HR Wallingford
Working with water

Growth and Innovation in the Ocean Economy

Final Project Report

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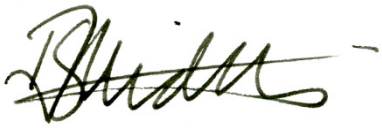

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Executive Summary

DG Mare commissioned a series of 'Checkpoint' studies, one for each European marine area. These studies were to determine whether the aims of providing good quality data of sufficient spatial coverage and presenting it in a way that can be used by both the public and private sectors, have been met, particularly considering the diverse nature of marine and maritime sector projects. This report outlines the approach adopted to answer the challenges set for the North Sea Checkpoint, gives a summary of the challenges and key findings, and provides recommendations for further development.

The objectives of the study were to be met through a literature review and a series of seven challenges: Wind Farm, Marine Protected Areas, Oil Platform Leak, Climate and Coastal Protection, Fisheries Management, Marine Environment and River Inputs. These challenges, by design, test the breadth and depth of the data provision for the North Sea in different ways. This study has shown that the majority of these can be met, at least partially, to the satisfaction of the users and with data that can be located, sourced and processed successfully. The INSPIRE themes which relate most strongly to the challenges are Hydrography, Oceanographic geographical features, Atmospheric conditions, Habitats and biotopes, and Species distribution. Each challenge has identified gaps in the necessary data provision for achieving the challenge and it is also possible to discern some patterns in the limitations of the data provision.

The overall statistics indicate that a relatively small proportion of the datasets initially identified were actually used to meet the challenges. A gradual reduction of data evaluated as 'in scope' occurs as the evaluation process proceeds. This indicates that it is difficult to ascertain the value of a dataset until the data itself is visible, highlighting serious deficiencies with the metadata. Also, although there may not appear to be a data gap at first sight, the detailed analyses uncover gaps which do exist. Moreover, a number of the challenges were, at most, partially met. Although a large number of datasets were on offer, these could not meet the challenge set to the satisfaction of the scientists undertaking them. In addition to identified limitations with spatial and temporal coverage, the main gaps in the data provision appear to be related to biology and ecology. There were also data gaps in physical parameters.

Analysis of the lifecycle of finding, evaluating and using the data to meet the challenges shows that considerable potential for aiding the Blue Economy lies with the presentation of the available data to the user communities. With its coverage and guiding principles, EMODnet is well positioned to coordinate the adoption of a metadata standard for discovery and use of marine data. Adoption of this standard across the community would then facilitate the formation of a federated catalogue solution for marine data, incorporating existing data portals and supply mechanisms. It would not be the responsibility of a service like EMODnet to ensure that the data is used, rather that data suppliers have a well-publicised, high-usability avenue for ensuring that their data is described and accessible. Blue Economy users and interest groups would then place the onus on data suppliers to offer their data products using this federated catalogue solution.

A key ingredient missing from the current information architecture is the user evaluation of the data. As a result, the project has prototyped the Data Advisor facility where context specific user experiences are recorded to aid evaluation by other potential users and generate summary statistics. The evaluation criteria used are intended to be intuitive and easy to assess. As such, EMODnet is also well placed to enable the creation of a user feedback service, based on the idea of the project's Data Advisor to accompany existing catalogues of marine data.

It is also clear that standardisation is necessary in the technical and functional structure of marine datasets. This issue is indicative of scientific data as a whole and, although a network such as EMODnet cannot be expected to solve this issue, it may be possible to move towards a solution through the adoption of standards for representing spatio-temporal data.

This report is the first version of the final deliverable to DG Mare under the North Sea Checkpoint project contract reference SI2.658142. The work was undertaken by HR Wallingford Ltd, Institute for Marine Resources & Ecosystem Studies (IMARES) and McAllister-Elliot & Partners (MEP).

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1. Introduction

This report is the first version of the final deliverable to DG Mare under the North Sea Checkpoint project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work was undertaken by HR Wallingford Ltd, Institute for Marine Resources & Ecosystem Studies (IMARES) and McAllister-Elliot & Partners (MEP).

The European 2020 strategy identifies that long term and sustainable growth in the marine and maritime sector could make a major contribution to the long term economic prospects of EU member states. For development in this sector to continue both private companies and public institutions require access to a broad spectrum of marine data. The data which is needed may present a range of obstacles to the end user, for example the data is not always readily available due to download or usage restrictions, or that the standards of collection and presentation may be very different between data sets within and between different EU member states, and that the quality and resolution of the data may be poor or the costs of obtaining the data may be prohibitive.

In order to offer standardised data of good quality with sufficient spatial and temporal resolution the EU developed the European Marine Observation and Data Network (EMODnet) to centralise European marine data. Since 2007 there have been various projects aimed at gathering various marine data sets and presenting them in a way that can be used by both the public and private sectors. Whilst this work has been continuing it has become unclear whether the aims of providing good quality data of sufficient spatial coverage have been met, particularly considering the diverse nature of marine and maritime sector projects. As this is the case the EU DG Mare commissioned a study to determine if the data provided by the various EMODNet databases would be sufficient for different developments and environmental assessments.

The study asked for various Challenges to be addressed using the available data from the network of EMODNet websites and data portals alongside any EU member state data that was available. The marine areas covered by the EU were split into regions termed ‘Checkpoints’ for the purposes of the study. The Checkpoints are: North Sea, Mediterranean, Atlantic, Arctic, Baltic and Black Sea. This report outlines the approach adopted to answer the Challenges set for the North Sea Checkpoint, and provides a summary of the Challenges and key findings for each one. It also provides recommendations for further development of the EMODNet data services.

1.1. Contract

The work undertaken by HR Wallingford, in consortium with McAlister Elliot Partners (MEP) and IMARES was conducted under European Commission Directorate-General for Maritime Affairs and Fisheries Service Contract MARE/2012/11 – Lot 1 The North Sea, Contract Number SI2.658142.

1.1.1. Rationale and objectives

Annex 1 of this contract provides the tender specifications and describes the technical requirements of the project work. Section 2.1.2 and 2.1.3 of Annex 1 describes the Rationale and Objectives for the project. It highlights that although EU initiatives such as the European Marine Observation and Data Network, Global Monitoring for Environmental Security and the Data Collection Framework for Fisheries have delivered ‘seamless layers’ of marine data across national boundaries, there are still some shortcomings with Europe’s marine data architecture. Therefore, DG MARE expect that by completing this work:

1. A clearer view of synergies between different monitoring, observation and data collection programmes;
2. An identification of how well the present data collection and monitoring programmes meet the needs of users;
3. An identification of gaps;
4. A view of where new technologies will allow faster, quicker and more accurate observation;
5. An understanding of required temporal or spatial resolution of data products such as bathymetry or marine sediments.

With this rationale and aims in mind the specific objective of the study given by DG MARE:

> …is to examine the current data collection, observation and data assembly programmes in a sea basin, analyse how they can be optimised and deliver the findings to stakeholders through an internet portal.
>
> *DG Mare Tender Specification, Section 2.1.3*

1.1.2. Challenges

In order to meet with the objectives of the study DG Mare specified that the a series of challenges (including a literature review) should be undertaken, to test the data and its availability. The requirements of these challenges are set out in Section 2.1.6.1 of the tender specification, and include:

1. 2.1.6.1 (1) – Windfarm siting challenge;
2. 2.1.6.1 (2) – Marine Protected Areas challenge;
3. 2.1.6.1 (3) – Oil Platform Leak challenge;
4. 2.1.6.1 (4) – Climate and Coastal Protection challenge;
5. 2.1.6.1 (5) – Fisheries Management challenge;
6. 2.1.6.1 (6) – Marine Environment challenge;
7. 2.1.6.1 (7) – River Inputs challenge.

The specific outputs from each of the challenges is described in Section 2.1.6.2 of the tender specification, and covers, for example; data delivery (temporal and spatial); data sources; effort required to obtain the data and summary of lessons learnt. These items are dealt within each of the challenge reports, provided as appendices to this report.

1.1.3. Expert panel

Section 2.1.8 of the tender specification identifies the requirement for an expert panel to provide input and review. The first expert panel meeting was held at Reading, UK on 05 May 2015 where 17 stakeholders attended and included members of Crown Estates, MEDIN, CEFAS, EUCC and OSPAR. The next expert panel meeting is planned for February 2017, to coincide with the other sea basin checkpoint meetings.

1.2. Method adopted and approach

The method applied to achieve the objectives of the project was not a simple audit of allegedly available data which took as fact the claims of the data providers. It was necessary to complete the process of each

challenge as a real user: searching for available data; attempting to obtain the data found; attempting to open the data collected; attempting to use the data for the specific required purpose. The purposes laid out in the challenges reflected specific real uses of the data that would typically be required by industry or government. It was sometimes reported by the scientists attempting the challenges that the question they were being asked was not what they would prefer to answer – they would tend to ask the question in different terms or address a completely different question altogether. This creative tension gave an insightful window into the gap between the relative worlds of the scientist and the policy maker or commercial user. Whilst the scientist would wish to use the data to answer a very specific and detailed question, the policy maker or commercial user often needs to phrase things at a higher level.

One advantage of the method, undoubtedly by design, was to go through the entire process of using the data without accepting any information about it at face value. The appraisal itself covered the entire lifecycle of the specific challenge in question and the evaluation refers to the usefulness of the data in terms of each challenge. In particular, HR Wallingford is a private sector contractor (albeit with a bias towards scientific consultancy and research) and the challenges were attempted from this point-of-view. As such, the criteria used to evaluate the datasets were undertaken with this commercial approach. For example, in addition to considering the cost of a particular dataset, the time taken to process it into a usable form or even successfully open it was also a key consideration. Organisations will pay a higher initial price for data if it saves their staff time in obtaining or using it.

Usability of the actual evaluation technique was also a key consideration. A highly usable method will be much more replicable, gain more traction and be more sustainable. Moreover, it was also desired that the method be consistent with the INSPIRE directive as implemented at the time that each task was undertaken. As such, each challenge was attributed, dataset by dataset, to one or more INSPIRE themes, as given in Appendix B.

1.3. Website and Data Advisor

The project web presence consists of two elements, static content and the Data Advisor system. The static content pages are hosted on the central EMODnet DRUPAL content management system and are accessed at http://www.emodnet.eu/northsea. It includes descriptions including the project objectives, challenges and approach.

The Data Advisor prototype system records user experiences of data with respect to the challenges and INSPIRE themes. It consists of the following elements:

1. A relational database storing challenges, datasets, considerations and supporting entities;
2. A web service providing an interface to the relational database;
3. An interactive web application for querying the web service and displaying the results.

Data is evaluated against the set of criteria given in the table below, these criteria have been devised such that each could easily be interpreted by any user of the data, from incidental users to experts with long track records.

Table 1.1: Criteria for user evaluation of datasets

Criteria	Description
Contribution	Were the parameters offered by the dataset useful for solving the challenge?
Location	Were the temporal and spatial locations relevant?
Commercial	Do the prices and licences enable solving the challenge?
Attributes	Is the accuracy, precision and resolution sufficient?
Delivery	Can the data be supplied in time?
Usability	Is the format usable and the supporting metadata sufficient?

The figure below illustrates a typical screenshot from the Data Advisor, where the information for a particular dataset has been expanded and a check mark indicates that it has passed evaluation, a cross indicates it has failed evaluation and a question mark shows that it has not been evaluated.

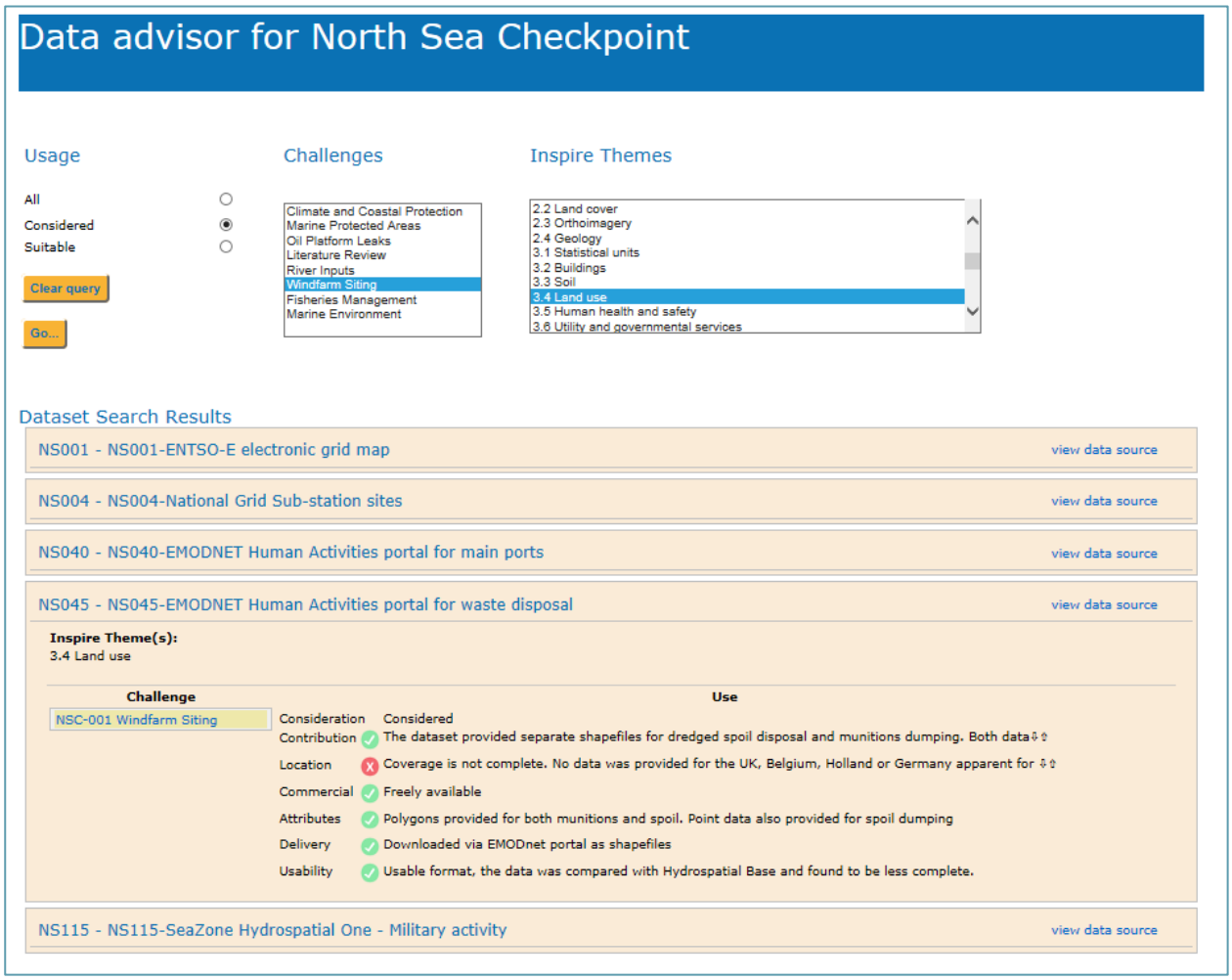


Figure 1.1: Data Advisor screenshot

Source: North Sea Checkpoint Data Advisor system

2. Challenges

2.1. Literature review

A purpose of the Checkpoint projects is to determine the availability of marine data which can be used by both public and private bodies to develop policy and commercial opportunities, termed the Blue Economy. A broad literature review was carried out as part of the North Sea Checkpoint to provide a context for the Blue Economy in the North Sea and to identify where data gaps are limiting development. This work complimented the specific data adequacy analyses conducted for the challenges and aided development of the assessment method for each of the subsequent challenges.

2.1.1. Approach

The literature survey is approached from the perspective of a proxy-user of data services in the Blue Economy. This is to reflect not only the findings of the literature itself, but also the challenges in discovering and accessing the value of the literature. A systematic review process was undertaken where search terms were defined by the project team and these were then used as parameters for queries in different internet search engines. The terms were used singly and in combination in various search engines to determine the discoverability of data.

Literature was reviewed at two levels:

1. An analysis of the literature items themselves, determining what literature exists on the topics searched for, and;
2. The content of the literature determining what information the literature provided regarding data supply.

This two level approach was needed to assess how generally accessible useful information on marine data activities are, as well as the science of using these data to solve actual problems.

2.1.2. Data gathered

The survey of literature identified 50 separate literature resources and these could be allocated into the following categories:

- Portal-specific documentation and reports ; where portals known to provide information within the North Sea area were identified, information about the portals was sought, particularly with respect to whether there was separate documentation discussing usability, data gaps or user experiences.
- Scientific literature; where peer-reviewed publications contained information about the experience of sourcing data, what type of data gaps may exist and the constraints experienced with accessing data.
- Grey literature: conference and workshop proceedings where articles contained information about the experience of sourcing data, what type of data gaps may exist and the constraints experienced with accessing data.

A full list of the literature discovered and a discussion of its discoverability and accessibility is provided in the literature review report (Appendix A.1).

2.1.3. Main issues

The key issues affecting access to data include commercial sensitivity, intellectual property and cost. This means that it may be difficult to obtain relevant data, leading to the use of inferior or patchy data for projects where timescales do not allow for more complete information to be accessed.

Many of the data portals identified as provided literature for use in the Blue Economy are interlinked, with several overlapping and providing data to others. Often the same data is available from multiple sources. This can make it difficult to ensure that the most up to date versions were found. In many cases, the task of identifying documents most likely to contain useful feedback on data fitness for purpose and accessibility, such as the methodological reports, was more challenging than sourcing the data itself. This is further complicated by the presence of web services which are no longer being actively maintained, are still relevant but have been superseded by other initiatives e.g. MESH (Mapping of European Seabed Habitats) has been superseded by the EU SeaMap (see Appendix A.1 for full discussion of issues).

There exists extensive signposting for data where metadata has been generated. However, it remains difficult to identify and source data where metadata has not yet been produced. Whilst some useful signposting to current EU funded projects was found on websites such as MEDIN and GMES there were numerous signposts which are broken or outdated but returned as results when a search engine was the starting point for the query.

2.1.4. Recommendations

The EMODnet project reports for each of the portals contained by far the most useful and accessible information relating to data access, coverage and usability for the North Sea Data. The use of portals, such as those maintained by EMODNet, as a central repository is key to identifying original data providers and documenting “versioning” metadata.

There are more initiatives surrounding metadata than direct access to raw or meaningful numeric data. This is not always useful and it is only by reviewing the actual data that an end user can often determine if it will be of use or not. However, the metadata is not always complete or may be missing altogether making it difficult to assess usefulness of the data set. Equally, it can be useful to visualise data to determine spatial coverage at a glance. Map viewing facilities would aid this process.

Data Portals and Engagement with the wider Blue Economy

Marine data initiatives either directly or through third parties, should have greater outreach to those who may be considered likely to be Blue Economy or marine community data users to actively elicit their feelings and understanding of likely usage and usability. This will be required to ensure that the data portals are genuinely providing value to this sector of the user community.

When data portals do gather feedback from their users, there can be a focus on gathering statistics about web-site visits, rather than capturing the information on usability such as:

- was the data required held or signposted in the portal?
- was the data successfully accessed?
- was the data useful for the intended purpose?
- was the data adequately described prior to download, so that the user understood what was being provided?
- what sort of time did it take to access the data?

- does the data require specialist or proprietary software to read it?

Publishing this feedback in reports which are directly accessible from the portal site can further the dialogue with users, who are more likely to volunteer their views if they see that those views are actively considered.

Table 2.1: General points for EMODnet on literature and data availability

	Comments
EMODnet portals	The documentation associated with each sub portal has become very difficult to discover, partly due to some original sub portals having had their own web address, which have subsequently been rationalised. In some cases both the outdated address and the new address provide a portal and only the outdated address has the documentation associated with it explicitly. This provides possibility for confusion, particularly with respect to which site will be of use and contains the most recent information.
EMODNet documentation	There is a web address with all EMODnet documentation contained in one place, however reaching this is challenging as the it is not well-signposted from the portal sites The description on the link ("European Marine Observation and Data Network on EU maritime forum") does not suggest that it is a document repository, especially since frequent internet users associate 'forum' usage with internet forum message board pages. There is opportunity to improve terminology to enhance user-friendliness.
EMODNet data reports	It however proved difficult to source the project reports relating to each portal. While some project final reports were held on the Europa Webgate resource, others were found on parallel portal sites, such as the Pilot EMODnet – Biology Pilot Portal at http://www.emodnet-biology.eu/ . No link to the same report was available through the central EMODnet portal which led to a different web address for the Biology Portal http://www.emodnet.eu/biology. EurOBIS data feeds into EMODnet, also available via the EurOBIS website and portal.
SeaDataNet	Identified the speed of upload of data to the portal as being key to its usefulness. Therefore the provision of metadata informing users of the survey and upload timeframes enables the data to be assessed for its fitness for purpose and filtered where necessary.
Data usage	Services like EMODnet cannot expect to address all possible users of the data and should be cautioned against creating data products. There may be more benefit in focussing on creating routes for third parties, focussed on particular user communities, to exploit public data. These targeted data services may come and go with the market, however EMODnet should be a consistent layer, unaffected by such market or technological conditions.

2.2. Wind Farm siting

The Wind Farm siting challenge addressed the stages of work required for a desk-based assessment of potential development sites along National Territorial Water boundaries in the North Sea basin. The primary aim of the challenge was to assess whether the data currently available would be appropriate and sufficient for the preliminary stages of identifying potential new wind farm development sites. A secondary aim was to identify, if possible, any locations where a wind farm could potentially be developed in the boundary areas of the North Sea basin where:

- Norwegian, UK, Danish, German and Dutch waters meet;
- UK, Dutch and Belgian waters meet;
- UK, Belgian and French waters meet.

The challenge was undertaken from the perspective of a wind farm operator assessing suitable locations for offshore wind sites. As such it took into consideration factors that can affect generating capacity, construction and maintenance, potential environment impacts, and current sea-use.

The full report for this challenge is presented in Appendix A.2.

2.2.1. Approach

The method used for this challenge is based on an approach used by HR Wallingford for commercial projects for the offshore wind industry to aid companies in selecting potential wind farm sites. The method is well-established and has been successfully used in identifying licence areas for other sea uses[1]. A list of data groups required for the site selection process was provided by DG Mare in the project outline; in this case data were gathered for both metocean and environmental parameters as both are important to wind farm siting.

The approach classifies data by their level of suitability, ranging from a grade 5 for exclusion zones, to a grade 1 for areas deemed appropriate for wind farm development. Buffers zones are used to limit site proximity to sensitive areas, allowing an efficient analysis of the interaction of the constraints and opportunities to produce an overall picture of the suitability of different parts of the area of interest for a wind farm. For each of the environmental features and marine activities mapped, a high level assessment is applied to determine the suitability (ranging from Very High to Very Low) within the study area (Table 2.2:).

Table 2.2: Site suitability scoring index

Grade	Level	Symbol	Description
5	Very High		The presence of a receptor or marine activity makes the area unsuitable for wind farm development
4	High		The proximity to a suitability receptor or marine activity is adversely affected by the new wind farm or may put the wind farm at risk
3	Medium		The marine activity or sensitive receptor may be adversely affected by the installation and presence of a wind farm although the site may be suitable for development

[1] The HR Wallingford approach can be regarded as a 'best practice' as we are unaware of any published guidelines for offshore renewable site selection.

Grade	Level	Symbol	Description
2	Low		The site is suitable for development and there are only minor adverse impacts anticipated on the sensitive receptor or marine activity
1	Very Low		The site is suitable for development and there are no adverse impacts anticipated on the sensitive receptor or marine activity

The challenge was approached by mapping the data gathered for both parameters after they had been assessed and scored using the system show in Table 2.2: . Buffer areas were also applied where necessary to grade marine features e.g. the location of ordnance disposal sites was given a 0.5km buffer which was deemed appropriate to the type of feature and the proposed seabed use, in this case development of a wind farm. The final data requirements and site suitability classifications are presented in Table 4.2 of Appendix A.2.

As the challenge was focussed on identifying transboundary areas in the North Sea in which a wind farm could be sited a 100km buffer was applied to the intersection points between national marine boundaries. This was considered to be large enough to provide a suitable search area for identifying new wind farm licence areas of commercially viable size, while being small enough to meet the brief by remaining in proximity of the boundaries between National waters.

2.2.2. Data gathered

A broad range of data was identified, downloaded and reviewed for the challenge. The primary source of data was from online resources.

As the study areas for the wind farm siting covered the boundaries between national waters, the data used needed either to be sourced from each country or sourced from a location where the data had already been compiled into one or more datasets covering the North Sea. Following an initial assessment of data accessibility and fitness for purpose, a small number of datasets were used in the analysis for the wind farm siting exercise. Full details of the data gathered and reasons for its use, or for being disregarded, are presented in Appendix A.2.

2.2.3. Main issues

As the wind farm site selection process is primarily based on spatial analysis, the challenge required data to be made available in formats which could easily be used in a Geographic Information System (GIS). This was the case for most data identified and reviewed for the challenge, although the ease with which data could be identified and accessibility of the data, format and usability of data varied a great deal.

For this challenge a great deal more data was downloaded and appraised for use than was actually applied to the challenge. In most cases this was due to the metadata being imprecise thereby making assessment of the dataset for use in the challenge difficult and the provenance of the data was also missing in some cases meaning that the quality of the data and the standards used to collect it were unknown.

Data sets for key parameters e.g. wind and wave conditions, were available for the challenge. These were either charged for at a cost per point of data, making them expensive for a site selection study, or had a coarse resolution meaning that their usefulness for site selection was limited. Physical, archaeological and other maritime use information was readily available in different formats. The data which appeared to be most challenging to access in a format which was of use to wind farm siting was that related to biology and

ecology, particularly fisheries data and information on the migration routes for birds and marine mammals. A full discussion of the datasets examined is provided in the Windfarm Data Adequacy Report (Appendix A.2).

A further issue was the time spent identifying data and determining its usefulness for the challenge. This was due to the limitations of the metadata requiring full download of the data in order to evaluate it. This often lead to resources being investigated which were not relevant to the challenge or were complex to use for planning purposes as that was not the originally intended use of the data. Determining which of the datasets was the most up-to-date and definitive version was also a difficulty as many were obtainable from multiple sources and it was not always clear which had been updated when. The loss of data resolution in favour of providing a data product was a re-occurring problem particularly with data relating to sea-use and human activities.

2.2.4. Was the challenge met?

The wind farm site selection challenge was successful in identifying potential sites across the two study areas specified in the project brief. Limitations were expected for both of the study areas as the territorial boundaries between Norwegian, UK, Danish, German and Dutch waters (Area A) lies in the middle of the North Sea to the east of Dogger bank, a long way offshore in relatively deep water, while the boundaries where UK, Dutch and Belgian waters meet and UK, Belgian and French waters meet lie close together towards the eastern extent of The Channel (Area B) in an area of heavy sea-use. A full discussion of the sites identified is provided in Appendix A.2.

2.2.5. Recommendations

The delivery of this challenge relied very heavily on the commercial SeaZone Hydrospatial data set rather than data from EMODnet and Copernicus, mostly due to the ease of use of the SeaZone data for GIS mapping purposes compared to other sources. In general there are very distinct data gaps for data related to fisheries and other marine animals (birds and mammals primarily) where reports describing data rather than the actual data are available for use. There is a need to examine how EMODnet can fill this gap. Also, for some EMODnet portals, harmonisation of data structures across suppliers has led to a reduction in data value. If EMODnet is to be a reference others can rely on, data supply should be as close to the source form as possible. Other points relating to this challenge are outlined in Table 2.3:.

Table 2.3: Points for EMODNet on Wind Farm Siting Data Adequacy

Points for EMODnet	Comments
Human activities portal	ICES statistical areas and FAO fishery purposes could not be downloaded for this challenge. When accessed, the offshore windfarm dataset displayed as point data rather than polygons. The actual or proposed footprint of the windfarm, along with associated boundaries would be more useful (European Atlas of the Sea, so portal not directly responsible). We acknowledge that this portal is still at an early state and has not yet fully populated its data catalogue.
Biology portal	Sites were investigated but not considered as the data was found to be too detailed and a broader interpretation of ecology was required. Most data is point occurrence, without consideration of species movements, even when seasonal distributions are known to alter. Geographic migration routes for birds and cetaceans is a current gap.
Bathymetry portal	Resolution of bathymetry varies with territorial waters, so comparison of

Points for EMODnet	Comments
	boundary areas ended up with variable resolution. Whilst the dataset was considered for use, less processing of data was required by using the SeaZone product which was preferred for this challenge.
General	Some source paths to data were broken. Data available from EMODnet was often available from multiple sources, which took time to appraise in terms of being definitive and most up-to-date. Fishing data was difficult to source and not found for this challenge. In some cases EMODnet portals had not received data from all National data providers, so information was only available in limited territorial waters. Portals containing links to the download of zip files such as the seabed habitat portal and the human activities portal were easy to use and enabled fast access to the data. There are currently limited means for searching the metadata from the contents of the portals for EU funded resources before the data is downloaded. The EMODnet query tool would be a suitable platform for developing capability for users to search through discovery metadata for all EMODnet data products and potentially data from other EU portals.

2.3. Marine Protected Areas

The primary aim of the Marine Protected Areas (MPA) challenge was to assess whether the data currently available from national and international organisations spanning the 8 focus countries of the UK, France, the Netherlands, Denmark, Belgium, Sweden, Germany and Norway, are appropriate to determine whether the MPA network constitutes a representative and coherent network as described in Article 13 of the Marine Strategy Framework Directive[2].

