be made available within the thematic portals. By using common standards for geospatial information, the portal will be able to communicate with other OGC compliant data and metadata (ICES geonetwork, VLIZ geonetwork) portals through WMS, WFS, CSW.

More information on SEXTANT available at <http://www.ifremer.fr/sextant/en/nos-services>

2. CONSTRUCTION OF THE EMODNET WEBSITE

An EMODnet website is being set up and populated with information on the overall EMODnet initiative. Upon completion, the website will contain detailed information and links to the different thematic portals and will give an overview of the European Marine Observation and Data Network, and its partner institutes. The website will also make use of social media (Facebook, Twitter, LinkedIn) to announce news and disseminate information. The website will embed the EMODnet Central Portal and will be available from <http://www.emodnet.eu>. All web statistics will be monitored, including hits on the EMODnet Central Portal website and by requesting users to log-in (Single Sign-On)

3. CONSTRUCTION OF THE EMODNET PORTAL

3.1 EMODnet Portal

The EMODnet Central Portal will provide a user-friendly web interface to allow access to the data products that are compiled by the different thematic portals. The user should be able to search for the different thematic data products, by geographic location, and by geographic region, should be able to visualise the different layers, download the layers and should be linked back to the data and information that was used to compile the layers. The portal will allow to retrieve compiled information from a specific geographic location or region on the system, provided through the different data products.

3.2 Functionalities EMODnet Portal

The EMODnet central portal will allow the user to perform a spatial query on different data products simultaneously. The user will be able to retrieve bathymetric, geological, seabed habitat, physical, chemical and biological information from the same location or an area, at a specific moment in time if relevant. The portal will compile this information and make it downloadable, and provide links to data product catalogues with more information about the individual data products, how they have been created and where, and how the original data can be retrieved within the individual portals. This will redirect the user to the different thematic data portals. The data products will be visualised through a GIS interface, allowing visualisation and manipulation of the different data products. Since the EMODnet Central Portal is fully OGC compliant, different data product servers and metadata catalogue servers will be able to communicate with the portal.

3.2.1 Data Products - visualization

The selected data products will be visualized through a GIS web interface. The selected geographic location will be visualized (being a region, a coordinate, coordinates or a specific bounding box. It will be possible to provide animations on data products, with a temporal component.

3.2.2 Data Products - querying and selection

The user will be able to perform a spatial query on the different data products that are available through the web services. Specifically, the user may be able to use an interface to input one coordinate point, a bounding box, or a region (a shapefile of an EEZ, MSFD region) along with Date and Depth, if appropriate, and extract the information within that region. E.G. abundance of occurring species by Biology, Distance to mooring station and its data for Physics, Depth by Bathymetry, Seabed Habitat, Seabed Geology, Concentration of chemicals for given date and depth. Eventually, the user will be also able to perform queries on the layers themselves: Retrieve the species that exceed a certain heavy metals threshold that occur within Posidonia habitat between the 5 and 10m depths.

The spatial query will initially focus on a few mature data products from each lot. The spatial querying system also allows users to search for data products information from a specific buffer around an area, for example to render all data within 20 miles from the coastline. The querying interface will be constructed to make this selection procedure as intuitive as possible. It will also be possible to search and retrieve meta information from the EMODNET product data catalogue from all data products available in the different lots of EMODNET.

3.2.3 Data Products - downloading

The thematic data products will be available for download. The products can be downloaded as different WMS (gif, geotiff, jpg, pdf, kml, svg, georss) or WFS(gml, shapfile, csv) formats. After performing a spatial, temporal and or thematic query, the data from the selected data products will be aggregated and the information will be made downloadable in a compiled data file. When selecting an geographic area, information from the data products will be aggregated into specific grid cells with size of the cells controlled by the resolution of the product and if possible also by the users' choice. All downloads will be monitored.

