EMODnet Thematic Lot n° 7

Human Activities

EMODnet Phase 2 –Final report

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Table of Content

Table of Content 2
List of abbreviations and acronyms 4
Executive summary 6
1. Introduction 21
2. Highlights of the project 23
3. Description of the work done 25
WP1 – Project Management 25
WP 2 – Development of the portal and maintenance 25
WP3 - Design and implementation of the GIS database 27
WP 4/5/7 – Data collection / harmonisation/data analysis 29
WP 6 – Population of the database 29
WP 8 – Monitoring of effectiveness in addressing users' needs 30
WP 9 – Fine-tuning 38
4. Challenges encountered during the project 41
5. Analysis of performance and lessons learned 46
6. Analysis of sustainability 52
7. User Feedback 56
8. Allocation of project resources 58
9. Outreach and communication activities 59
10. Evolution of Progress Indicators 63
Indicator 4. Volume of each type of data and of each data product downloaded from the portal 71
Indicator 5. Organisations that have downloaded each data type 72
Indicator 6. Using user statistics to determine the main pages utilised and to identify preferred user navigations routes 76
Indicator 7. List of what the downloaded data has been used for (divided into categories e.g. Government planning, pollution assessment and (commercial) environmental assessment, etc.) 79

Indicator 8. List of web-services made available and user organisations connected through these web-services 79
Annex 1: Additional User Statistics 86
Additional User Statistics 86
Annex 2: Data analysis 88

List of abbreviations and acronyms

AIC – Automatic Identification System

CEFAS - Centre for Environment, Fisheries and Aquaculture Science

EMODnet - The European Marine and Observation Data Network

EMSA - European Maritime Safety Agency

EUMOFA - European Market Observatory for fisheries and aquaculture

EWEA - European Wind Energy Association

FAO – Food and Agriculture Organisation of the United Nations

HVDC – High-voltage, direct current

ICES - International Council for the Exploration of the Sea

IMO – International Maritime Organization

INSPIRE – Infrastructure for Spatial Information in the European Community

IOGP – International Association of Oil & Gas Producers

JNCC – Joint Nature and Conservation Committee

JRC - Joint Research Centre

LRIT – Long-range identification and tracking

MMO - The Marine Management Organization

MoU - Memorandum of Understanding

MSFD – Marine Strategy Framework Directive

MSP – Maritime Spatial Planning

NAMR – National Agency for Mineral Resources

SEO - Search Engine Optimisation

SOLAS – International Convention for the Safety of Life at Sea

SOWFIA – Streamlining of Ocean Wave Farms Impact Assessment

SPLASHCOS - Submerged Prehistoric Archaeology and Landscapes of the Continental Shelf

SST – Sea surface temperature

SSS – Sea surface salinity

STECF - Scientific, Technical and Economic Committee for Fisheries

TACs – Total allowable catches

WFS - Web Feature Service

WMS - Web Map Service

WP – Work Package

Executive summary

The European Marine and Observation Data Network (EMODnet) Human Activities (www.emodnet-humanactivities.eu) is a project financed by the EU Commission, which aims to map the spatial extent and intensity of a wide array of marine and maritime activities in EU waters.

The project is part of a wider long-term initiative, whose purpose is to unlock fragmented and hidden marine data resources across Europe, and to make these available to individuals and organisations (public and private). This should facilitate investment in sustainable coastal and offshore activities through improved access to quality-assured, standardised and harmonised marine data which are interoperable and free of restrictions on use.

There are currently 8 web portals (Bathymetry, Geology, Seabed Habitats, Biology, Chemistry, Physics, Human Activities and Coastal Mapping) that are making available geographic datasets addressing different maritime themes.

EMODnet Human Activities aims to facilitate access to existing marine data on activities carried out in EU waters, by building a single entry point for geographic information on 13 different themes:

1. Aggregate extraction
2. Cultural heritage
3. Dredging
4. Environment
5. Fisheries
6. Hydrocarbon extraction
7. Main ports
8. Mariculture
9. Ocean energy facilities
10. Other forms of area management / designation
11. Pipelines and cables
12. Protected areas
13. Wind farms

The portal went live on the 4th of April 2014. Its design is based on harmonisation discussion document and EMODnet Style Guide elaborated by the EMODnet Secretariat. Web pages use responsive design, allowing the pages to resize to fit different devices.

The information provided through the portal is collated from a variety of sources, harmonised and made interoperable. Generally speaking, most datasets are sourced from public institutes.

Data are free of any restrictions, so as to ensure their use from a multitude of stakeholders (policy makers, researchers, students, spatial planners, etc.).

Besides making available data for download, the portal also features an interactive map, through which users can have a quick and user-friendly overview of where activities are taking place, as well as filter data according to certain attributes.

The portal includes the following pages:

1. **Home page**
2. **About**: this section provides information on EMODnet in general, on Human Activities, on current data providers, and on the partners of the consortium in charge of the Human Activities lot.
3. **View data:** an interactive map displays data on all the Human Activities data themes. It is believed that this section may be the one in which users are most interested, hence particular attention was paid to making it easily accessible. From the home page, users can access the interactive map with just one click. Users can activate / deactivate layers (datasets), filter them by predefined attributes, download data, zoom in / out, toggle map full screen, obtain an encoded URL that remembers map extent, base mapping type, which layers are displayed and how they are filtered. The URL can then be shared via email or on social media, by clicking on dedicated buttons. Point 'clustering' was developed for the map, so that layers with many points can be viewed effectively, and at smaller scales.
4. **Search data:** the "data catalogue" makes available all datasets for search and download. Data can be downloaded in different formats, proprietary and non-proprietary, to reach the widest possible range of users. It is also possible to access Human Activities data via Web Map Service (WMS) and/or Web Feature Service (WFS), This section also makes available INSPIRE-compliant metadata. Before download, users are asked for organization name and country (both non-mandatory), and sector (mandatory). This information is stored and included in statistical results.
5. **Submit data**: this section consists of a form through which users can contact the Human Activities team to integrate their data into EMODnet. Although only two submissions have been received through this form so far, it is important to place the necessary emphasis on this section, since it testifies how EMODnet is a collaborative process that aims to make available as much data as possible. It is expected that the new Data Ingestion facility will contribute to this requirement.
6. **Help:** this section includes a list of frequently asked questions, plus a generic contact form and a questionnaire through which users can evaluate the portal and its services.
7. **Documents**: this is an archive of all documents produced during the project, e.g. progress reports and, yearly reports
8. **Blog**: an archive with all news related to the Human Activities lot, plus a series of short 'stories', written in a catchy style, and aimed at increasing the portal's user base.

The map portal uses MapServer and OpenLayers technology. Google Aerial/Hybrid is used as the base mapping, but users can also choose 'Satellite' and 'Map' – the latter recommended for older computers and / or slow connections. Google Analytics is used to analyse user statistics.

User Feedback

A comprehensive user survey was carried out in the third year of the project, in order to fine-tune the portal and collect suggestions for the next phase of EMODnet. On the 11th of January, a questionnaire to evaluate the Human Activities portal was sent to 449 potential users. The Cultural heritage theme received the lowest overall score. Many respondents commented that it should contain more datasets such as locations of shipwrecks, location of archeological sites (both were made available a few months later), scenic routes onshore (e.g. Wild Atlantic Way), and more detailed information on already available lighthouses (height, size, active/inactive, flashing intervals, organization in charge of maintaining lighthouse.

In January 2016, a Search Engine Optimization (SEO) strategy was launched. SEO is the process of affecting the visibility of a website or a web page in a web search engine's unpaid results. In general, the earlier (or higher ranked on the search results page), and more frequently a site appears in the search results list, the more visitors it will receive from the search engine's users.

Last but not least, it should also be noted that EMODnet Human Activities was presented to a number of events across Europe, including the Maritime Day in Bremen and the Baltic MSP Forum in Riga. The decision to start presenting the project during important relevant events stemmed from the acknowledgment of how fundamental it is to raise potential users' awareness of EMODnet, as a key factor to its success. Despite its enormous potential as the entry point for marine data in Europe, EMODnet – and all the more so Human Activities – is relatively little known to stakeholders.

Main Challenges

Table 1 -Summary of main challenges

Activity – data sets	Challenge	Measures
Data collection	Some data sources unwilling to cooperate.	The Human Activities team repeatedly invited data sources to cooperate. In some cases, formal letters were sent.
Establishment of machine-to-machine connections	Several data sources not using WMS/WFS.	Not all data sources are able to serve their data via WMS/WFS. Those who are generally use their own data models, which defeats the point of making available interoperable data. In this case, the approach is to download the data and store them temporarily in our database, so that users can view the datasets on the portal.
Communication	The Human Activities portal is not as popular as it could be. Too many people outside the EMODnet family are not aware of its existence.	A search engine optimization (SEO) strategy was devised. In the first six months after its implementation, the number of unique visitors doubled.
Coordination with the MSFD process	Poor coordination with the MSFD group.	The contract requires that a dialogue be established with the Working Group on Data, Information and Knowledge Exchange established under the MSFD to support access to data used for assessments and monitoring. Despite two coordination meetings with MSFD actors, very few specific requests were received as to how EMODnet Human Activities could contribute to the MSFD process. Conference calls were organised with several actors involved in the MSFD.
Sustainability over time	Signing a memorandum of Understanding (MoU) with data providers.	In order to ensure the sustainability of EMODnet beyond the duration of the contract, it was envisaged to sign a MoU with each data provider, by which they would commit to making available data to the Human Activities portal and

Activity – data sets	Challenge	Measures
		using EMODnet's data models. However, since it is likely that data models will have to be changed (see below) as a result of increased coordination with INSPIRE, it was decided not to sign any MoU until definitive data models are established.
Main Ports Fish Catches	Attribute data for Main Ports and Fish Catches are complex and include many linked tables. It is technically challenging to serve them via WFS.	The challenge is that the locations have a one-to-many relationship with the attributes. This means a location will be returned for every attribute, which is not as useful output as using the GIS files. In theory, it is possible to provide three separate WFS for the ports to show passenger, goods and vessel numbers. Along with this, one should also provide info on how to filter the data, so that user does not try to access the whole set of data. This will at least mean that subsets of the data will be available via WFS. At the same time, it should be noted that, by splitting ports into three separate datasets, WFS users will not be able to serve them together in a map: the points will overlap (every port will be replicated three time). A similar method could be used for the fishes catches by providing a WFS for division catches etc. and information on how to filter the data
Shipping	It was not possible to obtain AIS data.	Several sources were contacted. EMSA and JRC could not share their data with the Human Activities. Commercial sources were also contacted (e.g. Marine Traffic), but they refused to sell their data, because EMODnet would have made them available for free.
Pipelines and cables	Data on pipelines are not easily available and / or not accurate.	The possibility to obtain data on pipelines via DG ENER / MOVE was explored with DG MARE. This data however is property of a

Activity – data sets	Challenge	Measures
		commercial third party, and could not be obtained.
Aquaculture	Metadata concerning species reared, size of the facilities and rearing techniques are often not available and/or different between Member States; Data are not updated at the same frequency and data from some projects are not sure to be updated (Euroshell mappings)	Further harmonization was necessary to solve this issue.
Maritime transport – vessel traffic	For countries with many reporting ports, such as DK, DE, EL, ES, HR, IT, SE and UK, it was not possible to download all data for all years in one single file.	For the listed countries, quarterly data were downloaded in instalments, e.g. 1-3 year batches.
Dredging	It was extremely difficult to find data on dredging and aggregates on the central and eastern Mediterranean and the Black Sea.	Some of the obtained data did not have all the necessary information available, so were not included in the database.

Analysis of Performance and Lessons Learned

According to the Contract (§ 2.4 of the Tendering Specifications) "the human activity parameters should include the geographical position and spatial extent of the activity, its temporal variation (within year if appropriate, between years), time when data was provided and attributes to indicate the intensity of the activity. The data should be aggregate or presented so as to preserve personal privacy and commercial-sensitive information. The data should also include a time interval so that historic as well as current activities can be included".

The following objectives were set for all the lots:

1) *Assemble existing data from public and private organisations relating to the state of sea basins; processing them into interoperable formats which includes agreed standards, common baselines or reference conditions; assessments of their accuracy and precision and creating data products as defined in the tender*.

   Out of the 14 datasets included in the Human Activities contract, only 'Commercial shipping, recreational shipping' is not covered. 'Pipelines and cables' is covered partially (pipelines are missing). As far as shipping is concerned, the situation is described more in detail in § 1 and § 4. This dataset should have consisted in a vessel density map of EU waters represented on a grid. By clicking on a grid cell, a user would have retrieved the average number of ships in a given year, along with some basic attributes. To create such a map, it is necessary to process Automatic identification system (AIS) data. Member States have an obligation to share this data with the

EMSA, in the framework of SafeSeaNet. EMSA was therefore the preferred source, as it would have made it possible to collect AIS data for the entire EU. However, despite a negotiation process that lasted throughout the contract, no results were achieved. The JRC too holds long-range identification and tracking (LRIT) and AIS data in the framework of the 'Blue Hub', but could not share the data with the Human Activities team as the data is property of Member States and requires specific permission to be given to third parties. Commercial sources (e.g. Marine Traffic) were also contacted, but refused to sell their data if EMODnet were to make it available for free through the portal.

As regards pipelines, in many Member States, geographic position of pipelines cannot be disclosed for security reasons. There are a number of commercial sources that maintain datasets on pipelines, but their representation on a map is often a schematic route rather than the actual position.

All the other datasets are covered as per the Tendering Specifications. Generally speaking, most datasets are sourced from public institutions, because these have an obligation to provide data, ensure continuity, and their data are free and free of any restrictions. The Human Activities team decided not to involve data sources in the consortium partnership, therefore all data sources are providing data on a voluntary basis, without getting any financial compensation. Sourcing data from multiple providers implied that the Human Activities team had to create common data models in order to provide homogeneous and interoperable data. In general, the Human activities team created common data models based on the 'lowest common denominator', and converted original data models into the new ones. The new data models were then sent to original sources for validation. This process was conceived to minimize the effort of data providers as much as possible, since they are not part of the Human Activities consortium.

In light of the above, almost all datasets included in Human Activities can be considered 'data products', as they ultimately are an interpolation of different sets of raw data harmonized into a single, homogeneous dataset.

Furthermore, some datasets not included in the contract were added by the Human Activities team:

- State of bathing waters
- Fish catches
- Monthly first sales of fish in EU ports
- Hydrocarbon licenses
- Offshore installations
- Lighthouses

2) *Develop, test, operate and maintain a portal allowing public access and viewing of data, metadata and data products as below.*

The portal went live on 4 April 2014. A detailed description of its features is provided in § 3 – WP 2

3) *Monitor and report on the effectiveness of the system in meeting the needs of users in terms of ease and speed of use, quality of information and fitness for purpose of the data and products delivered.*
On the 11th of January 2016, a questionnaire to evaluate the Human Activities portal was sent to 449 potential users. We collected users' feedback until the end of February. A detailed analysis is provided in § 3 – WP 8.

4) *Analyse what further steps need to be taken to improve the accuracy, precision, coverage and ease of use of the data.*
Based on feedback from users, as well as on the experience of the Human Activities team, a list of possible improvements for the next phase of EMODnet is presented:

- Extend the scope of the project to neighbouring countries, depending on data availability. At the moment Human Activities already covers some non-EU countries, but it is on a voluntary basis. In certain areas (e.g. the Mediterranean), it is paramount to cover neighbouring countries, since EU and non-EU countries border on the same sea basin and may pursue conflicting uses of the sea. However, at the same time, it should be considered that data may not be easily available.
- Include coastal data. This is very relevant for Human Activities, especially on account of land-sea interactions. Indicative examples of coastal data are: purification plants, rivers, nuclear plants, coastal pollution, etc.
- Establish a clear link between Human Activities and MSP: according to the new MSP directive Member States shall establish their plans and submit them to the EC by 2021. It would be useful to harmonise plans and make them available on Human Activities, as this would not only show what happens in the present, but also what will (or is likely to) happen in the future.
- Include areas used for military purposes, although this information may be classified in some countries.
- Port areas: according to the contract, ports are represented as points. It is probably more meaningful to represent them as polygons. In addition, at the moment the only information made available is related to traffic (passengers, goods, and vessels), but other information could also be collected (environmental profiles, employment, etc.).
- Collect data on carbon capture & storage, and natural gas storage
- Showing live ship traffic: several users asked for this type of information. However, considering that it was not possible to collect historical AIS data, it seems very unlikely that real-time AIS data will be made available by either public or private sources.
- Collect data on marine and beach litter: very important datasets in the context of the MSFD. Neither of them is covered at present.

- Collect data on industrial and domestic wastewaters (both treated and untreated)
- Collect data on desalinisation plants
- Collect data on thermal plants (and cooling waters)
- Tourism and leisure: many users asked to include this data, although not all of them specified what they mean by it. Indicative examples may be hotels, marinas, etc.
- Collecting more dataset related to fishing: fishing effort within a grid cell by metier (based on STECF), MSFD “fisheries descriptors" (D1, D4 and D6), stock abundance (from EMODnet biology), TACS and quotas, data on the fishing fleet, etc.

In terms of accuracy and precision, current specific issues are:

- Aggregate extraction and dredging: there is no established and regular data collection system. Information is currently collated from a variety of sources, including PDF files. Polygons are not available, and the information is often reported as a point (presumably the centroid of an area). To improve accuracy and precision, Member States should update the information on these activities regularly.
- Hydrocarbon extraction: Greece, Romania and Bulgaria are not providing any data. Romania and Bulgaria do not even respond to enquiries, although it is possible that, in the future, data may be obtained via the Black Sea Commission. An official letter of the EU Commission inviting these Member States to cooperate may be of help. Furthermore, several countries (e.g. UK) do not make available information on the status of boreholes (e.g. active, abandoned, suspended, etc.)
- Mariculture: national registers are transmitted to DG SANTE in the framework of Directive 2006/88/EC. However, the coordinates are self-reported by producers, and often do not reflect actual position. No information is given on the coordinate system used, so it is impossible to understand whether there is a reporting error or a conversion error (from one coordinate system to the other). Apart from Cyprus, the information is never available as polygons, but only as points. Furthermore, no information on production by farm is available.
- Pipelines and cables: information on position is often available only as a schematic route, because in many Member State the actual location of pipelines is classified.
- Wind farms: many Member States represent wind farms as points rather than polygons.

5) *Keep the portal operational and be prepared to transfer to the Commission or to a party designated by Commission*

Guidelines and manuals will be delivered to the third party that will manage the project in the next phase. They are not included in this Report for the sake of brevity.

Summary of Lessons Learned

- **Uncertainties in measuring or obtaining indicator for required parameters**: no particular challenges were encountered in relation with this aspect, apart from a few exceptions. In the case of mariculture, for instance, it seems impossible to obtain data on production at the level of individual farm. Producers are reluctant to share data, because it is considered financially confidential information. There is no available source to obtain this data, apart from producers themselves. An alternative method could be to contact fish feed producers. Since aquaculture is essentially an industrial process, feed producers know exactly the input put into it. Based on that, it may be possible to calculate the output. However, when contacted in the framework of project EUMOFA[1], feed producers refused to share the type of information required. A potential solution could be to use satellite images to locate farms at sea. Based on their shape and size, it may be possible to estimate the species and the quantity farmed[2]. It should be noted that this method is quite time-consuming and would probably require a dedicated project.

  In the case of pipelines, information on their location is not available in most countries. Some countries (e.g. Italy) are not allowed to disclose this information for security reasons. There is no feasible solution in the short term, unless data disclosure policies are revised. A solution could be to purchase a dataset on pipelines from a commercial information provider, but there remains a number of challenges. The information providers contacted (Infield, Wood Mackenzie) specified that, although they have information on several parameters, they do not always know the exact location of pipelines either. Another challenge is that commercial information providers are not willing to sell their data, if these are made available on EMODnet for free.

  One might wonder whether it makes sense for EMODnet to make available datasets that are incomplete or inaccurate, rather than focusing on datasets for which a wealth of information is available. In the case of incomplete datasets, the obvious answer is that incomplete data is better than no data at all. Moreover, if EMODnet gains visibility, it is possible that some sources, initially reluctant to share data, are persuaded to do so. This makes a good argument for focusing on communication and dissemination activities, besides data collection and processing. On the other hand, inaccurate data should not be included in EMODnet, unless

[1] The European Market Observatory for fisheries and aquaculture (EUMOFA) is a market intelligence tool on the European Union fisheries and aquaculture sector: http://www.eumofa.eu

[2] For further information, please see http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3275594/

they are clearly flagged as such. This is the case, for instance, of one of the datasets on cables made available by Human Activities. The dataset (provided by Telegeography) includes information on all telecommunication cables worldwide (some of them have been excluded on Human Activities, because it focuses on Europe), but cable routes are represented as stylised paths, and the actual route location is not available. In this case, it was decided to make available the dataset anyway, clearly explaining that actual routes locations are not available (they are available through other datasets, which have a different coverage).
In the medium term, it may make sense to share as many datasets as possible, even though data are known to be incomplete or slightly inaccurate. However, users should be made fully aware of limitations, so that they can decide whether the data made available are fit for purpose. To do so, it is paramount to compile comprehensive metadata that give as much information as possible on how the data were collected and processed.

- **Willingness of bodies to share data**: generally speaking, most data providers were willing to share their data with EMODnet. This is a significant finding, because, contrary to the other EMODnet lots, Human Activities does not include data providers in its consortium. All data providers collaborate with Human Activities without receiving any form of financial compensation whatsoever. A complete list of organisations approached to supply data with no result is provided in Section 10, Indicator 3. In most cases, organisations did not provide data because they did not have it. Only in few cases, they did not reply at all. The problem is particularly evident in Bulgaria, Romania, and, as far as hydrocarbon extraction is concerned, in Greece. An official visit to the competent authorities of these countries may help solve this issue.
  As described above, there was a specific problem with AIS data from the EMSA, which took a long time to address the request for data submitted by DG MARE and the Human Activities team, and eventually did not give a positive reply. It was reported that AIS data are property of the Member States and contain confidential information. A possible solution could be to share AIS data with the Human Activities team, without including confidential information (mainly name of vessel and name of ship owner), which incidentally is of no use for EMODnet. Alternatively, raw AIS data can be purchased from a commercial information provider.
- **Rules limiting access to data**: most datasets on Human Activities are sourced from public institutions, which, generally speaking, make their data available for free and without restrictions. In one case (telecommunication cables) the dataset was made available by a private company (Telegeography, US), which agreed to share their data for free. There are specific rules in many countries that limit access to data on oil and gas pipelines for security reasons, since it is believed that they may become potential objectives for terrorist groups. Similarly, the datasets on wrecks and on underwater settlements are available only as a WMS, because it is believed that disclosing exact location may facilitate looting.
- **Cost of data**: all data available on Human Activities were made available by sources for free.

- **Formats, standards, information systems**: in terms of information technology the main challenge was to collect data via web services. Several data providers are equipped to serve their data via WMS or WFS, but, since in Human Activities data are harmonised from several sources by using a single data model, the use of web services would require that all sources adopt EMODnet Human Activities' data models. Despite having tried repeatedly throughout the project, no data source agreed to make available a dedicated web service for Human Activities (i.e. serving their data according to our data model). It is likely that in the future this problem will be solved through progressive convergence between INSPIRE and Human Activities' data models.

  Another challenge concerns data formats. In some cases, information is available only in paper format or pdf (e.g. aggregate extraction in Italy, mariculture farms position from national sanitary registers, hydrocarbon licences in Poland). Unfortunately, this challenge cannot be tackled by the Human Activities team.

- **Effort required to prepare data**: the effort to prepare data is highly intensive in EMODnet Human Activities. There are 14 datasets in the contract (plus those added by the consortium) and most of them are sourced by multiple providers, in general one per each Member State. Preparing data is a time consuming activity, as it includes the following steps:

  1. Looking for raw data
  2. Analysing it
  3. Define a common data model
  4. Harmonise raw data into a common data model
  5. Validate it with sources
  6. Writing metadata
  7. Publishing data and metadata online

  The process is time consuming because, in the vast majority of cases, data models differ to a great extent from Member State to Member State. In theory, the INSPIRE geoportal could be a useful repository of homogeneous and interoperable data, but in practice not all Human Activities datasets are available and / or homogeneous. It is possible to streamline data collection and processing by using web-services such as WMS and / or WFS. Since common data models developed by the Human Activities team are now available, machine-to-machine connections could be established with several sources. This approach would have the advantage of having originators maintaining and updating their data. However, in practice not all data sources are willing to make available their data with the model developed by the Human Activities team. Another problem is that several datasets are sourced from PDF files, and thus need to be georeferenced manually.

Analysis of Sustainability

Availability of standard procedures facilitating data flow: the Human Activities data flow relies almost entirely on the work carried out by the Human Activities team, who collect, process and make available data in a homogeneous and interoperable way. This process works well as long as EMODnet remains a project funded by the EU Commission and carried out by a third party, but it is not necessarily sustainable in the long term. What happens to the data flow when the project ends? In the next phase of EMODnet, special attention should be paid to setting up more formal procedures for data transmission, which can remain in place after the end of the contract. This can be done via hard law or soft law instruments. The first option entails a new regulation at EU level that dictates specific obligations and standards. It has the advantage of creating a well-defined legal framework, but it may not be feasible in the short term, as it would inevitably involve long negotiations. The second option is to conclude non-binding agreements (e.g. gentlemen's agreements, MoUs, etc.) with data providers to obtain their commitment to providing EMODnet with data. It should be a more practicable option in the short-term, but it does not establish a long-term data flow with the same degree of certainty as a hard law instrument.

