LITERATURE SURVEY
INITIAL ASSESSMENT OF DATA FITNESS FOR USE

Deliverable 1

Lead contractor for this deliverable: Ifremer

Work Package 1 : Literature survey	
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A project funded by:

EUROPEAN COMMISSION, DIRECTORATE-GENERAL FOR MARITIME AFFAIRS AND FISHERIES,

MARITIME POLICY ATLANTIC, OUTERMOST REGIONS AND ARCTIC

European Commission

Work Package number	**1**
Work Package title	**Literature Survey**
Deliverable number	**1**
Title	**Initial assessment of data fitness for *use***
Short description	The tender asks to answer the following questions in the context of the Atlantic basin: • What are the existing overviews of data? • When inadequacy of data is pointed out in the literature, what is it due to (e.g. reluctance of data owners to release data, lack of accuracy)? • Are there any statements made as to fitness for purposes of data (e.g. for fish stock or environmental assessments, for spatial planning, for licensing, for coastal protection, for safe navigation)? This report contains a literature survey and a data inventory, the findings of which will: • allow for a preliminary assessment of data fitness for *use*, the purposes being here, in lieu of challenges, use cases identified in the literature, • provide the challenges with a first overview on what data is available, where it is available, and how is it being made available, • allow for the identification of challenges common data needs.
Keywords	Checkpoint, data fitness for use assessment, methodology, ISO standards for Geographic information, Monitoring systems, overview
Editor / Organisation	J. Populus / Ifremer
Deliverable due date	M10
Comments	“data fitness for purpose” has been replaced by “data fitness for use” in the title of the deliverable according to the concepts of the Data Quality ISO standard for Geographic Information

History				
Version	**Author(s) / organisation**	**Status**	**Date**	**Comments**
1.0	**Eric Moussat / Ifremer**	**Draft**	**07/06/16**	**Template for LS**
2.0	**Eric Moussat/Jacques Populus**	**Final**	**01/7/16**	

Dissemination level		
PU	Public	**x**
CO	Confidential for project partners and EU Commission only	

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Glossary

AORA	Atlantic Ocean research Alliance
BODC	British Oceanographic Data Centre
CFP	Common Fisheries Policy
Characteristic	Distinguishing feature [ISO 9000:2005]
CLS	Collecte Localisation Satellites (FR)
Copernicus	European Program for establishing European capacity for Earth Observation
CSW	Catalogue Service for Web
DAC	Data Assembly Center
DAR	Data Adequacy Report
DCR	Data Collection Regulation
DCF	Data Collection Framework
DG-MARE	Directorate-General for Maritime Affairs and Fisheries
DPS	Data Product Specification (ISO 19131)
EC	European Commission
ECMWF	European Centre for Medium-Range Weather Forecast
EDMERP	European Directory of Marine Environmental Research Projects
EDMO	European Directory of Marine Organizations
EEA	European Environmental Agency
EEC	European Economic Community
EEZs	Exclusive Economic Zones
EIONet	European Environment Information and Observation Network
EMIS	Environmental Marine Information System (EEA)
EMODnet	European Marine Observation and Data Network
EMSA	European Maritime Safety Agency
EOV	Essential Ocean Variables
ESA	European Space Agency
EUMETNET	European National Meteorological Services
EUNIS	European Nature Information System
EUROGOOS	European Global Ocean Observing System
FAO	Food and Agriculture Organization
FOO	Framework for Ocean Observing
GEBCO	General Bathymetric Chart of the Oceans
GES	Good Environmental Status
GEO	Group on Earth Observation
Geoportal	type of web portal used to find and access geographical information
GEOSS	Global Earth Observation System of Systems
GISCO	Geographical Information System of the European Commission
GOOS	Global Ocean Observing System
GRDC	Global Runoff Data Base
HAB	Harmful algal blooms
HELCOM	The Baltic Sea Convention
ICES	International council for the exploration of the sea
ICZM	Integrated Coastal Zone Management
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer (FR)
IHO	International Hydrographic Organization
IMO	International Maritime Organization

IMP	Integrated Marine Policy
INSPIRE	Infrastructure for Spatial Information in the European Community
IOC	Intergovernmental Oceanographic Commission
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ISO IEC	ISO International Electrotechnical Commission
ISO NP	ISO New Proposal
ISO NP TS	ISO NP Technical Specification
IUCN	Internation Union for Nature Conservation
JCOMM	Joint WMO-IOC Commission on Marine Meteorology
JRC	Joint Research Centre
MBES	Multibeam echosounder
MS	Member States
MSFD	Marine Strategy Framework Directive
MSP	Maritime Spatial Planning
NIS	Non-indigenous species
NRT	Near Real Time
OBIS	Ocean biogeographic information system
ODIMS	Ospar data and information system
OSPAR	The Oslo Paris Convention
PAR	Photosynthetically Available Radiation (PAR)
P01	BODC Parameter Usage Vocabulary
P02	SeaDataNet Parameter Discovery Vocabulary
P03	SeaDataNet Agreed Parameter Groups
Requirement	Need or expectation that is stated, generally implied or obligatory [ISO 9000:2005]
RSC	Regional sea convention
SDN	SeaDataNet
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
WISE	Water Information System for Europe
WFD	Water Framework Directive
WMO	World Meteorological Organisation
VMS	Vessel Monitoring System

Executive summary

As stated in the terms of reference of the Atlantic Checkpoint, the Literature Survey had three objectives: (i) to make an inventory of all the characteristics (or phenomena) required by the challenges, along with their data sources, from international to European and national, (ii) to carry out a literature review by identifying references of studies related to the challenges and establish whether these cases shared the same characteristics and the same sources as those identified in the inventory above, (iii) based on this to perform a preliminary assessment of the fitness for use of the identified data sets. For this latter objective, the questions to be answered are whether the data seem to be appropriate to deal with the issue(s) at stakes in the challenges and whether they were easy to collate.

The first two tasks really fed each other. The data inventory helped identify documents for the literature review, while the literature review helped identify data sources for the data inventory. To allow for efficient compilation of data between the partners, standards were used such as the SeaDataNet vocabulary and classification of data types. The data inventory revealed that 78 different characteristics (referred to as P02 in SeaDataNet) were necessary as inputs to the 11 challenges. Over 500 data sources were identified for them, which means in average 5 data sources for a given characteristic, a number shedding light on data dispersion among providers. A number of statistics were computed from these characteristics with a view to identify the most frequently mentioned across challenges. The opportunity was also given to us to compare three basins (Atlantic, MedSea and Black Sea) and retrieve even more commonalities between data needed.

In all 42 case studies from the literature were scrutinized with a view to retrieve (i) the characteristics used by the authors along with their requirements, (ii) whether they had been satisfied with their data sets in terms of both appropriateness and availability. The information from these case studies was very patchy and the description of the requirements and their fulfillment was sometimes not treated by authors as thoroughly as should have been. More specifically authors very seldom quote quantities (e.g. a resolution) is support of their needs, which made difficult to come up with quantitative assessments. However these cases mostly confirmed the list of about 15 key characteristics resulting from the inventory which will later help set the scene for subsequent steps.

1 Introduction

1.1 The sea basin checkpoint concept

The concept of sea-basin checkpoints was introduced within the "Marine Knowledge 2020" Communication and refined in the Roadmap. Although EU initiatives such as the European Marine Observation and Data Network, Copernicus and the Data Collection Framework for Fisheries have managed to deliver seamless layers of marine data across national boundaries, there are still some shortcomings with Europe's marine data architecture.

Up to now observations of the sea have been made for specific purposes. Seabeds are surveyed to ensure safe navigation, fish are sampled to estimate the size of the stock and pollution concentration is measured to meet regulations on bathing water or aquaculture production. In order to save costs and improve marine knowledge, the EU is now moving to a new paradigm where data must be collected once to satisfy multiple uses to support the sustainable Blue Growth at the scale of the EU Sea basins.

This has led the Commission to establish a formal way of assessing these uses by launching the checkpoint concept.

EMODNET checkpoints are monitoring system assessment activities (Fig 1.1) aiming to support the sustainable Blue Growth at the scale of a Sea Basin (Fig 1.2) by:

- clarifying the data collection and warehousing landscape of all compartments of the marine environment and highlighting the existing programs at national, European and international level;
- evaluating their fitness-for-use building indicators that will show the accessibility and usability of observation and modeled data sets and their roles and synergies based upon targeted applications (challenges);
- defining priorities to make existing monitoring systems meeting present and future challenge needs.

Fig 1.3 shows the extents of the six checkpoint sea basins.

Fig. 1.1 Boundaries of the Checkpoint Sea Basins.
Source : EMODnet Central portal (http://www.emodnet.eu/checkpoints)

The checkpoint assessment reported in the so-called Data Adequacy Reports (DAR) are the input of an overall cyclic process (Fig 1.2) to make the existing European Sea basin data collection and assembly programs meeting the user needs considered relevant for the EU maritime strategy identified in Challenges or Use cases.

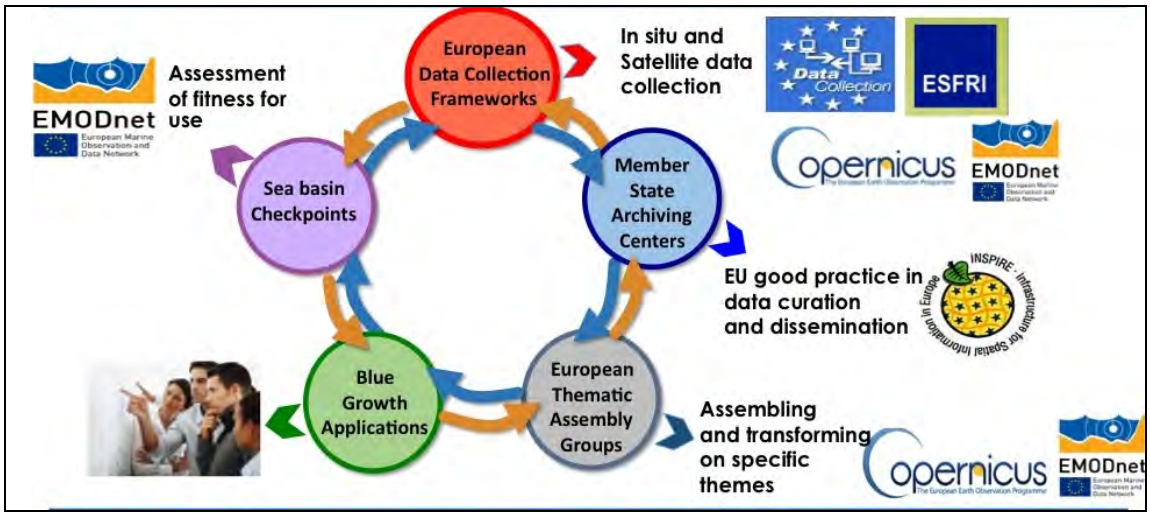


Fig. 1.2: Role of the Checkpoints in the overall monitoring system management process

In this virtual loop, the main audience of the Emodnet Checkpoints are the institutional stakeholders and policy makers as well as the data providers (Table 1.1) but the results will also benefit to end-users and a wider public searching information of general interest.

Table 1.1: Target audience analysis for different Checkpoint activities such as General project information, Data Adequacy Reports and Checkpoint Service components

Checkpoint activity/Audience	Institutional stakeholders/ Policy makers	Upstream data providers	Inter-mediate Users	End Users	General audience
General information					Main driver
Data Adequacy Reports: gap indicators	Main Driver				
Data Adequacy Reports: input data adequacy indicators		Main driver			
Checkpoint Service: GIS catalogue			Main driver		
Checkpoint Service: Targeted products				Main driver	

The challenges involve the assessment of the upstream data against eleven important applications relevant to sustainable blue growth (Fig. 1.3). These challenges are regional study cases which, through concrete demonstrations of use and results, will participate in the assessment of the observing infrastructure at sea basin scale for the Atlantic.

Developing such assessments is expected to represent a very large and not limited amount of information to collect and to provide. Checkpoints would rather adopt a common assessment framework allowing to produce, manage and report results in a comparable, reproducible and synthetic way. Based on the experience of the Medsea Checkpoint (Moussat et al., 2014), the Atlantic checkpoint has adopted the same gap analysis methodology to evaluate input data by making use of :

- the principles of the ISO standards for the Geographic Information (ISO 19131 Data Product Specifications, ISO 19157 Data Quality and ISO 19115 Metadata) in line with the INSPIRE Directive to provide the assessments using metadata to determine and show the gaps and the adequacy of existing data for the Challenges. By adequacy of data, we mean their “usability” in the sense of the ISO 19157 i.e. the “degree of adherence of a data set to a specific set of requirements”;
- the concepts developed by ISO 9004 (Managing for the sustained success of an organization – A quality management approach) and ISO/15504 (Information technology) to derive indicators from these metadata to ensure the effective communication of information considered important for the judgement of the capability of the monitoring systems to deliver data according to challenge needs.

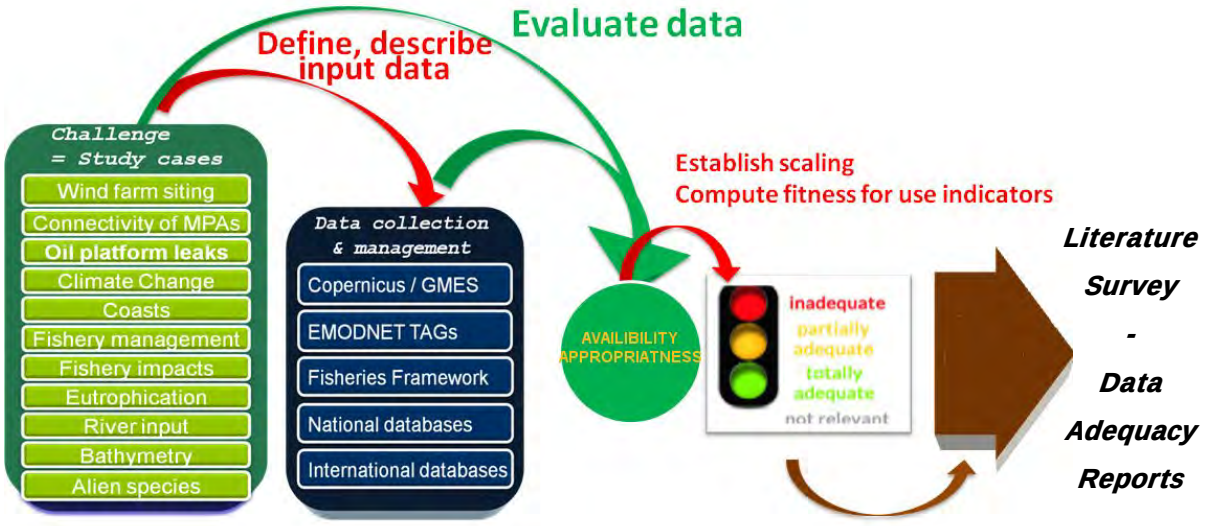


Fig. 1.3: Overview of the assessment process applied to use cases (Literature Survey) and to the Challenges. LS and DARs will provide an overview of the monitoring efforts including the checkpoint dashboard, the experts comments on data adequacy and synergies, priorities for monitoring system optimization

The specific objective of the Literature Survey is to summarize findings of previous studies of the adequacy of data in the sea basin. By “adequacy of data”, the following questions should be answered:

- What existing overviews of data are there?
- Are there references in literature to goals not achieved because of inadequacy of data (e.g. unable to estimate coastal erosion accurately)

- Is inadequacy due to reluctance of data-owners to release data, time taken to obtain data, lack of measurements, lack of accuracy or lack of precision?
- Are there any statements made as to data fitness for purpose, e.g. for fish stock or environmental assessments, spatial planning, licensing, coastal protection, safe navigation.

Here, the data adequacy will not be assessed with respect to the eleven challenges, but to selected cases of use described in the literature, each being a concrete past or present marine user application summarizing the most relevant findings.

1.2 Assessment methodology

Data users confront situations requiring different levels of data quality as the challenge partners do. Extremely accurate data is required by some data users for certain needs and less accurate data are sufficient for other needs. In other words, data adequacy is a relative evaluation which depends on the goal for which data are created or used and on the requirements to achieve it.

Fig. 1.4 adapted from ISO 19157 Data Quality for the Geographic Information describes the principles of the evaluation of the fitness of existing data for use by a challenge. This schema is applicable as well to the use cases selected for the Literature Survey.

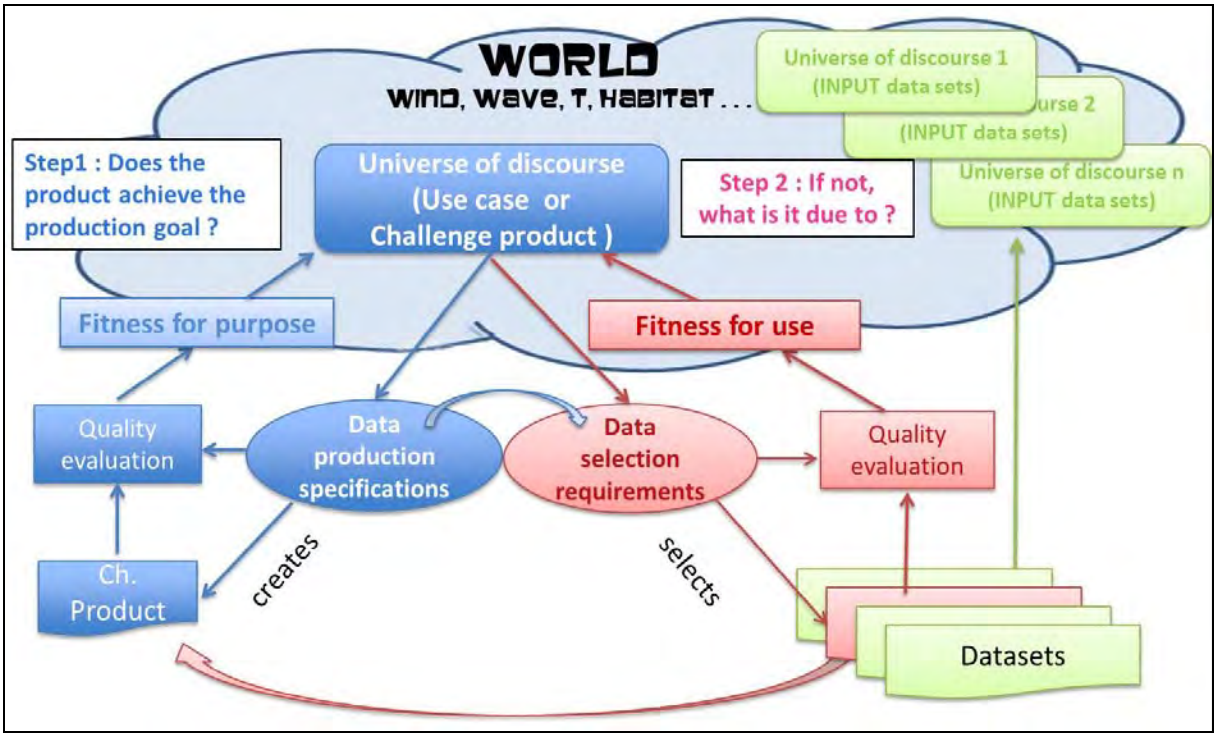


Fig. 1.4: Medsea assessment process adapted from ISO 19157 Data Quality - Geographic Information

The so-called “Universe of discourse” is the ‘view of the real or hypothetical world that includes everything of interest’ (ISO 19101) for the application e.g. phenomena such as wind or waves, their respective attributes: speed, height, etc, their relationships and includes the requirements in terms of quality assessment criteria (see chapter 2 for further details).

The data quality evaluation measures how well the dataset represents the universe of discourse (ISO 19113). In a production process, it is determined by comparison of the quality

of the actual output of the application with the expected quality stated in the requirements of production (product specifications).

In a data selection process, it is determined by comparison of the quality of the selected input data with the expected quality stated in the requirements of the selection. In practice, the requirements of the selection of input data are frequently similar to the specifications of the product making use of them (e.g. the geographical extent).

The “Fitness for purpose” is the result of the evaluation of the created product: it represents the distance separating a product (here the actual output of the application) from the expected one. By fitness for purpose, the following question should be answered: does the product achieve the production goal?

The “Fitness for use” is the result representing the “distance” which separates selected input data from the expected ones by comparison of their quality with the expected quality stated in the requirements of selection. One must note that this comparison is here not made against the quality requirements specified by the creator because the goal for which data have been selected may have little to do with the goal for which the input data were created. By fitness for use, the following question should be answered: If input data are inadequate, what is it due to?

To recap, the gap analysis follows the same steps whatever the application is derived from a use case selected in the Literature Survey and or from a Challenge and requires to:

- identify the parameters needed for the creation of the product
- identify the most relevant quality criteria and requirements for production and input data selection

Universe of discourse (Requirements)

- collate of the quality metadata corresponding to these criteria

As-is analysis

- compare the quality of the output against the requirements of production.

Gap analysis

When the production has not achieved its goal, the assessment includes the identification of the gaps in the input dataset against the specification of selection. In the case of the Literature Survey, this will consist in identifying the relevant criteria sources of limitation of use of existing data and the statements made as fitness for use.

1.3 Atlantic Policy framework

Data policy is to a large extent driven by the European Commission through its Integrated Marine Policy (IMP) whose implementation relies on bodies such as the EEA or initiatives such as EMODnet. It is also within the remit of several regional or international organizations that may have either geographic or thematic scope. This is the case for e.g. the OSPAR Commission or the ICES, the latter having a data centre that holds a great wealth of data for the Baltic, North Sea and wider Atlantic basins. On top of this, other initiatives such as the Atlantic Alliance (AORA) are taking momentum in forging links across the Atlantic with a view to jointly collecting more marine data.

In the following we list the general policy framework that composes the target audience to focus the EMODnet Checkpoint information and service.

1.3.1 Integrated Maritime Policy

At EU level, the policy framework is provided by the Integrated Maritime Policy (IMP) that seeks to provide a more coherent approach to maritime issues, with increased coordination between different policy areas. IMP means a Union policy whose aim is to foster coordinated

and coherent decision-making to maximise the sustainable development, economic growth and social cohesion of Member States, and notably the coastal, insular and outermost regions in the Union, as well as maritime sectors, through coherent maritime-related policies and relevant international cooperation. Specifically the framework covers these cross-cutting policies:

- Blue Growth
- Marine data and knowledge
- Maritime spatial planning
- Integrated maritime surveillance
- Sea basin strategies

The IMP is the reference policy framework for the EMODnet Checkpoints.

1.3.2 The Atlantic Strategy

Approved by the European Commission in 2011, the Atlantic strategy identifies challenges and opportunities in the region and takes stock of existing initiatives that can support growth and job creation. The strategy is being implemented through the Atlantic Action Plan. The Commission calls on stakeholders to help design concrete projects which would be able to benefit from EU funding.

Coasts, territorial and jurisdictional waters of five EU member states (France, Ireland, Portugal, Spain and the United Kingdom, and their overseas territories, i.e. the Azores, the Canary Islands, French Guiana, Guadeloupe, Madeira, Martinique, Saint-Barthélemy and Saint-Martin), as well as international waters fall within the strategy's scope.

The development of the Atlantic Strategy dovetails with the Integrated Maritime Policy for the EU, which aims to coordinate all EU policies with a maritime dimension to ensure environmental sustainability and the quality of living conditions in coastal regions while promoting the growth potential of maritime industries.

In its priority 2 “Protect, secure and develop the potential of the Atlantic marine and coastal environment”, the Strategy calls for exploring and protecting marine waters and coastal zones by:

- Developing a European Atlantic ocean observing and predictive capability, based on existing structures, platforms and mechanisms to support the implementation of EU policies, reduce costs for industry, public authorities and research institutions, stimulate innovation and reduce uncertainty in the behaviour of the Atlantic ocean and the impact of climate change;
- Contributing to the development of tools and strategies to address global climate change issues, including mitigation and adaptation strategies;
- Supporting marine environmental protection and efforts to achieve "good environmental status" of Atlantic waters by 2020.

This is clearly an incentive to the development of transnational initiatives to develop the capacity of observing and monitoring our oceans underpinning the need for enhanced data infrastructures.

1.3.3 The EU Directives

Policy is mostly shaped up by the EU Directives, which set out the rules for data collation and collection along with the implementation of their central repositories, dissemination policies and procedures.

The EU Directives all imply the collation of historical and the collection of new data which can be spatial (with some coverage) or temporal, i.e. more frequent in time albeit in a limited number of locations only. For example the Water framework Directive, although featuring

mostly temporal monitoring data at specific locations, also requests combined spatial and temporal data with the obligation of Member States to report over time the spatial extension of several key habitats. There are today four major directives.

The Birds and Habitats Directive (also known as Natura 2000) requires basic knowledge and status over time of a number of marine species and habitats;

The Water Framework Directive (WFD) requires data on a number of water constituents as well as marine habitats for the inshore area;

The Marine Strategy Framework Directive (MSFD) aims to achieve good environmental status of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. The MSFD constitutes the vital environmental component of the Union's future maritime policy, designed to achieve the full economic potential of oceans and seas in harmony with the marine environment. It extends much further in space but also in types of data than the WFD, with about any possible marine thematic area concerned. The MSFD not only deals with environmental data, but also with pressure data and hence human activities generating these pressures;

The Marine Spatial Planning Directive (MSP) was recently enacted to establish a framework for the sustainable growth of maritime economy, the sustainable development of marine areas and use of marine resources. Within the IMP this provides for the establishment and implementation by Member States of maritime spatial planning, with the aim of contributing to the objectives specified in Article 5, taking into account land-sea interactions and enhanced cross-border cooperation, in accordance with relevant Unclos provisions. MS have the obligation by 2021 to come up with their plans, i.e. the optimal distribution of human activities within their waters to ensure sustainable development and protection. This means they will have to organize information sharing across borders.

The MSFD and EMODnet regularly hold coordination meetings with a view to provide a mechanism for the EMODnet portals and their coordinators to understand the needs of MSFD reporting, as carried out by Member States and Regional Sea Conventions (RSC), and for the MSFD reporters to identify ways in which EMODnet can contribute to the process.

1.3.4 The AORA

The Atlantic Ocean Research Alliance was born with the signature of the Galway Statement on Atlantic Ocean Cooperation on 24 May 2013. Its overarching objectives include:

- Improvement of ocean health and stewardship;
- Promoting sustainable management of resources;
- Improvement of ecosystem assessments and forecasts and promotion of deeper understanding of vulnerabilities and risks, including climate change;
- To generate new tools to increase resilience, conserve rich biodiversity, manage risk and determine social, environmental, and economic priorities;
- To promote our citizens' understanding of the value of the Atlantic by putting forward oceans literacy.

The following priority research areas are the ones likely to have a bearing on the policy in the Atlantic Ocean in terms of data collection, storage and availability ("map it, manage it, and mind it"):

- Knowledge Sharing Platform
- The aim is to establish a long-term Knowledge Sharing Platform in the identified research priorities to allow for long-term usability of the data, information and knowledge thereby ensuring tangible value creation from invested resources.
- Ocean Observation

- Atlantic ocean observations are essential for providing reliable data to develop the blue growth agenda, oil and gas exploration, assessment of marine environmental status, safety and security, protection from natural hazards, understanding marine science, health of marine environment, etc. Observation involves the measurement of many variables such as temperature, pressure, chlorophyll and wind speed, to name a few, that are needed to be able to model and forecast for ocean management.
- Seabed and benthic habitat mapping

We need to better understand the features and biodiversity that make up the ocean seabed. With global population and seafood demand spiralling, we need to map our seabed to define favorable habitats for fishing, key sites for conservation, and safe navigation for shipping.

1.3.5 The Data Collection Framework (DCF)

Commission Regulation (EC) No. 665/2008 of the 14 July 2008 has established the Data Collection Framework (DCF), a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy (CFP). Under this regulation the European Commission requires Member States to collect data on Biological and Economic aspects of many European fisheries and related fisheries sectors. Once published in Scientific, Technical and Economic Committee for Fisheries (STECF) reports, the processed and aggregated data become publicly available for further studies and analyses. The datasets are updated annually once the relevant STECF reports are published. Each published data set is accompanied by the reference to the STECF report in which the data was analysed, a metadata document describing the structure of variables and their definitions and the date when the data set was last published.

Data made available to the experts can be interactively explored through basic filtering and aggregations functionalities and downloaded in standard formats for more advanced statistical analyses and modeling. This includes:

- EU Aquaculture
- Fisheries Dependent Information
- Fleet Economic Performance
- Mediterranean and Black Sea
- Fish Processing Industry

1.3.6 The European Environmental Agency

The EEA data policy is to support, promote and enable the continuing availability of latest data and the maintenance of long-term series of observations. It promotes the wider exploitation, re-use and re-combination of data from different sources in different frameworks and media than those for which they were originally commissioned as well as the full, free and open access to all kinds of data where possible. It ensures the publication of relevant metadata, stewardship and sharing of data from EU funded research projects.

The Marine Geoportal EMIS relies on biological and physical variables generated from both hydrodynamic models and satellite remote sensing. A number of these variables and advanced products are available as raster datasets to the scientific and environmental managerial community through various tools (GIS Viewer, EMIS-R, Marine Analyst, Maps) which enable the user to conduct regional assessments. The available data sets are:

- Chlorophyll_a and anomalies
- Sea surface temperature and anomalies
- Diffuse Attenuation Coefficient Kd490
- Photosynthetically Available Radiation (PAR)
- Absorption Coefficient of Phytoplankton
- Absorption Coefficient of detritus/CDOM

- Particulate backscatter Coefficient
- Surface Productive Layer (Euphotic Depth)

The water data centre provides the European entry point for water related data as part of the Water Information System for Europe (WISE). It contains the input (reporting mechanisms) and output (visualisation of results) for compliance information under several water directives (WFD, Bathing water, UWWT directive, etc) as well as voluntary information as reported e.g. under the EEA regulation through the Eionet. The information compiled and maintained here is used in indicators, assessments and policy developments that are further accessible through the thematic links in WISE.

The Eurosion initiative was based on the fact that a considerable amount of the European Union's coast is currently eroding despite the development of a wide range of measures to protect shorelines from eroding and flooding. The prospect of further sea level rise due to climate change and the heritage of mismanagement in the past imply that coastal erosion will be a growing concern in the future. EUROSION is based on the assumption that coastal erosion is a phenomenon that can never be completely controlled but can be managed in an economically and ecologically sustainable fashion.

As part of its objectives, Eurosion has produced a GIS database at scale 1:100,000 meant to provide baseline information on the different factors influencing coastal erosion processes and the value of assets at risk. The full GIS database is now part of the Geographical Information System of the European Commission (GISCO) and has to be requested directly from Eurostat.

1.3.7 The OSPAR Convention

The Regional Sea Convention (RSC) for the Atlantic is the OSPAR Convention. Created in 1992, OSPAR is the mechanism by which 15 Governments & the EU cooperate to protect the marine environment of the North-East Atlantic. The annex on biodiversity and ecosystems was adopted in 1998 to cover non-polluting human activities that can adversely affect the sea.

For the purpose of the OSPAR Convention, the ecosystem approach is defined as "*the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity*".

The application of the ecosystem approach integrates conservation and management approaches, such as marine protected areas or measures targeted on single species and habitats, as well as other approaches carried out under existing national and international policy and legal frameworks and helps adapt the management of human activities to the complex and dynamic nature of marine ecosystems. The often limited or incomplete scientific knowledge in marine management requires the application of the precautionary principle, which is central to the ecosystem approach.

The OSPAR Data and Information System (ODIMS) is an online tool to improve the discovery, visualisation and accessibility of OSPAR data. It provides users with the necessary details to access the latest data collected as part of the ongoing monitoring work carried out in the OSPAR Maritime Area. The bulk of data about chemistry and pollution, OSPAR's initial "*raison d'être*", which were completed over time with some biological and human activities data.

1.3.8 ICES

ICES is an intergovernmental organization whose main objective is to increase the scientific knowledge of the marine environment and its living resources and to use this knowledge to provide unbiased, non-political advice to competent authorities. ICES delivers scientific publications, information and management advice requested by member countries and international organizations and commissions such as the Oslo Paris Commission (OSPAR), the Helsinki Commission - Baltic Marine Environment Protection Commission (HELCOM), the

North East Atlantic Fisheries Commission (NEAFC), the North Atlantic Salmon Conservation Organization (NASCO), and the European Commission (EC).

The ICES Data Centre accepts a wide variety of marine data and metadata types into its databases. By maximizing the availability of data to the community at large, ICES promotes the use of these data, thereby ensuring that their maximum value can be realized and thus contribute to an increased understanding of the marine environment.

Basically data belong to four main categories :

- Commercial fish catches;
- Trawl Survey (Bottom Trawl, Beam Trawl, Fish species, Commercial Fish Species) ;
- Oceanography (Physical Measurements, Ocean Chemistry, Ocean Climate, Nutrients, Water Column;
- Environmental (Contaminants, Biota, Sediment, Biological Communities, Fish Disease, Plankton, Benthos).

1.3.9 The International Union for Conservation of Nature

Established in 1964, the IUCN Red List of Threatened Species has evolved to become the world's most comprehensive information source on the global conservation status of animal, fungi and plant species. The IUCN Red List is a critical indicator of the health of the world's biodiversity. Far more than a list of species and their status, it is a powerful tool to inform and catalyze action for biodiversity conservation and policy change, critical to protecting the natural resources we need to survive. It provides information about range, population size, habitat and ecology, use and/or trade, threats, and conservation actions that will help inform necessary conservation decisions.

The IUCN Red List is used by government agencies, wildlife departments, conservation-related non-governmental organizations (NGOs), natural resource planners, educational organizations, students, and the business community. To date, many species groups including mammals, amphibians, birds, reef building corals and conifers have been comprehensively assessed. As well as assessing newly recognized species, the IUCN Red List also re-assesses the status of some existing species, sometimes with positive stories to tell.

IUCN are working to reverse, or at least halt, the decline in biodiversity. Increased assessments will help to build the IUCN Red List into a more complete 'Barometer of Life'. To do this we need to increase the number of species assessed to at least 160,000 by 2020. This will improve the global taxonomic coverage and thus provide a stronger base to enable better conservation and policy decisions. The IUCN Red List is crucial not only for helping to identify those species needing targeted recovery efforts, but also for focusing the conservation agenda by identifying the key sites and habitats that need to be saved. At its core, the IUCN Red List helps to set future conservation and funding priorities.

1.4 Structure of this document

This deliverable contains four sections:

- The terminology, methodology and framework for input data collation carried out during the first ten months of the project (Section 2);
- The overall analysis of the input data collated. From this analysis a consolidated excel file containing all the characteristics and their properties was produced. Indicators were computed and their findings discussed. This is the first key output of the literature survey (Section 3);
- An overview of all significant observational capacities and monitoring systems found in the Atlantic Basin, second key output of the study (Section 4);

- A survey of relevant Use Cases as a preliminary output for assessment of challenges. These use cases assess the status of data availability and suitability based on the scrutiny of several case studies from the literature.
- Section 6 summarises the findings from both standpoints (i) challenge (II) characteristics and gives preliminary conclusions on data appropriateness and availability.

Finally a short discussion and conclusion tries to shed light on the marine data status in the Atlantic basin and sets the scene for the subsequent data adequacy report.

2 Terms of reference for the Literature Survey

For the purpose of the project, a common terminology has been adopted to ensure an effective communication of information with the project partners, the stakeholders, the data providers and the end-users of the results. It is basically the same as the one used in the Medsea Checkpoint with the hope that it will offer possibilities of comparison between checkpoints. It consists of two major components:

- A terminology for information collation, data management (data base), data quality evaluation and report based on the ISO series for Geographic Information (ISO19115 Metadata, ISO19131 Data product specifications , ISO19157 Data Quality…) and common practices;
- A set of common vocabularies for thematic data discovery and classification per parameter.

2.1 Description of data

Data

Reinterpretable representation of information in a formalised manner suitable for communication, interpretation or processing (ISO 19115).

Dataset

A dataset is an identifiable collection of data (ISO 19115). It can be a time series, a lithological description of a marine sample, a gridded dataset such as a DTM, an hydrodynamic model output, a GIS dataset or a feature layer of a GIS dataset, a data base or a table of values in a publication. A data set can be constituted of several files (eg the set of seismic data files recorded along the same line).

Collection of datasets

A collection of datasets is a set of datasets.

Dataset series

A dataset series is a collection of datasets sharing the same product specification (ISO19115). This is the concept in use on the Inspire Geoportal.

Feature

Abstraction of real world phenomena (ISO 19101)

Geographic data

Data with implicit or explicit reference to a location relative to the Earth (ISO19109)

Input data set

This is the collection of existing data to be input to the Challenges.

Level of processing

Step of in the data processing flow going from observational data into information.

Metadata

Information about a resource (ISO 19115-1). Examples of resources: dataset, dataset series, service, document, initiative, software, person or organization.

Production mode

Transmission mode of observational data: Real Time (or near real time) or Delayed.

Provider (data)

This is the physical organization which provides data whatever the originator (creator), a custodian or a simple distributor. In the project, the data provider is the organization from which partners get their input data sets (by ordering or downloading). In the literature survey, this is the organization which have provided the input dataset to the application described in the use cases.

Other terms

In order to build a metadatabase for the literature survey and later the EMODnet Checkpoint Service, a template has been designed and provided with guidelines to each challenge partner to collate upstream metadata. This procedure has been adopted first by the MedSea Checkpoint and is also being adopted by the Atlantic Checkpoint so that a comprehensive and interoperable framework can be established for these two areas. The template elements are described in Annex 1.

2.2 Assessment criteria

In the assessment process, the quality evaluation is carried out according to a series of selected criteria. A list has been defined by the Medsea Checkpoint in the past three years. The criteria are focused on two basic questions:

- What is made available to the challenge?
- How it is made available?

The selection of criteria is based on the most relevant requirements. The criteria identified in the Medsea Literature Survey and consolidated by the Medsea challenge when they created their products have been mapped with the quality classes defined in the ISO 19157 Data Quality standard for Geographic Information which concerns 99% of the data needed by the challenges.

“What” is evaluated using nine quantitative criteria of appropriateness selected among the 4 ISO quality classes below (on a total of 5):

Completeness criteria

- Omission, i.e. the degree of absence of data in a dataset;
- spatial extent of the dataset effectively covered by the dataset both horizontally and vertically;
- time extent ie the time interval represented by the dataset.

Consistency (logical) criteria

- conceptual consistency : this criterion will be used to determine the number of required parameters for which input data were not found.

Accuracy (thematic) criteria including

- the quantitative attribute accuracy (i.e. the closeness of measurements to values accepted as or known to being true);
- the classification correctness of the smallest object or event that can be resolved:
  - spatial resolution: both horizontally and vertically.
  - time resolution.

Temporal quality criteria

- the temporal validity of data ie the max elapsed time from last update

Note that none of the criteria defined in the positional accuracy class of ISO 19157 have been selected by MedSea because these criteria where not determinant for its challenges however

it does not mean that they are not applicable to the challenges and use cases of the Atlantic Checkpoint.

In addition non quantitative quality elements are used in the quality assessment process:

- usage : the application (s) for which a dataset has been used by the data producer or by others;
- lineage : the description of the sources and history of a data set.

"How" is evaluated using the following eight criteria considered relevant for the checkpoints by the literature survey of Medsea:

Visibility

- Ability to identify and to get quickly on the appropriate site delivering the desired datasets
- Level at which the data are indexed e.g. EU catalogue
- Visibility of data policy

Accessibility

- Services : manual ordering, discovery, downloading, advanced services
- Data policy : restricted, undermoratorium, unrestricted
- Pricing
- Readyness for use (format including convention)

Performance

- Responsiveness

2.3 Data discovery and thematic classification

For the purposes of the project and to avoid confusion with other uses of the terms listed below, the following definitions apply in this literature survey and in the follow-up project activities. These definitions are based on the methodology adopted by the project partners for classifying the existing upstream data of the challenges:

- for discovery purposes and statistics
- to assess their fitness for use and to report on the adequacy of marine data marine parameter by parameter according to the DAR specifications.

Characteristic

In this document, a Characteristic is an attribute of a distinguishing feature which refers :

- either to a variable derived from the observation, the measurement or the numerical model output of a phenomenon or of an object in the environment,
- or to the geographical representation of an object on a map by a set of vectors (polygon, curve, point) eg "coastline" or a raster (a spatial data model that defines space as an array of equally sized cells such as a grid or an image).

Note: a Parameter is a measurable characteristic

Environmental matrices

This concept was introduced by Medsea to avoid ambiguities when using a characteristic such as e.g. temperature that can be monitored in air or water at the same time. The environmental matrices create a partition of the environment in separate areas where characteristics are measured or computed, as follows:

- Air
- Ice
- Fresh water

- Marine water
- Biota/Biology
- Riverbed/Seabed
- Human activities

Parameter vocabulary lists

The concept of checkpoint requires to group characteristics in accurate,consistent and controlled semantic categories for a better overview of what is needed or available and to reveal the common potential synergies among users of the same data sets.

For the purpose of the project, the SeaDataNet classification lists (P01 to P03) initially designed for marine data have been adopted because:

- the vocabularies are governed by a Governance Group ensuring the vocabulary is consistent with the needs and the practices of the marine community through time. This vocabularies can be enriched on request to the Governance Group;
- they are designed for discovery services;
- the SDN classification offers three different levels of granularity (from the finer to the coarser): characteristics (BODC Parameter Usage Vocabulary list P01), categories of characteristics (Parameter Discovery P02 list) and groups of categories (Parameter Groups P03 list) allowing to navigate from the more general level of information to the most detailed one;
- the vocabularies and definitions are available on-line at:

http://www.seadatanet.org/Standards-Software/Common-Vocabularies.