2.3.1. Approach

The network of MPAs in the North Sea was analysed in terms of OSPAR's guidelines of features, representivity, connectivity, resilience and management with the aim to:

- Create a database of MPAs designed to allow the creation of GIS outputs and the calculation of statistics;
- Analyse the North Sea MPA network for ecological coherence in terms of the OSPAR guidelines[3];
- Create interactive GIS outputs from the database which could provide all the information about a site including which country had designated the MPA and how the area fit into the overall coherent network of protected sites.

Data were gathered at an international and national level to account for country-specific MPA plans and designations. This approach allowed for a comprehensive list of MPAs in the North Sea basin to be collated. The full method applied to create the GeoDatabase for this challenge is presented in Appendix A.3.

[2] Marine Strategy Framework Directive: http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32008L0056&from=EN [Accessed: 14.04.2015].

[3] Since OSPAR's 2006 paper 'Guidance on developing an ecologically coherent network of OSPAR marine protected areas' (Ref number 2006-3), the way users have analysed ecological coherence has moved on from the simple 5 criteria.

2.3.2. Data gathered

The MPA challenge was primarily based on spatial analysis and for the production of an interactive MPA map, GeoDatabase and other GIS maps of MPA distribution and connectivity, the challenge required data to be made available in formats which could be easily manipulated in GIS systems. Thirteen spatial data sets (including 10 MPA boundary datasets, 2 habitat datasets and 1 maritime boundary dataset) were selected for the final analysis and were easily obtainable via national and international data portals. The datasets were available without cost and were easily edited in GIS software to be relevant to the study area. These are detailed in Table 4.2 of Appendix A.3 along with a full list of all datasets assessed for use in the challenge.

The datasets were supplemented with other information such as MPA management plans and national legislation. The discoverability and accessibility, format and usability of these supplementary data varied due to the numerous organisations from which data were sourced. All datasets were found by internet search, rather than provided via request to organisations. In terms of cost, most data were free to download and often immediately available, without registration.

2.3.3. Main issues

EU data standards were helpful for basic information on designations of MPAs but countries implement MPA management plans at different paces and so availability of these data varies. Language was also a restriction when locating national information in some countries.

The main issue with the data was the lack of spatial information with regards to Annex I and II species and larval dispersal patterns for the species of interest within the MPAs. As the challenge required the ecological coherence of the MPA network to be predicted from current data the lack of this data in particular was a key gap when attempting to understand whether a coherent network had been developed.

2.3.4. Was the challenge met?

The MPA challenge has been successful in collating the information from 8 different countries MPA plans, although large gaps were seen in certain data categories, such as information relating to the management of MPAs. The data were analysed with a view to discover whether the North Sea MPA network constitutes a representative and coherent network as described in Article 13 of the Marine Strategy Framework Directive.

The challenge was only partially successful as the analysis of coherence could only be run on the data for habitats due to the lack of spatial information available for species. The challenge therefore was able to identify the data gaps that exist, which is an overarching aim of this project. The available data are not sufficient to fully predict the ecological coherence of the North Sea MPA network, yet single aspects of ecological coherency, such as representivity can be assessed, and the geographic mapping of the network was completed using the data available.

2.3.5. Recommendations

It is of note that the sources of these datasets, OSPAR and the EEA, have lags in updating their MPA databases. It is recommended prior to the completion of this challenge updates are taken into account on the GeoDatabase. This will ensure EMODnet is displaying the most representative dataset for the North Sea MPA network. Further points that should be considered are outlined in Table 2.4:.

Table 2.4: Key points for EMODNet on Marine Protected Area Network Data Adequacy

Data Source	Comments
Bathymetry portal	If more complex larval connectivity analyses were to be conducted by a marine user, bathymetry datasets may prove to be very useful when modelling larval movement over certain ocean features.
Seabed Habitats portal	Datasets in this portal were useful the MPA Challenge. The broad scale habitats dataset (EUSeaMap) was downloaded for use in the 'Features and Representivity' aspect of the Challenge (see Appendix A.3 Section 5.1.2). The OSPAR habitat data set is also available for download from this portal. Both datasets were selected for use as they allowed full (albeit coarse) coverage of the North Sea basin. ■ The EUSeaMap predictive habitat map did not fully cover the extent of the study area, whereas the OSPAR dataset did. ■ The types of habitats represented are different: The EUSeaMap data set is based on EUNIS habitat classification and OSPAR has its own habitat classification. The resulting 'Features and Representivity' statistics differed depending on the dataset. The majority of the OSPAR threatened and/or declining habitats were well represented within the MPA network, all having a significant number of replicates in MPAs, whereas the EUNIS habitats showed a more mixed picture. Many of the named habitats without a EUNIS code were bathyal (c. 1000-4000 meters depth) or deep sea habitats located around the coast of Norway or north of Shetland/Orkney, which are areas with relatively poor MPA coverage.
Biology portal	Generally, the data sets provided by the Biology Portal relate to data collected over short time periods or in relation to specific species in target locations, which was not useful for basin-wide analysis. Species distribution datasets were not at a useful level of detail for the MPA analysis. The species distribution datasets display the whole species range, and although some datasets are available for some species listed under Annex I and II and OSPAR, mapping their general range overlap with MPA distribution is too coarse a scale. More pertinently, not all species featured in the North Sea MPA network have datasets. Therefore, the type of dataset that would have been useful for this challenge would be have been a spatial data layer file, containing point data of the locations of Annex I and II and OSPAR species listed in North Sea MPAs. This would allow a marine user to easily identify to what extent the MPA network might protected these species. Most data is point occurrence, without consideration of species movements, even when seasonal distributions are known to alter.

2.4. Oil Platform Leak

The aim of the Oil Platform Leak challenge was to determine the availability of data for an impact assessment of an oil spill from a platform in the North Sea basin. The challenge was carried out to assess the data available in the required response time for a preliminary (within 24 hrs) and complete impact assessment (within 72 hours) and as an aid to identifying possible data and knowledge gaps. The expected

outcome of this challenge was to understand whether suitable data sets are available to provide sufficient input for emergency response to pollution incidents, including an appreciation of the conditions of severe time pressures and the constraints that may put on data availability.

The main aim of this challenge as specified in the project brief was to:

1. Determine the likely trajectory of the slick resulting from a (simulated) leak at an oil platform and the statistical likelihood that sensitive coastal habitats or species or tourist beaches will be affected;
2. Provide a preliminary assessment of the likely impact of the oil within 24 hours of the start of the challenge;
3. Provide a refined assessment within 72 hours;
4. Provide a post-challenge critique of the data availability and suitability for use within the reporting of the challenge.

2.4.1. Approach

The challenge was approached as a simulated exercise with the timing and location of the oil leak provided by DG MARE after commencement of the North Sea Checkpoint project. In this case the Brent Delta platform was selected as the location of the leak by DG MARE and the date was 10 May 2016.

The challenge was assessed by modelling the trajectory of the oil spill based on its initial location using a Eulerian/Lagrangian model called GNOME (see Appendix A.4.1 for further details on the model and its use in the challenge). The results of the modelling were then mapped using GIS to determine the potential impacts on ecology and human activities from the oil spill.

2.4.2. Data gathered

The required data to model the movement of the oil (trajectory) was wind (speed and direction) and water current. For the potential impacts on ecology and human activities data on shipping lanes, bathing beaches, Natura 2000 sites and fisheries were collected to feed the assessment. A full list of the data gathered is provided in the Data Adequacy Report (DAR) for this challenge (see Appendix A.4.1).

2.4.3. Main issues

Some wind data was difficult to locate from freely accessible sources at a sufficient spatial scale, particularly the hind and forecast information that would be needed for this type of assessment. The spatial resolution of some data sets, for wind and currents, near the coast was quite coarse leading to some interpolation of data (see Appendix A.4.1 for further information) so that the challenge could be carried out.

With regards to this specific challenge the data used is only updated once per day at around 11:00, which limits the possibilities for updating the assessment. The data also only allows for predicting impacts up to 7 days in the future, which will limit the timeframe of the oil spill response.

2.4.4. Was the challenge met?

The challenge was successful as a model of oil spill trajectories was run and the potential areas of impact on ecology and human uses of the marine environment could be assessed. Part of the challenge was to identify potential data gaps after both 24 and 72 hours (see Appendices A.4.2 and A.4.3 for results of these assessments). This was also successful with the following gaps found:

- Data gaps limiting the preliminary assessment (24h report):
  - Tourist beaches
  - Shipping lanes
  - Details on the Natura 2000 areas are not yet addressed
- For the refined assessment (72h report), the following has been identified as final data gaps:
  - Tourist beaches (especially the locations of tourist beaches at the Shetlands)
  - Shipping lanes
  - Fisheries activity on a time scale shorter than a whole year
  - Distribution data of seabirds and marine mammals. Possibly also other biological distribution data on e.g. fish and benthic species. This is not caused by absence of survey data (which may be scarce nonetheless), but is caused by the non-existence of (geographically explicit) data sets that are prepared and ready for use. However as the usefulness of such data is also strongly dependent on the specifics of e.g. an oil spill incident, getting the details right for both the geographical detail and the correct time scale will remain difficult.

2.4.5. Recommendations

In a number of cases the update frequency of GIS data sets that were used in the post-analysis phase of the challenge is low, usually once per year or less, which is usually sufficient but may cause some issues for an oil spill assessment. Also, the level of on-line access that organisations currently prefer to offer is that of the Web Mapping Service (WMS). It allows outside viewing of a ready-made representation of the data, but a WMS does not expose the attributes of the data for analysis. This is what a Web Feature Service (WFS) does offer. Thus for outside uses that require analysis of geographical data sets a WFS option should be made available. This could be on request, with either a limit on the period or with a small fee.

Table 2.5: Points for EMODnet on Oil Platform Leak challenge Data Adequacy

Data Source	Comments
MyOcean	Some of the data on MyOcean was inaccessible a one point, although not on the day of the challenge. This is important to note as in a real oil spill response event this would have a detrimental effect on determining potential impacts in a sufficient timescale. It has also been noted that the oil spill trajectories sometimes did not reach the shore due to the coarseness of the MyOcean data around the coast. Although a solution was implemented which was sufficient in this situation this issue should be investigated and addressed if possible.

2.5. Climate and Coastal Protection

The Climate and Coastal Protection Challenge addressed the stages of work required for desk-based assessments intended to calculate variables such as annual sea level rise, annual change in temperature and annual sediment mass balance over the North Sea Basin. The challenge was undertaken from the perspective of a data user or a consultancy company requiring easy access to, and interpretation of, sea level, sea temperature and sediment data.

2.5.1. Approach

The challenge was split into two sets of assessments: (1) to produce spatial data layers for the past 10, 50 and 100 years and; (2) to produce time history plots averaged over the whole Basin of selected climate and coastal process variables for different depths and geographic locations.

To meet this challenge a very broad literature review was carried out to determine the available datasets, their cost and licensing agreements, their documentation and quality check procedures and their appropriateness to compute each of the following parameters:

- Sea level;
- Sea surface temperature;
- Mid and bottom sea water temperature;
- Sediment type.

Once available datasets were identified, their appropriateness for the challenge was evaluated, as far as the documentation allowed, in term of their accuracy and consistency, and was further filtered with different criteria as follows:

- Spatial Coverage;
- Temporal coverage;
- Data access or delivery;
- Data use.

A full breakdown of data gathered and the assessment process is provided in Appendix A.5.

2.5.2. Data gathered

A wide range of data types and sources were identified, downloaded when possible and reviewed for the challenge. The primary sources of the larger sets of data seem to be split into two online resources categories:

- EU funded websites (EMODnet portals, MyOcean); and
- National government funded resources (BODC, NOC resources, NASA).

Full information on datasets downloaded and assessed is provided in Appendix A.5. However, only two datasets were found to provide records combining both a long time period and a reasonably resolved geographical coverage of the North Sea Basin for use in this challenge (referred to as DT.Clim.NS042 and DT.Clim.NS043).

2.5.3. Main issues

The Climate and Coastal Protection Challenge has presented difficulties, not least because data availability for the past 50 and 100 years – and in some cases for most recent years - is limited. There are also issues related to assessing the contribution that the data can make to the challenge without first downloading and processing the information. This is due to the metadata being too imprecise to rule data in or out and there may be no lineage information to verify the provenance of the data and hence the value of its contribution. As a result, the range of data considered, downloaded and reviewed was much broader than the data deemed appropriate for use.

Spatial coverage is also a difficulty with the data as information is often restricted to single points along the coast which may be placed some distance apart. Temporal coverage also proved to be an issue for this challenge as technology collecting the required data has changed significantly over the last few decades. Satellite data is providing better spatial and temporal resolution, but mostly for the last 10 years. Prior to that the data has been extrapolated using mathematical models.

The challenge was approached from the viewpoint of a consultant/data user rather than a scientist with experience of running mathematical models to determine adequacy of the data provided. The process of carrying out this challenge determined that usable data for non-expert users is rare and mainly for informative purposes only.

- Some of the outputs necessary for the Climate and Coastal Protection Challenge had to be computed from available datasets. Time spent on writing scripts to process specific and unique datasets, to compute variables and display them is non negligible and needs be considered for any research or project. As a result, a large amount of data identified by this challenge is not usable for non-expert users.
- There is a plethora of EU-level websites offering data that would be appropriate to the project. These data sources are, however, often derived from a combination of the same sources. The interpretation and the investigation into this combination of sources remains difficult and requires investigative analysis to determine the true value of each of the datasets. There is a need to adopt persistent signposting services (like that being proposed by North Sea Checkpoint) to broker the right data to the right application.

2.5.4. Was the challenge met?

The Climate and Coastal Protection Challenge has been partially met, identifying many useful and appropriate datasets but also encountering significant limitations, especially because data availability for the past 50 and 100 years – and in some cases for most recent years – is limited.

Data identified is delivered in two main formats: ASCII and NetCDF. Those formats are standard and, as such, typically easy to use. However it is only relatively easy to use for engineers or scientists and not straightforward to use or even read for non-expert users. The challenge could be met in this instance, but only because the work was carried out by scientists experienced with using these types of data.

A full discussion of the Challenge is provided in Appendix A.5.

2.5.5. Recommendations

It was not possible to fully meet the challenge aims. Whilst metadata provide some information, it is rarely sufficient to appraise ‘fitness for purpose’ and data is available from multiple sources, which took time to appraise in terms of being definitive and most up-to-date. It is generally recommended that the provision of fisheries data sets in format for non-specialist end users would also be beneficial.

Table 2.6: Points for EMODNet on Climate and Coastal protection Data Adequacy

Points for EMODnet	Comments
Physics portal	The zip file of tidal gauge information appeared to download but couldn't be opened, hence it was not used.
General	The time series of measurements is in most cases historically insufficient and geographically patchy, e.g. tidal gauges are limited to coasts and islands with only occasional mid-basin information where structures had been placed, such as rigs. Since the historic record deemed appropriate for the challenge was a singular dataset, no validation of the results was achieved. More recent data, such as the satellite observations are far more comprehensive, but their time series is not yet sufficiently long for deriving climate change considerations. On the scale of the North Sea basin, no sediment data was discovered that could address the challenge. Usable data for non-experts is rare, as the datasets available require expert processing.

2.6. Fisheries Management

The primary aim of the Fisheries Management Challenge was to assess whether the data currently available from national and international organisations from the 11 relevant countries in the North Sea (UK, Sweden, Ireland, the Faroe Islands, Norway, France, Finland, Belgium, Denmark, the Netherlands, and Germany) are sufficient to describe the extent of fisheries activities and their impact on the North Sea environment. A further aim of the challenge was to determine the accessibility of fisheries data by end users.

2.6.1. Approach

The approach to this challenge was to collect data which was considered of most relevance to the fisheries industry and this challenge and to assess whether this information could be analysed to provide guidance on use of the North Sea basin as a fishery that could be used for management of the fisheries. The data considered relevant to fisheries management were:

- Landings data;
- Discards data;
- Bycatch data;
- Spatial fishing effort data.

The data were analysed, collated and mapped to provide an updated and complete picture of fishing effort in the North Sea. The data was additionally analysed for spatial and temporal trends where possible. These data were requested from international and national fisheries data collection agencies so that requests were targeted to the most appropriate agencies. Desk-based internet searches were conducted initially, followed by direct contact with national agencies and other agencies including ICES and the JRC (EU Joint Research Centre). Agencies were contacted so that the project could assess the process by which end users could request data.

2.6.2. Data gathered

Data were gathered from a range of sources presented in Table 2.7:. A full list of the data downloaded from each source, and the adequacy of the data for use in the fisheries challenge, is presented in the Challenge Report in Appendix A.6.

Table 2.7: Data sources for the fisheries management challenge

International sources	National sources
EC JRC data;	**UK:** MMO landings data, Environment Agency Geostore, Marine Scotland data portal;
ICES, catch and stock assessment datasets and fishing activity datasets;	**Germany**: Federal Office for Agriculture and Food (Bundesanstalt für Landwirtschaft und Ernährung – BLE) fisheries landings data;
EMODnet Portals;	**Belgium**: Department of Agriculture and Fisheries (Vlaanderen Landbouw and Visserij) Sea Fisheries Publications;
Food and Agricultural Organisation (FAO) capture production database;	**France**: Ifremer and Obsmer fishing fleet data;
	Norway: Norwegian Directorate of Fisheries fisheries data;
	Sweden: Swedish Agency Marine and Water Management (Hav och vatten) fisheries data;
	Ireland: Sea Fisheries Protection Authority (SFPA) fisheries data;
	The Netherlands: LEI research institute (at Wageningen University and Research Centre – WUR) Agrimate fisheries data;
	Denmark: Danish Nature Agency (Naturstyrelsen) Agrifish datasets

2.6.3. Main issues

Generally there is a significant amount of fisheries landings and effort data provided on various national fisheries websites, but they are often in PDF format, embedded in reports, only for restricted time series, not grouped in the same way between countries and only viewable on interactive web maps. With the datasets available for this challenge, only fine resolution mapping and analysis of fisheries data can be done on a national, but currently not basin-wide level.

The assessment of whether the data is in a format that is easily accessed and understandable by an end user determined that in some cases specialist knowledge of software e.g. GIS mapping tools, would be needed to perform the required analyses of the data. It was also determined that some data required a significant amount of processing and guidance from the JRC to manipulate correctly for the challenge. Without the key contacts and understanding of the data this would have been difficult to carry out.

There can also be significant costs associated with obtaining the fishing data from National agencies in a format which can be used, one quote provide was in the region of €20,000-30,000.

2.6.4. Was the challenge met?

The challenge was partially successful, updated maps of the fishing effort in the North Sea were produced and spatial and-temporal analyses of trends were possible but only due to the international data which was freely obtainable. There are gaps in the data, most particularly at a national level, with regards to fisheries discards, by-catch and spatial activity which could make development of fisheries management plans challenging. The full assessments carried out and the results of the challenge are presented in Appendix A.6.

2.6.5. Recommendations

It is generally recommended that the provision of fisheries data sets in format for non-specialist end users would be beneficial. There are initiatives underway to do this but these will take time to complete and it is suggested that end users could influence data calls, such as the next ICES call in 2017, to address some of the accessibility issues identified in the challenge report (see Appendix A.6).

Table 2.8:Points for EMODnet on Fisheries Management Data Adequacy

Points for EMODnet	Comments
Bathymetry portal	Datasets are generally required for planning marine installations and infrastructure such as wind turbines, coastal defences, oil platforms and pipelines. The portal contains datasets on mean depth, depth contours and marine topography which are useful as reference base maps for GIS images. As ocean base maps are already part of Arc-GIS software packages (the software used to create the maps for this Challenge), EMODnet bathymetry datasets were not required although many could be used.
Geology portal	Complex geological feature datasets, often specific to particular areas and processes (e.g. sediment accumulation rates) were deemed inappropriate for the Fisheries Management Challenge.
Seabed habitats	The Fisheries Management Challenge does not require an assessment of the impacts on seabed habitats so datasets were not utilised. Bathymetry datasets are also available from this portal (discussed above).
Chemistry portal	The data provided by this portal were not deemed relevant to the Fisheries Management Challenge. The data sets are mainly related to eutrophication, contaminants and readings from oceanographic monitoring instruments.
Biology portal	The data sets provided by the Biology Portal are those of species distribution and not related to fisheries, so were not utilised for the Challenge.
Physics portal	The datasets provided by this Portal, such as sea water temperature, salinity, waves, winds and light attenuation are useful for analyses more complex than that of the Fisheries Management Challenge.
Human activities portal	Datasets in this portal were not utilised for the challenge as mainly, human activity data related to aquaculture, dredging, aggregate extraction, waste disposal and marine energy usage, rather than fishing activity. The FAO

Points for EMODnet	Comments
	capture production dataset available from this portal is useful for users wanting a general overview of catches landed into the region over a long time series, but data are not available by ICES area, or gear type, so were not utilised for the challenge. It would be useful if some form of fishing activity data (such as kW hour activity data, or other aggregated VMS or AIS fishing activity data) were provided as part of this portal.

2.7. Marine Environment

The aim of this challenge was to produce gridded data layers of the average seasonal eutrophication over a 10 year period in the North Sea basin.

2.7.1. Approach

The approach taken for this challenge used the method of the OSPAR Contracting Parties for measuring eutrophication. The method is described in detail in the Data Adequacy Report (DAR) for this challenge (Appendix A.7), in brief this entailed the collection of information on various eutrophication parameters that are then given an assessment level and analysed for trends over time to determine eutrophication patterns. The assessment of eutrophication is not carried out at a whole basin level but rather on smaller geographical scales which are then aggregated to provide a whole basin view.

2.7.2. Data gathered

The data gathered for the challenge is presented in full in Appendix A.7. In brief, this included:

- Riverine inputs and direct discharges;
- Area specific nutrient concentrations;
- Area specific N/P ratio;
- Chlorophyll *a* concentrations;
- Phytoplankton indicator species and macrophytes (including macroalgae) presence;
- Oxygen availability;
- Changes to the zoobenthos and fish populations, including kills due to changes in environmental conditions;
- Area specific organic carbon/organic matter;
- Presence of algal toxins.

2.7.3. Main issues

As whole basin data for an assessment of eutrophication does not exist the challenge relied on accessing information that had been collected and provided by EU member states. The main issue with this approach is the variability in monitoring data held by different nations as there are different programmes and standards of reporting meaning that collation of the data was difficult for this challenge.

The temporal and spatial coverage for some of the required data was insufficient to provide an assessment of seasonal eutrophication over a 10 year period. It was also the case that where data were available over a

reasonable time period the access was sometimes restricted to a particular number of years meaning the information was less useful. There were also odd data gaps for some of the key parameters used to assess eutrophication, with macrophyte/macroalgae data only available for the Kattegat and little to no information on fish kills for any of the countries that are monitoring eutrophication. There was also some bias identified in the datasets as locations within heavily modified water bodies close to e.g. fish farms were monitored with a greater regularity than areas which were less modified or considered natural, even if they had been identified as suffering from eutrophication.

One of the main issues also identified was in regards to the metadata provided with several of the datasets. This was either insufficient or lacking meaning that the data downloaded for use in the challenge was unusable as the temporal or spatial scale was unknown or the quality of the data could not be determined.

2.7.4. Was the challenge met?

The challenge set in this case was not met due to the lack of temporal and spatial data available for the required parameters. Therefore no series of seasonal eutrophication over a 10 year period could be produced.

2.7.5. Recommendations

There is no map of Eutrophication for the whole North Sea basin, and it is currently not possible to create one. Identifying the steps needed to create such a tool, and the carrying out the work to do so, should be possible for certain years. This may then lead to identification of barriers to data collection or provision which can be overcome to provide the temporal information requested for the challenge.

Table 2.9: Points for EMODNet on Marine Environment Data Adequacy

Points for EMODNet	Comments
Chemistry portal	There was a considerable amount of data on water chemistry available through EMODnet on nitrates, phosphates, silicates and ammonium. The benefits of these datasets are: ■ Temporal extent and resolution that should be suitable for the analysis. ■ Geographic extent and resolution that should be suitable for the analysis. The primary issue with these data is the way in which dates are formatted in the data. These are not in an immediately usable and the link to the metadata online returns a blank page. As a result of this, the datasets are not readily useable.
Seabed habitats	The data held here is good for defining the boundaries between physical and biological parameters but were of limited use in the challenge due to the data contained not being what was needed for a eutrophication assessment.
EurORBIS	The metadata for this information was lacking meaning that the temporal resolution was unknown. This meant that the datasets were not readily useable in any assessment where understanding of temporal variability was required.

2.8. River inputs

River inputs are of importance to the evaluation of the environment in the North Sea. Rivers convey freshwater, sediment and nutrients to sea. A number of economically and environmentally important species migrate between freshwater and the sea at different stages of their lives; meaning that the quality of both the marine and the freshwater environment is important to their survival. The aim of the river inputs challenge was to assess the inputs from rivers flowing into the North Sea basin that could be used to evaluate the environment of the North Sea.

2.8.1. Approach

The work has been carried out by completing a literature review of studies that have reviewed river input data or that have used this type of data in order to determine the range of data sources that are available. Where relevant, the data providers identified from the literature review were contacted to obtain the relevant data from them. In parallel with this activity, national agencies that are responsible for river management were contacted to obtain data that they can make available. Further to this, internet-based data portals and the websites of major environmental management organisations in northern Europe were scrutinised in order to obtain data. Metadata have been stored in the data register provided in the Data Adequacy Report (DAR) for this challenge (see Appendix A.8).

Quality checks have been carried out to determine, as far as possible, the accuracy and consistency of the data. Suitable data have been used to compile time series of annual inputs and monthly averages, maxima and minima for the past ten years wherever possible. This has been carried out in order to assess whether the availability, consistency and resolution of the data are sufficient for the task.

2.8.2. Data gathered

For each river inflow a time series covering a ten year period (2005-2015) for the following parameters was required:

- Water
- Sediment
- Total nitrogen
- Phosphates
- Salmon
- Eel.

Time series data would allow annual inputs and monthly averages, maxima and minima for the ten year period to be calculated. Full information on the data gathered, and the adequacy of the information, is presented in Appendix A.8.

2.8.3. Main issues

There were data gaps for all of the variables required for this challenge. With regards to the physico-chemical inputs the minimum, maximum and mean values were not calculated as only three of the countries with rivers inputting to the North Sea Basin held comprehensive data sets. There is also low confidence in

the data that has been collected as the upper and lower annual values have been reported as the same, or similar, leading to the conclusion that these are actually averages rather than minima and maxima.

For the biological components, in this case fish species of salmon and eel, only the UK (specifically England) held comprehensive data sets that included abundance of the fish.

As with previous challenges several datasets were not fully useable due to the lack of metadata detailing location or dates of collection. Where data was not geo-referenced it was difficult to determine if it was useful for the challenge.

A full discussion of the data adequacies and issues is presented in Appendix A.8, however a main issue identified was that none of the data for the challenge was available from a centralised data portal as was the case with other challenges. Therefore national agencies within those countries with river inputs to the North Sea were contacted which was time consuming and occasionally incurred a data handling charge.

2.8.4. Was the challenge met?

With regards to understanding the general river inputs to the North Sea basin from a geographical perspective i.e. where are they coming from, the challenge was met, although it was not possible to provide a fully geo-referenced spatial presentation of the data. Understanding the inputs over time was not fully met for all countries where rivers input to the North Sea as for most there are only 3 years of data available for use in the challenge. A full discussion of the challenge and the limitations of the data obtained is presented in Appendix A.8.

2.8.5. Recommendations

The data gathered for this challenge was not provided by EMODNet as it was all deemed to be riverine in nature regardless of the fact the rivers flow into a marine area. It would seem that data for transitional waters are not held centrally by EMODNet which has made conducting the challenge difficult. It would therefore be useful if either EMODNet held this data or the issues associated with the data from the European Environment Agency (EEA) i.e. sediment discharges and the Waterbase datasets, were addressed and a link to these were placed on the EMODNet home page.

3. Main Data Gaps

The challenges, by design, test the breadth and depth of the data provision for the North Sea in different ways. Each has identified gaps in the necessary data provision for achieving the challenge and this specific information is given in the associated reports and summaries for the challenge. It is, however, possible to discern some overall patterns in the limitations of the data provision.

The overall statistics (given in Appendix B) indicate that a relatively small proportion of the datasets initially identified were actually used to meet the challenges: 34% were discarded before being considered in detail, 36% were discarded after careful consideration, 13% were considered suitable but not used, leaving just 17% used to meet the challenges. Such a falloff of appropriate data through the evaluation process indicates that, although there may not appear to be a data gap at first sight, the detailed analyses uncover gaps which do exist. Moreover, a number of the challenges were, at most, partially met. Although a large number of datasets were on offer, these could not meet the challenge set to the satisfaction of the scientists undertaking them. Indeed, the Marine Environment Challenge was not met even though 64 datasets were originally identified as being appropriate. This was due to the challenge requiring an assessment of seasonal

eutrophication over a 10 year period which could not be evaluated due to the lack of both spatial and temporal coverage of necessary data. The lack of temporal coverage was also supported by, for example, the River Inputs challenge.