If sharing data with EMODnet is to be made mandatory at national or EU level (first option), the next phase of EMODnet should probably focus on establishing data models and guidelines for data transmission, in order to minimize the workload related to collection and processing of data. Coordination with INSPIRE could be very helpful here; since there is already an obligation for Member States in terms of interoperability and, where practicable, harmonisation of spatial data sets and services, a new regulation specifically addressing EMODnet could be unnecessary. It may be more productive to invest in increased coordination and cooperation between INSPIRE and EMODnet, a process which should also include an analysis of current gaps in INSPIRE data themes and data models.

Maintenance: in the long term, it is expected that EMODnet becomes a fully-fledged initiative, and its workload should be reduced to ordinary running and maintenance activities. To do so, it is paramount to establish data transmission via web services. This will make sure that data are updated and maintained by their originators, thus ensuring that the EMODnet team may focus on ordinary running, or possibly – if the remit is extended – on the development of products upon request of the EU Commission, Member States and / or regional organizations. As of today, there is a number of challenges to establishing data transmission via web services, at least as far as Human Activities is concerned (see Section 4 of this Report). To remove these barriers, it would be necessary that data sources adopted common data models that can be developed by EMODnet in coordination with INSPIRE.

Model for governance by actors in the system: the current governance model of EMODnet is appropriate for this phase, where the system is still a work in progress. In the long run, when data flows are consolidated, it is suggested to give EMODnet a permanent structure and headquarters. The management of the project can be commissioned to an EU DG, an EU agency or to a contractor selected with a procurement procedure, depending on the resources available. What is important is that the European Marine Observation and Data Network is clearly identifiable. Data providers should be involved in it only as contributors, and not in the management of the project. The current model, where data providers also happen to be developing EMODnet, works very well in this phase for several lots, because EMODnet is still a work in progress, but their role should be limited to laying the groundwork for a sustainable system. This model could not be followed by Human Activities, as the number of sources involved tends to be far higher than in the other lots. Nevertheless, in view of ensuring sustainability, it is important that data providers limit their role to providing data that are collected as part of their national remit. Besides relying on a team of professionals that manage the system, EMODnet governance should also envisage a steering committee made up by key actors such as regional sea conventions, MSFD and MSP groups, INSPIRE, and national contact points at institutional level. The guiding principle should remain 'collecting data once and using it many times'. Special attention should be paid to coordinating data flows in such a way to make them consistent across multiple levels (local, national, EU and possibly international) and avoid duplication.

Institutional setting: as suggested during the EMODnet Open Conference in 2015, it would be advisable that at least four DGs of the EU Commission (MARE, ENV, RTD and GROWTH) would draft a vision and a roadmap of what EMODnet should become in the coming years. EMODnet should remain an EU-led initiative, because there is a clear added value for the EU to be involved. The effort necessary to streamline data flows and make available interoperable and homogeneous data is not likely to be attained without a coordination at EU level, as the experience gained during the project suggests spontaneous cooperation between Member State is only an occasional phenomenon.

Required resources including cost: as far as Human Activities is concerned, in the long run the effort to keep EMODnet operational is not expected to be particularly intensive. The most cumbersome activity is the one that is being carried out in the current phase, where the system is being set up, with sources, data models, and data flows not yet fully consolidated. In the long run, the EMODnet Human Activities team may need the following human resources full time:

- A manager
- 3 analysts that perform routine checks and develop products
- A GIS coordinator
- A GIS technician
- 3 IT technicians

- A communication and social media expert (part time)
- 2 administrative support staff

The total cost for human resources may be estimated between EUR 500 000 and EUR 600 000 per year depending on where the headquarters will be located. To this cost, one should also add the costs for the IT infrastructure and licences, which, if the current infrastructure is maintained, may amount up to EUR 20 000 per year, considering that only open source software is used.

It should be noted that there may be economies of scale if the various lots are merged into a single project, and if DIGIT's infrastructure is used.

1. Introduction

The European Marine and Observation Data Network (EMODnet) Human Activities (www.emodnet-humanactivities.eu) is a project financed by the EU Commission, which aims to map the spatial extent and intensity of a wide array of marine and maritime activities in EU waters.

The project is part of a wider long-term initiative, whose purpose is to unlock fragmented and hidden marine data resources across Europe, and to make these available to individuals and organisations (public and private). This should facilitate investment in sustainable coastal and offshore activities through improved access to quality-assured, standardised and harmonised marine data which are interoperable and free of restrictions on use.

There are currently 7 web portals (Bathymetry, Geology, Seabed Habitats, Biology, Chemistry, Physics and Human Activities) that are making available geographic datasets addressing different maritime themes.

The contract for the Human Activities portal was signed on the 17th of September 2013 and the project has been developed by a consortium made up of 6 companies: Cogea, AND International, AZTI Tecnalia, CETMAR, Eurofish International Organisation, and Lovell Johns.

EMODnet Human Activities aims to facilitate access to existing marine data on activities carried out in EU waters, by building a single entry point for geographic information on 13 different themes:

1. Aggregate extraction
2. Cultural heritage
3. Dredging
4. Environment
5. Fisheries
6. Hydrocarbon extraction
7. Main ports
8. Mariculture
9. Ocean energy facilities
10. Other forms of area management / designation
11. Pipelines and cables
12. Protected areas
13. Wind farms

It was not possible to include 'Commercial and recreational shipping', a product which, according to the contract, should have consisted of a vessel traffic density map of EU waters. The main reason is that at the beginning of the project it was decided with DG MARE to create the map based on AIS data

provided by the European Maritime Safety Agency (EMSA), but, after a long negotiation process, it turned out that EMSA would not make available their data to the Human Activities team.

Furthermore, five entirely new datasets were collected and made available: hydrocarbon licence blocks, offshore oil and gas installations, fish catches (by FAO statistical area), monthly first sales of fish (by port), status of bathing waters, and lighthouses.

The information provided through the portal is collated from a variety of sources, harmonised and made interoperable. Generally speaking, most datasets are sourced from public institutes.

Data are free of any restrictions, in such a way as to ensure their use from a multitude of stakeholders (policy makers, researchers, students, spatial planners, etc.).

Besides making available data for download, the portal also features an interactive map, through which users can have a quick and user-friendly overview of where activities are taking place, as well as filter data according to certain attributes.

All datasets available on the portal are complemented with INSPIRE-compliant metadata, so as to provide Human Activities users with complete information on the way data are processed.

The overarching objective of the project is to make it easier for the widest possible number of users to access existing information on the spatial extent of human activities at sea. In the long term, this will inform better evidence-based decision making, and reduce the indirect costs related to retrieving data currently scattered across multiple sources.

The general idea is that EMODnet Human Activities users will be empowered with a ready-to-use database, thus spending less time looking for data, while being able to focus more on their final goals.

A comprehensive user survey was carried out in the third year of the project, in order to fine-tune the portal and collect suggestions for the next phase of EMODnet. It emerged that more emphasis should be placed on promotion activities, since Human Activities seems to be very well known and used in the EMODnet community, but not among the general public.

Users choose EMODnet Human Activities because it provides easier access to information otherwise scattered across different sources.

Compared with the other EMODnet portals, Human Activities tends to have a cross-cutting impact on several marine areas, thus serving a variety of purposes. Its data, for instance, are being used as a proxy for pressures (e.g. to define the footprint of disturbance to the seabed) by experts of various marine disciplines, and this makes Human Activities one of the EMODnet portals with the most heterogeneous user base.

2. Highlights of the project

- The portal went live in April 2014 and EMODnet is now the most complete source of geographically-referenced data on human activity in European seas. Among other things, it includes an interactive map that enables to view and filter data, a catalogue ('Search Page') to search and download data and metadata, and a blog. All data can be served via WMS/WFS (with the exception of ports and fish catches).
- The following datasets (not included in the contract) are available: hydrocarbon licence blocks, offshore installations, fish catches by FAO statistical areas, monthly first sales of fish by port, status of bathing waters, lighthouses.
- Guidelines for data updating and transmission were drafted. The guidelines aim to harmonize the various dataset schemas used in EMODnet Human Activities as much as possible, as well as to streamline the update process of thematic datasets.
- On 11th January 2016, a questionnaire to evaluate the Human Activities portal was sent to 449 potential users. We collected users' feedback until the end of February. During this period 107 questionnaires were compiled. Main findings:
    - Wind farm theme received the highest overall score
    - Cultural heritage theme received the lowest overall score
    - Lineage section of the metadata should be improved in terms of accessibility and information completeness
    - More emphasis should be place on promotion activities. EMODnet Human Activities seems to be very well known and used in the EMODnet community, but not in the general public.
- A Fine-tuning plan based on users' feedback was prepared.
- A Search Engine Optimization (SEO) strategy was devised to increase Human Activities' user base beyond the EMODnet community. Title, description and keyword tags were added to all main pages and dataset description pages. Dataset pages appear in Google ranking, so users searching for datasets and themes have an improved chance of discovering the portal. A blog was implemented and several initial posts were published. 6 months after the implementation of the strategy, unique visitors doubled.
- The most important communication activities:
    - European Maritime Day (2014, 2015, 2016)
    - Baltic MSP Forum in Riga (2014)
    - Member States Expert on MSP in Brussels (2014)
    - EuroGOOS Conference in Lisbon (2014)
    - EurOCEAN Conference in Rome (2015)

- EMODnet - MSFD coordination meeting (January and December 2015)

3. Description of the work done

WP1 – Project Management

The project is being managed through Teamwork, a cloud-based project management platform that makes it possible to assign roles and responsibilities, set milestones, monitor task progress and deadlines. The platform is also used as an online repository to share working files between the Consortium members.

WP 2 – Development of the portal and maintenance

EMODnet Human Activities went live on the 4th of April 2014. Its design is based on harmonisation discussion document and EMODnet Style Guide elaborated by the EMODnet Secretariat. Web pages use responsive design, allowing the pages to resize to fit different devices.

The portal includes the following pages:

1. **Home page**
2. **About**: this section provides information on EMODnet in general, on Human Activities, on current data providers, and on the partners of the consortium in charge of the Human Activities lot.
3. **View data:** this section consists of the interactive map that displays data on all the Human Activities data themes. It is believed that this section may be the one in which users are most interested, hence particular attention was paid to making it easily accessible. Upon visiting Human Activities home page, users can access the interactive map with just one click. From the map users can activate / deactivate layers (datasets), filter them by predefined attributes, download data, zoom in / out, toggle map full screen, obtain an encoded URL that remembers map extent, base mapping type, which layers are displayed and how they are filtered. The URL can then be shared via email or on social media, by clicking on Facebook, Twitter or LinkedIn buttons. Point 'clustering' was developed for the map, so that layers with many points can be viewed effectively, and at smaller scales.
4. **Search data:** the "data catalogue" makes available all datasets for search and download. Generally speaking, data can be downloaded in different formats, proprietary and non-proprietary, to reach the widest possible range of users. It is also possible to access Human Activities data via Web Map Service (WMS) and/or Web Feature Service (WFS), This section also makes available INSPIRE-compliant metadata. Before data or metadata is download, users are asked for organization name and country (both non-mandatory), and sector (mandatory). This information will be stored and included in statistical results.
5. **Submit data**: this section consists of a form through which users can contact the Human Activities team to integrate their data into EMODnet. Although only two submissions have been

received through this form so far, it is important to place the necessary emphasis on this section, since it testifies how EMODnet is a collaborative process that aims to make available as much data as possible. It is expected that new Data Ingestion facility will contribute to this requirement.

6. **Help:** this section includes a list of frequently asked questions, plus a generic contact form and the questionnaire.
7. **Documents**: this is an archive of all documents produced during the project, e.g. progress reports and, yearly reports.
8. **Blog**: an archive with all news related to the Human Activities lot, plus a series of short 'stories', written in a catchy style, and aimed at increasing the portal's user base.

From any page of the portal, it is possible to eave feedback (yellow tab on the left-hand of the screen) and to go directly to EMODnet Central portal.

The map portal uses MapServer and OpenLayers technology. Google Aerial/Hybrid is used as the base mapping, but users can also choose 'Satellite' and 'Map' – the latter recommended for older computers and / or slow connections.

WFS v1.1.0 web services were created, and link were added to the Search Data page. WFS was refined and tested with VLIZ, so that it can be used for the development of the Query Tool, available on the central portal. As a result, WFS format is now available as either XML or GeoJSON as proposed by the EMODnet Technical Working Group.

Google Analytics is used to analyse user statistics. The indicator monitored are those proposed by EMODnet Secretariat to determine the main pages utilised and to identify preferred user navigation.

In January 2016, a SEO strategy was launched. SEO is the process of affecting the visibility of a website or a web page in a web search engine's unpaid results. In general, the earlier (or higher ranked on the search results page), and more frequently a site appears in the search results list, the more visitors it will receive from the search engine's users. SEO may target different kinds of search, including image search, local search, video search, academic search, news search and industry-specific vertical search engines.

As an Internet marketing strategy, SEO considers how search engines work, what people search for, the actual search terms or keywords typed into search engines and which search engines are preferred by their targeted audience. Optimizing a website may involve editing its content, HTML and associated coding to both increase its relevance to specific keywords and to remove barriers to the indexing activities of search engines. Promoting a site to increase the number of backlinks, or inbound links, is another SEO tactic.
The SEO strategy for Human Activities consists of the following steps:

- Tagging

  - Title, descriptions and keyword tags were added to all main pages and dataset description pages. These were optimized, and included results from keyword research (via Google Ad Words) where applicable. Image tags were also added to the several images available on the main pages.
  - A sitemap XML was generated and submitted to Google Search Console for indexing
  - Dataset pages are now appearing in Google rankings, so users searching for datasets and themes now have an improved chance of discovering EMODnet Human Activities.
- Implement Blog
  - WordPress has been implemented and the current news articles have been migrated.
  - RSS Feed of blog now available.
  - Several initial blogs published.
- Social Media sharing tools have been added to the 'Share Map' tool, to allow direct sharing of a custom map view URL to Twitter, Facebook and LinkedIn.

WP3 - Design and implementation of the GIS database

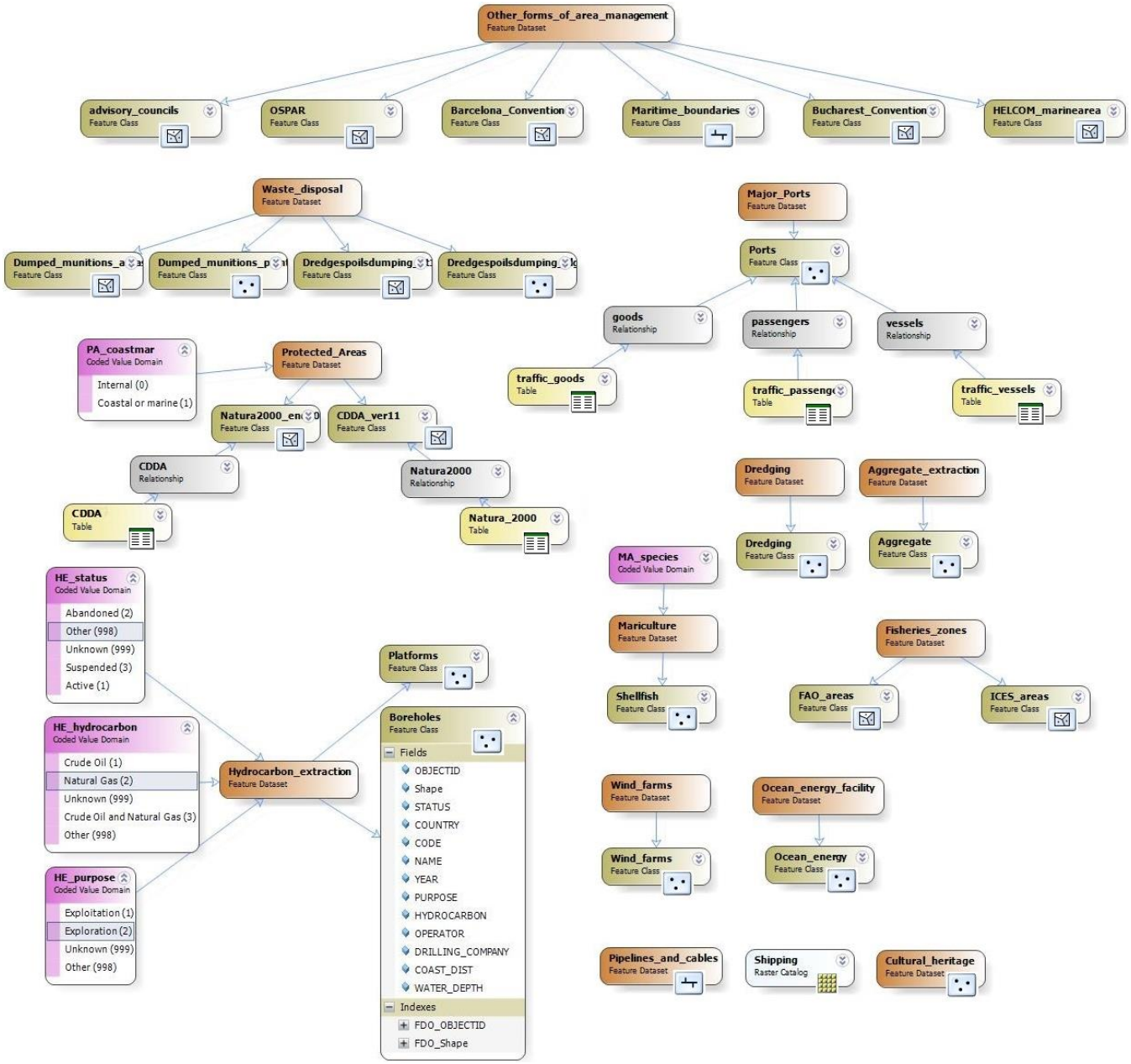
The design and implementation of the geographical database started with identifying appropriate representations for each data theme (points, lines, polygons, rasters etc.). 32 datasets were edited in the database, defining their spatial domain and coordinate system (WGS84). Each feature is conceived to be a collection of spatially- or thematically-related feature classes that share a common coordinate system. Moreover, a raster catalogue was created for the data theme "Commercial shipping, recreational shipping" to display adjacent, fully overlapping, or partially overlapping raster datasets. Since raw data were never received, the catalogue was not populated with actual data.

A full schema defines not only the physical structure of the database, but also the rules, relationships, and properties of each dataset. For this reason, the data collection process started together with the database schema design. As data were being collected, it was possible to understand what types of information common to all Member States were actually available, in such a way as to create attribute fields in each feature class. In doing so, it was possible to define mandatory fields, as specified in the contract, as well as additional attributes, which are continuously updated.

Once the database schema was defined, the feature classes of each dataset containing mandatory and additional fields were edited. Field types (text, double or long integer), domains and subtypes were added to each feature class.

Data were uploaded into the database and into their feature classes after the harmonisation process. Harmonisation mainly consists in projecting datasets in a common coordinate system, and in editing the attributes of collected shapefiles or tables. This procedure made it possible to feed the database and – when necessary, based on the findings from data collection – modify its schema at the same time. The current state of the database is outlined in the figures below:

Figure 1 – Database schema



Data themes are currently populated with vector data of one or more geometry types. Each feature class is a collection of geographic features that share the same geometry type (such as point, line, or polygon) and the same attribute fields for a common area.

Generally speaking, there are two ways to organize feature classes:

1. E.g. in the case of Hydrocarbon Extraction, after the harmonisation process, data were loaded in their feature class (boreholes or platforms, both point type) where they are automatically organised according to fields properties and several coded values domains.
2. E.g. In the case of Main ports, given the amount of information contained in each dataset (passengers, goods and vessels traffic) it was decided to keep the geometric (i.e. points representing main ports) and the alphanumeric (i.e. tables containing attributes) components separate. Subsequently, through a relationship class (one-to-many) it was possible to correlate the geometric and the alphanumeric component using a common key field.

WP 4/5/7 – Data collection / harmonisation/data analysis

See a full report in the Annex

WP 6 – Population of the database

The following datasets have been loaded:

- Aggregate extraction
- Dredging
- Cultural heritage
    - Lighthouses
    - Wrecks
    - Settlements
- Environment
    - Protected areas
    - State of bathing waters
- Fisheries
    - Fishery zones
    - Fish Catches by FAO Fishery Statistical Areas
    - Monthly first sales of fish
- Hydrocarbon extraction
    - Active licences
    - Boreholes
    - Offshore installations
- Main ports
    - Traffic (passengers, goods, vessels)
- Mariculture

    - Finfish production
    - Shellfish production
- Ocean energy facilities
    - Project locations
    - Test sites
- Other forms of area management/designation
    - Advisory councils
    - International conventions
    - Maritime boundaries
- Pipelines and cables
    - Telecommunication cables (schematic routes)
    - Telecommunication cables (actual route locations)
    - Landing stations
- Waste disposal
    - Dredge spoil dumping
    - Dumped munitions
- Wind farms

WP 8 – Monitoring of effectiveness in addressing users' needs

On 11th January 2016, a questionnaire to evaluate the Human Activities portal was sent to 449 potential users. Feediback from users was collected until the end of February. During this period 107 questionnaires were compiled. The questionnaire included 37 questions organized in 5 groups:

1. User groups (mandatory questions);
2. Dataset questions (mandatory question);
3. Datasets rating (mandatory questions);
4. Future datasets (mandatory question);
5. General questions about the website.

Below is an overview of the survey results.

USER GROUPS

106 full responses and 51 incomplete responses were received. The vast majority of respondents work for a research organization (65%) and 26,5% are involved in at least one of the following groups: Member States Expert group on MSP, MSFD actors/WG DIKE, (former) MODEG.

DATASET QUESTIONS

Respondents were given the possibility to evaluate one or more datasets. 'Environment' was the one which received more evaluations:

Table 2 – Number of respondents by dataset

Dataset	No. of respondents
Aggregate extraction	40
Cultural heritage	22
Dredging	39
Environment	**79**
Fisheries	46
Hydrocarbon extraction	32
Main ports	32
Mariculture	22
Ocean energy facilities (other than wind farms)	36
Other forms of area management / designation	40
Pipelines and cables	34
Waste disposal	30
Wind farms	42

DATASETS RATING

In this section respondents were asked to evaluate on a scale from 1 (very poor) to 5 (excellent) the datasets of their interest in terms of:

1. **Spatial coverage** - if the coverage of the dataset (geographical area where data was collected, a place which is the subject of a collection) is adequate or could be improved.

2. **Information accuracy**. Accuracy can be defined as the degree or closeness to which the information on a map matches the values in the real world. In GIS data, accuracy can be referred to a geographic position, but it can also be referred to attribute, or conceptual accuracy. Precision refers to how exact is the description of data. Precise data may be inaccurate, because it may be exactly described but inaccurately gathered (e.g. maybe the surveyor made a mistake, or the data was recorded wrongly into the database);

3. **Topology accuracy**. Topology is the arrangement that constrains how point, line, and polygon features share geometry. Topology defines and enforces data integrity rules (for example, there should be no gaps or overlapping between polygons, etc.);

4. **Added value of information**. Does this information, as it has been processed and made available in EMODnet, have an added value compared with the same information available elsewhere?

5. **Metadata: level of information**. This is a judgment of an overall quality of the metadata;

6. **Metadata: clarity of information on process history of the dataset**. This is a statement on process history and/or overall quality of the spatial dataset (lineage section of the metadata);

7. **Metadata: clarity of information on data sources**. Is it sufficiently clear who the primary data sources are?

8. **Metadata: clarity of information on contact points**.

Cultural heritage theme received the lowest overall score. Many respondents commented that it should contain more datasets such as locations of shipwrecks, location of archeological sites, scenic routes onshore (e.g. Wild Atlantic Way), and more detailed information on already available lighthouses (height, size, active/inactive, flashing intervals, organization in charge of maintaining lighthouse). It should be noted that the dataset on wrecks was made available in the final part of the project. Another dataset on wrecks is also available on EMODnet bathymetry. However, it was not included in Human Activities, because the cultural heritage theme focuses on ancient wrecks and submerged archeological sites (according to UNESCO's definition), while the datasets made available by EMODnet bathymetry includes objects (not necessarily shipwrecks) sunk at any time in history.

Wind farms received the highest overall score. However, respondents noted that it is a rapidly changing human activity and would need more frequent updates. Moreover, it should contain more detailed metadata, information on licensing authority, turbine type, individual capacity, water depth of site, foundation type, power takeoff methodology (offshore substation vs high-voltage, direct current (HVDC) cabling).

Moreover, it was pointed out by the respondents that the lineage section of the metadata should be improved in terms of accessibility and should provide more detailed information.