It must be noted that the classification available at:
http://www.eionet.europa.eu/gemet/inspire_themes
will be mapped with the SDN classification to be compliant with the Inspire directive when cataloguing the data sets and collections needed by the challenge.

The GEMET thesaurus[1] is also introduced (SeaDataNet P022 Vocabulary list). The GEneral Multilingual Environmental Thesaurus has been developed as an indexing, retrieval and control tool for the European Topic Centre on Catalogue of Data Sources (ETC/CDS) and the European Environment Agency (EEA). GEMET is formed by a first point entry with a list of environmental themes.

[1] The GEMET thesaurus, GEneral Multilingual Environmental, has been developed as an indexing, retrieval and control tool for the European Topic Centre on Catalogue of Data Sources (ETC/CDS) and the European Environment Agency (EEA). GEMET is formed by a first point entry with a list of environmental themes. This is followed by further categorization and finally a concept definition with links to broader than/narrower than and related terms and also a list of multilingual alternative names.

3 Identification and classification of characteristics and input data sets

3.2 Introduction

The wide range of characteristics related to the ocean (the SeaDataNet P02 Discovery parameter list contained more than 400 entries :

http://seadatanet.maris2.nl/v_bodc_vocab_v2/welcome.asp) combined with the multiple uses of these characteristics for environmental monitoring, spatial planning, security and sustainable blue growth makes the number of references and the identification of gaps to consider not manageable.

Based on the experience of the MedSea checkpoint, we have identified first the characteristics required by the different challenges to develop their ideal applications and products and the potential data sources in order to select a series of representative case studies making use of some of their essential characteristics for the literature survey.

3.2.1 Characteristics

The Literature Survey has identified 78 different characteristic categories (P02) across all challenges (Fig3.1).

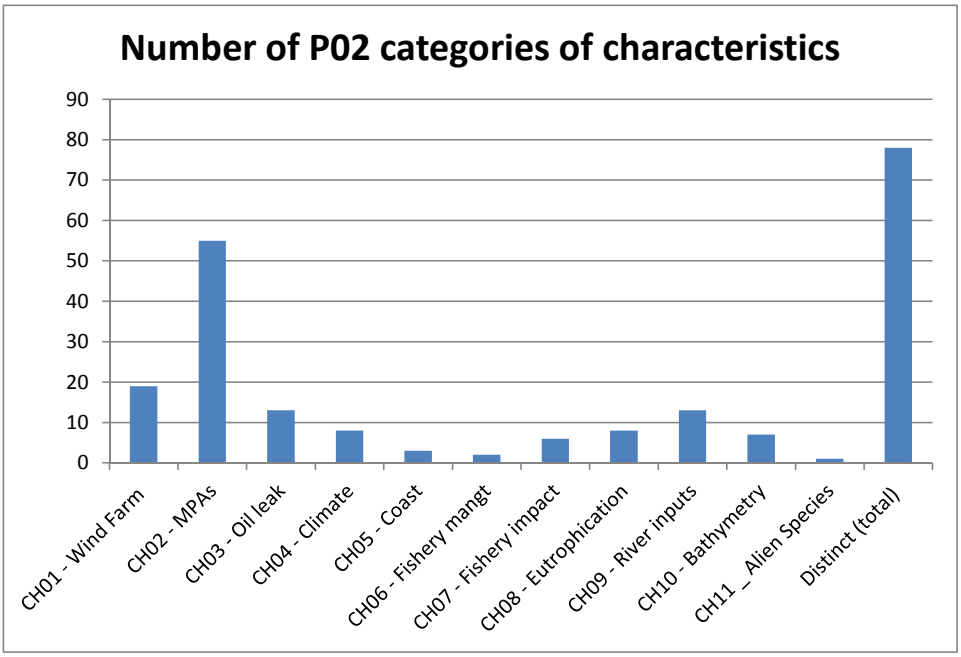


Fig.3.1: Number of categories of characteristics needed by the challenges (using the SDN P02 Discovery parameter list)

The distribution of the characteristics per matrix is specific to each challenge (Fig.3.2).

Several factors influence this distribution:

- The definition of the challenges by the tender :
  - challenges 4 to 11 are focused by definition of the tender on a limited number of characteristics. Challenges with few characteristics are mainly related to data assembly, such as Challenge 5 (Coasts), which is only related to sea level and

sediment mass balance, Challenge 6 (Fisheries management) which only looks at biomass estimates of catches, and Challenge 11 (Alien Species) the stated goal of which is to assemble data for alien species information;

- Conversely challenges 1 to 3 (Windfarm, MPA and Oil leak) are spatial planning (Windfarm, MPA) and impact monitoring (Oil Leak) applications which have to develop complex value-added products potentially involving all matrices.

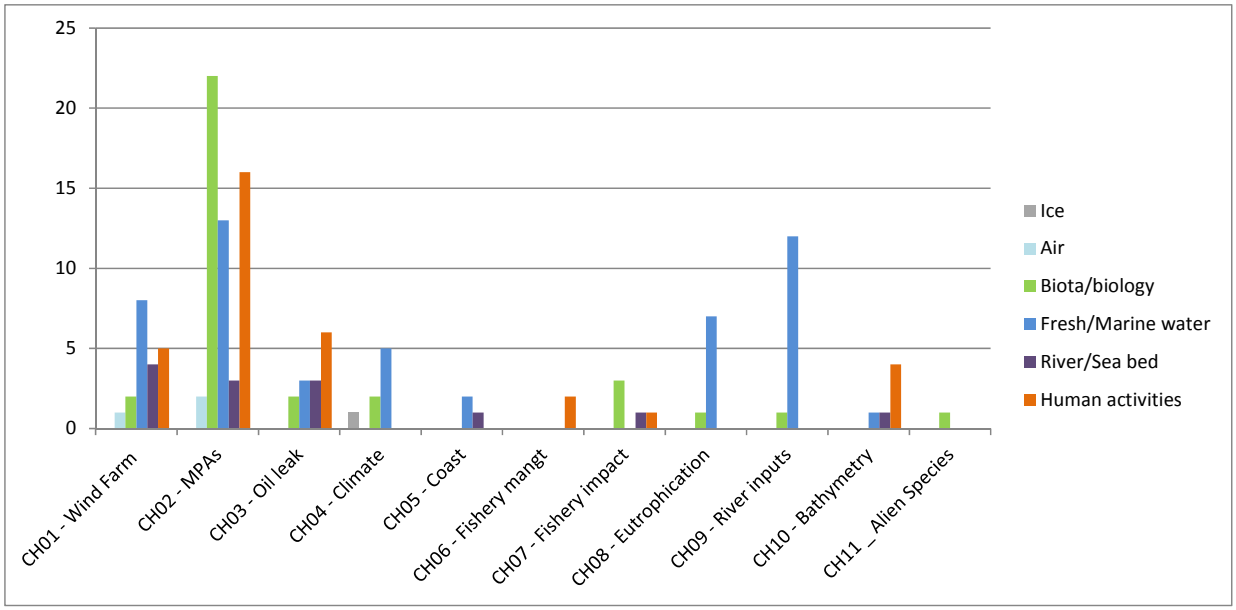


Fig. 3.2: Distribution of the characteristic categories by matrix and challenge

- The geographical area: Wind farm, MPA and Oil leaks concern coastal areas where human and biological activities have the highest density.
- The matrixes themselves: Biota/biology and Human activities are complex worlds the description of which requires numerous characteristics and categories of characteristics.

The numbers of categories characteristic (P02) and groups of categories (P03) are along the same proportion.

3.3 List of essential characteristics for each challenge

The essential characteristics represented by the P02 categories have been listed by matrix and P03 group together with the characteristics for each challenge in the following sections.

The names of the groups and categories of characteristics correspond to the “preferred labels” used by SeaDataNet in the Common vocabulary P03 and P02 lists available at http://seadatanet.maris2.nl/v_bodc_vocab_v2/welcome.asp. Clicking on the list number and searching the “preferred label” gives access to the full definition of the selected group or category[2].

Characteristics names listed by challenge partners do not have always a corresponding entry in the P01 Parameter Usage Vocabulary list in spite of the 35756 entries in usage in the existing datasets. Missing characteristics - in italic - are due to:

- the extensive definition of “characteristic” which includes spatial objects;

[2] Recent categories of characteristic created by BODC on request of the Checkpoint (e.g. Invasive Species) have still to be updated on the SDN web site.

- the under-representation of some scientific disciplines in SeaDataNet;
- some fuzzy definitions which however do not impact the attribution of the P02 category.

For a few categories of characteristics such as “Administrative units” or “Administration and Dimensions”, we will refer also to the characteristic names for a better understanding of the challenge requirements.

3.3.1 Characteristics for Challenge 1: Windfarm siting

Challenge 1 partners have identified 47 input datasets which correspond with 19 categories of characteristics (P02) and 5 environmental matrices as follows:

CH01 - Wind Farm			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Air	Meteorology	Wind strength and direction	Wind speed (gust) in the atmosphere
			Wind speed in the atmosphere
			Wind speed (10m) in the atmosphere by model prediction
Biota / Biology	Birds, mammals and reptiles	Bird counts	*Seabird distribution and abundance data*
		Bird reproduction	*SeaBirds reproduction area (Nesting Counts)*
	Habitat	Habitat extent	*Distribution and extent of threatened and/or declining habitats (OSPAR)*
			Essential Fish habitat extent
			Spatial distribution of Biological Zones
Human activities	Construction and structures	Hazards to navigation	*Submarine telecommunication cables*
	Fisheries	Administrative units	*FAO fisheries marine areas*
	Human activities	Industrial activity	*Oil and Gas Offshore installations*
			Wind Farms offshore installations (localisation)
		Transport activity	*Vessel Traffic Density*
	Administration and dimensions	Administrative units	*EEZ limits (200 nm)*
			ICES ecoregions
			Marine Protected Areas Network (MPA) - Spatial extent
			Territorial sea limits (12 nm)
Marine water	Other physical oceanographic measurements	Combined action of waves and currents	*Kinetic Energy due to waves and currents*
	Water column temperature and salinity	Temperature of the water column	Temperature of the water body
		Skin temperature of the water column	Skin temperature of the water body by advanced very high resolution radiometer (AVHRR)
			Surface max/min water temperature
	Currents	Vertical velocity of the water column (currents)	*Current speed averaged over the water column*
		Horizontal velocity of the water column (currents)	Current direction in the water body
		Horizontal velocity of the water column (currents)	Current speed (Eulerian) in the water body
	Waves	Wave direction	*Mean waves direction*
			Mean waves direction by model prediction
			RMS of bottom amplitude displacement
			RMS of bottom amplitude displacement by model prediction
			RMS of bottom velocity amplitudes
			RMS of bottom velocity amplitudes by model prediction
		Wave height estimates	Significant height of waves {Hs} on the water body
			Significant height of primary swell by model prediction
		Wave height and period statistics	Average height of waves (highest one third) on the water body
			Wave peak period by model prediction
Riverbed/ SeaBed	Rock and sediment sedimentology	Depositional environment	Description of depositional environment type of sediment by classification to a term from CGI Event Environment
	Rock and sediment lithology and mineralogy	Lithology	*Lithology (Spatial distribution& type of Seabed substrate)*
	Terrestrial	Terrestrial mapping	*Coastline*
		Bathymetry and Elevation	Sea-floor depth (below mean sea level) {bathymetric depth}
			Sea-floor height (above Lowest Astronomical Tide datum) {bathymetric height}

3.3.2 Characteristics for Challenge 2: Protected marine areas

Challenge 2 partners have identified 133 input datasets which correspond with 59 categories of characteristics (P02) and 6 environmental matrices as follows:

CH02 - Marine Protected Areas			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Air	Meteorology	Air temperature	*Evolution of atmospheric temperature*
		Wind strength and direction	Wind speed in the atmosphere
Biota/ Biology	Birds, mammals and reptiles	Bird counts	*Seabirds: Abundance (Threatened and/or Declining species)*
		Bird taxonomy-related	*Birds: species abundance & distribution*
		Cetacean behaviour	*Cetacean: trajectories (Threatened and/or Declining)*
		Cetacean abundance	*Cetacean: Abundance (Threatened and/or Declining Species)*
		Seal abundance	*Seal: Abundance (Threatened and/or Declining Species)*
		Bird reproduction	*Seabirds: Reproduction Areas (Threatened and/or Declining)*
		Cetacean reproduction	*Cetacean: Reproduction Areas(Threatened and/or Declining*
		Seal reproduction	*Seal: Reproduction Areas (Threatened and/or Declining Species)*
		Reptile abundance	*Reptile: Abundance (Threatened and/or Declining species)*
		Reptile reproduction	*Reptile: Reproduction Areas (Threatened and/or Declining Species)*
		Bird behaviour	*Seabirds: igratory Patterns (Threatened and/or Declining species)*
		Seal behaviour	*Seal: Migratory Patterns (Threatened and/or Declining Species)*
	Fish	Fish taxonomy-related	*Fish taxonomy-related abundance per unit area of the bed*
		Fish reproduction	*Reproduction Areas of Threatened and/or Declining Fish Species*
		Fish behaviour	*Migratory Patterns of Threatened and/or Declining Fish Species*
	Phytoplankton and microphytobenthos	Phytoplankton generic abundance in water bodies	Abundance of phytoplankton per unit volume of the water body by optical microscopy
		Primary production in the water column	*Evolution of intensity and period of primary production in the water column*
	Pigments	Chlorophyll pigment concentrations in water bodies	Concentration of chlorophyll {Chl CAS 1406-65-1} per unit volume of the water body
	Habitat	Habitat characterisation	*List & Distribution of Seabed Habitat (EUNIS)*
		Habitat extent	*List & Distribution of Threatened and/or Declining Species (OSPAR, EUNIS)*
			Phenology evolution and distribution of Threatened and/or Declining Species
			Signigicant Marine Ecosystems and Classification
	Biota abundance, biomass and diversity	INVD/Invasive species monitoring parameters	*Abundance and taxon*
			Distribution of species over time
			List of species taxon
			Vectors of invasive species
Fresh water	Carbon, nitrogen and phosphorus	Nitrate concentration parameters in the water column	Concentration of nitrate {NO3- CAS 14797-55-8} per unit mass of the water body [unknown phase]
		Nitrite concentration parameters in the water column	Concentration of nitrite {NO2- CAS 14797-65-0} per unit mass of the water body [unknown phase]
		Phosphate concentration parameters in the water column	Concentration of phosphate {PO43- CAS 14265-44-2} per unit mass of the water body [unknown phase]
	Currents	River flow and discharge	*Evolution of the flow exchange between the river and the sea*

Human activities	Anthropogenic	Pollution events	*Pollution events*
		Industrial discharges	Volume (estimated) of pollution discharge
	Construction and structures	Hazards to navigation	*Pipe lines and cables*
		Industrial activity	*Infrastrusture Types (Tourism, Industrial…)*
		Man-made structures	*Lighthouses*
		Transport activity	*Ports (localisation & capacity)*
	Fisheries	Administrative units	*Fisheries Marine Areas (Retsricted and open)*
		Fish and shellfish catch statistics	*Fish and Shellfish Catch Statistics*
		Fishing by-catch	*Fishing by-catch*
		Fishery characterisation	*Finfish farming*
			Fishing and Shellfishing Types (Scientific, Cultural, Industrial, Leisure) and Areas
			Shellfish farming
	Human activities	Administrative units	*Anchorages areas*
			EUR27 List of Species and Habitats
			Heritage Marine Sites
			IHO Sea Areas
			IUCN List of Threatened and/or Declining Species
			Locations & classes of marine protected areas
			Locations of Natura 2000 sites
			Management information for Marine Protected Area
			Management information for Natura 2000 sites
			Maritime Boundaries
			Military Activities : Restricted Areas
			OSPAR boundaries
			Regulations Areas for marine vessel traffic
		Industrial activity	*Active Boreholes*
			Aggregate Extraction
			Dredging areas
			Licence of Hydrocarbon Extraction
			Offshore installations (Oil and Gas)
			Offshore installations (Wind Farms) - Existing & planned
			Submarine Ocean Energy Facilities
		Litter abundance and type	*Dredge Spoil Dumping sites*
			Dumped Munitions locations
		Marine archaeology	*Marine Archaeology & wrecks Site*
		Marine environment leisure usage	*Leisure Ativity (Diving, Snorkeling…)*
			Status of Bathing Waters
		Transport activity	*Marine traffic density and trajectory : All Traffic overview*
			Marine traffic density and trajectory: Per Vessel Size

Marine water	Carbonate system	Alkalinity, acidity and pH of the water column	*Evolution of ocean acidity*
	Dissolved gases	Dissolved oxygen parameters in the water column	*Dissolved oxygen Evolution in the water column*
	Other physical oceanographic measurements	Ocean Heat Content	*Ocean Heat Content*
	Water column temperature and salinity	Salinity of the water column	Salinity of the water body
		Temperature of the water column	Temperature of the water body
	Currents	Horizontal velocity of the water column (currents)	Current direction in the water body
			Variation over time of current speed value
	Sea level	Sea level	Surface elevation daily mean (unspecified datum) of the water body
	Waves	Wave direction	Direction of waves on the water body
		Wave height and period	*Evolution of Wave height and period*
Riverbed/ SeaBed	Habitat	Habitat extent	*Distribution and evolution over time of habitats that function as potential carbon sinks (salt marshes, mangroves, seagrass, and*
	Macroalgae and seagrass	Benthic primary production	*Evolution of intensity and period of benthic primary production*
		Habitat extent	*Evolution of distribution of macroalgae and seagrass habitat (habitats that function as potential carbon sinks)*
	Suspended particulate material	Concentration of suspended particulate material in the water column	Concentration of suspended particulate material {SPM} per unit volume of the water body
	Terrestrial	Terrestrial mapping	*Coastline*
		Coastal geomorphology	*Modification over time of coastline shape*
		Bathymetry and Elevation	Sea-floor depth (below mean sea level) {bathymetric depth}
			Sea-floor depth (below mean sea level) {bathymetric depth} in the water body by derivation from GEBCO_14 30 arc-second global grid
			Geomorphological types of features on the sea floor
			Place names of features on the sea floor

3.3.3 Characteristics for Challenge 3: Oil leak

Challenge 3 partners have identified 49 input datasets which correspond with 49 categories of characteristics and 5 environmental matrices as follows:

CH03 - Oil plateform leak			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Air	Meteorology	Wind strength and direction	Wind velocity (10m along y-axis) in the atmosphere by model prediction
Biota/ Biology	Habitat	Habitat characterisation	*Large Marine Ecosystems (LME)*
			EUNIS Seabed Habitats
		Habitat extent	*Environmental Sensitivity Index*
			Marine Protected Areas Network (MPA)
			Protected Areas
			Threatened and/or Declining Habitats
Human activities	Fisheries	Fish and shellfish catch statistics	*Fish catch geospatial statistics*
		Fishery characterisation	*Benthic fisheries footprint*
			Mariculture sites
	Human activities	Industrial Activity	*Oil and Gas Offshore installations*
			Wind Farms offshore installations (localisation)
		Marine environment leisure usage	*State of bathing waters*
			Urban density
		Transport activity	*Ports localisation*
	Administration and dimensions	Administrative Units	*Protected Areas*
			Marine Protected Areas Network (MPA)
			EEZ (200 nm)
Marine water	Water column temperature and salinity	Salinity of the water column	Salinity of the water body
		Temperature of the water column	Temperature of the water body
	Currents	Horizontal velocity of the water column (currents)	Integrated eastward current velocity (Eulerian) in the water body
			Eastward current velocity in the water body
Riverbed/ SeaBed	Rock and sediment lithology and mineralogy	Lithology	*Lithology (Spatial distribution& type of Seabed substrate)*
	Terrestrial	Terrestrial mapping	*Coastline*
		Bathymetry and Elevation	Sea-floor depth (below mean sea level) {bathymetric depth}
			Sea-floor depth (below mean sea level) {bathymetric depth} in the water body by derivation from GEBCO_14 30 arc-second global grid

Note here than wave parameters are not used because the OSCAR oil spill model does not assimilate them.

3.3.4 Characteristics for Challenge 4: Climate

Challenge 4 partners have identified 18 input datasets which correspond with 8 categories of characteristics and 3 environmental matrices as follows:

CH04 - Climate			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Biota/ Biology	Phytoplankton and microphytobenthos	Phytoplankton taxonomic abundance in water bodies	*Phytoplankton taxonomic abundance per unit volume of the water body*
		Phytoplankton generic abundance in water bodies	Abundance of phytoplankton per unit volume of the water body by optical microscopy
Ice	Cryosphere	Snow and ice mass, thickness and extent	Coverage (by area) of ice on the water body by Advanced Microwave Scanning Radiometer for EOS (AMSRE-E)
			Coverage (by area) of ice on the water body by model prediction
			Coverage (by area) of ice on the water body by image analysis
Marine water	Other physical oceanographic measurements	Density of the water colum	Sigma-theta of the water body by computation from salinity and potential temperature using UNESCO algorithm
		Ocean Heat Content	*Ocean Heat Content*
	Water column temperature and salinity	Salinity of the water column	Salinity of the water body
		Temperature of the water column	Temperature of the water body
	Currents	Horizontal velocity of the water column (currents)	Northward current velocity in the water body

3.3.5 Characteristics for Challenge 5: Coasts

Challenge 5 partners have identified 18 input datasets which correspond with 3 categories of characteristics and 2 environmental matrices as follows:

CH05 - Coasts			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Marine water	Sea level	Sea level	*Surface elevation of the water body - Near real time sea level*
			Surface elevation (unspecified datum) of the water body
			Sea level anomalies
			Sea level anomalies
			Reconstructed sea level
			Sea level trends
			Surface elevation daily mean (unspecified datum) of the water body
Riverbed/ SeaBed	Sedimentation and erosion processes	Sedimentation flux quantification in the water column	Sedimentation volume flux of suspended particulate material {SPM} per unit time per unit area of the water body by sediment trapping and physical measurement
	Terrestrial	Bathymetry and Elevation	Sea-floor height (above NAP datum) {bathymetric height} in the water body by multi-beam echo sounder

3.3.6 Characteristics for Challenge 6: Fishery management

Challenge 6 partners have identified 43 input datasets which correspond with 2 categories of characteristics and 1 environmental matrix as follows:

CH06 - Fisheries Management			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Human activities	Fisheries	Fish and shellfish catch statist	*Fish and shellfish catch statistics*
		Fishing by-catch	*Weight and number of fish and by-catch by species and year discarded*

3.3.7 Characteristics for Challenge 7: Fishery impact

Challenge 7 partners have identified 22 input datasets which correspond with 7 categories of characteristics for 3 environmental matrices as follows:

CH07 - Fisheries Impact			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Biota/ Biology	Habitat	Habitat extent	*Distribution and extent of threatened and/or declining habitats*
			Distribution of EUNIS habitats
	Biota abundance, biomass and diversity	Shellfish abundance and biomass in water bodies	*Shellfish abundance*
Human activities	Fisheries	Fishing effort	*Fishing intensity (Fishing intensity (number of times a unit area of seabed has been trawled)*
Riverbed/ SeaBed	Rock and sediment lithology and mineralogy	Lithology	*Lithology (Distribution of rock and soft sediments)*
Riverbed/ SeaBed	Terrestrial	Bathymetry and Elevation	Sea-floor depth (below mean sea level) {bathymetric depth}

3.3.8 Characteristics for Challenge 8: Eutrophication

Challenge 8 partners have identified 48 input datasets which correspond with 9 categories of characteristics and 3 environmental matrices as follows:

CH08 - Eutrophication			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Biota/ Biology	Pigments	Chlorophyll pigment concentrations in water bodies	Concentration of chlorophyll-a epimer per unit volume of the water body [particulate >unknown phase]
Fresh water	Carbon, nitrogen and phosphorus	Particulate total and organic nitrogen concentrations in the water column	Concentration of nitrogen (total) per unit volume of the water body [particulate >unknown phase]
		Nitrate concentration parameters in the water column	Concentration of nitrate {NO3- CAS 14797-55-8} per unit mass of the water body [unknown phase]
		Phosphate concentration parameters in the water column	Concentration of phosphate {PO43- CAS 14265-44-2} per unit mass of the water body [unknown phase]
		Dissolved total or organic phosphorus concentration in the water column	Concentration of total phosphorus {P CAS 7723-14-0} per unit volume of the water body [dissolved plus reactive particulate <unknown phase]
Marine water	Carbon, nitrogen and phosphorus	Nitrate concentration parameters in the water column	Concentration of nitrate {NO3- CAS 14797-55-8} per unit mass of the water body [unknown phase]
		Nitrite concentration parameters in the water column	Concentration of nitrite {NO2- CAS 14797-65-0} per unit mass of the water body [unknown phase]
		Phosphate concentration parameters in the water column	Concentration of phosphate {PO43- CAS 14265-44-2} per unit mass of the water body [unknown phase]
	Dissolved gases	Dissolved oxygen parameters in the water column	Concentration of oxygen {O2 CAS 7782-44-7} per unit volume of the water body [dissolved plus reactive particulate phase] by in-situ sensor
			Concentration of oxygen {O2 CAS 7782-44-7} per unit volume of the water body [dissolved plus reactive particulate phase]
	Water column temperature and salinity	Salinity of the water column	Salinity of the water body
			Salinity of the water body by CTD
		Temperature of the water column	Temperature of the water body

3.3.9 Characteristics for Challenge 9: River inputs

Challenge 9 partners have identified 96 input datasets which correspond with 13 categories of characteristics and 2 environmental matrices as follows:

CH09 - River inputs			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Biota/ Biology	Fish	Fish abundance in water bodies	*Eels inputs to sea*
			Salmon inputs to sea
Fresh water	Carbon, nitrogen and phosphorus	Ammonium and ammonia concentration parameters in water bodies	Concentration of ammonia {NH3 CAS 7664-41-7} per unit volume of the water body [dissolved plus reactive
			Concentration of ammonium {NH4+ CAS 14798-03-9} per unit mass of the water body [unknown phase]
			Kjeldahl nitrogen [mg/l N]
			Total oxidised nitrogen [mg/l N]
		Particulate total and organic nitrogen concentrations in the water column	Concentration of nitrogen (total) per unit volume of the water body [particulate >unknown phase]
		Nitrate concentration parameters in the water column	Concentration of nitrate {NO3- CAS 14797-55-8} per unit mass of the water body [unknown phase]
		Nitrite concentration parameters in the water column	Concentration of nitrite {NO2- CAS 14797-65-0} per unit mass of the water body [unknown phase]
		Phosphate concentration parameters in the water column	Concentration of total phosphorus {P CAS 7723-14-0} per unit volume of the water body [dissolved plus reactive particulate <0.2um phase] by filtration, oxidation and colorimetric autoanalysis
			Concentration of phosphate {PO43- CAS 14265-44-2} per unit mass of the water body [unknown phase]
		Phosphorus concentrations in suspended particulate material	Concentration of total phosphorus {P CAS 7723-14-0} per unit volume of the water body [dissolved plus reactive particulate <0.2um phase] by filtration, oxidation and colorimetric autoanalysis
		Dissolved inorganic nitrogen concentration in the water column	Concentration of nitrogen (inorganic) {DIN} per unit volume of the water body [dissolved plus reactive particulate<="" td="">
		TDNT/Dissolved total and organic nitrogen concentrations in the water column	Concentration of nitrogen (organic) per unit volume of the water body [dissolved plus reactive particulate<="" td="">
	Water column temperature and salinity	Salinity of the water column	Salinity of the water body
		Temperature of the water column	Temperature of the water body
	Fluxes	River flow and discharge	Riverine discharge of water
Riverbed/ SeaBed	Suspended particulate material	Concentration of suspended particulate material in the water column	Concentration of suspended particulate material {SPM} per unit volume of the water body
			Turbidity of the water body
			Annual sediment yield [t/km2/y] ie the mass of sediment annually leaving a catchment per unit of catchment

3.3.10 Characteristics for Challenge 10: Bathymetry

Challenge 10 partners have identified 26 input datasets which correspond with 8 categories of characteristics and 3 environmental matrices as follows:

CH10 - Bathymetry			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Human activities	Human activities	Administrative Units	*Dredged areas*
		Transport activity	*Port location & capacity*
			Shipping routes
	Administration and dimensions	Reference numbers	*Type of instrument used for bathymetry readings*
		Date and time	*Age of bathymetry measurement*
Marine water	Sea level	Sea level	Surface elevation annual mean (unspecified datum) of the water body
			Surface elevation (unspecified datum) of the water body
			Sea Level anomalies
			Sea level trends
Riverbed/ SeaBed	Rock and sediment lithology and mineralogy	Lithology	*Lithology (Spatial distribution& type of Seabed substrate)*
	Terrestrial	Bathymetry and Elevation	Sea-floor depth (below mean sea level) {bathymetric depth}
			Confidence in the bathymetric measurements (ENC quality flags)
			Depth uncertainty
			Standard deviation of measurements (for repeat surveys)

3.3.11 Characteristics for Challenge 11: Alien species

Challenge 11 partners have identified 51 input datasets which correspond with 1 category of characteristics for 1 environmental matrix as follows:

CH11 - Alien Species			
Environm. matrix	**Group of category of characteristic (P03)**	**Category of characteristic (P02)**	**Characteristic name (P01 in roman text)**
Biota/ Biology	Biota abundance, biomass and diversity	Invasive species monitoring parameters	*Alien species and taxon*
			Vectors of invasive species
			Year of introduction of invasive species (including citation)

3.4 Synthesis

3.4.1 Synthesis per group of categories of characteristics (P03)

The combination of the environmental matrices and the SeaDataNet common vocabulary allows the analysis of the Challenge needs in an easy and comprehensive way. Table 3.1 lists the group of characteristic categories (P03) of the environmental matrices concerned by the Challenges.

28 P03 groups have been identified by the challenges. Some recurrent needs appear: the number of times a P03 has been requested by more 3 challenges is represented in bold in table 3.1. P03 groups related to the Air and to Ice matrices have not been requested by other challenges than Wind Farm and Climate.

Table 3.1: P03 groups of characteristic categories (P02). Groups concerned by more than one third of the challenges are in bold characters.

Envir. matrix	Group of category of characteristic (P03)
Air	Meteorology
Biota /Biology	**Biota abundance, biomass and diversity**
	Birds, mammals and reptiles
	Fish
	Phytoplankton and microphytobenthos
	Macroalgae and seagrass
	Pigments
	Habitat
Ice	Cryosphere
Human activities	Anthropogenic contamination
	Construction and structures
	Fisheries
	Human activities
	Administration and dimension
Fresh / Marine water	**Carbon, nitrogen and phosphorus**
	Carbonate system
	Dissolved gases
	Currents
	Fluxes
	Sea level
	Suspended particulate material
	Water column temperature and salinity
	Waves
	Other physical oceanographic measurements
Riverbed / SeaBed	**Rock and sediment lithology and mineral.**
	Rock and sediment sedimentology
	Terrestrial

Unsurprisingly, the efforts to satisfy the challenges concern usual groups of oceanographic parameters related to the physical properties and the composition of the matrices which belong or contribute to the production of some of the “Essential Ocean Variables” defined by GOOS (see Fig 3.4 from http://goosocean.org/index.php?option=com_content&view=article&id=14&Itemid=114).

Perhaps less obvious is the need of data related to circulation and fluxes within and between matrices here explicitly mentioned for marine and fresh waters or at a lower level (P02) in the other matrices.The emphasis on “Fisheries” is quite expectable as they constitute the one human activity most sensitive in terms of exploitation of marine resources and in terms of management of space. The need for bathymetry and coastline (Terrestrial group), as well as lithological information on seabed substrate are recurrent needs which should be emphasized as they are characteristic categories which tend to be neglected.

Thanks to the classification, it is possible to make a comparison with the results of MedSea literature survey. The distribution is consistent with Medsea results except for an obvious difference: the “Ice” matrix!

The other differences are of lesser importance:

- “Reference and positioning” has not been mentioned however this group concerns a series of characteristics related to vessel identification, positioning and speed that are data supporting the production of other characteristics which are requested in place of them such as “traffic density” (CH01 – Wind farms, CH 02 – Marine Protected Areas), “fishing intensity” (CH7 – Fishery impact), or “shipping routes” (CH10 – Bathymetry) : see details in sections 3.2.n (where n is the challenge number).
- For a similar reason, “rock and sediment physical properties” mentioned by Medsea for the determination of the substrate according to “grain size” analysis is not required here because the nature of the substrate integrating this information is associated to the “lithology” P03 group.
- Another two differences are either of the same nature or the result from different appreciations of the usefulness of some characteristics for the challenges (which can change when the challenges will start specifying their products) and to the differences between the challenges from one checkpoint to another. We can cite the “optical properties” of the water and the “sedimentation and erosion process”.

It is however important to note that the requirements vary from one checkpoint to the next within a challenge: someone will require observations to produce by themselves the expected variable (eg AIS data to determine the “fishing intensity”) while someone else can consider this variable has to be made available for their purpose. It is thus important to identify what are the “essential variables” which should be made available for a given usage and to distinguish them from the supporting variables to collect.

3.4.2 Synthesis per categories of characteristics (P02)

Table 3.3 lists for each environmental matrix the categories of characteristics (P02) along with their parent categories (P03) needed by the challenge and shows which challenge expressed this need.

Table 3.3: List of P03 group and P02 categories of characteristics expected from the input dataset sources. Names in bold text indicate P03 groups or P02 categories needed by 3 or more challenges.

Environm.matrix	Group of category of characteristic (P03)	Category of characteristic (P02)	CH01	CH02	CH03	CH04	CH05	CH06	CH07	CH08	CH09	CH10	CH11
Air	Meteorology	Air temperature		1									
		Wind strength and direction	1	1									
Biota/ Biology	**Biota abundance, biomass and diversity**	Invasive species monitoring parameters		1									1
		Shellfish abundance and biomass in water bodies							1				
	Birds, mammals and reptiles	Bird behaviour		1									
		Bird counts	1	1									
		Bird reproduction	1	1									
		Bird taxonomy-related abundance per unit area of surface		1									
		Cetacean abundance		1									
		Cetacean behaviour		1									
		Cetacean reproduction		1									
		Seal abundance		1									
		Seal behaviour		1									
		Seal reproduction		1									
		Reptile abundance		1									
		Reptile reproduction		1									
	Fish	Fish abundance in water bodies									1		
		Fish taxonomy-related abundance per unit area of the bed		1									
		Fish reproduction		1									
		Fish behaviour		1									
	Phytoplankton and microphytobenthos	Phytoplankton generic abundance in water bodies		1		1							
		Phytoplankton taxonomic abundance in water bodies				1							
		Primary production in the water column		1									
	Macroalgae and	Benthic primary production		1									
	Pigments	**Chlorophyll pigment concentrations in water bodies**		1					1	1			
	Habitat	Habitat characterisation		1	1								
		Habitat extent		1	1				1				
Ice	Cryosphere	Snow and ice mass, thickness and extent				1							
Human activities	Anthropogenic contamination	Pollution events		1									
		Industrial discharges		1									
	Construction and structures	Hazards to navigation	1	1									
		Industrial activity		1									
		Man-made structures		1									
		Transport activity		1									
	Fisheries	Administrative units	1	1									
		Fish and shellfish catch statistics		1	1			1					
		Fishing by-catch		1				1					
		Fishery characterisation		1	1								
		Fishing effort							1				
	Human activities	**Administrative units**	1	1	1							1	
		Industrial activity	1	1	1								
		Litter abundance and type		1									
		Marine archaeology		1									
		Marine environment leisure usage		1	1								
		Transport activity	1	1	1							1	
	Administration and dimension	Reference numbers										1	
		Date and time										1	

48	Fresh/ Marine water	**Carbon, nitrogen and phosphorus**	Ammonium and ammonia concentration parameters in water								1			
49			Dissolved inorganic nitrogen concentration in the water column								1			
50			Dissolved total and organic nitrogen concentrations in the water								1			
51			**Nitrate concentration parameters in the water column**		1					1	1			
52			**Nitrite concentration parameters in the water column**		1					1	1			
53			Particulate total and organic nitrogen concentrations in the water								1			
54			Dissolved total or organic phosphorus concentration in the water							1				
55			**Phosphate concentration parameters in the water column**		1					1	1			
56			Phosphorus concentrations in suspended particulate material								1			
57		Carbonate system	Alkalinity, acidity and pH of the water column		1									
58		**Dissolved gases**	**Dissolved oxygen parameters in the water column**		1					1	1			
59		**Currents**	**Horizontal velocity of the water column (currents)**	1	1	1	1							
60			Vertical velocity of the water column (currents)	1										
61		**Fluxes**	River flow and discharge		1						1			
62			Sedimentation flux quantification in the water column					1						
63		**Sea level**	**Sea level**		1			1				1		
64		Suspended particulate	Concentration of suspended particulate material in the water								1			
65		**Water column temperature and salinity**	**Salinity of the water column**		1	1	1			1	1			
66			Skin temperature of the water column	1										
67			**Temperature of the water column**	1	1	1	1			1				
68		Waves	Wave direction	1	1									
69			Wave height estimates	1										
70			Wave height and period statistics	1	1									
71		Other physical oceanographic measurements	*(Missing category for) ocean heat content*		1		1							
72			*(Missing category for) combined action of waves and currents*	1										
73			Density of the water column				1							
74	Riverbed/	**Rock and sediment**	**Lithology**	1		1				1			1	
75	Riverbed/	Rock and sediment	Depositional environment	1										
76	Riverbed/	**Terrestrial**	**Bathymetry and Elevation**	1	1	1		1		1			1	
77	Riverbed/		Coastal geomorphology		1									
78	Riverbed/		**Terrestrial mapping** *(coastline)*	1	1	1								
			Total of P02 categories of characteristics	19	55	13	8	3	2	6	8	13	7	1

The observations from this table are the following:

- 99% of the upstream data needed by the challenges concern geo-referenced data.
- Less than 5% concern land surfaces, the other being related to the marine environment
- This helps identify at a glance where SeaDataNet sub-communities have been most active in organizing their data: this is the case for chemicals, larger animals, human activities. A few categories of characteristics (temporarily coded ZZZ) need to add codes to the P02 list. A new entry has already been added for Invasive species parameters.

Fig. 3.3 shows where the Mediterranean, Black Sea and Atlantic P02 and P03 parameters are compared. The consolidated lists of categories of characteristics identified for Atlantic, Black sea and MedSea Checkpoints are given in Annex 2.

The total number of P02s is larger for the Atlantic mainly due to:

- differences in the location and the geographical extent: Ice is an environmental matrix which was not relevant for the 2 other basins. There are local factors influencing the information needed in coastal areas impacting MPAs and Oil leak challenges;
- needs more detailed in some of the challenges allowing to better identify the corresponding categories especially for the MPA challenge;

- variations in the expression of needs: in the calls for tender, there is some latitude left to the challenges in terms of information to be provided in the deliverables. Atlantic has expressed needs for ideal deliverables however it is likely that this number will decrease later when challenges detail their specifications for the production of their deliverables, as has been observed in previous Checkpoints.

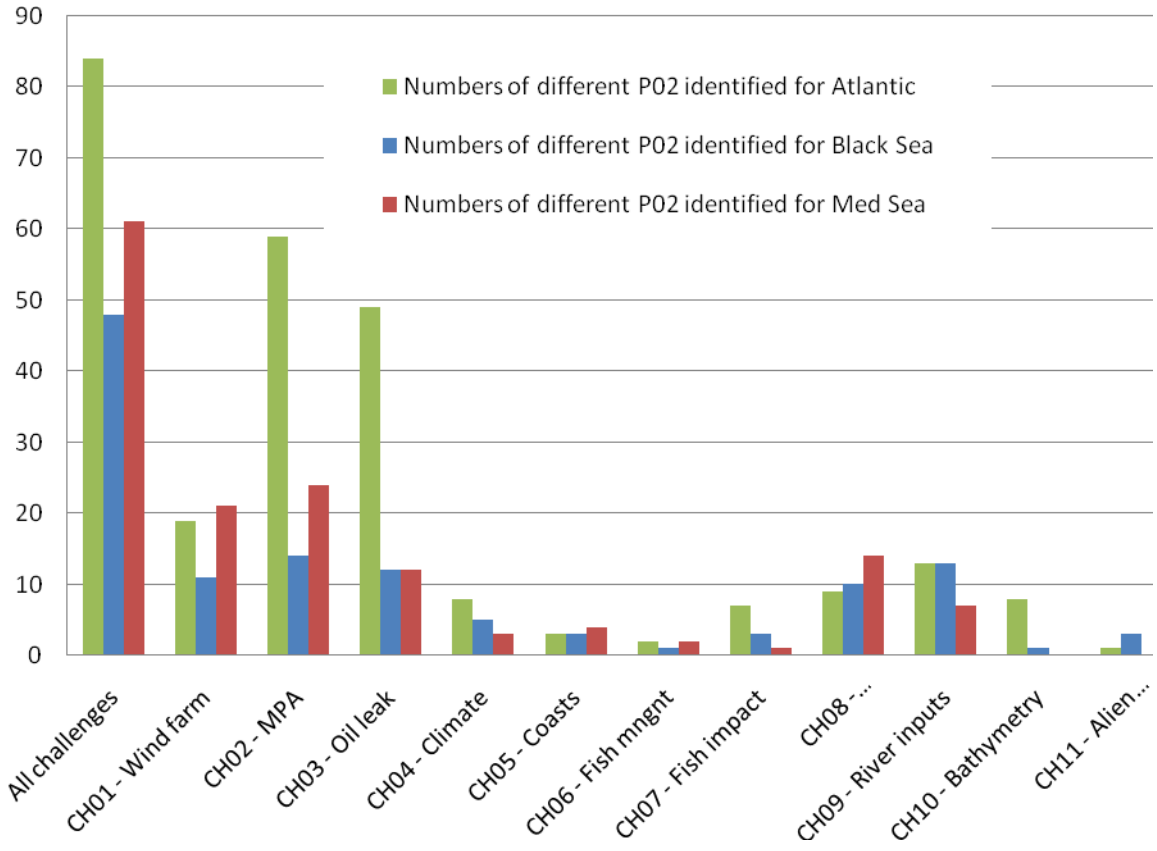


Figure 3.3: Number of distinct categories per challenge of the Atlantic, Black Sea and Mediterranean checkpoints

There are considerable similarities between the characteristics needed by these three basins at the level of P03 groups. These lists outlines the “essential” variables for the present set of uses (checkpoints) according to the extent of expertise within the project however it should not be concluded that they cover the needs of all possible uses.