In addition to the identified limitations with temporal coverage, the main gaps in the data provision appear to be related to biology and ecology:

- The Wind Farm challenge identified limitations of using biological and ecological data, particularly fisheries data and information on the migration routes for birds and marine mammals.
- The Marine Protected Areas challenge identified a lack of spatial information with regards to certain and larval dispersal patterns within the MPAs.
- The Oil Platform challenge identified gaps in the data supporting distribution of seabirds and marine mammals, also fisheries activity on a timescale shorter than a whole year.
- The Fisheries Management challenge identified gaps in the data, most particularly at a national level, with regards to fisheries discards, by-catch and spatial activity.
- The River Inputs challenge found that the data, for species of salmon and eel, only the UK (specifically England) held comprehensive datasets that included abundance of the fish.
- The Marine Environment challenge was not able to collect 'whole-basin' data for an assessment of Eutrophication.

The Oil Platform challenge required fast data provision to support real-time operations for a variety of parameters. Among other issues, it was found that data concerning certain managed areas was difficult to obtain. After 24 hours there was no data obtained on the locations of tourist beaches and shipping lanes and this limitation persisted through the challenge into 72 hours, particularly for the locations of tourist beaches in the Shetlands.

There were also data gaps in physical parameters:

- The Oil Platform challenge identified inadequacies in the spatial resolution of some data sets for wind and currents near the coast.
- The Climate and Coastal Protection challenge found that, on the scale of the North Sea basin, no sediment data was discovered that could address the challenge. Indeed, any usable data for non-experts is rare, since those datasets that are available require expert processing.

4. Further Discussion and Recommendations

The seven North Sea Checkpoint challenges represent complex scientific questions to be answered by a wide variety of datasets. This study has shown that the majority of these can be met, at least partially, to the satisfaction of the users and with data that can be located, sourced and processed successfully. Each challenge has its own unique character and is supported in different ways by the data:

- The Wind Farm challenge was met, relying heavily on the SeaZone HydroSpatial commercial data product.
- The Oil Spill challenge was met with a few gaps in the final data product provision.
- The River Inputs challenge was almost completely met but not all desired products were constructed.
- The Climate and Coastal Protection challenge was partially met, but limited in the temporal scale of the data products.

- The Marine Protected Areas challenge was partially met but lacked the full spatial information necessary for a full solution.
- The Fisheries challenge was partially met but with gaps in the data products.
- The Marine Environment challenge was not met to the satisfaction of the scientists attempting it.

The reported narrative from these challenges combined with the associated statistics from Appendix B indicate that, overall, the datasets performed adequately in meeting the challenges. Notwithstanding the more detailed analysis that indicates more confined actual usage, the overall provision of data for the North Sea represents a realistic foundation. In the main, the providers offered favourable commercial terms and delivered in a reasonable timescale, but there were bigger problems with the data's contribution to the precise requirements of the challenges, with attribution and with usability. Albeit with a small sample size, if the information in Appendixes B.4 and B.5 is taken at face value then the INSPIRE themes which relate most strongly to the challenges are Hydrography, Oceanographic geographical features, Atmospheric conditions, Habitats and biotopes and Species distribution, although one challenge (Marine Protected Areas) has a very strong intersection with Protected sites.

Considering the lifecycle of the usage of the data as the users attempted to fulfil the challenges:

- **Finding Candidate Data**
  A number of challenges reported difficulty in finding relevant data, however it is difficult to quantify this. There was a general feeling that there was (or should be) more data 'out there'. Locating the data was a little haphazard and reliant on the specialist knowledge of the scientists and was complicated since it was hard to identify some datasets uniquely. The literature survey activities reported that the data portals identified are often interlinked, with several overlapping and providing data to each other. Often the same data is available from multiple sources and it was difficult to ascertain which was the most up-to-date.

- **Assessing Candidate Data**
  It is important to have accurate, concise and informative metadata to describe target data, so that a quick assessment can be undertaken before more time is invested in unpacking the datasets themselves. The challenges reported many issues with the metadata provided. Metadata was sometimes missing, inaccessible or unintelligible, resulting in underuse of many potentially helpful sources. It is clear that the spatial and temporal coverages were not adequately described, indeed, over 30% of the datasets appeared to be in the right spatial or temporal location, but actually were not of use to the challenges. If the metadata was too imprecise to rule the data in or out then there was often no lineage information to verify the provenance of the data and hence the value of its contribution. Overall, if the metadata was complete and of high quality, then the statistics describing the process would show that the decision not to use a dataset was made after analysis of the metadata, whereas the falloff demonstrated in Appendix B is more gradual indicating that either good datasets were overlooked or that data that wasn't useful went too far through the analysis process. There is a clear need to standardise the metadata describing marine datasets and improve the quality of the information therein.

- **Obtaining and Using Data**
  Some potentially useful datasets were prohibitively expensive to obtain, either in purchase price or staff time. However, although potentially show-stopping when they arise, overall it can be seen that problems with usage terms and conditions and delivery time (represented by criteria 'Commercial' and 'Delivery') did not occur frequently. Problems were reported obtaining datasets due to under-maintenance of the links to the data or the metadata – perhaps the candidate data was created by a project and which has

now ceased. Some datasets were very time consuming to download. Indeed, it can be frustrating for a user to have to download and process an enormous dataset when they only need a small subset of it. Also, significant variation was identified with the variability in monitoring data held by different nations due to different programmes and standards of reporting.

It is clear that there is potential to better serve the Blue Economy with data and associated services to support its activities. The challenges have shown that the needs of the communities are varied in both breadth and depth and demonstrate a set of complex and specific requirements against the data available. These findings are in line with the initial recommendation noted from the project's literature survey that services like EMODnet:

> cannot expect to address all possible users of the data and should be cautioned against creating data products. There may be more benefit in focussing on creating routes for third parties, focussed on particular user communities, to exploit public data. These targeted data services may come and go with the market, however EMODnet should be a consistent layer, unaffected by such market or technological conditions
>
> *HR Wallingford Report DLS0342-RT002-R01, Section 4.3*

Indeed, analysis of the lifecycle of finding, evaluating and using the data to meet the challenges shows that considerable potential for aiding the Blue Economy lies with the presentation of the available data to the user communities.

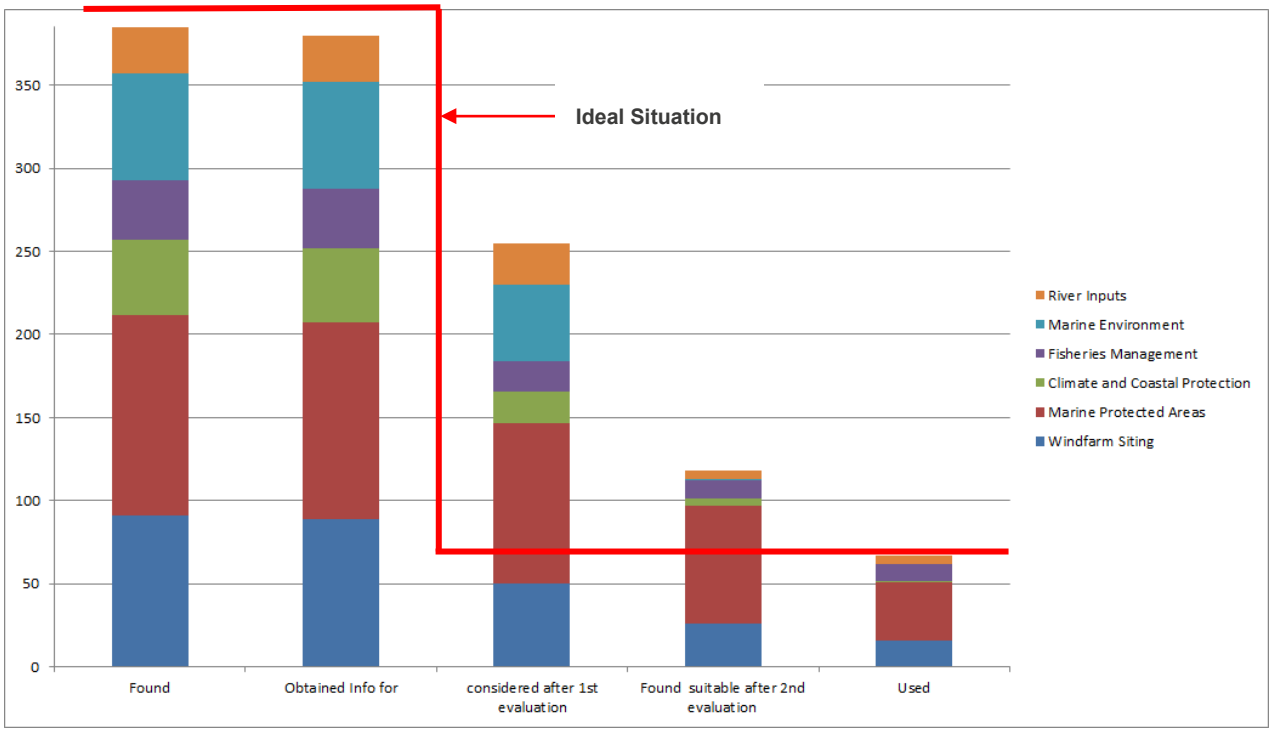


Figure 4.1: Datasets considered relevant after each stage of evaluation

Source: North Sea Checkpoint Data Advisor system

Figure 4.1 is another representation of the statistics in Appendix B.1, this time looking at the number of datasets under consideration after each stage of the evaluation process. It shows a fairly slow fall away to the final number used. The red line represents the ideal situation: more datasets found initially; information

obtained for all of those found; all inappropriate datasets eliminated after a single, quick evaluation of the metadata. The potential to find more datasets exists but cannot easily be enumerated and the longer time to evaluate the usefulness of datasets represents wasted staff effort and frustrated users.

With its coverage and guiding principles, EMODnet is well positioned to coordinate the adoption of a metadata standard for discovery and use of marine data. It should not be necessary to devise a standard from scratch, rather adopt one such as ISO19115[4]/ISO19139 or Dublin Core[5]. Should there be any elements not covered by the standard that the community considers essential then these can be offered as extensions to the standard. To avoid ambiguity in the precise phenomena described by the datasets, adoption of the standard would be best implemented when accompanied by adoption of a controlled vocabulary for parameter names such as CF Standard Names[6] or CSDMS Standard Names[7].

Adoption of this standard across the community would then facilitate the formation of a federated catalogue solution for marine data, incorporating existing data portals and supply mechanisms. Data suppliers can either set up their own catalogue service based upon the agreed metadata standard or offer entries to existing catalogue instances. Under this architecture, EMODnet would also be well placed to offer a general catalogue instance to cover all suppliers who wish to use it, together with a search facility with the capability of covering all federated catalogue instances. It would not be the responsibility of a service like EMODnet to ensure that the data is used, rather that data suppliers have a well-publicised, high-usability avenue for ensuring that their data is described and accessible. Blue Economy users and interest groups would then place the onus on data suppliers to offer their data products using this federated catalogue solution, which would apply to commercial data products as well as those offered for free. Indeed, the Wind Farm challenge has shown how commercial data products such as SeaZone HydroSpatial can sit alongside the more raw data sources. The overall architecture would be owned, curated and governed by a central coordinator, but the entries in the catalogue would be owned and maintained by the data suppliers, i.e. those who suffer if the records are incorrect, particularly if suppliers are incentivised by usage of their data.

There remains the complexity of being able to identify datasets uniquely. This is not simply a matter of assigning a digital object identifier to each dataset. Some datasets represent the raw output from instruments; others a processing of this raw output into standard representations; others the result of post-processing individual datasets; still others an aggregation of a variety of sources or an aggregation over time and space. One person's raw data is another's post-processed output. If metadata instances are going to be attributed to data sources then this must be done at a practical level. If this level is too fine, then it becomes unmaintainable and offers a confused picture to users; if this level is too coarse then it offers little practical use. It is recommended that a pragmatic solution be applied at the level of data products related to the owning organisations.

A key ingredient missing from the current information architecture is the user evaluation of the data. It was observed early in the project that getting useful feedback about the data was often more difficult than getting the data itself. The Climate and Coastal Protection challenge observed that there is a need to adopt persistent signposting services to broker the right data to the right application. As a result, the project has prototyped the Data Advisor facility, as described elsewhere in this document. Context specific user experiences are recorded to aid evaluation by other potential users and also generate summary statistics.

[4] http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=53798

[5] http://dublincore.org/

[6] http://cfconventions.org/standard-names.html

[7] https://csdms.colorado.edu/wiki/CSDMS_Standard_Names

Since any such user feedback mechanism depends on busy users offering their views on the data, it must be implemented with a high usability interface with a workflow as simple and short as possible. The prototype Data Advisor facility developed by the project evaluated the data against just six criteria (as given in table 3.10): Contribution, Location, Commercial, Attributes, Delivery, Usability. These criteria are intended to be intuitive and easy to evaluate. As such, EMODnet is also well placed to enable the creation of a user feedback service, based on the idea of the project's Data Advisor to accompany existing catalogues of marine data and linked to the metadata records in those catalogues. It should also be considered to introduce workflow items upon data acquisition to encourage users to contribute their experiences, e.g. automatic emails to users six weeks after their acquisition offering them a link to the feedback service. Such a service would need to be based on an agreed standard for user feedback, of the level of simplicity used on the project.

It is also clear that standardisation is necessary in the technical and functional structure of marine datasets. Datasets are provided by suppliers in a huge variety of formats and described in often local and esoteric vocabularies. This issue is indicative of scientific data as a whole and, although a network such as EMODnet cannot be expected to solve this issue, it may be possible to move towards a solution through the adoption of standards for representing spatio-temporal data such as TimeSeriesML[8] or NetCDF[9] and accompanied by controlled vocabularies for phenomena names.

[8] http://www.opengeospatial.org/standards/tsml

[9] http://www.opengeospatial.org/standards/netcdf

Appendices

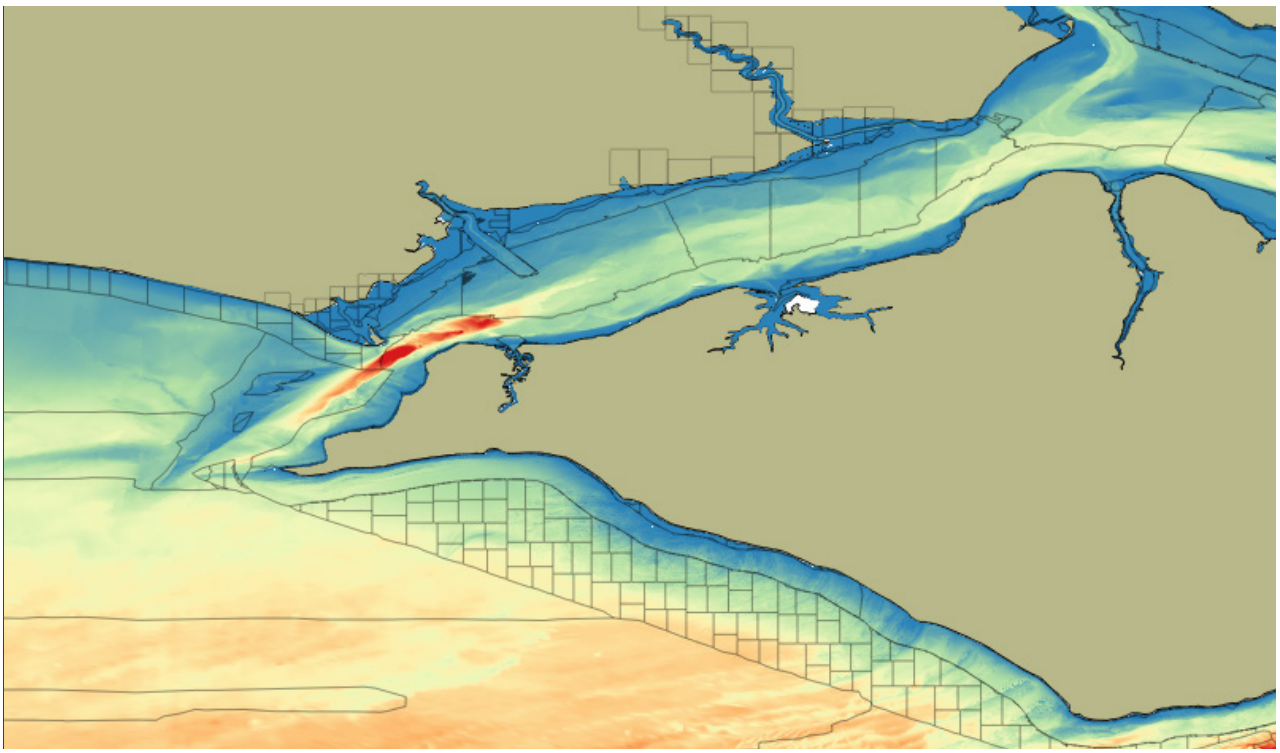
A. Data adequacy reports

A.1. Literature review

HR Wallingford
Working with water

Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report 01, including literature survey



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Executive Summary

This document summarises findings of existing studies related to the adequacy and data available for the North Sea basin. Although this review was not constrained by any particular North Sea data activity or study, a particular consideration was studies that have made use of EMODnet and Copernicus data services and where the experiences of using these data services have been reported.

This report is deliverable 02 to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in Sea Basin and Observation Data MARE/2012/11:North Sea) contract reference [SI2.658142]. The work was undertaken by HR Wallingford Ltd with input from the project members IMARES and McAllister-Elliot & Partners (MEP).

EMODnet was established on the principles that there was a lot of public sector data available that was not used adequately to underpin decision making in support of commercial and policy objectives across Europe. This situation persisted at a national level, but compounded at the international level where it was practically impossible for organisations to use marine environmental data across and between member states. In the scope of this check point, the literature review examines if this is still the case following ten years operation of the EMODnet and Copernicus programmes, with a focus on commercial and non-governmental users.

The literature survey considered public reports, journal papers, grey literature and web published articles and used the Mendeley tool to collate and discuss the findings. In total 50 documents were reviewed. Based on an analysis of the documents, we are still very much at the Wild West stage of the Blue Economy when it comes to data provision across the North Sea. If you know where to look, you could probably find the data you need, but it is not a case of 'Google, click, download'. Services that deliver data are increasing and some are maturing, however the vast majority would not be considered as 'trusted providers' or the 'go to' place for data. Indeed many are not discoverable via web searches either. Furthermore data portals or independent literature do not give widespread information on the value of the data for a particular use. In most cases it is incumbent on the user to download the data and then make assessment as to its value.

The Blue Economy comprises many actors and there is a desire to re-use data beyond its original collection intent, especially where the original collection was publicly funded. The key value add of public services like EMODnet is in providing data custodianship, version control and flexible download services. Allocating resources to these tasks should be seen as a priority over creating new data products and services that widen the gap between data 'as collected' and data 'as provided'. They also burden the public sector with the need to maintain these products. Actors in the Blue Economy will take sound data and create innovative products (including web services and apps); unfortunately they would be less likely to undertake data curation tasks.

Contents

C. Data Register

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1. Introduction

1.1. Overview

This report is the second deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11:North Sea) contract reference SI2.658142. The work was undertaken by HR Wallingford Ltd with input from the project members IMARES and McAllister-Elliot & Partners (MEP).

This document presents a literature survey summarising the findings of existing studies relating to the adequacy and data available for the North Sea basin. The purpose of this survey is to provide a context for the Blue Economy in the North Sea and where data gaps are limiting its development. As such this review compliments the specific analysis of data gaps for the data challenge exercises to be undertaken subsequently as part of the North Sea Checkpoint (NSCP) project.

The literature survey included the following types of documents

- Portal-specific documentation and reports ; where portals known to provide information within the North Sea area were identified, information about the portals was sought, particularly with respect to whether there was separate documentation discussing usability, data gaps or user experiences.
- Scientific literature; where peer-reviewed publications contained information about the experience of sourcing data, what type of data gaps may exist and the constraints experienced with accessing data.
- Grey literature: conference and workshop proceedings where articles contained information about the experience of sourcing data, what type of data gaps may exist and the constraints experienced with accessing data.

Each of the literature was reviewed at two levels. First is an analysis of the literature items themselves; second is the content of the literature. The analysis of the literature items considered what literature exists; the analysis of the content of the literature considered “what does this literature tell us about data supply?” This two level approach is needed to assess how generally accessible useful information on marine data activities are, as well as the science of using these data to solve actual problems.

A key consideration in the literature review is an assessment of the discovery and assessment of information such that users can make use of data. This is, if a data portal cannot be discovered and assessed as useful, and/or the portal does not allow for data to be subsequently discovered and assessed then it is of limited value to a user.

The survey has been undertaken using the free web-based tool Mendeley[1] as a collaborative area to share and comment on literature between project partners. The assessment of the literature was recorded using a scheme agreed within the data-challenge spreadsheet[2]. The findings from each of the literature was recorded in a separate schema within Mendeley.

[1] www.mendeley.com

[2] In this way the literature review, the literature review is treated as a project challenge , however unlike the data challenge, literature, rather than data, is assessed as to how it meets the challenge

1.2. Context of Literature Survey

The literature survey is approached from the perspective as a proxy-user of data services in the Blue Economy. This is to reflect not only the findings of the literature itself, but also the challenges in discovering and accessing the value of the literature. In this context, it has been attempted to not just consider commercial users, which is a temptation when 'economy' is mentioned, but to also consider non-governmental usage by others such as the leisure sector and the non-profit services of stakeholder organisations such as charities. Both of the latter have a significant role in marine usage, generate economic activity and exert influence over more obviously commercial users.

Data adequacy and availability means different things to different communities. This is an important consideration as much of the monitoring, data collection and aggregation has been undertaken by public bodies and the academic community, whose efforts have been extensive. However, the driving factors in the blue economy of commercial and other users may not directly match to the experiences of the academic and public sectors who are already very involved in the EC initiatives.

This is not to say that the latter sectors are being ignored. Indeed, data requirements of the Marine Strategy Framework Directive (MSFD) are considerable and the use of existing monitoring programmes and data sets will be essential to measure the progress over time of the steps taken to meet the aspirations of the MSFD. However, academic and public sectors have extensive linkages to the data initiatives, so their data requirements and accessing behaviours are likely to be different to that of commercial or other concerns. It was therefore decided that a 'two-pronged' approach should be taken, looking at both the data initiative reporting, and also seeking commercial or practical user reports.

1.3. Relationship between Literature Survey and Data Challenges

The overall aim of the literature survey is to identify and report on the contents of the documentation available on the adequacy and data available for the North Sea basin and summarise findings of existing studies. Data adequacy in the context of this literature survey means how easily the literature was discovered, accessed and how much it provided information on providing data to users.

Analysis of the literature using the data registry model will provide information on the effectiveness of data delivery systems as well as the data they deliver. This information is equivalent to those included in the adequacy reports for each of the challenges. It may be that literature discusses the same topic areas as the challenges, however this is not the expectation. The expectation is that the literature provides a set of conclusions about adequacy of data supply in the North Sea basin that can verify (or otherwise) the conclusions from the data adequacy reports produced by the challenges.

Full data gathering that is specific to the various challenges was considered to be an activity for that challenge, rather than an activity for this literature survey. The decision to keep the data gathering for challenge activity was taken because the value of specific data can only be assessed in the specific context of the challenge. No two usages of data are likely to be exactly the same, at the very least because of temporal and geographic alterations. However, literature that describes the data portal functioning and its usability, or the use of data portals for accessing data, was considered to be the main target for this literature survey. Literature that included gap analysis of data portal holdings was included as a secondary target.

In summary, the literature survey is designed to have a symbiotic relationship with the data challenges, providing background information for the challenges while expecting the result from each of the challenges to build upon the results of the literature survey.

2. Methodology

2.1. Data Gathering

The project team has searched for a broad range of research papers and grey literature from online resources such as portals, via internet search engines such as Google Scholar, the Biodiversity Heritage Library and Scirus and through electronic subscriptions to resources such as the Web of Science, the British Library and Elsevier Science Direct.

Each of the identified literature was initially documented using the Mendeley citation tool and shared with the project team. The literature was then graded using the data registry model according to the value criteria of: Contribution, Location, Commercial, Attributes, Delivery and Usability. An assessment was then undertaken of the content of the literature itself, relating to data gaps which may be relevant to the challenges and to the broader objectives of the project. This is discussed in more detail in Section 2.2

The survey of literature identified 50 separate literature resources and these could be allocated into the following categories:

- Data Portal and Data Initiatives Documentation;
- Research papers;
- Other grey literature.

Detail of each of these literature lists are presented in Appendix B.

Testing the discoverability of the various data initiatives (not the data themselves) through use of different search engines and search terms was assessed. This is to understand whether commercial, non-governmental and private sector users with no previous link to these activities would find them quickly and easily when identifying a need to access North Sea data.

There are barriers to finding information on data adequacy

A high priority for the literature survey was to focus on data adequacy and what 'adequacy' actually means in the context of finding, accessing and utilising data. Addressing this aspect started to provide information on finding and accessing data – for example, the use of electronic subscription services when surveying literature. There is a cost implication in accessing much scientific literature, which is difficult to accurately forecast when undertaking a piece of commercial or potentially charitable work.

Many non-academic organisations do not have comprehensive library services which are invaluable in assisting with targeted data retrieval. Some organisations may be operating in situations where even internet access is filtered so as to become an obstacle. Sometimes necessary software to work with particular data formats requires Information Technology sections to approve the download and installation. This means that the IT section may take a considerable time to test for system compatibility prior to releasing and installing the 'free' software on a potential user's machine or providing server access. This adds a time penalty to data access and further resource requirement, even if that necessary software is provided free.

2.2. Data Register

The findings from the literature survey are recorded in a data register. The data register is implemented as a spreadsheet and records the accessibility of the literature and the value of the literature. The concepts of Accessibility and Value are described in Table 2.1 and Table 2.2 below. The approach taken for the literature review in the context of the Access and Value criteria is shown below in Figure 2.1.

Table 2.1: Accessibility Criteria

AccessCriteria	
Discovery – *Can the dataset be found?*	Can the dataset be found. Any data that cannot be found, whether by humans or search engine will have no value
Evaluation – *Can the dataset content be assessed?*	Is there sufficient information (metadata) to determine if the dataset is of value? This determines whether a user will make use of the data. The evaluation metadata should ideally allow all the value criteria to be assessed

Table 2.2: Value Criteria

ValueCriteria	
Contribution - *What impact the data have on solving the problem.*	Fundamentally the data must contain the required parameter or phenomena to be of value. This is clear for single variables, but has more meaning when applied to groups of data such as total suspended matter, hydrodynamic conditions, rainfall etc. For example, total suspended matter alone may have less contribution to solving a problem than a combination of water quality and hydrodynamic parameters.
Location - *Where the measurements have been taken and at what time*.	The spatial and temporal distributions of the data are critical as most data are required for a particular site and/or time frame.
Commercial- *What the data costs.*	Any data will have to be selected within the constraints of what the data costs and the allocated budget. For end-customers data costs need to be set against benefit realised. Previous studies have shown organisations do not object to paying for data, but pricing needs to be clear so they can budget for it. Commercial terms are also a factor as this may dictate what can be done with the data
Attributes - *Fitness for purpose*.	This covers a number of factors about the data such as accuracy, precision and spatial and temporal resolution. In addition, it also embraces quality control parameters such as metadata and the traceability of processing applied to the data.
Delivery - *Can the data be supplied in time.*	Delivery is important in time critical applications. This is particularly the case in emergency operations such as monitoring oil spills, and in areas where the data have a short shelf life e.g. weather forecasts. This may also encompass the continuity issues of data, i.e. can the data be supplied on an on-going basis.
Usability - *How easy is it to use the data*	This covers such factors as the ease of visual presentation or ease of extraction to provide input to a numerical model or software package. Clearly, the demand will be greater for data that can be readily consumed by the customer.

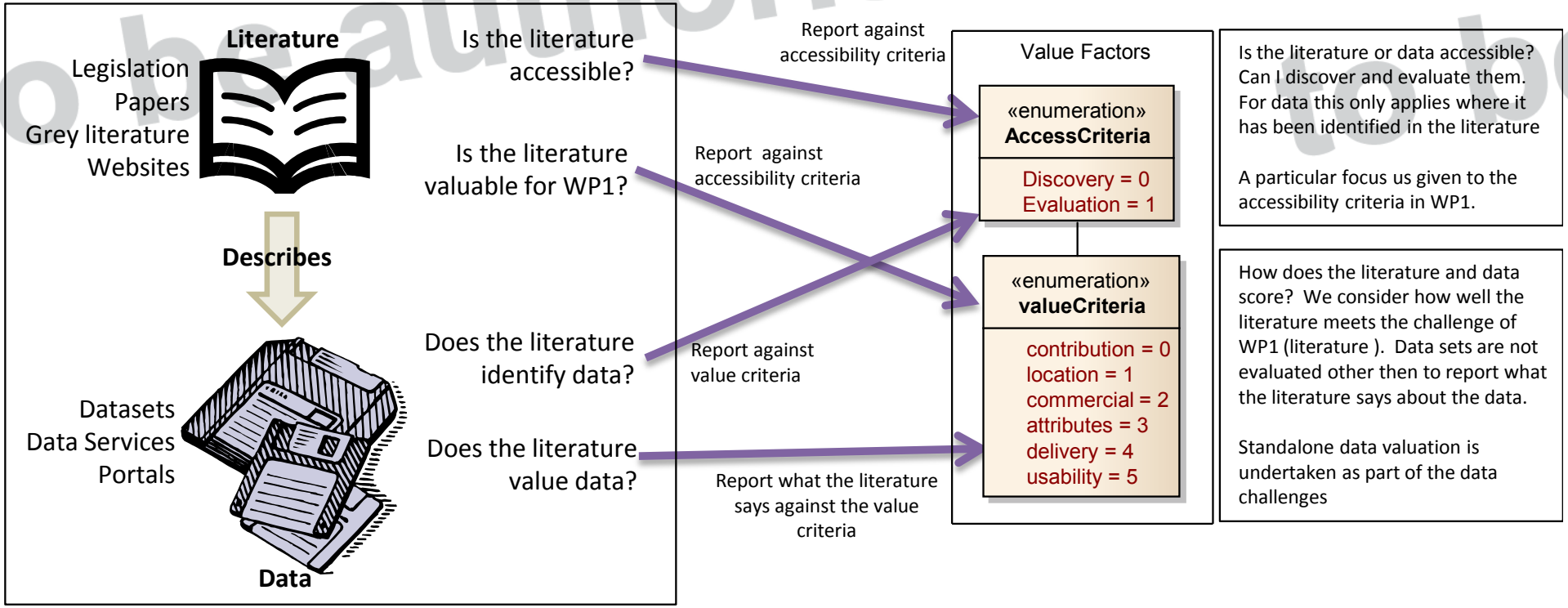

Figure 2.1: Literature Review Approach

3. Results of literature survey

3.1. Introduction

The items identified in the literature search are presented in Appendix B. Each of these items were also compiled into the data register as described in Section 2.2 I, This was partly to inform the approach to the challenges, which will also use this system, but also to document the various attributes of the literature information as it was discovered and its usefulness in informing this survey. The data register model can be found in Appendix C. Appendix B and C contain the 'raw' results of the literature review. subsequent sections in this chapter present the results. Overall, the results from the literature survey are presented as follows:

- Appendix B Literature identified;
- Appendix C Value assessment of literature;
- Section 3.2 Results from literature of policy initiatives for marine data management in the North Sea;
- Section 3.3 Results from literature of marine data management initiatives for the North Sea;
- Section 3.4 Results from literature on discovering data sources for activities in the North Sea;
- Section 3.5 Results from literature on accessing data to support activities in the North Sea;
- Section 3.6 Results from literature on the value of current data to support activities in the North Sea.