3.3 Use Cases

Use Cases represent the conceptual interactions between the Users and the Portal. In EMODnet we will put together a few use cases using data from different lots and highlight the added value of bringing thematic data together. By generating the functional requirements of the Portal, these use cases will be used as a blueprint for the actual technical development.

This document proposes three different use cases. Each of the different use cases is framed within a different policy context, makes use of data and data products of at least two thematic portals and functions as a driver for the development of a specific set of functionalities available at the central portal.

The first Use Case described below will be the first to be developed. The development of this first use case will require the lots to maintain fully operational Web Services. These, will in turn be crucial for the development of any other Use Cases. Therefore, no other Use Cases will be developed for as long as the initial Use Case, and the corresponding Web Services are not well established.

3.3.1 Use case 1: Combined output from different data products

Query EMODnet data products simultaneously							
What it is	Retrieve data from multiple data products via one single interface						
In what context (eg)	For providing Fisheries Authorities with information relevant to perform fisheries assessments						
What the output will be	The output is a list of values for a given coordinate point or list of points. For a given coordinate (e.g. current position of a vessel), the system will return a list of the required parameters (depth, seabed substrate, seabed habitat, mean temperature/salinity for a given time interval or depth, fishing zone, national jurisdiction, protected area etc).						
What are the technical specifications	This functionality will make use and integrate geographic webservices provided by the different thematic lots. It will provide the user with a tool that easily integrates the output from the different thematic products. The tool will be based upon OGC compliant webservices – and requires more specifically operational Web Feature Service (WFS) and Enhanced Web Map Service (WMS) that support the "GetFeatureInfo". Once the tool is operational, new OGC compliant data products, developed within the context of EMODnet can be added to this tool						
What data layers we need – what feature – in what format– assess the status	Source	WMS layer Name	*	Status WMS/WFS	What is needed?	Min. Required Fields	
	Hydrography	emodnet:mean_multicolour	yes		Depth values	Latitude, longitude, depth	
	Geology	EMODNET-Geology Seabed substrate	yes			Latitude, longitude, substrate	
	Biology	Emodnet: Species Group uniquespecies	yes		Species occurrence / abundance queryable by date in finer resolution	Latitude, longitude, species name, abundance /presence, date	
	Physics	stazioni			Data per coordinate point	Latitude, longitude, date, depth, value	
	Seabed Habitats	Predicted Habitats Seemap	yes			Latitude, longitude, value	
	Chemistry						
	Marineregions.org**	EEZ, FAO Fishing Area Ices, Statistical Area, Natura2000	yes			Latitude, longitude, value	
<u>Output Example:</u>							
Coordinate	Average Depth (m)	Seabed Substrate	Seabed Habitat	Cod mean abundance	Nitrates (5m -µmol/L)	ICES Statistical Area	EEZ
2,5461 51,7123	23,0	mud to sandy mud	Infralittoral mixed	0,37	16,1	XIIb	French EEZ
3,7461 54,7123	27,4	mud	Circalittoral sandy	0,45	34,1	VIIa	Dutch EEZ
6,5461 55,7123	87,5	course-grained sedi	Circalittoral muddy	1,89	27,1	Vib	Danish EEZ

* Supports Identify feature (click to view info)

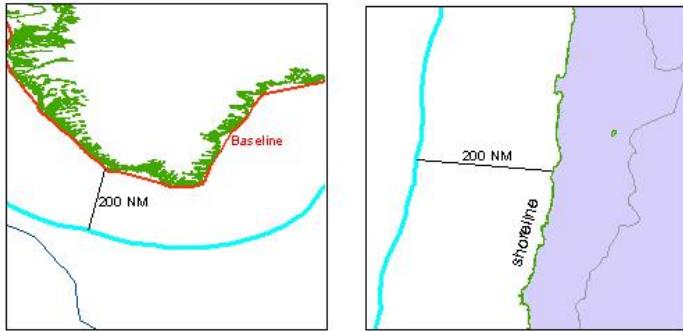
**: is not EMODnet portal, but can be added as it is OGC compliant and provides relevant information in this context