The present list of “Essential Ocean Variables” specified by GOOS, the permanent global system for observations, modeling and analysis of marine and ocean variables to support operational ocean services illustrates the point (Table 3.4). While there is a good intersection between EOVs and the Checkpoint findings in the domain of physics, the Checkpoint did not identify such things as transient tracers or carbon isotopes in biochemistry and HAB or Apex predator abundance in the biological domain. Conversely, categories related to the seabed, to contaminants or else to human activities relevant for the checkpoints are not in the GOOS list.

Table 3.4: GOOS Essential Ocean Variables
(source : http://goosocean.org/index.php?option=com_content&view=article&id=14&Itemid=114)

PHYSICS	BIOGEOCHEMISTRY	BIOLOGY AND ECOSYSTEMS
Sea state	Dissolved Oxygen	Phytoplankton biomass and productivity
Ocean surface vector stress	Inorganic macro nutrients	Harmful Algal Bloom (HAB) incidence
Sea ice	Carbonate System	Zooplankton diversity
Sea surface height	Transient tracers	Fish abundance and distribution
Sea surface temperature	Suspended particulates	Apex predator abundance and distribution
Subsurface temperature	Nitrous oxide	Live coral cover
Surface currents	Carbon isotope (^{13}C)	Sea grass cover
Subsurface currents	Dissolved organic carbon	Mangrove cover
Sea surface salinity		Macroalgual canopy cover
Subsurface salinity		
Heat flux / radiation		

3.4.3 Potential input datasets

According to the definition of a dataset series, the input datasets (when are single datasets) or dataset series are understood as “a collection of datasets sharing the same product specifications” and are identified, described and later evaluated by characteristic category and characteristic.

On this basis, a minimum of 551 datasets or series have been identified to be potentially appropriate for the challenge needs. Dataset series and datasets (such as the EMODnet bathymetry DTM) appear as many times as the number of the challenges needing them. This inventory of input datasets is not fully complete for MPAs challenge which started its compilation late due to a change in the consortium composition.

Tables 3.5 and Fig. 3.4 show the number of requested sets of data by matrix, group of categories of characteristics, and categories of characteristics for each challenge: MPA and Rivers challenges have the largest numbers of potential input data sets, followed oil leak, alien species, eutrophication and wind farm, all around 50 entries. Climate and Coasts challenges have the minimum number of identified input data sets, i.e. 18 for both.

It should be noted that these are “potential” data sets or series that might be chosen on the basis of the Challenge Targeted products requirements that need still to be specified. The final figures will be available in the first Data Adequacy Report.

Table 3.5: Number of input datasets identified per challenge, per environmental matrix and group of categories of characteristics

Matrix	P03 group of characteristics	Per Challenge											Number of input datasets
		1	2	3	4	5	6	7	8	9	10	11	
Air	Meteorology	4	2	7									13
Ice	Cryosphere				5								5
Fresh water	Carbon, nitrogen and phosphorus		3						27	37			67
	Water column temperature and salinity									34			34
	Fluxes		1							6			7
Marine water	Carbon, nitrogen and phosphorus								2				2
	Carbonate system		1										1
	Dissolved gases		1						4				5
	Other physical oc. meas. (Oc. heat, density of water column, combination of waves and currents)	1	1		2								4
	Water column temperature and salinity	2	2	2	7				12				25
	Currents	3	2	12	1								18
	Sea level		1			13					10		24
	Waves	14	2										16
Riverbed/ SeaBed	Terrestrial	4	9	7		4		2			10		36
	Habitat		1										1
	Macroalgae and seagrass		2										2
	Suspended particulate material		1							9			10
	Rock and sediment lithology and mineralogy	1		1				1			1		4
	Sedimentation and erosion processes					1							1
Biota/ Biology	Birds, mammals and reptiles	2	13										15
	Fish		3							10			13
	Phytoplankton and microphytobenthos		2		3								5
	Pigments		1						3				4
	Habitat	8	10	8				6					32
	Biota abundance, biomass and diversity		4									51	55
Human activities	Administration and dimensions	3		1									4
	Anthropogenic contamination		2										2
	Construction and structures	1	8	1							1		11
	Fisheries	1	7	4			43	13					68
	Human activities	3	54	6							4		67
	Total numbers of input datasets	47	133	49	18	18	43	22	48	96	26	51	551

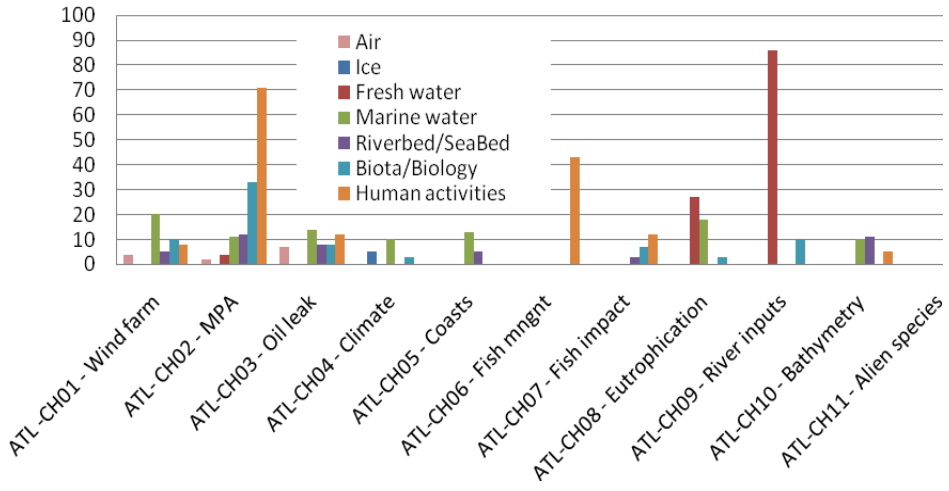


Figure 3.4: Input data sets (total number is 551) per challenge and matrix

A relevant indicator which can be derived from these statistics is the dispersion of data for a given challenge. Table 3.6 shows data dispersion as the ratio between the number of inputs and the number of P02s per challenge. Fig. 3.5 is an illustration of table 3.6 in logarithmic representation.

Table 3.6: Number of input dataset or dataset series identified by the challenges

	CH01 - Wind Farm	CH02 - MPAs	CH03 - Oil leak	CH04 - Climate	CH05 - Coast	CH06 - Fishery mangt	CH07 - Fishery impact	CH08 - Eutrophication	CH09 - River inputs	CH10 - Bathymetry	CH11 _ Alien Species	Total
Number of P02 category of characteristics	19	55	13	8	3	2	6	8	13	7	1	78
Number of input datasets	47	133	49	18	18	43	22	48	96	26	51	551
Ratio nb input datasets/nb P02	2.5	2.4	3.8	2.3	6.0	21.5	3.7	6.0	7.4	3.7	51.0	7.1

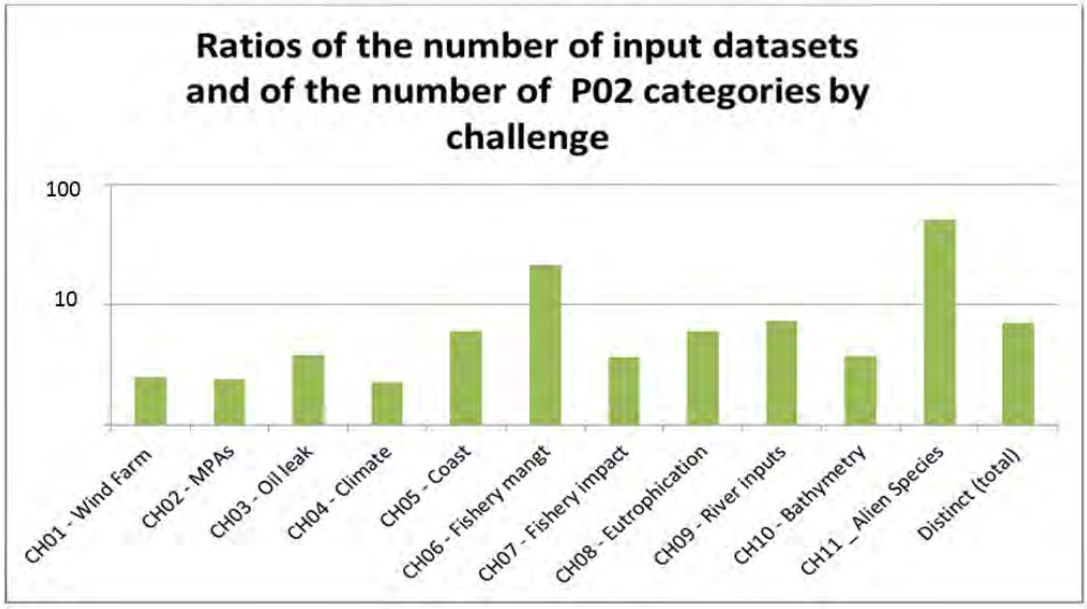


Fig. 3.5: Ratio of the number of potential input datasets to the number of P02 categories of characteristics per challenge (logarithmic scale; total number of input datasets: 551)

In the Atlantic, the ratios for Alien species, Fisheries management and Rivers are above the average and show how data sources for some challenges are scattered within the basins's communities of data providers. This might a justification for data policy-makers to call for specific actions from these communities.

3.5 Data providers

3.5.1 List of data centres

An important result of the survey is the identification of the data sources and datasets needed by the Challenge for each characteristic category. A list of 91 data providers has been identified as INT for International, EU for European, MS for EU Member States and USA.

Table 3.7: Major input data providers identified by Challenge experts

INT: 15	EU: 15	MS: 36	USA: 25
• 730/ICES (International Council for the Exploration of the Sea) • INT-GEBCO (General Bathymetric Chart of the Oceans) • IMO (International Maritime Organization) • 1869/FAO • ICCAT • OBIS (Ocean Biogeographic Information System) • UNEP-WCMC (World Conservation Monitoring Centre) • NASCO (International Atlantic Salmon Research Board) • IOC/UNESCO • EBSA (Ecologically or Biologically Significant Marine Areas) • 2421/GBIF secretariat • IUCN/UNEP • Fishbase Information and Research Group • UN-CABI (Centre	• EU-2547/ECMWF (European Center for Medium-Range Weather Forecasts) • EU-DG MARE (European Commission. Directorate-General for Maritime Affairs and Fisheries) • (EMODnet Habitat, Bathymetry, Biology, Chemistry, Physics, Geology, Human activities ; European atlas of the seas) • EU-EC DG MARE (European Commission. Directorate-General for Maritime Affairs and Fisheries) • EU-Copernicus Marine Environment Monitoring Service (CMEMS) • EU DG Environment (EEA - European Environment Agency) • OSPAR commission (Convention for the Protection of the Marine Environment of the North-East Atlantic) • EU-JRC (Institute for Environment and Sustainability) (EASIN - European Alien Species Information Network) • 3082/EU-EC DG MARE (European	• FR-AAMP (MAIA project - Marine Protected Areas in the Atlantic Arc) • BE-422/VLIZ (Flanders Marine Institute) • BE - K.U. Leuven (Katholieke Universiteit Leuven) (DESIRE) • FR-848/IFREMER/CENTRE DE BRETAGNE (PREVIMER (COASTAL OBSERVATIONS AND FORECAST, SEADATANET-PAN-EUROPEAN INFRASTRUCTURE FOR MARINE DATA) • FR-514/METEO France • FR - Orange Marine (SIGCables) • FR-CNES (AVISO -DUACS) • FR-CNRS-UMR-EPOC (Oceanic and Continental Environments and Paleoenvironments) (MAREL GIRONDE ESTUAIRE) • GE-BFG (Federal Institute of Hydrology) (Global Runoff Data Centre) • GR-HCMR (Hellenic Centre for Marine Research) (DEVOTES) • IE-396/Marine Insitute ((Nephrops Underwater TV Survey)) • LT-KUCORPÏ (Coastal Research and Planning Institute) (NOBANIS) • NL-IMARES (BENTHIS)	• US-BOEM (Bureau of Ocean Energy Management) • US Government Open Data Source • US-NACIS (Natural Earth) • US-NASA/JPL (PODAAC) • US-NASA - NSIDC (National Snow and Ice Data Centre) • US-NASA/ORNL DAAC (Global River Discharge Project) • US-NAVO (Naval Oceanographic Office) • US NAVY - FNMOC (GODAE) • US- NGA (National Geospatial-Intelligence Agency) • US-1433/NOAA (Tides and currents) • US-3584/NOAA/CSC (Mid-Atlantic Regional Ocean Assessment)US-NOAA/NMFS (COPEPOD) • US-

for Agriculture and Biosciences International) • Ramsar Convention (1971)	Commission. Directorate-General for Maritime Affairs and Fisheries) (DCR-DCF Data Collection Framework for Common Fisheries + Eel management plan)	• PT- IH-PT (Hydrographic Institute) • SP - Puertos del Estado - Oceanografia • SP - XG (Xunta de Galicia-Conselleria de Medio Ambiente e Desenvolvemento sostible) • SP-EJ (Eusko Jaurlaritza) (PROGRAMA DE VIGILANCIA Y CONTROL DE LA INTRODUCCIÓN DE ESPECIES INVASORAS EN LOS ECOSISTEMAS LITORALES) • UK - ABPmer (Atlas of UK Marine Renewable Energy Resources) • UK Anatec Ltd • UK-AFBI (North of Ireland Joint Agency Coastal Monitoring Programme)) • UK-BODC (Clean Safe Seas Environmental Monitoring Programme and EU ESEAS Research Infrastructure project) • UK-CEFAS • UK-CEH (Centre for Ecology & Hydrology) - DAISIE (Delivering Alien Invasive Species In Europe) • UK-784/DEFRA (MSFD descriptor 3) • UK - HR Wallingford (SeaZone solutions) • UK-JNCC (Seabird 2000) • UK-Lochaber Fisheries Trust • UK-MarineTraffic.com (AIS) • UK MOHC (Met Office Hadley Centre observations datasets) • UK-NASCO (International Atlantic Salmon Research Board) • UK-National Biodiversity Network (NBN) • UK-NERC/NOC) (Permanent Service for Mean Sea Level) • UK-NNSS (Non-native Species Programme) • UK - PML (VECTORS EC FP7/2007-2013 No.	NOAA/National MPA Center • US-2549/NOAA/NCEP (HYCOM) • US-1226/NOAA NESDIS • US-1978/NOAA-NGDC • US-NOAA-NODC/NCEI (WOD13) • US-1433/NOAA, Office of Response and restoration • US-PATH (Port Authority of New York and New Jersey Developer resources) • US-SAFMC (South Atlantic Fishery Management Council) • US-SERC (NEMESIS)) • US-SIO (Scripps Institution of Oceanography) • US-UHSLC/University of Hawaii sea level centre • US-363915:15 USCG (Northeast Ocean Data) • US USDA (NSIC)

		266445) • UK-SAFOS (Continuous Plankton Recorder)	

3.5.2 Data centres used by more than 3 challenges

Table 3.8 lists the programs (EDMERP) or organisations (EDMO) used by more than 3 challenges, which challenge used them, for what type of characteristics and layer of environmental matrix. The favorite data centres are:

- INT: ICES, GEBCO, FAO
- EU: Emodnet Bathymetry, Physics, Seabed habitat mapping, Copernicus CMEMS, EEA, OSPAR
- MS: BE-VLIZ, UK-MOHC
- US: NOAA (Tides & Currents)

Table 3.8: List of data centres mentioned as providers of the required input data sets for at least 3 challenges (the total number is 12 out of 91)

EDMERP/EDMO	Used by challenge	Environmental matrix	Group of category of characteristic (P03)
INT-730/ICES (International Council for the Exploration of the Sea)	ATL-CH01 - Wind Farm ATL-CH04 - Climate ATL-CH06 - Fish mngt ATL-CH07 - Fish Impact ATL-CH08 - Eutrophication ATL-CH09 - River inputs ATL-CH11 - Alien species	Marine water Biota/Biology Human activities	C015/Dissolved gases D025/Water column temperature and salinity B020/Fish B070/Biota abundance, biomass and diversity Z005/Administration and dimensions H004/Fisheries
INT-GEBCO (General Bathymetric Chart of the Oceans)	ATL-CH01 - Wind Farm ATL-CH03 - Oil leak ATL-CH05 - Coasts ATL-CH07 - Fish Impact ATL-CH10 - Bathymetry	Riverbed/SeaBed	T001/Terrestrial
INT-1869/FAO (AQUASTAT Programme, Vulnerable Marine Ecosystems, FAO Geonetwork, FAO Global Statistical Collections	ATL-CH01 - Wind Farm ATL - CH03 - Oil leak ATL-CH09 - River inputs ATL-CH06 - Fish mngt ATL-CH07 - Fish Impact	Fresh water Human activities	G015/Suspended particulate material B050/Habitat H004/Fisheries
EU-DG MARE (EMODnet Seabed Mapping (Habitats)	ATL-CH01 - Wind Farm ATL-CH02 - MPA ATL-CH03 - Oil leak ATL-ATL-CH07 - Fish Impact	Marine water Riverbed/SeaBed Biota/Biology	D020/Other physical oceanographic measurements G045/Rock and sediment lithology and mineralogy B050/Habitat

EU-EC DG MARE (EMODNet Bathymetry)	ATL-CH01 - Wind Farm ATL-CH02 - MPA ATL-CH03 - Oil leak ATL-CH05 - Coasts ATL-CH07 - Fish Impact ATL-CH10 - Bathymetry	Riverbed/SeaBed	T001/Terrestrial
EU-EC DG MARE (EMODNET Physics)	ATL-CH01 - Wind Farm ATL-CH04 - Climate ATL-CH05 - Coasts ATL-CH08 - Eutrophication ATL-CH09 - River inputs ATL-CH10 - Bathymetry	Marine water Fresh water	D025/Water column temperature and salinity D032/Sea level
EU-Copernicus Marine Environment Monitoring Service	ATL-CH03 - Oil leak ATL-CH04 - Climate ATL-CH05 - Coasts ATL-CH08 - Eutrophication ATL-CH09 - River inputs ATL-CH10 - Bathymetry	Marine water Biota/Biology Fresh water Ice	D030/Currents D025/Water column temperature and salinity D020/Other physical oceanographic measurements D032/Sea level C015/Dissolved gases B035/Pigments M015/Cryosphere
EU DG Environment / EEA) (Natura 2000, WISE , MSFD)	ARL-CH02 - MPA ATL-CH09 - River inputs ATL-CH11 - Alien species	Riverbed/SeaBed Human activities Fresh water Biota/Biology	T001/Terrestrial H005/Human activities D025/Water column temperature and salinity O005/Fluxes C005/Carbon, nitrogen and phosphorus B070/Biota abundance, biomass and diversity
OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic (RID, ODIMS, MPA)	ATL-CH01 - Wind Farm ATL-CH03 - Oil leak ATL-CH07 - Fish Impact ATL-CH08 - Eutrophication ATL-CH09 - River inputs	Riverbed/SeaBed Biota/Biology Human activities Fresh water	G015/Suspended particulate material B050/Habitat Z005/Administration and dimensions H005/Human activities C005/Carbon, nitrogen and phosphorus O005/Fluxes
BE-422/VLIZ (SCUFN, GEBCO, LME, MEOW, WORMS, MARBEF, MARBOUND, Marine Regions.org World Heritage Marine Sites)	ATL-CH01 - Wind Farm ATL-CH02 - MPA ATL - CH03 - Oil leak ATL-CH11 - Alien species	Riverbed/SeaBed Biota/Biology Human activities	T001/Terrestrial B050/Habitat B070/Biota abundance, biomass and diversity Z005/Administration and dimensions H005/Human activities
UK MOHC (Met Office Hadley Centre observations datasets)	ATL-CH04 - Climate ATL-CH08 - Eutrophication ATL-CH09 - River inputs	Marine water Fresh water Ice	O005/Fluxes D025/Water column temperature and salinity M015/Cryosphere

US-1433/NOAA (Tides and currents)	ATL-CH01 - Wind Farm ATL-CH02 - MPA ATL-CH03 - Oil leak ATL-CH05 - Coasts ATL-CH10 - Bathymetry	Air Marine water Riverbed/SeaBed	M010/Meteorology D030/Currents D032/Sea level T001/Terrestrial

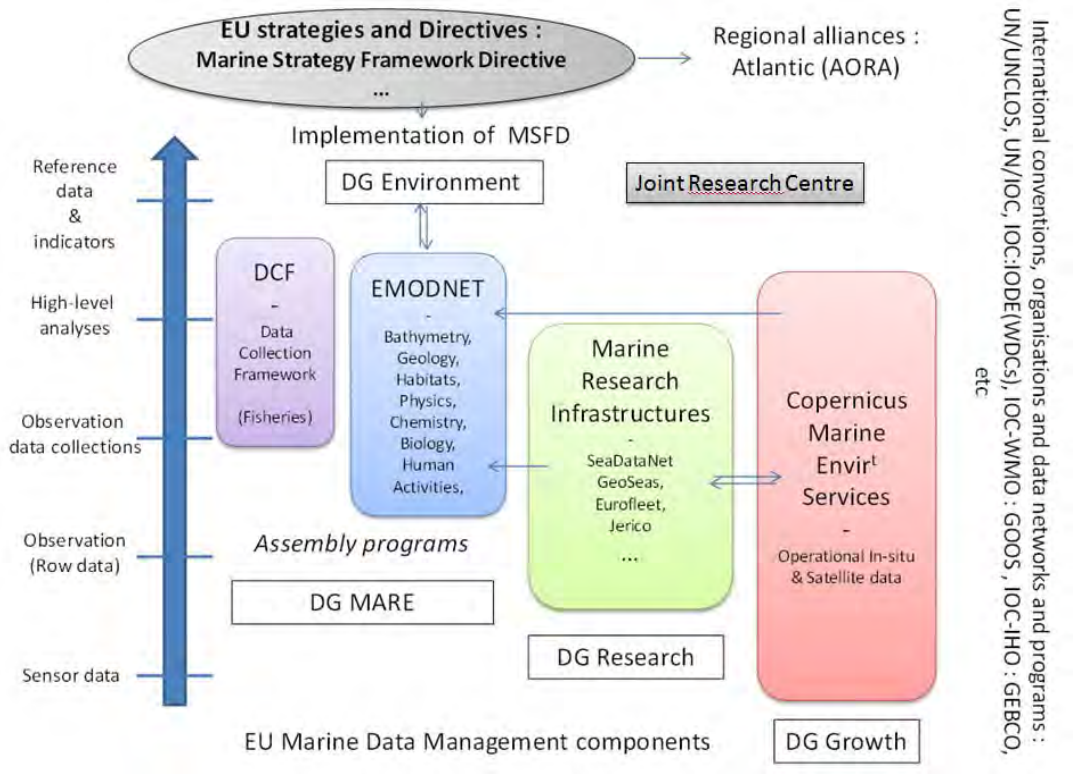
The full list of programs and data providers is given in Annex 3.

4 Basin monitoring system overview

In this section we will overview some of the key data sources that are listed in Chapter 3.3 as data providers. In the last years the Atlantic Ocean has been the focus of many international, European and national projects to set the basis and partially implement a basin-scale monitoring system. It is of special interest to cite the EU H2020 AtlantOS project (https://www.atlantos-h2020.eu/) which main objective is to achieve a transition from a loosely-coordinated set of existing ocean observing activities to a sustainable, efficient and fit-for-purpose Integrated Atlantic Ocean Observing System.

In the following two sections we will overview separately the international/intergovernmental and European programs and projects. Some of them are only in the Atlantic Sea but the majority are pan-European, or international, and have the Atlantic Sea as one of the activity areas.

The sketch herebelow represents the actors and relationships between EU strategies, the MSFD, the data collection and assembly programs and initiatives and the existing infrastructures inside as well as outside the EU. In spite of its imperfections, we hope this view will give some markers to the reader to navigate in the complex world of marine data sources described in the following pages.



4.1 European Atlantic monitoring programs and projects

The major European, intergovernmental and international data collection/management programs active in Atlantic Ocean Sea are listed in the following table. By ‘major’ we mean those international collaborative initiatives that include more than one country or individual institution. We have listed the main initiatives collecting physical, biogeochemical and

biological parameters. The choice for the projects has been to take only the FP7 and Territorial cooperation projects for the 2007-2016 period. We are aware that more projects could have been missing but the list certainly covers some of the essential data sources for upstream data listed in chapter 3.3 (data providers). The last column indicates what matrices each program/project deals with.

№	Name/Web site	Type of initiative	Main range of activities	Relevant matrices
1	**CMEMS** - Copernicus Marine Environment Monitoring Service http://marine.copernicus.eu/ And Copernicus satellite core products: www.copernicus.eu	Copernicus service DG-GROW	Monitoring and forecasting of European Seas	Ice Marine Water Biota/biology
2	**Data Collection Framework for Fisheries** http://datacollection.jrc.ec.europa.eu/	JRC and DG-MARE	Fishery data collection and management service	Human activities
3	**EMODNET** Data Portals http://www.EMODnet.eu/	DG-MARE consortia for marine data assembling (project)	Historical data assembling and management service	Air Ice Marine Water Biota/biology River bed/seabed Human activities
4	**Euro-ARGO / Global ARGO** http://www.euro-argo.eu/ www.argo.uscd.edu	European Research Infrastructure Consortia / international program	ARGO floats acquisition, upgrade and deployment in Europe and internationally	Marine Water
5	**E-SURFMAR** http://www.eumetnet.eu/e-surfmar/	EUMETNET Project	EEIG sponsored program for data collection and management	
7	**GEOSEAS** http://www.geo-seas.eu/	FP7 Project	e-infrastructure for geological and geophysical data	River bed/ seabed
9	**JERICO_NEXT** http://www.jerico-ri.eu	FP7 Project	Integrating infrastructure initiative for an European Research Infrastructure network of coastal observatories	Marine Water Biot/Biology
10	**SEADATANET-II** http://www.seadatanet.org/	FP7 Project	Historical data assembling and management service	Air Marine Water Biota/biology River bed/seabed
11	**FixO3**, The Fixed point Open Ocean Observatory network, http://www.fixo3.eu/	FP7 Project	Provides multidisciplinary observations in all parts of the oceans from the air-sea interface to the deep seafloor	Marine Water

12	**European Environment Agency (EEA)** http://www.eea.europa.eu/data-and-maps	European Agency	The European Environment Agency makes available a range of datasets, interactive maps, graphs and indices	Marine Water Biota/biology River bed/seabed Human activities
13	**EMSA – CleanSeaDatanet service** http://www.emsa.europa.eu/operations/cleanseanet.html	European Agency	Earth observation services (optical and SAR images)	Marine Water

Copernicus Marine Environment Service

The Copernicus Marine Environment Monitoring Service is part of the Copernicus Program (previously known as GMES), which is an EU Program implemented by the European Commission jointly with the European Space Agency (ESA) and the European Environment Agency (EEA). It is aimed at developing a set of European information services based on satellite Earth Observation and *in situ* data. The Copernicus Marine Environment Monitoring Service provides regular and systematic information about the physical state and dynamics of the ocean and the marine ecosystems for the global ocean and the European regional seas. This data covers analysis of the current situation, forecasts of the situation a few days in advance and the provision of retrospective data records (re-analysis).

Copernicus Marine Service is composed of 4 Thematic Assembly Centres (Sea Level, Ocean Colour, Temperature – Sea Ice – Wind, In Situ) and 7 Monitoring and Forecasting Centres (Global Ocean, Arctic Ocean, Baltic Sea, Atlantic NWS, Atlantic IBI, Mediterranean Sea, Black Sea) each delivering a set of environmental information products in real time and delayed mode, with a 'click-and-download' system. The pre-operational service is currently provided through the FP7 project MyOcean-2 (follow-up of the former MyOcean). The main products are described in the following table.

Name/Acronym	Main product delivered
Sea Surface Temperature, sea ice and winds Thematic Assembly Centre	Satellite SST data production and management service
Sea Level Thematic Assembly Centre	Satellite Sea Level data production and management service
Ocean Color Thematic Assembly Centre	Satellite Chlorophyll, light attenuation within the water column (water clarity) data production and management service
In Situ Thematic Assembly Center	In situ Real Time physical measurements data management service
Black Sea Monitoring and Forecasting centre	

The products delivered by the Copernicus marine environment monitoring service today are provided free of charge to registered users through an Interactive Catalogue available on the marine.copernicus.eu web portal. These products support marine and maritime applications and related EU policies, e.g. in the fields of: Marine safety, marine and coastal environment, marine resources, weather, seasonal forecasting and climate. The added value of the project is that the Copernicus data policy promotes the access, use and sharing of Copernicus information and data on a full, free and open basis.

Data Collection Framework for Fisheries

Since 2000, an EU framework for the collection and management of fisheries data has been in place. This framework was reviewed in 2008 resulting in the Data Collection Framework (DCF). Under this framework the Member States (MS) collect, manage and make available a wide range of fisheries data needed for scientific advice. Data are collected on the basis of National Programs in which the MS indicate which data are collected, how they are collected and the resources allocated for the collection. MS must report annually on the implementation of their National Programs and the Scientific, Technical and Economic Committee for Fisheries (STECF) evaluates these Annual Reports. Part of the data collected by the MS is uploaded in databases managed by the JRC in response to data calls issued by DG MARE. These data are analysed by experts of the STECF and form the basis for scientific opinions and recommendations formulated in STECF reports. The resulting scientific advices are used to inform the CFP decision making process. JRC assemble the data, store them in databases, analyse their quality and coverage and makes them available to the STECF Working Groups Once the STECF reports are finalised the data are disseminated in aggregated form for a target audience of experts for further use in scientific analyses and policy.

In the JRC website it is possible to find the necessary information and data related to the above described process including:

- Latest news in relation to data calls, deadlines, variable definitions, disaggregation levels and uploading procedures;
- National Programs and Annual Reports prepared by the MS;
- Access to the uploading facilities and data dissemination platforms for the experts and general public;
- Coverage reports on the data provided by the MS in response of the data calls managed by JRC;
- DCF technical documents, guidelines and legislation.

The Data Collection Framework is strictly linked with the Control Regulation. In particular, the assessment of commercial landings and effort (transversal variables) must be made on the basis of the exhaustive data gathered under the Council Regulation (EEC) No 2847/93 and of the Council Regulation (EC) No 104/2000. For the data not covered by these Regulations assessment of commercial landings and fishing effort has to be made by sampling and statistical procedures, in such a way that the estimates achieve certain precision of level both for stocks subject to TAC and quota and for stocks not subject to TACs and quotas.

EMODNET Data Portals

The European Marine Observation and Data Network (EMODnet) has the objective to unlock fragmented and hidden marine data resources and to make these available to individuals and organisations, both public and private, and to facilitate investment in sustainable coastal and offshore activities through improved access to quality-assured, standardised and harmonised marine data. EMODnet is an initiative from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE) as part of its Marine Knowledge 2020 strategy. Presently, there are eight sub-portals in operation that provide access to marine data from the following themes: bathymetry, geology, physics, chemistry, biology, seabed habitats, human activities and coastal mapping. One further portal covering human activities is currently under construction. Through the prototype websites of the European Marine Observation and Data Network (EMODnet), engineers and scientists can see what data are available for a given sea basin, and download both original observations and derived data products such as digital terrain models, sediment distributions and marine habitats. At the same time work is ongoing to help EU countries to optimise their sea observing programs.

EMODnet Bathymetry

The overall objective of this lot is a dedicated portal that will provide access by browsing and downloading to a harmonised medium resolution Digital Terrain Model (1/8 of minute of arc, approximately 250m of resolution) of all sea basins in European waters and access by discovery and shopping process to the underlying and assembled bathymetric surveys over the European seas held by public and private bodies in an uniform way. The Bathymetry portal was developed by adopting SeaDataNet standards and services. The lot has managed to gather and provide access to metadata and data from more than 10730 bathymetric survey datasets from 24 data centres from 14 countries and originated from more than 114 institutes. The DTM is based on 3 types of bathymetric data sources:

- Bathymetric surveys, such as LIDAR surveys, single and multibeam echosounder surveys, and even historic leadline soundings. These data sets are most preferred as data source because of their high resolution and of the possibility to apply the processing specified by the project for the production of the depth and associated statistics.
- Composite data sets are used to build a gridded bathymetry. In practice it appears that Hydrographic Offices (HO's) do not want or cannot deliver primary surveys but composite data sets from the Digital Terrain Models that they maintain themselves for producing, maintaining their nautical charts and following international IHO procedures.
- GEBCO 30" grid derived from a combination of altimetric data and soundings.

The portal offers access to the following metadata layers delivered with the data source, Minimum cell water depth, maximum cell water depth, average cell water depth, standard deviation of cell water depth, number of values used for interpolation of cell water depth, Source dataset used at each point. The horizontal coordinate reference system is the WGS 84. The depth reference system is the Lowest Astronomical Tide (LAT).

EMODnet Geology

The geology portal provides access to data and metadata held by each organisation based on standards developed in the Geo-Seas project and data products compiled at a scale of 1:250,000 using the standards developed during EMODnet early stage. The data and map products include information on the sea-bed substrate including rate of accumulation of recent sediments; the sea-floor geology and all boundaries and faults that can be represented at the 1:250,000 compilation scale with information on the lithology and age of each geological unit at the seabed; geological events and probabilities and minerals. In addition to sea-bed sediment information, EMODnet Geology is also compiling information on the Quaternary geology of the sea floor (sediments deposited during the last approximately 2 million years). Links are being established through common partners with the COST Action SPLASHCOS to consider drowned paleolandscapes that would be of value to marine archaeologists. SPLASHCOS aims to bring together archaeologists, marine geophysicists, environmental scientists, heritage agencies, and commercial and industrial organizations interested in researching, managing and preserving the archives of archaeological and palaeoclimatic information locked up on the drowned prehistoric landscapes of the European continental shelf, and to disseminate that knowledge to a wider public.

EMODnet Seabed Habitats

The Preparatory action was based on the EUNIS (European Nature Information System) broad scale seabed habitat map project. It was a preliminary attempt at covering a few European marine basins with a broad-scale map representing t The lot has the general objective of the EUSeaMap 2 project, to create a homogeneous seabed habitat map covering all European seas with enhanced validation, and to complement this with the collation of any

survey habitat maps available from Member States, their translation into the upper EUNIS levels referred to as “physical habitats”, and their storage in an attractive portal designed to meet users’ needs fully and effectively. Such a physical habitat map, featuring complete coverage of European seas, will be made available through the former EUSeaMap webGIS offering enhanced capabilities. The broad-scale map will be completed locally with detailed maps sourced by the Partners and/or other adjacent countries that have not been made widely available so far. It falls within the brief of this tender to enable Member States to ‘plug in’ their data, facilitating the publishing of this data with the implementation of bespoke tools.

EMODnet Chemistry

This Portal is connected to the SeaDataNet project. The objectives are:

- gather all measurements of a particular chemical species with their appropriate metadata within a given space and time window
- include the physical conditions under which the measurements were made (from EMODnet physical parameters portal or the GMES marine core service)
- visualise the measurement density in a given time and space window
- visualise a time evolution of a selected group of measurements
- show concentration plots for a given time and space window and also along the coast
- show inflows from rivers of nutrients. The user should be able to select a section of coast, a country or a region (NUTS3) and obtain time series of inflows of parameters expressed as mass or moles per unit time per river (or section of coast)
- calculate spatially distributed data products specifically relevant for Marine Strategy Framework Directive Descriptors 5 (eutrophication), 8 (chemical pollution) and 9 (contaminants in seafood) based on guidance provided by the Marine Strategy Framework Directive Common Implementation Strategy. For eutrophication, it is not necessary to calculate a eutrophication indicator but to provide the relevant data layers concerning water column chemistry that enable eutrophication to be calculated. In particular, it is necessary to provide spatial and temporal distribution of hypoxia and anoxia in water column and seabed.

EMODnet Biology

Marine biodiversity data are essential to measure and study the ecosystem health of maritime basins. These data are often collected with limited spatial and temporal scope and are scattered over different organizations in small datasets for a specific species group or habitat. The aim of this Lot is to assemble individual datasets, and process them into interoperable biological data products for assessing the environmental state of overall ecosystems and complete sea basins.

The main aims of the lot are:

- To provide access to specified monitoring data from the EMODnet biological data portal, by building on a detailed inventory and gap analysis of existing holdings of biological marine monitoring data that was created during the pilot project.
- To create specific biological data products to illustrate the temporal and geographic variability of occurrences and abundances of marine phytoplankton, zooplankton, macro-algae, angiosperms, fish, reptile, benthos, bird and sea mammal species.
- To seek the harmonisation of differing methodologies and strategies for data management under common protocols, data formats and quality control procedures (by adopting EMODnet and INSPIRE standards), and ensure that data can be consistently distributed, by making use of relevant, open webservices for user applications including regional data interpretation, environmental assessments and modelling.
- To execute spatial, temporal, and taxonomic queries. The spatial queries will be made possible by entering exact coordinates, by selecting a region on a geographic map or by

selecting standardized sea areas; e.g. Exclusive Economic Zone's (EEZs) of European countries from the Maritime Boundaries Geodatabase (MARBOUND, VLIZ), IHO seas or European regional and sub-regional seas, as currently defined by MSFD.

The portal offers access to the following datasets / species groups: biomass and abundance of phytoplankton, zooplankton, angiosperms, macro-algae, invertebrate bottom fauna, birds, mammals, reptiles, fish.

EMODnet Physics

The Physics preparatory action had the overall objectives to provide access to archived and near real-time data on physical conditions as monitored by fixed stations and Ferrybox lines in European sea basins and oceans and to determine how well the data meet the needs of users.

The existing EMODnet-Physics portal makes layers of physical data and their metadata available for use and contributes towards the definition of an operational European Marine Observation and Data Network (EMODnet). It is based on a strong collaboration between EuroGOOS associates and its regional operational systems (ROOSs), MyOcean and SeaDataNet consortia. The EMODnet Physics portal is giving access to two major data streams:

- Near-real-time (NRT: within 24 hours from acquisition) data, collected for operational needs, collected at fixed measuring stations (e.g. moored buoys, rigs/platforms, coastal stations) and by automatic observatories at sea (e.g. profiling floats, drifting buoys, ferrybox, ships of opportunity, research vessels) which are transmitted in near real-time to the shore, and
- Archived data derived from further elaboration and validation of the near real time (NRT) data.

The access to the first data stream is ensured by the EuroGOOS - ROOSs and the in-situ TAC system; the second data stream is organised through the SeaDataNet infrastructure. The Coriolis infrastructure plays an important role in giving access to the supplementary data from Argo floats (EuroArgo) and glider observations. The portal offers access to the following datasets: Sea water salinity, Sea water temperature, Water currents, Oxygen, Fluorescence, pH, Turbidity, Sea level, Waves, Horizontal wind speed, Wind direction, Atmospheric pressure, Atmospheric pressure hourly tendency, Dew point temperature, Air temperature in dry, Relative humidity, Light irradiance, Daily Ice cover.

EMODnet Human Activities

The main objective of the Human Activities Lot is to disseminate information on the geographical position, spatial extent, and attributes of a wide array of human activities related to the sea and its bed. Particular attention is given to providing historical time series (when possible) to indicate the temporal variation of activities. Through a single entry portal it is possible to view, query and download data and metadata from public and private sources all across Europe. The data is harmonised into interoperable formats that include agreed standards, common baselines or reference conditions; assessments of their accuracy and precision. Users can view, query, and download datasets or subsets of them, via web GIS. Metadata are also available for download.

The portal offers access to the following datasets: Aggregate extraction, Commercial shipping, Recreational shipping, Cultural heritage, Dredging, Fisheries zones, Hydrocarbon extraction, Major ports, Marinculture, Ocean energy facilities, Pipelines and cables, Protected areas, Waste disposal (solids, including dredge material, dumped munitions, marine constructions), Wind farms, as well as other forms of area management/designation.

EURO ARGO- GLOBAL ARGO

The main objective of the EURO-ARGO consortium is to organize and consolidate the European contribution and to set up a research infrastructure in support of the global ARGO program. EURO-ARGO having been endorsed by the European Strategic Forum on Research Infrastructures (ESFRI), the preparatory phase project had several objectives to progress towards defining the appropriate legal framework and to address several critical technical points related to instrumentation and sensors, data management and array design. Capacity building and outreach have also been given due consideration.

The official inauguration of Euro-Argo ERIC was hosted by the French Permanent Representation in Brussels on 17th July 2014. Euro-Argo is now the European research infrastructure that coordinates the procurement and deployment of about 250 floats per year, to monitor these floats and ensure that all the data can be processed and delivered to users (both in real-time and delayed mode).

Called the “Central-RI”, has its registered office in France for the first 5 years. The Central Infrastructure will coordinate Euro-Argo activities under arrangements with independent distributed national legal entities and facilities. The Euro-Argo ERIC shall have the following organs: a council, a Management Board, a Programme Manager and a scientific and technical advisory group (STAG).