3.2. Policy initiatives for the North Sea

Documentation from the policy initiatives was also sought and reviewed as shown in **Error! Reference source not found.**

Table 3.1: Policy initiatives documentation

Project	Summary	Documents
OSPAR Convention	The Convention for the Protection of the Marine Environment of the North-East Atlantic (1992)	-OSPAR Convention Annexes (I-V) - OSPAR Quality Status Report (QSRs)
HELCOM Convention	Convention on the Protection of the Marine Environment of the Baltic Sea Area	HELCOM Convention Amendment Articles 16-18 HELCOM COMBINE manual HELCOM Map and Data Service
Marine Strategy Framework Directive	EU Directive setting out a regional approach to the management of our seas, requiring Member States to cooperate with their neighbours when developing their marine strategies.	Marine Strategy Co-ordination Group reports (particularly WG DIKE – Data, Information and Knowledge Exchange)

Project	Summary	Documents
INSPIRE Directive	EU Directive setting out a general framework for a Spatial Data Infrastructure (SDI) for the purposes of European Community environmental policies and policies or activities which may have an impact on the environment. Its prime objectives are data exchange, data sharing and data re-use, for effective governance and policy making purposes.	INSPIRE Technical guidelines
Aarhaus Convension	The right of everyone to receive environmental information that is held by public authorities ("**access to environmental information**").	

3.2.1. Marine Strategy Framework Directive (MSFD)

The Marine Strategy Framework Directive (MSFD) outlines a transparent, legislative framework for an ecosystem-based approach to the management of human activities which supports the sustainable use of marine goods and services. The overarching goal of the Directive is to achieve 'Good Environmental Status' (GES) by 2020 across Europe's marine environment.

Marine strategies will be implemented through regional sea conventions to protect and conserve the marine environment, prevent its deterioration, and, where practicable, restore marine ecosystems in areas where they have been adversely affected. The Conventions seeks to protect the marine environment by establishing programs of scientific and technical research. The MSFD also stipulates that data should be made available by the competent authorities on the state of the marine area, activities and measures adversely affecting activities introduced by the convention.

3.2.2. UN Conventions

The OSPAR and HELCOM conventions provide an infrastructure for protection of the marine environment for the North Sea (NE Atlantic and Baltic respectively). The convention documents do not specifically identify gaps in marine data, however they do underline the importance of data and support its generation.

3.2.3. Aarhus Convention

The Aarhus Convention (1998) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters enforces The right of everyone to receive environmental information that is held by public authorities ("**access to environmental information**"). This can include information on the state of the environment, but also on policies or measures taken, or on the state of human health and safety where this can be affected by the state of the environment. Applicants are entitled to obtain this information within one month of the request and without having to say why they require it. In addition, public authorities are obliged, under the Convention, to actively disseminate environmental information in their possession" "

One of the national data initiatives to meet the Aarhus Convention aspirations is that of the UK government, which is currently assimilating various previous governmental departmental websites, in order to provide a completely linked website at www.gov.uk. This website also has an area for accessing government data

(data.gov.uk) and each dataset that has been catalogued so far has a star rating on the provision. This follows Tim Berners-Lees' Five Stars of Openness

Table 3.2: Tim Berners-Lees' Five Stars of Openness

Star rating	Description
★	make your stuff available on the Web (whatever format) under an open license
★★	make it available as structured data (e.g., Excel instead of image scan of a table)
★★★	use non-proprietary formats (e.g., CSV instead of Excel)
★★★★	use URIs to denote things, so that people can point at your stuff
★★★★★	link your data to other data to provide context

Source: http://5stardata.info/

This type of grading system allows users to understand how 'open' the data is prior to downloading it and gives value information which is simple to understand, unlike various other types of scientific metadata provided in data portals, although it cannot substitute for that metadata. It is additional user-friendly information and this approach of providing additional user-friendly information has informed the design of our grading spreadsheet system (data register model).

Unfortunately, many of the marine environmental datasets score 0 stars, demonstrating that although the datasets exist, they cannot be accessed directly. Many of these marine environmental datasets also have metadata and exposure through the UK Marine Environmental Data and Information Network (MEDIN), but likewise, the data is not yet directly accessible through this route either.

3.2.4. INSPIRE

Documentation on the INSPIRE Directive was discoverable with a simple Boolean search of "INSPIRE" or 'environmental data directivetive' using an internet search engine. However, several tries were required to find a good search term not including the name, so anyone currently unfamiliar with INSPIRE could encounter difficulties with discovering it. The favoured search engine was Google, although Bing and Yahoo Search were also tested. The INSPIRE website offers a feedback survey to those using it, although it asks visitors to the site to fill in the survey prior to accessing the site, which may lead to a lower response rate than if the survey popped up when visitors attempted to leave the site. The landing page of http://inspire.ec.europa.eu/index.cfm has a clear link to INSPIRE library, which makes the documentation location very obvious and is thus user friendly.

3.3. Data management initiatives for the North Sea

Data management initiatives are often implemented to meet the obligations of policy instruments to improve management of the environment. Documents from the various initiatives were read, and the outcomes recorded below in **Error! Reference source not found.**.

Table 3.3: Portal and data initiative documentation outcomes

Data search	Outcome
EMODnet reports	EMODnet final report proved to contain by far the most useful feedback relating to accessibility, coverage and usability of data compiled for each of the portals for the North Sea. The reports were however often difficult to locate and are not directly available via the current individual portal websites, or links to their location adequately expressed.
SeaDataNet reports	Data Policy document was useful. Further information was available in the project handbook though this wasn't clearly signposted on the website. No reports relating to product development were found.
EurOBIS reports	Good source of papers assessing quality, coverage and fitness for use of marine biogeographic data
BLAST reports	The State of the Art report was particularly useful
EDMERP	Provides metadata on relevant reports which include contact details but no way of directly accessing the reports.
EDMED	Inventory of marine data and Data Holding Centres. Appears to have been integrated into SeaDataNet
EDIOS	Directory of ocean observatory metadata. May be useful for challenges. Appears to have been integrated into SeaDataNet
MESMA	Primarily provides access to policy documents, useful for context
MASPNOSE	May provide useful contextual reports for some of the challenges, no papers found directly relating to data management
GMES	Useful for signposting to other EU projects such as MERSEA and MarCoast
MyOcean	Registration to the website required before any document searches could be undertaken
WINDSPEED	Very good access to project reports which contained information on project methodology
Project Adair	The scope of the project was too localised to benefit the literature survey.
MESH	Much of the documentation is quite dated in the context of this project. It is therefore considered likely that the reports on data gaps would now be out of date
MEDIN	The structure of the portal and report pages were very accessible. Documentation was useful, although some broken links were experienced during the review.
OSPAR Convention	Documents useful for context. No specific gaps identified from review of literature.
HELCOM Convention	Documents useful for context
Marine Strategy Framework Directive	Documentation useful for context. Restricted registration to CIRCA required to access WG DIKE papers and thus these papers were not scrutinised.
ICES	Documents particularly useful regarding user feedback survey, giving an idea of the gaps which exist between provider and user perceptions of data

Data search	Outcome
	requirements.
Google searches	Discoverability was more exposed – various documents were located which did not directly link to initiatives, but assisted in adequacy considerations
Other search engine searches	Discoverability proved to be more awkward, with search results being less focussed. This may reflect the familiarity of the users with particular search engines, or indexing algorithms.

3.3.1. INSPIRE

Data management policy instruments such as the INSPIRE Directive encourage the streamlining of data, for the North Sea and beyond, through the development of data standards encouraging interoperability, guiding quality assurance and enabling the development of harmonised derived datasets.

Inspire data standards are all based on ISO standards for metadata, data product design and data delivery via web services. INSPIRE has become the EU reference for data interoperability, however many of the data services relevant for marine data fall under Inspire Annex III which means Member States have until 2019 to adopt INSPIRE standards. INSPIRE however is only about data frameworks, it does not explicitly consider data content.

3.3.2. EMODnet

The European Marine Observation and Data Network (EMODnet) is a consortium of organisations within Europe that collate marine data, data products and metadata from a broad range of sources with the aim of improving 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. EMODnet complements INSPIRE in that EMODnet works with public authorities in Member States to release their data in accordance with INSPIRE standards.

EMODnet has generated six sub-portals which provide access to marine data from the following themes: bathymetry, geology, physics, chemistry, biology, and seabed habitats (EUSeaMap). All of the EMODnet portals are up and running though some are in earlier stages of their development. These portals provide access to metadata and, where possible, the download of derived data, for a broad range of datasets for the North Sea.

EMODnet is easily discoverable via search engines, using the term ‘European marine data initiative’, where it is returned on the front page of results. However, the documentation associated with each sub portal has become very difficult to discover, partly due to some original sub portals having had their own web address, which have subsequently been rationalised. In some cases both the outdated address and the new address provide a portal and only the outdated address has the documentation associated with it explicitly. This provides possibility for confusion, particularly with respect to which site will be of use and contains the most recent information.

Whilst a web address exists with all of the EMODnet documentation contained in one place, reaching this is more accidental than well-signposted from the portal sites, as the description on the link (“European Marine Observation and Data Network on EU maritime forum” button on the new rationalised portal pages) does not suggest that it is a document repository, especially since frequent internet users associate ‘forum’ usage with

internet forum message board pages. There is opportunity to improve terminology to enhance user-friendliness.

3.3.3. EurOBIS

The use of data standards such as taxonomic classifications facilitate the discoverability of data by the end user. For example, EurOBIS set standards for taxonomic classifications based on WoRMS – the World Register of Marine Species, which was then re-used for the development of the EMODnet Biology web portal. The use of shared standards for classifying data encourages data providers to standardise taxonomic classification during data recording and enables users to find biological data through a broader application of the same standards of classification. EurOBIS put in place quality control procedures to check quality, completeness and identify errors. As part of the procedures, a quality flag system was developed to help users identify fit for purpose data. It is suggested that the quality flag system could be extended, across the various initiatives, to allow users to add their own flags indicating how useful the data was found for their purposes, such that crowd-sourced information makes the quality system more robust. Our assessment from each challenge, the data register model, is one example of how this approach could be applied, although it may need refinement to be more explicit (fields such as attributes are fine when an explicit decision is taken about them between a working team, but are unsuitable for general dissemination at present).

3.3.4. ICES

Notes from the ICES Working Group on Operational Oceanographic Products for Fisheries and Environment (WGOOFE) in ICES Insight 2010 stated “it became clear that the wider ICES community might not be adequately represented by the users around the table. There was an additional danger that producers would drown out the views expressed by the user community”. They sent out a user questionnaire to marine researchers from environmental and fisheries backgrounds and the answers returned illustrated that the producers and users emphasis were not matching. Preferences about formats of data were divergent, but 91% of researchers wanted direct access to numerical data, whilst only 40% were interested in graphical presentations. This shows that the presentation format or data products are not often valued as highly as raw or meaningful numeric data for many users, despite producers expending considerable effort in developing products. The user community questioned was also the group as explicitly defined by ICES, so did not include the widest possible user community, which may alter the results. A more detailed write up of this exercise is available (Berx et al, 2011).This may change with time, but is a useful exercise that many data portal initiatives have not yet engaged in, or have failed to document adequately in an area which is directly accessible or signposted from the portal.

Data Portals and Engagement with the wider Blue Economy

Marine data initiatives either directly or through third parties, should have greater outreach to those who may be considered likely to be Blue Economy or marine community data users to actively elicit their feelings and understanding of likely usage and usability. This will be required to ensure that the data portals are genuinely providing value to this sector of the user community.

When data portals do gather feedback from their users, there can be a focus on gathering statistics about web-site visits, rather than capturing the information on usability such as:

- was the data required held or signposted in the portal?
- was the data successfully accessed?
- was the data useful for the intended purpose?
- was the data adequately described prior to download, so that the user understood what was being provided?
- what sort of time did it take to access the data?
- does the data require specialist or proprietary software to read it?

Publishing this feedback in reports which are directly accessible from the portal site can further the dialogue with users, who are more likely to volunteer their views if they see that those views are actively considered.

3.4. Discovery of data for North Sea challenges

3.4.1. Documentation Review

There are numerous projects and initiatives underway to improve the management of the Blue Economy and data availability for the North Sea. Discovery of the relevant projects is a challenge in itself as many of the projects and data resources are interlinked, with data from one repository feeding into one or more other portals. The “Review of International Data Initiatives” available on the MEDIN website provides a useful summary and diagram showing the relationships between the data initiatives currently underway and is therefore reproduced below in Figure 3.1. In many cases, the task of identifying documents most likely to contain useful feedback on data fitness for purpose and accessibility, such as the methodological reports, was more challenging than sourcing the data itself.

> “In many cases, the task of identifying documents most likely to contain useful feedback on data fitness for purpose and accessibility, such as the methodological reports, was more challenging than sourcing the data itself.”

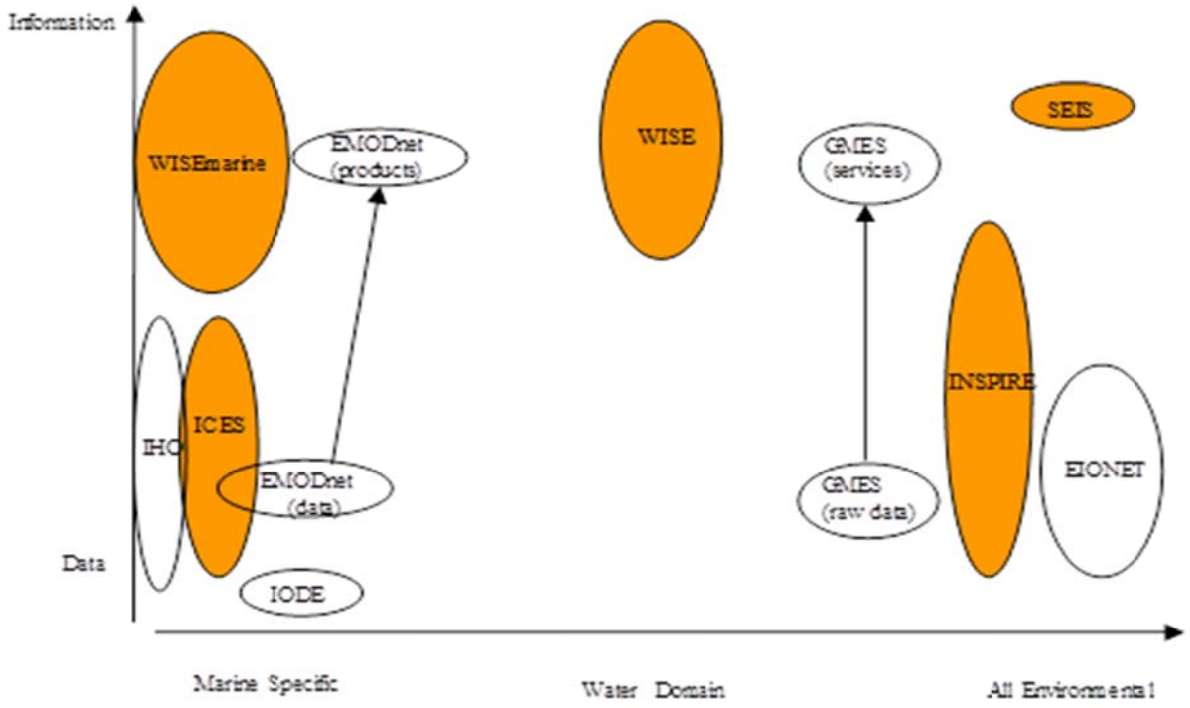

Figure 3.1: MEDIN representation of relationships between EU data initiatives

Source: MEDIN 2012, "International Data Initiatives Summary"

The overlap between the portals does complicate the task of gathering literature relating to the development and content of the portal, the data that they hold and user feedback. The user needs to be able to identify where possible the primary supplier of a dataset, in order to be confident that they are sourcing the most up-to-date definitive version of the dataset. This can be difficult where the pattern of supply of updates between the data provider and other portals is not made clear. Much of the information provided in the EMODnet portal reports on data gaps and quality relates to information drawn from other portals. For example, the Physics portal uses data from both SeaDataNet and MyOcean as key resources.

The broad range of data initiatives currently active are further complicated by the presence of webservices on the internet which are no longer actively being updated and, though still relevant, have been superseded by more recent initiatives and research. For example, any information gained through reviewing reports from the MESH project (last reports published in 2007), though important for documenting the work carried out for the MESH project, are not necessarily useful to the literature review as data issues and gaps identified then may have been resolved.

Similarly, several links to documents identified led to webpages which were no longer active. In some cases, the webpages appeared to have been security compromised according to virus checking or firewall software and as such, were not accessed. Whilst false positives are known to occur with such software, the risks of ignoring organisational security were too high to pursue these websites further.

Databases such as that which the Global Monitoring for Environment and Security – European Earth Observation Programme (GMES) and websites such as the MEDIN portal provide useful signposting to current EU funded projects. However, it was also easy to find signposting information that was outdated or

contained numerous broken links, when attempting to start from search engine enquiries. This 'noise' in information gathering by people unfamiliar with what initiatives might be live carries a significant resource implication for those users who may be restricted by time or money in their efforts to access data. Unfortunately, despite considerable searching, very little proactive published feedback from industrial or commercial users could be located. This was of considerable disappointment and the reasons behind this must be considered.

> Unfortunately, despite considerable searching, very little proactive published feedback from industrial or commercial users could be located. This was of considerable disappointment and the reasons behind this must be considered.

The Blue Economy is not always considered as an important data user – for example, the International Council for the Exploration of the Sea (ICES) Data and Information Group explicitly recognises only two types of user: that of internal to ICES for science and advisory purposes; and the marine and maritime research community. The type of data that ICES holds with respect to fish stocks, eggs and larvae will however be almost essential for anyone required to undertake an environmental impact assessment in the North Sea, even if just as a basis for informing the design of local surveys. Likewise non-governmental organisations, who represent a significant proportion of interested marine stakeholders, may wish to interrogate such data for their members, who have considerable influence in the way that the marine environment is managed.

Thus, there is a need for such users to be considered and for more information about usage of the data to be made available. It was noticeable how difficult it was to find relevant literature describing usage of data portals. Even where such literature exists, it is frequently not directly located with the data portals and poorly described in terms of tagging and exposure such that search engines can recognise and return such in web searches.

There also seems to have been very limited involvement of any data users in the provision of many of the data portal initiatives, with the data producers providing the impetus. Whilst it is laudable that the producers are providing access, the lack of feedback from users has led to a disconnect in what is provided against what is required. Few consultancies that represent potential marine and maritime developments have the resource available to them, or the motivation to engage sufficiently with the data portal working groups and partners, in order to reflect this type of usage.

Limited mention was made of data users from the commercial and non-governmental organisations. This can lead to an amplification of the data producer's views on what and how data should be provided, at the expense of the perspective of potential users outside of governmental policy and decision making. This runs the risk of failing to meet Blue Economy requirements, as representatives of that sector are not part of the brainstorming and direction setting at such meetings.

3.4.2. Data Review

Where documentation has been identified of potential use to challenges for later project work packages, the information found has been summarised and signposted in the data inventory. This meets the requirement of the literature to identify documents while avoiding duplicating effort with later work packages.

The key points identified during the study relating to sourcing data for the North Sea are as follows:

There exists extensive signposting for data where metadata has been generated. However, it remains difficult to identify and source data where metadata has not yet been produced. Extensive feedback has been provided through the EMODnet reports and via projects such as BLAST on the harmonisation of metadata for EU projects. Many instances have been identified where metadata is not available for datasets or the metadata has been compiled to a different standard or in a different language. But standardisation of approach, such as defined vocabularies, URI assignation, code lists and dataset citations, is gradually emerging in the data provider community and is anticipated to lead to improvements in this area.

The EMODnet project reports for each of the portals contained by far the most useful and accessible information relating to data access, coverage and usability for the North Sea Data. Many of the portals have set up a facility for receiving feedback from users which will prove very helpful in identifying data gaps and shortcomings. It however proved difficult to source the project reports relating to each portal. While some project final reports were held on the Europa Webgate resource, others were found on parallel portal sites, such as the Pilot EMODnet – Biology Pilot Portal at http://www.emodnet-biology.eu/ . No link to the same report was available through the central EMODnet portal which led to a different web address for the Biology Portal http://www.emodnet.eu/biology. EurOBIS data feeds into EMODnet, also available via the EurOBIS website and portal.

The data portals provide a valuable resource for signposting users to data providers for access to raw or meaningful numeric data. In many cases, data which can be downloaded from portals has been derived from multiple sources, quality assessed and harmonised to produce derived datasets which can be accessed via the portal. Where users require access to source data, they will in many cases need to revert to primary data providers to gain access. Access from primary data providers is highly variable in terms of response times, which can have an effect on timetabling and forecasting for commercial users.

The reports produced for the BLAST project provided useful insight into issues surrounding the sourcing of data for the North Sea. The project developed a metadata catalogue to gain an overview of existing projects, reports, documents and data. The database was developed to comply with both the INSPIRE directive and ISO19115 metadata standard. the “State of the Art” report assessed the data used for the project for INSPIRE compliance and to ensure the metadata could be useful beyond the lifespan of the project.

The BLAST project - State of the Art and Data audit for North Sea Region WP 3.1 and 3.2 – Final report (2011): Partner countries experienced different challenges in producing INSPIRE compliant discovery metadata:

- For Belgium, Denmark, difficult to access metadata for data not owned by project partners.
- Language differences , much of Norway’s metadata is in Norwegian only.
- Review of parallel projects identified lack of standardised discovery metadata for EU projects.

The multilingual needs for data portals was resolved in the case of the EMODnet Geology portal by delivering data via the multilingual OneGeology – Europe portal.

It is unclear as to whether the BLAST metadata catalogue has fed back to other EU portals to improve discoverability as information on that was not discovered. This was a common occurrence with reports – they

would set out ways forward, but no follow-up reporting was associated with this, so there was a lack of clarity as to whether the ways forward or recommendations were ever pursued. This leads to a lack of confidence that full value is being extracted from every data initiative project.

3.5. Accessing data for North Sea challenges

3.5.1. Information Review

Most of the documentary resources collated for the literature review were freely available online. In many cases, reports could be sourced through policy maker websites or via data and information portals.

In some cases, such as for SeaDataNet and CIRCA[3], registration was required to a website by the user to gain access to reports. Registration can often act as a deterrent to users, with concerns over whether this signifies some type of legal acceptance on behalf of companies, which staff are not authorised to undertake. It is also used to restrict access – for example, CIRCA access is not freely available to everybody.

HR Wallingford also had the benefit of membership to online resources such as the Web of Science, the British Library and Elsevier Science Direct. HR Wallingford has a strong focus on research in addition to consultancy and engineering services, but it should not be assumed that all potential data users on behalf of commercial and non-governmental entities will have invested in such subscription services. Whilst open source peer reviewed scientific papers are becoming more common, with services such as PLoS One or the Open Oceanography Journal increasingly popular, a vast majority of scientific literature is still extremely costly to access, although free services for discovering literature, such as Google Scholar, are now sophisticated and offer good results, with at least abstracts available for reading.

3.5.2. Data Review

Vast quantities of physical, environmental and socio-economic data has been produced for the North Sea, supporting the development of the Blue Economy. Each of the North Sea nations hold government-funded national repositories of data as well as generating extensive research-led and commercially-led marine datasets. Accessing marine data for the North Sea is therefore a complex process where users are required to identify definitive up-to-date and useable data, often at a cost, whether that cost be monetary or temporal.

The key issues affecting access to data include commercial sensitivity, intellectual property and cost. In many cases, data is freely available from data portals unless explicitly specified. This is the case for SeaDataNet. EMODnet portals provide metadata and derived data which are freely available while raw data is accessible via data providers. Commercial data often proved difficult to obtain for many of the portals.

Licensed data is often available from national and international data repositories such as hydrographic offices and government funded research facilities. Raw or meaningful numeric data is however often difficult to gain access to and there may be cost implications or time implications. The latter has often been neglected in the past, but is of importance in understanding data adequacy for commercial projects – response times from organisations holding data are extremely variable, particularly where data provision is not a priority for those organisations or has had insufficient resource allocation. This has particular implications where a strict timetable has been imposed by the commercial pressures and has led to inferior

[3] CIRCA is the document management system utilised by the EU MSFD working groups

or patchy data being used in preference to more complete and extensive sets, which were more difficult to access in a timely manner.

Research funded data are in some cases freely available and raw and meaningful numeric data can be found, but this varies between research bodies.

Commercial data is often sensitive, with restricted access. Even when commercial data sensitivity is lessened, there are rarely drivers to release this to the wider community. Sometimes there are concerns that there may be a decrease in market share if the data is made available to competitors. However, sometimes in newer markets, all or a majority of interested companies are agreeable to data gathering being a co-operative effort, or to regulatory restrictions requiring data dissemination. This has been true for some of the data gathered for the offshore renewables market, where initiatives such as the Collaborative Offshore Wind Research Into the Environment (COWRIE) and the UK Crown Estate Marine Data Exchange have been put in place.

Non-governmental organisations often act as data providers too, with volunteer surveys of considerable use, such as the Wetland Bird Survey (WeBS) carried out by the British Trust for Ornithology and again, efforts should be made to ensure that representatives of this sector have the resources available to them to be included in the data community, with their unique perspectives on user requirements as well as incorporating their data gathering outputs in the data portal dissemination community.

Data and metadata discovery portals such as EMODnet, SeaDataNet and MEDIN (UK) play a crucial role in providing signposts where raw and derived data cannot readily be downloaded. However, it has been found in the case of MEDIN that the service has been underutilised as initial experiences of users with actual data accessing have not lived up to expectations. These users then seek alternatives, rather than persisting. This has been acknowledged as a weakness and the focus has turned from ensuring that the MEDIN Data Archive Centres (DACs) are populated with data, to considering the ease of data access.

The technical workshop held on July 1st and 2nd 2014, titled 'Making Marine Data Make a Difference – Linking Data to enable Societal and Economic Benefits' was convened in the UK to discuss these hurdles, drivers towards better data accessibility and the tools that might be utilised for this aspiration. This has been a response to the UK Open Data White Paper – Unleashing the Potential, which is not focussed on marine data, but provides a great deal of direction to the UK government departments involved in collection and provision of data.

Often the same data is available from multiple sources. This can make it difficult to ensure that the most up to date versions were found. Portals again are key to identifying original data providers and documenting "versioning" metadata.

3.6. Value of data for North Sea challenges

3.6.1. Information Review

The fitness for purpose of the documentation reviewed for the literature survey varied a great deal. The documents which provide the richest source of feedback on data gaps are the methodological reports which accompany the development of data initiatives such as data and metadata portals and data harmonisation projects.

Although some data initiatives provide valuable feedback on data management issues experienced during their set-up, many others do not provide open access to their technical reports. The provision of these

reports and ease of access is something that should be encouraged to ensure that information on data gaps remains discoverable and available.

The identification of specific data gaps via the review of academic papers proved more difficult as papers did not always discuss data issues or failed to provide enough detail to make the feedback useful. Identification of feedback through the review of papers proved time consuming for less return than the review of methodological reports and the review and regular management of user feedback.

Similarly, the review of minutes from working group proceedings provided limited useful feedback for the level of effort required to review the documents.

3.6.2. Data Review

Feedback

The provision of feedback from data end users provides a valuable insight into data shortcomings and gaps, user requirements and information on how data is being used. The facilitation of feedback was the weakest part of most data initiatives. It has been mentioned at apposite points elsewhere in this report that there is a real gap in terms of meaningful feedback to understand in many cases whether the aspiration of data underpinning future stimulation of the Blue Economy is likely to be met. More efforts are required for meaningful discussion with the communities that underpin such things, for example (but not exclusively) commercial consulting companies, port authorities or oil and gas industry, who often carry out data gathering exercises to inform developments, environmental impact assessments or other marine activities.