3.3.2 Use case 2: Benthic Index Calculation (BEQI)

Run online calculations on EMODnet data products						
What it is	The Benthos Ecosystem Quality Index (BEQI) is a biological index that is used to assess the state of soft-sediment benthic habitats. The index can be calculated at ecosystem, habitat and community level and primarily aims at providing a signal that is capable of showing significant deviations from a defined reference state.					
In what context	The Benthos Ecosystem Quality Index (BEQI) is a biological index that is used to report on the state of soft-sediment benthic habitats of marine, coastal and transitional waters for the Marine Strategy Framework Directive and the Water Framework Directive.					
What the output will be	A tool providing the user the possibility to assess the state of ecosystems, habitats and communities for different European seabasins by comparing their data with an reference condition derived from observation data collected within EMODnet. The aim is to provide the possibility to assess the status of habitats at sea basin level.					
What are the technical specifications	Users will be able to run calculations on the data and data products produced by the different lots. The BEQI index will be used as an example, but the functional developments can be reused to calculate other indices on EMODnet data and data products as a lot of different member states defined those type of indices under the MSFD and WFD.					
What data layers we need – what feature – in what format– assess the status	Source	WMS layer Name	Min. Required Fields	*	Status WMS	What is needed?
	Seabed Habitats	Predicted Habitats Seemap	Latitude, Longitude, value	yes	OK	
	Geology	EMODNET-Geology Seabed substrate	Latitude, longitude, substrate	yes	OK	
	Biology		Latitude, Longitude, Taxonomic data Density (biomass is optional)			Biological reference datasets for seabed habitat at European sea level containing density, biomass and taxonomic data
	Human activities				no	Data layers on different pressures on the marine environments, to link the indices with human pressures
	<u>Output Example:</u>					
Habitat	Reference surface area (m ² or ha)	Assessment surface area (m ² or ha)	Level 2 EQR score	Calculate		
Mussel bank	45	2	BAD (0.036)	Add Row		
Biogenic Reef	35	17	MODERATE (0.485714)	Delete Row		
Infralittoral rock	25	23	HIGH (0.92)	Delete Row		
>> Download comma separated file (.csv)						
<input type="button" value="Reset"/>						

* Supports Identify feature

3.3.3 Use case 3: Coastal data

Implement spatial filters on data products						
What it is	The EMODnet Central Portal will allow the user to browse and select for coastal data processed by different thematic lots. This will require the possibility to browse for data measured along the national baseline or coastline.					
In what context	A key challenge for good implementation of Coastal Management Plans is the availability and accessibility of good quality coastal data. The terms of reference of the thematic EMODnet projects highlight in this context the importance to focus also on specific coastal data.					
What the output will be	Specific coastal dataproducts will be developed under phase 2: rates of sedimentation and erosion, coastal typology, high resolution bathymetry. The central portal should be able to combine these dataproducts, and provide the functionality to select these data, as measured from a distance from the national baseline or coastline					
How to implement this – what the functionalities will be	This functionality will allow to perform complex spatial queries on dataproducts. Essential for this is to have spatial information on the coastline and on national baseline.					
What data layers we need – what feature – in what format – assess the status	Source	WMS layer Name	Min. Required Fields	*	Status WMS	What is needed?
	Hydrography		Latitude, longitude, high resolution depth at coast			
	Geology	EMODNET-Geology	Latitude, longitude, sedimentation, erosion			
	Biology					Coastal data layer
	Chemistry					Coastal data layer
	EEA**		European Coastline			
	Marineregions.org**	Marineregions.org	National baseline	yes	OK	
Possible Output						
						

* Supports Identify feature (click to view info)