E-SURFMAR

E-SURFMAR (Surface Marine Operational Service) is a project of EUMETNET (http://www.eumetnet.eu/about-us) that has the main objective of coordinating, optimise and progressively integrate European activities for surface observations over the sea in support of Numerical Weather Predictions.

The main objective of E-SURFMAR is to formulate an optimum overall surface marine network design, to implement it and to regularly revise it according to data user's requirements. The first design study (2004) led to:

- an operational network of about 100 drifting buoys measuring air pressure and sea surface temperature in the North Atlantic and which make their data available in real time onto the Global Telecommunication System of WMO.
- the financial and technical support for the operation of 4 moored buoys as a baseline for the calibration and the validation of satellite-derived wind and wave observations.
- the support of the activities of Voluntary Observing Ships (VOS) in order to better coordinate and harmonise practices. This support includes compensation to participating members for the observations and the communications related to this component.
- both the operation of an increasing fleet of Shipborne Automated Weather Stations (SAWS) in support of the network design and, in parallel, the automation of the observation aboard ships through the development of such stations.

GEOSEAS

Geo-Seas is an e-infrastructure of 26 marine geological and geophysical data centres, located in 17 European maritime countries. Users are enabled to identify, locate and access pan European, harmonised and federated marine geological and geophysical datasets and derived data products held by the data centres through a single common data portal (http://www.geo-seas.eu/). Geo-Seas has expanded the existing SeaDataNet marine and ocean data management infrastructure to handle marine geological and geophysical data, data products and services, creating a joint infrastructure covering both oceanographic and marine geoscientific data.

JERICO-NEXT

Funded by the European Commission, FP7 Infrastructures, JERICO is an Integrating Activities action contributing to the international and global effort on climate change research (GEOSS), to provide coastal data inputs for operational ocean observing and forecasting, and also to answer the needs of the environmental research and societal communities and has been continued under H2020 as JERICO- NEXT.

The JERICO approach for data management is strongly based on the “use of what exists” through the creation of suitable partnerships with ongoing European data management initiatives for the minimization of duplication of efforts (Fanara et al., 2013). Thus, the JERICO data management framework for delayed-mode data used the SeaDataNet (SDN) infrastructure, while real-time data was being handled through MyOcean. The JERICO approach is driven by the great importance that MyOcean and SDN initiatives have had in the last few years, since both systems proved to be robust and successful in the archiving and distribution of marine data, and correspond to a perspective of long-term sustainability for the European marine infrastructures.

In the continuity of JERICO, the objective of JERICO-NEXT consists in strengthening and enlarging a solid and transparent European network in providing operational services for the timely, continuous and sustainable delivery of high quality environmental data and information products related to marine environment in European coastal seas. JERICO-NEXT emphasizes that the complexity of the coastal ocean cannot be well understood if interconnection between physics, biogeochemistry and biology is not guaranteed. Such integration requires new technological developments allowing continuous monitoring of a larger set of parameters. The main objective of the project is to improve and innovate the cooperation in coastal observatories in Europe by implementing the coastal part of a European Ocean Observing System, to cooperate with other European initiatives as ESFRI (EURO-ARGO, EMSO, EMBRC), Integrated Infrastructures (FIXO3), OCEAN OF TOMORROW sensors innovation project (SenseNET, NEXOS), the emerging European biological network (EMBRC) and EMODnet to contribute to provide services to the research community and the society.

SEADATANET II

Since 2006 SeaDataNet has been operating and further developing a pan-European infrastructure for managing, indexing and providing access to ocean and marine environmental data sets and data products (e.g. physical, chemical, geological, bathymetric and biological properties) and for safeguarding a long term archival and stewardship of these data sets. Data are derived from many different sensors installed on board of research vessels, satellites and in-situ platforms, that are part of the various ocean and marine observing systems. Data resources are quality controlled and managed at distributed data centres that are interconnected by SeaDataNet infrastructure and accessible for users through a central portal. Already 90 data centres from 35 European countries are connected to the SeaDataNet standards and services for marine data management.

SeaDataNet maintains pan-European discovery services with overviews of marine organisations in Europe and their engagement in marine research projects, managing large datasets, and data acquisition by research vessels and monitoring programs for the European seas and global oceans:

- European Directory of Marine Organisations (EDMO)
- European Directory of Marine Environmental Data (EDMED)
- European Directory of Marine Environmental Research Projects (EDMERP)
- Cruise Summary Reports (CSR)
- European Directory of Oceanographic Observing Systems (EDIOS)

- Common Data Index (CDI)

SeaDataNet develops data products and aggregated data sets on five regions, Mediterranean Sea, Black Sea, Baltic Sea, North Atlantic, and Arctic and North Seas, that can be explored and downloaded by geographical viewing services. SeaDataNet infrastructure is based on the following series of standards and conventions:

- Common metadata standards and XML schemas, based on ISO 19115 / 19139
- Standard data transport formats such as ODV ASCII and NetCDF (CF)
- Common QC methods and quality flag scale
- Common Vocabulary Web services, used to mark up metadata and data, covering a broad spectrum of disciplines. Governed by an international board (SeaVox)
- Unified user interfaces for querying Discovery services
- Use of OGC, ISO, and INSPIRE standard

EEA - European Environment Agency

The European Environment Agency (EEA) is an agency of the European Union. Its task is to provide sound, independent information on the environment. It is a major information source for those involved in developing, adopting, implementing and evaluating environmental policy, and also the general public. Currently, the EEA has 33 member countries.

The regulation establishing the EEA was adopted by the European Union in 1990. It came into force in late 1993 immediately after the decision was taken to locate the EEA in Copenhagen. Work started in earnest in 1994. The regulation also established the European environment information and observation network (Eionet). The EEA's mandate is:

- To help the Community and member countries make informed decisions about improving the environment, integrating environmental considerations into economic policies and moving towards sustainability
- To coordinate the European environment information and observation network (Eionet)

The main clients are the European Union institutions - the European Commission, the European Parliament, the Council - and Member States. In addition to this central group of European policy actors, EEA also serve other EU institutions such as the Economic and Social Committee and the Committee of the Regions. The business community, academia, non-governmental organizations and other parts of civil society are also important users of EEA’s information.

EMSA

Earth Observation contributes to maritime surveillance to help manage the actions and events that can have an impact on maritime safety and security, including for marine pollution, accident and disaster response, search and rescue as well as maritime border and fisheries control. Data from the satellites are downlinked to a network of Ground Stations, processed into images, and analysed. The images and results are then sent to the Earth Observation Data Centre at EMSA.

At EMSA, this information is integrated with vessel traffic and other maritime information and disseminated to users of EMSA’s Integrated Maritime Services. The Agency provides Near Real Time delivery to its end users. The time of image acquisition by satellite to delivery of a final image to end users is 30 minutes for radar data and 60 minutes for optical data.

Satellite radar images provide day and night coverage independent of fog and cloud cover. Satellite optical images, can be acquired only in daylight and cloud free conditions, but provide very high resolution colour images of ports, coastlines and targeted activities at sea.

The Agency aims to provide fast access to commercial radar and optical satellite images, particularly in emergencies or in response to requests for specific operations at sea; to ensure reliable delivery, which is important for co-ordination with maritime surveillance assets such as patrol vessels and surveillance plans; and to offer accurate information of high quality in an accessible and user-friendly format.

4.2 International Atlantic monitoring programs and projects

The last column indicates what checkpoint matrices each program/project deals with.

№	Name/Web site	Type of initiative	Main range of activities	Relevant Matrices
1	**GEBCO** http://www.gebco.net/	UNESCO-IOC program	Bathymetric data collection, analysis and management	River bed/Seabed
2	**GRDC** http://www.bafg.de/GRDC/EN/01_GRDC/grdc_node.html	WMO hydrological and meteorological center	Repository for world's river discharge data Integrating infrastructure initiative for an European Research	Fresh Water
3	**ICES** – International Council for the Exploration of the Sea www.ices.dk	International Institution	Historical marine dataset	Marine Water Biota/biology River bed/seabed Human activities
4	**PSMSL - Permanent Service for Mean Sea Level** http://www.psmsl.org	International Permanent service for mean sea level	Tide gauges data around the world	Marine Water
5	**SOCAT** www.socat.info	Mean Sea Level International initiative	A Collection of Surface Ocean CO2 Observations Quality Controlled by the Science Community	Air Marine Water
6	**GO-SHIP** http://www.go-ship.org/	International initiative	Collection of repeated hydrography surveys	Air Marine Water
7	**DBCP – Data Buoy Cooperation Panel** http://www.jcommops.org/dbcp/	International Initiative Joint Body IOC-WMO	an international program coordinating the use of autonomous data buoys to observe atmospheric and oceanographic conditions, over ocean areas where few other measurements are taken	Air Marine Water
8	**Sea level facility** http://www.ioc-sealevelmonitoring.org/index.php	International initiative	Web-site focused on operational monitoring of sea level for real time sea level stations that are part of IOC programs i.e. (i) the Global Sea Level Observing System Core Network; and (ii) the networks under the regional tsunami warning systems in the Indian Ocean (IOTWS), North East Atlantic & Mediterranean	Marine Water

			(NEAMTWS), Pacific (PTWS) and the Caribbean (CARIBE-EWS)	
9	**SAHFOS**, Sir Alister Hardy Foundation for Ocean Science, Continuous Plankton Recorder (CPR) Survey https://www.sahfos.ac.uk/	Internationally funded independent research organization	As a large-scale global survey, it provides the scientific and policy communities with a basin-wide and long-term measure of the ecological health of marine plankton.	Marine Water Biota/Biology
10	**OBIS-** Ocean Bio-geographic Information System http://www.iobis.org/	IOC/IODE Project	OBIS users can identify biodiversity hotspots and large-scale ecological patterns, analyze dispersions of species over time and space, and plot species' locations with temperature, salinity, and depth.	Biota/Biology
11	**OceanSITES**, http://www.oceansites.org/	International network JCOMM core observing program	OceanSITES is to collect, deliver and promote the use of high-quality data from long-term, high-frequency observations at fixed locations in the open ocean	Air Marine Water
12	**OSPAR Data and Information System (ODIMS)** http://www.ospar.org/data	International Convention for North East Atlantic Area	ODIMS (in development) will be an online tool to improve the discovery, visualisation and accessibility of OSPAR data. Sufficient information is currently available to allow users to access the latest data collected as part of the ongoing monitoring work carried out in the OSPAR Maritime Area	Marine Water Biota/biology River bed/seabed Fresh Water Human activities
13	**FAO** http://www.fao.org/geonetwork	UN Organisation	FAO produces a large number of Geographic Information System (GIS) datasets for monitoring, assessment and analysis of environmental and socio-economic factors, being fisheries one of the main datasets.	Biota/Biology Human activities
14	**IODE -** International Ocean Data and Information Exchange http://www.oceandataportal.org/	Programme of IOC-UNESCO	The Ocean Data Portal will provide seamless access to collections and inventories of marine data from the NODCs in the IODE network and will allow for the discovery, evaluation (through visualisation and metadata review) and access to data via web services.	Marine Water Biota/biology River bed/seabed Human activities

GEBCO

GEBCO aims to provide the most authoritative publicly-available bathymetry of the world's oceans. It operates under the joint auspices of the Intergovernmental Oceanographic Commission (IOC) (of UNESCO) and the International Hydrographic Organization (IHO).The regional groups that GEBCO collaborates with are:

- Intergovernmental Oceanographic Commission (IOC) Regional Mapping Projects;

- International Hydrographic Organization (IHO) regional coordination work;
- GEBCO's regional mapping projects;
- GEBCO/Nippon Foundation Indian Ocean Bathymetric Compilation (IOBC) Project;
- European Marine Observation and Data Network (EMODnet) Bathymetry.

GEBCO produces a range of bathymetric data sets and products. This includes global gridded bathymetric data sets a global set of digital bathymetric contours; the GEBCO Gazetteer of Undersea Feature Names; the GEBCO Digital Atlas; the GEBCO world map and the IHO-IOC GEBCO Cook Book— a reference manual on how to build bathymetric grids.

The GEBCO_08 Grid is a global 30 arc-second grid largely generated by combining quality-controlled ship depth soundings with interpolation between sounding points guided by satellite-derived gravity data. However, GEBCO's global elevation models are generated by the assimilation of heterogeneous data types. In areas where they improve on the existing grid, data sets generated by other methods have been included. Land data are largely based on the Shuttle Radar Topography Mission (SRTM30) gridded digital elevation model. A 'source identifier', SID, grid is also available to download to accompany the GEBCO_08 Grid. This shows which grid cells have been constrained by bathymetry data during the gridding process. It is assumed that all data sources refer to mean sea level. However, in some shallow water areas, the grids include data from sources having a vertical datum other than mean sea level. The grid is available to download from the British Oceanographic Data Centre (BODC). The format is either ASCII or netCDF.

GRDC

The Global Runoff Data Centre (GRDC) is an International data centre operating under the auspices of the World Meteorological Organization (WMO) and is internationally mandated by the United Nations. Established in 1988 to support the research on global and climate change and integrated water resources management, the GRDC has been serving for twenty years successfully as a facilitator between the producers of hydrologic data and the international research community. GRDC is a key partner in a number of data collection and data management projects on a global scale. Its primary objective consists in supporting the water and climate related programs and projects of the United Nations, its specialised agencies and the scientific research community by collecting and disseminating hydrological data across national borders in a long-term perspective.

River discharge is one of the Essential Climate Variables (ECVs) and needs to be systematically observed to characterise the state of the global climate system, its variability and vulnerability. National services are called by the "Second Report on the Adequacy of the Global Climate Observing System for Climate" (2AR) to ensure that their observations and associated metadata, including historical observations, are available at the established international data centres. Against the background of increasing data loads and the wide range of data formats and transfer protocols in use, the standardisation and harmonisation of data became essential to efficient data exchange. The GRDC contributes to the process of developing a metadata profile applicable to the description of hydrologic data and based on the relevant ISO standards.

ICES

Datasets are organized around specific thematic data portals. The ICES data portal gathers all the content for you if you are not sure which specific thematic portal you require.

- Biodiversity database hosts seabird and seals abundance and distribution records and is linked to OSPAR, and ICES groups (JWGBIRD, WGMME)

- Contaminants, biological effects, and biological community data are made available through the DOME web portal (Database on Oceanography and Marine Ecosystems).
- Eggs and Larvae database makes available data collected by ichthyoplankton surveys for use by ICES and the wider marine community.
- Fish Trawl Survey datasets collected in connection with the Data Collection Framework (EU DCF) are managed under the DATRAS portal.
- Fish predation is the focus of the fish stomach data portal.
- Historical plankton is an 'historical' dataset collection, where the dataset is considered complete and there are no immediate plans to update it;
- Oceanographic data which includes temperature, salinity, oxygen, chlorophyll a, and nutrients measurements are made available through the OCEAN web applications.
- Impulsive underwater noise collates data on licensed events such as pile driving, controlled explosions from naval operations across the OSPAR and HELCOM areas.
- Vulnerable Marine Ecosystems hosts data on deep-water VMEs in the North Atlantic.

PSMSL

Established in 1933, the Permanent Service for Mean Sea Level (PSMSL) has been responsible for the collection, publication, analysis and interpretation of sea level data from the global network of tide gauges. It is based in Liverpool at the National Oceanography Centre (NOC), which is a component of the UK Natural Environment Research Council (NERC).

SOCAT

At the “Surface Ocean CO2 Variability and Vulnerability” (SOCOVV) workshop at UNESCO, Paris in April 2007, co-sponsored by IOCCP, SOLAS, IMBER, and the Global Carbon Project, participants agreed to establish a global surface CO2 data set that would bring together, in a common format, all publicly available fCO2 data for the surface oceans. (The fugacity of carbon dioxide, or fCO2, is the partial pressure of CO2 (pCO2) corrected for non-ideal behaviour of the gas.) This is an activity that has been called for by many international groups for many years, and has now become a priority activity for the marine carbon community. This data set will serve as a foundation upon which the community will continue to build in the future, based on agreed data and metadata formats and standard 1st level quality-control procedures, building on earlier agreements established at the 2004 Tsukuba workshop on “Ocean Surface pCO2 Data Integration and Database Development”. This activity also supports the SOLAS and IMBER science plans and their joint carbon implementation plan. This data set is meant to serve a wide range of user communities and it is envisaged that, in the future, 2 distinct data products will be made available in this Surface Ocean CO2 Atlas (SOCAT):

- 2nd level quality controlled global surface ocean fCO2 data set following agreed procedures and regional review and,
- a gridded SOCAT product of monthly surface water fCO2 means on a 1° x 1° grid with no temporal or spatial interpolation.

The EU CarboOcean project, has compiled the publicly-available surface CO2 data held at CDIAC (Carbon Dioxide Information Analysis Center), WDC-MARE (World Data Center for Marine Environmental Sciences) and elsewhere into a common format database based on the IOCCP recommended formats for metadata and data reporting. This compilation currently includes data from more than 10 countries, producing an initial database composed of more than 1850 cruises from 1968 to 2007 with approximately 6.3 million measurements of various carbon parameters, available in a common format, 1st level quality-controlled data set. This data set was published in 2011.

GO-SHIP

Despite numerous technological advances over the last several decades, ship-based hydrography remains the only method for obtaining high-quality, high spatial and vertical resolution measurements of a suite of physical, chemical, and biological parameters over the full water column. Ship-based hydrography is essential for documenting ocean changes throughout the water column, especially for the deep ocean below 2 km (52% of global ocean volume not sampled by profiling floats).

Global hydrographic surveys have been carried out approximately every decade since the 1970s through research programs such as GEOSECS, TTO/SAVE, WOCE / JGOFS, and CLIVAR. However, global repeat hydrography has lacked formal global organization since the end of WOCE and this has led to a lack of visibility for hydrography in the global observing system as well as a significant decrease in the number of trans-basin sections carried out by some countries. More importantly, the lack of international agreements for implementation of hydrographic sections has led to disparate data sharing policies, duplication of some sections, and sections being carried out without the full suite of core variables.

The Global Ocean Ship-based Hydrographic Investigations Program (GO-SHIP) brings together scientists with interests in physical oceanography, the carbon cycle, marine biogeochemistry and ecosystems, and other users and collectors of ocean interior data, and coordinates a network of globally sustained hydrographic sections as part of the global ocean/climate observing system including physical oceanography, the carbon cycle, marine biogeochemistry and ecosystems.

GO-SHIP provides approximately decadal resolution of the changes in inventories of heat, freshwater, carbon, oxygen, nutrients and transient tracers, covering the ocean basins from coast to coast and full depth (top to bottom), with global measurements of the highest required accuracy to detect these changes. The GO-SHIP principal scientific objectives are: (1) understanding and documenting the large-scale ocean water property distributions, their changes, and drivers of those changes, and (2) addressing questions of how a future ocean that will increase in dissolved inorganic carbon, become more acidic and more stratified, and experience changes in circulation and ventilation processes due to global warming and altered water cycle.

The GO-SHIP Panel recommended the development of a sustained repeat hydrography program to:

- develop formal international agreements for a sustained international repeat ship-based hydrography program, including an internationally-agreed strategy and implementation plan building on the guidelines in the Community White Paper,
- advocate for national contributions to this strategy and participation in the global program,
- provide a central forum for communication and coordination, and
- develop syntheses of hydrographic data, in partnership with national, regional, and global research programs.

DBCP – Data Buoy Cooperation Panel

The primary objective of the DBCP is to maintain and coordinate all components of the network of over 1250 drifting buoys and 400 moored buoys that provide measurements such as sea-surface temperature, surface current velocity, air temperature and wind speed and direction. This data is useful for Weather and Ocean Forecasts and research and additionally can be used to complement or validate remotely-sensed data and operational models. The DBCP also explores and evaluates new technologies and uses those which prove successful to improve operations.

Sea Level Facility

The objective of this service is:

- to provide information about the operational status of global and regional networks of real time sea level stations
- to provide a display service for quick inspection of the raw data stream from individual stations.

This web-site initially focused on operational monitoring of sea level measuring stations in Africa and was developed from collaboration between Flanders Marine Institute (VLIZ) and the ODINAFRICA project of IODE. The site has since been expanded to a global station monitoring service for real time sea level measuring stations that are part of IOC programs i.e. (i) the Global Sea Level Observing System Core Network; and (ii) the networks under the regional tsunami warning systems in the Indian Ocean (IOTWS), North East Atlantic & Mediterranean (NEAMTWS), Pacific (PTWS) and the Caribbean (CARIBE-EWS).

SAHFOS

The Sir Alister Hardy Foundation for Ocean Science (SAHFOS) is an international charity that operates the Continuous Plankton Recorder (CPR) Survey. The Foundation has been collecting data from the North Atlantic and the North Sea on biogeography and ecology of plankton since 1931. More recently, as the Foundation has become more involved in international projects, work has expanded to include other regions around the globe.

OBIS- Ocean Bio-geopraphic Information System

The concept of OBIS was first developed at a conference sponsored by the Census of Marine Life (CoML) in 1997. At the time, a comprehensive system for the retrieval of ocean biological data did not exist. The databases that did exist to distribute ocean biological data failed to "usefully summarize known distributions and abundance of marine life nor are they organized to encouraged frequent use or intercomparison of datasets" (Grassle 2000). The problems generated by this disenfranchisement of marine data from the frequent user are very serious ones: if scientists cannot efficiently collect and effectively share data about the oceans with each other, how will anyone be able to generate new, comprehensive hypotheses about our oceans? If new findings about the oceans remain localized and hidden from the rest of the marine science community, then the data fails to have an impact on research in the marine science community at large.

Not long after the initial meeting, OBIS was established as a project of the Census of Marine Life to help facilitate global enfranchisement of data within the scientific community. The goal of OBIS was simple: to create "an online, user-friendly system for absorbing, integrating, and accessing data about life in the oceans" (Grassle 2000). The system would stimulate taxonomic and systematic research and generate new hypotheses concerning: - evolutionary processes - factors related to maintainance of species distributions - roles of marine organisms in marine ecosystem function (Grassle 2000).

OceanSITES – Fix03

OceanSITES is a worldwide system of long-term, deepwater reference stations measuring dozens of variables and monitoring the full depth of the ocean, from air-sea interactions down to 5,000 meters.

Since 1999, the international OceanSITES science team has shared both data and costs in order to capitalize on the potential of the moorings and ship-based time series. The growing network now consists of about 30 surface and 30 subsurface arrays. Satellite telemetry enables near real-time access to OceanSITES data by scientists and the public.

OceanSITES is an integral part of the Global Ocean Observing System. The network complements satellite imagery and other in-situ observation data (like Argo floats) by extending the dimensions of time and depth. FixO3 is its European contribution.

FixO3 is the European contribution.

OSPAR Data and Information System (ODIMS)

OSPAR is the mechanism by which 15 Atlantic Governments & the EU cooperate to protect the marine environment of the North-East Atlantic. Its annex on biodiversity and ecosystems was adopted in 1998 to cover non-polluting human activities that can adversely affect the sea.

The OSPAR Data and Information System (ODIMS) is an online tool to improve the discovery, visualisation and accessibility of OSPAR data. It facilitates access to all the data and information gathered through OSPAR's Joint Assessment and Monitoring Program across the different thematic work areas. It will help ensure that data is readily accessible for OSPAR assessments, but also help users find out what data are available, facilitate access to it and make use of it.

Being well aware how much the data management landscape in Europe is evolving, it has been critically important over this past year to remain engaged with Contracting Parties, fellow Regional Seas Conventions, data centres (e.g. ICES), and European Union processes and projects to ensure OSPAR remains on track. The ODIMS project is currently on schedule for completion by OSPAR 2016 and to be put straight to the test in support of the IA 2017.

FAO

The FAO GeoNetwork provides Internet access to interactive maps, satellite imagery and related spatial databases maintained by FAO and its partners. Its purpose is to improve access to and integrated use of, spatial data and information. Through this website FAO facilitates multidisciplinary approaches to sustainable development and supports decision making in agriculture, forestry, fisheries and food security. Maps, including those derived from satellite imagery, are effective communicational tools and play an important role in the work of various types of users:

- Decision Makers: e.g. sustainable development planners and humanitarian and emergency managers in need of quick, reliable and up to date user-friendly cartographic products as a basis for action and better plan and monitor their activities;
- GIS Experts in need of exchanging consistent and updated geographical data;
- Spatial Analysts in need of multidisciplinary data to perform preliminary geographical analysis and reliable forecasts to better set up appropriate interventions in vulnerable areas.

The FAO GeoNetwork allows to easily share spatial data among different FAO Units, other UN Agencies, NGO's and other institutions.

5 Use cases related to challenges

A total of 21 use cases were provided by the 11 challenges. There were basically two different situations: (i) for challenges having a single issue (e.g. Windfarm), only one use case was submitted as a compilation of several bibliographic references and related characteristics; (ii) for challenges having two different strands of work such as the Coasts challenge with sea level and sediment balance, two use cases were provided.

The use cases were based on the scrutiny of 42 references. If we except challenges 1, 3 and 5 (with respectively 11, 3 and 4 references), all other challenges examined 2 references, in most cases corresponding to one specific thematic area. The total number of unique P02s was about 55, to be compared to the 78 unique P02s identified in the compilation of characteristics of section 3. This lower number can be explained by (i) the fact that the selected case studies do not always fully cover the thematic scope of the challenges, hence a more limited number, (ii) authors may not report all the data they used, (iii) challenge leaders are optimistic in their "wish list" of data they deem useful to carry out their challenges. Table 5.1 displays the use cases with their numbers of references and P02.

Table 5.1: List of use cases

ID	Title	Ref.	P02 from LS
CH1-UC1	Data assessment for windfarm siting in the European shelf area	11	19
CH2-UC1	A GIS tool for planning and managing a marine ecosystem	2	10
CH2-UC2	Ecologically or Biologically Significant Marine Areas (EBSAs) in the Northwest Atlantic	1	
CH2-UC3	Analysis of the MPA network in the Atlantic Arc	1	
CH3-UC1	Prestige accident	4	6
CH4-UC1	Atlantic Ocean temperature change	1	4
CH4-UC2	Arctic Report Card	1	
CH5-UC1	Global sea level rise analysis	5	4
CH5-UC2	Estuarine Suspended Sediment Loads and Sediment Budgets in Tributaries of Chesapeake Bay	1	
CH6-UC1	Mass of landings of fish by species and year by FAO area and country	4	2
CH6-UC2	Demersal discard atlas for the South Western Waters	1	
CH7-UC1	OSPAR Request to Produce Fishing Abrasion Pressure Maps	1	

CH7-UC2	Assessing the risk of vulnerable species exposure to deepwater trawl fisheries: the case of orange roughy Hoplostethus atlanticus to the west of Ireland and Britain	1	5
CH8-UC1	The Interaction between Fish Farming and Algal Communities of the Scottish Waters	1	
CH8-UC2	Phytoplankton and Eutrophication Modelling in the Vilaine Bay	1	
CH9-UC1	A compendium of world river discharge to the oceans	1	5
CH9-UC2	Global suspended sediment and water discharge dynamics	1	
CH10-UC1	Connections Between Ocean Bottom Topography and Earth's Climate	1	3
CH10-UC2	Report of the Investigation into the Grounding of Passenger Vessel Queen Elizabeth II on 7 August 1992	1	
CH11- UC1	Geographic spread of widespread invasive alien species across Europe	1	6
CH11-UC2	Mapping the impact of alien species on marine ecosystems	1	
TOTAL		**42**	**62**

Below is a description of each use case with a short description followed by a list of characteristics along with the matrices concerned and a list of references.

5.1 Windfarm siting

CH1-UC1: Windfarm siting in the European shelf area

Offshore wind energy is an emerging industry and research, increasingly developing new solutions based on technological innovation. However, current commercial exploitation are limited to wind turbines relying on fixed foundations in marine zones with 40 to 50 m maximum water depth which will be a major constraint to the industry growth in general due to the limited suitable shallow water sites (Murphy et al., 2011; The Crown Estate, 2012) and also poses a strong limitation to countries and regions with narrow shallow water shelves. Increases in farm size and distance to shore are both inevitable in future offshore wind farm developments, to reduce the dependency on shallow water sites and to explore high wind resources in further offshore and deeper water regions (González and Diaz-Casas, 2016; Ng and Ran, 2016).

To unlock the market potential of this renewable energy industry in the future, new technology for developing further offshore deep water (>50 m) windfarm needs to be researched to reduce implementation and operational windfarm costs (Drake and Smith, 2010). Over the last years, the industry has been testing new deep offshore technology (Statoil, 2010; Jamieson, 2011; Vita, 2011; Borg et al, 2012; Principle Power, 2012; Collu and Borg, 2016). To exploit the vast wind resources available in deep water it is expected that commercial deep water windfarms will become more and more cost-effective and will gradually be installed in the near term (Arapogianni et al., 2013).

Characteristics

- MBAN Bathymetry
- ADUN Administrative limits

- DPEV Depositional environment
- COAS Terrestrial mapping
- EWSB Wind strength and direction
- WVST Wave height and period statistics
- LITH Lithology
- GWDR Wave direction
- LRZA Vertical velocity of the water column (currents)
- HEAV Wave height estimates
- RFVL Horizontal velocity of the water column (currents)
- PSST Skin temperature of the water colum
- TRAN Maritime transport
- GP004 Bird reproduction
- BRDA Bird counts
- HBEX Habitat extent
- IACT Industrial activity

Matrices

Air, Marine water, River/Seabed, Biota/Biology, Human activities

References

- Arapogianni, A., Genachte, A.M., and et al., 2013. Deep Water - The next step for offshore wind energy. European Wind Energy Association report. 51 pp.
- Borg, M., Collu, M., Brennan, F.P., 2012. Offshore Floating Vertical Axis wind turbines: advantages, Disadvantages and Dynamics Modelling State of art. In RINA International conference "Marine Renewable and Offshore Wind Energy", 26 – 27 September 2012.
- Collu, M.; Borg, M., 2016. Design of floating offshore wind turbines. In Offshore Wind Farms Technologies, Design and Operation, Chong Ng and Li Ran (Ed). 359-385 pp.
- Drake, K.R., Smith, T.W.P, 2010. An investigation into the Use of an Articulated Column Supported Wind Turbine in Water Depths of 60-120 meters. In RINA International conference "Marine Renewable and Offshore Wind Energy", 21 – 23 April 2010.
- González, S.F, Diaz-Casas, V., 2016. Present and Future of Floating Offshore Wind. In Floating Offshore Wind Farms, Castro-Santos, L., Diaz-Casas, V. (Ed.), Springer. pp 1-22.
Jamieson, P. 2011. Innovation in Wind Turbine Design, 1st ed, Wiley, London. 298 p.
- Murphy, J., Lynch, K., Serri, L., Airdoldi, D., Lopes, M., 2011. Site Selection Analysis for Offshore Combined Resource Projects in Europe. Results of the FP7 ORECCA Project Work Package 2, report. 123 p.
- Ng, C., Ran, L., 2016. Design of floating offshore wind turbines. In Offshore Wind Farms Technologies, Design and Operation, Chong Ng and Li Ran (Ed). 3-8 pp.
- Principle Power, 2012. WindFloat Prototype. Available at: http://www.principlepowerinc.com/en/windfloat.
- Statoil, 2010. Hywind Demo. Available at: http://www.statoil.com/en/TechnologyInnovation/NewEnergy/RenewablePowerProduction/Offshore/Hywind/Pages/HywindPuttingWind PowerToTheTest.aspx?redirectShortUrl¼http://www.statoil.com/hywind.
- The Crown Estate, 2012. UK Market Potential and Technology Assessment for floating offshore wind power: An assessment of the commercialization potential of the floating offshore wind industry. 24 p.
- Vita, L. 2011. Offshore floating vertical axis wind turbines with rotating platform (Ph.D. thesis), Technical University of Denmark, Roskilde, Denmark.

5.2 Marine Protected Areas

CH2-UC1: A GIS tool for planning and managing a marine ecosystem

Marine ecosystem resources are crucial for the economy and human activities in Transboundary Grenadine Islands area. Monitoring and mitigating the non-sustainable use of

these resources is essential for the stockholders to maintain good state of preservation and to establish effective sustainable developement. For this a 'Participatory GIS' Marine Resource and Space-use Information System (MarSIS) was developed to assist stakeholders in maintaining these objectives. MarSIS, which is based on Ecosystem-Based Management approach (EBM) and the concept of Marine Spatial Planning and Management (MSPM), is a geodatabase containing multi-disciplinary referenced data whose purposes are:

- effectiveness in data management and identification of information gaps
- promotion of spatial thinking including increased understanding or spatial relationships
- definition of areas of importance for conservation, human activity and threat. These can provide the basis for a scientifically appropriate and socially acceptable marine space-use plan.

MarSIS incorporates multi-disciplinary data collected from various sources (local or international) or from geoprocessing products and field surveys. (e.g. using Marxan geoprecessing http://www.uq.edu.au/marxan/index.html?p=1.1.1). It is a tool can to be used to assess the representativity and the coherence of an MPA network.

Characteristics

- MBAN Bathymetry
- MMST Roads
- HBEX Distribution of Coral Reefs
- MLES Recreational activities
- GP087 Finfish farming

Matrices

River/SeaBed, Human activities, Biota/Biology, Marine water

References

- Baldwin, K. Mahon, R. A. Geospatial framework to support ecosystem-based management and marine spatial planning for the transboundary Grenadine Islands.
- Baldwin, K. Developing a framework for a comprehensive marine multi-use zoning plan for the Grenadine Islands. University of the West Indies, Barbados. May 2012, 129pp. http://www.grenadinesmarsis.com/Home_Page.html"

CH2-UC2: Ecologically or Biologically Significant Marine Areas (EBSAs) in Northwest Atlantic

Ecologically or Biologically Significant Marine Areas (EBSA) is a concept that was mostly applied in the North Atlantic. It is a result of a collaboration between scientists to process pluridisciplinary data with a view to mapping areas requiring enhanced conservation measures meeting the following criteria:

- Uniqueness or rarity
- Special importance for life-history stages of species
- Importance for threatened, endangered or declining species and/or habitat
- Vulnerability, fragility, sensitivity, or slow recovery
- Biological productivity
- Biological diversity
- Naturalness

Pluridisciplinary data were collected to compute these EBSAs and to enable extension of MPAs in the NW Atlantic. It can also help assess the representativity and the coherence of MPA networks in protecting threatened ecosystems in shallow and deep waters. In this way it informs availability and interoperability of the best available marine and coastal biodiversity data sets.

Characteristics

- HBEX Marine Ecoregions of the World (MEOW)

- HBEX Large Marine Ecosystems (LMEs)
- HBEX Longhurst Marine Provinces
- CEMO Cetacean mortality
- FCST Catches of Commercial Pelagic Species

Matrices

River/Seabed, Human activities, Biota/Biology, Marine water

References

- Patrick Halpin, Jesse Cleary, Corrie Curtice, Ben Donnelly, Daniel Dunn, Jason Roberts. Data to inform the CBD Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas in the Northwest Atlantic, Prepared for the Secretariat of the Convention on Biodiversity (SCBD), March 2014.

CH2-UC3 - Analysis of the MPA network in the Atlantic Arc

The MAIA project covered the national marine jurisdiction of Portugal, Spain, France, UK and Ireland. It included an analysis of the effectiveness of the MPA network coherence in the Atlantic Arc carried out by geo-processing the MPA network boundaries along with various types of data (bio-regions, bathymetry, distribution of species and habitats). This procedure sought to highlight the degree of representation, within the MPA network perimeter, of the main features that justify protective measures: major ecosystems, habitats and species and to assess whether the MPA network constitutes a representative and coherent network as described in article 13 in the Marine Strategy Framework Directive. The following indicators were retrieved:

- Percentage of protection for different bio-regions in the Atlantic ARC with a cross-analysis between MPA network (Portugal, Spain, France, UK and Ireland) and the extent of the biogeographic area;
- Average depth in the Atlantic Arc MPA network;
- Percentage of protection for seabed habitats (at level 2 of the EUNIS classification);
- Percentage of protection for OSPAR habitats;
- Analysis of the distribution of species in relation to the French MPA network
- Connectivity between MPAs in the Atlantic Arc

Characteristics

- HBCH Eunis Seabed Habitat characterisation
- HBEX Distribution of Ospar Habitat
- BRDA Sightings of seabirds, littoral birds and terrestrial birds
- FABD Sightings of marine mammals and other marine fauna
- CEBH, GP004, GP018, GP018, GP069, GP088 and SEBH Species behavior and dispersal.

Matrices

River/Seabed, Human activities, Biota/Biology, Marine water

References

- Odion, M.. Ponge, B. First analyse of MAIA database - A tool designed for the Analysis of the MPA network In the Atlantic Arc, Poster - 11/10/2013, IMPAC 3.

5.3 Oil Leak Challenge

CH3-UC1 – Prestige case

The study focused on the coast of Galicia (Spain), southwest of the Galicia Bank where the Prestige oil spill described occurred. Numerical simulations of this spill were performed using the met.no oil spill fate model OD3D, comparing the impact of ocean forcing data from two

global ocean models: FOAM and Mercator. These two sets of twin numerical simulations of the Prestige spill were performed in order to illustrate the current state-of-the-art in operational oil spill fate prediction in Europe.

After extraction of the required input data, the different data sets are treated to meet met.no's internal file format requirements (temporal and spatial interpolations). Simulations are run with the OD3D model for the different phases of the oil spill. It results in predictions about drift, dispersion and weathering of the oil. In this case, maps of oil distribution are provided, showing the results of oil drift simulations plotted on sea charts used for navigation, including a budget of oil and emulsion amounts.

The report also provides a number of recommendations for improving operational oil spill modeling and for implementing a service chain for regional and global oil spill forecasting.

Characteristics

- RFVL Horizontal velocity of the water column (currents)
- EWSB Wind speed and direction
- CDTA Air temperature and density
- PSAL Salinity of the water column
- TEMP Temperature of the water column
- WVST Wave height and period statistics

Matrices

Air, Marine Water

References

- Bahurel, P., P. D. Mey, C. L. Provost, and P. L. Traon, A godae prototype system with applications - example of the Mercator system., in Proceedings International Symposium "En route to GODAE", 13-15 June 2002, Biarritz, France, edited by CNES, pp. 137–142, 2002.
- Bell, M. J., R. M. Forbes, and A. Hines, Assessment of the foam global data assimilation system for real-time operational ocean forecasting. J. Mar. Sys., 25, 1–22, 2000.
- Bell, M. J., R. Barciela, A. Hines, M. J. Martin, M. E. McCulloch, and D. Storkey, The forecasting ocean assimilation model (FOAM) system, in Building the European Capacity in Operational Oceanography - Proceedings of the Third International Conference on EuroGOOS, pp. 197–202, Elsevier, 2003.
- Daling, P. S., and M. Moldestad, The Prestige oil - Weathering properties, no. 2 in NEWS, SINTEF Applied Chemistry, 2003. 26.

5.4 Climate

CH4-UC1: Atlantic Ocean temperature change

This case study is a very focused initiative to provide updates of the climatic status of the North Atlantic Ocean on an annual basis. The data sets are contributed by members of a Working Group of ICES from their national hydrographic monitoring programs in order to update time series plots and made available through a website. This group then edits and collates some additional externally supplied information citing the originating information. The main additional data source is from NOAA with fully open and available data structures with immediate access. The optimal analysis is provided as the work of a co-author and as such for the initiative the access is immediate and highly available but for external users would require further collaboration and use of the Coriolis Data Centre. This is a very successful initiative but has a very narrow focus and well defined objective which has been incrementally developed over the last 16 years.

By combining in situ time-series, optimal analysis and gridded climatology the report is able to cover almost all of its objectives. In terms of improvements time-series within some of the areas could be added.

Characteristics

- TEMP Water temperature

Matrices

Marine water

References

- Gaillard, F. 2015. ISAS-13 temperature and salinity gridded fields. Pôle Océan. http://doi.org/z77

CH04-UC2: Arctic Report Card

The Arctic Report Card (ARC) extends over the Arctic region as a whole (extending beyond the EMODNET Arctic Challenge into the North Atlantic) and has been active since about 1900. It considers a range of environmental observations throughout the Arctic, and is updated annually with a view to highlight the changes that continue to occur in both the physical and biological components of the Arctic environmental system. It is designed to be a timely and peer-reviewed source for clear, reliable and concise environmental information on the current state of different components of the Arctic environmental system relative to historical records. The Report Card is intended for a wide audience, including scientists, teachers, students, decision-makers and the general public interested in the Arctic environment and science.

The ARC has three sections: (i) Annual updates on seven topics termed 'Vital Signs' including maps and time series of: Air Temperature, Terrestrial Snow Cover, Greenland Ice Sheet, Sea Ice, Sea Surface Temperature, Ocean Primary Productivity and Tundra Greenness, (ii) Updates on a number of indicators produced every 2-4 years, (iii) Reports on new items, emerging issues, that relate to long-term scientific observations in the Arctic reported as 'Frostbites'. It is peer-reviewed by the Arctic Monitoring and Assessment Programme (AMAP) of the Arctic Council.

Characteristics

- CRYS Sea Ice extent
- TEMP Sea surface temperature
- CPWC Arctic Ocean Primary Productivity

Matrices

Marine water, Cryosphere, Biota/Biology

References

- M. O. Jeffries, J. Richter-Menge, and J. E. Overland, Eds., 2015: Arctic Report Card 2015, http://www.arctic.noaa.gov/reportcard.