Each of the EMODnet portals set up an infrastructure for receiving feedback from portal users. The initial feedback comments received from users were reported on in the final reports. In some cases, the timeframe between launch of the portal and delivery of the report may have been too short to gain a fair representation of the challenges faced by users. The long term management strategy for feedback by each portal was not clearly documented in the reports.

Whilst many Blue Economy and non-governmental users were keen to receive raw or meaningful numeric data from providers, such data will require user manipulation. Some data formats could be provided which were not easily manipulated with standard available software, adding an extra time or cost implication in order to procure suitable software.

Metadata

There are more initiatives surrounding metadata than direct access to raw or meaningful numeric data. Controlled vocabularies are increasingly being implemented, along with direction as to what metadata is required for input to data portals, to standardise what users will require when searching for data.

The EurOBIS database employed stringent quality control procedures to improve the usability of data. The use of taxonomic standards, data viewing portals and a quality flagging system enable the user to identify data which is fit for purpose before they have downloaded the data or contacted data providers.

Portals, such as EMODnet and MEDIN which support INSPIRE compliant discovery metadata enable the user to gain an initial view on a dataset's usability by checking metadata relating to data delivery formats, extent and resolution before pursuing a dataset further. However, it is not always possible to assess data without initially viewing it. Some portals do not support a map viewing facility, limiting the user's ability to view the data before downloading it. Equally, where raw or meaningful numeric data needs to be sourced from

suppliers, it may not be possible to assess fitness for use until the data has been plotted and manipulated by the end user.

SeaDataNet identified the speed of upload of data to the portal as being key to its usefulness. Therefore the provision of metadata informing users of the survey and upload timeframes enables the data to be assessed for its fitness for purpose and filtered where necessary.

No information appears to exist about the speed of download of data for users, which is likely due to local conditions of users such as the type of internet connection available and the speed of local firewall and virus checking software. Nonetheless, download speeds do have an influence on whether users find the data useful or not. This was experienced when attempting to get time series data from MyOcean for a different project, where a limit was placed on how much data is accessible in one download.

Quality Management

Homogeneity in data is being encouraged through agreed data standards as promoted by the INSPIRE Directive. Many portal initiatives have actively pursued this with data providers, so whilst this is still currently a constraint, there is evidence that standards are being increasingly specified, utilised and documented as part of the metadata, particularly at the national governmental level.

During the harmonisation of Electronic Navigational Charts (ENCs) for the BLAST project, a new chart datum was developed to enable the co-ordination of land and sea data from countries surrounding the North Sea. This provided a harmonised seamless coverage between territorial waters and between land and sea.

The EMODnet biology report shows how data was reviewed to improve interoperability through quality control measure such as taxonomic standards and identification and removal of geographical errors.

Spatial Coverage

Coverage of data is likely to vary a great deal between datasets and for different areas within the North Sea region, and may be particularly reduced outside of territorial waters and in areas of lesser commercial human activity. The coverage and resolution of data depends on the commercial, national and EU priorities for gathering data and making it available. National and EU priorities have driven the collation of vast amounts of marine data for the North Sea, much of which is now accessible to end users. There are also extensive amounts of marine data that have been gathered for commercial purposes but have not been made publicly available.

In some cases, restrictions in access are due to issues of commercial sensitivity, although this is not always the case. Sometimes no resource is available to curate and provide the data, as lack of engagement from the commercial and non-government sectors with the data initiatives leads to a lack of consideration of the effort required to format, provide metadata and upload the information. It is not always clear to these sectors that any benefit would be derived by engaging.

The use of map browser facilities in data portals enables users to assess the spatial extent of data available via the portal, however, such services need to be quick and responsive for users to rate this facility highly. Specific feedback on data coverage for the North Sea will be best gathered through the collation and use of data for the project challenges.

The provision of feedback facilities for data portals and by data suppliers and the regular review and dissemination where appropriate of that feedback will both further the identification of data gaps and encourage the breaching of those gaps through the amendment of survey priorities where necessary.

A gap analysis was undertaken for EurOBIS data; the results are reflected in the EMODnet biology report which considers data coverage issues such as temporal gaps (lack of recent data and pre-1950 data), lack of commercial data and are reported in further detail in Hydrobiologia (Vandepitte et al 2011).

4. Key points for further discussion

4.1. Increasing the value of data services

It is highly recommended that outreach to those who may be considered likely to be Blue Economy or marine community data users to actively elicit their feelings and understanding of potential usage and usability will be required to ensure that the data portals are genuinely providing value to this sector of the user community. Documenting this outreach and linking to it from the data portal site, is also recommended to demonstrate that such user feedback is valuable and being acted upon.

Consideration needs to be given to whether data are truly accessible – the Tim Berners-Lee five star grading is being usefully applied by the UK government to their data initiatives. This could go further by also considering the time aspects of data accessibility, particularly when data is not directly downloadable but has to be requested from the data producer or archive centre. This project offers a data register model with a built-in method of assigning quality flags which can be further examined and refined to be more user-friendly.

As internet content matures, there may be a lack of curation to remove superseded, obsolete information, incorrect signposting or repair broken links. If resources are moved, then whilst information is removed, it would be useful for a link to the new information to be posted on the old site, rather than completely withdrawing the old site, for a limited time.

Resource requirements for maintenance and curation need to be explicitly stated and costed in any data provision initiative, so that users are aware of:

- whether the portal they are using is kept current;
- how long it will remain active; and
- how much confidence can be placed in the linking to other sources.

4.2. Challenges

Data discoverability depends on the search behaviour of the user seeking such information and constraints on resources, software and internet policies which may not have been considered previously by data providers. Dialogue between providers and users could assist in addressing some of these constraints.

Data accessibility may have some 'hidden' constraints, particularly with respect to time, resources available to the primary data provider or individual organisational information technology policies. These aspects should be identified as part of the challenges, to give a more realistic 'pseudouser' view.

Where user feedback is sought, consideration should be given to whether the feedback is focussed on meaningful questions about data discovery, accessibility, usability and value to that user. In addition, the widest possible range of potential users should be included in the solicitation of feedback.

Data portal sites where registration is required can act as a discouragement to potential users, particularly where it is unclear as to why registration is requested.

4.3. Data Products and Services

The Blue Economy comprises many actors and there is a desire to re-use data beyond its original collection intent, especially where the original collection was publicly funded. The key benefit of public services like EMODnet is in providing data custodianship, version control and flexible download services. Allocating resources to these task should be seen as a priority over creating new data products and services that widen the gap between data 'as collected' and data 'as provided'. They also burden the public sector with the need to maintain these products. Actors in the Blue Economy will take sound data and create innovative products (including web services and apps); unfortunately they would be less likely to undertake data curation tasks.

EMODnet in the Blue Economy

Services like EMODnet cannot expect to address all possible users of the data and should be cautioned against creating data products. There may be more benefit in focussing on creating routes for third parties, focussed on particular user communities, to exploit public data. These targeted data services may come and go with the market, however EMODnet should be a consistent layer, unaffected by such market or technological conditions.

5. Conclusions

This project reviewed literature on the adequacy of data on the North Sea to support the Blue Economy. The data review considered the accessibility of the literature, the value of the content of the literature and what the literature said about the value of particular data.

A general overview of existing information on data for the North Sea has been produced with the aim of providing context for the challenges and signposting to literature which has been evaluated for its usefulness in supporting the challenges.

The documentation collated for the purpose of the literature review was mostly freely available, but in some cases difficult to find. Gaining access to technical reports sometimes required registration to website, while other documents were linked to websites which were no longer active. Fitness for purpose of documentation gathered for the review varied with technical reports providing the richest source of information on data gaps while academic reports required a high level of effort to identify useful information.

The provision of data for the North Sea is supported by a complex network of data initiatives which enable access to data and metadata via online portals. The development of these portal and the associated projects underway to harmonise the data and make it more usable has proved a valuable exercise in identifying the gaps in marine data and challenges to making it accessible to end-users.

The lessons learnt from bringing marine data together via data portals such as EMODnet and SeaDataNet should be considered in conjunction with the needs of end-users to gain a full appreciation of the next stages in making marine data available. The (1) ongoing management of feedback facilities and (2) improving access to technical reports via the portals themselves will be key to improving our understanding of user requirements, facilitate the reporting of information gaps and quality issues and in turn enable them to gain a greater understanding of the data they use.

Data portals play a vital role in the sourcing and accessing of marine data through the provision of data download facilities, the signposting of raw data and provision of standardised discovery level metadata. The overlaps between portal facilities can however be confusing to users, particularly where identical datasets

can be sourced from different repositories. For the user to ensure that data downloaded is the most definitive and up-to-date version can be time consuming.

Some of the issues and constraints affecting user behaviour may have been 'hidden' by lack of documentation as they are not necessarily similar across different sectors. These include the organisational policies on information technology, availability of library services and competence (and confidence) of the users in search behaviours.

Key issues affecting access to data include:

1. commercial considerations , which limit the availability of large amounts of publically funded data through portals;
2. focus on aggregated data without maintaining access to the source data;
3. lack of provision for resource to make data available online or signposted by portals;
4. intellectual property, which often restricts the re-use of data;
5. cost, where users are required to access data under a commercial agreement; and

Commercial Data Supply

Although we recognise that although licencing and payment for data services may be regarded as a barrier to data users, they are a key enabler to value-add organisations building services to satisfy users in particular markets.

Information regarding the fitness for purpose of different datasets in particular contexts can only be gathered through (1) lessons learnt from undertaking the challenges and (2) regular review and acting upon user feedback.

Metadata and systems such as quality flagging play important roles in enabling users to identify data which meets their requirements. Data delivery formats however play an important part in the usability and fitness for purpose of data as, particularly in the case of raw data, can restrict the data's re-use without resourcing to expert support. However both metadata and data flagging are not at a maturity in the Blue Economy that they are systematically relied on when assessing data.

We are still very much at the Wild West stage of the Blue Economy when it comes to data provision across the North Sea. If you know where to look, you could probably find the data you need, but it is not a case of 'Google, click, download'. Services that deliver data are increasing and some are maturing, however the vast majority would not be considered as 'trusted providers' or the 'go to' place for data. Indeed many are not discoverable via web searches either. Furthermore data portals or independent literature do not give widespread information on the value of the data for a particular use. In most cases it is incumbent on the user to download the data and then make assessment as to its value.

Appendices

A. Scope of work of Literature Review

WP1:	Literature Review	
Lead Contractors:	HR WALLINGFORD IMARES	
Start Date : Month 1		
End Date : Month 9		
OBJECTIVE :		Client Ref
• Summarise findings of existing studies relating to the adequacy and data available for the North Sea basin.		Sec 2.1.5
INPUTS:		
• Reports and information drawn from EMODnet and GMES projects, fish stock assessments, OSPAR and Barcelona conventions and the Marine Strategy Framework. • Search web based library portals such as Web of Science, Scirus, Scopus, GreyNet, Google Scholar and Biodiversity Heritage Library,		
• Additional sources proposed: BLAST,		
TASKS :		
	Collation of Documentation	
	Review of Literature	
	The literature review will seek to classify findings as per the following: • Data sourcing and availability • Data coverage • Data resolution and fitness for purpose	
	Reporting	
	Produce a report of results outlining the conclusions of each assessment as well as a consolidated view of each parameter.	
RISKS:		
	• Literature review does not identify all available data sources • Required input data is not obtained within the required timescale • Required input data is protected by the Data Protection Act • Required input data is privately owned data and not publicly available • There are unforeseen or unreasonable costs are associated with acquiring data	
EXPECTED OUTCOMES :		
	Understanding of the adequacy of data available in the North Sea, considering parameters such as: • Presence • Metadata availability • Discoverability • Accessibility (including costs) • Purpose for which dataset was gathered • Other purposes for which dataset might be suited • Spatial coverage and resolution of datasets • Compatibility with other datasets • Quality assurance information	

WP1:	Literature Review
EFFORT AND STAFFING:	
Staff	
	25 days, HR Wallingford 6 days, MEP 23.5 days, IMARES

B. Literature Reviewed

B.1. Data Portals and Initiatives

Table B.1: Data portals and initiatives

Project	Summary	Relevance	Documents
EurOBIS	Database of biogeographic information on marine organisms	Data portal covering North Sea area linking users to marine species occurrence information.	MarBEF Data reports
EMODnet	European Marine Observation and Data Network – Aims at building a European marine data infrastructure	Framework of several data portals linking users to data arising from monitoring and surveillance. Covers North Sea area.	EMODnet workshop reports EMODnet final report
GMES	Global Monitoring for Environment and Security – European Earth Observation Programme. Includes a database of projects funded by the European Commission and the European Space Agency	Framework for various data portals linking users to data arising from remote sensing.	- MyOcean 2 reports - DORIS_Net reports
EDMED – European Directory of Marine Environmental Data	Developed by SEA_SEARCH and SeaDataNet EU initiatives	Data portal that has established itself as a European standard for indexing and searching data sets relating to the marine environment.	Products and tools available on SeaDataNet website (http://www.seadatanet.org/)
EDMERP – European Directory of Marine Environmental Research Projects	Developed by SEA_SEARCH and SeaDataNet EU initiatives	Data portal covering various European research projects	Products and tools available on SeaDataNet website (http://www.seadatanet.org/)
EDIOS – European Directory of Ocean observing Systems	Developed by EuroGOOS initiative	Data portal covering various observing systems operating repeatedly, regularly and routinely in European waters.	Products and tools available on EDIOS website (http://www.edios.org/)

Project	Summary	Relevance	Documents
MEDIN	Marine Environmental Data & Information network is a partnership of public and private UK organisations committed to improving access to marine data. MEDIN report directly to the Marine Science Coordination Committee (MSCC)	Data portal covers data in UK and abroad. Data standards review and quality reviews Data delivery to global databases	Review of EU data initiatives Analysis on reporting of marine data to Europe
BLAST - Bringing Land and Sea Together	Interreg IVB project for the North Sea Region Programme focussing on the harmonisation and integration of land and sea data.	-Data requirements for ICZM - Harmonization of spatial maritime information used for navigation and land-sea modelling	State of the Art and Data Audit for the North Sea Region WP 3.1 and 3.2
Project Adair	Partnership between Historic Scotland and the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) to improve the record and dissemination of the marine historic environment to underpin Scottish Ministers' policies for encouraging sustainable economic growth in the coasts and seas around Scotland	Presents marine heritage information for Scottish waters	Project Adair Report 2011-12
MESH	Establishing standards to produce a framework for quality seabed mapping in the future	Accurate, repeatable and standardised methodologies for data collection and interpretation for seabed mapping.	Products and tools are available through the website (http://www.searchmesh.net/).
WINDSPEED	The overall objective of the project was to develop a 2020-2030 roadmap for the deployment of Offshore Wind Energy (OWE) in this region of the North Sea as bounded by Belgium, Denmark,	Present state (in GIS) and future trends data for major human use functions in Central and Southern North Sea. Overview of policy for development of human use functions	Many reports and a scientific publication available through the website (www.windspeed.eu).

Project	Summary	Relevance	Documents
	Germany, the Netherlands, Norway and the United Kingdom. The potential for OWE and claims of other human use functions were included.	Interactions between human use functions Development of Decision Support Tool for spatial planning. Roadmap for the deployment of offshore wind energy (OWE) in the Central and Southern North Sea.	
MESMA	MESMA will supply innovative methods and integrated strategies for governments, local authorities, stakeholders and other managerial bodies for planning and decision making at different local, national and European scales. The aim is to combine an optimized use with a sustained ecosystem of high quality, taking into account ecological and economic differences.	This data system, containing information on the distribution of marine habitats and species, economic values and benefits and human uses and its effects will also be an interface between science, policy and decision makers. MESMA will supply strategic tools for sustainable development of European seas and coastal areas. An integrated toolbox that can be applied throughout Europe and includes the socio-economic settings and requirements	Products and tools are available through the website (http://www.mesma.org/).
MASPNOSE	Facilitation of concrete, cross-border cooperation among European countries on ecosystem-based maritime spatial planning (MSP).	Building on previous and ongoing initiatives, the project will explore opportunities for collaboration among North Sea countries and envision an international strategy for the Southern North Sea, establishing elements for a common agenda for cooperation of countries in the region	Reports and other project related information is available through the website (https://www.surfgroepen.nl/sites/CMP/maspnose/default.aspx).
Impact Assessment	Analysis of the impacts of many human activities in the Natura 2000 (Habitats Directive and Birds Directive) areas on habitat types, habitat species and bird species	Data about the spatial and temporal distribution of activities, species and habitats as well as the sensitivity of these species and habitats for those activities.	Several reports

Project	Summary	Relevance	Documents
	with conservation objectives. Revelation of the activities that may compromise the Natura 2000 conservation objectives. Proposal of mitigation measures to meet the objectives.	Identification of the habitats and species not meeting the conservation objectives.	
ODEMM	Options for Delivering Ecosystem based Marine Management. The overall aim is to develop a set of fully-costed ecosystem management options that would deliver the objectives of the Marine Strategy Framework Directive, the Habitats Directive, the European Commission Blue Book and the Guidelines for the Integrated Approach to Maritime Policy.	Operational Objectives to achieve the High-Level Policy Objectives set by the MSFD and the HD, and with reference to the proposed Maritime Policy; Management Options to meet the Operational Objectives; A risk assessment framework for the evaluation of Management Options and the risk; A cost-benefit analysis of a range of Management Options using appropriate techniques; Stakeholder opinions on the creation of governance structures directed towards implementation of the ecosystem approach, Communicating and consulting on the outcomes of the project effectively with policy makers and other relevant user groups.	Many reports and some scientific publications. Available through website (http://www.liv.ac.uk/odemm/)
BMDC	The Belgian Marine Data Center (BMDC) provides a web portal for monitoring data mainly from the Belgian Coast. An internal quality check procedure is applied to	The data include a number of bio-chemical and optical parameters as well as remote sensing reflectance data.	Reports associated with the centre not identified

Project	Summary	Relevance	Documents
	any archived data.		
BODC	The British Oceanographic Data Centre (BODC) is a UK national facility, holding a large number of biological, chemical, physical measurement data of the marine environment, for search and data distribution.	Publicly accessible marine data including biological, chemical, physical and geophysical data	Reports associated with the centre not identified
MaNIDA	The Marine Network for Integrated Data Access is a German national facility. It aims to provide a networked approach to access and mining of federated e-infrastructures together with a management strategy targeting its long-term sustainability and create a new paradigm in respect to integration, harmonization and aggregation of various types of quality-controlled data and related data products.	The data portal offers an integrative "one-stop-stop" framework for coherent discovery, visualization, download and dissemination of scientific information originating from nationally operated research platforms and monitoring facilities (vessels, observatories, alert systems). The content offered originates from distinct content providers by German marine research institutions ranging from cruise-related metadata to reports, publications, data (archived and near real time) and data products. The portal is based on open technologies and access is freely available for scientists, funding agencies and the public (no registration is required).	Mission statement and strategy, but no documents discovered about usability.
GeoSeaPortal	BSH is Germany's central provider of maritime services, with a focus on customer service and product quality. Its customers include shipping and other maritime industries and	Private company offering data discovery services.	Reports not identified with respect to the usage of GeoSeaPortal

Project	Summary	Relevance	Documents
	all those who need data and information about the oceans: business and science, federal and state authorities, departments, and political bodies. GeoSeaPortal is the data portal belonging to BSH.		
National Georegister	Geoinformation in the Netherlands	Meteorological and sea level information	Feedback is directed to the data providers, rather than collected at the portal. No reports on usability discovered.
ICES WGOOFE	ICES Working Group on Operational Oceanographic Products for Fisheries and Environment (WGOOFE) provides an interface between the users of operational oceanographic data products and their providers. WGOOFE runs a web based portal and is developing a number of new initiatives to improve the integration of operational oceanography in ICES Science and Advice.	Signposting oceanographic data and providing direct links.	Some grey literature published by members of working group – very useful in terms of user surveys
ICES Data Portals	Datasets are organised around specific thematic data portals, There is a start point at the ICES Data portal	Data portals include Ecosystem Data, Ocean, DATRAS (Fish trawl surveys), DOME (Contaminants and biological effects), Historical plankton, fish stomach data, and fish eggs & larvae.	Clearly signposted and thus easily discovered library of reports, mainly documenting the various data focussed working groups, with varying levels of pertinent information for the project.
iMarine	An open and collaborative initiative that will establish a data infrastructure to	As website wasn't accessed, no judgement was made.	Security warning received from firewall services when access

Project	Summary	Relevance	Documents
	support the Ecosystem Approach to fisheries management and conservation of marine living resources		was attempted.
ODIMS	OSPAR have endorsed a data and information management strategy in order to establish a long term strategic approach to the management of OSPAR data and information, ensuring discoverability, accessibility and usefulness. A key stage of the delivery of this strategy is the development of an online interface to facilitate access to data and information – the OSPAR Data and Information Management System (ODIMS). The initial objectives are to review the existing and anticipated data and information flows from Contracting Parties to OSPAR and the potential contribution of these data to MSFD implementation requirements, and review of the processes and systems for acquiring, managing and making available these data and information and to identify where these could be improved, including streamlining and harmonisation between Contracting Parties,	The two-year project for the development and implementation of ODIMS began in May 2014. The OSPAR Commission endorsed the data and information management strategy which aims to establish a long term strategy for the management of OSPAR data and information to ensure its availability and accessibility.	OSPAR coordinates monitoring in the North-East Atlantic Monitoring and Assessment 2014 No. 622 Available at http://www.ospar.org/documents/dbase/publications/p00622/p00622_ospar_monitoring_coordination_report.pdf However, as project has only just begun, no reports on usability are yet available

Project	Summary	Relevance	Documents
	RSCs and the EU/EEA in the MSFD and other relevant marine policy context		

B.2. Research papers

Berx, B., M. Dickey-Collas, M.D. Skogen, Y.-H. De Roeck, H. Klein, R. Barciela, R.M. Forster, E. Dombrowsky, M. Huret, M. Payne, Y. Sagarminaga, and C. Schrum. 2011. Does operational oceanography address the needs of fisheries and applied environmental scientists? Oceanography **24(1)**:166–171, doi:10.5670/oceanog.2011.14.

Costello, M.J. and Vanden Berghe, E. (2006) Ocean biodiversity informatics': a new era in marine biology research and management. Marine Ecology Progress Series **316**: 203–214.

Huettmann, F. (2005). Research and Management Viewpoint; Databases and Science-based Management in the Context of Wildlife and Habitat: Toward a certified ISO Standard for objective decision-making for the global community by using the Internet. Journal of Wildlife Management, **69(2)**:466-472 DOI: http://dx.doi.org/10.2193/0022-541X(2005)069[0466:DASMIT]2.0.CO;2

Richardson, E.A., Kaiser, M.J., Edwards-Jones, G., and Possingham, H.P. (2006) Sensitivity of marine-reserve design to the spatial resolution of socioeconomic data. Conservation Biology **20(4)**: 1191–1202

Muxika, I., Borja, A. and Bald, J. (2007). Using historical data, expert judgement and multivariate analysis in assessing reference conditions and benthic ecological status, according to the European Water Framework Directive. Marine Pollution Bulletin **55**: 16–29

Narayanaswamy BE, Coll M, Danovaro R, Davidson K, Ojaveer H, et al. (2013) Synthesis of Knowledge on Marine Biodiversity in European Seas: From Census to Sustainable Management. PLoS ONE **8(3)**: e58909. doi:10.1371/journal.pone.0058909

Staneva, J.V. and Stanev, E.V. (1998). Oceanic response to atmospheric forcing derived from different climatic data sets. Intercomparison study for the Black Sea. Oceonologica Acta **21(3)**: 393-417

Woodworth, P.L., Rickards,L.J. and Perez, B. (2009). A survey of European sea level infrastructure. Natural Hazards and Earth System Sciences **9**: 927-934

B.3. Other grey literature

Charlesworth, M. and Grant. C. (2008). Marine Data Accessibility and Use: A Review of Government and Industry Sectors in the UK. Hydro International March 2008, 25-29

Kent, E., Woodruff, S., Rayner, N., Arbetter, T., Folland, C., Koek, F., Parker, D., Reynolds, R., Saunders, R., Smolyanitsky, V., Worley, S. and Yoshida, T. (2005). Advances in the Use of Historical Marine Climate Data, 2nd International Workshop on Advances in the Use of Historical Marine Climate Data 17-20 October 2005 – Met Office, Exeter, United Kingdom.

Nyberg, J., Lindberg, T., Holmberg, J., Zetterlund, S. and Stolen, L. K. (2007) Marine environmental data, availability and harmonisation. BALANCE WP1 report SGU-Report 2007:36.

Rüh, C., Korduan, P. and Bill, R. (2011). Development of the reference model for the marine spatial data infrastructure Germany (MDI-DE). EnviroInfo2011: Innovations in Sharing Environmental Observations and Information.

Rüh, C., Korduan, P. and Bill, R. (2012) A framework for the evaluation of marine spatial data infrastructures to assist the development of the marine spatial data infrastructure in Germany (MDI-DE) – Accompanied by international case-studies. Proceedings of Global Geospatial Conference 2012 Québec City, Canada, 14-17 May 2012

Schäfer, A and Scientific MaNIDA Team (2013). MaNIDA: Insight into the German Marine Network for Integrated Data Access. Geophysical Research Abstracts 15, EGU2013-PREVIEW

Vandepitte. L, Waumans, F., Tyberghein, L, Vanhoorne, B. and Hernandez, F. Marine biogeographic data in EurOBIS: assessing their quality, completeness and fitness for use. International Conference on Marine Data and Information Systems 2013. 23-25 September, 2013 - Lucca (Italy)