Table 3 – Summary of datasets rating

Datasets rating – arithmetic mean								
	Spatial coverage	Information accuracy	Topology accuracy	Added value of information	Metadata: level of information	Metadata: clarity of information on process history of the dataset	Metadata: clarity of information on data sources	Metadata: clarity of information on contact points
Aggregate extraction	3,89	3,39	3,67	3,44	3,52	3,31	3,6	3,54
Cultural heritage	3,53	2,93	3,42	3,21	3,09	2,5	2,55	3
Dredging	3,71	3,29	3,32	3,08	2,76	2,6	3,19	3,04
Environment	3,73	3,73	3,66	3,53	3,57	3,41	3,49	3,43
Fisheries	3,71	3,21	3,33	3,35	3,45	3,24	3,45	3,54
Hydrocarbon extraction	4,14	3,78	3,62	3,7	3,75	3,35	3,8	3,85
Main ports	4,37	4	3,94	3,72	3,89	3,41	3,94	3,65
Mariculture	3,6	3,46	3,46	3,69	3,75	3,58	3,75	3,83
Ocean energy facilities	3,87	3,82	3,83	3,74	3,81	3,48	3,55	3,76
Other forms of area management	3,83	3,23	3,43	3,38	3,42	3,1	3,29	3,4
Pipelines and cables	4,14	3,8	3,7	3,48	3,38	3,29	3,67	3,67

Waste disposal	3,65	3,65	3,53	3,4	3,13	3	3,29	3,53
Wind farms	4,32	4,04	4,11	3,96	3,7	3,44	3,63	3,71

FUTURE DATASETS

We also asked users which new datasets they would like to be covered in the future phase of EMODnet (they could choose more than one answer).

Table 4 – New datasets most requested by stakeholders

Answer	No. of respondents
Shipping density	53
Oil and gas pipelines	47
Carbon capture & storage	26
Fish landings in EU ports	43
TAC and quotas	20
Fishing effort	50
Tourism	47
Maritime spatial plans	55
Areas used for military purposes	34
Marine and beach litter	49
Industrial and domestic wastewater	30
Thermal plants	17
Desalination plants	21
Ballast water management	24
Shipping accidents	32
Oil discharging	29
Fishing fleet	37
Urban generated waste	26
*Other	10

*Other suggested datasets:

- plastic particles;
- mammal stranding;
- 3rd country info;
- real time marine traffic of all kind and size;
- SST (sea surface temperature) /SSS (sea surface salinity);
- Coastal Risk Mitigation Efforts;
- surface sediments;
- geophysics, geochemistry;

Shipping density (based on AIS data) and oil and gas pipelines were the two more requested datasets. Both datasets were supposed to be made available under the current phase of EMODnet, but the sources contacted refused to provide data.

Fish landings in EU ports, on the other hand, is not included in EMODnet Human Activities contract but will be made available soon, based on EUMOFA data.

GENERAL QUESTIONS ABOUT THE WEBSITE

In the website general questions group, the following questions were asked:

- How users would rate our website (using the same scale from 1, very poor, to 5, excellent), plus comments (free text) for improving it;

Table 5 – Summary of website rating

Website key characteristics	Arithmetic mean
Overall content	3,82
Overall look / visual appeal	3,93
Ease of navigation across sections (is it logical and clear and you are able to find what you need quickly)	3,89
User-friendliness of the map	3,99
User-friendliness of data search	3,72

The feedback received in this section was generally positive. However, it was noted that the export tools could be improved, and that the map search is sometimes slow.

- How they learned about EMODnet Human Activities

Table 6 – How users learned about Human Activities

How did you learn about EMODnet Human Activities?	No. of respondents
I was involved in the consultation phase and preparatory action	46
I am involved in EMODnet	66
I attended a conference	17
Through EMODnet Central Portal	19
Through DG MARE website	5
Through social media	1

How did you learn about EMODnet Human Activities?	No. of respondents
Colleague/someone I know told me	21
Search engine	2
I've learned about it just now thanks to this questionnaire	6
Link from other page	2
I don't remember	0
Other	4

It emerged that the vast majority of the respondents know about EMODnet, because they are directly involved or were involved in the consultation phase and preparatory action. Only few people learned about the portal via search engine, social media or other form of communication channels. In order to reach a wider audience, more emphasis should be placed on promotion activities.

- How often they visit EMODnet Human Activities

Table 7 – How often users visit Human Activities

How often do you visit our website?	No. of respondents
Several times a week	4
Several times a month	11
About once a month	15
Less than once a month	15
Occasionally	32
Everytime I learn about new update	5
This is my first visit here	18
No answer	6

- How likely they would recommend and revisit our website

Table 8 – How likely users would recommend Human Activities

How likely are you to recommend and revisit our website?	No. of respondents
Very likely	27
Likely	52

Unsure	15
Unlikely	1
Extremely_unlikely	2
No answer	9

WP 9 – Fine-tuning

Based on users' feedback a fine tuning plan was drafted:

Aggregate Extraction

Done in the current phase:

- The metadata were improved with more detailed information on what field name refers to.
- Full reference to all the documents were included in the field 'Source details'.

What should be done in the next phase:

- New field to indicate, where available, if the extraction is ongoing or has ended.
- Extraction zones where there is operations on restoring the environmental rehabilitation characteristics.
- Display third countries and the extraction zones, wherever European companies are operational.
- Licensed areas for aggregates extraction.

Dredging

Done in the current phase:

- The metadata were improved with more detailed information (reference) in the field 'Source details'.
- All links to sources were revised. It was reported that url links are not a very reliable source for a long term maintenance. In order to minimize this problem, more detailed information (reference) was included in the 'Source details'.

What should be done in the next phase:

- New field to indicate, where available, if dredging is ongoing or has ended.
- Additional field with the information on the material (i.e. sand) and authority

Environment

To be done in the current phase:

- New symbology to better differentiate Natura 2000 and Nationally Designated Areas.
- New symbology to differentiate Special Areas of Conservation from Special Protection Areas.

Main Ports

What should be done in the next phase:

- Investigate if data on piers and quays and port depth are available.

Ocean energy facilities

What should be done in the next phase:

- In the next phase a new field could be added to indicate, where available, the description of the facilities/test sites.

Other forms of area management

To be done in the current phase:

- All links to sources will be revised

Pipelines and cables

Done in the current phase:

- The new version of telecommunication cables dataset will be available in September and it will include more detailed metadata.

What shouldbe done in the next phase:

- There is no single data source and information on electricity cables or centre's power capacity and performance, general capacity of stations and type of stations are not easily available. Alternative data sources (including commercial ones) should be explored.

Waste disposal

Done in the current phase:

- A more detailed description about what is meant by waste disposal (including information on boundaries for certain types of dumping at sea) was prepared.
- All metadata was updated.

Wind farms

Done in the current phase:

- All links to sources were updated.

What should be done in the next phase:

- Where available, more detailed information (when the operational phase started, licensing authority, turbine type, individual capacity, water depth of site) should be provided.

Furthermore, a specific theme should be dedicated tourism, as several users lamented that it is currently not covered in the portal. However, no clear indications were received as to what datasets the theme should contain. Possible options are:

- Density of hotels on the coast
- Maritime musea
- Aquaria
- World heritage sites
- Bathing sites (although this is already available under the theme 'Environment')
- Marinas

Musea, aquaria and world heritage sites are available on DG MARE's Atlas of the Seas and could be easily imported into the Human Activities portal. Density of hotels on the coast was calculated by the JRC for a paper on the lack of space as a constraint to the development of EU aquaculture[3].

[3] Hofherr J., Natale F., Trujillo P., Is lack of space a limiting factor for the development of aquaculture in EU coastal areas?, published in Ocean & Coastal Management 116 (2015) pp. 27-36.

4. Challenges encountered during the project

Table 9 – Challenges encountered during the project

Activity	Challenge	Measures
Data collection	Some data sources unwilling to cooperate[4].	The Human Activities team repeatedly invited data sources to cooperate. In some cases, formal letters were sent.
Establishment of machine-to-machine connections	Several data sources not using WMS/WFS.	Not all data sources are able to serve their data via WMS/WFS. Those who are generally use their own data models, thus making impossible for the Human Activities team to use their data. In this case our approach is to download the data and store them temporarily in our database, in such a way that users can view the datasets on the portal.
Communication	The Human Activities portal is not as popular as it could be. Too many people outside the EMODnet family are not aware of its existence.	A search engine optimization (SEO) strategy was devised. In the first six months after its implementation, the number of unique visitors doubled.
Coordination with the MSFD process	Poor coordination with the MSFD group.	The contract requires collaboration with the Working Group on Data, Information and Knowledge Exchange established under the MSFD to support access to data used for assessments and monitoring. Despite two coordination meetings with MSFD actors, no specific requests were received as to how EMODnet Human Activities could and should contribute to the MSFD process. Conference calls were organised with several actors involved in the

[4] A complete list of organisations approached to supply data with no result is provided in Section 10, Indicator 3. In most cases, organisations did not provide data because they did not have it. Only in few cases, we did not receive any reply at all.

Activity	Challenge	Measures
		MSFD process.
Sustainability over time	Signing a memorandum of Understanding (MoU) with data providers.	In order to ensure the sustainability of EMODnet beyond the duration of the contract, it was envisaged to sign a MoU with each data provider, by which they would commit to making available data to the Human Activities portal and using EMODnet's data models. However, since it is likely that data models will have to be changed (see below) as a result of increased coordination with INSPIRE, it was decided not to sign any MoU until definitive data models are established.
Main Ports Fish Catches	Attribute data for Main Ports and Fish Catches are complex and include many linked tables. It is technically challenging to serve them via WFS.	The challenge is that the locations have a one-to-many relationship with the attributes. This means a location will be returned for every attribute which is not as useful output as using the GIS files. In theory, it is possible to provide three separate WFS for the ports to show passenger, goods and vessel numbers. Along with this, one should also provide info on how to filter the data, so that user does not try to access the whole set of data. This will at least mean that subsets of the data will be available via WFS. At the same time, it should be noted that, by splitting ports into three separate datasets, WFS users will not be able to serve them together in a map: the points will overlap (every port will be replicated three time). A similar method could be used for the fishes catches by providing a WFS for division catches etc. and information on how to filter the data
Shipping	It was not possible to obtain AIS data.	Several sources were contacted. EMSA and JRC could not share their data with the Human Activities.

Activity	Challenge	Measures
		Commercial sources were also contacted (e.g. Marine Traffic), but they refused to sell their data, because EMODnet would have made them available for free.
Pipelines and cables	Data on pipelines are not easily available and / or not accurate.	The possibility to obtain data on pipelines via DG ENER / MOVE was explored with DG MARE. This data however is property of a commercial third party, could not be obtained.
Aquaculture	Metadata concerning species reared, size of the facilities and rearing techniques are often not available and/or different between Member States; Data are not updated at the same frequency and data from some projects are not sure to be updated (Euroshell mappings)	Further harmonization was necessary to solve this issue.
Maritime transport – vessel traffic	For countries with many reporting ports, such as DK, DE, EL, ES, HR, IT, SE and UK, it was not possible to download all data for all years in one single file.	For the listed countries, quarterly data were downloaded in instalments, e.g. 1-3 year batches.
Dredging	It was extremely difficult to find data on dredging and aggregates on the central and eastern Mediterranean Sea and the Black Sea.	Some of the obtained data did not have all the necessary information available, so were not included in the database.

Aside from the above challenges, a specific comment should be made on the experience with INSPIRE. The Human Activities team fully endorses INSPIRE approach, in particular when it aims 'to lay down general rules aimed at the establishment of the Infrastructure for Spatial Information in the European Community'. Lack of interoperability standards is one of the main difficulties in accessing marine data in the EU.

For this reason, over the past two years EMODnet Human Activities has paid particular attention to developing INSPIRE-compliant metadata for each dataset made available through the portal. The metadata are compiled and validated through INSPIRE's metadata editor, available at http://inspire-geoportal.ec.europa.eu/editor/.

At the same time the Human Activities team has also sought to source INSPIRE-compliant datasets, based on the assumption that Member States and data providers are (or are in the process of being) in line with Directive 2007/2/EC. This has been carried out primarily by searching for datasets on the 'discovery' section of the INSPIRE geoportal (http://inspire-geoportal.ec.europa.eu/discovery/), especially during the initial phase of the project. However, so far INSPIRE geoportal has not been particularly useful, mainly for the following reasons:

- only few datasets on the human activities of interest are currently included in the geoportal;
- when available for more than a country, datasets may differ in aspects such as data models, units of measurement, and coordinate systems, and thus require further harmonisation in any case;
- many countries upload data on the geoportal in their national language.

As a general rule, the Human Activities team do not enquire whether data sources are 'INSPIRE-compliant', as we believe that, although more than a synergy can be established between the two projects, it is out of the scope of EMODnet to survey INSPIRE compliance. A simple search on the INSPIRE geoportal reveals whether a certain dataset is available, and is thus considered an adequate method to find out whether there is sufficient data.

In June 2015 a meeting took place at the JRC in ISPRA where EMODnet thematic coordinators, the EMODnet central portal team and JRC, who are responsible for coordinating technical aspects of INSPIRE, discussed how to better connect the two projects

The level of compliance of EMODnet as a whole (including Human Activities) was considered advanced, although several steps need be taken to achieve full compliance. The main challenges as far as Human Activities is concerned are to be found in the fact that INSPIRE has recently developed a set of data models that were not available by the time the Human Activities team started working on the project. In principle, this should not be a problem, as data sources are supposed to adopt those data models as well. However, our experience suggests that the uptake of INSPIRE is not likely to increase dramatically in the near future, thus creating more than a problem for Human Activities if data models are to be modified in the meantime.

Another major obstacle to achieving full compliance is the inherent difficulty in taking stock of all the background information that is necessary to develop INSPIRE-compliant datasets. Even though INSPIRE has improved considerably over the last few months in terms of user-friendliness and ease of access, there still remains a number of cumbersome procedures that are described across a multitude of documents, not always easy to find, read and interpret. This makes it extremely difficult for users to come to master INSPIRE without investing considerable effort.

Nevertheless, together with the INSPIRE Working Group, the following approach was agreed to align EMODnet data models to INSPIRE:

Step 1 – Find the Target Application Schema

Step 2 – Find the Target INSPIRE Feature type to use

Step 3 – Analyze the attributes of the INSPIRE FEATURETYPE

Step 4 – Find the useful source data attributes for the mapping

Step 5 – Map the source and target attributes

Step 6 – Map the source and INSPIRE code list/enumeration values

Mapping the source object (EMODnet) to target (INSPIRE) rarely fits 100%, because the draft mapping exercise carried out a couple of years ago by INSPIRE was done on a different level of detail from EMODnet. Sometimes, it may happen that source data e.g. (harbour) can be mapped as a point object within INSPIRE 'Transport Network' theme, or as a polygon within the 'Sea Regions' theme. It depends on the level of detail that is included in the source data set, attributes and geometry and how it fits to the target object.

The INSPIRE Working Group suggested that Interactive Data Specification (http://inspire-regadmin.jrc.ec.europa.eu/dataspecification/FindYourScope.action) be used as a mapping tool to find the adequate INSPIRE object for any Human Activities dataset. For instance, by typing "borehole" or "extraction" various results are shown related to the Geology theme, but also to Mineral resources theme and Soil theme, and more than 4 application schemas with number of related INSPIRE objects. Through this tool, it is thus possible to find the INSPIRE object that is best matching (realistically, it quite unlikely to have 100% matching) to a given Human Activity data model.

Should no solutions be found with this method, the alternative solution is to use the INSPIRE Thematic Cluster Platform (https://themes.jrc.ec.europa.eu). INSPIRE Thematic Cluster is a specialized forum, where users can discuss with theme experts. On the forum, one may also propose extending an INSPIRE data model with attributes that are included in an EMODnet data model.

Finally, when no useful solutions are available, the last option is to share data in EMODnet data model and additionally sharing same data in INSPIRE data model. Sharing both datasets does not require any modifications to the database and to data flows.

Through Humboldt Alignment Editor one can transform a data model into an INSPIRE-compliant data model.

The disadvantages of this approach are that more hard disk space is required on the server (potentially every dataset will have to be made available twice) and that users may be confused.

5. Analysis of performance and lessons learned

According to the Contract (§ 2.4 of the Tendering Specifications) "the human activity parameters should include the geographical position and spatial extent of the activity, its temporal variation (within year if appropriate, between years), time when data was provided and attributes to indicate the intensity of the activity. The data should be aggregate or presented so as to preserve personal privacy and commercial-sensitive information. The data should also include a time interval so that historic as well as current activities can be included".

The following objectives were set for all the lots:

1) *Assemble existing data from public and private organisations relating to the state of sea basins; processing them into interoperable formats which includes agreed standards, common baselines or reference conditions; assessments of their accuracy and precision and creating data products as defined in the tender.*

   Out of the 14 datasets included in the Human Activities contract, only 'Commercial shipping, recreational shipping' is not covered. Another one, 'Pipelines and cables' is covered partially (pipelines are missing). As far as shipping is concerned, the situation is described more in detail in § 1 and § 4. This dataset should have consisted in a vessel traffic density map of EU waters represented on a grid. By clicking on a grid cell, a user would have retrieved the average number of ships in a given year, along with some basic attributes. To create such a map, it is necessary to process AIS data. AIS data are collected by Member States as a result of the 2002 IMO SOLAS Agreement. Member States have an obligation to share this data with the EMSA, in the framework of SafeSeaNet. EMSA was therefore the preferred source, as it would have made possible to collect AIS data for the entire EU. However, despite a negotiation process that lasted throughout the contract, no results were achieved. The JRC too holds LRIT and AIS data in the framework of the 'Blue Hub', but could not share the data with the Human Activities team as the data is property of Member States and requires specific permission to be given to third parties. Commercial sources (e.g. Marine Traffic) were also contacted, but refused to sell their data if EMODnet were to make it available for free through the portal.

   As regards pipelines, in many Member States, geographic position of pipelines cannot be disclosed for security reasons. There are a number of commercial sources that maintain datasets on pipelines, but their representation on a map is often a schematic route rather than the actual position.

   All the other datasets are covered as per the Tendering Specifications. Generally speaking, most datasets are sourced from public institutions, because these have an obligation to provide data, ensure continuity, and their data are free and free of any restrictions. The Human Activities team

decided not to involve data sources in the consortium partnership, therefore all data sources are providing data on a voluntary basis, without getting any financial compensation. Sourcing data from multiple providers implied that the Human Activities team had to create common data models in order to provide homogeneous and interoperable data. In general, the Human activities team created common data models based on the 'lowest common denominator', and converted original data models into the new ones. The new data models were then sent to original sources for validation. This process was conceived to minimize the effort of data providers as much as possible, since they are not part of the Human Activities consortium.

In light of the above, almost all datasets included in Human Activities can be considered 'data products', as they ultimately are an interpolation of different sets of raw data harmonized into a single, homogeneous dataset.

Furthermore, some datasets not included in the contract were added by the Human Activities team:

- State of bathing waters
- Fish catches
- Monthly first sales of fish in EU ports
- Hydrocarbon licences
- Offshore installations
- Lighthouses

2) *Develop, test, operate and maintain a portal allowing public access and viewing of data, metadata and data products as below.*

The portal went live on 4 April 2014. A detailed description of its features is provided in § 3 – WP 2

3) *Monitor and report on the effectiveness of the system in meeting the needs of users in terms of ease and speed of use, quality of information and fitness for purpose of the data and products delivered.*

On the 11th of January 2016, a questionnaire to evaluate the Human Activities portal was sent to 449 potential users. Feedback from users was collected until the end of February. A detailed analysis is provided in § 3 – WP 8.

4) *Analyse what further steps need to be taken to improve the accuracy, precision, coverage and ease of use of the data.*

Based on feedback from users, as well as on the experience of the Human Activities team, a list of possible improvements for the next phase of EMODnet is presented:

- Extend the scope of the project to neighbouring countries, depending on data availability. At the moment Human Activities already covers some non-EU countries, but it is on a voluntary basis. In certain areas (e.g. the Mediterranean), it is paramount to cover neighbouring countries, since EU and non-EU countries border on the same sea basin and

use the sea in conflicting ways. However, at the same time it should be considered that data may not be easily available.

- Include coastal data. This is very relevant for Human Activities, especially on account of land-sea interactions. Indicative examples of coastal data are: purification plants, rivers, nuclear plants, coastal pollution, etc.
- Establish a clear link between Human Activities and MSP: according to the new MSP directive Member States shall establish their plans and submit them to the EC by 2021. It would be useful to harmonise plans and make them available on Human Activities, as this would show not only what happens in the present, but also what will (or is likely to) happen in the future.
- Include areas used for military purposes. To be noted that this information may be classified in some countries.
- Port areas: according to the contract, ports are represented as points. It is probably more meaningful to represent them as polygons. In addition, at the moment the only information made available is related to traffic (passengers, goods, and vessels), but other information could also be collected (environmental profiles, employment, etc.).
- Collect data on carbon capture & storage, and natural gas storage
- Showing live ship traffic: several users asked for this type of information. However, considering that it was not possible to collect historical AIS data, it seems very unlikely that real-time AIS data will be made available by either public or private sources.
- Collect data on marine and beach litter: very important datasets in the context of the MSFD. Neither of them is covered at present.
- Collect data on industrial and domestic wastewaters (both treated and untreated)
- Collect data on desalinisation plants
- Collect data on thermal plants (and cooling waters)
- Tourism and leisure: many users asked to include this data, although not all of them specified what they mean by it. Indicative examples hotels, marinas, etc.
- Collecting more dataset related to fishing: fishing effort within a grid cell by metier (based on STECF), MSFD “fisheries descriptors” (D1, D4 and D6), stock abundance (from EMODnet biology), TACS and quotas, data on the fishing fleet, etc.

In terms of accuracy and precision, current specific issues are:

- Aggregate extraction and dredging: there is no established and regular data collection system. Information is currently collated from a variety of sources, including PDF files. Polygons are not available, and the information is often reported as a point (presumably the centroid of an area). To improve accuracy and precision, Member States should update the information on these activities regularly.
- Hydrocarbon extraction: Greece, Romania and Bulgaria are not providing any data. Romania and Bulgaria do not even respond to enquiries, although it is possible that in the future data may be obtained via the Black Sea Commission. An official letter of the EU Commission that invites this Member States to cooperate may be of help. Furthermore, several countries (e.g. UK) do not make available information on the status of boreholes (e.g. active, abandoned, suspended, etc.).
- Mariculture: national registers are transmitted to DG SANTE in the framework of Directive 2006/88/EC. However, the coordinates are self-reported by producers, and often do not reflect actual position. No information is given on the coordinate system used, so it is impossible to understand whether there is a reporting error or a conversion error (from one coordinate system to the other). Apart from Cyprus, the information is never available as polygons, but only as points. Furthermore, no information on production by farm is available.
- Pipelines and cables: information on position is often available only as a schematic route, because in many Member State the actual location of pipelines is classified.
- Wind farms: many Member States represent wind farms as point rather than polygons.

5) *Keep the portal operational and be prepared to transfer to the Commission or to a party designated by Commission*
   Guidelines and manuals will be delivered to the third party that will manage the project in the next phase. They are not included in this Report for the sake of brevity.

Summary of lessons learned:

Main barriers to the provision of data, in terms of:

- **Uncertainties in measuring or obtaining indicator for required parameters**: no particular challenges were encountered in relation with this aspect, apart from a few exceptions. In the case of mariculture, for instance, it seems impossible to obtain data on production at the level of individual farm. Producers are reluctant to share data, because it is considered financially confidential information. There is no available source to obtain this data, apart from producers themselves. An alternative method could be to contact fish feed producers. Since

aquaculture is essential an industrial process, feed producers know exactly the input put in it. Based on that, it may be possible to calculate the output. However, when contacted in the framework of project EUMOFA, feed producers refused to share the type of information required. A potential solution could be to use satellite images to locate farms at sea. Based on their shape and size, it may be possible to estimate the species and the quantity farmed[5]. It should be noted that this method is quite time-consuming and would probably require a dedicated project.

In the case of pipelines, information on their location is not available in most countries. Some countries (e.g. Italy) are not allowed to disclose this information for security reasons. There is no feasible solution in the short term, unless data disclosure policies are revised. A solution could be to purchase a dataset on pipeline from a commercial information provider, but there remains a number of challenges. The information providers contacted (Infield, Wood Mackenzie) specified that, although they have information on several parameters, they do not always know the exact location of pipelines, either. The other challenge is that commercial information providers are not willing to sell their data if these are made available on EMODnet for free.

- **Willingness of bodies to share data**: generally speaking, most data providers were willing to share their data with EMODnet. This is a significant finding, because, contrary to the other EMODnet lots, Human Activities does not include data providers in its consortium. All data providers collaborate with Human Activities without receiving any form of financial compensation whatsoever. A complete list of organisations approached to supply data with no result is provided in Section 10, Indicator 3. In most cases, organisations did not provide data because they did not have it. Only in few cases, they did not reply at all. The problem is particularly evident in Bulgaria, Romania, and, as far as hydrocarbon extraction is concerned, in Greece. An official visit to the competent authorities in these countries may help solve this issue. On a different note, several data were sourced from EU-funded project such as SPLASHCOS (submerged prehistoric archaeology), EUROSHELL (shellfish aquaculture), EUMOFA (first sale of fish), SOWFIA (ocean energy facilities), which may be seen as a good application of the 'collect-once-use-many-times' principle.

  As described above, there was a specific problem with AIS data from the EMSA, which took a long time to address our request for data, and eventually did not give a positive reply. It was reported that AIS data are property of the Member States and contain confidential information. A possible solution could be to share AIS data with the Human Activities, without including confidential information (mainly name of vessel and name of ship owner), which

[5] For further information, please see http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3275594/

incidentally is of no use for EMODnet. Alternatively, raw AIS data can be purchased from a commercial information provider.