5.5 Coasts

CH5-UC1: Global sea level rise analysis

Church and White (2011) have estimated the rise in global average sea level from satellite altimeter data for 1993-2009 and from coastal and island sea level measurements from 1880-2009. Monthly sea level data downloaded from the Permanent Service for Mean Sea Level (PSMSL) provided in-situ sea level data from around 2,000 tide gauges around the world. However, only carefully selected records meeting certain criteria were used, and peaked at 399 tide gauges in 1985. Corrections for local land motion resulting from the response of the Earth to changes in surface loading following the last glacial maximum were removed using the estimates of glacial isostatic adjustment (GIA). Also, the analyses were carried out with and without the correction of the sea level records for atmospheric pressure variations. The impact of terrestrial loading and gravitational changes resulting from dam storage were also tested. For the altimetry, TOPEX/Poseidon, Jason-1 and OSTM/Jason-2 satellite altimeter

missions measuring sea surface height relative to the centre of mass of the Earth were used and were gridded over the ice-free ocean between 65S and 65N. A number of necessary corrections were applied to these datasets following the user manuals and calibrations of TOPEX/Poseidon against tide gauges had previously been carried out. The derived products consist of the global estimates of sea level rise from in-situ data for 1880-2009 (i.e. reconstruction) and from satellites for 1993-2009 along with uncertainties. The linear trends are also derived as well as the variability in the rate of rise (i.e. acceleration) during the 20th century.

Characteristics

- ASLV Tide gauge records
- ASLV Satellite altimetry
- Vertical land motion
- CAPH Mean sea level pressure

Matrices

Marine water

References

- Church, J. A. and N.J. White (2011), Sea-level rise from the late 19th to the early 21st Century, Surveys in Geophysics, 32(4-5), 585-602.
- Cazenave, A., Chambers, D.P., Cipollini, P., Fu, L.L., Hurell, J.W., Merrifield, M., Nerem, S., Plag, H.P., Shum, C.K., Willis, J. (2009) The challenge for measuring sea level rise and regional and global trends. In, Hall, J., Harrison, D.E. and Stammer, D. (eds.) Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society, Vol. 1. OceanObs'09: Sustained Ocean Observations and Information for Society Noordwijk, The Netherlands, European Space Agency, 135-152. (ESA Special Publication WPP-306).
- Church, J.A., White, N.J., Coleman, R., Lambeck, K. and Mitrovica, J.X., 2004. Estimates of the regional distribution of sea level rise over the 1950-2000 period. Journal of Climate, 17(13), pp.2609-2625.
- Douglas, B. C., 1991: Global sea level rise. J. Geophys. Res., 96, 6981–6992.
- Allan R, Ansell T (2006) A new globally complete monthly historical gridded mean sea level pressure dataset (HadSLP2): 1850–2004. J Clim 19:5816–5842.

CH05-UC2: Estuarine Suspended Sediment Loads and Sediment Budgets in Tributaries of Chesapeake Bay

The purpose of the project was to identify estuarine sediment transport processes and estimate sediment loads and sediment budgets for the major tributaries of the Chesapeake Bay.

The results of this study represent the most comprehensive calculations to date of sediment loads for bay tributaries. The three rivers exhibit different magnitudes and transport directions of sediment loads at individual stations. Average sediment loads for the rivers as a whole show the York, Patuxent, and Potomac all importing sediment.

Characteristics

- MSFX Sedimentation flux quantification in the water column
- ASLV Sea level
- COGE Coastal geomorphology

Matrices

Marine water

References

- http://ccrm.vims.edu/publications/projreps/Sediment_Loads_Budget_Final_Report.pdf

5.6 Fisheries management

CH06-UC1: Mass of landings of fish by species and year by FAO area and country

The mass of landings by species and year is the more common statistic that is collected at global level and is the minimum parameter that is needed for starting evaluating fisheries effects and the state of the fish stocks exploited by humans. From the mass level the second step of knowledge is the number of fish, normally aggregated by length or by age in order to be used in more complex population dynamics models. Unfortunately in the definition of the specifications of the challenge it is clearly stated that only global numbers (without stratification in length or age) are requested, which makes it of lesser use for population dynamics assessment normally used in fisheries science.

FAO has estimated the total amount of catches (in fact landings until the earlies 90s for some countries) since 1950. FAO created the Coordinating Working Party on Fishery Statistics (CWP) in 1960 that provides a mechanism to coordinate fishery statistical programmes of regional fishery bodies and other inter-governmental organizations with a remit for fishery statistics. The CWP's purpose is (i) to continually review fishery statistics requirements for research, policy-making and management, (ii) to agree on standard concepts, definitions, classifications and methodologies for the collection and collation of fishery statistics, (iii) to make proposals for the coordination and streamlining of statistical activities among relevant intergovernmental organizations. One of the final products is the Capture Production 1950-2014 Database where provides the mass of marine organism fished by country and by FAO area.

Characteristics

- Fish and shellfish catch statistics

Matrices

Human activities

References

- FAO (1995). The Coordinating Working Party on Fishery Statistics: Its Origin, Role and Structure. FAO Fisheries Circular No.903. Rome, December 1995.
- Watson, R. & Pauly, D. (2001). Systematic distortions in world fisheries catch trends. Nature 414, 534-536 (29 November 2001.
- Pauly, D., & Zeller, D. (2003). The global fisheries crisis as a rationale for improving the FAO's database of fisheries statistics. Fisheries centre research reports, 11(6), 1-9.
- Worm, B., Davis, B., Kettemer, L., Ward-Paige, C. A., Chapman, D., Heithaus, M. R. & Gruber, S. H. (2013). Global catches, exploitation rates, and rebuilding options for sharks. Marine Policy, 40, 194-204.

CH06-UC2: Demersal discard atlas for the South Western Waters

The new Common Fisheries Policy (CFP) recently launched by the European Union (European Union 2013) aims at a gradual elimination of discards, and therefore includes provisions for a landing obligation. Discard management plans are required to detail the implementation of the landing obligation as per Article 15, § 5 and 6 of this regulation. As per article 14.2, Member States may produce a "discard atlas" showing the level of discards in each of the fisheries which are covered by Article 15(1).

This atlas has been prepared to serve as a basis for building up the discard management plan in the South Western Waters (SWW). It concerns demersal fisheries up to 20 metres above seafloor. The atlas includes (i) comprehensive information on discards and landings of the demersal fisheries in the South Western Waters (ii) existing management measures to mitigate discards (iii) elements of understanding on drivers and incentives for discarding and (iv) recommendations for mitigation solutions.

Characteristics

- Fishing by-catch

Matrices

Human activities

References

- Rochet M.-J., Arregi, L., Fonseca, T., Pereira, J., Pérez, N., Ruiz, J., and Valeiras J. Demersal discard atlas for the South Western Waters. 121 p.

5.7 Fisheries impact

CH7-UC1: OSPAR Request to Produce Fishing Abrasion Pressure Maps

ICES Working Group on Spatial Fisheries Data (WGSFD) answered an OSPAR data call (05/2014) to generate maps of fishing effort and fishing intensity in the OSPAR region using VMS and logbook data. The data has been worked up to produce abrasion maps and has been used by other ICES groups (BEWG & WGDEC) involved in assessing the impact of fishing activities that use bottom contacting gear with the seabed and in particular, the impact of such activities on sensitive habitats.

Annual maps of total fishing effort in hours and for each bottom contacting gear type and fishing intensity were generated at a resolution of 0.05 degrees for the OSPAR and HELCOM regions. A map of the relative change in fishing effort over years was also produced. Using findings from the EU FP7 BENTHIS project, gears and their components were categorised making it possible to map the fishing intensity that affects only the subsurface of the seabed and that which also penetrates the substrate separately. A gridded "swept area" approach (area x distance travelled), was utilized to convert the fishing activity data into a metric that represents abrasion at the OSPAR region scale. A habitat map of the region was scored qualitatively using a sensitivity matrix. Both habitat sensitivity and fishing pressure maps were combined to produce a map of fishing impact on sensitive habitats for the OSPAR region.

Characteristics

- ACYC VMS positions
- HBEX Seabed habitats
- FCST Fish and shellfish catch statistics

Matrices

Human activities, Seabed

References

- ICES. 2015. Report of the Working Group on Spatial Fisheries Data (WGSFD), 8–12 June 2015, ICES Headquarters, Copenhagen, Denmark. ICES CM 2015/SSGEPI:18. 150 pp.

CH7-UC2: Assessing the risk of vulnerable species exposure to deepwater trawl fisheries: the case of orange roughy Hoplostethus atlanticus to the west of Ireland and Britain

The susceptibility of orange roughy to current and historical fisheries was evaluated by carrying out a high resolution analysis of the spatial overlap between the distribution of the stock and the spatial footprint of recent fisheries. A one-off pilot survey over 15 days in the Irish EEZ was necessary, working to a depth of 2000m.

Characteristics

- MBAN Bathymetry
- ACYC VMS positions
- FCST Fish and shellfish catch statistics
- FEFF Fishing effort

Matrices

Human activities, Seabed

References

- Dransfeld, L., Gerritsen, H.D., Hareide, N.R. and Lorance, P. (2013). Assessing the risk of vulnerable species exposure to deepwater trawl fisheries: the case of orange roughy Hoplostethus atlanticus to the west of Ireland and Britain. Aquat. Living Resour. 26, 307–318.

5.8 Eutrophication

CH08_UC1: The Interaction between Fish Farming and Algal Communities of the Scottish Waters

The ultimate aim was to comment on the possible impact of marine cage fish farming on the environment with regard to i) the potential for eutrophication to affect algal communities and ii) the available scientific evidence on the linkage between aquaculture and algal bloom development with reference to the Scottish coastal waters. It also concerns itself with iii) the locally occurring effects of fish farming within the wider context, iv) the current knowledge on the occurrence and the time development of algal blooms (harmful or otherwise) in Scottish coastal waters and v) to assess the impact of nutrient inputs from fish farms on the algal communities of the Scottish coastal zone. The focus was on hydrography and nutrient conditions in Scottish coastal waters, both within the fjords and the shelf waters. The report also includes a review of the Scottish monitoring programs, a presentation of fish farm and nutrient waste production, data on primary production and occurrence of algal blooms

Characteristics

- RVDS Flow rate
- PSAL Salinity
- TEMP Temperature
- SECC Secchi disk depth
- AMON Ammonium and ammonia concentration parameters in water bodies
- NTRA Nitrate concentration parameters in the water column
- PHOS Phosphate concentration parameters in the water column
- SIXX Concentration of silicon species in the water column
- MZBN Microzooplankton generic abundance in water bodies
- PNTX Phytoplankton generic abundance in water bodies

Matrices

Marine Water

References

- Scottish Executive 2003, The Interaction between Fish Farming and Algal Communities of the Scottish Waters - A review. http://www.gov.scot/resource/doc/46930/0014748.pdf

CH08-UC2: Phytoplankton and Eutrophication Modelling in the Bay of Vilaine

The Bay of Vilaine (South Brittany) has been showing for many years eutrophication issues (red tides, anoxia, toxic blooms) which cause dramatic biological and economical problems. Facing these biological and economic problems, scientific studies have been performed and the results are joined in an ecological box model of the bay. It simulates the primary production through nitrogen and phosphorus cycle, dissolved oxygen, and salinity, used to calibrate the advection-dispersion fluxes of the physical submodel. A special attention is reported on the oxygen and nutrients balance sheet. Simulations try to quantify the oxygen demand and to recognize the major cause of anoxia. Results are applied to reproduce the July 1982 anoxia, which caused drastic fish mortalities. The ecological box model, which combines a three-dimensional hydrodynamic model and a biological model, describes phytoplankton, nutrient

cycles and seasonal oxygen evolution in the Bay of Vilaine. To couple these models, currents were averaged over time and space into a box model of the bay. This describes the results of sensitivity analyses to elucidate the model's behaviour in relation to eutrophication.

This use case is useful to assess the appropriateness of data to assess eutrophication and its causes; the case is good to describe parameters needed and methodology to apply to describe eutrophication. The assessment highlights improvements that could be made by using other parameters such as phytoplankton and oxygen in situ measurements in the biological model, satellite data of wind, ocean color data and sea surface temperature.

Characteristics

- TDIN Dissolved inorganic nitrogen concentration in the water column
- TDPX Dissolved total or organic phosphorus concentration in the water column
- ZNTN Zooplankton non taxonomy-related biomass expressed as nitrogen per unit volume of the water column
- NTSD Nitrogen concentrations in sediment
- DOXY Dissolved oxygen parameters in the water column
- PSAL Salinity of the water column
- TEMP Temperature of the water column
- CSLR Solar Radiation
- WVST Wave height and period statistics
- ASLV Sea Level
- RFVL Horizontal velocity of the water column (currents)
- EWSB Wind strength and direction
- RVDS River flow and discharge

Matrices

Marine water, Fresh water

References

- Chapelle A., Lazure P., Menesguen A. (1994). Modelling eutrophication events in a coastal ecosystem. Sensitivity analysis. Estuarine Coastal And Shelf Science, 39(6), 529-548.

5.9 River inputs

CH9-UC1: A compendium of world river discharge to the oceans

The GEMS-GLORI register, circulated by UNEP for review in 1996, lists 555 world major rivers discharging to oceans (river discharge Q > 10 km^3/year, or drainage area A > 10 000 km^2, or sediment discharge > 5Mt/year, or basin population >5M people). Up to 48 river attributes are listed, including major ions and nutrients (C, N, P) in dissolved, particulate, organic and inorganic forms. The authors restricted their study to the largest rivers, and chose a criteria that is based on water discharge, drainage area, suspended load and basin including major industries or very high population.

For many rivers, two or three sets of data are provided with relevant periods of records and references. Although half of the selected rivers are not yet documented for water quality, most of the first 40 rivers are well described (Irrawady, Zambezi, Ogooué, Magdalena, are noted exceptions). Altogether about 10 000 individual data from 500 references are listed. The global coverage in terms of river discharge and/or drainage area ranges from 40 to 67% for most major water quality attributes but drops to 25% for some organic and/or particulate forms of N and P. Planned development of the register includes collection of information on particulate chemistry and data on endorheic rivers and selected tributaries.

GEMS-GLORI can be used to compute world budgets at global scale and, in most cases, some regional ones provided that sound procedures are used.

Characteristics

- RVDS Flow rate
- TDNT N-Total
- PHOS P-Total

Matrices

Fresh water

References

- Meybeck, Michel; Ragu, Alain (1997): Presenting the GEMS-GLORI, a compendium of world river discharge to the oceans. Freshwater Contamination (Proceedings of Rabat Symposium S4, April-May). IAHS Publications.

CH9-UC2: Global suspended sediment and water discharge dynamics

The purpose of the application is to establish a quantitative description of global river fluxes. That is one of the main goals of contemporary hydrology and geomorphology. The application is based on numerical modelling of rivers input. Numerical models are based on hypothesis and rely on a large number of semi-empirical parameters. Therefore they require data both for parameter calibration and validation to confirm that initial hypothesis is relevant for representing natural and often non linear processes. Data can also be used for assimilation in order to adjust a set of parameters.

The present case study highlights the use of data and progress in numerical modelling. Eventually, the authors estimate changes in global river water discharge and suspended sediment flux over a 50-year period, 1960–2010, applying a new version of the WBMsed (WBMsed v.2.0) global hydrological water balance model. For numerical reasons, the product provides information for rivers whose drainage basin is larger than 40,000km^2 and river discharge greater than 30m^3.s^{-1}.

The model presented here is used to simulate water discharge and suspended sediment flux at 6 arc-minute resolution between 1960 and 2010. The results are used to analyse the yearly trends (normalized departure from mean) at both pixel scale and continental average. In this paper, an analysis on continental-scale interplay between suspended sediment flux and water discharge is presented. A more focused analysis in three large basins (Ganges, Danube and Amazon) is performed to explain discrepancies between water and sediment discharge, demonstrating an intriguing spatial–temporal interplay between lithology, topography and precipitation.

Characteristics

- RVDS Flow rate
- LIFX Sedimentation flux of suspended particulate material
- MBAN Land elevation
- CPRP Precipitation rate

Matrices

Fresh Water, Seabed

References

- Sagy Cohen, Albert J. Kettner, James P.M. Syvitski, Global suspended sediment and water discharge dynamics between 1960 and 2010: Continental trends and intra-basin sensitivity, Global and Planetary Change, Volume 115, April 2014, Pages 44-58, ISSN 0921-8181, http://dx.doi.org/10.1016/j.gloplacha.2014.01.011.

5.10 Bathymetry

CH10-UC1: Connections Between Ocean Bottom Topography and Earth's Climate

The aim of the study is to get an understanding of the influence of the seafloor as one of the critical controls on the ocean's general circulation. Its influence comes through a variety of mechanisms including the contribution of mixing in the ocean's interior through the generation of internal waves created by currents flowing over rough topography. The influence of topographic roughness on the ocean's general circulation occurs through a series of connected processes. The enhancement of vertical mixing over regions of rough topography has important implications for the abyssal stratification and circulation. These in turn have implications for the storage and transport of energy in the climate system, and ultimately the response of the climate system to natural and anthropogenic forcing. Finally, mixing of the stratified ocean leads to changes in sea level; these changes need to be considered when predicting future sea level.

The following actions were planned: (i) Outlining the connections between ocean bathymetry, tides, ocean circulation and heat transport, sea level and more generally the Earth's climate, (ii) establishment of the basic principles governing these processes, in particular, identification of areas where ocean tides flow over rough topography requiring an accurate bathymetry to determine. These are to be supported by global bathymetry datasets with particular interest in areas of topographic roughness.

Characteristics

- MBAN Bathymetry

Matrices

Seabed

References

- Jayne, S. R., St. Laurent, L. C. and Gille, S. T. 2004. Connections between ocean bottom topography and Earth's climate, Oceanography Special Issue - Bathymetry from Space, Vol. 17, No 1/2004, doi 10.5670/oceanog.2004.68.

CH10_UC2: Report of the Investigation into the Grounding of Passenger Vessel QUEEN ELIZABETH 2 on 7 August 1992

On 7 August 1992, Queen Elizabeth II, a UK registered passenger vessel with 1824 passengers and 1003 crew members on board, grounded on uncharted and previously unsurveyed rocks located to the south of Cuttyhunk Island, MA, USA.

Recommendations to the UK Hydrographic Office are that they should, where applicable, endeavour to provide charted information relating to the dates and coverage areas of surveys conducted by other national authorities upon which a particular Admiralty chart is based. The Marine Directorate was also recommended to provide further guidance on squat so that its effect on a particular vessel, when operating under a range of anticipated circumstances and conditions, may be reasonably estimated in cases where no specific data based on manoeuvering trials or computer simulation is available. Areas where ocean tides flow over rough topography require an accurate bathymetry to determine.

Characteristics

- HZNV Hazards to navigation
- ASLV Sea level

Matrices

Seabed

References

- Marine Investigation Branch 1992, Report of the Investigation into the Grounding of Passenger Vessel QUEEN ELIZABETH 2 on 7 August 1992. https://assets.publishing.service.gov.uk/media/54c1529bed915d1594000015/MAIBReport_Queen Elizabeth2-1992.pdf)

5.11 Alien species

CH11-UC1: Geographic spread of widespread invasive alien species across Europe

The European Union lacks a comprehensive framework to address the threats posed by the introduction and spread of non-indigenous species (NIS). Current efforts are fragmented and suffer substantial gaps in coverage. One of the problems facing the designers of roadmaps, programs and management measures of NIS is the lack of standardisation of terminology and metrics to describe the status of biological invasions, influenced, in turn, by quality, validity and potential bias of the underlying data. At present, data are rarely if ever gathered through standardized surveys specifically designed to detect NIS. Poorly studied NIS taxa, NIS in poorly-studied habitats and regions, small-bodied species and additional lacunae impede our understanding of NIS diversity.

Thus far, the most reliable indicator is past performance: widespread NIS are likely to disperse further. Therefore, for the purpose of this study, the geographic spread of multicellular NIS across European Seas was used as a proxy measurement for potential impact. The term "invasive" is used to denote an NIS whose population has proliferated and is rapidly extending its range. NIS are recorded as "widespread" when present in 10 or more countries, and as "post-1990" widespread when recorded and spread to five or more countries since 1990. The date of introduction is rarely known, therefore the first record within each country is used (the date of collection or, when missing, the date of publication), noting the date of collection may be some years after the actual date of introduction.

Three European seas are concerned: the Baltic Sea, the Western European Margin and the Mediterranean. A country-based approach was applied to assess patterns of NIS-richness in European Seas, and identify the principal introduction routes and vectors, the most widespread NIS and their spatial and temporal spread patterns. The records of introduction events are listed per country. For bi-coastal countries (e.g. France Mediterranean, France Atlantic) introduction records are listed separately for each seacoast.

Characteristics

- FABD Fauna abundance per unit area of seabed
- ACNT Macroalgae and seagrass taxonomic counts
- FCNT Fish taxonomy-related counts
- ZFIT Zooplankton and zoobenthos physiological condition parameters
- ZOOB Zoobenthos taxonomy-related counts

Matrices

Marine Water, Biology

References

- Galil, B.S., Marchini, A., Occhipinti-Ambrogi, A., Minchin, D., Narščius, A., Ojaveer, H., Olenin, S., 2014. International arrivals: widespread bioinvasions in European Seas. Ethology Ecology & Evolution 26, 152–171. doi:10.1080/03949370.2014.897651

CH11-UC2: Mapping the impact of alien species on marine ecosystems

Management of marine ecosystems requires spatial information on current impacts, including those emanating from invasive alien species (IAS). The purpose of this use case is to develop a standardized, quantitative method for mapping cumulative impacts of IAS on marine

ecosystems. The methodology was applied in the Mediterranean Sea but could be used in other European seas.

A conservative additive model was developed to account for the Cumulative IMPacts of invasive ALien species (CIMPAL) on marine ecosystems. According to this model, cumulative impact scores are estimated on the basis of the distributions of invasive species and ecosystems, and both the reported magnitude of ecological impacts and the strength of such evidence. In the Mediterranean Sea case study, the magnitude of impact was estimated for every combination of 60 invasive species and 13 habitats for every 10 km*10 km cell of the basin. Products developed are maps of the CIMPAL score for the Mediterranean.

Characteristics

- FABD Fauna abundance per unit area of seabed
- ACNT Macroalgae and seagrass taxonomic counts
- FCNT Fish taxonomy-related counts
- ZFIT Zooplankton and zoobenthos physiological condition parameters
- ZOOB Zoobenthos taxonomy-related counts
- HBEX Habitat Extent

Matrices

Marine Water

References

- Katsanevakis, S., Tempera, F., Teixeira, H., 2016. Mapping the impact of alien species on marine ecosystems: the Mediterranean Sea case study. Diversity Distrib. 22, 694–707. doi:10.1111/ddi.12429

6 Preliminary assessment of data suitability and availability according to literature

This section deals with the information about appropriateness and availability retrieved from the use case excel files (Appendix 4). This information provided material for two syntheses: a) per challenge in 6.1, b) per characteristic in 6.2. Section 6.3 addresses characteristics not reported by the challenges.

6.1 Assessment per challenge thematic area

6.1.1 Wind farm siting

Appropriateness

Offshore wind farm siting requires knowledge from a wide range of attributes from physical, biological and human data sources. The main requirements for these data in terms of appropriateness are their extent, resolution and completeness. Most of the input characteristics scored low appropriateness (36 from 41 scored 1: not at all Satisfied to partly satisfied) due to limitations on spatial resolution and extent.

Moreover, only a few characteristics belonging to the Air matrix were identified. This is an important gap on source data considering that the most important inputs for OWF siting are the spatial information on wind velocity or power distributions. The air matrix datasets found also lack appropriate information on wind vertical distribution.

Some datasets are originated and made available from national institutions without concerns on spatial data coverage and standardization across regions and countries. More cooperation among institutions and countries, in the framework of The INSPIRE Directive, is needed for more standardization on data processing and format.

For bathymetry (resolution requirement: better than 500m), suitability was ensured with the 250m resolution Emodnet DTM.

Availability

The majority of sites are from non-private organizations. Generally input datasets scored high concerning visibility, accessibility and performance indicators (resp. 96, 80 and 90%) and were mostly freely downloadable although some providers required user identication prior to downloading and some allow data display but not downloading.

6.1.2 Marine protected areas

Appropriateness

The authors report a lack of information about related species for each Eunis seabed habitat, and a special mention about "Cymodocea meadows" whose presence and distribution are little known. They also mention the insufficient quantity of data to analyse the effectiveness of connectivity between MPAs.

Data for OSPAR habitats distribution do not encompass the whole study area, especially in the deep sea. There is a lack of information about species present in each seabed habitats, which is essential to assess the richness of the seabed and what protection MPAs achieve.
There are big gaps in data representing life cycle and behaviour of threatened and declined species. This data is important to assess the effectiveness of connectivity of MPAs network.

Many deep sea offshore habitats are under-studied and poorly inventoried. The most prominent data gaps involve the lack of consistent, region-wide surveys of biological data on marine species across taxa and trophic groups. This especially applies to the abyssal plain, which is under-represented, with available biological data being more restricted to surface or shallow water regions in and around coastal areas.

Availability

The average availability of data on species was scored 2, although 3 was obtained for Eunis and Ospar habitats. No access was possible to some existing fisheries survey data, collected by several countries, as this information is not covered by OBIS, the primary source of fisheries data. Some data on seabed features from these surveys was available but no data on fish populations. More specific data gaps were also identified as follows: Seamounts, shelf edges and canyons, hydrothermal vents, migratory corridors and marine mammals, seabirds.

6.1.3 Oil leak

Appropriateness

For oil spill management the requirements were of two types: (i) real time data (temporal resolution) for oil spill monitoring, (ii) static descriptive data for sensitivity assessment.

Regarding impact data, there are gaps in data bases about touristic beaches as well as a aquaculture activities, the main two sectors impacted by an oil spill reaching the shore. For touristic beaches the proxy “bathing water quality” was considered, which gives a first approach to sensitive areas.

Availability

Oil spill drift data for this use case were easily accessible in real time as most of them come from the European Copernicus portal. Some sources indicated in the use case were not accessible (direct url is not working) but the dataset associated refers to well known dataset. There was an exception in performance (long extraction time) for wind speed and direction and air temperature and density.

6.1.4 Climate

Appropriateness

Temperature data for the climate challenge were found to perform well (scoring from 2-3) and be quite suitable to the intended use.

For the assessment of primary productivity the authors identify a number of caveats. The assessment aims to determine and understand primary production rates but is reliant on satellite derived surface chlorophyll values. Linking primary productivity rates & estimating subsurface chlorophyll biomass with surface chlorophyll-a values is still challenging and dificulties remain in coastal regions due to river sediments and turbidity limiting the validity of algorithms calculated.

Availability

Availability and visibility of the data required for these assessments is high with major international collaborations generating the data and making it available through data centres. The SST availability is state-of-the-art and this data source is used by many researchers, students and assessors across disciplines (scoring 2 to 3 in our assessment) from current data sources.

Derivation of primary production estimates based on chlorophyll algorithms is more technical but the source datasets are available to researchers though earth observation portals.

6.1.5 Coasts

Appropriateness

Even though this use case describes processes highly data dependent and references data sources, insufficient detail is given as to the precise parameters incorporated or produced. As such, the references listed allow the user to broadly understand the inputs and outputs, but it is not possible to do so with the necessary levels of precision required to reproduce entirely.

Other limitations include using a single monitoring station to represent the entire cross-sectional area in order to benefit from the valuable long-term record of TSS concentrations.

Availability

Data availability is good (scores 2-3), although some additional data, e.g. GPS, would improve the quality of the outputs. Data is provided free of charge and the visibility is high, it can be very easily found using popular web browsing engines. Some delays are reported as to the fewer in-situ data sets for most recent years due to the delays in submission of these datasets to the database by individual institutions. It has negative effects on the quality of outputs in recent years. Priorities for future development include the maintenance and continuation of the observing network and infrastructure such as the PSMSL database. High quality satellite-altimeter observations need to continue also and GPS measurements need to become widely available to provide valuable information on vertical land motion.

With the exceptions of the Chesapeake Bay hydrodynamic model, the total suspended solids data and the Maryland shoreline surveys, other data sources were highly accessible and attainable with good performance of the delivery mechanism. However, policy conditions were not clear and obvious for any of the data sources accessed.

6.1.6 Fisheries management

Appropriateness

For fish catches the main requirement is the total amount of biomass (in weight) fished by all the countries members of FAO broken down by FAO fishing area, species or group of species and year. Obviously the level of coverage, sampling effort, accuracy of official data, etc varies from country to country, being more complete, consistent and accurate in direct relation to the economic development of the countries (with exceptions suc as China and Spain). However none of the numbers given by FAO in their statistics have any measurement of the accuracy or consistency and are a single number by species or group of species, year FAO fishing area and country. Nevertheless this is the unique trial to compile a worldwide fisheries statistics database with common rules among all the countries associated to FAO. The policy of FAO for the database produced is perfect only being impaired by the lack of compliance of the countries in data quality or in delays in data transmission. Priorities for the future should be the improvement of data quality.

For by-catches the requirement is for the total amount of biomass (in weight) fished and discarded, species or group of species and year. Additionally for the fulfillment of the new landing obligation and the discard plans the work has to be segmented by métier and using the data collected under the DCF. The main problem with the by-catch/discards in fisheries is the spatio temporal and intra métier variability. There are some studies demonstrating that in some métiers it should be necessary to sample more than the 75% of the total trips of the métier for increasing the accuracy of the estimates what is economically impossible to afford.

Areas of improvement in the study and reduction of discards are:

- Changes in spatio-temporal fishing strategies: real-time fishing effort control, closed areas, shared information;
- Changes in approaches and tools for sorting the catch;
- Changes in tactics for managing quotas (at individual or Producer Organization levels);
- Marketing strategies for lower value catch;
- Impacts of quota restrictions on discarding;
- Incentives for discard reduction.

Availability

For catches there are fully maintained databases with long time series of marine organism capture data in weight, available publicly at the shortest time possible. In spite of some delays in data submission by some countries, data are scored high availability.

By-catches and discards data availability is medium: public availability of data is not fully proven even if it is supposed to be covered by the Data Collection Framework.

6.1.7 Fisheries impact

Appropriateness

It was not possible to access raw VMS data or logbook data for any country in the Checkpoint area. The worked up data on fishing impact, intensity and pressure only cover OSPAR regions and are at a coarse resolution (0.05 degrees). In the future, if the “worked up” VMS data can be accessed for more countries and at a finer resolution, or at a resolution equal to the habitat data (250m), better estimates of fisheries impact on sensitive habitats will be achievable.

The habitat data is being continuously updated with each phase of the EMODnet project and, therefore, will get better in terms of resolution and detail with time.

Availability

The VMS data are considered to be sensitive, and are not freely available. Cleaned datasets of aggregated VMS data with fishing effort in hours by year and main gear groups for the OSPAR and HELCOM areas were created and are available on request.

The unavailability of raw VMS data inhibits progress on any study measuring fishing impact on habitats at a fine scale. However, studies focusing on a particular fishery and covering a small area require only a subsection of the VMS data, therefore in the future, there might be a case that could be put forward for accessing those VMS records that pertain only to the fishery in question.

For habitat data, maintained databases with latest high quality collated habitat data available on the servers. This is the case for the EMODnet data which is freely available with the new phase of the project proposing to produce multi-resolution maps.

For fish and shellfish catch statistics only the aggregated data becomes publicly available for further studies and analyses due to possible commercial sensitivities.

Generally data availability scored medium (2) for this challenge.

6.1.8 Eutrophication

Appropriateness

In the first use case at the site level, there was insufficient temporal resolution nutrient data available to assess the impact of increased nutrient loading. At the subregional level there was insufficient spatial resolution data to model the dissipation of the nutrients from the sites. At the regional level the available monitoring data was of insufficient length to determine the regional impacts on the development of harmful algal blooms in locations with aquaculture facilities.

In the second case most of the data were either measured or modelled specifically for the study. The use case was good to describe parameters needed and methodology to apply to describe eutrophication. The appropriateness of the data sources for this use case was rather good. The lack of zooplankton measurements was replaced by rough modelling biomass and detritic forms of phosphorus and nitrogen. The lack of wind measurements in the region was replaced by assuming that the wind at Belle Ile will be constant over the region. The paper clearly described the parameters and the methodology used to simulate eutrophication. Some improvement could be made by using phytoplankton and oxygen in situ measurements in the biological model. Satellite data of wind, ocean color data and sea surface temperature can provide an interesting source of spatio-temporal information for the biological and the hydrodynamic models.

Availability

General information for most data sources was easy to find and access. However, obtaining the precise data used in the study was not possible from the information given. In some cases the raw data was accessible whereas summary statistics were used, in other cases only background information was available.

For river flow and discharge, raw data was easy to find and obtain, however the study refers to associated summary statistics which were not immediately visible, so score 3 was given. For all other data (chemicals, phytoplankton and microzooplankton) visibility was a main issue and data source could not be found from the information given. The group does not maintain its own databases but contributes to databases, so identifying the data in the latter is difficult. However as this is public data it must be available somewhere. Availability score was set at 1.

In the use case the data used are mainly in situ measurements and modeling results obtained in the frame of a punctual scientific study. So the major part of the data is unavailable in referenced catalogue service and offers no visibility for results and input availability. Although it is an old case study, this is actually a good use case because it highlights either the lack of data at the required resolution at local level for eutrophication studies or the lack of availability of such data to the public. Such shortcomings are global issues even encountered in more contemporary studies. Therefore, the outcomes from this use case are a good example to highlight the general need for organisations to make the data more widely available to others.

6.1.9 River input

Appropriateness

The requirements for rivers input data are as follows: Flow rate (5 to 10 year records), Drainage > 10 000km^2, annual discharge > 317 m^3 * s^{-1}, suspended load > 5Mt/year, population density> 500 inhabitants/km^2, coordinates of river mouth, temporal resolution, sampling station close to river mouth.

The authors highlight different issues about data appropriateness. The main one is the sampling period between discharge and concentration in order to compute accurate fluxes. Others issues were related to the lack of information about the actual computation of averaged values, or to the lack about the information related to river mouth locations. One should mention that the presented database was populated in early nineties. Current knowledge has helped in tackling the latter problem. From the authors' perspectives, the priorities for this challenge are as follows: (i) assessing long term trends of water quality, (ii) assessing data quality with the addition of relevant indicators of data quality, (iii) completing the dataset with tributaries in estuaries.

The exact dates for records are sometimes missing. Values are calculated on a discharge-weighted basis and multiple formulas have been used to interpolate fluxes from concentration versus discharge collected at different sampling periods. It is generally not known how the average published values were computed. Error in units is another issue for accuracy.

Requirements for high spatial and temporal resolution precipitation data are highlighted because they may have a major effect on water discharge and sediment load, even at a global scale.

Other data could be included to increase the quality of the modeling. Erosion depends on a relief and land use. Information at a global scale is identified as a future request. Moreover, precise locations of dams are also requested, as those structures modify sediment transport.

Availability

This study case is based on a collation work performed in 1990's. Therefore, at that time, data could not be retrieved from the Internet. However, data are now available online, especially from GRDC. This dataset is subject to an agreement that leads to a lack of responsiveness.

Data used in this study case are all available from online catalogues and they score quite good (almost 3 on average). Only the access to river gauges has a low responsiveness induced by a preliminary registration and river selection procedure requesting emails exchanges.

6.1.10 Bathymetry

Appropriateness

Gross details of rough seabed topography were attained, however a higher resolution bathymetry data set will improve our ability to better quantify ocean mixing, and understand its impact on the Earth's climate. Resolution and accuracy are the main requirements. We could not resolve all of the length scales responsible for internal wave generation, so the authors suspect that such length scales representing topographic roughness are underestimated by an order of magnitude.

For bathymetry, the main requirements are resolution, accuracy and extent. The primary concern is that the charts in the case study did not show the correct depths below chart datum at the grounding positions. Full sidescan sonar coverage would also be necessary to detect any dangers to navigation lying between sounding lines. Thus, the 1939 US Coast and Geodetic Survey would not meet present day standards.

The information presented on Charts 2456 and 2890 is taken from United States Government charts. Charted soundings in the grounding area are frequent and regularly spaced. However, no reference is made on either chart as to the date of the Hydrographic surveys on which the chart is based.

Availability

Overall, notwithstanding the need to register, the source data was attained reasonably easily through a google scholar search of the reference. However, the data was only provided as an image with no raw, source readings given, which in some cases hampers further use.

Data was easily found, however the UK Hydrographic Office site is difficult to navigate and data are only available as part of a catalogue. Availability was rated 2.

6.1.11 Alien Species

Appropriateness

The wish is for a database maintained by the ICES WGITMO (Working Group on the Introduction and Transfer of Marine Organisms) in order to ensure best available data reliability and validity across the study area. AquaNIS does not include unicellular NIS, though it is well established that anthropic dispersal and redistribution of propagules in ballast water and sediments and shellfish transplantation facilitate range expansions. These include microalgae, viruses, bacteria, ciliates and other protists.

Priorities for future developments are: (i) including the (x,y) coordinates of the introduction events (currently the best resolution is LME sub-region) in AquaNIS (ii) including unicellular NIS. New data required are the ever-rising role of shipping (commercial and recreational) as vector for widespread and recently spread NIS.

Consistency of fauna abundance data is something badly lacking. There is an uneven quality of alien species distributional data. The lack of high-quality widespread information throughout the basin made the authors use presence-only data as a status variable of the alien species in the present exercise. This implied that the impact of each species was taken as uniform across its reported range, although in reality the abundance of each species varies considerably across its distributional range.

Availability

Hundreds of papers in the literature report ecological impacts of single or groups of alien marine species, more often on a single ecosystem in a specific location. However, a comprehensive large-scale analysis of the cumulative impact of all alien marine species to all ecosystems is lacking, regionally or globally.

6.2 Identification of criteria for data quality assessment

Using the ISO 19157 quality elements (see Ch2), the list of the quality criteria relevant for the different use cases has been established. It includes the list of the Medsea criteria but a few additional ones have been cited in the use cases which are reported below.

6.2.1 Appropriateness :

Consistency (logical)

Conceptual consistency refers to several aspects of the implicit data model of the user to represent its world of interest, the 2 last ones being new criteria identified by the Use cases of Atlantic :

- missing parameters needed for the development of the products of the user by the challenges.
- the consistency of the parameters definition, data being sometimes produced according to different sampling methods or algorithms and for specific purposes than do not fit the user need (eg “soundings” for navigation purpose may be different of the observed depth)

The spatial distribution consistency of the different characteristics which could be assigned to **the topological consistency** of ISO.

Completeness

Omission i.e. the degree of absence of data in a dataset. In Medsea, this is expressed by:

- the spatial extent of the dataset effectively covered by the dataset both horizontally and vertically;
- the time extent ie the time interval represented by the dataset.
- the Atlantc use cases identified also the number of expected features (eg Species, or submarine cables).

Accuracy (thematic) criteria including

Classification correctness of the smallest object or event that can be resolved:

- the spatial resolution: both horizontally and vertically.
- the time resolution

Quantitative accuracy of the measurements (ie the closeness of measurements to values accepted as or known to being true)

- **precision**
- **non quantitative attribute correctness** (eg the taxon)

The 2 last ones have been mentioned only once each in the Atlantic use cases and are not in the list of Medsea.

Temporal quality criteria

- **Temporal validity** of data i.e. the max elapsed time from last update.

Positional accuracy

These criteria defined in the **positional accuracy** class of ISO 19157 have not been selected by MedSea because these criteria where not determinant for its challenges however it is more relevant for the determination of the sea level rise with regards to the impact of the ground motion.

Metadata quality

In addition the Use cases have revealed low **metadata quality** that should be taken into account in the assessment especially when time observation are missing or not provided (eg “soundings”) .

6.2.2 Availibility

Visibility :

- Ability to identify and to get quickly on the appropriate site delivering the desired datasets

The visibility of data policy has not been mentioned

Accessibility :

- Services: Viewing services are sometimes the only way to access data limiting their use. This criterion is recurrent.
- Data policy : degree of restriction to access data
- Readyness for use (format)

Most of the data used in these Use cases were free of charge so no statements have been collected on this point

Performance

- Responsiveness :

The lack of responsiveness is linked to data policies or to delays in public updates more than to technical problems.

6.2.3 Synthesis

The relevant criteria depend on the intented use and the kind of parameter needed. Tables 6.2.1 and 6.2.2 (Appropriateness) and 6.2.3 (Availability) reveal for each Use Case where are the limitations encountered matrix by matrix. Section 3 details parameter by parameter the findings of the Use cases.

6.2.3.1 Appropriatness

Unsurprisingly, the “ Air”, “Biology/Biota” and “Human activities” matrices show the highest number of limitations and concern in priority the absence of observations (missing characteristics), the consistency of the spatial distribution between characteristics, the lack of observations in space in particular in deep areas, the spatial resolution .

More surprisingly, the temporal extent of time series and the temporal validity have not been mentioned for these matrices, shortcomings which are at the present time of a secondary importance. The other criteria are apparently less relevant for similar reasons.

Seabed observations lack resolution appropriate to user needs and for the same reason exhibit low temporal validity (probably due to the difficulties to collect such observations).

Lesser issues are reported concerning the Marine Water matrix which benefit from the efforts of a large community to develop operational services in link with global challenges such as climate change and its impacts.

A few use cases suffered from the lack of characteristics for Ice and Land.

6.2.3.2 Availibility

It is however more difficult to conclude anything about the conditions of data availability due to the recent evolution of the conditons of access which have to be evaluated by the challenges (sometimes dated references).