C. Data Register

NSC-000-Lite **Datasets Identified by the North Sea Checkpoint**

AutoFilled

Full ID	Project ID	Requirement	URI	Name	Description	Datasets
DT.Lite.LS001-EMODNET Biology Report 2011	LS001		http://www.emodnet-biology.eu/documents/func-startc	EMODNET Biology Report 2011	Report outlining the development of an online marine biological data portal allowing the access and download of marine biological data across Europe.	Species data, microfauna, macrofauna and benthos
DT.Lite.LS002-EMODNET geology Final Report	LS002		https://webgate.ec.europa.eu/maritimeforum/sites/ma	EMODNET geology Final Report	Webpage outlines datasets produced and link to portal. No reports found via portal. Report was found on Europa Webgate by searching "EMODnet Final Report"	seabed sediments, seafloor geology, geological boundaries, rates of erosion and sedimentation, geological events, seismic profiles, minerals
DT.Lite.LS003-OSPAR Quality Status Report 2010	LS003		http://qsr2010.ospar.org/en/downloads.html#	OSPAR Quality Status Report 2010	Website providing full access to the report, chapter by chapter.	No
DT.Lite.LS004-OSPAR Convention 2007	LS004		http://www.ospar.org/html_documents/ospar/html/osp	OSPAR Convention 2007	Link to a pdf file for the OSPAR Convention document , 2007 revision	No
DT.Lite.LS005-MyOcean Quality Information Document for Global Sea Physical Analysis and Forecasting product	LS005		http://www.myocean.eu/automne_modules_files/pme dia/public/r1135_9_myo2-qlo-quid-001-002-v1.2_accepted_rfc-394.pdf	MyOcean Quality Information Document for Global Sea Physical Analysis and Forecasting product	Technical report outlining data accuracy for the Global high-resolution system and calibration results	satellite observations, meteorology, sea colour (chlorophyll), sea level, sea surface temperature, weather forecasting model
DT.Lite.LS006-State of the Art and Data Audit for the North Sea Region WP 3.1 and 3.2	LS006		http://blast-project.eu/media.php?file=470	State of the Art and Data Audit for the North Sea Region WP 3.1 and 3.2	Report providing overview of existing projects. Reports, documents and data relevant to the project and assessing their compliance with INSPIRE	No
DT.Lite.LS007-MEDIN International Data Initiatives Summary	LS007		http://www.oceannet.org/library/key_documents/key_ docs.html	MEDIN International Data Initiatives Summary	Spreadsheet summarising international data management initiatives relevant to the marine environment	No
DT.Lite.LS008-EMODnet - Hydrography Final Report 2011	LS008		https://webgate.ec.europa.eu/maritimeforum/sites/ma ritimeforum/files/Hydrography-Final-Report-v1-total.pdf	EMODnet - Hydrography Final Report 2011	Report was found on Europa Webgate by searching "EMODnet Final Report", not via EMODnet Hydrography Portal	Bathymetry data
DT.Lite.LS009-EMODnet - Chemistry Final Report 2011	LS009		https://webgate.ec.europa.eu/maritimeforum/sites/ma ritimeforum/files/EMODNETChemistry_Final_Report.pdf	EMODnet - Chemistry Final Report 2011	Report was found on Europa Webgate by searching "EMODnet Final Report", not via EMODnet Chemistry Portal	Chemical buffer data
DT.Lite.LS010-EMODnet - Physics Bimonthly reports	LS010		http://151.1.25.219/emodnet2dnn/documents	EMODnet - Physics Bimonthly reports	reports were found via a search for "EMODnet final report physics"	Physical parameters
DT.Lite.LS011-Project Adair Report 2011-12	LS011		http://www.rcahms.gov.uk/rcahms_media/files/public ations/project_adair_report_2011_12.pdf	Project Adair Report 2011-12	Available via online search	Wrecks
DT.Lite.LS012-Project Adair Report 2012-13	LS012		http://www.rcahms.gov.uk/rcahms_media/files/public ations/project_adair_report_2012-13.pdf	Project Adair Report 2012-13	Available via online search	Wrecks
DT.Lite.LS013-WINDSPEED WP4 - Windspeed Methods and Tools Report 2009	LS013		http://www.windspeed.eu/media/publications/D4.2.pd f	WINDSPEED WP4 - Windspeed Methods and Tools Report 2009	Good documents list available on the Windspeed website.	No
DT.Lite.LS014-WINDSPEED WP2 - Inventory of Windspeed potential based on sea depth, wind speed and distance from shore. 2011, (WP 2.1)	LS014		http://www.windspeed.eu/media/publications/WINDS PEED_D2_1_revised_May_2011.pdf	WINDSPEED WP2 - Inventory of Windspeed potential based on sea depth, wind speed and distance from shore. 2011, (WP 2.1)	Good documents list available on the Windspeed website.	wind speed data, bathymetry, seabed geology
DT.Lite.LS015-WINDSPEED WP3 - Current & Future non wind sea use functions	LS015		http://www.windspeed.eu/media/publications/Windsp eed_WP3_D3.1_update_V2_final.pdf	WINDSPEED WP3 - Current & Future non wind sea use functions	Good documents list available on the Windspeed website.	Marine infrastructure and sea-use
DT.Lite.LS016-EMODnet - Human Activities 3rd Bimonthly report, May 2014	LS016		http://www.emodnet-humanactivities.eu/documents/3rd%20progress%20r eport.pdf	EMODnet - Human Activities 3rd Bimonthly report, May 2014	Useful report describing data gathering challenges	Human activities
DT.Lite.LS017-Defra Magic Map	LS017		http://magic.defra.gov.uk/MagicMap.aspx	Defra Magic Map	Can check for all environmental areas or protected areas within a specified region, contains a variety of datasets, some of which are downloadable	Terrestrial, marine conservation zones, bathing water quality, shellfish waters, shellfish harvesting areas, offshore windfarms, subsurface infrastructure, surface infrastructure, oil and gas installations, marine and coastal habitat classifications, important bird areas, seabird nesting areas, seabird vulnerabilities to oil spill, marine mammals, SPA & SAC, marine protection areas, protected wrecks
DT.Lite.LS018-Recommended Protected Zones in the North Sea (MCZs)	LS018		http://www.northseawildlife.org.uk/userfiles/File/YWT%20Protect%20%26%20Connect%208%20FINAL%20KS.pdf	Recommended Protected Zones in the North Sea (MCZs)	Graphical representation of zones on a map	Marine conservation zone proposals
DT.Lite.LS019-Marine Life	LS019		http://www.marine-life.org.uk/about-us	Marine Life	Collecting and collating data on cetacean and seabird research and monitoring projects	Marine mammals, seabirds
DT.Lite.LS020-Marine Life publications	LS020		http://www.marine-life.org.uk/press--publications/publications--reports	Marine Life publications	Collection of their reports and publications	No
DT.Lite.LS021-OSPAR map of protected areas	LS021		http://carto.mpa.ospar.org/1/ospar.map	OSPAR map of protected areas	Convention for the protection of the Marine Environment of the North-Ease Atlantic (OSPAR) have an interactive map system as well	Marine conservation areas
DT.Lite.LS022-UK Marine Science Strategy	LS022		http://archive.defra.gov.uk/environment/marine/documents/science/mscc/mscc-strategy.pdf	UK Marine Science Strategy	see p.33 and 34 about MEDIN who are collating data and making it more available?!	No
DT.Lite.LS023-MMO MDR (MMO Master Data Register)	LS023		http://www.marinemanagement.org.uk/evidence/documents/mdr.pdf	MMO MDR (MMO Master Data Register)	The Marine Management Organisation (MMO) has developed a comprehensive catalogue of spatially referenced environmental data to inform its functions. This catalogue is known as the MMO Master Data Register (MDR) and it currently contains information to support their business and regulatory and decision-making functions. The MDR is a key internal tool for data management.	No
DT.Lite.LS024-MMO Data Management	LS024		http://www.marinemanagement.org.uk/evidence/gathering.htm	MMO Data Management	Policy on how the MMO sort and keep data	No
DT.Lite.LS025-MESH - mapping European Seabed Habitats	LS025		http://www.searchmesh.net/	MESH - mapping European Seabed Habitats	The website is designed to give easy access to the hundreds of project outputs that include an interactive mapping page, a catalogue of mapping studies, practical guides, tool kits, data templates and technical reports.	Marine habitat classifications
DT.Lite.LS026-Belgian Marine Data Centre	LS026		http://www.mumm.ac.be/datacentre/	Belgian Marine Data Centre	Belgian national data portal	Marine water quality, air temperature, winds, atmospheric pressure, air quality, sediment quality, sediment particle size, sediment shear stress, biota contaminant concentrations, species densities and abundances
DT.Lite.LS027-ICES Data Portal	LS027		http://ecosystemdata.ices.dk/	ICES Data Portal	International Council for the Exploration of the Sea collates a variety of information, primarily for fisheries management purposes. There are a collection of data portals from ICES, but these are all signposted from the site given	Biological communities, contaminants and biological effects, fish trawl surveys, fish eggs and larvae, fish stomach contents, oceanographic
DT.Lite.LS028-British Oceanographic Data Centre	LS028		https://www.bodc.ac.uk/data/online_delivery/	British Oceanographic Data Centre	United Kingdom national data portal and data archive centre	Oceanographic, including acoustic, sea colour, currents, meteorological, waves, bathymetry, water quality
DT.Lite.LS029-National Oceanographic Data Centre	LS029		http://www.nodc.nl/	National Oceanographic Data Centre	Netherlands national data portal of oceanographic observations	Not determined
DT.Lite.LS030-NAUTILUS portal French Marine Data Centre	LS030		http://www.ifremer.fr/sismer/index_FR.htm	NAUTILUS portal French Marine Data Centre	SISMER Systèmes d'Infomations Scientifique pour la MER	
DT.Lite.LS031-MaNIDA Marine Network for Integrated Data Access	LS031		http://manida.awi.de/	MaNIDA Marine Network for Integrated Data Access	German national data portal of scientific information arising from national marine research and monitoring	Still under construction
DT.Lite.LS032-GeoSeaPortal	LS032		https://www.geoseaportal.de/gdi-bsh-portal/ui	GeoSeaPortal	Privately owned portal to provide data and information needed by marine and maritime customers	Not determined
DT.Lite.LS033-Nationaal Georegister	LS033		http://www.nationaalgeoregister.nl/geonetwork/srv/du tsearch	Nationaal Georegister	Netherlands national data portal of geoinformation	Meteorological, sea level
DT.Lite.LS034-ICES Working Group on Operational Oceanographic Products for Fisheries and Environment	LS034		http://groupsites.ices.dk/sites/wgoofe/Pages/default.aspx	ICES Working Group on Operational Oceanographic Products for Fisheries and Environment	Signposting various oceanographic hindcast, realtime and forecast data sources.	No, signposting only
DT.Lite.LS035-Vandepitte. L, Waumans, F., Tyberghein, L, Vanhoorne, B. and Hernandez, F. Marine biogeographic data in EurOBIS: assessing their quality, completeness and fitness for use. International Conference on Marine Data and Information Systems 2013. 23-25 September, 2013 - Lucca (Italy)	LS035		http://www.viz.be/imisdocs/publications/251125.pdf	Vandepitte. L, Waumans, F., Tyberghein, L, Vanhoorne, B. and Hernandez, F. Marine biogeographic data in EurOBIS: assessing their quality, completeness and fitness for use. International Conference on Marine Data and Information Systems 2013. 23-25 September, 2013 - Lucca (Italy)	Report outlining the data adequacy of EurOBIS portal	No
DT.Lite.LS036-2nd Interim Report of the Working Group on Operational Oceanographic Products for Fisheries and Environment (WGOOFE)	LS036		http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGSUE/2013/WGOOFE2013.pdf	2nd Interim Report of the Working Group on Operational Oceanographic Products for Fisheries and Environment (WGOOFE)	Working Group Report, containing information on user feedback of the website as well as consideration of data adequacy	No
DT.Lite.LS037-OSPAR coordinates monitoring in the North-East Atlantic Monitoring and Assessment 2014 No. 622	LS037		http://www.ospar.org/documents/dbase/publications/p00622/p00622_ospar_monitoring_coordination_report.pdf	OSPAR coordinates monitoring in the North-East Atlantic Monitoring and Assessment 2014 No. 622	Report setting out the future OSPAR portal, which is currently under development	No
DT.Lite.LS038-Berx, B., M. Dickey-Collas, M.D. Skogen, Y.-H. De Roeck, H. Klein, R. Barciela, R.M. Forster, E. Dombrowsky, M. Huret, M. Payne, Y. Sagarminaga, and C. Schrum. 2011. Does operational oceanography address the needs of fisheries and applied environmental scientists? Oceanography 24(1):166–171	LS038		http://www.tos.org/oceanography/archive/24-1_berx.html	Berx, B., M. Dickey-Collas, M.D. Skogen, Y.-H. De Roeck, H. Klein, R. Barciela, R.M. Forster, E. Dombrowsky, M. Huret, M. Payne, Y. Sagarminaga, and C. Schrum. 2011. Does operational oceanography address the needs of fisheries and applied environmental scientists? Oceanography 24(1):166–171		No
DT.Lite.LS039-Costello, M.J. and Vanden Berghe, E. (2006) Ocean biodiversity informatics': a new era in marine biology research and management. Marine Ecology Progress Series 316: 203–214.	LS039		http://www.int-res.com/articles/meps_oa/m316p203.pdf	Costello, M.J. and Vanden Berghe, E. (2006) Ocean biodiversity informatics': a new era in marine biology research and management. Marine Ecology Progress Series 316: 203–214.		No
DT.Lite.LS040-Huettmann, F. (2005). Research and Management Viewpoint; Databases and Science-based Management in the Context of Wildlife and Habitat: Toward a certified ISO Standard for objective decision-making for the global community by using the Internet. Journal of Wildlife Management, 69(2):466-472	LS040		http://dx.doi.org/10.2193/0022-541X(2005)069[0466:DASMIT]2.0.CO;2	Huettmann, F. (2005). Research and Management Viewpoint; Databases and Science-based Management in the Context of Wildlife and Habitat: Toward a certified ISO Standard for objective decision-making for the global community by using the Internet. Journal of Wildlife Management, 69(2):466-472		No

DT.Lite.LS041-Richardson, E.A., Kaiser, M.J., Edwards-Jones, G., and Possingham, H.P. (2006) Sensitivity of marine-reserve design to the spatial resolution of socioeconomic data. Conservation Biology 20(4): 1191–1202	LS041	http://www.uq.edu.au/spatialecology/docs/Publications/2006_Richardsonetal_Sensitivityofmarine-reserve.pdf	Richardson, E.A., Kaiser, M.J., Edwards-Jones, G., and Possingham, H.P. (2006) Sensitivity of marine-reserve design to the spatial resolution of socioeconomic data. Conservation Biology 20(4): 1191–1202	No
DT.Lite.LS042-Muxika, I., Borja, A. and Bald, J. (2007). Using historical data, expert judgement and multivariate analysis in assessing reference conditions and benthic ecological status, according to the European Water Framework Directive. Marine Pollution Bulletin 55: 16–29	LS042	http://www.sciencedirect.com/science/article/pii/S0025326X06002220	Muxika, I., Borja, A. and Bald, J. (2007). Using historical data, expert judgement and multivariate analysis in assessing reference conditions and benthic ecological status, according to the European Water Framework Directive. Marine Pollution Bulletin 55: 16–29	No
DT.Lite.LS043-Narayanaswamy BE, Coll M, Danovaro R, Davidson K, Ojaveer H, et al. (2013) Synthesis of Knowledge on Marine Biodiversity in European Seas: From Census to Sustainable Management. PLoS ONE 8(3): e58909. doi:10.1371/journal.pone.0058909	LS043	doi:10.1371/journal.pone.0058909	Narayanaswamy BE, Coll M, Danovaro R, Davidson K, Ojaveer H, et al. (2013) Synthesis of Knowledge on Marine Biodiversity in European Seas: From Census to Sustainable Management. PLoS ONE 8(3): e58909. doi:10.1371/journal.pone.0058909	No
DT.Lite.LS044-Staneva, J.V. and Stanev, E.V. (1998). Oceanic response to atmospheric forcing derived from different climatic data sets. Intercomparison study for the Black Sea. Oceonologica Acta 21(3): 393-417	LS044	http://www.sciencedirect.com/science/article/pii/S0399178498800261	Staneva, J.V. and Stanev, E.V. (1998). Oceanic response to atmospheric forcing derived from different climatic data sets. Intercomparison study for the Black Sea. Oceonologica Acta 21(3): 393-417	No
DT.Lite.LS045-Woodworth, P.L., Rickards,L.J. and Perez, B. (2009). A survey of European sea level infrastructure. Natural Hazards and Earth System Sciences 9: 927-934	LS045	doi:10.5194/nhess-9-927-2009	Woodworth, P.L., Rickards,L.J. and Perez, B. (2009). A survey of European sea level infrastructure. Natural Hazards and Earth System Sciences 9: 927-934	No
DT.Lite.LS046-Charlesworth, M. and Grant. C. (2008). Marine Data Accessibility and Use: A Review of Government and Industry Sectors in the UK. Hydro International March 2008, 25-29	LS046	http://www.hydro-international.com/issues/articles/id889-Marine_Data_Accessibility_and_Use.html	Charlesworth, M. and Grant. C. (2008). Marine Data Accessibility and Use: A Review of Government and Industry Sectors in the UK. Hydro International March 2008, 25-29	No
DT.Lite.LS047-Kent, E., Woodruff, S., Rayner, N., Arbetter, T., Folland, C., Koek, F., Parker, D., Reynolds, R., Saunders, R., Smolyanitsky, V., Worley, S. and Yoshida, T. (2005). Advances in the Use of Historical Marine Climate Data, 2nd International Workshop on Advances in the Use of Historical Marine Climate Data 17-20 October 2005 – Met Office, Exeter, United Kingdom.	LS047	http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-88-4-559	Kent, E., Woodruff, S., Rayner, N., Arbetter, T., Folland, C., Koek, F., Parker, D., Reynolds, R., Saunders, R., Smolyanitsky, V., Worley, S. and Yoshida, T. (2005). Advances in the Use of Historical Marine Climate Data, 2nd International Workshop on Advances in the Use of Historical Marine Climate Data 17-20 October 2005 – Met Office, Exeter, United Kingdom.	No
DT.Lite.LS048-Nyberg, J., Lindberg, T., Holmberg, J., Zetterlund, S. and Stolen, L. K. (2007) Marine environmental data, availability and harmonisation. BALANCE WP1 report SGU-Report 2007:36.	LS048	http://balance-eu.org/xpdf/balance-technical-summary-report-no-1-4.pdf	Nyberg, J., Lindberg, T., Holmberg, J., Zetterlund, S. and Stolen, L. K. (2007) Marine environmental data, availability and harmonisation. BALANCE WP1 report SGU-Report 2007:36.	No
DT.Lite.LS049-Rüh, C., Korduan, P. and Bill, R. (2011). Development of the reference model for the marine spatial data infrastructure Germany (MDI-DE). EnviroInfo2011: Innovations in Sharing Environmental Observations and Information.	LS049	http://enviroinfo.eu/sites/default/files/pdfs/vol6919/0419.pdf	Rüh, C., Korduan, P. and Bill, R. (2011). Development of the reference model for the marine spatial data infrastructure Germany (MDI-DE). EnviroInfo2011: Innovations in Sharing Environmental Observations and Information.	No
DT.Lite.LS050-Rüh, C., Korduan, P. and Bill, R. (2012) A framework for the evaluation of marine spatial data infrastructures to assist the development of the marine spatial data infrastructure in Germany (MDI-DE) – Accompanied by international case-studies. Proceedings of Global Geospatial Conference 2012 Québec City, Canada, 14-17 May 2012	LS050	http://www.gsdi.org/gsdiconf/gsdi13/papers/113.pdf	Rüh, C., Korduan, P. and Bill, R. (2012) A framework for the evaluation of marine spatial data infrastructures to assist the development of the marine spatial data infrastructure in Germany (MDI-DE) – Accompanied by international case-studies. Proceedings of Global Geospatial Conference 2012 Québec City, Canada, 14-17 May 2012	No
DT.Lite.LS051-Schäfer, A and Scientific MaNIDA Team (2013). MaNIDA: Insight into the German Marine Network for Integrated Data Access. Geophysical Research Abstracts 15, EGU2013-PREVIEW	LS051		Schäfer, A and Scientific MaNIDA Team (2013). MaNIDA: Insight into the German Marine Network for Integrated Data Access. Geophysical Research Abstracts 15, EGU2013-PREVIEW	No

Valuation of the data for the literature review

NSC-000-Lite

Data Set / Source	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Lite.LS001-EMODNET Biology Report 2011	Used	Contribution	True	Useful report, containing lots of feedback on the management of data
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free and accessible, though the pilot portal was found by chance at http://www.emodnet-biology.eu/, not via the main portal http://emodnet.eu/biology
		Attributes	True	Report was structured in a similar way to the requirements of the project brief. Very useful
		Delivery	True	Available online
		Usability	True	Very helpful document which informed the literature survey
DT.Lite.LS002-EMODNET geology Final Report	Used	Contribution	True	Useful report containing plenty of information on geology data available for North Sea, data gaps and harmonisation work undertaken
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely available
		Attributes	True	Report contains information on how data was compiled and harmonisation, along some information on gap analysis
		Delivery	True	Downloadable, but difficult to find as there is no link on the EMODnet Geology portal pages
		Usability	True	Useful for identifying gaps and user challenges for geological data for the North Sea
DT.Lite.LS003-OSPAR Quality Status Report 2010	Considered	Contribution	True	Provides overview of progress in meeting requirements under the OSPAR Convention
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely accessible
		Attributes	False	Non-specific references to data gaps
		Delivery	True	Available online, easy to find
		Usability	False	Useful for context. Provides overview of progress made. Some general references to data requirements
DT.Lite.LS004-OSPAR Convention 2007	Considered	Contribution	False	Used for context though no specific feedback relating to data
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely accessible
		Attributes	False	legal document which didn't specifically feedback on data gaps
		Delivery	True	Available online
		Usability	False	Useful for context. Highlights need for research, data and quality standards
RQ.Lite.LS005-MyOcean Quality Information Document for Global Sea Physical Analysis and Forecasting product	Considered	Contribution	True	Used for context, lots of information on physical ocean measurements
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely accessible
		Attributes	True	Provides information on quality assessment and validation process for data presented in MyOcean
		Delivery	True	Report available online
		Usability	True	Useful for challenges employing physical marine data
DT.Lite.LS006-State of the Art and Data Audit for the North Sea Region WP 3.1 and 3.2	Used	Contribution	True	Useful report, containing lots of feedback on the management of North Sea data
NSC-000-Lite		Location	True	Covers part of North Sea area
		Commercial	True	Freely available
		Attributes	True	Useful summary of EU projects and assessment of INSPIRE compliance at the end of the report.
		Delivery	True	Available online via BLAST website
		Usability	True	Contained useful information which informed the literature survey
DT.Lite.LS007-MEDIN International Data Initiatives Summary	Used	Contribution	True	Summary of data management strategies relevant to the marine environment
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely available
		Attributes	True	Useful overview
		Delivery	True	Available online via the MEDIN website
		Usability	True	Useful in summarising current data initiatives and the complex relationships between them
DT.Lite.LS008-EMODnet - Hydrography Final Report 2011	Used	Contribution	True	Useful report describing the compilation of data for the EMODnet Hydrography portal and associated data management issues
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely available
		Attributes	True	Describes how data was collated and compiled for the portal, covers issues with coverage, metadata, resolution and data gaps
		Delivery	True	Online, but difficult to find as there is no link on the EMODnet Hydrography portal page. Found via Europa website
		Usability	True	Plenty of useful information to feedback via the literature review
DT.Lite.LS009-EMODnet - Chemistry Final Report 2011	Used	Contribution	True	Useful report which providesvaluable information on data management issues through compilation of chemical data for the portal
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free access to user (you have to log in maybe you have to pay to become a member?)
		Attributes	True	Provides review of spatial and temporal coverage, metadata compilation, quality assurance and feedback from users and user web-statistics
		Delivery	True	Unknown (you have to log in), difficult to find, eventually found through Europa site
		Usability	True	Very useful for reviewing data gaps for chemical data for the North Sea
DT.Wind.LS010-EMODnet - Physics Bimonthly reports	Used	Contribution	True	Latest report (17) provides useful overview of entire project which enables access to marine data from measurement stations and ferryboxes including wave measurements, temperature salinity, horizontal velocity, light atenuation and sea level. Both near real-time and archived data of time series.
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	True	provides review of gap analysis, data and metadata compilation and feedback from users and user web-statistics
		Delivery	True	via EMODnet Physics portal, although there appears to be two running in parallel?? http://151.1.25.219/emodnet2dnn/Home and http://www.emodnet.eu/physics
		Usability	True	Contains useful information for literature survey
DT.Lite.LS011-Project Adair Report 2011-12	NotConsidered	Contribution	True	Project integrating wreck data around Scottish Waters
NSC-000-Lite		Location	True	Covers Scottish territorial waters
		Commercial	True	Freely available
		Attributes	False	Focuses solely on wrecks in Scottish Waters.
		Delivery	True	Report available online via project website
		Usability	False	Too specific for use in the literature survey.
DT.Lite.LS013-WINDSPEED WP4 - Windspeed Methods and Tools Report 2009	Considered	Contribution	True	project modelling technical viability of offshore windfarm sites
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free and acccesable
		Attributes	True	Document refered to other report sections for further information on data
		Delivery	True	Document available via Windspeed website, saved as pdf
		Usability	False	Better information on other report sections
DT.Lite.LS014-WINDSPEED WP2 - Inventory of Windspeed potential based on sea depth, wind speed and distance from shore. 2011, (WP 2.1)	Used	Contribution	True	Useful review of some of the data used in the development of the Windspeed model
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely available
		Attributes	True	Provides some information on quality of data used. Will be reviewed in further detail for the windfarm challenge
		Delivery	True	Document available via Windspeed website
		Usability	True	Useful
DT.Lite.LS015-WINDSPEED WP3 - Current & Future non wind sea use functions	Used	Contribution	True	Useful review of some of the data used in the development of the Windspeed model
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Freely available
		Attributes	True	Provides information on quality of data used, data gaps and harmonization work required to undertake the project. Will be reviewed in further detail for the windfarm challenge
		Delivery	True	Document available via Windspeed website
		Usability	True	Useful
DT.Lite.LS016-EMODnet - Human Activities 3rd Bimonthly report, May 2014	Used	Contribution	True	Report outlining early stages of portal development
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	free
		Attributes	True	Provides useful information on data gaps and harmonisation issues.
		Delivery	True	pdf available online

		Usability	True	Useful
DT.Lite.LS017-Magic Map	Considered	Contribution	True	Information on presence of protected areas or areas of concern etc
NSC-000-Lite		Location	True	UK territorial waters
		Commercial	True	free
		Attributes	False	Original website became moribund, with no resources for curation and thus was badly out of date and some datasets which mapped contained errors. However, it has recently been refreshed and commitment made (with explicit reference to responsibilities) to maintain and curate. However, it does not provide any information on data adequacy.
		Delivery	True	Comes up as a box/table on screen. - can also use the download summary linked below to access some of the raw data. Not all datasets that are mapped are available to download, however. Some are available through other websites, some have to be requested from the data providing organisation
		Usability	True	User Interface - draw area of interest and then it compiles list of designations etc that would affect that area. T&Cs: http://magic.defra.gov.uk/Copyright_Information_Data_Download.htm Raw data download: http://magic.defra.gov.uk/Dataset_Download_Summary.htm
DT.Lite.LS018-Recommended Protected Zones in the North Sea (MCZs)	Considered	Contribution	True	graphical idea of location of MCzs
NSC-000-Lite		Location	True	North Sea
		Commercial	True	Free
		Attributes	False	Information available elsewhere and no provision of information on data adequacy
		Delivery	False	a map image with areas identified
		Usability	False	No metadata
DT.Lite.LS019-Marine Life	Considered	Contribution	True	They are collecting and collating data on cetacean and seabird research and monitoring projects
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	False	Unknown - it is unclear whether the collected data is available for sharing or purchase
		Attributes	True	cetacean and seabird data
		Delivery	False	Unknown
		Usability	False	Unknown
DT.Wind.LS019-Marine Life	Considered	Contribution	True	Collection of publications and reports listed on the website arranged by date
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	False	Marine ecosystems and particular animals focused
		Delivery	True	Downloadable pdfs off the website
		Usability	False	No information on data adequacy
DT.Lite.LS020-Marine Life publications	Considered	Contribution	True	Location of marine protected areas (MPAs) also there is more specific info about the individual areas on the same site at the following address: http://mpa.ospar.org/home_ospar/keyfigures
NSC-000-Lite		Location	True	North East Atlantic
		Commercial	True	Free
		Attributes	True	Various protected site locations
		Delivery	False	A map image with areas identified
		Usability	False	No direct information for literature survey
DT.Lite.LS021-OSPAR map of protected areas	Considered	Contribution	True	Location of marine protected areas (MPAs)
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	True	Directs users to MEDIN who may make the information wanted available
		Delivery	True	Pdf on website
		Usability	False	No direct information for literature survey
DT.Lite.LS022-UK Marine Science Strategy	Considered	Contribution	True	List of organisations/company with data, any MMO data can be asked for here:http://www.marinemanagement.org.uk/a2i/index.htm
NSC-000-Lite		Location	True	UK territorial waters
		Commercial	True	Pdf of contacts is free
		Attributes	True	Information and links for data
		Delivery	True	Downloadable pdf
		Usability	False	No direct information for literature survey
DT.Lite.LS023-MMO MDR (MMO Master Data Register)	Considered	Contribution	False	List of datasets, but doesn't really give any flavour of accessibility, but designed to make the evidence base transparent rather than accessible
NSC-000-Lite		Location	True	UK territorial waters
		Commercial	True	Free
		Attributes	True	Signposts and catalogues MMO data holdings, fully compliant metadata to MEDIN standards.
		Delivery	True	Viewable pdf
		Usability	False	No direct information for literature survey
DT.Lite.LS024-MMO Data Management	Considered	Contribution	False	No consideration of users or data adequacy
NSC-000-Lite		Location	False	No location associated
		Commercial	True	Free
		Attributes	True	Provides useful context on which standards are being applied to the database
		Delivery	True	Available to read on website
		Usability	False	No direct information for literature survey
DT.Lite.LS025-MESH - mapping European Seabed Habitats	Null	Contribution	False	No consideration of users or data adequacy
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	True	Contains extrapolated models to map areas without direct data, so provides a way of removing data gaps. However, this needs careful treatment, but consideration of this approach could be useful for other data sets
		Delivery	True	GIS data layers available for direct download
		Usability	False	Likely to be useful for challenges, but not for assessing general data adequacy
DT.Lite.LS026-Belgian Marine Data Centre	Considered	Contribution	False	No consideration of users or data adequacy
NSC-000-Lite		Location	True	Covers Belgian territorial wates
		Commercial	True	Free, but registration required
		Attributes	True	Many datasets available, but associated literature does not include user feedback or data adequacy considerations
		Delivery	False	Not tested due to registration requirement
		Usability	False	Likely to be useful for challenges, but not for assessing general data adequacy
DT.Lite.LS027-ICES Data Portal	Used	Contribution	True	Good associated library with extensive additional documentation
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free access to datasets
		Attributes	True	Regular working group outputs contain a variety of information
		Delivery	True	Documents all available for download, mostly delivered as pdf
		Usability	True	Likely to be useful for challenges as well
DT.Lite.LS028-British Oceanographic Data Centre	Used	Contribution	True	Good associated library with extensive additional documentation
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free, but registration required
		Attributes	True	Documents contain a variety of information
		Delivery	True	Documents all available for download, mostly delivered as pdf, some information available for reading on website
		Usability	True	Likely to be useful for challenges as well
DT.Lite.LS029-National Oceanographic Data Centre	Considered	Contribution	False	Unable to access data area of website
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	False	Expected to be free although not tested due to accessibility
		Attributes	False	Currently not assessed due to accessibility
		Delivery	False	Unable to access data area of website
		Usability	False	Likely to be useful for challenges if data access is made available, but not for assessing general data adequacy
DT.Lite.LS030-NAUTILUS portal French Marine Data Centre	Considered	Contribution	False	No information on data adequacy
NSC-000-Lite		Location	True	Covers French territorial waters
		Commercial	True	Free
		Attributes	True	Large number of datasets
		Delivery	True	Downloads available, but not tested
		Usability	False	Likely to be useful for challenges, but not for assessing general data adequacy
DT.Lite.LS031-MaNIDA Marine Network for Integrated Data Access	Considered	Contribution	True	Good associated documents with consideration of users
NSC-000-Lite		Location	True	Covers German territorial waters
		Commercial	True	Free
		Attributes	False	Not yet fully populated, although data portal prototype is available. Feedback from users being elicited from prototype
		Delivery	False	Not yet fully populated, although data portal prototype is available
		Usability	True	May be useful for challenges if progressed further before challenges are undertaken
DT.Lite.LS032-GeoSeaPortal	Considered	Contribution	False	No information on data adequacy
NSC-000-Lite		Location	True	Covers German territorial waters
		Commercial	True	Free
		Attributes	True	Some parts of website only in German, although others offer alternative translations
		Delivery	False	Information displayed, rather than downloadable