- **Rules limiting access to data**: most datasets on Human Activities are sourced from public institutions, which, generally speaking, make their data available for free and without restrictions. In one case (telecommunication cables) the dataset was made available by a private company (Telegeography, US), which agreed to share their data for free. There are specific rules in many countries that limit access to data on oil and gas pipelines for security reasons, since it is believed that they may become potential objectives for terrorist groups. Similarly, the datasets on wrecks and on underwater settlements are available only as a WMS, because it is believed that disclosing exact location may facilitate looting.
- **Cost of data**: all data available on Human Activities were made available by sources for free.
- **Formats, standards, information systems**: in terms of information technology the main challenge was to collect data via web services. Several data providers are equipped to serve their data via WMS or WFS, but, since in Human Activities data are harmonised from several sources by using a single data model, the use of web services would require that all sources adopt EMODnet Human Activities' data models. Despite having tried repeatedly throughout the project, no data source agreed to make available a dedicated web service for Human Activities (i.e. serving their data according to our data model). It is likely that in the future this problem will be solved through progressive convergence between INSPIRE and Human Activities' data models.

  Another challenge concerns data formats. In some cases, information is available only in paper format or pdf (e.g. aggregate extraction in Italy, mariculture farms position from national sanitary registers, hydrocarbon licences in Poland). When the data was considered useful and fit for purpose, the Human Activities team digitised and geo-referenced the data. While this solution makes it possible to not lose precious information, it should be seen as a last resort, because the digitisation process inevitably affects geographic precision of data (several approximations are necessary).
- **Effort required to prepare data**: the effort to prepare data is highly intensive in EMODnet Human Activities. There are 14 datasets in the contract (plus those added by the consortium) and most of them are sourced by multiple providers, in general one per each Member State. Preparing data is a time consuming activity, as it includes the following steps:
  1. Looking for raw data
  2. Analysing it
  3. Define a common data model
  4. Harmonise raw data into a common data model

5. Validate it with sources
6. Writing metadata
7. Publishing data and metadata online

The process is time consuming because in the vast majority of cases data models differ to a great extent from Member State to Member State. In theory, the INSPIRE geoportal could be a useful repository of homogeneous and interoperable data, but in practice not all Human Activities datasets are available and / or homogeneous. It is possible to streamline data collection and processing by using web-services such as WMS and / or WFS. Since common data models developed by the Human Activities team are now available, machine-to-machine connections could be established with several sources. This approach would have the advantage of having originators maintaining and updating their data. However, in practice not all data sources are willing to make available their data with the model developed by the Human Activities team. Another problem is that several datasets are sourced from PDF files, and thus need to be georeferenced manually.

6. Analysis of sustainability

Availability of standard procedures facilitating data flow: the Human Activities data flow relies almost entirely on the work carried out by the Human Activities team, who collects, process and makes available data in a homogeneous and interoperable way. This process works well as long as EMODnet remains a project funded by the EU Commission and carried out by a third party, but it is not necessarily sustainable in the long term. What happens to the data flow when the project ends? In the next phase of EMODnet, special attention should be paid to setting up more formal procedures for data transmission, which can remain in place after the end of the contract. This can be done via hard law or soft law instruments. The first option entails a new regulation at EU level that dictates specific obligations and standards. It has the advantage of creating a well-defined legal framework, but it is not necessarily feasible in the short term. The second option is to conclude non-binding agreements (e.g. gentlemen's agreement, MoUs, etc.) with data providers to obtain their commitment to providing EMODnet with data. It should be a more practicable option in the short-term, but it does not establish a long-term data flow with the same degree of certainty as a hard law instrument.

If sharing data with EMODnet is to be made mandatory at national or EU level (first option), the next phase of EMODnet should probably focus on establishing data models and guidelines for data transmission, in order to minimize the workload related to collection and processing of data.

Coordination with INSPIRE could be very helpful here; since there is already an obligation for Member States in terms of interoperability and, where practicable, harmonisation of spatial data sets and services, a new regulation specifically addressing EMODnet could be unnecessary. It may be more productive to invest in increased coordination and cooperation between INSPIRE and EMODnet, a process which should also include an analysis of current gaps in INSPIRE data themes and data models.

Whether the first or the second approach works better is difficult to say. Overall, the soft approach adopted by Human Activities worked fairly well, because it made it possible to harmonise and make available several datasets at little to no cost for data sources (the cost of processing the data were borne by the contractor). The second approach (adopted by INSPIRE) in theory creates a stable legal framework that should facilitate data ingestion by EMODnet. However, it is also true that increased bureaucracy may imply that a considerable amount of time is necessary before the framework is finalized. Furthermore, the costs connected to collecting and processing the data are born by a multitude of subjects (all data providers), while in the first approach it is possible to benefit from economies of scale. Likewise, decentralizing the process inevitably leads to minor differences in the approaches adopted.

At the current stage of implementation, the INSPIRE approach is probably not fit for purpose for EMODnet. The level of compliance with the standards set is still low, and there seems to be some confusion as to how to deal with certain issues.

Maintenance: in the long term, it is expected that EMODnet becomes a fully-fledged initiative, and its workload should be reduced to ordinary running and maintenance activities. To do so it is paramount to establish data transmission via web services. This will make sure that data are updated and maintained by their originators, thus ensuring that the EMODnet team may focus on ordinary running, or possibly – if the remit is extended – on the development of products at request of authorized users (e.g. EC, Member States authorities, regional sea conventions, etc.). As of today, there is a number of challenges to establishing data transmission via web services, at least as far as Human Activities is concerned (see Section 4 of this Report). To remove these barriers, it would be necessary that data sources adopt common data models that can be developed by EMODnet in coordination with INSPIRE.

Model for governance by actors in the system: the current governance model of EMODnet is appropriate for this phase, where the system is still a work in progress. In the long run, when data flows are consolidated, it is suggested that EMODnet be given a permanent structure and headquarters. The management of the project can be commissioned to an EU DG, an EU agency or to a contractor selected with a procurement procedure, depending on the resources available. What is important is that the European Marine Observation and Data Network is clearly identifiable. Data providers should be involved in it only in their quality of contributors, and not in the management of

the project. The current model where data providers are developing EMODnet works very well in this phase for several lots, because EMODnet is still a work in progress, but their role should be limited to laying the groundwork for a sustainable system. This model could not be followed by Human Activities, as the number of sources involved tends to be far higher than in the other lots. Nevertheless, in view of a sustainable project, it is important that data providers limit their role to providing data that are collected as part of their national remit. Besides relying on a team of professionals that manage the system, the EMODnet governance should also envisage a steering committee made up by key actors such as regional sea conventions, MSFD and MSP groups, INSPIRE, and national contact points at institutional level. The guiding principle should remain 'collecting data once and using it many times. Special attention should be paid to coordinating data flows in such a way as to make them consistent across multiple levels (local, national, EU and possibly international) and avoid duplication.

Institutional setting: as suggested during EMODnet Open Conference in 2015, it would be advisable that at least four DGs of the EU Commission (MARE, ENV, Research & Innovation, DG GROWTH) could draft a vision and a roadmap of what EMODnet should become in the coming years. EMODnet should remain an EU-led initiative, because there is a clear added value for the EU to be involved. The effort necessary to streamline data flows and make available interoperable and homogeneous data is not likely to be attained without a coordination at EU level.

Required resources including cost: as far as Human Activities is concerned, in the long run the effort to keep EMODnet operational is not expected to be particularly intensive. The most cumbersome activity is the one that is being carried out in the current phase, where the system is being set up, with sources, data models, and data flows not yet fully consolidated. In the long run, the EMODnet Human Activities team may need the following human resources full time:

- A manager
- 3 analysts that perform routine checks and develop products
- A GIS coordinator
- A GIS technician
- 3 IT technicians
- A communication and social media expert (part time)
- 2 administrative support staff

The total cost for human resources may be estimated between EUR 500 000 and EUR 600 000 per year depending on where the headquarters will be located. To this cost, one should also add the costs for the IT infrastructure and licences, which, if the current infrastructure is maintained, may amount up to EUR 20 000 per year, considering that only open source software is used.

It should be noted that there may be economies of scale if the various lots are merged into a single project, and if DIGIT's infrastructure is used.

7. User Feedback

Table 10 – Summary of user feedback

Date	Name	Organization	Type of user feedback	Response time to address user request
2015/03/04	Maria Olsson	Swedish Energy Agency	Technical	20 days
2015/03/17	Trevor Alcorn	Marine Institute	License Agreement for Use of Digital Data	1 day
19/05/15	Laura Robson	Joint Nature and Conservation Committee (UK)	The JNCC is currently looking into options for Data Archive Centres for human activities data. They wanted to explore existing DACs and establish whether it would be worthwhile setting up a DAC for these data in the UK. They wondered whether there is any scope for JNCC to support the data supply to this portal for the UK	Laura was contacted by telephone soon after she sent her e-mail.
24/06/15	Bernard Vanheule	International Association of Oil & Gas Producers	IOGP represents the oil and gas producers community world-wide and also at EU level. Their Marine & Environment Committee is working on various issues, mainly addressing offshore aspects. In that context they were thinking to make use of the EMODnet map showing the location of offshore oil & gas installations. They also noted that some boreholes in the Human Activities map are missing, and offered suggestions as to how to fill gaps. In addition, the IOGP offered to collaborate with the Human Activities team by connecting us with their associates in order to get data from industry for those countries that are not cooperating.	Bernard was contacted by telephone soon after she sent her e-mail.
01/07/2015	Arianna	University of	A PhD in Environmental	An email was sent to

Date	Name	Organization	Type of user feedback	Response time to address user request
	Azzellino	Technology, Milan	Engineering, Arianna enquired on the scope of the project, since she was interested in using HA data to calculate pressure on the costal environment from human activities	Arianna the very next day, and she was then called on the phone the next week.
14/08/2015	Frankie Peckett	Joint Nature Conservation Committee	Frankie has signalled an issue with Contact Form and with downloading the files for pipelines and cables.	Frankie has been contacted by e-mail the day after he signalled the problem. The problem was sorted out a few days later. In the meantime, Frankie was sent the data he couldn't download via email.
13/10/2015	Chris Moulton	OSPAR	Technical (problem with WFS). OSPAR tried to attach a WFS datastore (wind farms, polygons) to geoserver and from there trying to publish a layer from that datastore. The datastore could be attached successfully, but upon trying to publish the layer, an error was displayed.	Issue solved. The WFS were created using Mapserver. As an alternative, they were provided via Geoserver
13/01/2016	Emma Sullivan	National Oceanography Centre	Request for permission to use data provided by EMODnet Human Activities in a paper	1 day
12/07/2016	Dennis Gräwe	Landesamt für Umwelt, Naturschutz und Geologie (LUNG)	Enquire on telecommunication cable metadata	Same day

Furthermore, on 11th January a questionnaire to evaluate the Human Activities portal was sent to 449 potential users. We collected users' feedback until the end of February. During this period 107 questionnaires were compiled (WP 8 – Monitoring of effectiveness in addressing users' needs).

8. Allocation of project resources

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1. Collecting, harmonising and giving access to data: 50%
2. Creating data products[6]: 0%
3. Developing and maintaining (IT): 15%
4. Management and reporting: 5%
5. Answering questions and other communication activities: 17%
6. Other (*equipment and consumables, travel and subsistence expenses, overheads, etc.)*: 13%

[6] N.B.: As of today, Human Activities does not provide data products, if these are defined as gridded or interpolated data. If shipping density data had been available, then the data product 'commercial shipping, recreational shipping' would have been an exception. However, almost all human activities datasets are to be considered as data products, in that data are sourced from multiple providers and harmonized into a common data model

9. Outreach and communication activities

The events considered the most important in terms of raising visibility and or quality of exchange with target audience are highlighted in bold

Table 11 – Summary of outreach and communication activities

Date	Media	Title	Short description and/or link to the activity
19-20 May 2014		**European Maritime Day**	**Cogea had a booth to present all their projects with DG MARE. Many visitors asked about EMODnet Human Activities.**
17-18 June 2014		Baltic MSP Forum	EMODnet Human Activities was presented at the Baltic MSP Forum in Riga. Once again participants demonstrated considerable of interest towards the project.
2 October 2014		Member States Expert Group on MSP	EMODnet Human Activities was presented at the Member States Expert Group on MSP in Brussels.
3 October 2014	Skype	Web conference with EWEA	EMODnet was presented to the EWEA (now WindEurope). A collaboration protocol was agreed for sharing information about new references on wind farms. EWEA sent the HA team more info about potential installation of wind farms whenever possible. The data collected by the HA team are exchanged with EWEA for validation.
6 October 2014	PPT presentation	EurOCEAN 2014	Together with the other

			portals, it was presented how EMODnet fits in the wider marine data landscape in Europe and showcase new sea-basin level approaches to evaluate marine data availability and observation capacity from a use-perspective.
29 October 2014	PPT presentation	EuroGOOS 2014	EMODnet Human Activities was presented at EuroGOOS 2014.
16 January 2015	GoToMeeting	**Coordination with key stakeholders**	**We opened an ongoing dialogue with key stakeholders (ICES, World Maritime University, JRC, Helcom, European Environment Agency, Wageningen University, The Crown Estate, Cefas, OSPAR) to better explain what EMODnet Human Activities is about and to coordinate with them. We collected useful feedback that helped us fine tune the portal.**
27 January 2015	-	**EMODnet – MSFD Coordination meeting**	**A demonstration of the portal was provided. Further to the discussion on metadata we had during the Coordination meeting, the "lineage" section has been expanded.**
31 March 2015	GoToMeeting	Coordination with OSPAR	Main issues discussed: improvement of datasets based on OSPAR data; improvement of "lineage" (quality & validity) section of metadata on Human Activities; OSPAR also noted that it would be useful to provide a sort of a 'change log' to easily

			spot changes whenever a dataset is updated
28-29 May 2015	PPT presentation and paper posters	**European Maritime Day 2015**	**Cogea had a booth at the EMD 2015 in Athens where users could ask information on EMODnet Human Activities. The project was also presented at a workshop organised by the Secretariat: "Marine data and information powering Blue Growth"**
May 2015	Promotional video	PrimeFish (H2020 project)	The promotional video of EMODnet is uploaded in the website of the PrimeFish (H2020 project): http://primefish.eu/
22 June 2015	Digital video (YouTube® channel)	What is EMODnet?	The promotional video of EMODnet is uploaded on the website of the PrimeFish (H2020 project): http://primefish.eu/content/what-emodnet
21 September 2015	PPT Presentation	Impact on the shipping industry of integrating dynamic routing with the environmental aspects of Maritime Spatial Planning	EMODnet Human Activities was presented during the MONALISA Workshop in Genoa.
20 October 2016	**PPT Presentation**	**EMODnet Open Conference**	**EMODnet was presented in a conference opened to all stakeholders. The afternoon breakout sessions offered an opportunity to do some brainstorming on how to face future challenges and improve the current situation.**
From 17 to 20 November 2015	Poster	Annual meeting of MareFrame project	A dissemination poster of Human Activities was presented during the Annual meeting of MareFrame project (http://mareframe-

			fp7.org/) and the final event of the Perseus project
December 2015	Eurofish Magazine	Making marine data widely and easily available	https://issuu.com/eurofish/docs/eurofish_magazine_6_2015/16?e=1376257/31856692
30 May – 3 June, 2016	Oral session	Young Researchers Workshop at MSEAS 2016 – Brest (France)	The Platform Human Activities included in EMODnet was presented during the Young Researchers Workshop at ICES, MSEAS2016 (Understanding marine socio-ecological systems) [link]
15 June 2016		EUROFISH Magazine	Distribution of Karmenu Vella's blog "Looking Beneath the Surface" in connection with EUROFISH newsletter sent to 925 subscribers http://us1.campaign-archive1.com/?u=7d70f17c7740ec2e5c0bca188&id=70f6dd0fd1&e=61c650cb78

10. Evolution of Progress Indicators

Indicator 1. Volume of data made available through the portal

Table 12 -Volume of data made available through the portal

Activity			Type/format				
			Points	Lines	Polygons	Related tables/records	Raster tiles/ cells
Cultural heritage (Lighthouses)			4.062				
Mariculture	Shellfish		1.217				
	Finfish		831				
Aggregate extraction			263			1 related table containing 858 records	
Dredging			967			1 related table containing 4.315 records	
Ocean energy facility	Projects		137			1 related table containing 200 records	
	Test sites				56		
Other forms of area management/designation	International conventions				4		
	Maritime boundaries			198			
	Advisory councils				7		
Waste disposal (solids, including dredge material, dumped munitions, marine constructions)	Dumped munitions		98		163		
	Dredge spoil dumping		1.396		1.731		
Wind farms			295		187		
Fisheries	Fishery zones (FAO and ICES)	FAO Fishery Statistical Areas			322		
		ICES Statistical Areas			65		
	Fishery catches by FAO statistical area				135 areas with related data	5 related tables by FAO area level containing 110.720 records. Major 9.506, division 57.259, subdivision 19.973, subarea 22.900, subunit 1082	
	Monthly first sales, EUMOFA		1.480			1 related table containing 672.501 records	
Hydrocarbon extraction	Boreholes		23.837				

Activity			Type/format				
			Points	Lines	Polygons	Related tables/records	Raster tiles/ cells
	Active licenses				2.030		
	Offshore installations		1.725				
Pipelines and cables	Landing stations (schematic cables)		430				
	Schematic cables			171			
	Actual route locations (cables)			202			
Environment	Protected areas	Nationally designated areas (CDDA)			12.135 coastal and marine areas		
		Natura 2000			4.667 coastal and marine areas		
	State of bathing waters		15.978				
Commercial shipping, recreational shipping							
Main ports traffic	Goods		1.047 ports with related data			1 related table containing 148.623 records	
	Passengers					1 related table containing 63.882 records	
	Vessels					1 related table containing 2.278.500 records	

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).

Table 13 List of data providers

Country	Name	Type
BE	Coordination Centre for Integrated Coastal Zone Management	Government
BE	Management Unit of the North Sea Mathematical Models (MUMM), The Royal Belgian Institute of Natural Sciences	Science
BG	Waste disposal in Bulgarian territorial waters	Government
BG	Basin Directorate for Water Management in Black Sea Region - Varna	Government
CY	Ministry of Energy	Government
CY	Department of Fisheries and Marine Research.	Government
DE	BSH Federal Maritime and Hydrographic Agency of Germany	Government
DE	Landesamt für Bergbau, Energie und Geologie	Science
DK	Danish Nature Agency	Government
DK	ICES	Science
DK	Danish Energy Agency	Government
DK	Ministry of Food, Agriculture and Fisheries of Denmark	Government
EL	Ministry of Environment, Energy & Climate Change	Government
EL	Hellenic Navy Hydrographic Service. (Ministry of Defense)	Government
EL	Geographic Policy and International Affairs Office Hellenic Navy Hydrographic Service	Government
ES	CEDEX	Government
ES	Hydrographic Office (Ministry of Defence)	Government
ES	IGME	Science
ES	Ministerio de Agricultura, Alimentación y Medio Ambiente	Government
ES	Ministry of Defence	Government
ES	Ministry of Public Works and Transport	Government
ES	Puertos del Estado	Government
ES	Ministry for Infrastructures-Ports Department	Government
FI	Ministry of Environment	Government
FI	Ministry of Transport and Communications	Government
FR	Centre d'études techniques maritimes et fluviales (CETMEF)	Government
FR	Comité National de la Conchyliculture	Producers' Association
FR	French Naval Hydrographic and Oceanographic Service	Government
FR	IFREMER	Science
FR	SHOM. Service Hydrographique et Oceanographique de la Marine	Government

Country	Name	Type
FR	SIG Cables, Orange ©	Industry
FR	Bureau de Recherches Géologiques et Minières	Government
FR	CETMEF - Centre d'études techniques maritimes et fluviales	Science
HR	Ministry of Defence of the Republic of Croatia	Government
HR	Croatian Hydrocarbon Agency	Government
IE	Department of Communications, Energy and Natural Resources	Government
IE	Marine institute	Government
IE	Ireland maritime boundaries	Government
IE	Sea Fisheries Protection Authority	Government
IE	Marine Institute Ireland	Government
IT	Associazione Mediterranea Acquacoltori	Producers' Association
IT	Ministero dello Sviluppo Economico	Government
IT	Regione Lazio, Direzione Regionale Infrastrutture, Ambiente e Politiche Abitative, Centro di Monitoraggio GIZC / ISPRA	Government
IT	Hydrographic Institute-Ministry of Defence and Servizio emergenze ambientali in mare (SEAM)	Government
LT	Ministry of the Environment	Government
LV	Environment Protection Agency	Government
LV	Ministry of Economy	Government
LV	Ministry of Environmental Protection and Regional Development	Government
LV	Latvian environment geology and meteorology centre	Government
LV	Maritime Administration of Latvia	Government
ME	Geological Survey of Montenegro	Government
MT	Permanent Representation of Malta to the EU	Government
MT	Ministry for Transport and Infrastructure - Continental Shelf Department	Government
NL	Ministry of Economic Affairs	Government
NL	PBL Netherlands Environmental Assessment Agency	Government/Research
NL	Wageningen UR	Science (University)
NL	Rijkswaterstaat Noordzee and TNO	Government and Industry
NO	Norwegian Petroleum Directorate	Government
PL	Hydrographic Office of the Polish Navy (Ministry of Defence)	Government
PL	Ministry of Defence	Government
PL	Ministry of Science and Higher Education (Institute of Oceanology)	Government
PL	Polish Geological Institute	Government
PL	The Polish Geological Institute (Ministry of the Environment)	Government
PT	APA-APFF, Direção de Gestão de Espaços, Ambiente e Infraestruturas	Government
PT	Directorate General for Natural Resources, Safety, and Maritime Affairs	Government
PT	Ministry of Environment, Spatial Planning and Energy	Government

Country	Name	Type
PT	Direção de Serviços de Ambiente Marinho e Sustentabilidade. Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos	Government
PT	Directorate General for Energy and Geology	Government
PT	ENMC - Entidade Nacional para o Mercado de Combustíveis	Government
SE	Swedish Agency for Marine and Water Management	Government
SE	The Swedish Agency for Marine and Water Management	Government
SE	Swedish Energy Agency	Government
UK	Department of Energy & Climate Change	Government
UK	Ministry of Defence- UK Hydrographic Office	Government
UK	The Crown Estate	Government
UK	Scotland's Aquaculture	Government
UK	Department of Environment - Marine Division	Government
UK	Scottish Government spatial information and data	Government
International	FAO	International Organisation
International	HELCOM	Science
International	IEA-OES Ocean Energy Installations	International Organisation
International	SOWFIA Project	Science
International	TETHYS	Science
International	OSPAR	International Organisation
International	EWEA	Industry
EU	EU Commission – DG MARE – Atlas of the Seas	EC DG
EU	European Environment Agency	EC Agency
EU	EUROSHELL	7FP Project
EU	Eurostat	EC DG
EU	Joint Research Centre (JRC)	EU Commission
International	International Council for the Exploration of the Sea (ICES)	International Organisation
US	TeleGeography	Industry
ZA	Greg's Cable Map	-

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

Table 14 – List of sources contacted to supply data with no result

Country	Name	Type of data	Reason why data has not been supplied
BG	Ministry of Economy	Hydrocarbon extraction and licensing	No reply
BG	Ministry of Environment and Water. Water Management Directorate	Waste disposal	No reply
BG	Bulgarian Ministry of Defence	Waste disposal	No reply
BG	Geological Institute “Strashimir Dimitrov”	Hydrocarbon extraction and licensing	No reply
BG	Ministry of Environment and Water. Water Management Directorate	Waste disposal	No reply yet
BG	Bulgarian Maritime Administration	Waste disposal	Not under their responsibility
BG	Bulgarian Ports Infrastructure Company	Waste disposal	No reply yet
BG	Black Sea Commission	Waste disposal	They are not covering the offshore installations
HR	Croatian Environment Agency	Waste disposal	In Croatia there are no systematic actions on marine litter issue and consequently no data collection either.
DK	Hydrocarbon extraction	GEUS - Geological Survey of Denmark and Greenland	No answer
EE	Ocean energy facilities	Estonia-Laboratory of Wave Engineering	No answer
ES	Hydrocarbon extraction	Ministerio de Industria, Energía y Turismo	No answer
FO	Faroese Earth and Energy Directorate	Hydrocarbon extraction	No reply.
EL	YPEKA	Hydrocarbon extraction	No reply.
EL	Ministry of Environment, Energy and Climate Change	Waste disposal	No reply
HR	Hydrocarbon extraction	Croatian Geological Survey	No answer

Country	Name	Type of data	Reason why data has not been supplied
IT	Dredging	Regione Emilia Romagna	No answer
IT	Ministry of Environment	Waste disposal	No reply
LV	Ministry of Economics of the Republic of Latvia	Hydrocarbon extraction and licensing	No reply
LT	Hydrocarbon extraction	Geological Survey of Lithuania	No answer
MT	Ministry for Sustainable Development,	Waste disposal	No reply
MT	The Malta Environment & Planning Authority	Waste disposal	No reply
ME	GEOZAVOD – The Geological Survey of Montenegro	Hydrocarbon extraction and licensing	No reply
MT	Ministry for Transport and Infrastructure	Hydrocarbon extraction	No reply.
NO	The Norwegian Mapping and Cadastre Authority, the Institute of Marine Research, the Norwegian Environment Agency	Waste disposal	They refer to OSPAR database
PL	Institute of Oceanology of the Polish Academy of Sciences	Waste disposal	Their database is still under construction. As soon it is finalizsd, we could establish the data transfer.
PT	Aggregate extraction	Portuguese Sea and Atmosphere Institute	They said they already provide data for the WGEXT Report (ICES)
PT	Dredging	National Information System on Water Resources	Suggested to contact other sources
RO	NAMR	Hydrocarbon extraction	No reply.
RO	Hydrocarbon extraction	Geological Institute of Romania	No answer
RO	Geological Institute of Romania	Hydrocarbon extraction and licensing	No reply
RO	NAMR – National Agency for Mineral Resources	Hydrocarbon extraction and licensing	No reply
RO	Romanian Navy-Ministry of Defence	Waste disposal	No reply
RO	Water Resources Directorate-	Waste disposal	No reply

Country	Name	Type of data	Reason why data has not been supplied
RO	Ministry of Environment and Forests	Waste disposal	Not under their responsibility
RO	National Institute of Hydrology and Water Management	Waste disposal	No reply yet
RO	National Administration Romanian Water	Waste disposal	No reply yet
RO	National Research and Development Institute on	Waste disposal	No reply yet
SE	Hydrocarbon extraction	Geological Survey of Sweden	The information requested is stored on paper-based media
SI	Ministry of the Environment and Spatial Planning	Waste disposal	No reply
SI	Environmental Agency (Ministry of the Environment and Spatial Planning)	Waste disposal	No reply
SI	Ministry of Infrastructure	Waste disposal	No reply
UK	Centre for Environment, Fisheries and Aquaculture Science (CEFAS)	Waste Disposal Data	The Marine Management Organization (MMO) is the regulator for these activities in England and therefore the owner of this type of data. Cefas act as a technical adviser for the MMO only for projects on which consultation is required. In the case of the UK and national institutions from Scotland, North Ireland and Wales, there was misunderstanding since some contacts referred to CEFAS as the key general institution for those marine data in UK waters, but, at the same time, we received some communications from CEFAS telling that the MMO is the holder of those data. We are still waiting for formal communication from MMO reporting on the issue.