Table 6.2.1: Summary of assement criteria for appriopriateness from use cases. Informed cells indicate a shortage in the criteria for the given matrix. (Matrix abbreviations are as follows: Air, Ice, MW: Marine water, FW: Fresh Water, BB: Biota/Biology, SB: Riverbed/Seabed, HA: Human activities, Land)

		Specific Use in Use Case	Appropriatness					
			Consistency			**Completeness**		
			Conceptual Data Model			Lack of data		
			Missing Characteristic	Characteristic definition	Between characteristic	Horizontal Extent	Vertical Extent	Temporal extent
1	1	OWF Wind Power assessment	Air		All	Air	Air	
		OWF Installation and Impact	HA,SB			BB,MW,HA		
2	1		BB, HA		HA			
	2					BB,HA	BB	
3	1	Oil spill impact			HA			
4				BB		BB		Ice
5	1		SB, HA	MW				MW
	2							
6	2							
7	1		HA			BB,HA	BB,SB	
	2		HA		HA	HA	HA	HA
8	1							MW
	2					Air, BB		
9	1			MW				MW

Table 6.2.2 (cont'): Summary of assement criteria for appriopriateness from use cases. Informed cells indicate a shortage in the criteria for the given matrix. (Matrix abbreviations are as follows: Air, Ice, MW: Marine water, FW: Fresh Water, BB: Biota/Biology, SB: Riverbed/Seabed, HA: Human activities, Land)

			Appropriatness							
			Thematic Accuracy						**Temporal quality**	**Positional Accuracy**
			Classification correctness			Non quantitative attribute correctness (eg Taxon)	Characteristic accuracy	Characteristic precision		
		Specific Use in Use Case	Horizontal resolution	Vertical rsolution	Temporal resolution				Temporal validity	
1	1	OWF Wind Power assessment	Air	Air						
		OWF Installation and Impact	BB,MW,HA							SB
2	1		SB,							
	2		BB,HA							
3	1	Oil spill impact								
4										
5	1						MW			SB
	2									
6	2					HA	HA	HA		
7	1		HA, BB				BB			
	2		SB							
8	1		MW		MW					
	2									
9	1									

Table 6.2.3: Summary of assement criteria for availability from use cases. Informed cells indicate a shortage in the criteria for the given matrix. (Matrix abbreviations are as follows: Air, Ice, MW: Marine water, FW: Fresh Water, BB: Biota/Biology, SB: Riverbed/Seabed, HA: Human activities, Land)

Challenge	Use case	Use	Availibility				
			Visibility	Accessibility			Performance
			Ease to find Data Set	Data policy	Services	Format	Responsivness
1					Air, SB,MW	Air, MW	
2							
3							Air
4							
5			MW		MW		MW
6		1					HA
7	1		HA	HA			HA
	2		HA	HA			HA
8			BB,MW		BB,MW		
9	1			FW	FW		FW
	2		FW,LAND	FW,LAND			FW,LAND
10			SB			SB	
11	2					BB	

6.3 Assessment per category of characteristic

The idea of this preliminary assessment is to show: (i) what data are most wanted to perform the challenges, (ii) whether this is confirmed by references in the literature, (iii) whether literature reports issues about the suitability and the availability of these data.

As it would be an overwhelming task to identify gaps in all the 78 characteristics (P02) reported in section 3, there was a need to establish a priority list and primarily assess the most salient characteristics. From section 3 we easily retrieved the characteristics that are shared by more than one challenge. Additionally we checked in Appendix 2 that these characteristics are shared by the 3 basins (Atlantic, MedSea and Black Sea).

Furthermore, we also confirmed the use of these characteristics by the authors of the references, which strengthened our choice. In table 6.1 below we show this list of these 22 characteristics P02 being grouped under their parent group P03. Due to the SeaDataNet classification, at P02 level some characteristics are fairly well described (e.g. sea level), however for some others the P02 remains fairly broad, as is the case for ADUN within Z005. In this case, we describe in the right hand side column what exactly within the ADUN type is most needed.

Table 6.1: Key characteristics

P03	P02	Comments
M010/Meteorology	EWSB/Wind strength and direction	
B015/Birds, mammals and reptiles	BRDA/Bird counts CEBH/Cetacean behaviour	
B050/Habitat	HBCH/Habitat characterisation HBEX/Habitat extent	
C005/Carbon, nitrogen and phosphorus	NTRA/Nitrate concentration parameters in the water column PHOS/Phosphate concentration parameters in the water column	
D025/Water column temperature and salinity	TEMP/Temperature of the water column PSAL/Salinity of the water column	
D030/Currents	RFVL/Horizontal velocity of the water column (currents)	
D032/Sea level	ASLV/Sea level	
O005/Fluxes	RVDS/River flow and discharge	
T001/Terrestrial	MBAN/Bathymetry and Elevation ACYC/Reference number	VMS (ship position)
G045/Rock and sediment lithology	LITH/Lithology	Seabed substrate
G060/Sedimentation and erosion processes	MSFX/Sedimentation flux in the water column	
Z005/Administration and dimensions	ADUN/Administrative units	MPA boundaries
H004/Fisheries	FCST/Fish and shellfish catch statistics FEFF/Fishing effort GP080/Fishing by-catch	
H005/Human activities	TRAN - MLES	Maritime transport Aquaculture Tourism

6.3.1 Wind speed and direction (M010)

Wind speed is required for Windfarms and Oil leak challenges. These data were reported to be easily accessible in real time as most of them come from the European Copernicus portal. For wind speed climatologies input datasets generally scored high visibility, accessibility and performance indicators. They were mostly freely downloadable although some providers required user identification prior to downloading and some offered data display but not downloading.

6.3.2 Birds counts and cetacean behaviour (B015)

Both birds are marine mammals are potentially impacted by offshore windfarms. They also are vectors of connectivity in a network of MPAs. Data for these characteristics are required by both the Windfarm and MPA challenges, in relation to impact for the former, in relation to MPA network for the latter. Visible and accessible seabird distribution and abundance data were found in existing data bases in Europe.

6.3.3 Habitats (B050)

Habitat data were required by several challenges. Maintained databases with latest high quality collated habitat data are available on the servers. The suitability of habitat data is generally limited by the lack of habitat maps giving a full biological level of detail (maps from surveys), even in the coastal zone (for example the Cymodocea seagrass habitat is said to be poorly mapped). These maps from surveys still cover a very limited extension of the seabed.

When comprensiveness is contemplated, broad-scale maps such as the ones available from EMODnet meet this requirement, however being an expression of environmental drivers describing the abiotic levels of the EUNIS classification, they remain of limited value for biological use, assessment of the impact of fisheries or assessment of the level of protection of MPAs.Their availability is high.

6.3.4 Nitrate and phosphate concentrations in water column (C005)

These data are all available from online catalogues (mainly GRDC), however this dataset is subject to an agreement that leads to a lack of responsiveness. Only the access for river gauges has a low responsiveness induced by a preliminary registration and river selection procedure requesting emails exchanges. Some flaws can be mentioned: the exact dates for records are sometimes missing. Values are calculated on a discharge-weighted basis and multiple formulas have been used to interpolate fluxes from concentration versus discharge collected at different sampling periods. It is generally not known how the average published values were computed. Error in units is another accuracy issue.

In some of the literature reviewed, nitrate and phosphate were reported as poorly visible, whether from networks measurements or model outputs. The studies were quite local and the outputs of the models were not efficiently stored for further use.

6.3.5 Water column temperature and salinity

Water column temperature and salinity were found to be quite appropriate to deal with issues addressed in the literature. The data used to produce the reported time series was available through a dedicated portal. Sea surface temperature (SST) data dor the Arctic Report is appropriate with a 3-decade base period and coverage across the full area, also allowing sub region time series to be calculated.

Temperature data sources all performs well (2 to 3) and are quite suitable to the intended use. Their availability is high, as they are processed and distributed by the well-established community of physical oceanography that uses a combination of models and remote sensing data.

6.3.6 Currents (D030)

Much the same as above can be said for currents as they are also coming from the same physical oceanographic community. Currents data were easily accessible from the European Copernicus portal, mostly for horizontal current speed. Vertical current speed are not as easily found.

6.3.7 Sea level (D032)

Sea level is explicitly one of the topics of the Coasts challenge, but also an input to the Bathymetry challenge. Data availability was reported to be good, with data free of charge and high visibility. Some delays are reported as to the fewer in-situ data sets for most recent years due to the delays in submission of these datasets by individual institutions. Priorities for future development include the maintenance and continuation of the observing network and infrastructure such as the PSMSL database.

High quality satellite-altimeter observations need to continue also and GPS measurements need to become widely available to provide valuable information on vertical land motion. The ability to assess sea level will in turn increase our capacity to better quantify ocean mixing and understand its impact on the Earth's climate.

6.3.8 Fluxes (O005)

Fluxes are a primary requirement of challenge "River inputs" but also a relevant input for challenge "Eutrophication" as rivers and their nutrient load are the triggering factor for eutrophication. This needs to be linked to nitrate and phosphate concentrations in the water column, whose availability was ranked quite high (see 6.2.4 above)

The authors were able to collate a large number of river discharge and contaminant input to the sea. However, they highlight various issues about data appropriateness. The main one is the sampling period between discharge and concentration in order to compute accurate fluxes. Others issues were related to the lack of information about the actual computation of averaged values, or to the lack about the information related to river mouth locations.

In terms of availability raw river flow and discharge data were easy to find and obtain, however associated summary statistics were not immediately visible.

6.3.9 Bathymetry, Elevation, Reference numbers (T001)

Elevation, covering both bathymetry and coastal topography, is a characteristic shared by many challenges and studies, either directly or as a parameter that is used as an input to other intermediate variables. For example, when associated with water transparency, it allows the computation of the photic zone.

For bathymetry, the main requirements are resolution, accuracy and extent. Where accurate and high resolution data are needed, available data sets may not meet the requirements as some charts do not show the correct depths below chart datum at some grounding positions and reference to the date of the hydrographic surveys on which the chart is based may not be available. For example the UK Hydrographic Office site was found difficult to navigate. Global assembly data bases such as EMODnet are quite comprehensive but higher resolution grid could be generated for areas with multibeam (MBES) data available.

Under Reference numbers this category also contains ship positional data (VMS). VMS data are considered to be sensitive, and are not freely available. The unavailability of raw VMS data inhibits progress on any study measuring fishing impact on habitats at a fine scale. However, studies focusing on a particular fishery and covering a small area require only a subsection of the VMS data, therefore in the future, the case could be put forward for accessing those VMS records that pertain only to the fishery in question.

6.3.10 Lithology (G045)

Much the same as bathymetry, seabed substrate is fundamental in a number of issues that require knowledge about the seabed. Substrate maps are derived from acoustic surveys complemented by seabed samples. Due to their cost they still cover a very limited extension of the seabed. When they were made from samples only, they usually get a lower quality score because of the interpolation required. In this case they may be inappropriate to deal with some problems requiring high resolution. Broad-scale substrate maps may be deemed sufficient for some more regional issues.

The availability of these broad-scale sediment maps is still low cause many countries have not been able to carry out large historical seabed surveys. When these data do exist, they have in many cases recently been assembled by EMODnet Geology, with high visibility and easy access.

6.3.11 Sediment flux quantification (G060)

Linking primary productivity rates & estimating subsurface chlorophyll biomass with surface chlorophyll-a values is still challenging. Additional difficulties are identified by the authors in coastal regions due to river sediments and turbidity limiting the validity of algorithms.

Sedimentation flux of suspended particulate material (lithogenic fraction) per unit time per unit area of the water body needs to be freely available, however the conditions of availability are still low.

Requirement for high spatial and temporal resolution in precipitation data is also highlighted as well as precise location of dams.

6.3.12 Fisheries (H004)

The Fisheries management challenge and related literature references mention fisheries data coming from several data sources such as the EU Data collection framework or the FAO but many of them do not seem to be in the form needed.

For catches there are fully maintained databases with long time series of marine organisms capture data in weight, available publicly at the shortest time possible. In spite of some delays in data submission by some countries, data are scored as highly available. However only aggregated data become publicly available for further studies and analyses due to possible commercial sensitivities.

By-catches and discards data availability is medium: public availability of data is not fully proven even if it is supposed to be covered by the Data Collection Framework (DCF).

6.3.13 Human activities (H005)

Human activities really have a very large scope from aquaculture to oil business, maritime traffic and a numbr of others. Although they are commonly grouped under a single initiative (as e.g. in the EMODnet assembly program), they require the involvement of a very diverse community of actors. For the sake of efficiency it appears necessary here to separately assess each main sector of human activities.

Many challenges require the knowledge of human activities, primarily the first three ones (Windfarm, MPA and Oil leak) which share the need to assemble a lot of pluridisciplinary data, but also for instance Alien species where human activities (e.g. maritime transport or shellfish stock movements) are a vector of dissemination of these species.

Tourism

Regarding impact data, there are gaps in data bases about touristic beaches which are utterly sensitive to an oil spill reaching the shore. The requirement is for high resolution maps of beaches and other scenic areas. Sampling locations from the bathing water quality network were used as a proxy, roughly indicating places that should be protected in priority. However in future, elements of coastal sensitivity elements should be made available at a resolution commensurate with that of oil spill models.

For Windfarm and MPAs the types of recreational activities and their extents are necessary. The need is identified to carry out field survey supported by remore sensing imagery to produce georeferenced data.

Aquaculture

The need for marine aquaculture areas is strongly expressed by the first two challenges for both planning and coastal sensitivity reasons. Aquaculture sites are often found as point locations rather than polygons boundaries. Data on shellfish aquaculture currently available on the EMODnet Human activity portal are clearly not satisfactory, as they are still mostly in point form from many sources. GIS compliant cadatre data were found for Ireland and France but are still missing elsewhere. More efforts are needed from the community to provide an effective representation of aquaculture suitable to many challenges.

More generally gaps were identified in the literature which could well be bridged by using satellite imagery.

Maritime transport

Maritime transport data are necessary for the Windfarm and MPA challenge as they represent a constraint for these developments. Basically major shipping routes are sufficient (such as the Channel shipping corridors) in this case. The Alien species challenge needs shipping knowledge because ships ballast water is a vector of introduction of exotic species.

6.3.14 Administrative units (Z005)

Administrative limits per se, i.e. other than describing human activities, are very few because obviously the justification for an administrative limit is precisely that there is a management requirement. Such categories as MPA boundaries, a number of marine boundaries (territorial waters, EEZ, marine ecosystmes, OSPAR or MSFD regions) are not linked to one particular activity but are needed to partition space for overarching reasons. They belong to the P03 "Z005 Administration and dimensions" and are coded ADUN. Those pertaining to the high seas are well described and highly visible in repositories, with an exception for territorial waters whose boundaries are not as easy to obtain.

6.4 Characteristics not mentioned by challenges

6.4.1 Additional matrix

A few characteristics mentioned in the use cases pertain to the land realm, which means an additional matrix would be welcome:

- MMST (Roads), mentioned by MPA
- CPRP (Precipitation rate) mentioned by Rivers
- Vertical land motion mentioned by Coasts (no SDN reference, see below)

6.4.2 Additional characteristics

Some marine characteristics were found in the literature that have not been mentioned in the inventory made by the challenges in section 3. It would be a case for challenges to incorporate these characteristics in their inventories and take them into account for the next phase. They are the following:

MPA

- CEMO: Cetacean mortality

Eutrophication

- AMON Ammonium and ammonia concentration parameters in water bodies
- SIXX Concentration of silicon species in the water column
- MZBN Microzooplankton generic abundance in water bodies
- TDIN Dissolved inorganic nitrogen concentration in the water column
- TDPX Dissolved total or organic phosphorus concentration in the water column
- ZNTN Zooplankton non taxonomy-related biomass expressed as nitrogen per unit volume of the water column
- CSLR Solar Radiation

Alien species

- FABD Fauna abundance per unit area of seabed
- ACNT Macroalgae and seagrass taxonomic counts
- FCNT Fish taxonomy-related counts
- ZFIT Zooplankton and zoobenthos physiological condition parameters
- ZOOB Zoobenthos taxonomy-related counts
- FABD Fauna abundance per unit area of seabed
- ACNT Macroalgae and seagrass taxonomic counts
- FCNT Fish taxonomy-related counts
- ZFIT Zooplankton and zoobenthos physiological condition parameter

6.4.3 Characteristics not referenced in SeaDataNet

Some characteristics were mentioned that do not yet have a SeaDataNet code. It would be a case of submitting these to the BODC for inclusion into SeaDataNet.

- Vertical land motion
- Combined action of waves and currents
- Ocean heat content

Marine aquaculture (fish and shellfish alike) is also a section in need of improvements. Although aquaculture is part of fisheries according to the FAO definition, it is problematic to assimilate the two activities. SeadataNet fisheries only refer to animals taken from the wild and therefore GP087 (Fishery characterization) is supposed to describe the extent, intensity, timing and method of fisheries. A suggestion to be made to SeaDataNet would be to create an “Aquaculture” entry under “Human activities” (H005) along other human activities such as archaeology, leisure etc., because all of these activities share strong space requirements.

7 References

- Allan R, Ansell T (2006) A new globally complete monthly historical gridded mean sea level pressure dataset (HadSLP2): 1850–2004. J Clim 19:5816–5842.
- Arapogianni, A., Genachte, A.M., and et al., 2013. Deep Water - The next step for offshore wind energy. European Wind Energy Association report. 51 pp.
- Bahurel, P., P. D. Mey, C. L. Provost, and P. L. Traon, A godae prototype system with applications - example of the Mercator system., in Proceedings International Symposium "En route to GODAE", 13-15 June 2002, Biarritz, France, edited by CNES, pp. 137–142, 2002.
- Baldwin, K. Mahon, R. A. Geospatial framework to support ecosystem-based management and marine spatial planning for the transboundary Grenadine Islands.
- Baldwin, K. Developing a framework for a comprehensive marine multi-use zoning plan for the Grenadine Islands. University of the West Indies, Barbados. May 2012, 129pp. http://www.grenadinesmarsis.com/Home_Page.html"
- Bell, M. J., R. M. Forbes, and A. Hines, Assessment of the foam global data assimilation system for real-time operational ocean forecasting. J. Mar. Sys., 25, 1–22, 2000.
- Bell, M. J., R. Barciela, A. Hines, M. J. Martin, M. E. McCulloch, and D. Storkey, The forecasting ocean assimilation model (FOAM) system, in Building the European Capacity in Operational Oceanography - Proceedings of the Third International Conference on EuroGOOS, pp. 197–202, Elsevier, 2003.
- Borg, M., Collu, M., Brennan, F.P., 2012. Offshore Floating Vertical Axis wind turbines: advantages, Disadvantages and Dynamics Modelling State of art. In RINA International conference "Marine Renewable and Offshore Wind Energy", 26 – 27 September 2012.
- Cazenave, A., Chambers, D.P., Cipollini, P., Fu, L.L., Hurell, J.W., Merrifield, M., Nerem, S., Plag, H.P., Shum, C.K., Willis, J. (2009) The challenge for measuring sea level rise and regional and global trends. In, Hall, J., Harrison, D.E. and Stammer, D. (eds.) Proceedings of OceanObs’09: Sustained Ocean Observations and Information for Society, Vol. 1. OceanObs’09: Sustained Ocean Observations and Information for Society Noordwijk, The Netherlands, European Space Agency, 135-152. (ESA Special Publication WPP-306).
- Chapelle A., Lazure P., Menesguen A. (1994). Modelling eutrophication events in a coastal ecosystem. Sensitivity analysis. Estuarine Coastal And Shelf Science, 39(6), 529-548.
- Church, J. A. and N.J. White (2011), Sea-level rise from the late 19th to the early 21st Century, Surveys in Geophysics, 32(4-5), 585-602.
- Church, J.A., White, N.J., Coleman, R., Lambeck, K. and Mitrovica, J.X., 2004. Estimates of the regional distribution of sea level rise over the 1950-2000 period. Journal of Climate, 17(13), pp.2609-2625.
- Collu, M.; Borg, M., 2016. Design of floating offshore wind turbines. In Offshore Wind Farms Technologies, Design and Operation, Chong Ng and Li Ran (Ed). 359-385 pp.
- Daling, P. S., and M. Moldestad, The Prestige oil - Weathering properties, no. 2 in NEWS, SINTEF Applied Chemistry, 2003. 26.

- Drake, K.R., Smith, T.W.P, 2010. An investigation into the Use of an Articulated Column Supported Wind Turbine in Water Depths of 60-120 meters. In RINA International conference "Marine Renewable and Offshore Wind Energy", 21 – 23 April 2010.
- Dransfeld, L., Gerritsen, H.D., Hareide, N.R. and Lorance, P. (2013). Assessing the risk of vulnerable species exposure to deepwater trawl fisheries: the case of orange roughy Hoplostethus atlanticus to the west of Ireland and Britain. Aquat. Living Resour. 26, 307–318.
- Douglas, B. C., 1991: Global sea level rise. J. Geophys. Res., 96, 6981–6992.
- FAO (1995). The Coordinating Working Party on Fishery Statistics: Its Origin, Role and Structure. FAO Fisheries Circular No.903. Rome, December 1995.
- Gaillard, F. 2015. ISAS-13 temperature and salinity gridded fields. Pôle Océan. http://doi.org/z77
- Galil, B.S., Marchini, A., Occhipinti-Ambrogi, A., Minchin, D., Narščius, A., Ojaveer, H., Olenin, S., 2014. International arrivals: widespread bioinvasions in European Seas. Ethology Ecology & Evolution 26, 152–171. doi:10.1080/03949370.2014.897651.
- González, S.F, Diaz-Casas, V., 2016. Present and Future of Floating Offshore Wind. In Floating Offshore Wind Farms, Castro-Santos, L., Diaz-Casas, V. (Ed.), Springer. pp 1-22.
Jamieson, P. 2011. Innovation in Wind Turbine Design, 1st ed, Wiley, London. 298 p.
- Halpin Patrick, Jesse Cleary, Corrie Curtice, Ben Donnelly, Daniel Dunn, Jason Roberts. Data to inform the CBD Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas in the Northwest Atlantic, Prepared for the Secretariat of the Convention on Biodiversity (SCBD), March 2014.
- http://ccrm.vims.edu/publications/projreps/Sediment_Loads_Budget_Final_Report.pdf
- ICES. 2015. Report of the Working Group on Spatial Fisheries Data (WGSFD), 8–12 June 2015, ICES Headquarters, Copenhagen, Denmark. ICES CM 2015/SSGEPI:18. 150 pp.
- Jayne, S. R., St. Laurent, L. C. and Gille, S. T. 2004. Connections between ocean bottom topography and Earth's climate, Oceanography Special Issue - Bathymetry from Space, Vol. 17, No 1/2004, doi 10.5670/oceanog.2004.68.
- Jeffries M. O., J. Richter-Menge, and J. E. Overland, Eds., 2015: Arctic Report Card 2015, http://www.arctic.noaa.gov/reportcard.
- Katsanevakis, S., Tempera, F., Teixeira, H., 2016. Mapping the impact of alien species on marine ecosystems: the Mediterranean Sea case study. Diversity Distrib. 22, 694–707. doi:10.1111/ddi.12429.
- Marine Investigation Branch 1992, Report of the Investigation into the Grounding of Passenger Vessel QUEEN ELIZABETH 2 on 7 August 1992. https://assets.publishing.service.gov.uk/media/54c1529bed915d1594000015/MAIBReport_QueenElizabeth2-1992.pdf)
- Meybeck, Michel; Ragu, Alain (1997): Presenting the GEMS-GLORI, a compendium of world river discharge to the oceans. Freshwater Contamination (Proceedings of Rabat Symposium S4, April-May). IAHS Publications.
- Moussat, E. Pinardi, N. 2014. MedSea Checkpoint Literature Survey available at: http://www.emodnet-mediterranean.eu/reports_news/
- Murphy, J., Lynch, K., Serri, L., Airdoldi, D., Lopes, M., 2011. Site Selection Analysis for Offshore Combined Resource Projects in Europe. Results of the FP7 ORECCA Project Work Package 2, report. 123 p.
- Ng, C., Ran, L., 2016. Design of floating offshore wind turbines. In Offshore Wind Farms Technologies, Design and Operation, Chong Ng and Li Ran (Ed). 3-8 pp.
- Odion, M., Ponge, B. First analyse of MAIA database - A tool designed for the AnalysIs of the MPA network In the Atlantic Arc, Poster - 11/10/2013, IMPAC 3.
- Pauly, D., & Zeller, D. (2003). The global fisheries crisis as a rationale for improving the FAO's database of fisheries statistics. Fisheries centre research reports, 11(6), 1-9.
- Principle Power, 2012. WindFloat Prototype. Available at: http://www.principlepowerinc.com/en/windfloat.

- Rochet M.-J., Arregi, L., Fonseca, T., Pereira, J., Pérez, N., Ruiz, J., and Valeiras J. Demersal discard atlas for the South Western Waters. 121 p.
- Sagy Cohen, Albert J. Kettner, James P.M. Syvitski, Global suspended sediment and water discharge dynamics between 1960 and 2010: Continental trends and intra-basin sensitivity, Global and Planetary Change, Volume 115, April 2014, Pages 44-58, ISSN 0921-8181, http://dx.doi.org/10.1016/j.gloplacha.2014.01.011.
- Scottish Executive 2003, The Interaction between Fish Farming and Algal Communities of the Scottish Waters - A review. http://www.gov.scot/resource/doc/46930/0014748.pdf
- Statoil, 2010. Hywind Demo. Available at: http://www.statoil.com/en/TechnologyInnovation/NewEnergy/RenewablePowerProduction/Offshore/Hywind/Pages/HywindPuttingWind PowerToTheTest.aspx?redirectShortUrl¼http://www.statoil.com/hywind.
- The Crown Estate, 2012. UK Market Potential and Technology Assessment for floating offshore wind power: An assessment of the commercialization potential of the floating offshore wind industry. 24 p.
- Vita, L. 2011. Offshore floating vertical axis wind turbines with rotating platform (Ph.D. thesis), Technical University of Denmark, Roskilde, Denmark.
- Watson, R. & Pauly, D. (2001). Systematic distortions in world fisheries catch trends. Nature 414, 534-536 (29 November 2001.
- Worm, B., Davis, B., Kettemer, L., Ward-Paige, C. A., Chapman, D., Heithaus, M. R. & Gruber, S. H. (2013). Global catches, exploitation rates, and rebuilding options for sharks. Marine Policy, 40, 194-204.

8 Conclusion

This literature survey is only the fisrt step in an attempt to assess the quality of marine data within the Atlantic Area. It will be followed over the next two years by data adequacy assessments based on effective data sets from real data sources. However this is not feasible without formalizing the extreme variety of marine data sources. This is what SeaDatanet has embarked on several years ago by developing a hierarchical classification that we felt very useful to resort to and which in turn our work is going to enrich.

Yet there is still a need not only to categorise data types but also to establish blocks of data which would receive high priority on the agenda from the international community. This is being discussed in a few arenas such as the Framework for Ocean Observing (born in 2012 under Unesco) which set as one of its initial initiatives to convene three Ocean Observing System Panels: Physics, Biology/Ecology and Carbon/Biogeochemistry. These panels are tasked with proposing a set of Essential Ocean Variables (EOVs) which would then be promoted as fundamental measurements needed to address the current scientific and societal ocean/climate-related issues. This list would enable funding of the interdisciplinary, integrated global ocean observing network (the improved, multidisciplinary GOOS).

On the same track specifically in the Atlantic the ICES Working Group on the NorthWest Regional Sea (WGNARS) in its 2014 session had identified bottom water temperature, surface water temperature, sea-ice cover and timing, freshwater input, stratification and salinity as key large scale biophysical and fishing and energy development and/or exploitation as the major large scale anthropogenic interactions. This is however limited to the North American side of the Atlantic Ocean.

At first glance there are some discrepancies in the scope of data between these different initiatives. Some of them can be easily explained on the Checkpoint part. For example in our challenges, several big issues areas are not considered such as contaminants, litter and plastics, acidification, to quote a few. The water properties and content in the photic zone (transparency, chlorophyll, suspended solid), where so many key processes take place, is hardly mentioned because of no direct relevance to any of the challenges. As has been very

modestly done in section 6.2 it is our intention in our subsequent data adequacy assessment work to focus on these EOVs and take advantage of this strong Checkpoint community to come up with yet another but hopefully more thorough framework for the definition of EOVs that can guide us towards informed recommendations for future EU data policy.

Appendix 1: Template used to collect characteristics and input data sets information

The combination of the environmental matrices and the Seadatanet/sextant classification allows for the standardization of the needs expressed by the Challenges and graphical comparisons between Challenges in terms of required characteristics. The template used for this standardization/description is given here.

Folder 1: Introduction-Identification

Please fill in yellow boxes

Checkpoint sea basin	Atlantic	Document pag	1	Document title	Upstream data identification	Format Version date	27/12/2015

Challenge information

Number	1	Title	Offshore windfarm siting

Editing information

Revision date *(Mandatory)*	Contact information : organisation name, contact name, e-mail, phone	Information on changes *(Mandatory)*	Status Draft, Consolidated, Entered in Sextant *(Mandatory)*
01/12/2015	IPMA, Victor Henriques, victorh@ipma.pt	Characteristics added- fill in test	*Draft*
27/12/2015	IPMA, Victor Henriques, victorh@ipma.pt	Added new data	*Draft*
07/03/2016	IPMA, Victor Henriques, victorh@ipma.pt	Added new data	*Draft*
25/03/2016	IPMA, Victor Henriques, victorh@ipma.pt	Changed data to consolidation	*Consolidated*

Editing guide

This is a working document to help **identify the upstream data** potentially used by the challenges and to establish later their fitness for use (in the Data Adequacy Report), as defined in the assessment methodology has been adopted (cf. attached doc extracted form MEDSEA). This methodology makes use of :

- **the ISO 19115 metadata standard** for the description of input data (geographic information)
- **the SeaDataNet common vocabularies for a consistent description of the thematic content needed by the challenges ("characteristics")** (http://www.seadatanet.org/Standards-Software/Common-Vocabularies)
- **the European Directory of Marine Organisations (EDMO) and of Marine Environmental Research Project (EDMERP) to reference provider (http://www.seadatanet.org/Metadata)**

Following the MSFD nomenclature, data sets are made out of **'Characteristics'** (see Annex III of MSFD).
A "characteristic" is a distinguishing feature of the world of interest of an application which refers :
- either to a variable derived from the observation, the measurement or the numerical model output of a phenomenon of the environment (eg "Salinity of the water body by CTD").
- or to objects represented by points, lines or polygons (GIS features) such as "rivers", "submarine cables", "MPAs"... and their attributes (eg depth of isobath).

All the characteristics required by each challenge must be listed in this template as far as possible together with their respective potential data sources and intended uses (applications) of the challenge. There is only one file by challenge under the responsibility of challenge leader.

The 3 following folders have to be filled in addition to the present one (Identification page) :
1/ Characteristics : what data are needed ?
2/ Data sources : where does the data come from ?
3/ Overview : what for are there produced ?

Convention used

1/Create one line and a unique identifier (yellow column) for each combination of ("characteristic","data source") in the "characteristics" folder.
Use the same identifier to continue the description in the following folders.
Do not use automatic incrementing of identifier.
2/M means "mandatory", C means "conditionnal" (the metadata must be filled when available), O means optionnal.
3/When there is a multiple choice, select the cell to be filled to make the list of choices appearing (black arrow at the right of the cell) then click on the desired value to select it (not applicable for SDN voc.)
4/When a mandatory information is missing, use "NA" for not available
5/File name convention to use for saving your excell file once edited : Atlantic_Chn_T1_status_YYMMDD
where n is the challenge number and YYMMDD is the date (eg 151110)

Terminology used

Custodian: party that accepts accountability and responsibility for the resource and ensures appropriate care and maintenance of the resource
Dataset : a dataset (DS) is an identifiable collection of data. A dataset can be as small as a single GIS feature or a feature attribute contained in a larger dataset.
Dataset series : collection of datasets sharing common characteristics (ISO 19115-1 Metadata). Note : here characteristic has a usual meaning.
Data provider : the organisation that supplies data (whatever the party is in addition : creator, custodian, distributor only...).
Distributor : party who distributes the data
Identifier : should be understand as a unique identifier ie a numeric or alphanumeric string that is associated with a single entity within a given system eg a record in a database, a dataset in a dataset collection, a program in a program directory, an organisation in an organisation directory...
Originator : party who created the data

Folder 2: Characteristics

1/Characteristics definition and category (M=Mandatory, C= conditional, O=optional)							
Unique Identifier (integer number) for the combination : (variable, dataset, intended use) or (geo. feature, dataset, intended use)	**Environmental matrix where characteristics are specified**	**SDN Discovery group code of Parameter (P02) for variables**	**Variable characteristic code**	**Inspire topic category for characteristics**	**Processing level of characteristics**	**Production mode**	**Hierarchy data level**
	Air, Fresh water, Marine Water, River bed /SeaBed, Biota/Biology or Human activities	(http://www.seadatanet.org/Standards-Software/Common-Vocabularies)	SDN parameter list (P01) (http://www.seadatanet.org/Standards-Software/Common-Vocabularies)	Use P22 list of SDN http://seadatanet.maris2.nl/v_bodc_vocab_v2/welcome.asp . For further explanations , see http://inspire.ec.europa.eu/index.cfm/pageid/2/list/7	A- Observation (raw, QC) B- high level analyzed observational product (L1,L2,L3, L4 for satellite, merged from many datasets, etc.) C- Forecast/Hindcast D- Publication O- Other	1.delayed 2.real-time	1- dataset 2- dataset series 3- non geographic dataset
(M)	(M)	(M)	(C) (if the code does not exist please put an extended description)	(C)	(M)	(M)	(M)

Folder 3: Data sources

2/Data sources Note : many datasets are missing in the existing catalogues such as the European Directory for Marine Environmental Data (http://www.seadatanet.org/Metadata) or in the catalogue of the Geoportal http://inspire-geoportal.ec.europa.eu/. Please mention if your data set is missing in these catalogues.								
Unique Identifier (integer number)	Programme/ Project name	SDN EDMERP Identifier http://www.seadatanet.org/Metadata/EDMERP-Projects	Data provider	SDN EDMO Identifier http://www.seadatanet.org/Metadata/EDMO-Organisations	Data set identifier	Data collection or data set name as given by the provider	Catalogue URL	Dataset URL
(M)	(C)	(M) (if EDMERP is available please use the same name in Programme/Project name)	(M)	(M) (if EDMO is available please use the same EDMO name in Data Provider)	(M)	(M)		(C)

Folder 4: Overview

3/Overview elements of dataset Please specify the intended use for each characteristics at the moment of production.				
Identifier (M)	Purpose of Characteristics production (provider specification) (M)	Production and quality assessment specifications reference (C)	Challenge name and Intended use by the Challenge (M)	Intended use description (objective, process description, output data) (M)

Appendix 2: Consolidated list for Atlantic, Black Sea and Med Sea Checkpoint characteristics

Ch name	Environmental matrix	P03	P02	ATL	BLA	MED
CH01 - Wind Farm	Air	M010/Meteorology	CAPH/Pressure (measured variable) exerted by the atmosphere		1	**1**
CH01 - Wind Farm	Air	M010/Meteorology	CDTA/Air temperature and density		2	**2**
CH01 - Wind Farm	Air	M010/Meteorology	CHUM/Atmospheric humidity		1	**1**
CH01 - Wind Farm	Air	M010/Meteorology	EWSB/Wind strength and direction	4	2	2
CH01 - Wind Farm	Marine water	D020/Other physical oceanographic measurements	ZZZ/ Combined action of waves and currents	1		
CH01 - Wind Farm	Marine water	D025/Water column temperature and salinity	PSST/Skin temperature of the water column	2		
CH01 - Wind Farm	Marine water	D025/Water column temperature and salinity	TEMP/Temperature of the water column		1	**1**
CH01 - Wind Farm	Marine water	D025/Water column temperature and salinity	PSAL/Salinity of the water column		1	**1**
CH01 - Wind Farm	Marine water	D030/Currents	LRZA/Vertical velocity of the water column (currents)	1		
CH01 - Wind Farm	Marine water	D030/Currents	RFVL/Horizontal velocity of the water column (currents)	2	2	**2**
CH01 - Wind Farm	Marine water	D032/Sea level	ASLV/Sea level		1	**1**
CH01 - Wind Farm	Marine water	D034/Waves	GWDR/Wave direction		1	**1**
CH01 - Wind Farm	Marine water	D034/Waves	WVSP/Spectral wave data parameters		1	**1**
CH01 - Wind Farm	Marine water	D034/Waves	WVST/Wave height and period statistics	9	4	4
CH01 - Wind Farm	Marine water	D034/Waves	HEAV/Wave height estimates	5	1	**1**
CH01 - Wind Farm	Riverbed/SeaBed	T001/Terrestrial	MBAN/Bathymetry and Elevation	3		1
CH01 - Wind Farm	Riverbed/Seabed	T001/Terrestrial	COAS/Terrestrial mapping	1		

CH01 - Wind Farm	Riverbed/SeaBed	G045/Rock and sediment lithology and mineralogy	LITH/Lithology	1		
CH01 - Wind Farm	Riverbed/SeaBed	G045/Rock and sediment lithology and mineralogy	SSTR/Sediment structure			**1**
CH01 - Wind Farm	Biota/Biology	B050/Habitat	DPEV/Depositional environment	4		
CH01 - Wind Farm	Biota/Biology	B050/Habitat	HBEX/Habitat extent	3		
CH01 - Wind Farm	Biota/Biology	B015/Birds, mammals and reptiles	GP088/Bird behaviour			**1**
CH01 - Wind Farm	Biota/Biology	B015/Birds, mammals and reptiles	BRDD/Bird taxonomy-related abundance per unit area of surface			**1**
CH01 - Wind Farm	Biota/Biology	B015/Birds, mammals and reptiles	BRDA/Bird counts	1		**1**
CH01 - Wind Farm	Biota/Biology	B015/Birds, mammals and reptiles	GP004/Bird reproduction	1		**1**
CH01 - Wind Farm	Biota/Biology	B020/Fish	FCNT/Fish taxonomy-related counts			**1**
CH01 - Wind Farm	Biota/Biology	B020/Fish	FATX/Fish abundance in water bodies			**1**
CH01 - Wind Farm	Biota/Biology	B020/Fish	FREP/Fish reproduction			**1**
CH01 - Wind Farm	Biota/Biology	B070/Biota abundance, biomass and diversity	FABD/Fauna abundance per unit area of the bed			**3**
CH01 - Wind Farm	Human activities	Z005/Administration and dimensions	ADUN/Administrative units	4		
CH01 - Wind Farm	Human activities	H004/Fisheries	ADUN/Administrative units	1		
CH01 - Wind Farm	Human activities	Z005/Administration and dimensions	TRAN/Transport activity	1		
CH01 - Wind Farm	Human activities	H002/Construction and structures	HZNV/Hazards to navigation	1		
CH01 - Wind Farm	Human activities	H005/Human activities	IACT/Industrial activity	2		
CH01 - Wind Farm				47 **ATL**	18 **BLA**	30 **MED**
CH02 - MPA	Air	M010/Meteorology	EWSB/Wind strength and direction	1		**2**
CH02 - MPA	Air	M010/Meteorology	CDTA/Air temperature	1		
CH02 - MPA	Fresh water	D030/Currents	RVDS/River flow and discharge	1		
CH02 - MPA	Fresh water	C005/Carbon, nitrogen and phosphorus	NTRA/Nitrate concentration parameters in the water column	1		
CH02 - MPA	Fresh water	C005/Carbon, nitrogen and phosphorus	NTRI/Nitrite concentration parameters in the water column	1		

CH02 - MPA	Fresh water	C005/Carbon, nitrogen and phosphorus	PHOS/Phosphate concentration parameters in the water column	1		
CH02 - MPA	Marine water	B035/Pigments	CPWC/Chlorophyll pigment concentrations in water bodies		3	
CH02 - MPA	Marine water	C005/Carbon, nitrogen and phosphorus	SAMO/Nutrient fluxes between the bed and the water column			**1**
CH02 - MPA	Marine water	C010/Carbonate system	ALKY/Alkalinity, acidity and pH of the water column	1		
CH02 - MPA	Marine water	C015/Dissolved gases	DOXY/Dissolved oxygen parameters in the water column	1		**2**
CH02 - MPA	Marine water	D020/Other physical oceanographic measurements	ZZZ/ Ocean Heat Content	1		
CH02 - MPA	Marine water	D025/Water column temperature and salinity	PSST/Skin temperature of the water column		3	
CH02 - MPA	Marine water	D025/Water column temperature and salinity	TEMP/Temperature of the water column	1	6	**3**
CH02 - MPA	Marine water	D025/Water column temperature and salinity	PSAL/Salinity of the water column	1	6	3
CH02 - MPA	Marine water	D030/Currents	RFVL/Horizontal velocity of the water column (currents)	2		**2**
CH02 - MPA	Marine water	D032/Sea level	ASLV/Sea level	1	7	
CH02 - MPA	Marine water	D034/Waves	GWDR/Wave direction	1		
CH02 - MPA	Marine water	D034/Waves	WVST/Wave height and period statistics	1		
CH02 - MPA	Marine Water	Z005/Administration and dimensions	ADUN/Administrative units			**20**
CH02 - MPA	Marine Water	Z005/Administration and dimensions	ALAT/Horizontal spatial co-ordinates			**3**
CH02 - MPA	Riverbed/Seabed	T001/Terrestrial	COAS/Terrestrial mapping	3		**1**
CH02 - MPA	Riverbed/Seabed	T001/Terrestrial	COGE/Coastal geomorphology	1		
CH02 - MPA	Riverbed/Seabed	T001/Terrestrial	MBAN/Bathymetry and Elevation	5	2	**1**
CH02 - MPA	Riverbed/Seabed	Z005/Administration and dimensions	ADUN/Administrative units			**2**
CH02 - MPA	Biota/Biology	B015/Birds, mammals and reptiles	GP004/Bird reproduction	1		
CH02 - MPA	Biota/Biology	B015/Birds, mammals and reptiles	GP018/Cetacean reproduction	1		
CH02 - MPA	Biota/Biology	B015/Birds, mammals and reptiles	GP025/Seal reproduction	1		
CH02 - MPA	Biota/Biology	B015/Birds, mammals and reptiles	GP068/Reptile abundance	2		**3**