		Usability	False	Likely to be useful for challenges, but not for assessing general data adequacy
DT.Lite.LS033-Nationaal Georegister	Considered	Contribution	False	No information on data adequacy
NSC-000-Lite		Location	True	Covers Dutch territorial waters
		Commercial	True	Free
		Attributes	True	Large number of datasets
		Delivery	True	Free
		Usability	False	Likely to be useful for challenges, but not for assessing general data adequacy
DT.Lite.LS034-ICES Working Group on Operational Oceanographic Products for Fisheries and Environment	Used	Contribution	True	Directly considers user requirements
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	True	Available as a pdf document
		Delivery	True	Downloadable pdf
		Usability	True	Information quoted in report
DT.Lite.LS035-Vandepitte. L, Waumans, F., Tyberghein, L, Vanhoorne, B. and Hernandez, F. Marine biogeographic data in EurOBIS: assessing their quality, completeness and fitness for use. International Conference on Marine Data and Information Systems 2013. 23-25 September, 2013 - Lucca (Italy)	Used	Contribution	True	Directly considers data adequacy
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	True	Available as a pdf document
		Delivery	True	Downloadable pdf
		Usability	True	Information quoted in report
DT.Lite.LS036-2nd Interim Report of the Working Group on Operational Oceanographic Products for Fisheries and Environment (WGOOFE)	Used	Contribution	True	Directly considers user requirements
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	True	Reports available as pdf documents
		Delivery	True	Downloadable pdf
		Usability	True	Information quoted in report
DT.Lite.LS037-OSPAR coordinates monitoring in the North-East Atlantic Monitoring and Assessment 2014 No. 622	Considered	Contribution	False	Report focussed on provision of new data portal
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Free
		Attributes	False	Wrong focus for the literature survey
		Delivery	True	Downloadable pdf
		Usability	False	Data portal not yet released, although good information on frame of reference
DT.Lite.LS038-Berx, B., M. Dickey-Collas, M.D. Skogen, Y.-H. De Roeck, H. Klein, R. Barciela, R.M. Forster, E. Dombrowsky, M. Huret, M. Payne, Y. Sagarminaga, and C. Schrum. 2011. Does operational oceanography address the needs of fisheries and applied environmental scientists? Oceanography 24(1):166–171	Considered	Contribution	False	Little consideration of data delivery
NSC-000-Lite		Location	True	Non-specific
		Commercial	True	Scientific publication subscription may be required, copyright applies
		Attributes	False	Wrong focus for the literature survey
		Delivery	True	Available through scientific subscription service
		Usability	False	Not as focussed on data delivery as expected
DT.Lite.LS039-Costello, M.J. and Vanden Berghe, E. (2006) Ocean biodiversity informatics': a new era in marine biology research and management. Marine Ecology Progress Series 316: 203–214.	Used	Contribution	True	Consideration of users
NSC-000-Lite		Location	True	Non-specific
		Commercial	True	Scientific publication subscription may be required, copyright applies
		Attributes	True	Focussed on data delivery for real world requirements
		Delivery	True	Available through scientific subscription service
		Usability	True	Good information for this literature survey
DT.Lite.LS040-Huettmann, F. (2005). Research and Management Viewpoint; Databases and Science-based Management in the Context of Wildlife and Habitat: Toward a certified ISO Standard for objective decision-making for the global community by using the Internet. Journal of Wildlife Management, 69(2):466-472 DOI: http://dx.doi.org/10.2193/0022-541X(2005)069[0466:DASMIT]2.0.CO;2	Used	Contribution	True	Consideration of users
NSC-000-Lite		Location	True	Non-specific
		Commercial	True	Scientific publication subscription may be required, copyright applies
		Attributes	True	Focussed on data delivery for real world requirements
		Delivery	True	Available through scientific subscription service
		Usability	True	Good information for this literature survey
DT.Lite.LS041-Richardson, E.A., Kaiser, M.J., Edwards-Jones, G., and Possingham, H.P. (2006) Sensitivity of marine-reserve design to the spatial resolution of socioeconomic data. Conservation Biology 20(4): 1191–1202	Suitable	Contribution	True	Little consideration of data delivery, although highlighted a particular aspect of data coverage
NSC-000-Lite		Location	True	Non-specific
		Commercial	True	Scientific publication subscription may be required, copyright applies
		Attributes	True	Spatial resolution is one of the attributes that may affect challenge outputs
		Delivery	True	Available through scientific subscription service
		Usability	True	Likely to provide more information to individual challenges than to the literature survey
DT.Lite.LS042-Muxika, I., Borja, A. and Bald, J. (2007). Using historical data, expert judgement and multivariate analysis in assessing reference conditions and benthic ecological status, according to the European Water Framework Directive. Marine Pollution Bulletin 55: 16–29	Suitable	Contribution	True	Little consideration of data delivery, although highlighted a particular aspect of data coverage
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Scientific publication subscription may be required, copyright applies
		Attributes	True	Historical data is one of the attributes that may affect challenge outputs
		Delivery	True	Available through scientific subscription service
		Usability	True	Likely to provide more information to individual challenges than to the literature survey
DT.Lite.LS043-Narayanaswamy BE, Coll M, Danovaro R, Davidson K, Ojaveer H, et al. (2013) Synthesis of Knowledge on Marine Biodiversity in European Seas: From Census to Sustainable Management. PLoS ONE 8(3): e58909. doi:10.1371/journal.pone.0058909	Used	Contribution	True	Highlights lack of data interoperability
NSC-000-Lite		Location	True	Non-specific
		Commercial	True	Open source peer-reviewed publication, copyright applies
		Attributes	True	Not directly reviewing data portals, but does point out a problem with historic datasets and amalgamating them
		Delivery	True	Free
		Usability	True	Good information for this literature survey
DT.Lite.LS044-Staneva, J.V. and Stanev, E.V. (1998). Oceanic response to atmospheric forcing derived from different climatic data sets. Intercomparison study for the Black Sea. Oceonologica Acta 21(3): 393-417	Considered	Contribution	True	Compares changes in forecasting and understanding dependent on data set usage
NSC-000-Lite		Location	False	Black Sea
		Commercial	True	Scientific publication subscription may be required, copyright applies
		Attributes	True	Shows that the challenges may be affected by which dataset is chosen for use, so gives a perspective that must be considered hereafter
		Delivery	True	Available through scientific subscription service
		Usability	True	no direct information for literature survey
DT.Lite.LS045-Woodworth, P.L., Rickards,L.J. and Perez, B. (2009). A survey of European sea level infrastructure. Natural Hazards and Earth System Sciences 9: 927-934	Used	Contribution	True	Thoughtful consideration of why gaps exist, showing that engagement with international data portal initiatives is patchy amongst government agencies, that data is useful for more than one purpose and how it can be manipulated for multipurpose usage with some user requirements included. Also noted that multiple delivery sites can confuse users as to where they should most correctly access data.
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Scientific publication, but published with a creative commons licence, allowing frree access
		Attributes	True	Peer-reviewed, so reliable. May not be easily discoverable, as title doesn't really indicate it's usefulness to discussing data delivery

		Delivery	True	Downloadable
		Usability	True	Good information for this literature survey
DT.Lite.LS046-Charlesworth, M. and Grant. C. (2008). Marine Data Accessibility and Use: A Review of Government and Industry Sectors in the UK. Hydro International March 2008, 25-29	Used	Contribution	True	Report of a UK workshop that engaged industry representatives from various sectors. The findings emphasised that industry users felt that most important were clear licence conditions, evaluation metadata, geographic definition and direct access (ie internet downloads) to data.
NSC-000-Lite		Location	True	UK territorial waters
		Commercial	True	Trade publication so possibly originally subscribers only, but available free from internet now
		Attributes	True	Workshop report, in a trade publication, so good coverage to industry, may be less visible to data providers
		Delivery	True	Downloadable
		Usability	True	Good information for this literature survey
DT.Lite.LS047-Kent, E., Woodruff, S., Rayner, N., Arbetter, T., Folland, C., Koek, F., Parker, D., Reynolds, R., Saunders, R., Smolyanitsky, V., Worley, S. and Yoshida, T. (2005). Advances in the Use of Historical Marine Climate Data, 2nd International Workshop on Advances in the Use of Historical Marine Climate Data 17-20 October 2005 – Met Office, Exeter, United Kingdom.	Used	Contribution	True	Concentrated on the usage of data for scientists, with no reference to other potential users. However, the findings suggested that for this sector of users felt that most important were comprehensive metadata, communication between scientists and data providers, well documented gridded datasets, integrated datasets and dataset intercomparison
NSC-000-Lite		Location	True	Covers North Sea area
		Commercial	True	Available from American Meteorological Society journal so possibly originally subscribers only, but available free from internet now
		Attributes	True	Workshop report, in a science sector publication, so good coverage to data providers, may be less visible to Blue Economy
		Delivery	True	Downloadable
		Usability	True	Good information for this literature survey
DT.Lite.LS048-Nyberg, J., Lindberg, T., Holmberg, J., Zetterlund, S. and Stolen, L. K. (2007) Marine environmental data, availability and harmonisation. BALANCE WP1 report SGU-Report 2007:36.	Considered	Contribution	True	Whilst a user survey was undertaken, there was no indication as to what type of users were surveyed and a lack of population of the data portal was evident, so there were more gaps than information
NSC-000-Lite		Location	False	Black Sea
		Commercial	True	Free
		Attributes	False	Workshop report - a little information about users
		Delivery	True	Downloadable
		Usability	False	Not enough about data adequacy for this literature survey
DT.Lite.LS049-Rüh, C., Korduan, P. and Bill, R. (2011). Development of the reference model for the marine spatial data infrastructure Germany (MDI-DE). EnviroInfo2011: Innovations in Sharing Environmental Observations and Information.	Considered	Contribution	False	Article concentrates on technical specifications for future data provision - no information on accessing data or potential gaps.
NSC-000-Lite		Location	True	German territorial waters
		Commercial	True	Free
		Attributes	False	Focus not on data accessibility
		Delivery	True	Conference report, in a science sector publication, so good coverage to data providers, may be less visible to Blue Economy
		Usability	False	Not enough about data adequacy for this literature survey
DT.Lite.LS050-Rüh, C., Korduan, P. and Bill, R. (2012) A framework for the evaluation of marine spatial data infrastructures to assist the development of the marine spatial data infrastructure in Germany (MDI-DE) – Accompanied by international case-studies. Proceedings of Global Geospatial Conference 2012 Québec City, Canada, 14-17 May 2012	Considered	Contribution	False	Article concentrates on technical specifications for future data provision - no information on accessing data or potential gaps.
NSC-000-Lite		Location	True	German territorial waters
		Commercial	True	Free
		Attributes	False	Focus not on data accessibility
		Delivery	True	Conference report, in a science sector publication, so good coverage to data providers, may be less visible to Blue Economy
		Usability	False	Not enough about data adequacy for this literature survey
DT.Lite.LS051-Schäfer, A and Scientific MaNIDA Team (2013). MaNIDA: Insight into the German Marine Network for Integrated Data Access. Geophysical Research Abstracts 15, EGU2013-PREVIEW	Considered	Contribution	False	Article concentrates on technical specifications for future data provision - no information on accessing data or potential gaps.
NSC-000-Lite		Location	True	German territorial waters
		Commercial	True	Free
		Attributes	False	Focus not on data accessibility
		Delivery	True	Workshop report, in a science sector publication, so good coverage to data providers, may be less visible to Blue Economy
		Usability	False	Not enough about data adequacy for this literature survey

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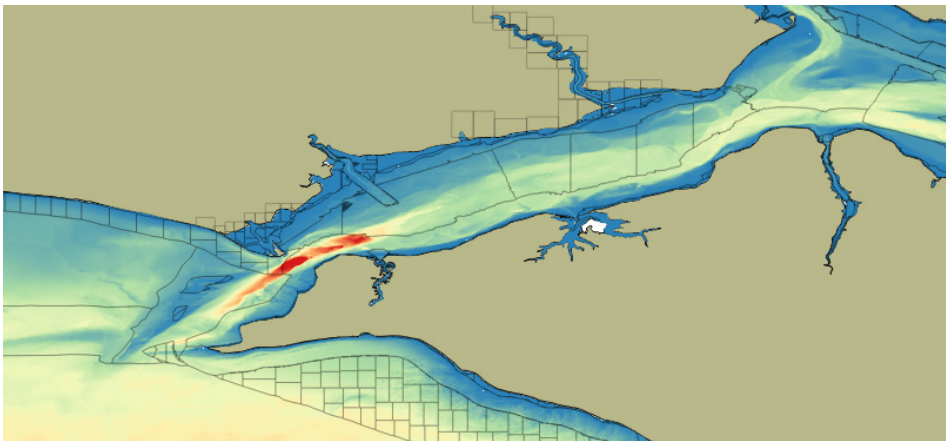
Working with water



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A.2. Windfarm Siting

HR Wallingford
Working with water

Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report - Wind Farm Challenge

DLS0342-RT005-R02-00 August 2015

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Executive Summary

This document summarises the findings of the Wind Farm challenge, conducted as part of the North Sea Checkpoint project (NSCP). This is the first of the project challenges to be completed; therefore the report will seek to provide a template for reporting the results of successive challenges.

This report is deliverable 05 to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in Sea Basin and Observation Data MARE/2012/11: North Sea) contract reference [SI2.658142]. The work was undertaken by HR Wallingford Ltd with input from the project members IMARES and McAllister-Elliot & Partners (MEP).

Although this document reports on the data challenge for possible wind farm sites, it should be stressed that this does not endorse or warrant the sites identified as suitable for development.

Points for EMODnet

Human activities portal – ICES statistical areas and FAO fishery purposes could not be downloaded for this challenge. When accessed, the offshore windfarm dataset displayed as points where boundaries are known to exist and would be more useful (European Atlas of the Sea, so portal not directly responsible). We acknowledge that this portal is still at an early state and has not yet fully populated its data catalogue.

Bathymetry portal – Resolution of bathymetry varies with territorial waters, so comparison of boundary areas ended up with variable resolution. Whilst the dataset was considered for use, less processing of data was required by using the SeaZone product which was preferred for this challenge.

Biology portal - Sites were investigated but not considered as the data was found to be too detailed and a broader interpretation of ecology was required. Most data is point occurrence, without consideration of species movements, even when seasonal distributions are known to alter. Geographic migration routes for birds and cetaceans is a current gap.

General – Some source paths to data were broken. Data available from EMODnet was often available from multiple sources, which took time to appraise in terms of being definitive and most up-to-date. Fishing data was difficult to source and not found for this challenge. In some cases EMODnet portals had not received data from all National data providers, so information was only available in limited territorial waters. Portals containing links to the download of zip files such as the seabed habitat portal and the human activities portal were easy to use and enabled fast access to the data. There are currently limited means for searching the metadata from the contents of the portals for EU funded resources before the data is downloaded. The EMODnet query tool would be a suitable platform for developing capability for users to search through discovery metadata for all EMODnet data products and potentially data from other EU portals.

Contents

1. Introduction

This report is the fifth deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work was undertaken by HR Wallingford Ltd with input from the project members IMARES and McAllister-Elliot & Partners (MEP). This document is the first Data Adequacy Report (DAR) presenting the findings for a completed challenge.

The Wind Farm Challenge has addressed the stages of work required for a desk-based assessment to identify potential wind farm development sites along National Territorial Water boundaries in the North Sea Basin. The assessment was made using available data.

All data gathered has been recorded in the data adequacy assessment database, providing a searchable record of each of the datasets reviewed and the results of its evaluation where considered for one or more challenges. The database is in the process of being made available via the project website.

Although each of the challenges requires a result to be produced from the exercise being undertaken, it is the process of gathering, appraising and using the data to meet that outcome which is most important in informing the overall objectives of the North Sea Checkpoint project.

In this context it should be noted that assessing data quality within a challenge is a continuous process through each stage of a challenge: data gathering, initial appraisal of the data, analysis and quality assurance of results, providing different insights into the accessibility and usefulness of a datasets at each stage.

2. Aim

The primary aim of the wind farm siting challenge is to assess whether the data currently available across and near territorial boundaries in the North Sea is appropriate in undertaking the preliminary assessment required to identify potential new wind farm sites.

The main aim of the challenge as specified in the project brief was to:

- Determine the suitability of sites for wind farm development along national marine boundaries in the North Sea Basin, where:
  - Norwegian, UK, Danish, German and Dutch waters meet;
  - UK, Dutch and Belgian waters meet;
  - UK, Belgian and French waters meet.
- Consider all factors used for wind farm siting, even if one of those factors makes the site unsuitable for development.

The challenge is being undertaken from the perspective of a wind farm operator assessing suitable locations for offshore wind sites. As such it takes into consideration factors that affect generating capacity, construction and maintenance, potential environment impacts, and current sea-use.

3. Context

EU "2030 framework for climate and energy policies" has a target to reduce EU domestic greenhouse gas emissions by at least 40% below the 1990 level by 2030 along with an objective of increasing the share of renewable energy to at least 27% of the EU's energy consumption by 2030. The latter objective is addressed by the EU Renewable Energy Directive (2009/28/EC). Offshore wind farms are expected to provide a significant contribution toward both of these aims. Investment decisions by renewable energy developers require a minimisation of risks that can be achieved if adequate data is available to inform any such risk assessment.

The study areas specified for the challenge were designed to consider data adequacy when dealing with:

- Differing requirements for Marine Spatial Planning for offshore development between EU nations; and
- The potential challenges of using data for site selection across national boundaries.

There is no internationally accepted definition of Marine Spatial Planning or currently any EU legislation on Marine Spatial Planning. Accordingly, the policies outlining the processes required for license area site selection and the data to be considered differ between the EU member states. In this context, the SeaEnergy 2020 project was initiated to consider how to best address and remove obstacles, whilst promoting an integrated and coordinated approach to Marine Spatial Planning. A report "Delivering offshore electricity to the EU: Spatial planning of offshore renewable energies and electricity grid infrastructures in an integrated EU maritime policy" was published in May 2012. This recognises that longer term planning frameworks are needed to deal with the significant increase in demand for space that is anticipated, as offshore renewables will be competing with other uses of sea areas.

The drivers for the gathering and archiving of marine data, the data gathering methods and standards employed and delivery formats also differ between EU countries. The process of identifying potential marine development licence sites requires the consideration of a broad range of marine data. EU programmes to make data more accessible such as EMODnet and Copernicus have improved the discoverability of marine data for users, while highlighting the difficulties in compiling definitive comprehensive data from nation states into a usable format.

4. Method

The method used for this challenge is based on the approach used by HR Wallingford on commercial projects for the offshore wind industry to aid companies in selecting potential wind farm sites. The method is well-established and has been successfully used in identifying licence areas for other sea uses[1].

The approach classifies data by their level of suitability, ranging from a grade 5 for exclusion zones, to a grade 1 for areas deemed appropriate for wind farm development. Buffers zones are used to limit site proximity to sensitive areas, allowing an efficient analysis of the interaction of the constraints and opportunities to produce an overall picture of the suitability of different parts of the area of interest for a wind farm. For each of the environmental features and marine activities mapped, a high level assessment is applied to determine the suitability (ranging from Very High to Very Low) within the two study areas (Table 4.1).

[1] The HR Wallingford approach can be regarded as a 'best practice' as we are unaware of any published guidelines for offshore renewable site selection.

Table 4.1: Site suitability scoring index

Grade	Level	Symbol	Description
5	Very High		The presence of a variable makes the area unsuitable for wind farm development
4	High		The proximity to a suitability receptor or marine activity is adversely affected by the new wind farm or may put the wind farm at risk
3	Medium		The marine activity or sensitive receptor may be adversely affected by the installation and presence of a wind farm although the site may be suitable for development
2	Low		The site is suitable for development and there are only minor adverse impacts anticipated on the sensitive receptor or marine activity
1	Very Low		The site is suitable for development and there are no adverse impacts anticipated on the sensitive receptor or marine activity

A list of data groups required for the site selection process was provided by DG Mare in the project outline. The data analysis has been undertaken in two stages:

1. Mapping of current sea-use

   In the first instance, to avoid siting a wind farm in an area of seabed already in use through existing license areas, seabed obstructions, infrastructure or human activities, the following datasets were mapped and defined as exclusion areas:

   - Existing sea-use, including:
     - Administrative/legislative boundaries
     - Cables and pipelines
     - Other wind farms and renewable energy devices
     - Oil and gas installations
     - Marine aggregate dredging grounds
     - Offshore disposal sites
     - Military training and disposal grounds.
   - Seabed obstructions, e.g. wrecks
   - Shipping lanes
   - Environmental sensitivities:
     - Marine Protected Areas.

   Where necessary, buffers were used to grade distance from some marine features.

2. Mapping of Environmental parameters

   The resulting layers were overlaid with data, to which a grading was applied where appropriate, to make an assessment, based on available data, of the suitability of an area of seabed for the construction and running of a wind farm and its likely energy. These datasets included:

   - Bathymetry
   - Seafloor geology
   - Distance from grid/supply chain

- Wind strength, including:
  - Maxima
  - Averages
  - Gusting
  - Long-term data
  - Direction where available
- Tidal data
- Topography.

The following data was also gathered and reviewed to consider potential environmental impacts of a wind farm:

- Environmental sensitivities:
  - Bird migration routes
- Commercial fishing grounds
- Distance from shore (visibility).

To define study areas for the work, the intersection points between national marine boundaries were given a 100km buffer (Figure 1). This was considered to be large enough to provide a suitable search area for identifying new wind farm licence areas of commercially viable size, while being small enough to meet the brief by remaining in proximity of the boundaries between National waters.

The output of the wind farm siting assessment is a series of individual GIS layers which considered existing sea use and the suitability of a site for development, each one graded using the suitability index displayed in Table 4.1. The classifications applied to data and suitability grades applied to them are presented in Table 4.2 and shown in Figures 2a and 2b. These were determined based on prior knowledge, documentary research and the default parameters used on the Windspeed project.

The classification of data and discussion of results take account of the potential for co-existence/ shared use with other sea-uses such as fishing and shipping, or the possible of relocation of other sea uses such as military practice areas. The areas selected are not dismissed on the basis of overlaps with shipping routes unless they are traffic management areas. It is also assumed that the presence of wrecks within an area does not preclude it as a potential wind farm license area. The potential development areas identified are not crossed by cables or pipelines although it is recognised that pipeline and cables can run through licence areas as long as a safe distance is agreed between them. The industry standard for the separation distance between a National Grid High Pressure gas pipeline and a wind farm turbine is 1.5 times the mast hub height. The safety advice can be found on the UK Onshore Pipeline Operators Associations website (www.ukopa.co.uk). There would therefore be could be scope for seabed co-use with the possibility of combining several of these smaller areas into a single larger licence area.

It is assumed that some data would only be expected to provide an initial impression of a site's suitability and that more accurate data would be gathered from potential sites following the initial site selection process. These datasets include seabed geology, wind and wave data, tidal data, ecological data and fishing activities.

The classification of existing sea use data enabled the identification of a series of potential licence areas, (Figures 3a & 3b).

Table 4.2: Data Requirements and Site Suitability classifications

• Existing Infrastructure: – Pipelines, submarine cables – Anchorage Areas – Disposal sites – Marine Aquaculture sites – Wind farm sites – Aggregate extraction areas – Military firing areas • Ordnance Disposal sites 0.5km buffer • Distance to Grid Over 371 km	• Commercial Navigation – Shipping traffic regulation areas – Ferry routes – Motorways of the sea • Wrecks 0.5 km buffer
• Designated Conservation Areas – Natura 2000 – MPAs • Commercial Navigation 1km buffer • Distance from shore 0-16km	• Distance to Grid 100 - 371 km • Bathymetry Depth over 60m
• Commercial Navigation 3km buffer • Bathymetry Depth between 50-60m • Existing infrastructure Cables and pipelines – 1 km buffer	• Distance to Grid 50 - 100 km buffer • Distance from shore 16 - 29km buffer
• Bathymetry Depth between 30-50m • Distance from shore 29 - 40km buffer	• Distance to Grid 20 - 50km buffer
• Bathymetry Depth between 0-30m • Distance from shore over 40km	• Distance to Grid 0 - 20km buffer

Source: HR Wallingford

The assessments of each dataset recorded in the data register for the wind farm siting challenge are provided in Appendix B.

5. Data

A broad range of data has been identified, downloaded where possible and reviewed for the challenge. The data was sourced primarily through online resources including:

- EU funded websites (EMODnet portals, Atlas of the sea, EEA);
- Government funded resources (BODC, NOC resources);
- Commercial spatial data products (SeaZone Hydrospatial products);
- Industrial websites (4COffshore, FINO).

As the wind farm site selection process is primarily based on spatial analysis, the challenge required data to be made available in formats which could easily be used in a Geographic Information System (GIS). This was the case for most data identified and reviewed for the challenge, although the discoverability and accessibility of the data, format and usability of data varied a great deal.

As the study areas for the wind farm siting covered the boundaries between national waters, the data used needed either to be sourced from each country or sourced from a location where the data had already been compiled into one or more datasets covering the North Sea. All data identified has been recorded in the data register (Appendix B). Following an initial assessment of data accessibility and fitness for purpose, a small number of datasets have been used in the analysis for the wind farm siting exercise. The data considered suitable for use in the challenge is listed in Table 5.1. Details of the datasets reviewed and either excluded or considered but not-used are provided in Appendix B.

Table 5.1: Data suitable in meeting the wind farm siting challenge

Data	Inspire theme	Sources Suitable
Wind strength	3.13 Atmospheric conditions	DT.Wind.NS103-CCMP wind data DT.Wind.NS101-Met Office
Wave data	3.13 Atmospheric conditions	DT.Wind.NS083-European Atlas of the Seas - Average coastal wave height and direction DT.Wind.NS098-NOAA Climate Forecast System
Seafloor geology	2.4 Geology	DT.Wind.NS027-One Geology - geology for European seabeds DT.Wind.NS026-EUSeaMap - predicted seabed habitat for Celtic, North, Baltic and western Med
Designated sites	1.9 Protected sites	DT.Wind.NS090-European Environment Agency - Natura 2000 - spatial data DT.Wind.NS076-European Atlas of the Seas - Natura 2000 sites DT.Wind.NS021-OSPAR map of protected areas
Fisheries and mariculture	3.19 Species distribution 3.9 Agricultural and aquaculture facilities	DT.Wind.NS015-CEFAS spawning and nursery grounds DT.Wind.NS107-SeaZone Hydrospatial One - Aquaculture and Fisheries DT.Wind.NS013-MMO fishing density grids

Data	Inspire theme	Sources Suitable
Bird and Cetacean migration	3.19 Species distribution	DT.Wind.NS116-JNCC Cetacean database 2013
Distance from grid/supply chain	3.20 Energy resources	DT.Wind.NS001-ENTSO-E electronic grid map DT.Wind.NS004-National Grid Sub-station sites
Distance from shore	3.11 Area management / restriction / regulation zones & reporting units	DT.Wind.NS119-ESRI land areas
Topography	2.1 Elevation	DT.Wind.NS029-EEA elevation map 1000m cell size
Bathymetry	1.8 Hydrography	DT.Wind.NS003-EMODNET Bathymetry Gridded Bathymetry. 1 arc second resolution DT.Wind.NS104-SeaZone Hydrospatial One - Bathymetry
Seabed infrastructure (Cables and pipelines)	3.20 Energy resources	DT.Wind.NS109-SeaZone Hydrospatial One - Cable and Pipeline installations
Commercial license areas (wind farms, dredging, oil & gas)	3.20 Energy resources 3.21 Mineral resources	DT.Wind.NS112-SeaZone Hydrospatial One - Licenced Areas DT.Wind.NS114-SeaZone Hydrospatial One - Renewable energy activity DT.Wind.NS118-The Crown Estate Wind farm Licence Areas
Military training and disposal grounds	3.11 Area management / restriction / regulation zones & reporting units	DT.Wind.NS115-SeaZone Hydrospatial One - Military activity
Seabed obstructions, e.g. wrecks	1.8 Hydrography	DT.Wind.NS105-SeaZone Hydrospatial One - Wrecks
Administrative boundaries	3.11 Area management / restriction / regulation zones & reporting units	DT.Wind.NS089-European Environment Agency - Maritime boundaries
Shipping	1.7 Transport networks	DT.Wind.NS084-European Atlas of the Seas - Ferry routes DT.Wind.NS085-European Atlas of the Seas - Motorways of the sea DT.Wind.NS110-SeaZone Hydrospatial One - Traffic Regulation
Tidal data	3.13 Atmospheric conditions	DT.Wind.NS080-European Atlas of the Seas -tidal amplitude DT.Wind.NS120-BODC tidal range data

Reasonably long term numerical model datasets for wind and waves are available for the North Sea either at a cost per point (e.g. Met Office ReMAP, NORA10, OceanWeather products), making them expensive for a site selection survey, or have a coarse resolution making their usefulness debatable for wind farm siting (e.g. ERA-Interim). Wind fields have been analysed from the Cross-Calibrated Multi-Platform (CCMP) wind dataset derived and distributed by NOAA/NASA. This dataset is readily available, with documentation and related scientific articles available only and data hosted on a well maintained data server (at PODAAC) with a variety of access methods available including OpenDAP – which was used here. The dataset is global, with a 25km spatial resolution, and 6 hour temporal resolution covering 1987 to 2011. It is distributed free of charge.