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

August 2014 – June 2016

Included are instances of downloads and initial requests for WFS links. Statistics exclude Human Activities and Central Portal partners.

Wind Farms	98
Natura2000	76
Telecommunication Cables (actual)	72
Main Ports	67
Dredging	65
Aggregate Extraction	60
CDDA	57
Dredge Spoil Dumping	56
Dumped Munitions	56
Hydrocarbon Extraction Boreholes	54
Shellfish Production	53
Hydrocarbon Extraction Active Licenses	51
Telecommunication Cables (schematic)	41
Fish Catches	36
Offshore Installations	31
Ocean Energy Facilities	30
Finfish Production	29
Maritime Boundaries	29
Advisory Councils	25
Telecommunication Landing Stations	20
State of Bathing Waters	19
OSPAR Maritime Area	16
FAO Fishery Statistical Areas	12
ICES Statistical Areas	11
Lighthouses	11
HELCOM Maritime Area	9
Bucharest Convention	5
Barcelona Convention	3

Indicator 5. Organisations that have downloaded each data type

Users are asked for their organisation name when downloading data or requesting WFS links. It is a non-mandatory field, therefore organisation include (but are not limited to):

April 2014 – June 2016

- 40South Energy (Energy), UK/IT
- ABPmer (Environment), UK
- ACRI (Environment), MA
- AECOM (Environment), UK
- Agence de L'eau Loire-Bretagne (Research), FR
- Agri-Food and Biosciences Institute - AFBI (Environment), UK
- Aix-Marseille University (Research), FR
- Aristotle University of Thessaloniki (Research), GR
- AWI - Alfred-Wegener-Institut (Education), DE
- Azores University (Research), PT
- BirdLife (Environment), BE
- Bist LLC (Fisheries and Agriculture)
- BP Crisis Management (Energy), US
- Ca' Foscari University of Venice (Research), IT
- Canadian Ferry Operators Association (Research), CA
- CEFAS - Centre for Environment , Fisheries and Aquaculture , Science (Fisheries and agriculture), UK
- Centre for Maritime Research and Experimentation - CMRE (Research)
- Centre of Environmental and Marine Studies (CESAM) - University of Aveiro (Environment), PT
- Centre of Marine Science of the University of the Algarve (Research), PT
- CEREMA - Centre for Studies and expertise on risk, the environment , mobility and development (Energy), FR
- CIBIO (Research), PT
- Clarksons (Energy), UK
- CNA (Research), US
- CNR-IAMC - The Institute of Marine Sciences / Institute for Coastal Marine Environment (Research), IT
- CNR-ISMAR - The Institute of Marine Sciences / National Research Council of Italy (Research), IT
- Collecte Localisation Satellite (Environment), FR
- DEA (Energy), DE
- DeepOcean (Energy), UK
- Department of Environment – Northern Ireland (Environment), UK
- DLTM - Liguria District of Marine Technology (Environment), IT
- DNV GL (Energy), UK

- DTU Aqua (Fisheries and agriculture), DK
- EC (Research), IT
- EcoAqua Project - The University of Las Palmas de Gran Canaria - ULPGC (Research), ES
- Ecologic Institute (Environment), DE
- Entidade Nacional para o Mercado de Combustíveis - ENMC (Energy), PT
- ERES (Mining), DE
- ETT (Research), IT
- EuroGOOS (Environment), BE
- European Environment Agency – EEA (Environment), DK
- European Food Safety Authority (Fisheries and agriculture), IT
- Federal Grid Company (Energy), RU
- Foundation of Research and Technology Hellas - FORTH (Research), GR
- French Ministry of Fisheries (Fisheries and agriculture), FR
- Fugro EMU (Environment), UK
- Genesis Oil and Gas (Environment), UK
- Geo-Marine Technology (Research), US
- Ghent University (Research), BE
- GMIT - Galway-Mayo Institute of Technology (Research), IE
- GMT Research (Research), US
- G-tec (Energy), BE
- GTK - Geological Survey of Finland (Environment), FI
- HELCOM (Environment), FI
- Heriot-Watt University (Education), UK
- HR Wallingford (Environment), UK
- HRI (Other), NL
- ICL (Research), UK
- Ifremer (Research), FR
- IMARES - Institute for Marine Resources & Ecosystem Studies (Research), NL
- INGV (Environment), IT
- Institute for Agricultural and Fisheries Research (Research), BE
- Institute for Marine Resources & Ecosystem Studies (Research), NL
- Institute for Water of the Republic of Slovenia (Environment), SI
- Institute IMDEA Agua (Research), ES
- International Association of Oil & Gas Producers - IOGP (Energy), BE
- International Council for the Exploration of the Sea - ICES (Environment), DK
- IOGP - The International Association of Oil & Gas Producers (Energy), BE
- JNCC (Research), UK
- John Jay College (Education), US
- Joint Nature Conservation Committee – JNCC (UK)
- Joint Research Centre – JRC (Research), IT
- Karlsruhe Institute of Technology (Research), DE
- Made Smart (Energy), NE

- Maersk Oil (Environment), DK
- Marine Hydrophisical Institute (Transport), UA
- Marine Institute (Research), IE
- Marine Systems Institute at TUT - Tallinn University of Technology (Research), EE
- MARUM - Center for Marine Environmental Sciences (Research), DE
- MEDDE/DPMA (Fisheries and agriculture), FR
- MEP (Fisheries and Agriculture), UK
- Mercator Océan (Environment), FR
- Michael Carder Ltd (Other), UK
- Ministry of Infrastructure and Developemnt (Other), PL
- MRAG (Fisheries and agriculture), UK
- National ICT Australia – NICTA (Transport), AU
- National Institute for Marine Research and Development (Environment), RO
- National Institute of Geophysics and Volcanology (Research), IT
- National Institute of Marine Geology and Geoecology (Research), RO
- National Oceanic and Atmospheric Administration - NOAA (Energy), US
- Natural Power (Environment), UK
- Naval Hydrographic and Oceanographic Service - SHOM (Other), FR
- Navionics (Other), IT
- Newcastle University (Education), UK
- NIRAS Consulting (Environment), UK
- Norwegian Coastal Administration (Transport), NO
- Orange (Other), FR
- OSPAR (Other), UK
- Periplus Consultancy (Mining), NE
- Periplus Group (Energy), NL
- Plymouth University (Research), UK
- Portuguese Institute of the Sea and the Atmosphere - IPMA (Research), PT
- RAC/SPA - Regional Activity Centre for Specially Protected Areas (Environment), ES
- Ramboll (Environment), DK
- Royal HaskoningDHV (Environment), UK
- RPS Group (Physical planning), Ireland
- Sea Fisheries Protection Authority (Fisheries and agriculture), IE
- SERTIT - University of Strasbourg (Research), FR
- SHOM - Naval Hydrographic and Oceanographic Service (Other), FR
- SHORELINE Scarl (Fisheries and agriculture), IT
- Stantec (Environment), CA
- Statoil ASA (Energy), NO
- Swedish Geological Survey (Environment), SE
- Teleplan Globe (Other), NO
- The Baltic Pavilion (Other), LV
- The George Washington University (Education), US

- The GIS Institute (Education), US
- The Intergovernmental Oceanographic Commission of UNESCO (Environment), FR
- Thünen - Institute of Sea Fisheries (Research), DE
- TPG (Mining), US
- Unimar (Fisheries and agriculture), IT
- Universität Bremen (Research), DE
- University Ca' Foscari of Venice (Research), IT
- University College Cork - UCC (Education), IE
- University of Aveiro (Research), PT
- University of Bucharest (Research), RO
- University of Gdańsk (Education), PL
- University of Ghent (Research), BE
- University of Glasgow (Research), UK
- University of Hamburg (Research), DE
- University of Hull (Education), UK
- University of Malaga (Research), ES
- University of Naples (Environment), IT
- University of Palermo (Fisheries and agriculture), IT
- University of Pennsylvania (Education), US
- University of South Wales (Education), UK
- University of Southampton (Education), UK
- University of the Azores (Research), PT
- University of the Highlands and Islands, (Environment), UK
- University of the West of England (Environment), UK
- University of Thessaly (Education), GR
- University of Turku (Environment), FI
- University of Venice - IUAV (Education), IT
- University of Veterinary Medicine - TiHo (Education), DE
- University of York (Environment), UK
- URS (Environment), ES
- Verband Deutsche Binnenfischerei und Aquakultur (Fisheries and agriculture), DE
- VisNed (Fisheries and agriculture), NL
- VVA, Valdani Vicari & Associati - VVA (Other), BE
- Witt O'Brien's (Other), UK
- World Maritime University (Research), SE
- WWF Italy (Environment), IT
- Xsealence (Environment), PT

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

April 2014 – June 2016

Statistics include all visitors including partners.

Table 15 -Web statistics for the 'View data' page of the portal

Month	Unique Page Views	Avg. Time on Page (mm:ss)	Page Views	New Visitors	% New Visitors
Apr-14	193	02:40	344	93	48.19%
May-14	214	04:12	290	82	38.32%
Jun-14	198	02:44	292	90	45.45%
Jul-14	150	02:27	260	70	46.67%
Aug-14	115	02:28	160	50	43.48%
Sep-14	144	02:09	198	76	52.78%
Oct-14	217	02:37	308	107	49.31%
Nov-14	148	02:02	205	89	60.14%
Dec-14	116	03:22	152	60	51.72%
Jan-15	165	02:20	245	87	52.73%
Feb-15	195	02:05	295	104	53.33%
Mar-15	223	02:36	315	115	51.57%
Apr-15	241	02:43	357	109	45.23%
May-15	209	02:22	312	91	43.54%
Jun-15	243	02:26	338	117	48.15%
Jul-15	249	02:12	335	113	45.38%
Aug-15	140	02:09	182	63	45.00%
Sep-15	249	02:32	400	102	40.96%
Oct-15	199	02:14	311	129	64.82%
Nov-15	242	02:17	367	129	53.31%
Dec-15	224	03:30	327	125	55.80%
Jan-16	345	03:24	554	165	47.83%
Feb-16	369	03:02	584	147	39.84%
Mar-16	455	02:38	643	259	56.92%
Apr-16	428	03:13	573	253	59.11%
May-16	329	03:16	502	162	49.24%
Jun-16	439	03:40	649	259	59.00%

Table 16 - Web statistics for the home page of the portal

Month	Unique Page Views	Avg. Time on Page (mm:ss)	Page Views	New Vistors	% New Vistors
Apr-14	200	01:00	287	86	43.00%
May-14	226	00:32	367	77	34.07%
Jun-14	178	01:25	262	72	40.45%
Jul-14	171	01:45	274	74	43.27%
Aug-14	138	02:35	217	57	41.30%
Sep-14	112	01:39	139	63	56.25%
Oct-14	190	00:47	231	90	47.37%
Nov-14	154	02:31	191	111	72.08%
Dec-14	179	02:22	203	125	69.83%
Jan-15	192	01:11	219	122	63.54%
Feb-15	146	00:49	216	91	62.33%
Mar-15	311	00:53	345	259	83.28%
Apr-15	344	01:02	435	291	84.59%
May-15	810	02:36	839	722	89.14%
Jun-15	895	01:58	921	811	90.61%
Jul-15	1122	02:49	1,155	1,038	92.51%
Aug-15	604	01:38	912	237	39.24%
Sep-15	209	00:58	280	96	45.93%
Oct-15	228	04:17	280	86	37.72%
Nov-15	253	04:44	290	63	24.90%
Dec-15	193	03:55	246	52	26.94%
Jan-16	280	02:30	375	24	8.57%
Feb-16	150	01:03	184	37	24.67%
Mar-16	147	00:57	188	42	28.57%
Apr-16	184	01:20	234	105	57.07%
May-16	268	00:46	315	164	61.19%
Jun-16	302	00:49	365	182	60.26%

Table 17 - Web statistics for the 'Search data' page of the portal

Month	Unique Page Views	Avg. Time on Page (mm:ss)	Page Views	New Vistors	% New Vistors
Aug-14	58	02:10	184	9	15.52%
Sep-14	76	01:03	188	32	42.11%
Oct-14	105	01:23	171	31	29.52%
Nov-14	66	02:44	111	43	65.15%
Dec-14	44	01:39	73	24	54.55%
Jan-15	75	01:32	137	33	44.00%
Feb-15	70	01:38	204	34	48.57%
Mar-15	83	00:55	308	43	51.81%
Apr-15	126	02:51	308	45	35.71%
May-15	134	01:14	369	53	39.55%
Jun-15	129	01:55	260	62	48.06%
Jul-15	111	01:32	293	53	47.75%
Aug-15	56	00:50	203	33	58.93%
Sep-15	135	02:09	394	38	28.15%
Oct-15	117	01:12	340	52	44.44%
Nov-15	101	00:15	243	54	53.47%
Dec-15	233	01:30	374	33	14.16%
Jan-16	259	01:20	387	80	30.89%
Feb-16	237	00:57	333	120	50.63%
Mar-16	223	00:44	334	125	56.05%
Apr-16	219	01:07	352	109	49.77%
May-16	240	01:33	389	96	40.00%
Jun-16	302	01:02	505	131	43.38%

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

August 2014 – June 2016

Users must select their sector when downloading data or requesting WFS links.

Table 18 – List of what the downloaded data has been used for

Environment	30.66%
Research	24.41%
Fisheries and agriculture	13.68%
Other	8.22%
Energy	8.03%
Education	7.04%
Mining	2.50%
Demography	1.45%
Physical planning	1.45%
Transport	1.18%
Tourism	0.86%
Forestry	0.33%
Health	0.20%

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

The following web services are available as OGC compliant web feature services (WFS), version 1.1.0, in a WGS84 projection (EPSG:4326). Output is GML or format GeoJSON format.

AGGREGATE EXTRACTION

Aggregate Extraction

http://77.246.172.208/WFSaggregates?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=aggregates

CULTURAL HERITAGE

Lighthouses

http://77.246.172.208/WFSlighthouses?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=lighthouses

DREDGING

Dredging

http://77.246.172.208/WFSdredging?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=dredging

ENVIRONMENT

Natura 2000

http://77.246.172.208/WFSnatura2000?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=natura2000

Nationally Designated Areas

http://77.246.172.208/WFScdda?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=cdda

State of Bathing Waters

http://77.246.172.208/WFSbathingwaters?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=bathingwaters

FISHERIES

FAO Fishery Statistical Areas

Users are referred to original source:
http://www.fao.org/figis/geoserver/area/ows?version=1.0.0&typeName=area:FAO_AREAS

ICES Statistical Areas

http://77.246.172.208/cgi-bin/mapserv.exe?map=E:/MS4W/ms4w/apps/mapfiles/WFSicesareas.map&SERVICE=WFS&VERSION=1.0.0&request=GetFeature&typeName=icesareas

HYDROCARBON EXTRACTION

Boreholes

http://77.246.172.208/WFShydrocarbons?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=hydrocarbons

Active Licenses

http://77.246.172.208/WFSactivelicenses?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=activelicenses

Offshore Installations

http://77.246.172.208/WFSplatforms?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=platforms

MARICULTURE

Shellfish Production

http://77.246.172.208/WFSshellfish?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=shellfish

Finfish Production

http://77.246.172.208/WFSfinfish?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=finfish

OCEAN ENERGY FACILITIES

Project Locations

http://77.246.172.208/WFSoenergy?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=oenerg

Test Sites

http://77.246.172.208/WFSoenergytests?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=oenergytests

OTHER FORMS OF AREA MANAGEMENT/DESIGNATION

Advisory Councils

http://77.246.172.208/WFSadvisorycouncils?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=advisorycouncil

Barcelona Convention

http://77.246.172.208/WFSbarcelona?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=barcelona

Bucharest Convention

http://77.246.172.208/WFSbucharest?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=bucharest

HELCOM Maritime Area

http://77.246.172.208/WFShelcom?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=helcom

OSPAR Maritime Area

http://77.246.172.208/WFSospar?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=ospar

Maritime Boundaries

http://77.246.172.208/WFSmaritimebnds?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=maritimebnds

PIPELINES AND CABLES

Telecommunication Cables (schematic routes)

http://77.246.172.208/WFScablesschematic?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=cablesschematic

Landing Stations

http://77.246.172.208/WFSlightouses?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=landingstations

BSH CONTIS Cables

http://77.246.172.208/WFSbshcontiscables?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=bshcontiscables

SIGCables Submarine Cables Routes

http://77.246.172.208/WFSsigcables?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=sigcables

Kis Orca Subsea Cables

http://77.246.172.208/WFSkisorcacables?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=kisorcacables

WASTE DISPOSAL

Dredge Spoil Dumping (Points)

http://77.246.172.208/WFSdredgespoildumping?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=dredgespoil

Dredge Spoil Dumping (Polygons)

http://77.246.172.208/WFSdredgespoildumpingpoly?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=dredgespoilpoly

Dumped Munitions (Points)

http://77.246.172.208/WFSmunitions?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=munitions

Dumped Munitions (Polygons)

http://77.246.172.208/WFSmunitionspoly?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=munitionspoly

WIND FARMS

Wind Farms (Points)

http://77.246.172.208/WFSwindfarms?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=windfarms

Wind Farms (Polygons)

http://77.246.172.208/WFSwindfarmspoly?SERVICE=WFS&VERSION=1.1.0&request=GetFeature&typeName=windfarmspoly

Attribute data for Main Ports and Fish Catches are complex and are currently not released as WFS.

Users are asked to volunteer their organisation name and sector and country when requesting initial WFS (web feature services) information. Organisation name and country are not mandatory fields. Only those organisations that can be easily validated online as genuine are listed. It is not possible to track user's organisations who have acquired the WFS links from other sources (e.g. from a shared link). Organisations that have made initial requests for WFS links include (but are not limited to) the following:

- ACRI (Environment), MA
- BP Crisis Management (Energy), US
- CEFAS - Centre for Environment , Fisheries and Aquaculture , Science (Fisheries and agriculture), UK
- Centre of Marine Science of the University of the Algarve (Research), PT
- CNR-ISMAR - The Institute of Marine Sciences / National Research Council of Italy (Research), IT
- Collecte Localisation Satellite (Environment), FR
- DEA (Energy), DE
- EcoAqua Project - The University of Las Palmas de Gran Canaria - ULPGC (Research), ES
- Entidade Nacional para o Mercado de Combustíveis - ENMC (Energy), PT
- ETT (Research), IT

- EuroGOOS (Environment), BE
- Joint Research Centre – JRC (Research), IT
- Federal Grid Company (Energy), RU
- French Ministry of Fisheries (Fisheries and agriculture), FR
- Fugro EMU (Environment), UK
- Ghent University (Research), BE
- G-tec (Energy), BE
- Heriot-Watt University (Education), UK
- IMARES - Institute for Marine Resources & Ecosystem Studies (Research), NL
- JNCC (Research), UK
- Marine Institute (Research), IE
- MEDDE/DPMA (Fisheries and agriculture), FR
- Michael Carder Ltd (Other), UK
- Norwegian Coastal Administration (Transport), NO
- Orange (Other), FR
- OSPAR (Other), UK
- Periplus Consultancy (Mining), NE
- RPS Group (Physical planning), Ireland
- SHOM - Naval Hydrographic and Oceanographic Service (Other), FR
- Swedish Geological Survey (Environment), SE
- Thünen - Institute of Sea Fisheries (Research), DE
- University Ca' Foscari of Venice (Research), IT
- Aix-Marseille University (Research), FR
- University of York (Environment), UK
- VisNed (Fisheries and agriculture), NL

Annex 1: Additional User Statistics

Additional User Statistics

Table 19 – Browser share on Human Activities

Chrome	60.03%
Firefox	23.60%
Internet Explorer	9.42%
Safari	6.06%
Android Browser	0.29%
Edge	0.23%
Opera	0.19%
Other	0.19%

Table 20 -Visitor location

United Kingdom	17.21%
Italy	15.38%
United States	12.79%
Spain	8.38%
Belgium	5.73%
Russia	4.23%
France	4.13%
Brazil	4.06%
Netherlands	2.42%
Germany	2.18%
China	2.06%
Denmark	1.49%
Greece	1.49%
Portugal	1.43%
Ireland	1.37%
Sweden	1.12%
Finland	1.11%
Japan	1.08%
Ukraine	0.78%
Other (EU)	2.98%
Other (non-EU)	8.56%

Figure 2 - Traffic Acquisition - July to December 2015

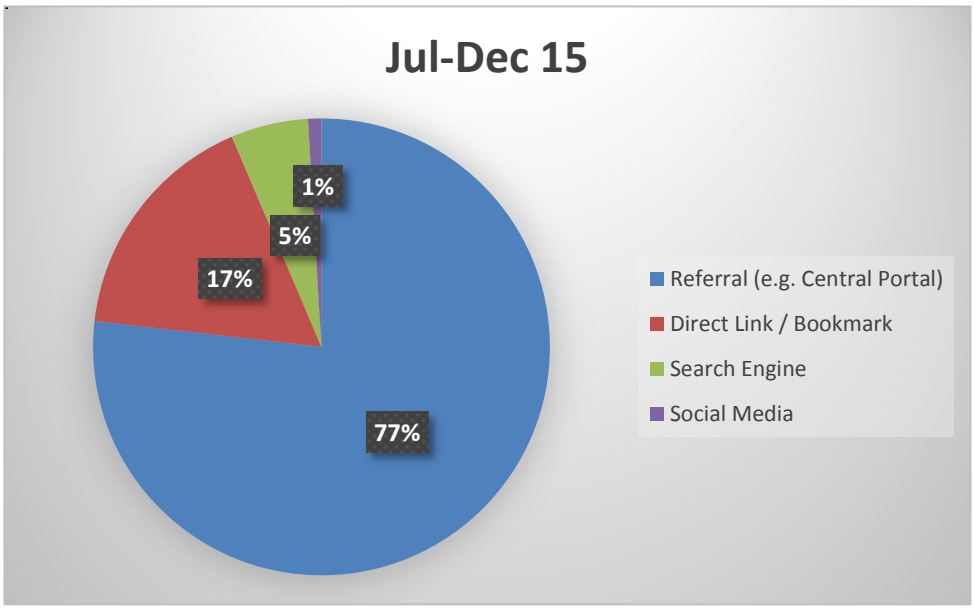
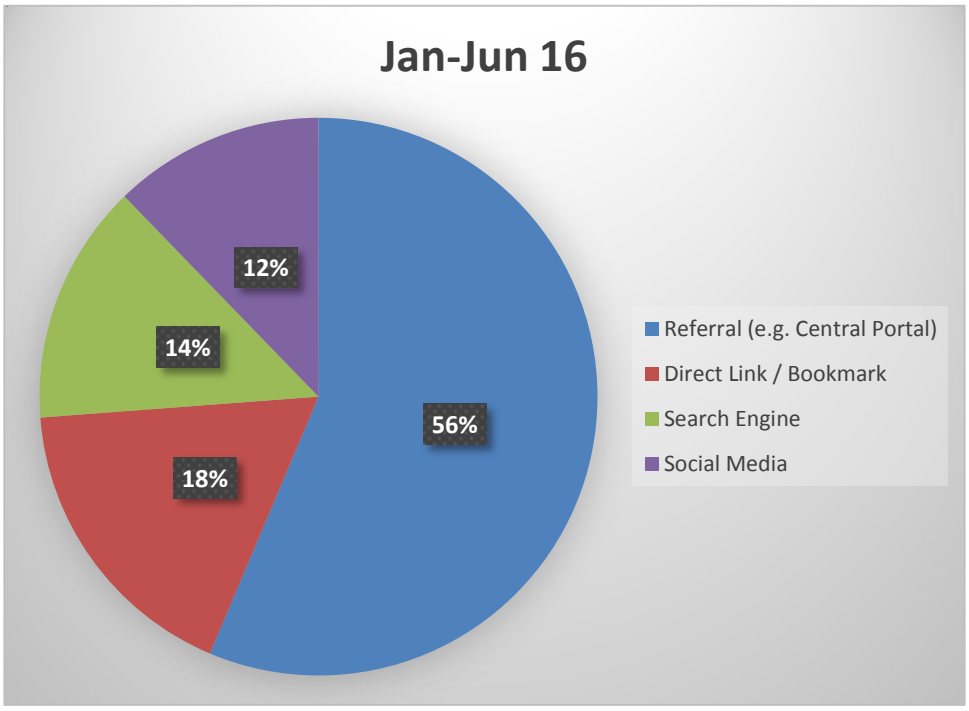


Figure 3 - Traffic Acquisition - January to June 2015 (after SEO implementation and blog launch)



Annex 2: Data analysis

Advisory councils

Geographic representation

Format: vector

Type: polygon

Detailed description

This shape lists the areas covered by the Regional Advisory Councils (RAC) as polygons as exposed in the Atlas of the Seas. Additional information regarding to legal foundation have been added to the original shape.