CH02 - MPA	Biota/Biology	B015/Birds, mammals and reptiles	GP069/Reptile reproduction	1		
CH02 - MPA	Biota/Biology	B015/Birds, mammals and reptiles	GP088/Bird behaviour	1		
CH02 - MPA	Biota/biology	B015/Birds, mammals and reptiles	BRDA/Bird counts	1	3	**2**
CH02 - MPA	Biota/biology	B015/Birds, mammals and reptiles	BRDD/Bird taxonomy-related abundance per unit area of surface	1		
CH02 - MPA	Biota/biology	B015/Birds, mammals and reptiles	CETA/Cetacean abundance	1	1	
CH02 - MPA	Biota/biology	B015/Birds, mammals and reptiles	CEBH/Cetacean behaviour	1	2	**2**
CH02 - MPA	Biota/biology	B015/Birds, mammals and reptiles	SEBH/Seal behaviour	1		
CH02 - MPA	Biota/biology	B015/Birds, mammals and reptiles	FOCA/Seal abundance	1		**1**
CH02 - MPA	Biota/biology	B020/Fish	FATX/Fish abundance in water bodies			**2**
CH02 - MPA	Biota/biology	B020/Fish	FBAB/Fish taxonomy-related abundance per unit area of the bed	1		
CH02 - MPA	Biota/biology	B020/Fish	FREP/Fish reproduction	1		
CH02 - MPA	Biota/biology	B020/Fish	GP085/Fish behaviour	1		
CH02 - MPA	Biota/biology	B030/Phytoplankton and microphytobenthos	PNTX/Phytoplankton generic abundance in water bodies	1		
CH02 - MPA	Biota/biology	B030/Phytoplankton and microphytobenthos	PPRD/Primary production in the water column	1		
CH02 - MPA	Biota/biology	B035/Pigments	CPWC/Chlorophyll pigment concentrations in water bodies	1		**1**
CH02 - MPA	Riverbed/Seabed	B050/Habitat	HBEX/Habitat extent	1		
CH02 - MPA	Riverbed/Seabed	B055/Macroalgae and seagrass	PU02/Macroalgae generic abundance in water bodies			**1**
CH02 - MPA	Riverbed/Seabed	B055/Macroalgae and seagrass	HBEX/Habitat extent	1		
CH02 - MPA	Riverbed/Seabed	B055/Macroalgae and seagrass	BEPP/Benthic primary production	1		
CH02 - MPA	Riverbed/SeaBed	G015/Suspended particulate material	TSED/Concentration of suspended particulate material in the water column	1		
CH02 - MPA	Riverbed/Seabed	G045/Rock and sediment lithology and mineralogy	LITH/Lithology			**1**
CH02 - MPA	Riverbed/Seabed	G060/Sedimentation and erosion processes	BEST/Sediment resuspension			**1**
CH02 - MPA	Riverbed/Seabed	GSED/Rock and sediment sedimentology	DPEV/Depositional environment			**1**
CH02 - MPA	Biota/biology	Z005/Administration and dimensions	ALAT/Horizontal spatial co-ordinates		3	
CH02 - MPA	Biota/biology	B050/Habitat	HBCH/Habitat characterisation	2		

CH02 - MPA	Biota/biology	B050/Habitat	HBEX/Habitat extent	8	2	**18**
CH02 - MPA	Biota/biology	B070/Biota abundance, biomass and diversity	INVD/Invasive species monitoring parameters	4		
CH02 - MPA	Biota/biology	B070/Biota abundance, biomass and diversity	FABD/Fauna abundance per unit area of the bed		3	
CH02 - MPA	Human activities	Z005/Administration and dimensions	ADUN/Administrative units		1	
CH02 - MPA	Human activities	H001/Anthropogenic contamination	IDIS/Industrial discharges	1		
CH02 - MPA	Human activities	H001/Anthropogenic contamination	GP001/Pollution events	1		
CH02 - MPA	Human activities	H002/Construction and structures	MMST/Man-made structures	2		
CH02 - MPA	Human activities	H002/Construction and structures	TRAN/Transport activity	1		
CH02 - MPA	Human activities	H002/Construction and structures	IACT/Industrial activity	1		
CH02 - MPA	Human activities	H002/Construction and structures	HZNV/Hazards to navigation	4		
CH02 - MPA	Human activities	H004/Fisheries	ADUN/Administrative units	2		
CH02 - MPA	Human activities	H004/Fisheries	FCST/Fish and shellfish catch statistics	1		
CH02 - MPA	Human activities	H004/Fisheries	GP080/Fishing by-catch	1		
CH02 - MPA	Human activities	H004/Fisheries	GP087/Fishery characterisation	3	2	
CH02 - MPA	Human activities	H005/Human activities	ADUN/Administrative units	1		
CH02 - MPA	Human activities	H005/Human activities	IACT/Industrial activity	10		
CH02 - MPA	Human activities	H005/Human activities	LITT/Litter abundance and type	5		
CH02 - MPA	Human activities	H005/Human activities	MARC/Marine archaeology	2		
CH02 - MPA	Human activities	H005/Human activities	MLES/Marine environment leisure usage	3		
CH02 - MPA	Human activities	H005/Human activities	TRAN/Transport activity	6		
CH02 - MPA	Human activities	H005/Human activities	ADUN/Administrative units	27		
CH02 - MPA				**133 ATL**	**44 BLA**	**73 MED**
CH03 - Oil leak	Air	M010/Meteorology	EWSB/Wind strength and direction	7	4	**8**
CH03 - Oil leak	Marine water	D030/Currents	RFVL/Horizontal velocity of the water column (currents)	12	2	**14**

CH03 - Oil leak	Marine water	D025/Water column temperature and salinity	TEMP/Temperature of the water column	1	1	**14**
CH03 - Oil leak	Marine water	D025/Water column temperature and salinity	PSAL/Salinity of the water column	1		
CH03 - Oil leak	Marine water	D034/Waves	GWDR/Wave direction		2	**7**
CH03 - Oil leak	Marine water	D034/Waves	WVST/Wave height and period statistics		4	**14**
CH03 - Oil leak	Riverbed/SeaBed	T001/Terrestrial	MBAN/Bathymetry and Elevation	4	2	2
CH03 - Oil leak	Riverbed/SeaBed	G045/Rock and sediment lithology and mineralogy	LITH/Lithology	1		
CH03 - Oil leak	Riverbed/SeaBed	T001/Terrestrial	COAS/Terrestrial mapping	3	1	**1**
CH03 - Oil leak	Riverbed/SeaBed	T001/Terrestrial	COGE/Coastal geomorphology		1	**1**
CH03 - Oil leak	Biota/Biology	B050/Habitat	HBEX/Habitat extent	7	5	4
CH03 - Oil leak	Biota/Biology	B050/Habitat	HBCH/Habitat characterisation	1		1
CH03 - Oil leak	Human activities	H005/Human activities	MLES/Marine environment leisure usage	2	1	1
CH03 - Oil leak	Human activities	Z005/Administration and dimensions	ADUN/Administrative Units	1		
CH03 - Oil leak	Human activities	H001/Anthropogenic contamination	GP001/Pollution events		3	**3**
CH03 - Oil leak	Human activities	H004/Fisheries	GP087/Fishery characterisation	3	2	2
CH03 - Oil leak	Human activities	H004/Fisheries	FCST/Fish and shellfish catch statistics	1		
CH03 - Oil leak	Human activities	H002/Construction and structures	TRAN/Transport Activity	1		
CH03 - Oil leak	Human activities	H005/Human activities	IACT/Industrial Activity	4		
CH03 - Oil leak				**49 ATL**	**28 BLA**	**72 MED**
CH04 - Climate	Ice	M015/Cryosphere	CRYS/Snow and ice mass, thickness and extent	5	17	
CH04 - Climate	Marine water	D020/Other physical oceanographic measurements	SIGT/Density of the water colum	1		
CH04 - Climate	Marine water	D020/Other physical oceanographic measurements	ZZZ/ Ocean Heat Content	1		
CH04 - Climate	Marine water	D025/Water column temperature and salinity	TEMP/Temperature of the water column	6	83	13

CH04 - Climate	Marine water	D025/Water column temperature and salinity	PSST/Skin temperature of the water column		6	6
CH04 - Climate	Marine water	D025/Water column temperature and salinity	PSAL/Salinity of the water column	1		
CH04 - Climate	Marine water	D030/Currents	RFVL/Horizontal velocity of the water column (currents)	1		
CH04 - Climate	Biota/Biology	B030/Phytoplankton and microphytobenthos	CNTX/Phytoplankton generic biomass in water bodies		5	
CH04 - Climate	Biota/Biology	B030/Phytoplankton and microphytobenthos	PNTX/Phytoplankton generic abundance in water bodies	2	4	
CH04 - Climate	Biota/Biology	B030/Phytoplankton and microphytobenthos	PATX/Phytoplankton taxonomic abundance in water bodies	1		
CH04 - Climate	Biota/Biology	B050/Habitat	HBEX/Habitat extent			**1**
CH04 - Climate				**18 ATL**	**115 BLA**	**20 MED**
CH05 - Coasts	Fresh water	O005/Fluxes	RVDS/River flow and discharge		2	
CH05 - Coasts	Marine water	D032/Sea level	ASLV/Sea level	13	42	8
CH05 - Coasts	Riverbed/SeaBed	T001/Terrestrial	MBAN/Bathymetry and Elevation	4		**2**
CH05 - Coasts	Riverbed/SeaBed	G060/Sedimentation and erosion processes	MSFX/Sedimentation flux quantification in the water column	1		
CH05 - Coasts	Riverbed/SeaBed	T001/Terrestrial	COGE/Coastal geomorphology		5	**2**
CH05 - Coasts	Human activities	H002/Construction and structures	MMST/Man-made structures			**1**
CH05 - Coasts				**18 ATL**	**49 BLA**	**13 MED**
CH06 - Fish mngt	Human activities	H004/Fisheries	FCST/Fish and shellfish catch statistics	25	1	11
CH06 - Fish mngt	Human activities	H004/Fisheries	FEFF/Fishing effort		2	
CH06 - Fish mngt	Human activities	H004/Fisheries	GP080/Fishing by-catch	18		6
CH06 - Fish mngt				**43 ATL**	**3 BLA**	**17 MED**
CH07 - Fish Impact	Marine water	H004/Fisheries	FIBM/Fish biomass in water bodies		1	
CH07 - Fish Impact	Biota/Biology	B050/Habitat	HBEX/Habitat extent	6		
CH07 - Fish Impact	Biota/Biology	H004/Fisheries	SABB/Shellfish abundance and biomass in water bodies	1		

CH07 - Fish Impact	Riverbed/SeaBed	G045/Rock and sediment lithology and mineralogy	LITH/Lithology	1		
CH07 - Fish Impact	Riverbed/SeaBed	T001/Terrestrial	MBAN/Bathymetry and Elevation	2		
CH07 - Fish Impact	Human activities	H004/Fisheries	GP087/Fishery characterisation		2	
CH07 - Fish Impact	Human activities	H004/Fisheries	FCST/Fish and shellfish catch statistics		3	
CH07 - Fish Impact	Human activities	H004/Fisheries	FEFF/Fishing effort	12		
CH07 - Fish Impact	Human activities	Z005/Administration and dimensions	ALAT/Horizontal spatial co-ordinates			10
CH07 - Fish Impact				**22** ATL	**6** BLA	**10** MED
CH08 - Eutrophication	Fresh water	C005/Carbon, nitrogen and phosphorus	AMON/Ammonium and ammonia concentration parameters in water bodies			1
CH08 - Eutrophication	Fresh water	C005/Carbon, nitrogen and phosphorus	NTOT/Particulate total and organic nitrogen concentrations in the water column	6	2	1
CH08 - Eutrophication	Fresh water	C005/Carbon, nitrogen and phosphorus	NTRA/Nitrate concentration parameters in the water column	8		
CH08 - Eutrophication	Fresh water	C005/Carbon, nitrogen and phosphorus	PHOS/Phosphate concentration parameters in the water column	7		
CH08 - Eutrophication	Fresh water	C005/Carbon, nitrogen and phosphorus	TDPX/Dissolved total or organic phosphorus concentration in the water column	6		
CH08 - Eutrophication	Marine water	C005/Carbon, nitrogen and phosphorus	NTRA/Nitrate concentration parameters in the water column		14	1
CH08 - Eutrophication	Marine water	C005/Carbon, nitrogen and phosphorus	NTRI/Nitrite concentration parameters in the water column	2		1
CH08 - Eutrophication	Marine water	C005/Carbon, nitrogen and phosphorus	PHOS/Phosphate concentration parameters in the water column		10	2
CH08 - Eutrophication	Fresh water	C005/Carbon, nitrogen and phosphorus	TPHS/Particulate total and organic phosphorus concentrations in the water column		2	
CH08 - Eutrophication	Marine water	C015/Dissolved gases	DOXY/Dissolved oxygen parameters in the water column	4	2	
CH08 - Eutrophication	Marine water	D015/Optical properties	ATTN/Transmittance and attenuance of the water column			6
CH08 - Eutrophication	Marine water	D025/Water column temperature and salinity	TEMP/Temperature of the water column	6	7	1
CH08 - Eutrophication	Marine water	D025/Water column temperature and salinity	PSST/Skin temperature of the water column			3
CH08 - Eutrophication	Marine water	D025/Water column temperature and salinity	PSAL/Salinity of the water column	6		3
CH08 - Eutrophication	Marine water	D030/Currents	LRZA/Vertical velocity of the water column (currents)			1

CH08 - Eutrophication	Marine water	D030/Currents	RFVL/Horizontal velocity of the water column (currents)			2
CH08 - Eutrophication	Marine water	D032/Sea level	ASLV/Sea level			1
CH08 - Eutrophication	Biota/Biology	B030/Phytoplankton and microphytobenthos	AATX/Phytoplankton taxonomic surface area in water bodies		1	
CH08 - Eutrophication	Biota/Biology	B030/Phytoplankton and microphytobenthos	CNTX/Phytoplankton generic biomass in water bodies		1	1
CH08 - Eutrophication	Biota/Biology	B030/Phytoplankton and microphytobenthos	PNTX/Phytoplankton generic abundance in water bodies		1	
CH08 - Eutrophication	Biota/Biology	B035/Pigments	CPWC/Chlorophyll pigment concentrations in water bodies	3	5	1
CH08 - Eutrophication				**48 ATL**	**45 BLA**	**25 MED**
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	AMON/Ammonium and ammonia concentration parameters in water bodies	8		
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	NTOT/Particulate total and organic nitrogen concentrations in the water column	2	3	
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	NTRA/Nitrate concentration parameters in the water column	9	4	4
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	NTRI/Nitrite concentration parameters in the water column	5		
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	PHOS/Phosphate concentration parameters in the water column	2	3	3
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	PXSP/Phosphorus concentrations in suspended particulate material	7		
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	TDIN/Dissolved inorganic nitrogen concentration in the water column	2		
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	TDNT/Dissolved total and organic nitrogen concentrations in the water column	2		4
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	TDPX/Dissolved total or organic phosphorus concentration in the water column			3
CH09 - River inputs	Fresh water	C005/Carbon, nitrogen and phosphorus	TPHS/Particulate total and organic phosphorus concentrations in the water column		3	
CH09 - River inputs	Fresh water	O005/Fluxes	RVDS/River flow and discharge	6	14	8
CH09 - River inputs	Fresh water	D025/Water column temperature and salinity	TEMP/Temperature of the water column	20	3	
CH09 - River inputs	Fresh water	D025/Water column temperature and salinity	PSAL/Salinity of the water column	14		
CH09 - River inputs	Riverbed/SeaBed	G015/Suspended particulate material	TSED/Concentration of suspended particulate material in the water column	9	12	**9**
CH09 - River inputs	Marine Water	C005/Carbon, nitrogen and phosphorus	NTOT/Particulate total and organic nitrogen concentrations in the water column		1	
CH09 - River inputs	Marine Water	C005/Carbon, nitrogen and phosphorus	NTRA/Nitrate concentration parameters in the water column		11	

CH09 - River inputs	Marine Water	C005/Carbon, nitrogen and phosphorus	TPHS/Particulate total and organic phosphorus concentrations in the water column		2	
CH09 - River inputs	Marine Water	C005/Carbon, nitrogen and phosphorus	PHOS/Phosphate concentration parameters in the water column		8	
CH09 - River inputs	Marine Water	D025/Water column temperature and salinity	TEMP/Temperature of the water column		7	
CH09 - River inputs	Biota/Biology	B020/Fish	FATX/Fish abundance in water bodies	10		**2**
CH09 - River inputs				**96 ATL**	**71 BLA**	**33 MED**
CH10 - Bathymetry	Riverbed/SeaBed	T001/Terrestrial	MBAN/Bathymetry and Elevation	8	33	
CH10 - Bathymetry	Riverbed/SeaBed	T001/Terrestrial	ACYC/Reference numbers	1		
CH10 - Bathymetry	Riverbed/SeaBed	T001/Terrestrial	AYMD/Date and time	1		
CH10 - Bathymetry	Riverbed/SeaBed	G045/Rock and sediment lithology and mineralogy	LITH/Lithology	1		
CH10 - Bathymetry	Marine water	D032/Sea level	ASLV/Sea level	10		
CH10 - Bathymetry	Marine water	H005/Human activities	ADUN/Administrative Units	1		
CH10 - Bathymetry	Human activities	H005/Human activities	TRAN/transport activity	4		
CH10 - Bathymetry				**26** ATL	**33** BLA	**0** MED
CH11 - Alien species	Biota/Biology	B070/Biota abundance, biomass and diversity	INVD/Invasive species monitoring parameters	51		
CH11 - Alien species	Biota/biology	B045/Zooplankton	GP079/Zooplankton wet weight biomass		6	
CH11 - Alien species	Biota/biology	B045/Zooplankton	ZATX/Zooplankton taxonomy-related abundance per unit volume of the water column		13	
CH11 - Alien species	Biota/biology	B045/Zooplankton	ZCTC/Zooplankton taxonomy-related biomass expressed as carbon per unit volume of the water column		5	
CH11 - Alien species				**51 ATL**	**24 BLA**	**0 MED**

Appendix 3: List of data providers for the 11 Challenges

- Challenge 01: Windfarm siting
- Challenge 02: Protected marine areas
- Challenge 03: Oil leak
- Challenge 04: Climate
- Challenge 05: Coasts
- Challenge 06: Fishery management
- Challenge 07: Fishery impact
- Challenge 08: Eutrophication
- Challenge 09: River inputs
- Challenge 10: Bathymetry
- Challenge 11: Alien species

Data providers (organisation or programme name)	Environmental matrix	Group of category of characteristic (P03)	Challenges										
			01	02	03	04	05	06	07	08	09	10	11
INT-730/ICES (International Council for the Exploration of the Sea)	Marine water Biota/Biology Human activities	C015/Dissolved gases D025/Water column temperature and salinity B020/Fish B070/Biota abundance, biomass and diversity Z005/Administration and dimensions H004/Fisheries	x			x		x	x	x	x		x
INT-GEBCO (General Bathymetric Chart of the Oceans) 43/BODC (British Oceanographic Data Centre)	Riverbed/SeaBed	T001/Terrestrial	x		x		x		x			x	
INT-1869/FAO	Fresh water Human activities	G015/Suspended particulate material B050/Habitat H004/Fisheries	x		x			x	x		x		
INT-2421/GBIF (Global Biodiversity Information Facility)	Biota/Biology	B050/Habitat B070/Biota abundance, biomass and diversity		x									x
IMO (Global Ballast Water Management Programme)	Biota/Biology	B070/Biota abundance, biomass and diversity											x
INT-OBIS (ESAS database)	Biota/Biology	B015/Birds, mammals and reptiles	x										
INT-UNEP-WCMC (The World Database on Protected Areas)	Human activities	H005/Human activities		x									
INT-EBSA (Ecologically or Biologically Significant Marine Areas)	Biota/Biology	B050/Habitat		x									
INT-Ramsar Convention	Human	H005/Human activities		x									

(wetland sites)	activities											
INT-IUCN/UNEP (World Database on Protected Areas)	Biota/Biology	B050/Habitat			x							
INT-IOC/UNESCO (Sonel/GLOSSn etwork)	Marine water	D032/Sea level					x					
INT-ICCAT	Human activities	H004/Fisheries						x				
INT-NASCO (SALSEA - Salmon)	Fresh water	B020/Fish								x		
INT- Fishbase	Biota/Biology	B020/Fish								x		
INT-UN-CABI (Invasive Species Compendium)	Biota/Biology	B070/Biota abundance, biomass and diversity										x
EU-EC DG MARE (EMODNet Bathymetry)	Riverbed/SeaBed	T001/Terrestrial	x	x	x		x		x			x	
EU-EC DG MARE (EMODNET Physicss)	Marine water Fresh water ???	D025/Water column temperature and salinity D032/Sea level	x			x	x		x	x	x	
EU-COPERNICUS (CMEMS)	Marine water Biota/Biology Fresh water ??? Ice	D030/Currents D025/Water column temperature and salinity D020/Other physical oceanographic measurements D032/Sea level C015/Dissolved gases B035/Pigments M015/Cryosphere			x	x	x		x	x	x	
OSPAR	Riverbed/SeaBed Biota/Biology Human activities Fresh water	G015/Suspended particulate material B050/Habitat Z005/Administration and dimensions H005/Human activities C005/Carbon, nitrogen and phosphorus O005/Fluxes	x		x			x	x	x		
EU-DG MARE (EMODnet Seabed Mapping - Habitats -)	Marine water Riverbed/SeaBed Biota/Biology	D020/Other physical oceanographic measurements G045/Rock and sediment lithology and mineralogy B050/Habitat	x	x	x			x				
EU DG Environment (EEA) (Natura 2000 + WISE +MSFD)	Riverbed/SeaBed Human activities Fresh water Biota/Biology	T001/Terrestrial H005/Human activities D025/Water column temperature and salinity O005/Fluxes C005/Carbon, nitrogen and phosphorus B070/Biota abundance, biomass and diversity		x						x		x
EU-EC DG MARE (EMODNET Human Activities s)	Biota/Biology Human activities	B050/Habitat H002/Construction and structures H004/Fisheries H005/Human activities		x	x							

EU-EC DG MARE (EMODNET - European atlas of the seass)	Marine water Riverbed/SeaBed Human activities	D032/Sea level G060/Sedimentation and erosion processes H005/Human activities					x					x	
EU-EC DG MARE (Data Collection (DCR-DCF) for Common Fisheries)	Human activities	H004/Fisheries						x	x				
EU-EC DG MARE (EMODnet Chemistry)	Marine water ??? Riverbed/SeaBed Biota/Biology Fresh water ???	C015/Dissolved gases C005/Carbon, nitrogen and phosphorus G015/Suspended particulate material B035/Pigments								x	x		
EU-EC DG MARE (EMDONET-Biology)	Biota/Biology	B070/Biota abundance, biomass and diversity B020/Fish									x		x
EU-2547/ECMWF (European Center for Medium-Range Weather Forecasts)	Air	M010/Meteorology			x								
EU-EC DG MARE (EMODNet Geology)	Riverbed/SeaBed	G045/Rock and sediment lithology and mineralogy							x				
EU-EC DG MARE (Eel management plan)	Fresh water	B020/Fish									x		
EU-JRC/IES (European Alien Species Information Network	Biota/Biology	B070/Biota abundance, biomass and diversity											x
BE-422/VLIZ (SCUFN, LME, MEOW, WORMS, MARBEF, MARBOUND)	Riverbed/SeaBed Biota/Biology Human activities	T001/Terrestrial B050/Habitat B070/Biota abundance, biomass and diversity Z005/Administration and dimensions H005/Human activities	x	x	x								x
UK MOHC (Met Office Hadley Centre observations datasets)	Marine water Fresh water Ice	O005/Fluxes D025/Water column temperature and salinity M015/Cryosphere				x				x	x		
FR-848/IFREMER (PREVIMER - COASTAL OBSERVATIONS AND FORECAST)	Air Marine water	M010/Meteorology D030/Currents D025/Water column temperature and salinity D034/Waves	x		x								
FR-CNES (AVISO (DUACS))	Marine water	D030/Currents D032/Sea level			x		x						
UK-BODC (Clean Safe Seas Environmental Monitoring Programme and EU ESEAS Research Infrastructure project)	Riverbed/SeaBed Fresh water Marine water	G015/Suspended particulate material O005/Fluxes D032/Sea level					x				x		

UK - HR Wallingford (SeaZone solutions)	Riverbed/SeaBed Human activities	T001/Terrestrial G045/Rock and sediment lithology and mineralogy					x					x	
- PSMSL (Permanent Service for Mean Sea Level)	Marine water	D032/Sea level					x					x	
FR - Orange Marine (SIGCables)	Human activities	H005/Human activities	x										
PT- IH-PT (Hydrographic Institute)	Riverbed/SeaBed Human activities	G005/Gravity, magnetics and bathymetry Z005/Administration and dimensions	x										
SP - Puertos del Estado - Oceanografia	Air Marine water	M010/Meteorology D030/Currents D025/Water column temperature and salinity D034/Waves	x										
UK - ABPmer (Atlas of UK Marine Renewable Energy Resources)	Air Marine water	M010/Meteorology D034/Waves	x										
UK-JNCC (Seabird 2000)	Biota/Biology	B015/Birds, mammals and reptiles	x										
FR-AAMP (MAIA project: Marine Protected Areas in the Atlantic Arc)	Human activities	H005/Human activities		x									
UK-MarineTraffic.com (coastal AIS)	Human activities	H005/Human activities		x									
FR-514/METEO France	Air	M010/Meteorology			x								
UK-SAFOS (Continuous Plankton Recorder)	Biota/Biology	B030/Phytoplankton and microphytobenthos				x							
UK-784/DEFRA (UK MSFD descriptor 3s)	Human activities	H004/Fisheries						x					
IE-396/Marine Institute (Nephrops Underwater TV Survey)	Biota/Biology	H004/Fisheries							x				
NL-IMARES (Benthic Ecosystem Fisheries Impact Studie)	Human activities	H004/Fisheries							x				
UK-CEFAS	Marine water	C005/Carbon, nitrogen and phosphorus								x			
UK-Lochaber Fisheries Trust	Biota/Biology	B020/Fish									x		
BE - K.U. Leuven (DESIRE)	Fresh water	G015/Suspended particulate material									x		
FR-848/IFREMER (SEADATANET-PAN-EUROPEAN INFRASTRUCTURE FOR MARINE DATA 2)	Riverbed/SeaBed Fresh water	G015/Suspended particulate material C005/Carbon, nitrogen and phosphorus D025/Water column temperature and salinity									x		
FR-CNRS-UMR-EPOC (MAGEST -MAREL GIRONDE ESTUAIRE -)	Riverbed/SeaBed	G015/Suspended particulate material									x		

GE-BFG (Global Runoff Data Centre)	Fresh water	O005/Fluxes								x			
UK-AFBI (North of Ireland Joint Agency Coastal Monitoring Programme)	Riverbed/SeaBed	G015/Suspended particulate material								x			
SP - Xunta de Galicia-RAIA (Iberian Margin Ocean Observator)	Fresh water	D025/Water column temperature and salinity								x			
UK-Lochaber Fisheries Trust	Biota/Biology	B020/Fish								x			
UK-NASCO (SALSEA - salmon)	Biota/Biology	B020/Fish								x			
UK-National Biodiversity Network (NBN)	Fresh water	B020/Fish								x			
UK Anatec Ltd	Human activities	H005/Human Activities									x		
GR-HCMR (DEVOTES project)	Biota/Biology	B070/Biota abundance, biomass and diversity										x	
LT-KUCORPÏ (NOBANIS + AQUANIS)	Biota/Biology	B070/Biota abundance, biomass and diversity										x	
SP-Eusko Jaurlaritza (GIPUZKOA + BIZKAIA)	Biota/Biology	B070/Biota abundance, biomass and diversity										x	
UK-CEH (DAISIE)	Biota/Biology	B070/Biota abundance, biomass and diversity										x	
UK-NNSS (Non-native Species Programme)	Biota/Biology	B070/Biota abundance, biomass and diversity										x	
UK - PML (VECTORS project)	Biota/Biology	B070/Biota abundance, biomass and diversity										x	
US-1433/NOAA (Tides and currents)	Air Marine water Riverbed/SeaBed	M010/Meteorology D030/Currents D032/Sea level T001/Terrestrial	x	x	x		x				x		
US-1226/NOAA NESDIS (National Environmental Satellite, Data, and Information Service)	Riverbed/SeaBed	T001/Terrestrial G045/Rock and sediment lithology and mineralogy			x						x		
US-NOAA- NODC/NCEI (World Ocean Database)	Marine water Biota/Biology	D025/Water column temperature and salinity B030/Phytoplankton and microphytobenthos				x	x						
US-NASA/JPL/ PODAAC	Marine water	D032/Sea level					x				x		
US-UHSLC/University of Hawaii sea level centre	Marine water	D032/Sea level					x				x		
US-BOEM (Renewable Energy Program	Human activities	H005/Human activity	x										
US-SAFMC (South Atlantic Habitat and Ecosystem Atlas)	Biota/Biology	B050/Habitat	x										
US-3584/NOAA/CSC (Coastal Services Center: Mid-Atlantic Regional Ocean Assessment)	Human activities	H005/Human activities		x									

US-1978/NOAA-NGDC / National Geophysical Data Center	Riverbed/SeaBed	T001/Terrestrial		x									
US-363915:15 USCG (Northeast OceanMap and Data for ocean planning in the Northeastern United States)	Biota/Biology Human activities	B015/Birds, mammals and reptiles H002/Construction and structures H004/Fisheries H005/Human activities		x									
US-NACIS (Natural Earth)	Riverbed/SeaBed Human activities	T001/Terrestrial H005/Human activities			x								
US-NAVO (Naval Oceanographic Office)	Marine water	D030/Currents			x								
US NAVY - FNMOC (Global Ocean Data Assimilation Experiment)	Air	M010/Meteorology			x								
US- NGA (National Geospatial-Intelligence Agency)	Human activities	H005/Human activities			x								
US-NOAA/National MPA Center (National Ocean and Atmopsheric Administration, National Marine Protected Areas Center)	Biota/Biology	B050/Habitat			x								
US-2549/NOAA/NCEP (HYCOM ocean monitoring, analysis and forecast)	Marine water	D025/Water column temperature and salinity D030/Currents			x								
US-1433/NOAA, Office of Response and restoration (National Oceanic and Atmospheric Administration)	Biota/Biology	B050/Habitat			x								
US-NASA - NSIDC (National Snow and Ice Data Centre)	Ice	M015/Cryosphere				x							
US-NOAA/NMFS (COPEPOD- The Coastal & Oceanic Plankton Ecology, Production & Observation Database)	Biota/Biology	B030/Phytoplankton and microphytobenthos				x							
US-NASA/ORNL DAAC (RivDIS - Global River Discharge Project	Fresh water	O005/Fluxes								x			
US Government Open Data Source	River bed/SeaBed	T001/Terrestrial									x		
US-PATH (Port Authority of New York and New Jersey Developer resources)	Human activities	H005/Human activities									x		

US-SIO (Scripps Institution of Oceanography)	Riverbed/SeaBed	T001/Terrestrial										x	
US-SERC (NEMESIS - National Exotic Marine and Estuarine Species Information System))	Biota/Biology	B070/Biota abundance, biomass and diversity											x
US USDA (NSIC - National Invasive Species Information Center))	Biota/Biology	B070/Biota abundance, biomass and diversity											x

Appendix 4: Use Cases

Below are the 22 use cases files showing the sub-sections “Use case data requirements” and “gap analysis” with a quality assessment scored 1 to 3. The section “As is analysis” has been masked, being of no immediate relevance at this point. Column headers only appear on CH1_UC1 just below.

CH1_UC1

APPROPRIATENESS

		Description of output data, processes and fitness for use evaluations by component Create as many sections (i.e. repeat lines 2-5) as components				
M		**The outputs for this Use Case are (1) maps displaying the spatial extent and attributs of the input characteristics available with geographic coordinates and (2) availability and appropriateness analysis of input characteristics based on several indicators.**				
M		**Appropriateness**				
		Use case data requirements (M)			**Gap analysis**	
		Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied”
	CH1_Input1	G005	MBAN	Bathymetric data with good resolution (<=500 m); Coverage should be complete, consistent and at least 1' arc resolution for the whole use case area.	None	3
	CH1_Input2	Z005	ADUN	Exclusive Economic Zones Boundaries (EEZ) complete and consistent for the whole study area	None	3
	CH1_Input3	B050	DPEV	Completness, consistency mapping with spatial distribution of habitats/biotopes for the the shelf of Europe	There are limitations concerning spatial extent and species and communities description.	1

CH1_Input4	B050	DPEV	Predicted broad-scale EUNIS habitats - Atlantic area	There are limitations concerning spatial resolution.	2
CH1_Input5	T001	COAS	Consistent, complete and accurate shoreline dataset	Dataset accuracy is unknown	3
CH1_Input6	H004	ADUN	Consistent, complete and accurate statistical marine fisheries areas	None	3
CH1_Input7	Z005	ADUN	Consistent and complete ICES Ecoregions	None	3
CH1_Input8	G005	MBAN	Complete and consistent Bathymetric grid data with ~900 m resolution over the whole area	None	3
CH1_Input9	Z005	ADUN	Consistent and complete data on International Territorial sea	dataset was removed from source site	1
CH1_Input10	G005	MBAN	Consistent and complete bathymetric grid models of several coastal portuguese areas	Spatial resolution is high (~100) their extent is scattered and very limited	1
CH1_Input11	M010	EWSB	Complete and consistent wind speed and power for the whole study area for UK	Spatial resolution is low (12km)and their extent is limited to to UK (UK Continental Shelf, England, Wales, Scotland, Northern Ireland, Channel Islands)	1
CH1_Input12	D034	WVST	Complete and consistent mean significant wave for the whole study area for UK	Spatial resolution is low (12km)and their extent is limited to UK (UK Continental Shelf, England, Wales, Scotland, Northern Ireland, Channel Islands)	1
CH1_Input13	B050	HBEX	Consistent and complete threatened and/or declining habitats dataset for the study area	OSPAR zone.Spatial extent does not cover all User Case area.	1
CH1_Input14	B050	DPEV	Consistent and complete habitats dataset for the study area	Mapping is spatially very limited	1
CH1_Input15	B050	DPEV	Consistent and complete habitats dataset for the study area	Mapping is spatially very limited	1
CH1_Input16	D020	Combined action of waves and currents	Consistent and complete seabed kinetic energy maps for waves and currents in the North Sea and Celtic Sea	Distribution confined to North Sea and Celtic Sea. Falls outside the Use Case area	1
CH1_Input17	B050	HBEX	Consistent and complete delimitation of Biological Zones for the Atlantic waters of Portugal, Spain, Ireland and France	None	3
CH1_Input18	Z005	ADUN	Consistent and complete delimitation of Marine Protected Areas Network(MPA) shapefile	None	3
CH1_Input19	G045	LITH	Consistent and complete dataset on spatial distribution of Seabed substrate types	Data could not be downloaded	1
CH1_Input20	D034	WVST	Consistent and complete forecast dataset of Significant height of waves {Hs} on the water body for the North Atlantic	Dataset with too low spatial resolution and it can not be georeferenced	1

	CH1_Input21	D034	WVST	Consistentv and complete forecast dataset of Significant height of primary swell by model prediction for the North Atlantic	Dataset with too low spatial resolution and it can not be georeferenced	1
	CH1_Input22	D034	GWDR	Consistent and complete forecast dataset of rms of bottom amplitude displacement by model prediction for the North Atlantic	Dataset with too low spatial resolution and it can not be georeferenced	1
	CH1_Input23	D034	GWDR	Consistent and complete forecast dataset of rms of bottom velocity amplitudes by model prediction for the North Atlantic	Dataset with too low spatial resolution and it can not be georeferenced	1
	CH1_Input24	D034	GWDR	Consistent and complete forecast dataset of Mean waves direction by model prediction for the North Atlantic	Dataset with too low spatial resolution and it can not be georeferenced	1
	CH1_Input25	D034	WVST	Consistent and complete forecast dataset of Significant height of waves {Hs} on the water body in the North East Atlantic	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input26	D034	WVST	Consistent and complete forecast dataset of Significant height of primary swell by model prediction in the North East Atlantic	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input27	D034	GWDR	Consistent and complete forecast dataset of rms of bottom amplitude displacement by model prediction in the North East Atlantic	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input28	D034	GWDR	Consistent and complete forecast dataset of rms of bottom velocity amplitudes by model prediction in the North East Atlantic	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input29	D034	GWDR	Consistent and complete forecast dataset of Mean wave direction by model prediction in the North East Atlantic	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input30	D030	LRZA	Consistent and complete forecast dataset of Direction and Intensity of average currents over vertical along the North east Atlantic	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input31	M010	EWSB	Consistent and complete forecast dataset of Direction and Intensity of wind along the North east Atlantic	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input32	M010	EWSB	Consistent and complete forecast dataset of Direction and Intensity of wind in the Channel-Bay of Biscay coast	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input33	D025	PSST	Consistent and complete forecast dataset of Direction and Intensity of Sea surface temperature in the Channel-Bay of Biscay coast	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
	CH1_Input34	M010	EWSB	Consistent and complete historical total or anual data Mean wind speed (m/s) at sea surface in stations network and model	Datasets are located in sparse geographic points (modeled or stations)	1

			points.		
CH1_Input35	D034	HEAV	Consistent and complete historical data on Waves-significant height(m) at stations (measurement network) and model points.	Datasets are located in sparse geographic points (modeled or stations)	1
CH1_Input36	D030	RFVL	Consistent and complete historical data Currents speed (cm/s) at stations (measurement network) and model points.	Datasets are located in sparse geographic points (modeled or stations)	1
CH1_Input37	D030	RFVL	Consistent and complete historical data Currents propagation Direction(º) at stations (measurement network) and model point.	Datasets are located in sparse geographic points (modeled or stations)	1
CH1_Input38	D025	PSST	Consistent and complete historical data on Surface max/min Mean Water Temperature (ºC) at stations (measurement network) and model points.	Datasets are located in sparse geographic points (modeled or stations)	1
CH1_Input39	H005	TRAN	Consistent and complete Vessel Traffic Density in the USA Atlantic Continental Shelf	Dataset confined to the USA Atlantic Continental Shelf	1
CH1_Input40	B015	GP004	Consistent and complete seabird Nesting Counts in Britain and Ireland	Dataset scope is centred on UK	1
CH1_Input41	B015	BRDA	Consistent and complete seabird distribution and abundance data	Dataset scope is centered on UK	1
CH1_Input42	B050	HBEX	Consistent and complete Essencial Fish Habitat extent	Dataset scope is outside the Use Case area (USA)	1
CH1_Input43	H005	IACT	Consistent and complete submarine telecommunication cable routes	information on cable routes is confined to a limited number of submarine telecom cables	1
CH1_Input44	H005	IACT	Consistent and complete Inventory of Offshore Installations	None	3
CH1_Input45	H005	IACT	Consistent and complete Offshore Wind-farms location	OSPAR zone.Spatial extent does not cover all User Case area.	2
CH1_Input46	D034	WVST	Consistent and complete Wave peak period by model prediction (1/peak frequency)	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1
CH1_Input47	D034	WVST	Consistent and complete Wave peak period by model prediction (1/peak frequency)	Dataset is partly outside the Use Case area, it can not be georeferenced and does not cover all the Use Case Area	1

Synthesis on data appropriateness of the existing sources for the use case including (but not limited to) :
- goals not achieved because of data inadequacy
- causes : lack of measurement (completness in terms of "characteristics", in term of coverage...) , lack of resolution, lack of consistency (thematic, spatial, between different "characteristics", or between sources of a same characteristic
-statements made as fitness for use of the data sources
- priorities for future development : new data required and for to improve usability

(M)
OWF siting demands knowledge from a wide range of attributes from physical and human data sources. Most of input characteristics scored low appropriateness (1= "Not at all Satisfied to partly Satisfied") due to limitations on spatial resolution and extent. Moreover, few characteristics belonging to Air Matrix were colected. This is an important gap on source data considering that the most important inputs for OWF siting are the spatial information on wind vel.or power distributions. The air matrix datasets found also lack appropriate information on wind vertical distribution. Some datasets are originated and made available from national institutions without concerns on spatial data coverage and standadization across regions and countries. More cooperation among institutions and countries, in the framework of INSPIRE Directive, is needed for more standardization on data processing and format. Data source Appriateness 1 - 36 2 - 2 3 - 9

AVAILABILITY

		Availability						
M		Use case data requirement (M)			Gap analysis (M)			
		Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied		
						Visibility	Accessibility	Performance
	CH1_Input1	G005	MBAN	highly visible and accessible bathymetry model from source site.	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input2	Z005	ADUN	EEZ boundaries highly visible and accessible from source site.	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input3	B050	DPEV	highly visible and accessible from source site. Coverage should be complete for some zones in the User Case area.	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input4	B050	DPEV	highly visible and accessible from source site. Coverage	Characteristic acomplished all visibility, accessibility	3	3	3

			should be complete for the User Case area.	and Performance requirements			
CH1_Input5	T001	COAS	Consistent and complete shoreline dataset to all northern Atlantic	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
CH1_Input6	H004	ADUN	Consistent and complete poligons on fisheries statistical marine areas across all northern Atlantic	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
CH1_Input7	Z005	ADUN	Consistent and complete poligons delimitating ICES Ecoregions	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
CH1_Input8	G005	MBAN	highly visible and accessible bathymetry raster dataset from source site.	Characteristic fully acomplished visibility requirements but it is limited on accessibility and Performance	3	2	2
CH1_Input9	Z005	ADUN	Consistent and complete poligons of the International Territorial sea	dataset was removed from source site	1	1	1
CH1_Input10	G005	MBAN	Visible and acessible bathymetric models of several coastal portuguese areas	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
CH1_Input11	M010	EWSB	high visible and medium acessible offshore wind speed and power models	Characteristic acomplished all visibility requirements. Some lack of Accessibility and Performance	3	2	2
CH1_Input12	D034	WVST	high visible and acessible offshore significant wave height models	Characteristic acomplished all visibility requirements. Some lack of Accessibility and Performance	3	2	2
CH1_Input13	B050	HBEX	high visible and acessible distribution os threatened and/or declining habitats	Characteristic acomplished all Visibility, Accessibility and Performance requirements.	3	3	3
CH1_Input14	B050	DPEV	high visible and acessible distribution of seabed habitats	Characteristic acomplished all Visibility, Accessibility and Performance requirements.	3	3	3
CH1_Input15	B050	DPEV	high visible and acessible distribution of seabed habitats	Characteristic acomplished all Visibility, Accessibility and Performance requirements.	3	3	3
CH1_Input16	D020	Combined action of waves and currents	high visible and acessible distribution of kinetic energy	Modeled seabed energy characteristic acomplished all requirements (visibility, accessibility and Performance) thouth does not cover the Use Uase area	3	3	3
CH1_Input17	B050	HBEX	Visible and accessible delimitation of Biological Zones	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
CH1_Input18	Z005	ADUN	Visible and accessible delimitation of MPA	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
CH1_Input19	G045	LITH	Visible and accessible spatial distribution of Seabed substrate types	Data could not be downloaded	1	1	1
CH1_Input20	D034	WVST	visible and accessible forecast dataset of Significant height of waves {Hs} on the water body	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input21	D034	WVST	visible and accessible forecast dataset of significant height of primary swell by model prediction	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3

CH1_Input22	D034	GWDR	visible and accessible forecast dataset of rms of bottom amplitude displacement by model prediction	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input23	D034	GWDR	visible and accessible forecast dataset of visible and accessible forecast dataset of rms of bottom velocity amplitudes by model prediction	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input24	D034	GWDR	visible and accessible forecast dataset of Mean waves period and direction by model prediction	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input25	D034	WVST	visible and accessible forecast dataset of Significant wave height and direction in the North East Atlantic	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input26	D034	WVST	visible and accessible forecast dataset of Significant height of primary swell by model prediction in the North East Atlantic	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input27	D034	GWDR	visible and accessible forecast dataset of rms of bottom amplitude displacement by model prediction in the North east Atlantic	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input28	D034	GWDR	visible and accessible forecast dataset of rms of bottom velocity amplitudes by model prediction in the North east Atlantic	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input29	D034	GWDR	visible and accessible forecast dataset of Mean wave direction by model prediction in the North east Atlantic	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input30	D030	LRZA	visible and accessible forecast dataset of current speed averaged over the water column in the North east Atlantic	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input31	M010	EWSB	visible and accessible forecast dataset of Wind speed (10m) in the atmosphere by model prediction	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input32	M010	EWSB	visible and accessible forecast dataset of Wind speed (10m) in the atmosphere by model prediction	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input33	D025	PSST	visible and accessible forecast dataset of Sea Surface Temperature	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
CH1_Input34	M010	EWSB	visible and accessible historical total or anual data Mean wind speed (m/s) at sea surface in stations network and model points.	Tables with figures can be displayed but not downloaded	3	1	3
CH1_Input35	D034	HEAV	visible and accessible historical data on Waves-significant height(m) at stations (measurement network) and model points.	Tables with figures can be displayed but not downloaded	3	1	3
CH1_Input36	D030	RFVL	visible and accessible historical data Currents speed (cm/s) at stations (measurement network) and model points.	Tables with figures can be displayed but not downloaded	3	1	3

	CH1_Input37	D030	RFVL	visible and accessible historical data Currents propagation Direction(º) at stations (measurement network) and model point.	Tables with figures can be displayed but not downloaded	3	1	3
	CH1_Input38	D025	PSST	visible and accessible Historical data on Surface max/min Mean Water Temperature (ºC) at stations (measurement network) and model points.	Tables with figures can be displayed but not downloaded	3	1	3
	CH1_Input39	H005	TRAN	visible and accessible Vessel Traffic Density in the USA Atlantic Continental Shelf	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input40	B015	GP004	visible and accessible seabird Nesting Counts	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input41	B015	BRDA	Visible and accessible seabird distribution and abundance data	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input42	B050	HBEX	visible and accessible Essencial Fish Habitat (EFH) extent.	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input43	H005	IACT	visible and accessible Submarine telecommunication cable routes	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input44	H005	IACT	Inventory of Offshore Installations	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input45	H005	IACT	visible and accessible Offshore Wind-farms	Characteristic acomplished all visibility, accessibility and Performance requirements	3	3	3
	CH1_Input46	D034	WVST	visible and accessible Wave peak period by model prediction (1/peak frequency)	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3
	CH1_Input47	D034	WVST	visible and accessible Wave peak period by model prediction (1/peak frequency)	Data only could be downloaded as image swf. it could not be used as georeferenced dataset	3	3	3

Synthesis on data availibility of the existing sources for the use case including (but not limited to) :
- goals not achieved because of data inadequacy
- causes : reluctance of data owners to release data, time taken to obtain data (visibility, accessibility, performance),
- statements made as fitness of the services
- priorities for future development to improve conditions of availibity
(M)

The majority of Input datasets scored high concerning visibility, accessibility and performance indicators. Downloaded Datasets were free of charge though some providers required user identication prior to downloading and some allow data display but not downloading. Majority of sites are from non-private organizations.