**: is not EMODnet portal, but contains critical data to develop functionality

3.4 Standards

The EMODnet Central Portal will implement the geospatial standards defined by the OGC (Open Geospatial Consortium). The portal will implement the Web Map Server (WMS) specification, defining a standard protocol for generating cartographic maps over the web and the Web Feature Server (WFS), defining a standard protocol for querying and retrieving vector features over the web. The services are compliant with the INSPIRE view and downloading services. The product metadata catalogue Sextant is also based on the standards of the Open Geospatial Consortium (OGC) and ISO TC211 standards and implements the Catalogue Service for the Web (CSW). This service is compliant with the INSPIRE discovery services and by applying this protocol, Sextant allows access and dissemination of standardized geospatial metadata.

3.5 Web services

By adopting geospatial standards (WMS, WFS, CSW), the EMODnet portal will provide several web services which allow the user for example to have direct access to the geographic data, maps and metadata from a GIS desktop or for online applications. Additional web services will be developed allowing to upload your file with geographic coordinates and the system will add information derived from the data products to the uploaded file. Thus, each lot must be able to supply the EMODnet central portal with fully functional, OGC-compliant, Web Services (WMS and/or WFS). In order to achieve this, lots products and services should be tested and rated following directives agreed upon in advance. Below, possible options are described.

3.5.1 WMS/WFS Testing

Testing: <http://cite.opengeospatial.org/teamengine/>

The test available from the link above provides an online testing facility as part of the OGC Compliance Program, it is meant for those seeking OGC certification, but it can be used by EMODnet as a platform to ensure that the Web Services are up to a minimum required level of operation.

3.5.2 WMS/WFS Rating

After an assessment of the OGC services, we should identify and implement the steps to have at least a three star rating – definition of the Star Ratings inspired in OneGeology – where we have the GetFeatureInfo parameter, meaning the WMS is “queryable” and data products can be combined – but aiming to go for an operational WFS (four star) with metadata links. Below an explanations of the OGC certification.

Star Rating	Level of service attained	Technical and service parameters to be met	EMODnet products
One star	Basic Web Map Service (WMS)	Web Map Service (WMS) supporting "GetCapabilities" and "GetMap" requests to deliver map images.	•

Two star	Upgraded Web Map Service (WMS)	<ul style="list-style-type: none"> ▪ One Star requirements met. ▪ Map legend provided. ▪ Minimum metadata available (contact information, abstract, access constraints, cataloguing keywords). 	▪
Three star	Enhanced Web Map Service (WMS)	<ul style="list-style-type: none"> ▪ Two Star requirements met. ▪ "GetFeatureInfo" (at least text/html format) request supported. ▪ Web Map Service (WMS) v. 1.3.0 supported. ▪ Additional keywords to make GetCapabilities response ISO19115 core compliant ▪ Clear statement of use relating to data, including licence and charging details (where appropriate). ▪ Access to data must be transparent, simple and fair to all. 	▪
Four star	Web Feature Service (WFS)	<ul style="list-style-type: none"> ▪ Three Star requirements met. ▪ "MetadataURL" for each WMS layer and WFS feature type should point to a metadata record conforming at least to the metadata profile. ▪ Web Feature Service (WFS) at a minimum v. 1.1.0. 	▪

Nature of Signoff	Person	Signature	Date	Role
Author	Simon Claus			Project Manager
Reviewer	Francisco Souza Dias			Scientific Assistant

DOCUMENT CHANGE RECORD

Date	Version	Author	Change Details
07th March 2013	Version 1	Simon Claus	Design Document
03th November 2013	Version 1	Simon Claus	Include comments from EMODnet coordinators
4th December 2013	Version 2	Francisco Souza Dias	Use Cases
5th December 2013	Version 2	Francisco Souza Dias	Insert WMS testing and rating. Review and complete all use cases
18th February 2014	Version 3	Francisco Souza Dias	Merging of versions 1 and 2
2 June 2014	Version 4	Simon Claus	Minor changes version 3