Data model

Fields	Data Type	Attributes
Name	Text	Long Distance Fleeet; South-western Waters; North-western Waters; Mediterranean; North Sea; Baltic; Pelagic Stocks
legalFound	Date	
legalFou_1	Text	
country	Text	
namespace	Text	
nationalLe	Text	International
NUTScode	Text	BE; DE; DK; EE; ES; EU; FI; FR; GR; HR; IE; IT; LT; LV; MT; NL; PL; PT; SE; SI; UK
URL	Text	

Missing information

None.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Russia	✓	
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia	✓	
	Croatia	✓	
Black Sea	Bulgaria	✓	
	Romania	✓	
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Greece	✓	
Aegean-Levantine Sea	Greece	✓	
Macaronesia	Portugal	✓	
	Spain	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
European Atlas of the Seas	http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas/#lang=EN;bkgd=5:1;mode=1;pos=11.754:54.605:4;theme=48:0.8:1;	

Accuracy of data

Information about foundation and countries represented in each RAC has been added to information contained in the original source (Atlas of the Seas). Furthermore the original shapefile has been re-projected into WGS84.

Difficulties encountered

None

Aggregate Extraction

Geographic representation

Format: vector

Type: point

Detailed description

The geodatabase on aggregate extractions provides spatial information on removal of sand and gravel from the seabed of the EU. The extracted aggregates are mainly used in the construction industry, but they are also used as a source of material for coastal beach nourishment or as filling material. This database is the result of the aggregation and harmonization of datasets provided (as XLS, PDF, SHP and DOC files) by several sources from all across the EU.

The ICES Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (**WGEXT**; http://www.ices.dk/community/groups/Pages/WGEXT.aspx) reviews the quantity, quality, location, and uses of extracted marine sediments in the ICES Member Country, and provides an annual summary of data on marine sediment extraction. Available data (by extraction area) presented in the annual reports have been collected. This information has been completed with data provided by the Royal Belgian Institute of Natural Sciences (**MUMM**-Management Unit of the North Sea Mathematical Models), the Spanish Ministry of Agriculture, Food and Environment (**MAGRAMA**-División para la Protección del Mar), the French **IFREMER**, **The Crown Estate** (United Kingdom) and **HELCOM** (the Baltic Sea).

Unfortunatelly, the Mediteranean Sea is not so well covered, especially the central and eastern areas. The available information from Italy has been collected from the Istituto Superiore per la Protezione e la Ricerca Ambientale (**ISPRA**) reports. In relation to the Black Sea, there is no data available.

Although harmonization of all these original files in a single dataset is carried out by AZTI-Tecnalia, validation and quality assurance remain up to primary data sources. The harmonisation process consisted of identifying a set of attributes common to all the different dataset. To do so, it was necessary to define a homogenous set of variables for each attribute. Therefore, raw data attributes may use a different terminology, although the information contained remains basically the same. Harmonisation has mainly consisted in:

- Identifying duplicates (e.g., same record from different data sources).
- Harmonising terminology, e.g., purpose and end use.
- Converting polygons into points (considering the centroid of the polygon).
- Harmonising the coordinate reference systems into the system of reference WGS84.

Data model

Fields (alias)	Data Type	Attributes
Position information	Text	E.g.: Estimated; original; polygon centroid of dredging area; polygon centroid of dredging polygon
Country	Text	E.g.: Belgium; Denmark; Finland; France; Germany; Ireland; Italy; Poland; Spain; Sweden; The Netherlands; United Kingdom
Sea basin	Text	E.g.: Greater North Sea; Celtic Sea; Bay of Biscay and Iberian Coast; Western Mediterranean; Adriatic Sea; Baltic Sea; Macaronesia
Extraction area	Text	
Area of activity (km^2)	Number (double)	
Year	Number (double) or range of years	
Permitted amount (m^3)	Number (double) or N/A (not available	
Permitted amount (t)	Number (double) or N/A (not available	
Requested amount (m^3)	Number	

Fields (alias)	Data Type	Attributes
	(double) or N/A (not available	
Requested amount (t)	Number (double) or N/A (not available	
Extracted amount (m^3)	Number (double) or N/A (not available	
Extracted amount (t)	Number (double) or N/A (not available	
Extraction type	Text or N/A (not available	Marine sediment extraction
Purpose	Text or N/A (not available	E.g.: Commercial; Others; N/A
End use	Text or N/A (not available	E.g.: Beach nourishment; Construction; Filling material; Port construction; Reclamation fill; N/A

Missing information

Few data from the Central and Eastern Mediterranean Sea and from the Black Sea are currently available through our data sources.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia		
	Latvia		
	Lithuania		

Sea basin	Country	Data coverage	Notes
	Russia		
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway		
	Denmark	✓	
	Germany		
	The Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden		
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal		
Western Mediterranean	Spain	✓	
	France		
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia		
	Croatia		

Sea basin	Country	Data coverage	Notes
Black Sea	Bulgaria		
	Romania		
Ionian Sea and the Central Mediterranean Sea	Italy		
	Greece		
Aegean-Levantine Sea	Greece		
	Cyprus		
Macaronesia	Portugal		
	Spain	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
1. HELCOM (Dredging sites)	http://maps.helcom.fi/website/mapservice/index.html	**Minna Pyhälä** (minna.pyhala@helcom.fi)
2. ICES-Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT)	http://www.ices.dk/community/groups/Pages/WGEXT.aspx	**Maria Lifentseva** (Maria.Lifentseva@ices.dk)
3. (FR) IFREMER	http://wwz.ifremer.fr/institut	**Laure Simplet** (Laure.Simplet@ifremer.fr)
4. (ES) Ministerio de Agricultura, Alimentación y Medio Ambiente (MAGRAMA), División	http://www.magrama.gob.es/es/	**Ainhoa Pérez Puyol** (APPuyol@magrama.es)

Data source by Member State	Link	Contact person and e-mail
para la Protección del Mar		
5. (BE) MUMM-Managenet Unit of the Norht Sea Mathematical Models, The Royal Belgian Institute of Natural Sciences)	http://www.mumm.ac.be/EN/	**Serge Scory (S.Scory@mumm.ac.be)**
6. (IT) ISPRA, Regione Lazio, Direzione ambiente, Centro di Monitoraggio, GIZC	http://www.isprambiente.gov.it/it	**Maria Concetta Giunta** (mariaconcetta.giunta@isprambiente.it)
7. (UK) The Crown Estate	http://www.thecrownestate.co.uk/	**Kevin O'Shea** (kevin.o.shea@rhdhv.com)

Accuracy of data

When the extraction site was not georrefered in the original dataset, coordinates were estimated based on the available information (e.g., the name of the area). Since extraction sites in this EMODnet dataset are represented as points, extraction areas represented as polygons in the original datasets are represented by the polygon centroid in the current dataset.

For further information on validation and quality assurance, it is suggested that primary data sources are contacted. Generally speaking, data are to be considered very reliable, because they come from national sources officially in charge for their collection.

Difficulties encountered

In the Atlantic area and the Baltic Sea, ICES and HELCOM have information available. However, in the Mediterranean and Black Seas, these information is not centralized and therefore, it is not easy to be collected.

Dredge spoils dumping

Geographic representation

Format: vector

Type: polygon and points

Detailed description

Shapefiles of dumping sites show features defined as both polygons and points in the Baltic Sea, North Sea, Celtic Seas, Iberian Coast and Bay of Biscay, Macaronesia, West Mediterranean and Adriatic Sea.

Different sources have been used depending on the country or basin. For the Baltic Sea sites of dredged spoils dumping, a shapefile has been downloaded from the HELCOM's map server. The positions of the dumping points in France were digitized from several geo-referenced maps scanned from the reports of CETMEF (2009, 2010, 2012 and 2013). In the case of Italy the positions were digitized from several geo-referenced maps based on scanned versions of IMO's reports (2010 and 2011) on the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and its 1996 Protocol. So the position of these points needs be reviewed. The coordinates of dumping points in Norway, Sweden, Germany and Spain have been taken form OSPAR dumping reports of 2008, 2009, 2010 and 2011. The coordinates of dumping points in Spain have been updated from 2012 MAGRAMA (Spanish Government) reports to OSPAR. In the case of Portugal a shapefile available from DGRM (Portuguese Government) has used. Data from Bulgaria have been provided as central point and radius by Bulgarian Ministry of environment and waters. As far as the UK is concerned a shapefile was provided by the Department of Environment - Marine Division.

Furthermore, the original geographical references have been re-projected into WGS84.

Data model

Fields	Data Type	Attributes
ID	Number (integer)	
Country	Text	Denmark; Estonia; Finland; France; Germany; Italy; Latvia; Lithuania; Norway; Poland; Portugal; Russia; Spain; Sweden; Bulgaria; United Kingdom
Name	Text	
Updateyear	Number (integer)	
OSCOM Code	Text	
Depth (m)	Text	
Status	Text	Operational; Closed; Closed not4WD; Disused; Not 4 waste dis; Open;
years_oper	Number (integer)	
D_Coast_km	Number (real)	

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden		
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Russia	✓	
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	
	Germany	✓	
	Netherlands		
	Belgium		
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland		
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia		
	Croatia	✓	
Black Sea	Bulgaria	✓	
	Romania		
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Greece	✓	
Aegean-Levantine Sea	Greece		
Macaronesia	Portugal	✓	
	Spain	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
Spanish Minister of Agriculture, Food and Environment (MAGRAMA) - ES	http://www.magrama.gob.es/en/	APPuyol@magrama.es
CETMEF-MEDEE (Centre d'Études Techniques Maritimes Et Fluviales - Département Environnement Littoral et Cours d'Eau) - FR		celine.le-guyader@developpement-durable.gouv.fr
Basin Directorate for Water Management in Black Sea Region – Varna – Black Sea countries		bdvarna@bsbd.org
Department of Environment - Marine Division - UK		cara.lavery@doeni.gov.uk
Direção de Serviços de Ambiente Marinho e Sustentabilidade. Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos - PT		edias@dgrm.mam.gov.pt
Scottish Government spatial information and data - UK		Martyn.Cox@scotland.gsi.gov.uk
Servizio emergenze ambientali in mare (SEAM) - IT		valerio.sammarini@isprambiente.it
Independent Public Relations and Publishing Department Ministry of Defence of the Republic of Croatia - HR		infor@morh.hr
Hellenic Navy Hydrographic Service - EL		geopol_hnhs@navy.mil.gr
Department of Fisheries and Marine Research - CY		gkokosis@dls.moi.gov.cy

Accuracy of data

Accurate to original source.

Difficulties encountered

None

Dredging

Geographic representation

Format: *vector*

Type: *point*

Detailed description

The geodatabase on dredging provides spatial information on dredging sites in the EU, and includes different types of dredging activities, such as capital (or new-work) dredging, maintenance dredging, dredging for coastal protection). This database is the result of the aggregation and harmonization of datasets provided (as MDB, XLS, PDF, SHP and DOC files) by several sources from all across the EU.

Only HELCOM have shapefiles available for dredging activity in the Baltic Sea (http://maps.helcom.fi/website/mapservice/index.html): **'Dredging sites'**, that includes all kinds of dredging (harbor maintenance, harbor capital, sea lanes, sand/gravel/boulder/maerl extraction) from time period 2003-2007, and **'Dredging sites points/areas'**, that includes capital and maintenance dredging activities in 2013 and 2014, represented as points/areas.

On the other hand, the North-East Atlantic area is well covered in the OSPAR database **'Dumping of wastes or other matters at sea'** (http://www.ospar.org/data) has been collected. Records considered are those from 'Table 3a Amounts' of the database which are selected in the 'Dredged material' column and include information on the extraction site ('Origin' column). For these records, the extraction sites locations have been estimated based on the available information (e.g., the port name, origin of the dredging material). This information has been completed with data provided by some Spanish authorities (MAGRAMA-División para la Protección del Mar, Puertos del Estado, Basque Government-Dirección de Infraestructuras del Transporte), by the French Ministère de l'écologie, du développement durable et de l'énergie, and by the Portuguese APA-APFF, Direção de Gestão de Espaços, Ambiente e Infraestruturas.

Unfortunatelly, the Mediteranean Sea is not so well covered, especially the central and eastern areas. There information has been collected, in general, from reports, authorizations, project information and regulations, some of them available at port authorities or regions web pages. In relation to the Black Sea, there is only one record available, obtained from the Dredging News Online web page.

Although harmonization of all these original files in a single dataset is carried out by AZTI-Tecnalia, validation and quality assurance remain up to primary data sources. The harmonisation process consisted of identifying a set of attributes common to all the different dataset. To do so, it was necessary to define a homogenous set of variables for each attribute. Therefore, raw data attributes may use a different terminology, although the information contained remains basically the same. Harmonisation has mainly consisted in:

- Identifying duplicates (e.g., same record from different data sources).
- Harmonising terminology, e.g., extraction type, purpose and end use.
- Converting polygons into points (considering the centroid of the polygon).

- Harmonising the coordinate reference systems into the system of reference WGS84.

Data model

Fields	Data Type	Attributes
POSITION INFO	Text	Estimated; original; polygon centroid of dredging area; polygon centroid of dredging polygon
COUNTRY	Text	BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, ME, MT, NL, PL, PT, RO, SI, FI, SE, UK, NO, IS
SEA BASIN	Text	Greater North Sea; Celtic Sea; Bay of Biscay and Iberian Coast; Western Mediterranean; Adriatic Sea; Black Sea; Ionian Sea and the Central Mediterranean Sea; Aegean-Levantine Sea; Macaronesia
EXTRACTION AREA	Text	
YEAR	Number (double) or range of years	
PERMITED AMOUNT (m^3)	Number (double) or N/A (not available	
PERMITTED AMOUNT (t)	Number (double) or N/A (not available	
EXTRACTED AMOUNT (m^3)	Number (double) or N/A (not available	
EXTRACTED AMOUNT (t)	Number (double) or N/A (not	

Fields	Data Type	Attributes
	available	
EXTRACTION TYPE	Text or N/A (not available	Harbour dredging; estuary dredging; sea dredging; sea lane; N/A
PURPOSE	Text or N/A (not available	Maintenance dredging; capital dredging; commercial; others; N/A
END USE	Text or N/A (not available	Beach nourishment; commercialization; confined deposit; construction material; embankment; filling material; land deposit; reuse; sea disposal; wetland restoration; N/A

Missing information

Few data from the Central and Eastern Mediterranean Sea and from the Black Sea are currently available through our data sources.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Russia		
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	

Sea basin	Country	Data coverage	Notes
	Denmark	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia		
	Croatia		
Black Sea	Bulgaria	✓	
	Romania		
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Malta	✓	
	Greece	✓	

Sea basin	Country	Data coverage	Notes
Aegean-Levantine Sea	Greece	✓	
	Cyprus	✓	
Macaronesia	Portugal	✓	
	Spain	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
1. OSPAR (Dumping of Wastes or Other Matter at Sea)	http://www.ospar.org/content/content.asp?menu=01511400000000_000000_000000	**Sylvie Ashe** (sylvie.ashe@ospar.org)
2. HELCOM (Dredging sites)	http://maps.helcom.fi/website/mapservice/index.html	**Minna Pyhälä** (minna.pyhala@helcom.fi)
3. HELCOM MONAS (Monitoring and Assessment Group)	http://helcom.fi/helcom-at-work/groups/monas	**Minna Pyhälä** (minna.pyhala@helcom.fi)
4. (FR) Centre d'études techniques maritimes et fluviales (CETMEF)	http://www.eau-mer-fleuves.cerema.fr/	**Lea Gerard** (lea.gerard@developpement-durable.gouv.fr)
5. (PT) Administração do Porto de Aveiro, Administração do Porto da Figueira da Foz, Direção de Gestão de Espaços, Ambiente e Infraestruturas	www.portodeaveiro.pt	**Maria Manuel Cruz** (mariamanuel.cruz@portodeaveiro.pt)
6. (ES) Ministerio de Agricultura,	http://www.magrama.gob.es/es/	**Ainhoa Pérez Puyol** (APPuyol@magrama.es)

Data source by Member State	Link	Contact person and e-mail
Alimentación y Medio Ambiente (MAGRAMA), División para la Protección del Mar		
7. (ES) Puertos del Estado	http://www.puertos.es/es-es/Paginas/default.aspx	**José Sierra (**jsierra@PUERTOS.ES**)**
8. (IT) Autorità Portuale di Genova	http://www.apge.macisteweb.com	**N/A (**info@porto.genova.it**)**
9. (IT) Autorità Portuale di Piombino	http://www.ap.piombinoelba.it/en/node/117	**N/A (**info@ap.piombinoelba.it **)**
10. (ES) Basque Government, Dirección de Infraestructuras del Transporte	http://www.garraioak.ejgv.euskadi.eus/r41-429/es/	**Luis Ignacio López de Aguileta (**obras-puertos@ej-gv.es**)**
11. (MT) Malta Environment & Planning Authority	www.mepa.org.mt	**N/A (**customercare@mepa.org.mt**)**
12. SEDNET	http://www.sednet.org/download/SpecialSession1-9-Michael-Aftias.pdf	**Marjan Euser (**marjan.euser@deltares.nl**)**
13. (IT) Dredging, Environmental & Marine Engeneering	http://www.deme-group.com/it/sidra/projects/civitavecchia-dragaggio-roccia	**N/A (**info.deme@deme-group.com**)**
14. (IT) Francesco Baittiner	http://francescobaittiner.it/porto-di-napoli-%E2%80%93-parte-il-dragaggio-dei-fondali-comunicato-stampa/	**N/A (**info@francescobaittiner.it**)**
15. (IT) Regione Siciliana - Assessorato del Territorio e	http://www.artasicilia.eu/old_site/web/news/14176.pdf	**N/A (N/A)**

Data source by Member State	Link	Contact person and e-mail
dell'Ambiente		
16. Bolletino Ufficiale della Regione Campania	http://burc.regione.campania.it/eBurcWeb/directServlet?DOCUMENT_ID=65085&ATTACH_ID=89634	**N/A (N/A)**
17. (IT) Capitaneria di Porto Monfalcone	http://www.porto.monfalcone.gorizia.it/public/allegati/28-4-2014-14-31-56_331138.pdf	**N/A (N/A)**
18. (IT) Capitania di Porto di Roma	http://www.comune.roma.it/PCR/resources/cms/documents/dragaggio_canale_pescatori_2013.pdf	**N/A (N/A)**
19. (IT) CINSEDO - Centro Interregionale Studi e Documentazione	http://www.regioni.it/dalleregioni/2012/02/23/dragaggio-del-porto-di-fano-conferenza-dei-servizi-i-metri-cubi-dragati-in-tutto-saranno-circa-3000-243166/	**N/A (N/A)**
20. (IT) Comune di Ragusa	http://www.comune.ragusa.gov.it/doc/users/31/66662att_detdir_133_15.PDF	**N/A (N/A)**
21. (IT) Dravosa	http://www.dragaggio.com/lavori-italia/approfondimento-cagliari-2006/	**N/A (N/A)**
22. Dredging News Online	http://www.sandandgravel.com/news/article.asp?v1=9704	**N/A (N/A)**
23. (IT) Italia Nostra	http://www.italianostra.org/?p=17453	**N/A (N/A)**
24. (IT) Regione Emilia-Romagna	http://ambiente.regione.emilia-romagna.it/suolo-bacino/sezioni/pubblicazioni/servizio-difesa-del-suolo-della-costa-e-bonifica/pdf/new-tools-coastal-management-lq/at_download/file/New_tools_coastal_	**N/A (N/A)**

Data source by Member State	Link	Contact person and e-mail
	manag_LQ-.pdf	
25. (IT) Regione Lazio	http://www.regione.lazio.it/binary/rl_ambiente/tbl_progetti/053_2014.pdf	**N/A (N/A)**
26. (IT) Transporto Europa	http://www.trasportoeuropa.it/index.php/home/archvio/14-marittimo/12118-il-porto-di-taranto-riavvia-i-dragaggi	**N/A (N/A)**
27. (IT) Provincia di Pescara	http://commissariodragaggio.comnet-ra.it/index.php?start=15	**N/A (N/A)**
28. (FR) Prefecture de la Region Languedoc-Roussioon	http://www.languedoc-roussillon.developpement-durable.gouv.fr/	**N/A (N/A)**
29. (FR) Préfecture des Alpes Maritimes	http://www.alpes-maritimes.gouv.fr/	**N/A (N/A)**
30. (FR) Prefecture du L'Herault	http://www.herault.gouv.fr/	**N/A (N/A)**
31. (FR) Préfecture du Var	http://www.var.gouv.fr/	**N/A (N/A)**
32. (CY) Cyprus Ports Authority	http://www.cpa.gov.cy/CPA/page.php?pageID=1&langID=0	**George Zavos (**Geozavos@cpa.gov.cy**)**

Accuracy of data

When the dredging site was not georeferenced in the original dataset, coordinates were estimated based on the available information (e.g., the port name, origin of the dredging material).

For further information on validation and quality assurance, it is suggested that primary data sources are contacted. Generally speaking, data are to be considered very reliable, because they come from national sources officially in charge for their collection.

Difficulties encountered

In the Atlantic area and the Baltic Sea, OSPAR and HELCOM have dredging information available. However, in the Mediterranean and Black Seas, these information is not centralized and therefore, it is not easy to be collected.

Dumped Munitions

Geographic representation

Format: vector

Type: points, polygons

Detailed description

Munition dumping sites defined as points and polygons in the Baltic Sea, Bay of Biscay and Iberian peninsula and Western Mediterranean.

Information in point format is available only for the OSPAR region. (http://www.ospar.org/html_documents/ospar/html/data/ospar_munitions_dumpsites.zip). Spatial entities for the Baltic sea, Bay of Biscay and Iberian peninsula and Western Mediterranean area have been selected and distance to coast has been calculated in km.

Different sources have been used depending on the country or basin. The coordinates of areas of munitions dumping in the Mediterranean Sea have been taken from the report "Ammunitions Dumping Sites in the Mediterranean Sea" by the MED POL (United Nations Environmental Programme) 22 May 2009. In the case of Spain, coordinates provided by Ministry of Defence have been included in the Atlantic and Mediterranean coast. Munitions dumping sites in France have also been digitized from marine charts available at http://data.shom.fr. Dumping areas in the Baltic Sea have been taken from "Notices to Mariners. 2014" (Maritime Administration of Latvia) and "Report to the 16th Meeting of Helsinki Commission; 1994".

Data model

Fields	Data Type	Attributes
ID	Number (real)	
TYPE_OF_MU	Text	Unknown; Chemical; Conventional; Conventional & Chemical
DIST_COAST	Number (real)	
SOURCE	Text	

Missing information

Position in France have been digitized based on marine charts.

Data coverage

Sea basin	Country	Data coverage		Notes
		Points	*Polygons*	
Baltic Sea	Sweden	✓	✓	
	Finland			
	Estonia			
	Latvia		✓	
	Lithuania			
	Russia			
	Poland			
	Germany			
	Denmark	✓	✓	
Greater North Sea	Norway			
	Denmark			
	Germany			
	Netherlands			
	Belgium	✓		
	France	✓	✓	
	United Kingdom			
	Sweden			
Celtic Sea	United Kingdom			
	Ireland			
Bay of Biscay and Iberian Coast	France	✓	✓	
	Spain	✓		
	Portugal			
Western Mediterranean	Spain	✓	✓	
	France		✓	
	Italy		✓	
Adriatic Sea	Italy			
	Slovenia			
	Croatia			
Black Sea	Bulgaria			
	Romania			
Ionian Sea and the Central Mediterranean Sea	Italy			
	Greece			
	Malta		✓	
Aegean-Levantine Sea	Greece			
Macaronesia	Portugal			
	Spain			

Data sources

Data source by Member State	Link	Contact person and e-mail
OSPAR Commission – BE, DK, ES, FR, PT, SE		sylvie.ashe@ospar.org
HYDROGRAPHIC SERVICE-Maritime Administration of Latvia – LV		navarea@lhd.lv
SHOM - FR		webmaster@shom.fr
Ministry of Defence - ES		gcoll@fn.mde.es
MED POL (United Nations Environmental Programme) - IT		

Accuracy of data

Accurate according to original source.