	Visib.	Accessib.	Perform.
1 -	2	7	2
2 -	0	3	3
3 -	45	37	42

CH2_UC1

APPROPRIATENESS

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied”

MBAN	**BATHDPTH**	A detailed bathymetry data set in the Lesser Antilles was identified as a primary objective for national and regional GIS activities within the Lesser Antilles Pelagic Ecosytem (LAPE) Project . For this purpose, a set of Marine Nautical Charts originally at 1:100.000, 1:200.000 and 1:300.000 scale were digitized and integrated with smaller scale data when necessary. The final product, delivered into two phase, end of January 2005 and end of March 2005, includes digital bathymetric layers, covering the entire Project area, ranging from 0 to about 8000 m depth, in vector and raster formats, plus some additional layers.	Resolution of this data is very weakness to aim the purpose of this use case. For this reason This data is enhanced with sonar data collected during field survey in the study area for modelise a grid with 50m resolution	1
MBAN	**BATHDPTH**	A detailed bathymetry data set in the Lesser Antilles was identified as a primary objective for national and regional GIS activities within the Lesser Antilles Pelagic Ecosytem (LAPE) Project . For this purpose, a set of Marine Nautical Charts originally at 1:100.000, 1:200.000 and 1:300.000 scale were digitized and integrated with smaller scale data when necessary. The final product, delivered into two phase, end of January 2005 and end of March 2005, includes digital bathymetric layers, covering the entire Project area, ranging from 0 to about 8000 m depth, in vector and raster formats, plus some additional layers.	Resolution of this data is very weakness to aim the purpose of this use case. For this reason This data is enhanced with sonar data collected during field survey in the study area for modelise a grid with 50 m resolution	1
MMST	**Roads**	na	na	3

HBEX	**Distribution of Coral Reefs**	Data represent the distribution of the coral reef in the warm water. It's a result of compilation of different data sources in tropical and subtropical area. Coverage, extent and resolution are satisfying for to do some geoprocessing and to combine with another data types	Nothing to report	3
MLES	**Including extent and types of recreational activities**	Data represent the distribution of recreational activities	Several gaps was identified for recreational data. For limited this lack fields surveys was programed to collect informations and some satellite imagery was digitised for produce georeferenced data for mitigated this lack	1
H004	**GP087**	Data represent the distribution of potential site of mariculture	Several gaps was identified for mariculture data. For limited this lack satellite imagery was digitised for produce georeferenced data for mitigated this lack	1

AVAILABILITY

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied			
				Visibility	Accessibility	Performance
MBAN	BATHDPTH	na	na	na	na	na

MBAN	BATHDPTH	Data available in the Fao catalogue server	data need a special processing for to be ready to use	2	2	2
MMST	Roads	Data available in the Nature Conservansy catalogue server	na	2	2	2
HBEX	Distribution of Coral Reefs	Data can to be displayed and downloaded in the "OCEAN DATA VIEWER" catalogue	na	2	2	2
MLES	Including extent and types of recreational activities	Unvailable data	na	1	1	1
H004	GP087	Unvailable data	na	1	1	1

CH2_UC2

APPROPRIATENESS

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	

HBEX	**Global Open Ocean and Deep Seabed (GOODS) biogeographic classification**	"A new biogeographic classification of the world's oceans has been developed which includes pelagic waters subdivided into 30 provinces as well as benthic areas subdivided into three large depth zones consisting of 38 provinces (14 bathyal, 14 abyssal and 10 hadal). In addition, 10 hydrothermal vent provinces have been delineated. This classification has been produced by a multidisciplinary scientific expert group. It represents the first attempt at comprehensively classifying the open ocean and deep seafloor into distinct biogeographic regions."	lack in the deep sea	2
HBEX	**Marine Ecoregions of the World (MEOW)**	"WWF defines an ecoregion as a "large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions"."	data not extend to pelagic and deep benthic environment	2
HBEX	**Large Marine Ecosystems (LMEs)**	"Large Marine Ecosystems (LMEs) are regions of ocean space encompassing coastal areas from river basins and estuaries to the seaward boundary of continental shelves and the seaward margins of coastal current systems"	data not extend to pelagic and deep benthic environment	2
HBEX	**Longhurst Marine Provinces**	"This dataset represents a partition of the world oceans into provinces as defined by Longhurst (1995; 1998; 2006), and are based on the prevailing role of physical forcing as a regulator of phytoplankton distribution. The dataset represents the initial static boundaries developed at the Bedford Institute of Oceanography, Canada."		2

CEMO	**Historical Whale Captures**	"The Wildlife Conservation Society (WCS) has digitally captured the Townsend Whaling Charts that were published as a series of 4 charts with the article titled "The distribution of certain whales as shown by logbook records of American whale ships" by Charles Haskins Townsend in the journal Zoologica in 1935. The 4 charts show the locations of over 50,000 captures of 4 whale species; sperm whales (36,908), right whales (8,415), humpback whales (2,883) and bowhead whales (5,114). Capture locations were transcribed from North American ("Yankee") pelagic whale vessel log books dating from 1761 to 1920 and plotted onto nautical charts in a Mercator projection by a cartographer. Each point plotted on the charts represents the location of a whaling ship on a day when one or more whales were taken and is symbolized by month of the year using a combination of color and open and closed circles."		2
FCST	**Catches of Commercial Pelagic Species**	Figures on commercial pelagic species catch were drawn from the FAO Tuna Atlas data service. This service summarizes catch data in 5-degree squares, aggregating data submitted to FAO by Regional Fisheries Management Organizations (RFMO). Maps show total catch from 1996-2013 for Atlantic Bluefin tuna and swordfish. Albacore, Bigeye, and Skipjack and Yellowfin tuna data are also available. The data can be subset by longline , purse seine and an "other" gear type.	resolution data very weakness to aim the purpose of this use case and "gaps may exist, depending on Regional Fisheries Management Organizations (RFMO) submission"	2

AVAILABILITY

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
HBEX	**Global Open Ocean and Deep Seabed (GOODS) biogeographic classification**	Unavailable data	na	2	2	2
HBEX	**Marine Ecoregions of the World (MEOW)**	data available in "marine region" catalogue	na	2	2	2
HBEX	**Large Marine Ecosystems (LMEs)**	data available	na	2	2	2
HBEX	**Longhurst Marine Provinces**	data available in "marine region" catalogue	na	2	2	2
CEMO	**Historical Whale Captures**		na	2	2	2
FCST	**Catches of Commercial Pelagic Species**	data available in GIF fomat	data must be referenced for to be used	2	2	2

CH3_UC1

AVAILABILITY

Data for this use case are easily accessible as most of them are available on the European Copernicus portal. Some sources indicated in the use case are not accessible (direct url is not working) but the dataset associated refers to well known dataset,
ALL data are easily accessible (score 3), except for the grey ones taking a long extraction time/

RFVL	Horizontal velocity of the water column (currents)
RFVL	Horizontal velocity of the water column (currents)
EWSB	Wind speed and direction
CDTA	air temperature and density
PSAL	Salinity of the water column
TEMP	Temperature of the water column
WVST	Wave height and period statistics

CH4_UC1

AVAILABILITY and APPROPRIATENESS
Temperature data sources all performs well (2 to 3) and are quite suitable to the intended use

TEMP	TEMPPR01	Data portal access, the data used to produce the reported tim-series is available through a dedicated portal
TEMP	TEMPPR01	This is an optimal analysis product 'ISAS' Plots supplied to the report by the Coriolis datacentre at IFREMER
TEMP	TEMPPR01 NOAA Optimum Interpolation SSTv2	Data portal access, the data used to produce the reported temperature maps is available through a 3rd party onlines resource

CH4_UC2

APPROPRIATENESS

For the assessment of primary productivity in the Arctic (Frey et al., 2015) the authors identify a number of caveats. They use satellite data for the calculation of Chloprophyll-a (MODIS-Aqua Reprocessing 2014.0, OC3 algorithm: http://oceancolor.gsfc.nasa.gov/.) and derive anomalies compared to a short base period of 2003-2014 from which the satellite data is available. Cloud cover and sea-ice generate areas where Chlorphyll-a anomalies cannot be mapped. The assessment aims to determine and understand primary production rates in the Arctic but is reliant on satellite derived surface chlorophyll values. Linking primary productivity rates & estimating subsurface chlorophyll biomass with surface chlorophyll-a values is still challenging (Tremblay et al. 2015). Additional dificulties are identified by the authors in areas in coastal regions due to river sediments and turbidity limiting the validity of algorithms (e.g., Demidov et al. 2014, Chaves et al. 2015). These satellite retrieval algorithms require that in situ observations be available. Seasurface temperature data dor the Arctic Report is appropriate with a 3 decade base period and coverage across the full area, also allowing sub region time-series to be calculated. The sea-ice report focusses on the most robust derived metric of the sea- ice extent at the seasonal extrema (winter maximum extent and summer minimum extent) this has a 3 decade base period. Other metrics discussed are the ice age and ice thickness. Ice thickness has a limited time-series of 7 years derived from 2 satellite missions (CryoSat-2 and IceBridge) such that interannual changes can be identified but not long term trends. Since the early 1980s ice age has been estimated using satellite and drifting buoy observations providing a 3 decade base period allowing trend and anomaly timeseries.(Tschudi et al. 2010; Maslanik et al. 2011, Tschudi et al. 2015).

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	
CRYS	SICECSAT	Sea Ice extent, avearage coverage of sea ice in a given season/month		2
TEMP	TEMPPR01	SST- reporting on the August mapped SST and the annual average timeseries of temperatures in the mraginal seas.		3
CPWC	CHLAMSAT	Arctic Ocean Primary Productivity		2

AVAILABILITY

Availability and visibility of the data required for these assessments is high with major international collaborations generationg the data and making it available through data -centres. The SST availability is state-of-the-art and this data source is used by many researchers, students and assessors across disciplines. Sea-ice extent assessments are highly visible with a full trail back to the source information. Derivation of primary production estimates based

on chlorophyll algorithms is more technical but the source datasets are available to researchers though earth observation portals.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
CRYS	SICECSAT	The reported sea-ice maps and timeseries are constructed from data available from 3rd part portal- link provided		3	3	3
TEMP	TEMPPR01	SST- timeseries are constructed from data available from 3rd part portal- link provided.		3	3	3
CPWC	CHLAMSAT	Arctic Ocean Primary Productivity maps and timeseries-		3	2	2

CH5_UC1

APPROPRIATENESS

Goals were achieved and the obtained global sea level rise estimates, both reconstructed from the in-situ measurements and from satellite altimetry are in line with other works in this area. Also there is a good consistence between the reconstructed sea level trends over the "altimetry era" and the sea level trends from the altimetry itself. However, the authors reported some shortcomings related to:
- Gaps in in-situ data coverage in the Southern Ocean, the South Atlantic Ocean and around Africa
- in-situ sea level measurements not being related to a common datum, therefore a change in sea leve over a time step (a month) was used instead and overall it appears not to be any major issue
- significant increase in the uncertainties of the estimates prior to 1940 after applying the atmospheric correction and when the seasonal signal is not removed; the analysis point to the issues with the data source used for the atmospheric correction (HadSLP2), but further analysis is needed. It is also pointed that the seasonal signal has to be removed.

It is also reported that only TOPEX/Poseidon altimetry had previously been calibrated against the coastal tide gauges, whereas Jason-1 and Jason-2 were not. However, it does not seem to impact on the fitness for use and consistence of this data or at least no specific comments are made. PSMSL database provides monthly mean sea level for around 2,000 tide gauges, but only relatively small proportion of these were deemed suitable for the analysis and the number peaked at 399 gauges in 1985. The database dates back to 1860, however data prior to 1880 was deemed unsuitable due to too scarce spatial coverage and only limited to the northern hemisphere. The altimetry data appears to be fit for use and provides excellent and evenly distributed global coverage. As regards the overall fitness for use of the input data, the authors point to two major uncertainties. These are the incomplete global coverage of sea level measurements (particularly in the southern hemisphere) and uncertainties in land motions used to correct the sea level records.
Statements are made as to the necessity for the continuation of high quality altimetry measurements to extend the time coverage. Further priorities for future development include widespread adaptation of GPS measurements to provide data for land motion correction - the existing datasets are only becoming long enough these days to make this data usable. Priorities also include the maintenance and continuation of the observing network and infrastructure such as PSMSL. Furthermore it is desirable to continue to improve the International Terrestrial Reference Frame. More elegant analysis of the observations can be pursued given the availability of data to include changes in the gravitational field, ocean thermal expansion and changes in the cryosphere. The authors also point that data archaeology and paleo observations to extend the spatial and temporal coverage of in-situ sea level observations need to be vigorously pursued.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	
ASLV	AHGTZZ01	Tide gauge records are the primary source of data to reconstruct historical sea level change, but only coastal and island locations are available. The requirement is also for good, evenly distributed global coverage.	Gaps in in-situ data coverage in the Southern Ocean, the South Atlantic Ocean and around Africa. Sea level measurments not related to a common datum, so the change between time steps used instead.	2
ASLV	ASLVMNDY	For the satellite altimetry, the sufficiently long dataset is required (17 years used by Church and White (2011))	No specific gaps mentioned	3

ASLV	ASLVMNDY	For the satellite altimetry, the sufficiently long dataset is required (17 years used by Church and White (2011))	No specific gaps mentioned	3
ASLV	ASLVMNDY	For the satellite altimetry, the sufficiently long dataset is required (17 years used by Church and White (2011))	No specific gaps mentioned	3
		Vertical land motion required for correction of sea level measurements from tide-gauges	Church and White (2011) point that the GIA data is model data and data from direct measurements using GPS systems is only becoming long enough to be useful recently.	2
CAPH		Mean sea level pressure required to correct of the sea level records for atmospheric pressure variations. Global coverage required and data has to date back to the start of tide-gauge records.	Problems with the atmospheric correction prior to 1940 pointing to problems with the data set used (HadSLP2).	2

AVAILABILITY

Data availability is good and did not impact on the acheievement of goals, although some additional data, e.g. GPS, may improve the quality of the outputs as discussed in the Apprpriateness section. Data is provided free of charge and the visibility is high, can be very easily found using popular web browsing engines. Some delays are reported as to the fewer in-situ data sets for most recent years due to the delays in submission of these datasets to the database by individual institutions. It has negative effects on the quality of outputs in recent years. Priorities for future development include the maintainance and continuation of the observing network and infrastructure such as the PSMSL database. High quality satellite-altimeter observations need to continue also and GPS measurements need to become widely available to provide valuable information on vertical land motion.

ASLV	AHGTZZ01	Maintained databases with long-term in-situ sea level	Fewer number of in-situ locations available from PSMSL in last couple of years - delay in data submission by	**3**	**3**	**3**

			institutions			
ASLV	ASLVMNDY	The sufficiently long dataset is required (17 years combined satellite alltimetry data set used by Church and White (2011))		**3**	**3**	**3**
ASLV	ASLVMNDY	The sufficiently long dataset is required (17 years combined satellite alltimetry data set used by Church and White (2011))		**3**	**3**	**3**
ASLV	ASLVMNDY	The sufficiently long dataset is required (17 years combined satellite alltimetry data set used by Church and White (2011))		**3**	**3**	**3**
		This is a very specialised data set. Requirement is for visibility in scientific publications.		**2**	**2**	**2**
CAPH		Requirement is for easy access.		3	3	**3**

CH5_UC2

APPROPRIATENESS

Even though this use case describes processes highly data dependent and references data sources, insufficient detail is given as to the precise parameters incorporated or produced. As such, the references listed allow the user to broadly understand the inputs and outputs, but it is not possible to do so with the necessary levels of precision required to reproduce entirely.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)		Identify requirements not at all to partly satisfied	

MSFX	MSDWFXSD	completeness, accuracy, consistency	not applicable	3
MSFX	MSDWFXSD	completeness, accuracy, consistency	Extrapolating data to different spatial scales is one source of error. For example, using a single monitoring station to represent the entire cross-sectional area was required in order to benefit from the valuable long-term record of TSS concentrations.	1
MSFX	MSDWFXSD	resolution, extent, completeness, consistency, accuracy	not applicable	3
ASLV	ASLVZZ01	accuracy, completeness	Many of the older surveys (unavailable in digital format) were digitized previously by the Comprehensive Coastal Inventory (a division of CCRM at VIMS).	2
ASLV	ASLVZZLA	accuracy, completeness	not applicable	3
COGE	not known	accuracy, completeness	not applicable	3
COGE	not known	accuracy, completeness	not applicable	3
ASLV	ASLVMNDY	accuracy, completeness	not applicable	3

AVAILABILITY

With the exceptions of the Chesapeake Bay hydrodynamic model, the total suspended solids data and the Maryland shoreline surveys, other data sources were highly accessible and attainable with good performance of the delivery mechanism. However, policy conditions were not clear and obvious for any of the data sources accessed.

MSFX	MSDWFXSD	visibility, accessibility	Could not find source	1	1	1
MSFX	MSDWFXSD	visibility, accessibility, performance	Could not find source	1	1	1
MSFX	MSDWFXSD	visibility, accessibility	not applicable	2	2	2

ASLV	ASLVZZ01	visibility, accessibility	not applicable	2	2	2
ASLV	ASLVZZLA	visibility, accessibility	not applicable	2	2	2
COGE	not known	visibility, accessibility	not applicable	2	2	2
COGE	not known	visibility, accessibility	Center for Coastal Resources Management website easy enough to find, but difficult to locate actual data	1	1	1
ASLV	ASLVMNDY	visibility, accessibility	not applicable	2	2	2

CH6_UC1

APPROPRIATENESS

The policy of FAO for the database produced is perfect only being impaired by the non compliances of the countries in the quality of the data or in delays in the transmission of data.

Fish and shellfish catch statistics		Maintained databases with long time series of marine organism capture data in weight, available publicly at the shortest time possible.	Delay in data submission by countries	3	3	3

CH6_UC2

APPROPRIATENESS

The main problem with the by-catch/discards in fisheries is the variability spatio temporal and intra metier. There are some studies demostrating matemathically that in some metiers it should be neccesary to sample more than the 75% of the total trips of the metier for reducing the accuracy of the estimates what is economically inposible to afford.
Areas of improvement in the study and reduction of discards are:

· Changes in spatio-temporal fishing strategies – real-time fishing effort control,closed areas, shared information…

· Changes in approaches and tools for sorting the catch
· Changes in tactics for managing quotas (at individual or Producer Organizationlevels)
· Marketing strategies for lower value catch
· Impacts of quota restrictions on discarding
· Incentives for discard reduction.

Fishing by-catch		Total ammount of biomass (in weight) fished and discarded by all the Members of the UE in the South Western Waters (SWW), species or group of species and year. Additionally for the cumpliment of the new landing obligation and the discard plans the work has to be segmentated by metier and using the data collected under the DCF.	A number of research projects have been undertaken, or will be shortly launched, to investigate the bycatch issues and discard mitigation strategies in the SWW region. However, a large number of knowledge gaps persist. Further research would be relevant to the move towards reduced bycatch and improved catch utilization necessary to comply with the landing obligation. Since discarding is widely variable in time, space, among countries and fishing activities, and even individual fishers and fishing operations, this research needs to be métier-specific	3

AVAILABILITY

In this case study the data availability is really easy since the producers of the data are mainly the same people that produced the discards atlas. So the public availability of data is not fully proven even if it is supposed to be covered by the Data Collection Frameworlk

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
Fishing by-catch		In this case study almost the same people that is in charge of the by-catch sampling program is producing the discards atlans so	Aqquracy and precision of the data due to the high variablility intrinsic to by-catch.	2	1	2

		they have fully available the data.				

CH7-UC1

APPROPRIATENESS

It is not possible to access raw VMS data or logbook data for any country in the Checkpoint area. The worked up data on fishing impact, intensity and pressure only cover OSPAR regions and are at a coarse resolution (0.05 degrees).
The habitat data is being continuously updated with each phase of the EMODnet project and, therefore, will get better in terms of resolution and detail with time.
In the future, if the "worked up" VMS data can be accessed for more countries and at a finer resolution, or at a resolution equal to the habitat data (250m), better estimates of fisheries impact on sensitive habitats will be achievable.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied"
ACYC Reference numbers	N/A	VMS data is recorded for all vessels larger than 15m since 2009 and for vessels larger than 12m since 2012. There is currently no high-resolution data available for vessels less than 12m. Raw VMS data is unavailable. The WGSFD aggregates the raw VMS data from each country by the number of hours fished in an ICES statistical square (0.05 x 0.05 degree).	No VMS data avaialable for vessels under 12m which will be of concern if assessing certain gear types, e.g. bivalve dredges. Aggregsated VMS data has a coarser spatial resolution resolution in comparison to the raw VMS data therefore, the accuracy of the data at scales larger than 0.05 degrees is reduced.	1
HBEX	N/A	Collated EUNIS level 3 habitat maps at varying broad scales, maps are of low resolution and confidence, produced	no data in deep waters	2

		primarily by compiling traced maps from reports with maps generated from interpolated sample data.		
HBEX	N/A	Collated EUNIS level 3 habitat maps at a medium scale, maps are usually produced from interpreted multibeam data, groundtruthed by sample data.	no data in deep waters	2
HBEX	N/A	Collated EUNIS level 3 habitat maps at a fine scale, maps are predominantly produced from interpreted multibeam echosounder data and high resolution biological sample datasets.	no data in deep waters	2
HBEX	N/A	Broad scale predictive habitat map at a resolution of 250m. Map consists of collated data at varying scales coupled with modelled data on biological zones.	Deep waters frequently don't have any substrate information and are labelled as depth zones.	2
HBEX	N/A	Point data on threatened habitats in the OSAPR region.	Extent of species distribution unknown. Polygon layerss currently being developed by JNCC.	2
FCST Fish and shellfish catch statistics	N/A	Logbook data provides information on country, year, month, ICES statistical rectangle, catch by species, gear code, DCF metier level 6, vessel length category and fishing days.	In some circumstances the veracity of the data can be questioned.	2

AVAILABILITY

ACYC Reference numbers	N/A	The VMS data are considered to be sensitive, and are not freely available. Cleaned datasets of aggregated VMS data with fishing effort in hours by year and main gear groups for the OSPAR and HELCOM areas were created and are available on request.	Raw data is unavailable.	2	2	2
HBEX	N/A	Maintained databases with latest high quality collated habitat data available on the servers	Maps are unavailable when being updated	2	2	2
FCST Fish and shellfish catch statistics	N/A	Only the aggregated data becomes publicly available for further studies and analyses due to possible commercial sensitivities.	Raw data is unavailable.	2	2	2

CH7-UC2

The unavailability of raw VMS data inhibits progress on any study measuring fishing impact on habitats at a fine scale. However, studies focusing on a particular fishery and covering a small area require only a subsection of the VMS data, therefore in the future, there might be a case that could be put forward for accessing those VMS records that pertain only to the fishery in question.
The EMODnet data is freely available and the new phase of the project proposes to produce multi-resoultion maps.

APPROPRIATENESS

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied”

MBAN	BATHDPTH	Most comprehensive and up-to-date collated bathymetric dataset	Higher resolution grid could be generated for areas with MBES	3
FEFF	N/A	Discard observers placed on board commercial fishing vessels		1
ACYC Reference numbers	N/A	VMS data is recorded for all vessels larger than 15m since 2009 and for vessels larger than 12m since 2012. There is currently no high-resolution data available for vessels less than 12m. Raw VMS data is unavailable. The WGSFD aggregates the raw VMS data from each country by the number of hours fished in an ICES statistical square (0.05 x 0.05 degree).	No VMS data avaialable for vessels under 12m which will be of concern if assessing certain gear types, e.g. bivalve dredges. Aggregsated VMS data has a coarser spatial resolution resolution in comparison to the raw VMS data therefore, the accuracy of the data at scales larger than 0.05 degrees is reduced.	2
FCST Fish and shellfish catch statistics	N/A	Logbook data provides information on country, year, month, ICES statistical rectangle, catch by species, gear code, DCF metier level 6, vessel length category and fishing days.	In some circumstances the veracity of the data can be questioned.	2
FEFF	N/A	A pilot survey to monitor abundance and ditribution of deepwater species fished using a demersal trawl with a 27m sweep length.	VMS data recorded in conjunction with multibeam and trawl data	2
FEFF	IDWS	2006-2009, using bottom trawls to collect fish from 500-1800m. ICES areas VI and VII. Co-ordinated with Scottish deepwater survey below.	Coverage does not extend south to meet French deepwater survey. Time series ended	1
FEFF	N/A	10 yr time-series from a trawl survey (NE Atlantic) to assess temporal variation in the abundance and length frequency of deepwater fish.	N/A	3

AVAILABILITY

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
MBAN	BATHDPTH	Quick access and delivery	Data gaps filled using GEBCO	3	3	3
Scientific Observer Programme	N/A	Not generally available	Raw data is unavailable	1	1	1
ACYC Reference numbers	N/A	The VMS data are considered to be sensitive, and are not freely available. Cleaned datasets of aggregated VMS data with fishing effort in hours by year and main gear groups for the OSPAR and HELCOM areas were created and are available on request.	Raw data is unavailable.	2	2	2
FCST Fish and shellfish catch statistics	N/A	Only the aggregated data becomes publicly available for further studies and analyses due to possible commercial sensitivities.	Raw data is unavailable.	2	2	2
Acoustic survey	N/A	Data available subject to authors permission	Raw data is unavailable.	2	2	2

CH09-UC1

APPROPRIATENESS

The authors were able to collate a large number of river discharge and contaminant input to the sea. However, they highligh different issues about data appropriateness. The main one is the sampling period between discharge and concentration in order to compute accurate fluxes. Others issues were related to the lack of information about the actual computation of averaged values, or to the lack about the information related to river mouth locations. One should mention that the presented database was populated in early nineties. Current knowledge has helped in tackling the latter problem. From the authors perspectives, the priorities, related to the challenge, are the next ones : assessing long term trends of water quality; assessing the data quality with the addition of relevant indicators of data quality; completing the dataset with tributaries in estuaries.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Other quantitative or descriptive information related to completness, consistency , accuracy or other quality aspect relevant for the use case
RVDS	RFDSCH01 / Flow rate [1000m3/d]	5 to 10 year records, Drainage> 10 000km2, runoff < 3 mm/year, annual discharge > 317 m3/s, suspended load > 5Mt/year, population density> 500 inhabitants/km2, coordinates of river mouth, temporal resolution, sampling station close to river mouth	period of records may be less than one full hydrological cycle. Exact dates for records are sometimes missing. Values are calculated on a discharge-weighted basis and multiple formula have been used to interpolate fluxes from concentration vs discharge collected at different sampling periods. It is generally not know how the average published values were computed. Error in units is another issue for accurary.

AVAILABILITY

This study case is based on a collation work performed in 1990's. Therefore, at that time, data could not be retreived from internet. However, data are now available online, especially from GRDC. These data set is constraint to an aggrement that leads to a lack of responsivness

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
	latitude and longitude of the mouth			3	3	3
RVDS	RFDSCH01 / Flow rate [1000m3/d]	data collected from litterature		3	3	3
RVDS	RFDSCH01 / Flow rate [1000m3/d]	data collected from litterature	Need contacts from national representative and delivery is dependent upon local constraints	1	1	1
RVDS	RFDSCH01 / Flow rate [1000m3/d]	data collected from litterature		3	3	3
RVDS	RFDSCH01 / Flow rate [1000m3/d]	data collected from litterature	For control, GRDC is requesting a form from users. That leads to a lack of performance	3	2	1
RVDS	RFDSCH01 / Flow rate [1000m3/d]	data collected from litterature		3	3	3
TDNT	N-Total [kt/a]	data collected from litterature		3	3	3
TDNT	N-Total [kt/a]	data collected from litterature	Need contacts from national representative and delivery is dependent upon local constraints	1	1	1
TDNT	N-Total [kt/a]	data collected from litterature		3	3	3
TDNT	N-Total [kt/a]	data collected from litterature	For control, GRDC is requesting a form from	3	3	3

			users. That leads to a lack of performance			
PHOS	P-Total [kt/a]	data collected from litterature		3	3	3
PHOS	P-Total [kt/a]	data collected from litterature	Need contacts from national representative and delivery is dependent upon local constraints	1	1	1
PHOS	P-Total [kt/a]	data collected from litterature		3	3	3
PHOS	P-Total [kt/a]	data collected from litterature	For control, GRDC is requesting a form from users. That leads to a lack of performance	3	3	3

CH9_UC2

APPROPRIATENESS

Spatial and temporal variability in precipitation may have a major effect on water discharge and sediment load, even at a global scale.
Requirement for high spatial and temporal resolution in precipitation is highlighted.
Other data could be included to increase the quality of the modelling. Erosion depends on a relief and land use. Information at a global scale are identified as a future request. Moreover, precise location of dam is also requested by the author, as those structures modify sediment transport.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	

RVDS	RFDSCH01 / Flow rate [1000m3/d]	globally distributed river gauges		1
LIFX	LITHFLUX/Sedimentation flux of suspended particulate material (lithogenic fraction) per unit time per unit area of the water body	US river gauges		1
MBAN	XXXX	need for global coverage and high spatial resolution		1
CPRP	CPRRRG01/Precipitation rate (liquid water equivalent) in the atmosphere by in-situ rain gauge	temporal resolution not sufficient, therefore need to couple with NCEP that provides with daily estimates		2
CPRP	CPRRRG01/Precipitation rate (liquid water equivalent) in the atmosphere by in-situ rain gauge	spatial resolution not sufficient enough, therefore need to couple xith GPCC estimates		2

AVAILABILITY

Data used in this study case are all available from online catalogues. Only the access for river gauges has a low responsiveness induced by a preliminary registration and river selection procedure requesting emails exchanges.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
RVDS	RFDSCH01 / Flow rate [1000m3/d]	freely available		1	1	2

LIFX	LITHFLUX/Sedimentation flux of suspended particulate material (lithogenic fraction) per unit time per unit area of the water body	freely available		1	1	1
MBAN	XXXX	freely available		1	1	1
CPRP	CPRRRG01/Precipitation rate (liquid water equivalent) in the atmosphere by in-situ rain gauge	freely available		1	1	1
CPRP	CPRRRG01/Precipitation rate (liquid water equivalent) in the atmosphere by in-situ rain gauge	freely available		1	1	**1**

CH10_UC1

APPROPRIATENESS

Gross details of rough topography were attained, however "A higher resolution bathymetry data set will improve our ability to better quantify ocean mixing, and understand its impact on the Earth's climate".

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied”
MBAN	BATHDPTH	Resolution, Accuracy	Resolution: Could not resolve all of the length scales responsible for internal wave generation. The authors suspect that such length scales representing topographic roughness are underestimated by an order of	1

			magnitude.	

AVAILABILITY

Overall, the source data was attained reasonably easily through a google scholar search of the reference. Notwithstanding the need to register, it was attained easily. However, the data was only provided as an image with no raw, source readings given. This hampered further use considerably.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
MBAN	BATHDPTH	Performance	Dataset was available as image only, without access to raw, source values. These needed to be inferred from image.	2	2	2

CH10_UC2

APPROPRIATENESS

The primary concern is that the charts in use did not show the correct depths below chart datum at the grounding positions.
Charts 2456 and 2890 are on a scale of 1:100,000. The traditional UK standard for surveys on such a scale was for sounding lines to be spaced at a maximum of 500 metres. Such a standard was achieved within 0.5 mile of the grounding position. owever, an area is usually surveyed at a larger scale than it is charted. In UK waters an area such as this would, today, be surveyed at a scale of 1125,000 with a line spacing of 125 metres. Areas with depths

less than 40 metres would be interlined at 62.5 metre spacing. Full sidescan sonar coverage would also be necessary to detect any dangers to navigation lying between sounding lines. Thus, the 1939 US Coast and Geodetic Survey would not meet present day standards.
The area of grounding is within the coverage of both charts.
The information presented on Charts 2456 and 2890 is taken from United States Government charts. Charted soundings in the grounding area are frequent and regularly spaced. However, no reference is made on either chart as to the date of the Hydrographic surveys on which the chart is based.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied”
HZNV	n/a	Resolution, Accuracy, Extent	1. Innacurate depths shown 2. no reference is made on either chart as to the date of the hydrographic surveys on which the chart is based. 3. the 1939 survey, on which the chart data is based, would not meet present day standards.	1
HZNV	n/a	Resolution, Accuracy, Extent	1. Innacurate depths shown 2. no reference is made on either chart as to the date of the hydrographic surveys on which the chart is based. 3. the 1939 survey, on which the chart data is based, would not meet present day standards.	1
HZNV	n/a	Resolution, Accuracy, Extent	not applicable	not stated
HZNV	n/a	Resolution, Accuracy, Extent	not applicable	not stated

ASLV	ASLVACDR	Accuracy	not applicable	not stated

AVAILABILITY

Data was easily found, however the ukho site is difficult to navigate and data are only available as part of a catalogue.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
HZNV	n/a	visibility, accessibility	Chart was available to download as part of the entire online catalogue.	2	2	2
HZNV	n/a	visibility, accessibility	Chart was available to download as part of the entire online catalogue.	2	2	2
HZNV	n/a	visibility, accessibility	Chart was freely available to download as pdf	3	3	3
HZNV	n/a	visibility, accessibility	Chart was freely available to download as pdf	3	3	3
ASLV	ASLVACDR	visibility, accessibility	Freely available to view.	2	2	2

CH11_UC1

APPROPRIATENESS

Priorities for future development are: 1) including the x,y coordinates of the introduction events (currently the best resolution is LME sub-region) in AquaNIS 2) including unicellular NIS. New data required: data on the ever-rising role of shipping (commercial and recreational) as vector for widespread and recently spread NIS.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied”
FABD Fauna abundance per unit area of seabed, but also: ACNT, FCNT, ZFIT, ZOOB		Database maintained by the ICES WGITMO (Working Group on the Introduction and Transfer of Marine Organisms), in order to ensure best available data reliability and validity across the study area.	AquaNIS does not include unicellular NIS, though it is well established that anthropic dispersal and redistribution of propagules in ballast water and sediments and shellfish transplantation facilitate range expansions. These include microalgae, viruses, bacteria, ciliates and other protists.	2

AVAILABILITY

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
FABD Fauna abundance per unit area of seabed, but also: ACNT, FCNT, ZFIT, ZOOB			Adding the option to enter georeferenced data, documenting secondary spread both within a country or regional sea	2	2	2

CH11-UC2

APPROPRIATENESS

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of resolution, extent, completness, consistency , accuracy or other quality aspect relevant for the use case (expected values)	Identify requirements not at all to partly satisfied	Appropriatness of data source according to application goal 1= "Not at all Satisfied to partly Satisfied," 2= "Satisfied," 3 = "More than Satisfied to Very Satisfied"

FABD Fauna abundance per unit area of seabed, but also: ACNT, FCNT, ZFIT, ZOOB		consistency (uneven quality of alien species distributional data)	The lack of high-quality widespread information throughout the basin made the authors use presence-only data as a status variable of the alien species in the present exercise. This implied that the impact of each species was taken as uniform across its reported range, although in reality the abundance of each species varies considerably across its distributional range.	2
HBEX Habitat Extent		coarse resolution		

AVAILABILITY

Hundreds of papers in the literature report ecological impacts of single or groups of alien marine species, more often on a single ecosystem in a specific location. However, a comprehensive large-scale analysis of the cumulative impact of all alien marine species to all ecosystems is lacking, regionally or globally.

Characteristic category code & name (SDN P02)	Characteristic name (SDN P01 code and name if available)	Identify the most relevant requirements in term of visibility, accessibility and performance (expected conditions)	Identify requirements not at all to partly satisfied	Evaluate conditions of availbility of data source /application goal 1= “Not at all Satisfied to partly Satisfied,” 2= “Satisfied,” 3 = “More than Satisfied to Very Satisfied		
				Visibility	Accessibility	Performance
FABD Fauna abundance per unit area of seabed, but also: ACNT, FCNT, ZFIT, ZOOB		Not having to login, offering data exports in a variety of formats (not just WFS!)	downloading data in a more user-friendly format than WFS	3	1	2