Difficulties encountered

None

Fish catches

Geographic representation

Format: vector

Type: polygon

Detailed description

The geo-database on fish catches in the EU was created in 2015 by Cogea for the European Marine Observation and Data Network (EMODnet). It is the result of the aggregation of EUROSTAT's fish catches datasets fish_ca_atl 27, fish_ca_atl 34, fish_ca_atl 37. EUROSTAT data have been related to FAO's geo-referenced fishing statistical areas. Fish species have been grouped by EUMOFA's larger aggregations such as Commodity Groups (CG) and Main Commercial Species (MCS). Live weight in tonnes is provided for each fish species caught in EU fishing statistical areas, by year of reference, fish species, CG, and MCS. The dataset is updated yearly, as soon as new data from EUROSTAT is released. It covers a time series from 1950 to 2012.

Data model

Fields	Data Type	Attributes
SPECIES	Text	FAO 3-alpha code of fish species
FISH NAME	Text	Latin name of fish species

FISH_EN	Text	English name of fish species
MCS code	Number	Main Commercial Species code, according to EUMOFA
CG code	Number	Commodity Group code, according to EUMOFA
FISHREG	Number	FAO statistical area
COUNTRY	Text	Name of fishing country

Missing information

None.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Russia	✓	
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	

Sea basin	Country	Data coverage	Notes
	Island	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia	✓	
	Croatia	✓	
Black Sea	Bulgaria	✓	
	Romania	✓	
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Greece	✓	
Aegean-Levantine Sea	Greece	✓	

Sea basin	Country	Data coverage	Notes
Macaronesia	Portugal	✓	
	Spain	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
EU	Food and Agriculture Organisation of the United Nations (FAO)	Emmanuel.Blondel@fao.org
EU	EUROSTAT	

Accuracy of data

Fishery statistics are collected from official national sources either directly by Eurostat for the members of the European Economic Area (EEA) or indirectly through other international organisations for other countries. The data are collected using internationally agreed concepts and definitions developed by the Coordinating Working Party on Fishery Statistics (CWP), comprising Eurostat and several other international organisations with responsibilities in fishery statistics. The flag of the fishing vessel is used as the primary indication of the nationality of the catch, though this concept may vary in certain circumstances.

In general, the data refer to the fishing fleet size on 31 December of the reference year. The data are derived from national registers of fishing vessels which are maintained pursuant to Regulation 26/2004 which contains information on the vessel characteristics — the administrative file of fishing vessels is maintained by the European Commission's Directorate-General for Maritime Affairs and Fisheries.

There has been a transition in measuring the tonnage of the fishing fleet from gross registered tonnage (GRT) to that of gross tonnage (GT). This change, which has taken place at different speeds within the national administrations, gives rise to the possibility of non-comparability of data over time and of non-comparability between countries.

Catches of fishery products include items taken for all purposes (commercial, industrial, recreational and subsistence) by all types and classes of fishing units operating in inshore, offshore and in high-seas fishing areas. The flag of the fishing vessel is used as the primary indication of the nationality of the catch. The catch is normally expressed in live weight and derived by the application of conversion factors to the landed or product weight. As such, catch statistics exclude quantities which are caught and taken from the water (that is, before processing) but which, for a variety of reasons, are not landed.

Difficulties encountered

Processing EUROSTAT's tables to make them suitable for a geo-database is a time consuming process. It would be desirable that EUROSTAT could transmit the data according to the above-mentioned data model.

Fisheries Zones

Geographic representation

Format: Vector

Type: Polygons

Detailed description

This dataset is made up of two separate layers. 'FAO Statistical Areas for Fishery Purposes' and 'ICES Statistical Areas'.

FAO Statistical Areas are arbitrary areas, the boundaries of which were determined in consultation with international fishery agencies on various considerations, including (i) the boundary of natural regions and the natural divisions of oceans and seas; (ii) the boundaries of adjacent statistical fisheries bodies already established in inter-governmental conventions and treaties; (iii) existing national practices; (iv) national boundaries; (v) the longitude and latitude grid system; (vi) the distribution of the aquatic fauna; and (vii) the distribution of the resources and the environmental conditions within an area.

The rationale of the FAO Major Fishing Areas has been that the areas should, as far as possible, coincide with the areas of competence of other fishery commissions when existing. This system facilitates comparison of data, and improves the possibilities of cooperation in statistical matters in general.

ICES Statistical Areas delineate the divisions and subdivisions of FAO Major Fishing area 27. The ICES Statistical Areas are used as bounding areas for calculation of fish statistics, e.g. catch per unit effort (CPUE) and stock estimates.

Data model

FAO areas

Fields	Data Type	Attributes
Area code	Number	FAO code of the statistical area
Level	Text	Division, Major, Sub-division, Sub-area, Sub-unit
Ocean	Text	Name of the Ocean
Subocean	Number	Subdivision of the Ocean

ICES areas

Fields	Data Type	Attributes

Fields	Data Type	Attributes
Area km^2	Number	
ICES areas	Text	Code of ICES area

Missing information

The contract only requests to make available FAO and ICES areas, and in this regard the dataset is complete. However, in view of giving more valuable information, additional data could be associated to FAO and ICES polygons, such as state of fish stocks and catch per unit effort. Information on catches by fishing area has already been provided as a separate dataset.

Data coverage

N.B. coverage by country is not reported for this dataset, because it does not make sense for this type of data.

Sea basin	Data coverage	Notes
Baltic Sea	✓	
Greater North Sea	✓	
Celtic Sea	✓	
Bay of Biscay and Iberian Coast	✓	
Western Mediterranean	✓	
Adriatic Sea	✓	
Black Sea	✓	
Ionian Sea and the Central Mediterranean Sea	✓	
Aegean-Levantine Sea	✓	
Macaronesia	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
FAO (all EU)	Food and Agriculture Organisation of the United Nations (FAO)	Emmanuel.Blondel@fao.org
ICES (all EU)	International Council for the Exploration of the Sea (ICES)	accessions@ices.dk

Accuracy of data

As regards FAO areas, the FAO declares that the designations employed and the presentation of material in this information product are not warranted to be error free and do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. FAO makes every effort to ensure, but does not guarantee, the accuracy, completeness or authenticity of the information in this information product.

For various historical reasons the Areas in the Pacific were not so developed, with the exception of Area 87 corresponding to the CPPS area of competence. Initiatives for closer cooperation between agencies in the interest of better data, not only in the field of tunas, have suggested that some changes are necessary to the present FAO fishing areas/boundaries in the Pacific.

The boundaries of fishing areas could be modified and adjusted according to new requirements, but it is inadvisable to introduce too frequent amendments to the already established areas. Revisions to boundaries should only be introduced after consultation with all the national fishery authorities and fishery agencies concerned with the areas under revision. Unless there are other over-riding reasons, boundaries lines should be drawn along 5° lines of longitude and latitude.

When it comes to ICES, its areas delineate the divisions and subdivisions of FAO Major Fishing area 27, so the same consideration should apply.

Difficulties encountered

None.

Hydrocarbon extraction (boreholes)

Geographic representation

Format: *vector*

Type: *point*

Detailed description

The geo-database on offshore hydrocarbon extraction in the EU was created in 2014 by Cogea for the European Marine Observation and Data Network (EMODnet). It is the result of the aggregation and harmonization of datasets provided by several sources from all across the EU (plus Norway). It is updated every six months, and is available for viewing and download (data on Germany are available only for viewing) on EMODnet - Human Activities web portal (www.emodnet-humanactivities.eu). The database contains points representing offshore hydrocarbon boreholes drilled in the following countries: Croatia, Cyprus, Denmark, France, Germany, Greece, Ireland, Italy, Latvia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Spain, and UK. Each point has the following attributes: status (active, abandoned, suspended, unknown, other), country, code, name, year (spud date), purpose (exploration, exploitation, other, unknown), fluid type (oil, gas, oil and gas, other, unknown), operator, drilling company, coastal distance and water depth. The new features in the current version of the dataset are:- Update of boreholes data to April 2015- The dataset on Germany now contains boreholes, instead of platforms (in the previous version). The source is also different.

Data model

Fields	Data Type	Attributes
STATUS	Number (double)	Active; abandoned; suspended; other, unknown
COUNTRY	Text	BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, ME, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK, NO, IS
CODE	Text or Unknown	
NAME	Text or Unknown	
YEAR	Number (double)	
PURPOSE	Number (double)	Exploitation; exploration/appraisal; other; unknown
HYDROCARBON	Number (double)	Crude oil; natural gas; crude oil and natural gas; other, unknown
OPERATOR	Text or Unknown	
DRILLING_COMPANY	Text or Unknown	

Fields	Data Type	Attributes
COAST_DISTANCE	Number	
WATER_DEPTH	Number (double)	

Missing information

It would be interesting to have information on quantities extracted, but it is unlikely to find any source that makes available this data publicly.

Please note that this dataset has been integrated by two additional datasets: 'hydrocarbon licenses' and 'offshore installations'.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden		
	Finland		
	Estonia		
	Latvia	✓	
	Lithuania		
	Russia		
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium		

Sea basin	Country	Data coverage	Notes
	France	✓	
	United Kingdom	✓	
	Sweden		
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia		
	Croatia	✓	
Black Sea	Bulgaria		
	Romania		
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Greece	✓	
	Malta	✓	
Aegean-Levantine Sea	Greece		
	Cyprus	✓	
Macaronesia	Portugal	✓	
	Spain	✓	

With the notable exception of Greece, Romania and Bulgaria, all Member States where offshore extraction activities take place are duly covered

Data sources

Data source by Member State	Link	Contact person and e-mail
France	Bureau de Recherches Géologiques et Minières	contact-brgm@brgm.fr
Croatia	Croatian Hydrocarbon Agency	barbara.doric@azu.hr
Denmark	Danish Energy Agency	rt@ens.dk
UK	Department of Energy & Climate Change	Phil.Harrison@decc.gsi.gov.uk
Ireland	Department of Communications, Energy and Natural Resources	padadmin@dcenr.ie
Portugal	Directorate General for Energy and Geology	Josemigueal.martins@dgeg.pt
Netherlands	Rijkswaterstaat Noordzee and TNO	rico.tonis@tno.nl
Montenegro	Geological Survey of Montenegro	jovanovic.b@geozavod.co.me
Spain	Geological and Mining Institute of Spain (IGME)	t.medialdea@igme.es
Germany	Landesamt für Bergbau, Energie und Geologie	Hans-Juergen.Brauner@lbeg.niedersachsen.de
Latvia	Latvian environment geology and meteorology centre	klientu.serviss@lvgmc.lv

Data source by Member State	Link	Contact person and e-mail
Malta	Ministry for Transport and Infrastructure - Continental Shelf Department	charles.a.galea@gov.mt
Italy	Ministry of Economic Development (MISE), Directorate-general for mineral and energy resources	nicola.santocchi@mise.gov.it
Cyprus	Ministry of Energy, Commerce, Industry and Tourism	snicolaides@mcit.gov.cy
Greece	Ministry of Environment, Energy and Climate Change	spyridonbellas@gmail.com
Norway	Norwegian Petroleum Directorate	FactWeb@npd.no
Poland	Polish Geological Institute	wpac@pgi.gov.pl

Accuracy of data

Data are collected by responsible authorities in each country. They are supposed to be reliable and accurate, although this cannot be validated by the Human Activities team. When abnormal data have been found, the Human Activities team has contacted the responsible authority.

Difficulties encountered

Collecting and harmonising data has been a very time consuming activity. Several sources still do not cooperate. For some of them it has been possible to collect data online (e.g. France, Denmark), while for some others data are still missing (Greece, Bulgaria, Romania).

International conventions (Barcelona, Bucharest, Helsinki, OSPAR)

Geographic representation

Format: vector

Type: polygon

Detailed description

This dataset visualises the marine areas covered by the Barcelona Convention, the Bucharest Convention, the Helsinki Convention and the OSPAR Convention

Data models

Barcelona Convention and Bucharest Convention

Fields	Data Type	Attributes
ID	Number (integer)	

Helsinki Convention

Fields	Data Type	Attributes
OBJECTID_1	Number (integer)	
OBJECTID	Number (integer)	
CODE	Number (integer)	
SHAPE_Leng	Number (real)	
Shape_Le_1	Number (real)	
Shape_STAr	Number (real)	
Shape_STLe	Number (real)	

OSPAR Convention

Fields	Data Type	Attributes
Id	Number (integer)	
Region	Text	I; II; III; IV; V
Area_LAEA	Number (real)	

Missing information

None

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Russia	✓	
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia	✓	
	Croatia	✓	
Black Sea	Bulgaria	✓	
	Georgia	✓	
	Romania	✓	
	Russian Federation	✓	
	Turkey	✓	
	Ukraine	✓	
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Greece	✓	
Aegean-Levantine Sea	Greece	✓	

Sea basin	Country	Data coverage	Notes
Macaronesia	Portugal	✓	
	Spain	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
Barcelona Convention	http://www.unep.ch/regionalseas/regions/med/t_barcel.htm	
Bucharest Convention	http://www.blacksea-commission.org/	
Baltic Marine Environment Protection Commission	http://www.helcom.fi/	
OSPAR Convention	http://www.ospar.org/content/	

Accuracy of data

The Barcelona Convention marine area shapefile was made by cutting out the "sea area" from a coastline polygon. The edges in the Gibraltar strait and Aegean Sea areas are based on agreed boundaries as defined by the Barcelona Convention.

The Bucharest Convention shapefile was locally created by cutting marine area of Black Sea and Sea of Azov.

Helsinki Convention: *S*hapefile downloaded from http://maps.helcom.fi/ArcGIS/services/DataDelivery/MapServer/WMSServer.

Difficulties encountered

None.

Lighthouses

Geographic representation

Format: Vector

Type: Points

Detailed description

Data have been collected from one single source: the Amateur Radio Lighthouse Society[7] (ARLS).

The dataset includes the name of lighthouse, its code in the ARLSH database, its geographical coordinates and the grid square within which it is located.

Data are harmonized by ARLS.

According to the source, coordinates are approximate for most of the lighthouses and would need to be refined in the future

Data model

Fields	Data Type	Attributes
NAME	Text	e.g. Burgas North Head Of Jetty
ARLS NUMBER	Text	Country code, Number (e.g.: BUL001)
STATUS	Text or unknown	Active / Removed, relocated or destroyed
COUNTRY	Text	BE, BG, DK, DE, EE, IE, EL, ES, FR, IT, CY, LV, LT, ME, MT, NL, PL, PT, RO, SI, FI, SE, UK, NO, IS
GRIDSQUARE	Text or unknown	e.g. KN32rl
COAST_DISTANCE	Number	(in meters)

Missing information

Regarding the heritage value of some ancient lighthouses, it would be interesting to have the following information:

- Date of construction;
- Classification in national or international systems, such as monuments of heritage value

These data are available through other sources (not downloadable) and could be added to the dataset in the future.

Precise coordinates are also available through other sources. Requests for database extractions have been made, but responses are still pending.

Data coverage

[7] http://arlhs.com/

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Russia	✓	
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	

Sea basin	Country	Data coverage	Notes
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia	✓	
	Croatia	✓	
Black Sea	Bulgaria	✓	
	Romania	✓	
	Russia	✓	
	Turkey	✓	
	Ukraine	✓	
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Malta	✓	
	Greece	✓	
Aegean-Levantine Sea	Greece	✓	
	Cyprus	✓	
	Turkey	✓	
Macaronesia	Portugal	✓	
	France	✓	
	Spain	✓	

Data sources

Data source by Member State	*Link*	*Contact person and e-mail*
ARLS	http://wlol.arlhs.com/	***None (downloadable***

database)

Accuracy of data

The position of points is approximate in ARLS database. Coordinates are rounded to a minute of longitude or latitude. Other sources could provide more accurate data (Lighthouses are US, Marine traffic etc.) but they have not responded to our requests at the time of writing.

Difficulties encountered

We encountered difficulties in getting in touch with websites managers and database owners for collecting precise coordinates of lighthouses.

Mariculture (finfish)

Geographic representation

Format: vector

Type: point

Detailed description

The dataset provides information about the location of seawater finfish farms.

There are no available European maps for fish farms but there is an obligation for MS to inventory all authorized sites under the Council Directive 2006/88/EC on animal health requirements for aquaculture animals.

The data to be provided by MS include site names:

- the name and addresses of the aquaculture production business;
- the registration number and particulars of the authorisation delivered;
- the geographical position of the farm;
- the purpose, type (i.e. type of culture system, or facilities such as land-based facilities, sea cages, earth ponds);
- the species of aquaculture animals reared at the farm;
- updated information on the health status.

Despite this obligation, the availability of data varies significantly among MS, from no data available at all to a complete regularly updated dataset (only found in Scotland). Most MS with only a marginal finfish production are not able to provide a list with the geo-location of farms. In the main producer countries, there is usually a public list of authorized farms with geo-location data and sometimes information on the species. However the purpose and type of aquaculture is in most cases not available or largely incomplete.

In addition, there is no standard requirement in terms of the naming of the species nor for the geographical systems of reference used for the coordinates, which is usually not specified with the data.

There has been therefore a significant work of harmonization, in order to:

- Identify seawater farms in order to exclude land-based systems and freshwater farms (some sites located within the coastline remain for instance in estuaries or when the sites were explicitly identified as seawater sites, in that case it is indicated in the field POSITION_COASTLINE in order to interpret correctly the distance to the shore);
- Identify duplicates (same name and coordinates);
- Harmonise the species description;
- Harmonise the coordinate reference systems.

The dataset allows to locate seawater fish farms for the main producer MS in the EU.

Data model

Fields	Data Type	Attributes
COUNTRY	Text	AUSTRIA, BELGIUM, BULGARIA, CROATIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM
COMPANY_NAME	Text or Unknown	
SPECIES	Text or Unknown	"Salmon, Trout, Tunas, Seabass, Seabream, Meagre, Mullet, Other." For harmonisation purposes, we have kept generic names (e.g. Salmon for Atlantic salmon), detailed names or scientific names can be found in the complementary tables for some countries. There may be more than one species by farm or production area, in that case names are separated by comas.
ID	Number	This field links to the complementary tables by country.
DISTANCE_TO_SHORE_M	Number	
POSITION_COASTLINE	Text	"At sea", "Within the coastline"

Missing information

Relatively important datasets are still missing for finfish farming concerning Croatia (ongoing data collection), Italy and France (pending data delivering). Other countries missing data are less important in terms of marine finfish farming production/number of farms.

The species, which is a valuable information is not always available by farm and therefore cannot always be shown on the map. For instance, we know that Finnish farms produce mainly rainbow trout (90% of the production according to the national authority) and that most Greek farms produce both seabass and seabream (95% of the production) but this information is only available in the metadata.

Other valuable information would be:

- The status of the site (active/inactive), which is only available in Scotland;
- The purpose of the farm (e.g. human consumption/research…), which is only very partially available;
- The existence of certification systems (not available at all and not asked in the current sources).

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden		No data but a very few marine farms for rainbow trout
	Finland	✓	No indication on species farmed but mainly rainbow trout
	Estonia		No data, maybe one farm existing (salmon and rainbow trout)
	Latvia		No marine finfish farms
	Lithuania		No marine finfish farms
	Poland		No marine finfish farming
	Germany		No data but very low production of salmonids (less than 10 tonnes)
	Denmark	✓	
Greater North Sea	Norway		

Sea basin	Country	Data coverage	Notes
	Denmark	✓	
	Germany		No data but very low production of salmonids (less than 10 tonnes)
	Netherlands		Only land-based marine finfish farming (sole)
	Belgium		No marine finfish farming
	France		
	United Kingdom	✓	Only land-based marine finfish farming (trout)
	Sweden		No data but a very few marine farms for rainbow trout
Celtic Sea	United Kingdom		No marine finfish farming
	Ireland	✓	
Bay of Biscay and Iberian Coast	France		
	Spain	✓	
	Portugal		No data but a few farms at sea (low production of seabass and seabream)
Western Mediterranean	Spain	✓	
	France		
	Italy		
Adriatic Sea	Italy		
	Slovenia		No data but maybe a very few seabass and

Sea basin	Country	Data coverage	Notes
			seabream farms
	Croatia		No existing data
Black Sea	Bulgaria		Only one marine fish farm but land-based
Ionian Sea and the Central Mediterranean Sea	Italy		
	Malta		No data but a few marine farms existing
	Greece	✓	No indications on species farmed but 95% seabream and seabass
Aegean-Levantine Sea	Greece	✓	No indications on species farmed but 95% seabream and seabass
	Cyprus	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
Greece: Greek Ministry of Agriculture	http://www.minagric.gr/index.php/el/	**Mr.Perdirakis** sperdikaris@minagric.gr
Poland: Veterinary services	www.wetgiw.gov.pl	**Wioleta Świerczewska** wioleta.swierczewska@wetgiw.gov.pl
Ireland: Marine Institute		**Ayesha Power** Ayesha.Power@marine.ie
Croatia: Veterinary Services		**Ivica Sučec** ivica.sucec@mps.hr

Data source by Member State	Link	Contact person and e-mail
Denmark: Ministry of Food, Agriculture and Fisheries		**Sten Mortensen** STM@fvst.dk
Bulgaria: Veterinary Services		**Damyan Iliev** damyan.iliev@bfsa.bg
Portugal: Veterinary Services		**Margarida Vieira** mcvieira@dgav.pt
UK (Scotland): Scotland's Aquaculture	http://aquaculture.scotland.gov.uk	aquaweb.administrator@sepa.org.uk
Spain: Magrama	http://www.magrama.gob.es/es/ganaderia/temas/trazabilidad-animal/infacuicultura16042015_tcm7-374338.xls	**Ms Carmen Gonzales** gonzalezm@magrama.es

Accuracy of data

The main issue with accuracy comes from the lack of update of the lists provided.

Difficulties encountered

Besides harmonization issues described above, the main difficulty has been to identify the relevant services in the national authorities to obtain the list of authorized farms in an electronic format (some lists were only available in pdf or not downloadable at all) and to obtain the information on the geographical system of reference used.

Mariculture (shellfish)

Geographic representation

Format: vector

Type: points

Detailed description

The dataset provides information about the location of shellfish farms.

It relies on the EUROSHELL project (http://www.euroshell-fp7.eu/Mapping-with-Sextant/Catalogue) for France, Ireland, Italy, the Netherlands and the UK (for England and Wales only). Euroshell data come from professional, scientific and governmental sources (Associazione Mediterranea Acquacoltori in Italy, the Sea Fisheries Protection Authority in Ireland, the Comité National de la Conchyliculture and IFREMER in France, Wageningen in the Netherlands).

Data for other countries were not available in the Euroshell database so we used the lists of registered production sites under Council Directive 2006/88/EC on animal health.

Points represented in the map correspond to different definitions depending on the source. They represent farm sites in Denmark, Greece, Ireland, Italy, Spain and the UK while they represent the centre of production areas for France and the Netherlands.

The availability of data varies significantly among MS. Most MS with only a marginal shellfish production are not able to provide a list with the geo-location of farms. Among available datasets, information on species at the farm level is not available for Ireland, Denmark and the Netherlands.

Within the Euroshell project, geographical coordinates had been harmonized into one system of reference (WGS 84) but for data coming from the registered lists under Council Directive 2006/88/EC, geographical systems of reference vary amongst countries and are usually not specified in the datasets.

Harmonisation has mainly consisted in:

- Identifying duplicates (same name and coordinates);
- Harmonising the species description;
- Converting polygons into points;
- Harmonising the coordinate reference systems.

Data model

Fields	Data Type	Attributes
COUNTRY	Text	AUSTRIA, BELGIUM, BULGARIA, CROATIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM
SITE_NAME	Text or Unknown	Company Name (IT,IRL), Farm name (UK-Scotland), Area name (FR, NL) or Registration Code (UK-England and Wales)
ITEM	Text	Specifies what the point represents considering that

Fields	Data Type	Attributes
		the nature of the data varies depending on the country : Production area, Farm (when it comes from professional sources) or Registered site (when the data come from the Public Register of Aquaculture Production Businesses);
SPECIES	Text or Unknown	For harmonization purposes, we have kept generic names (e.g. Oysters rather than Pacific Oysters), detailed names or scientific names can be found in the complementary tables for some countries. There may be more than one species by farm or production area, in that case the two names are separated by comas.
ID	Number	This field links to the complementary tables by country.
POSITION_INFO	Text	characterises the geographic data: Estimated, Polygon centroid, Original, Estimated polygon centroid
DISTANCE_TO_SHORE_M	Number	
POSITION_COASTLINE	Text	"At sea", "Within the coastline" (e.g. in Estuaries)

Missing information

Relatively important datasets are still missing for shellfish farming concerning Italy and Germany (mussel production). Other countries where data is missing or non-existent are less important in terms of marine shellfish farming production/number of farms.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden		No data but only a small mussel production
	Finland		No marine shellfish farms
	Estonia		No marine shellfish farms
	Latvia		No marine shellfish farms

Sea basin	Country	Data coverage	Notes
	Lithuania		No marine shellfish farms
	Poland		No marine shellfish farms
	Germany		No data and significant mussel production
	Denmark	✓	
Greater North Sea	Norway		
	Denmark	✓	
	Germany		No data and significant mussel production
	Netherlands	✓	Production area data
	Belgium		
	France	✓	Production areas data
	United Kingdom	✓	
	Sweden		No data but only a small mussel production
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal		No data but very small production (clams, oysters)
Western Mediterranean	Spain	✓	
	France	✓	
	Italy		Data missing and relatively important mussel production

Sea basin	Country	Data coverage	Notes
Adriatic Sea	Italy		Data missing and relatively important mussel production
	Slovenia		No data but a small mussel production
	Croatia		No existing data
Black Sea	Bulgaria		No existing shellfish farming
Ionian Sea and the Central Mediterranean Sea	Italy		Data missing and relatively important mussel production
	Malta		No existing shellfish farming
	Greece	✓	
Aegean-Levantine Sea	Greece	✓	
	Cyprus		No existing shellfish farming

Data sources

Data source by Member State	*Link*	*Contact person and e-mail*
France, Ireland, Italy, the Netherlands and UK *(England): Euroshell project (led by IFREMER)*	http://www.euroshell-fp7.eu/Mapping-with-Sextant/Catalogue	***Mr Jean Prou*** jean.prou@ifremer.fr
UK (Scotland): Scotland's Aquaculture	http://aquaculture.scotland.gov.uk	aquaweb.administrator@sepa.org.uk
Spain: Magrama	http://www.magrama.gob.es/es/ganaderia/temas/trazabilidad-animal/infacuicultura16042015_tcm7-374338.xls	***Ms Carmen Gonzales*** gonzalezm@magrama.es

Denmark: Ministry of Food, Agriculture and Fisheries		***Sten Mortensen*** STM@fvst.dk
Greece: Greek Ministry of Agriculture	http://www.minagric.gr/index.php/el/	***Mr Perdirakis*** sperdikaris@minagric.gr

Accuracy of data

For France and the Netherlands, points represent the centre of production areas as defined by professional organisations (polygon centroid calculated from the polygons provided by the Euroshell project).

Difficulties encountered

It was not possible to collect data from Italy and Germany. There might be a problem as to the update of the dataset. The data were sourced from the Euroshell project, which is concluded. Contacts have been established with the Association Européenne des Producteurs de Mollusques (lead partner) to keep the data up-to-date.

Maritime boundaries

Geographic representation

Format: vector

Type: line

Detailed description

These conventions list the coordinates of points which are the vertices of segments which, in turn, define the maritime boundaries. This layer therefore features the following elements:

- The textual content of international conventions establishing maritime boundaries in Europe. Maritime boundaries featured in this layer include territorial waters, bi- or multi-lateral boundaries (e.g. in the North Sea) as well as contiguous and exclusive economic zones. Some fishing areas are also defined. The coordinates of points listed in these conventions are vertices of maritime boundaries
- The maritime boundaries themselves, defined as the segments which links the different points listed in the international conventions. This layer covers the coast and surrounding seas of EU-25 as well as the sea around Iceland and Greenland. Restrictions are those cases where no regulatory text exists within the UNCLOS up to now.

Basic and additional information has been incorporated from additional data available in the original source (EEA).

Data model

Fields	Data Type	Attributes
MBLSZOTPID	Number (integer)	
LocalId	Number (integer)	
SiteName	Text	
legalFound	Date	
legalFou_1	Text	
country	Text	
nationalLe	Text	Bilateral; Unilateral; Multilateral
NUTScode	Text	BE; BL; CY; DE; DK; EE; ES; LB
mblsds_MBL	Text	

Missing information

None

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and	France	✓	

Sea basin	Country	Data coverage	Notes
Iberian Coast	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain	✓	
	France	✓	
	Italy	✓	
Adriatic Sea	Italy	✓	
	Slovenia	✓	
	Croatia	✓	
Black Sea	Bulgaria	✓	
	Romania	✓	
Ionian Sea and the Central Mediterranean Sea	Italy	✓	
	Greece	✓	
Aegean-Levantine Sea	Greece	✓	
Macaronesia	Portugal	✓	
	Spain	✓	

Data sources

Data source by Member State	Link	Contact person and e-mail
European Environment Agency (all EU MS)	www.eea.europa.eu	
Department of Communications, Energy and Natural Resources (Ireland) - Petroleum Affairs Division (UK, IE, FR)	http://www.dcenr.gov.ie/natural-resources/en-ie/Oil-Gas-Exploration-Production/Pages/Spatial-%28GIS%29-Data.aspx	Oonagh.OLoughlin@dcenr.gov.ie
Marine Regions (ES)	http://www.marineregions.org/downloads.php	

Accuracy of data

Accurate to the original source.

Difficulties encountered

Ireland, Spain and Italy have warned needs updating.

Ocean Energy Facilities

Geographic representation

Format: *vector*

Type: *point (for projects) and polygons (for test sites)*

Detailed description

The geodatabase on ocean energy facilities provides spatial information of maritime energy production facilities (projects and test sites) in the EU with a focus on wave, tidal, tidal barrage, tidal lagoon, and salinity gradient (osmotic power) production facilities (test sites and projects). This database is the result of the aggregation and harmonization of datasets provided by several sources from all across the EU.

The dataset is based on data obtained by the **SOWFIA Project** (http://sowfia.eu/), that has collected information on the Environmental Impact Assessment activities being carried out at a range of marine renewable energy test and research sites across Europe. Data has been completed with information gathered by **TETHYS** (http://tethys.pnnl.gov/), a knowledge management system that actively gathers, organizes, and disseminates information on the environmental effects of marine and wind energy development, and by the Ocean Energy Systems Energy Technology Initiative (**OES**) interactive web-based GIS mapping application (http://www.ocean-energy-systems.org/oes-projects/task-6-web-gis-database/). The 'Marine energy production facilities' layer, available at the **European Atlas of the Seas** (http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm), has been also considered.

On the other hand, data from the United Kingdom have been updated with information available at the maps and GIS data service of the **The Crown Estate** (,http://www.thecrownestate.co.uk/energy-and-infrastructure/downloads/maps-and-gis-data/), the **RenewableUK** UK Marine Energy Database (UKMED; https://maps.espatial.com/maps/pages/map.jsp?geoMapId=19671&TENANT_ID=115744), the **Marine Scotland Interactive** resource that provides access to spatial data held by Marine Scotland (http://www.gov.scot/Topics/marine/science/MSInteractive/Themes/renewables-register), and the European Marine Energy Centre (**EMEC**; .http://www.emec.org.uk/).

Although harmonization of all these original files in a single dataset is carried out by AZTI-Tecnalia, validation and quality assurance remain up to primary data sources. The harmonisation process consisted of identifying a set of attributes common to all the different dataset. To do so, it was necessary to define a homogenous set of variables for each attribute. Therefore, raw data attributes may use a different terminology, although the information contained remains basically the same. Harmonisation has mainly consisted in:

- Identifying duplicates (e.g., same record from different data sources).
- Harmonising terminology.
- Converting polygons into points (considering the centroid of the polygon).
- Harmonising the coordinate reference systems into the system of reference WGS84.

Data model (for projects)

Fields (alias)	Data Type	Attributes
Position information	Text	E.g.: Estimated; original; polygon centroid
Country	Text	E.g.: Belgium; Denmark; France; Ireland; Italy; Netherlands; Norway; Portugal; Russia; Spain; Sweden; United Kingdom
Sea basin	Text	E.g.: Baltic Sea; Greater North Sea; Celtic Sea; Bay of Biscay and Iberian Coast; Western Mediterranean; Macaronesia; Barents Sea; Norwegian Sea
Distance to coast (metres)	Number (double)	
Location	Text	Specific site, e.g.: Costa Head (Orkney)
Project name	Text	
Start year	Number (double), range of years or N/A (not available)	
End year	Number (double), range of years or N/A (not available)	
Resource	Text or N/A (not available)	E.g.: Tidal; Wave; Wave/Wind
Technology	Text or N/A (not available)	E.g.: Archimedes screw; Attenuator; Horizontal Axis Turbine; etc.
Device	Text or N/A (not available)	Device model
Device scale	Text or N/A (not available)	E.g.: Prototype; 1:10 scale; Full scale; etc.
Project scale	Text or N/A (not available)	E.g.: Pre-commercial; Commercial; Demonstration array; Sea testing; etc.
Project status	Text or N/A (not available)	E.g.: In planning; In development; Under construction; Operation; etc.
Project capacity (kW)	Number (double) or N/A (not available)	Capacity in Kilowatts (kW)
Project promoter	Text	

Fields (alias)	Data Type	Attributes
Promoter web page	Text	
Source type	Text	E.g.: E-mail, web page, personal communication, etc.
Service or data available	Text	E.g.: N/A (not available), pdf report, Excel file, Shapefile, WFS, Map viewer, etc.
Link to source	Text	E.g.: N/A (not available), web page link, shapefile link, pdf report link, WFS link, etc.
Source details	Text	E.g.: N/A (not availlable), Title of the pfd report, Consulted institution and contact person, web page, etc.
Date of last access	Number	Date of the last access to the source
Metadata available	Text	Yes/No
Metadata link	Text or N/A (not available)	
Other links	Text or N/A (not available)	
Notes	Text or N/A (not available)	

Data model (for sites)

Fields (alias)	Data Type	Attributes
Test site	Text	Short name of the test site
Name	Text	Name of the test site
Location	Text	Specific site, e.g.: Costa Head (Orkney)
Country	Text	E.g.: Denmark; France; Ireland; Norway; Portugal; Spain; Sweden; The Netherlands; United Kingdom
Sea basin	Text	E.g.: Bay of Biscay and Iberian Coast; Celtic Sea; Greater North Sea; Norwegian Sea

Fields (alias)	Data Type	Attributes
Distance to coast (metres)	Number (double)	Distance from the polygon centroid to the coast
Resource	Text or N/A (not available)	E.g.: Tidal; Wave; Wave/Wind
Start year	Number (double), range of years or N/A (not available)	
End year	Number (double) or N/A (not available)	
Lease status	Text or N/A (not available)	E.g.: Consented, Lease, Submitted, etc.
Status	Text	E.g.: Planned, Under construction, Operational, Decommissioned, etc.
Capacity (kW)	Number	Capacity in Kilowatts (kW)
Depth (m)	Number (double), range of depths or N/A (not available)	
Area (km2)	Number (double) or N/A (not available)	
Grid connection	Text or N/A (not available)	E.g.: No, Yes, Planned, etc.
Number of berths	Number (double) or N/A (not available)	
Developer	Text	
Developer web page	Text	
Source type	Text	E.g.: E-mail, web page, personal communication, etc.
Service or data available	Text	E.g.: N/A (not available), pdf report, Excel file, Shapefile, WFS, Map viewer, etc.
Link to source	Text	E.g.: N/A (not available), web page link, shapefile link, pdf report link, WFS link, etc.
Source details	Text	E.g.: N/A (not availlable), Title of the pfd report, Consulted institution and contact

Fields (alias)	Data Type	Attributes
		person, web page, etc.
Date of last access	Number	Date of the last access to the source
Metadata available	Text	Yes/No
Metadata link	Text or N/A (not available)	
Other links	Text or N/A (not available)	
Notes	Text or N/A (not available)	
Position information	Text	E.g.: Estimated; original
Position source	Text	

Missing information

Data from the Central and Eastern Mediterranean Sea and from the Black Sea are currently not available through our data sources.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	Only projects data available
	Finland	✓	Only projects data available
	Estonia		
	Latvia		
	Lithuania		
	Russia		
	Poland		
	Germany		
	Denmark	✓	Only projects data available
Greater North Sea	Norway	✓	Only projects data available

Sea basin	Country	Data coverage	Notes
	Denmark	✓	
	Germany		
	The Netherlands	✓	
	Belgium	✓	Only projects data available
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
	France	✓	Only projects data available
Bay of Biscay and Iberian Coast	France	✓	
	Spain	✓	
	Portugal	✓	
Western Mediterranean	Spain		
	France		
	Italy	✓	Only projects data available
Adriatic Sea	Italy	✓	Only projects data available
	Slovenia		
	Croatia		
Black Sea	Bulgaria		
	Romania		
Ionian Sea and the Central Mediterranean	Italy	✓	Only projects data available
	Malta		

Sea basin	Country	Data coverage	Notes
Sea	Greece		
Aegean-Levantine Sea	Greece		
	Cyprus		
Macaronesia	Portugal	✓	Only projects data available
	Spain	✓	
Barents Sea	Russia	✓	Only projects data available
Norwegian Sea	Norway	✓	

Data sources

Most of information has been retrieved from the following sources:

Source	Web page
SOWFIA Project Database	http://sowfia.hidromod.com/
TETHYS Database	http://mhk.pnnl.gov/
IEA-OES GIS Map of Ocean Energy Installations	http://www.ocean-energy-systems.org/ocean_energy_in_the_world/gis_map/
EMEC Orkney	http://www.emec.org.uk/marine-energy/wave-and-tidal-projects/;
The Crown Estate	http://www.thecrownestate.co.uk/energy-and-infrastructure/wave-and-tidal/
The European Atlas of the Seas	http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm

Other Member States were directly asked for Ocean Energy information. In the following table, only answered emails are included.

Data source by Member State	*Link*	*Contact person and e-mail*	*Comments*
OSPAR	http://www.ospar.org	***Sylvie Ashe*** sylvie.ashe@ospar.org	***OSPAR does not collect wave, tide or current data***
Marine Institute (Ireland)	http://www.marine.ie	***Trevor Alcorn*** Trevor.Alcorn@Marine.ie	***License Agreement for Use of Digital Data***
Estonian Renewable Energy Association, Estonia	http://www.taastuvenergeetika.ee	***Rene Tammist*** rene.tammist@taastuvenergeetika.ee	***In Estonia there is very little research carried out on ocean energy. Current technology ocean energy has no perspective. There has been some research done on the potential of wave energy:*** https://www.ioc.ee/wiki/doku.php?id=en:strukt:wavelab
Klaipėda University, Lithuania	http://www.ku.lt/en/marine-science-and-technology-center/	***Marine Science and Technology Centre (MARSTEC)*** nb@corpi.ku.lt	***There are no such activities launched or plan in Lithuanian part of Baltic Sea.***

Accuracy of data

Most of the Ocean Energy projects and test sites were original geo-referenced and were represented as points and polygons, respectively. When the site was not geo-referenced in the original dataset, coordinates were estimated based on the available information (e.g., the name of the area). Geo-referenced data are to be considered very reliable, because they come from sources in charge for their collection.

Difficulties encountered

Different databases/map viewers, that include information on projects and/or test sites, are available for ocean energy. The main problem is that the information available for each project/test site is each of these databases/map viewers is not always the same. In those cases, the more updated information has been considered or the original source has been consulted.

Protected areas

Geographic representation

Format: vector

Type: polygon

Detailed description

The dataset on marine and coastal protected areas in the EU was created in 2014 by Cogea for the European Marine Observation and Data Network. The dataset is entirely based on the European Environmental Agency's (EEA) datasets “Natura 2000” and “CDDA polygons” (i.e. nationally designated areas).

Natura 2000 is an ecological network composed of sites designated under the Birds Directive (Special Protection Areas, SPAs) and the Habitats Directive (Sites of Community Importance, SCIs, and Special Areas of Conservation, SACs).

The Common Database on Designated Areas (CDDA) is more commonly known as Nationally designated areas. The inventory began in 1995 under the CORINE programme of the European Commission. It is now one of the agreed Eionet priority data flows maintained by EEA with support from the European Topic Centre on Biological Diversity. It is a result of an annual data flow through Eionet countries. The EEA publishes the data set and makes it available to the World Database of Protected Areas (WDPA). The CDDA data can also be queried online in the European Nature Information System (EUNIS).EEA's data have been filtered by Cogea to show only maritime areas (i.e. areas entirely at sea), and coastal areas (internal areas that intersect and/or are tangent to the coast).This dataset cover the whole EU (except Croatia) in the case of Natura 2000 data , and Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Great Britain, Greece, Ireland, France, Germany, Iceland, Italy, Kosovo under UNSC Resolution 1244/99, Latvia, Liechtenstein, Lithuania, the former Yugoslav Republic of Macedonia, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden and Switzerland in the case of CDDA polygons.

Data model

Natura 2000

Fields	Data Type	Attributes
Member State	Text	
Release Date	Number	Date when the area was established under Natura 2000

Fields	Data Type	Attributes
Site Code	Number	Natura 2000 code
Site Name	Text	
Site Type	Text	A (area classified as special protection site), B (site classified under the habitats directive), C (the area designated under the habitats directive is the same as the special protection site)

CDDA

Fields	Data Type	Attributes
Area (ha)	Number	
Country	Text	
IUCN Category	Text	
Site Code	Number	
Site Name	Text	
Title - English	Text	
Title - Original Language	Text	
Year	Number	Year when the area was established

Missing information

None.

Data coverage

Sea basin	Country	Data coverage – Natura 2000	Data coverage - Nationally Designated Areas	Notes
Baltic Sea	Sweden	✓	✓	

Sea basin	Country	Data coverage – Natura 2000	Data coverage - Nationally Designated Areas	Notes
	Finland	✓	✓	
	Estonia	✓	✓	
	Latvia	✓	✓	
	Lithuania	✓	✓	
	Poland	✓	✓	
	Germany	✓	✓	
	Denmark	✓	✓	
Greater North Sea	Norway		✓	
	Denmark	✓	✓	
	Germany	✓	✓	
	Netherlands	✓	✓	
	Belgium	✓	✓	
	France	✓	✓	
	United Kingdom	✓	✓	
	Sweden	✓	✓	
Celtic Sea	United Kingdom	✓	✓	
	Ireland	✓	✓	
Bay of Biscay and Iberian Coast	France	✓	✓	
	Spain	✓	✓	
	Portugal	✓	✓	
Western Mediterranean	Spain	✓	✓	
	France	✓	✓	

Sea basin	Country	Data coverage – Natura 2000	Data coverage - Nationally Designated Areas	Notes
	Italy	✓	✓	
Adriatic Sea	Italy	✓	✓	
	Slovenia	✓	✓	
	Croatia		✓	
	Albania		✓	
Black Sea	Bulgaria	✓	✓	
	Romania	✓	✓	
Ionian Sea and the Central Mediterranean Sea	Italy	✓	✓	
	Greece	✓	✓	
Aegean-Levantine Sea	Greece	✓	✓	
Macaronesia	Portugal	✓	✓	
	Spain	✓	✓	

Data sources

Data source by Member State	*Link*	*Contact person and e-mail*
European Environment Agency (all countries)	European Environment Agency (EEA)	eea.enquiries@eea.europa.eu

Accuracy of data

The spatial data (borders of sites) submitted by each Member State are validated by the European Environment Agency (EEA) and linked to the descriptive data. Any problems identified during this process are brought to the attention of the concerned Member States.

Please note that some Member States have submitted sensitive information that has been filtered out of this database. The following Member States have submitted sensitive information: Austria, Finland, France, Germany, Ireland, Italy, Latvia, Luxembourg, Poland, Spain and Sweden. This concerns mainly species associated to specific sites. All reference to these species has been removed from the related sites. If this sensitive

information is necessary to your field of research, please contact the Member States' administrations individually.

EEA does not have permission to distribute some or all sites reported by Estonia, Romania and Turkey.

Difficulties encountered

None.

Submarine cables

Geographic representation

Format: vector

Type: line, point

Detailed description

The dataset on submarine telecom cables is made up of two different layers:

- 'Actual route locations' was created by Cogea in 2014 for the European Marine Observation and Data Network. The underlying data are collated from a variety of sources: SIGCables (managed by Orange), the Federal Maritime and Hydrographic Agency (BSH Contis), and Greg's Cable Map (via Kis-Orca).The database contains lines representing actual cable routes locations.
- 'Schematic routes (lines) and landing stations (points)' was created by Cogea in 2014 for the European Marine Observation and Data Network. The underlying data is property of Telegeography (www.telegeography.com) and is available online at https://github.com/telegeography/www.submarinecable.com/. The database contains lines and points representing cables and related landing points. Cables are represented as stylised paths, as actual cable routes locations are not available. The dataset covers the whole EU.

Data model

Actual route locations

Fields	Data Type	Attributes
Name	Text	Name of the cable

Schematic routes

Fields	Data Type	Attributes

Fields	Data Type	Attributes
Date	Number	Date when the cable was laid
Landing Points	Text	Names of the landing points
Name	Text	Name of the cable
Owners	Text	Owners of the cable
Source	Text	Name of the data source
Total Cable System Length (km)	Number	
URL	Text	

Landing points

Fields	Data Type	Attributes
Name	Text	Name of the landing point

Missing information

Actual cable routes are missing for most Member States. Furthermore the datasets currently cover only telecommunication cables, while it would be interesting to collect data on power cables.

Data coverage

Sea basin	Country	Data coverage – schematic routes	Data coverage – actual route locations	Notes
Baltic Sea	Sweden	✓		
	Finland	✓		
	Estonia	✓		
	Latvia	✓		
	Lithuania	✓		

Sea basin	Country	Data coverage – schematic routes	Data coverage – actual route locations	Notes
	Russia			
	Poland	✓		
	Germany	✓	✓	
	Denmark	✓		
Greater North Sea	Norway	✓	✓	
	Denmark	✓	✓	
	Germany	✓	✓	
	Netherlands	✓	✓	
	Belgium	✓	✓	
	France	✓	✓	
	United Kingdom	✓	✓	
	Sweden	✓		
Celtic Sea	United Kingdom	✓	✓	
	Ireland	✓	✓	
Bay of Biscay and Iberian Coast	France	✓	✓	
	Spain	✓	✓	
	Portugal	✓	✓	
Western Mediterranean	Spain	✓		
	France	✓	✓	
	Italy	✓	✓	
Adriatic Sea	Italy	✓		
	Croatia	✓		

Sea basin	Country	Data coverage – schematic routes	Data coverage – actual route locations	Notes
Black Sea	Bulgaria	✓	✓	
	Romania	✓	✓	
	Turkey	✓	✓	
	Ukraine	✓		
	Russia	✓		
	Georgia	✓		
Ionian Sea and the Central Mediterranean Sea	Italy	✓	✓	
	Greece	✓		
	Malta	✓		
Aegean-Levantine Sea	Turkey	✓	✓	
	Cyprus	✓	✓	
	Greece	✓		
Macaronesia	Portugal	✓		
	Spain	✓		

Data sources

Data source by Member State	Link	Contact person and e-mail
1. Germany	BSH Contis	Bettina.Kaeppeler@bsh.de
2. UK, Ireland, Portugal, Spain, France, Belgium, Netherlands, Germany, Denmark, Norway, Iceland	Greg's Cable Map	greg@mahlknecht.co.za
3. France	SIG Cables, Orange ©	postmaster@sigcables.com

4. EU	TeleGeography	ovandenbussche@telegeography.com

Accuracy of data

Actual cable routes can be considered accurate. Schematic routes, on the other hand, are simply 'stylized paths' and do not represent the actual positions of cables. Landing points too are not geo-referenced.

Difficulties encountered

It seems particularly challenging to obtain reliable geo-referenced information on actual cable route locations. Typically, this information is collected by different departments in each Member States, and is often not publically available, due to a number of reasons.

Knowing the exact positions of cables at sea is crucial for fisheries and shipping, and awareness should be raised to convince data owners to share their data.

Wind farms

Geographic representation

Format: vector

Type: polygons

Detailed description

The dataset includes information on the position and attributes of wind farms across Europe. Information has been collated from different sources, such as the OSPAR Commission, the Atlas of the Seas, the European Wind Energy Association, EnergiData (Denmark), and the Swedish Energy Agency.

When available, wind farms have been represented as polygons, since this gives a better idea of the spatial extent of a farm.

The attributes covered include: number of turbines, status of the farm (e.g. if it's operational or planned), Member State, year of installation, power (in mW) and distance from coast.

Data model

Fields	Data Type	Attributes
Name	Text	
N_Turbines	Text	
Status	Text	authorised; authorised, but court case in process; operational
country	Text	Belgium; Denmark; France; Germany; Ireland; Netherlands; Norway; Sweden; United Kingdom
YEAR	Number	

	(integer)	
WEBSITE_	Text	
DistCst_km	Number (real)	
power_MW	Number (real)	

Missing information

Information is available only as points in most countries, although it would be more accurate to represent wind farms as polygons.

Data coverage

Sea basin	Country	Data coverage	Notes
Baltic Sea	Sweden	✓	
	Finland	✓	
	Estonia	✓	
	Latvia	✓	
	Lithuania	✓	
	Russia	✓	
	Poland	✓	
	Germany	✓	
	Denmark	✓	
Greater North Sea	Norway	✓	
	Denmark	✓	
	Germany	✓	
	Netherlands	✓	
	Belgium	✓	
	France	✓	
	United Kingdom	✓	
	Sweden	✓	
Celtic Sea	United Kingdom	✓	
	Ireland	✓	
Bay of Biscay and Iberian Coast	France		
	Spain		
	Portugal	✓	
Western Mediterranean	Spain		
	France		
	Italy		
Adriatic Sea	Italy		

Sea basin	Country	Data coverage	Notes
	Slovenia		
	Croatia		
Black Sea	Bulgaria		
	Romania		
Ionian Sea and the Central Mediterranean Sea	Italy		
	Greece		
Aegean-Levantine Sea	Greece		
Macaronesia	Portugal		
	Spain	✓	

Data sources

Data source by Member State	*Link*	*Contact person and e-mail*
Atlas of the Seas (DG MARE) – all countries	http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas/	Jean Dusart Jean.dusart@ec.europa.eu
OSPAR Commission – OSPAR region	http://www.ospar.org/data	sylvie.ashe@ospar.org
EnergiData – DK	http://www.energidata.dk/	mrs@ens.dk
EWEA – all countries	http://www.ewea.org/	Andrew.Ho@ewea.org
Swedish Energy Agency - SE	https://www.energimyndigheten.se/en/	marten.thorsen@energimyndigheten.se

Accuracy of data

The data sourced from the Atlas of the Seas have been updated by EWEA. Data from Denmark have been updated by EnergiData. Data from Sweden have been updated by Swedish Energy Agency.

Difficulties encountered

None.