The regional wave models of the Climate System Forecast Reanalysis (CFSR) project have been used to estimate wave climate at the sites. These are thought to provide good estimates of wave climate in general, and sufficient accuracy for site selection studies, while needing additional detailed validation and calibration of extremes before use in design. Spatial resolution varies between 4 and 18km in the wave model (forced by a 50km resolution atmosphere model). Temporal resolution is 3 hours, with coverage from 1979 to 2009.

The dataset is distributed free of charge, and is hosted on a data server at NOAA. Metadata, in terms of study reports, is readily available. The dataset is available to download in full, and takes considerable effort to download and decode, with some clarification on coordinates needed through communication with the dataset owners. Tidal range data was downloaded from the BODC website and from the Europa.eu website via the European Atlas of the Sea. Tidal data provided through the Europa.eu website was based on tidal range at the 237 locations extrapolated from the database distributed by ARGOSS. This database combines tidal harmonics assimilated from approximately 7300 coastal stations into a shallow-water tidal model with satellite measurements used to give a good overview of the tidal patterns in deep water, to provide a tidal model in shallow coastal seas where tidal effects are most prominent. Measures of maxim7um and minimum mean spring and neap tides were also reviewed from the NERC website (http://www.ntslf.org/tides).

6. Results

6.1. Challenge output

6.1.1. Introduction

The wind farm site selection exercise was successful in identifying potential sites across the two study areas specified in the project brief. Limitations were expected for both of the study areas as the territorial boundaries between Norwegian, UK, Danish, German and Dutch waters (Area A) lies in the middle of the North Sea to the east of Dogger bank, a long way offshore in relatively deep water, while the boundaries where UK, Dutch and Belgian waters meet and UK, Belgian and French waters meet lie close together towards the eastern extent of The Channel (Area B) in an area of heavy sea-use.

6.1.2. Area A

Area A lying to the East of the Dogger Bank (Figure 1) is already home to a large offshore license area, designated by the UK for development. The Dogger Bank is listed as an MPA and under Natura 2000 in UK waters, designated for the EU Habitats Directive interest feature ‘Sandbanks which are slightly covered by sea water all the time’.

An initial mapping of existing sea-use within the area (Figure 2a) showed some existing licence areas including the expansive Dogger Bank wind farm licence area. There area is expected to see considerable shipping traffic running from the Channel and southern North Sea ports, up towards the Baltic and is known to be popular with the fishing industry.

The assessment of existing sea-use identified approx. 5,637.84 km² of seabed currently unutilised for which further assessment of potential for wind farm licencing could be undertaken (Figure 3a). Much of the study area is characterised by moderate to deep water and is of considerable distance from the existing grid. Water depth and distance to shore are two of the most important cost drivers for offshore wind farm development.

An assessment of the bathymetry data showed that the areas identified for potential development lie at a depth of between -20 and -120m. In areas with a depth of less than 45m, there could be scope for installation of jacket foundation turbines. For areas with depths over 45m, the use of floating turbines would need to be considered. Technology for floating turbines is currently being trialled in several areas although still remains in its infancy.

The distance to the existing grid of any of potential wind farms in Area A would be considerable, with distances expected over 250 km. To put this in perspective, the average water depth of wind farms completed, or partially completed, in 2013 was 20 metres (m) and the average distance to shore was 30 km (EWEA, 2014). A plot produced by EWEA of planned, licensed and built wind farms showing average distance from shore against water depth showed that online, under construction and consented wind farms focus on water depths of less than 60m and consider a maximum distance from shore of 120km. Although these maxima are expected to increase with developments in technology, the cost of construction and maintenance also increase with depth and distance from shore.

Offshore wind farms located near the coast, to date, tend to be connected to the grid using conventional alternating current transmission systems. This approach is most economical for distances under 80 kilometres from the grid. Over longer distances, however, energy is lost due to reactive power losses through the submarine cable's insulation layer. The development of High Voltage Direct Current (HVDC) technology, would enable large amounts of direct current can be transmitted over hundreds of kilometres with almost no losses, reducing the costs of developing wind farms further offshore. The offshore grid, currently under development for the North Sea, is expected to be constructed to produce 40GW by 2020 and 150GW by 2030.

Therefore, the cost implications of developing wind farms in this area, primarily guided by whether depth and distance from shore are expected to be high, though the technology will soon make such developments economically viable. The existing licence area on the Dogger Bank is expected to produce 7200MW across six wind farms within the licence area, making it one of the largest planned developments to date. The size of the area licenced would need to be large enough for the construction, laying of cables and long-term maintenance to be economic.

Wind speed data was extracted from the CCMP database for turbine heights of 10m (Figure 4). An indication of hub height winds can be gained by applying a roughness length based height correction, e.g. A factor of 1.23 applied to a 10m height wind speed can be used to estimate a 120m height wind speed. The wind roses extracted from the data showed similar patterns in wind characteristics across the Southern North Sea, suggesting a prevalent wind direction with 40% of conditions ranging from WSW to SWS and wind speeds ranging from 0-40m/s most commonly in the range 5-10 m/s. The wind speed averages range from 7 to10m/s which are within a range which would be a firm basis for a more in-depth assessment of wind

parameters to be undertaken using higher resolution commercial products such as the Met Office 35 year re-analysis or the NORA10 dataset.

The regional wave models of the CFSR project used to estimate wave climate (Figure 5) suggested a fairly consistent mean significant wave height across the site ranging from 2.3 to 2.5m. Assuming a maximum significant wave height of 1.5m to maintain site access, a more detailed analysis of potential sites would need to be undertaken to estimate the numbers of days per annum where significant wave height exceeds 1.5m as these would be expected to be relatively high. Based on the data gathered by the National Tidal and Sea Level facility for Whitby, tidal range was estimated for the Dogger Bank with B with mean spring tidal predictions calculated between 2008-2026 ranging from 1.0-5.60m and mean neap tidal ranges of between 2.25 - 4.50m. These values would expected to be lower offshore with a tidal range estimated between 2-3m.

The geology data available from the EMODnet OneGeology portal provided only a rough indication of the character of superficial sediments in the area. Although a higher resolution of data would have been available from The British Geological Survey (BGS) for UK waters, this would only have provided partial coverage of the study area. Focussed geotechnical sampling would be expected to be undertaken in advance of any licence application being pursued. The data showed that the majority of the North Sea is characterised by fine grained sediments with banks of coarser gravel beds running out towards the Dogger Bank.

An assessment of the distance from the sea for potential licence areas showed than none were close enough to the coast to be visible and would therefore not be expected to have an impact on the landscape character. The seascape character would only be affected from the perspective of passing shipping traffic and would be dependent on the distance between the vessels and the turbines.

The most accessible data for assessing fisheries, commonly used in wind farm environmental assessments in combination with on-site sampling was the data published by CEFAS using ICES rectangles (Figure 6). The data provided an overview of spawning and nursery site records which would benefit from being viewed alongside VMS data and be supported by ecological survey to provide a more detailed and up-to-date reflection of fish habitats and fishing activity. A review of fishing nursery and spawning data published by CEFAS suggested Area A to be a high intensity spawning ground for Cod with low intensity spawning and nursery sites for Spurndog, Herring, European Hake, Ling, Mackerel, Sandeels, Anglerfish, blue whiting and Whiting.

6.1.3. Area B

Area B, located in the northern extremity of the English Channel/La Manche (Figure 1) is characterised by high levels of commercial and recreational navigational activity. Much of the inshore areas are restricted navigational areas such as inshore traffic zones, with traffic separation zones running up the middle of the channel. Ferry routes cross between the major ports of England, France, Belgium and the Netherlands, as well as running out towards the North Sea and Baltic ports. The area is divided up by an extensive network of pipelines and cables running between England and mainland Europe (Figure 2b).

The exclusion of seabed areas where existing features would restrict the development of a wind farm leaves numerous small potential license areas ranging from 3km² in size. All areas with an area of less than 20km² were removed from the resulting analysis as these were considered to be too small to be viable as potential wind farm licence application areas. The assessment of existing sea-use identified approx. 3,262.90 km² of seabed currently unutilised for which further assessment of potential for wind farm licencing could be undertaken (Figure 3b).

The bathymetry across much of the area is relatively shallow exhibiting depths of –0 to -55m, with most areas exhibiting depths under 30m able to accommodate a range of wind farm designs, though most of those shallower coastal areas are already occupied by navigational restriction areas, existing licence areas and environmental protection areas, restricting scope for further development. The mid channel depths range from -30to -50m, much of which could accommodate wind farm development.

Distances to the grid are small enough to enable a new wind farm to be connected using conventional alternating current transmission systems, for which an extensive network is already in place. A large number of wrecks lie on the seabed in the Channel. The position of these and potential for unrecorded wrecks and obstructions would need to be taken into account during the design of a wind farm but do not significantly affect the licencing process.

Despite the narrow reaches of the English Channel, none of the remaining potential development areas are within close enough proximity to the coastlines of England, France, Belgium or the Netherlands to present a significant impact to the character of the coastal landscape though would affect the seascape in the vicinity of a wind farm development.

Sediment depth and grain size affect the likely stability of a wind farm site and the likelihood of experiencing problems of erosion. The geology data available from the EMODnet OneGeology portal provided only a rough indication of the character of superficial sediments in the area, with no indication of sediment depth. Although more detailed geological data can be purchased for part of the North Sea from the BGS, a more detailed assessment of geological and geotechnical data would still need to be made using on-site geophysical and geotechnical sampling. The data from EMODnet substrate map suggested the presence of extensive gravel banks running along the Channel bed. The selection of seabed areas characterised by coarse grain size or a combination of mud and coarse sediment may be less prone to erosion depending on the tidal regime and sediment depths across potential licence areas.

Wind speed data was extracted from the CCMP database for turbine heights of 10m (Figure 4). An indication of hub height winds can be gained by applying a roughness length based height correction, e.g. A factor of 1.23 applied to a 10m height wind speed can be used to estimate a 120m height wind speed. The wind roses extracted from the data showed similar patterns in wind characteristics across the Southern North Sea, suggesting a prevalent wind direction with 40% of conditions ranging from WSW to SWS and wind speeds ranging from 0-40m/s most commonly in the range 5-10 m/s. The wind speed averages range from 7 to10m/s mid Channel which are within a range which would be a firm basis for a more in-depth assessment of wind parameters to be undertaken using higher resolution commercial products such as the Met Office 35 year re-analysis or the NORA10 dataset.

The regional wave models of the CFSR project (Figure 5) used to estimate wave climate suggested a fairly consistent mean significant wave height across the site ranging from 1.4 to 2.5m Hs. Assuming a maximum significant wave height of 1.5m to maintain access feasibility, a more detailed analysis of potential sites would need to be undertaken to estimate the numbers of days per annum where significant wave height exceeds 1.5m although these would be expected to remain relatively low. Based on the data gathered by the National Tidal and Sea Level facility for Harwich, tidal range was estimated for Area B with mean spring tidal predictions calculated between 2008-2026 ranging from 0.5-4.15m and mean neap tidal ranges predicted between 1.12 – 3.34m.

A review of fishing nursery and spawning data published by CEFAS suggested Area B to be a high intensity nursery ground for Herring and Sole in the mouth of the Thames Estuary and Sole off the Normandy Coast of France (Figure 6), with low intensity spawning and nursery sites for Cod, Tope Shark, Herring, Mackerel, Plaice, Sandeels, Sole, Thornback Ray and Whiting. The CEFAS data provided an overview of spawning

and nursery site records which would benefit from being viewed alongside VMS data and be supported by ecological survey to provide a more detailed and up-to-date reflection of fish habitats and fishing activity.

6.1.4. Outcome

The method used for wind farm siting was adapted from an approach used for site selection for much smaller license areas. Using this approach, it was possible to make an indicative assessment of potential areas for wind farm licencing using available data accessible online. A more detailed evaluation would need to be undertaken through a full environmental assessment using commercial data products combined with a regime of site specific data gathering to make a more accurate evaluation of site potential.

The location of wind farms on Area A would primarily be dependent on the wind farm technology available and therefore the timeframe for development. The development of floating turbines and HVDC technology will open up new areas for potential development.

The greatest challenge for Area B is finding a licence area large enough amidst existing marine activities and infrastructure for a wind farm to be cost effective. Although the cost of installation and maintenance would be relatively small, the size of potential new licence areas would be intersected by cable and pipelines and potentially present conflicts of interest with other sea users such as commercial shipping, recreational seafaring and fishing. The investigation of options for co-use of the seabed would enable larger licence areas to be defined.

6.2. Data Adequacy

This section reports on the data adequacy to deliver the challenge. Data adequacy is reported under the six value assessments used for screening the data.

6.2.1. Contribution – Does the data contain the right parameters?

On the surface there is a large amount of data available that can contribute to solving the wind farming challenge. The difficulties arise when looking deeper into the study as it is hard to appraise the precise contribution that data can make unless the data is actually used. For example the metadata may be too imprecise to rule data in or out and there may be no lineage information to verify the provenance of the data and hence the value of its contribution.

As a result of the above, the range of data considered, downloaded and reviewed was much broader than the data used as part of the wind farm siting process. Many sites had to be investigated in order to ascertain whether they contained data of potential use to the challenge. For instance, the EMODnet physics and EMODnet biology sites were looked at but data was not considered as the data was found to be too detailed and a broader interpretation of ecology was required respectively.

The core of data used for the wind farm siting was sourced from SeaZone Hydrospatial Base, as anticipated in the project design. SeaZone Hydrospatial Base covers the entirety of the study area with the datasets already processed in terms of resolving boundary and data provider variation issues, but is available as smaller ‘tiles’ so the cost can be minimised. The data was delivered as a geodatabase with accompanying mxd and instructions.

Hydrospatial Base supplies S57 navigational chart data, as well as additional information where available in a form suitable for desktop GIS. It contained much of the data needed to provide a characterisation of:

- Existing infrastructure:
  - Wind farm license areas
  - Dumping grounds
  - Cables and pipelines
  - Wrecks and obstructions
- Bathymetry
- Commercial navigation channels
- Mariculture sites
- Administrative boundaries.

In many cases, data providers sourced their data from different locations, leading to inconsistencies and uncertainty over the definitive versions of data and hence the contribution of one dataset over another. For example, munition dumping grounds provided by SeaZone's Hydrospatial Base were sourced from SHOM, while munition dumping grounds provided through the EMODnet Human Activities portal recorded OSPAR as the source. The SeaZone dataset was in this case used in the wind farm siting exercise as it appeared to contain all of the data in the EMODnet dataset as well as additional records. Some of the data available from EMODnet was available as polygons and others were provided as point data. All points provided by EMODnet were available as polygons from SeaZone; however the spatial locations sometimes varied between individual features (i.e. the point didn't sit within the equivalent polygon).

A series of buffer zones of the coastline were produced to represent the distance from shore to incorporate an assessment of visual impact into the sensitivity assessment. To obtain a representation of distance from grid, data was downloaded from the National Grid for the UK. A more comprehensive map was also downloaded from the ENTSO-E website as a pdf. The National Grid data and buffering of the shoreline were enough to make an initial assessment of the distance to the existing grid for the study areas in question. However, for accurate measurements of distances for specific licence application areas, the underlying data used to produce the map of existing sub-stations would need to be acquired from ENTSO-E or the sites would need to be identified from terrestrial vector maps.

Fishing data was difficult to source. CEFAS spawning and nursery data was downloaded and although the data was coarse and had last been updated in 2010, it proved to be the most accessible data on fisheries available. Beyond ICES, OSPAR, CEFAS data there is little data which is readily available online for planning purposes without needing to contact individual data providers directly with data enquiries.

There are a lot of published reports on bird migration, some EU resources due to become available online in the near future. However, these reports did not provide data which can be easily accessed for inclusion in spatial analysis – migration corridors did not appear to be available in geographically referenced formats. Some statistical data on fishing effort was available but the most valuable data for fishing, as shown in the ICES published reports, lies in the VMS data which is difficult to obtain and can be costly. The MMO publish annual datasets providing summaries of fishing activity for UK commercial fishing vessels of 15m and over in length that are deemed to have been fishing within a specified calendar year. The data is referenced to a grid equal to a 0.05 degree sub-rectangle to provide a higher resolution, however now supporting documentation was found to guide how the data should be used. Beyond these datasets, there was no easily accessible resource to be found for making assessments on fisheries and birds.

Although some data exists on bird and cetacean sitings, these do not provide an adequate understanding of migration routes Dynamics of marine species were not discovered – most species information is point occurrence data with no indication of potential movements, even when species are known to have specific

seasonal changes in distributions. In most wind farm licencing applications developers would be expected to site specific data on marine species.

Additional data gathered was sourced through the European Atlas of the Seas website, such as ferry routes and Motorways of the sea from the European Atlas of the Sea, used in combination with filtered traffic regulation areas from SeaZone Hydrospatial Base to produce a representation of shipping activity across the North Sea. The data was downloadable following re-direction to the originator's website such as Europa.eu.

6.2.2. Location – Does the data cover the correct time / space location?

A large proportion of data identified was accessible through EU-funded websites and therefore had an EU remit. Some of the data portals were already familiar to the project team following the literature survey, while others such as the European Atlas of the Sea were discovered through basic internet searches such as "download natura 2000 +north sea".

In many cases, there were contrasts in the coverage of data provided from different sources. In some cases EMODnet portals had not received data from all National data providers; accordingly the data downloaded covered only part of the project study area (for example Wind farm license areas covered only Norway, EMODnet Human activities portal) , or in some only provided data outside of the North Sea cases (dredge spoil dumping grounds, polygons, EMODnet Human activities portal).

6.2.3. Commercial – Are the commercial terms acceptable?

The commercial terms for addressing the challenge were acceptable. However if this challenge was being undertaken for real, then considerable sums of money would need to be spent to obtain specific information on the site characteristics. Nevertheless, there is a plethora of information that is either free or available at low cost (<€500). It should be noted that HR Wallingford owns and distributes SeaZone products and were able to access this for research purposes without cost to the project. However, if the data had been sourced at commercial rates, this cost would have been £1,814.39.

It is not a case that 'all data needed is free' as there is a market and demand for commercial marine data products driven by the difficulties in accessing high quality, definitive and comprehensive marine data. For many of the data types required to meet the challenge, a commercial product was available which reduced the time required in gathering and quality assessing data or provide a higher resolution of information than the data which is freely available online.

In most cases there was enough information held in the free products to make an initial assessment of the characteristics on a potential site. However, the purchase of chargeable data such as VMS data for mapping fishing activities and commercial shipping, commercial seabed geology products produced by the BGS for the North Sea and higher resolution wind and wave data would be necessary and expected in the context of a real marine licence application. For example, the Meteorological Office charges £5000 per data point for its wind and wave 35 year re-analysis data time series in the North Sea. It was unrealistic to use this within the context of the challenge.

Shipping density data provided by Anatec would have provided a truer reflection of commercial shipping activities in the North Sea than the derived datasets provided via the European Atlas of the Seas website but the data costs were unnecessary in meeting the requirements of the project. The MMO also published a GIS dataset of anonymous AIS tracks via the Environment Agency geostore, which provided a useful insight into ship movements across a single year and a density grid of the movements of fishing vessels over 15m.

Further publication of these types of datasets and availability through resources such as the EMODnet human activities portal alongside guidance on how the data should be displayed would provide planners and developers with a valuable resource.

Wind and wave data was sourced and downloaded where data was freely available. Sources of chargeable data were also recorded in the database but not used.

6.2.4. Attributes – Does the data have the correct attributes?

During the identification of possible data sources, it was found that there were considerable overlaps between data providers, often offering data from different sources. The data needed to be compared and metadata reviewed to decide whether the datasets were the same or not and to identify the most accurate data.

Where the same data was available from more than one source, it had to be downloaded in duplicate to ensure that the most up-to-date version was used. Data from multiple sources were grouped by type and appraised to identify resources best suited to meeting the challenge.

Some data was too coarse, usually as a result of being compiled into a single dataset alongside data from multiple sources provided at different resolutions. Where point data was provided in the place of extent polygons (e.g. European Atlas of Seas Offshore Wind farms, Europa.eu marine energy production facilities) data becomes too imprecise for use in a license area siting exercise, where knowing the spatial extent of existing marine license areas is very important.

Investigations subsequent to the challenge also revealed that the personnel undertaking the challenge had found the Human Activities portal non-intuitive, hence not noticing where they could download the wind farm polygon data and had instead clicked through to the Europe Atlas of Seas. One of the exacerbating reasons for this was that they were confined to using Internet Explorer 9 as a web browser, due to the data policy of the organisation. The “view data” part of the Human Activities portal functionality was compromised by this browser’s rendering, for example. A feedback form has now been submitted to the portal, containing this information and whilst it is not necessarily something that can be resolved, it is worth noting as a potential barrier to accessibility for some users, particularly if it is their first experience with the portals.

In addition there was considerable overlap in the type of data available. Human activity data in particular was often available via multiple EU sites as well as via SeaZone’s Hydrospatial products. The data tended to be a compilation from multiple providers and was often derived in order to provide it in a single format and resolution. For instance, commercial license areas depicted as point data rather than showing license area extents.

During the identification of possible data sources, it was found that there were also considerable overlaps between websites, particularly for government and EU funded data. In many cases, the same data was available through different websites, raising questions on which was the most up-to-date and definitive version. There were similarly themed datasets also available through different government funded resources, although the data needed to be compared and metadata reviewed to decide whether the datasets were the same or not.

6.2.5. Delivery - Can the data be provided to match the timeframe of the challenge?

The majority of data reviewed for the challenge were easily accessible, downloaded from the internet, sometime following registration to a website. This was the case for all of the freely available resources assessed. The requirement for registration was not considered to be a barrier to data access, though in some instances, where the registration process was not automated, the response from the data provider could be slower.

In the case of commercial products and data derived from commercial activities such as VMS data, the process of putting in a request for a quote, followed by an order could take a little longer, although none of the responses presented a barrier to the challenge.

The ease of use of EMODnet portals was found to vary with the nature of data and access requirements. Portals containing links to the download of zip files such as the seabed habitat portal and the human activities portal were easy to use and enabled fast access to the data.

6.2.6. Usability – Is the data format and supporting information suitable?

Some resources were only available as a pdf, kml or as a static image, while others are provided in a format allowing it to be put straight into a dynamic map with no pre-processing required. Much of the biological, chemical and physical datasets are provided in underived formats as they contain sampling results. Some users require the data to be maintained in its original format to enable applications such as time series modelling. This however makes the data more difficult to access for non-experts in these fields who may be looking for interpreted data such as characterisations or density maps.

There were instances where source paths to access datasets were broken. This occurred both during navigation to a data download page (for example the MPAs dataset shown in the European Atlas of the Seas portal could not be downloaded due to a broken link) and in the display of downloaded data, as was the case for the EEA hydrodynamics and sea-level rise data. An mxd was provided to facilitate the viewing of symbolised data. However the source path still led to the originator's C drive and D drive!

Some data such as the Europa.eu wind farm data contained no co-ordinate reference system (CRS) information so that the data displayed in the wrong place when loaded into a GIS workspace, making it difficult to use without having to first identify the projection used in order to assign the data a CRS and apply a transformation to bring it into line with other data. As the data was also displaying point data it was not used for the wind farm assessment.

6.3. Key Data Gaps

The main data gaps identified through the wind farm siting challenge were in sourcing spatial datasets for ecology and fishing activities. Although baseline data was found, much of the precise data had to be identified from reports and requested from the authors. There are EU initiatives in progress to make some data available but much of the existing data remains scattered and not very user-friendly. It is important therefor to make the most of data which has been made available. The interpreted AIS and VMS datasets published by the Marine Management Organisation in the UK could be useful to a broad range of users and need to be made more discoverable.

The resources for finding data for the North Sea are numerous. Some data is discoverable through data discovery portals such as those managed by SeaDataNet and MEDIN[2]. These have a strong focus on raw environmental data, such as survey results, though MEDIN are expanding their data archive centres to include other areas such as heritage data.

There are a broad range of data types available through EU-funded portals such as EMODnet, Copernicus, EEA and European Atlas of the Sea. While many of the data resources available provide useful metadata as part of the product download, there are currently limited means for searching the metadata from the contents of the portals for EU funded resources before the data is downloaded. The EMODnet query tool would be a suitable platform for developing capability for users to search through discovery metadata for all EMODnet data products and potentially data from other EU portals.

Better integration between EU-funded marine data resources such as EMODnet and the European Atlas of the Sea would be seen as a benefit. Although these resources have overlapping remits, the data provided is not necessarily sourced from the same providers, particularly in the case of human activities data. A centralised EU data discovery portal or promotion and development of existing discovery resources portals to incorporate data currently not supported such as human activities data would help users differentiate between data products and improve signposting. More information on metadata before pressing the download button could save considerable time spent searching for data.

The loss of data resolution in favour of providing a data product was a re-occurring problem particularly with data relating to sea-use and human activities. The display of extent polygons as point data makes the data useless in the context of marine spatial planning. This is a problem which could be addressed through the delivery of data by provider rather than by data type. Although the user would need to download more datasets and deal with the conflicts between datasets themselves, this would also ensure that the data provided through EMODnet was at its highest available resolution and would make it easier for the portals to publish regular updates.

These are issues which will be considered during the delivery of successive challenges and will be a valuable topic for discussion at the next panel meeting.

7. Discussion and Conclusions

7.1. Discussion

The data available for the study areas was suitable in meeting the requirements of the challenge though the quality of data differed.

The quality assessment of data was an ongoing process, based on assessing accessibility of data, costs, relevance, usability and usefulness via the data gathering and mapping stages of the challenge. All of these criteria varied a great deal between datasets.

Some key points regarding data adequacy for the North Sea have been identified through the completion of the wind farm challenge.

- The data for wind farm siting is required as far as possible in an accessible format, so that it can be easily viewed and compared to other data using off the shelf GIS products or spreadsheets. Much of the

[2] MEDIN - Marine Environmental Data and Information Network

data required to complete the challenge are the same as the baseline information used for most planning assessments and licence applications: **Usability**

- Identifying definitive data for all of the national waters was time consuming, often leading to the investigation of resources which later turned out not to be relevant or which proved too complex to use for planning purposes. The lack of detailed descriptions of the contents of data resources encouraged the use of a commercial product over freely available government and EU funded resources: **Delivery**
- A large proportion of data identified was accessible through EU-funded websites and therefore had an EU remit. It was therefore assumed that the data available from these sites would provide full coverage of EU waters. This was often not the case. Some datasets only contained data submitted by one or two EU nations and did not cover any of the challenge study area: **Location**
- There was considerable overlap in the type of data available. Human activity data in particular was often available via multiple EU sites as well as via SeaZone's Hydrospatial products. On the EU portals, the data tended to be a compilation from multiple provides and was often derived in order to provide it in a single format and resolution. For instance, commercial licence areas depicted as point data rather than showing licence area extents. This reduction in resolution made the data unsuitable in meeting the challenge requirements as the extents of existing licence areas needed to be known: **Attributes**
- In many cases, the same data was available through different EU and nationally funded websites, raising questions on which was the most up-to-date and definitive version. There were similarly themed datasets also available through different government funded resources, although the data needed to be compared and metadata reviewed to decide whether the datasets were the same or not. Although the data was useful, it took time to identify a definitive source: **Contribution**
- Some data, although freely available through EU websites, was not provided in a format which allowed it to be integrated into GIS for analysis alongside the other data. For example, the BGS data provided through EMODnet Geology was available as a kml, and had to be viewed alongside the challenge output after the analysis of core data.: **Usability**
- There were cases where the cost of data required to undertake a wind farm siting exercise was not justifiable. In these cases, chargeable and freely available data was reviewed for its usefulness to the challenge and the best available low cost or freely available data was used. A license for SeaZone Hydrospatial Base product was used as it had been identified in the proposal as a core dataset and a license has been made available for all of the project challenges. **Commercial**
- Some data such as the Europa.eu wind farm data contained no co-ordinate reference system (CRS) information so that the data displayed in the wrong place when loaded into a GIS workspace, making it difficult to use without having to first identify the projection used in order to assign the data a CRS and apply a transformation to bring it into line with other data. As the data was also displaying point data it was not used for the wind farm assessment: **Attributes**

7.2. Conclusions

The key conclusions for the wind farm challenge are as follows:

- The wind farm siting challenge could be delivered, using data readily available across the North Sea basin.
- Delivery of the challenge relied very heavily on the commercial SeaZone Hydrospatial data set rather than data from EMODnet and Copernicus. This is because the SeaZone data was available as a single

package with geometric and semantic inconsistencies addressed. It could be readily loaded as a single entity into a GIS.

- There is a plethora of EU-level websites offered relevant data that can contribute to the project. These data however are often derived from a combination of the same sources. The derivation however is not explicit, requiring considerable detective work to determine the true value of each of the data. There is a need to adopt persistent signposting services (like that being proposed by the North Sea Check Point) to broker the right data to the right application.
- There are very distinct data gaps for data related to fisheries, marine animals (birds and mammals primarily) where reports rather than data services need to be referred to. There is a need to examine how the EMODnet can fill this gap.
- For some EMODnet portals, harmonisation of data structures across suppliers has led to a reduction in data value. If EMODnet is to be a reference others can rely on, we need to encourage data supply as close to source as possible.

8. References

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http://www.ewea.org/fileadmin/files/library/publications/statistics/European_offshore_statistics_2013.pdf

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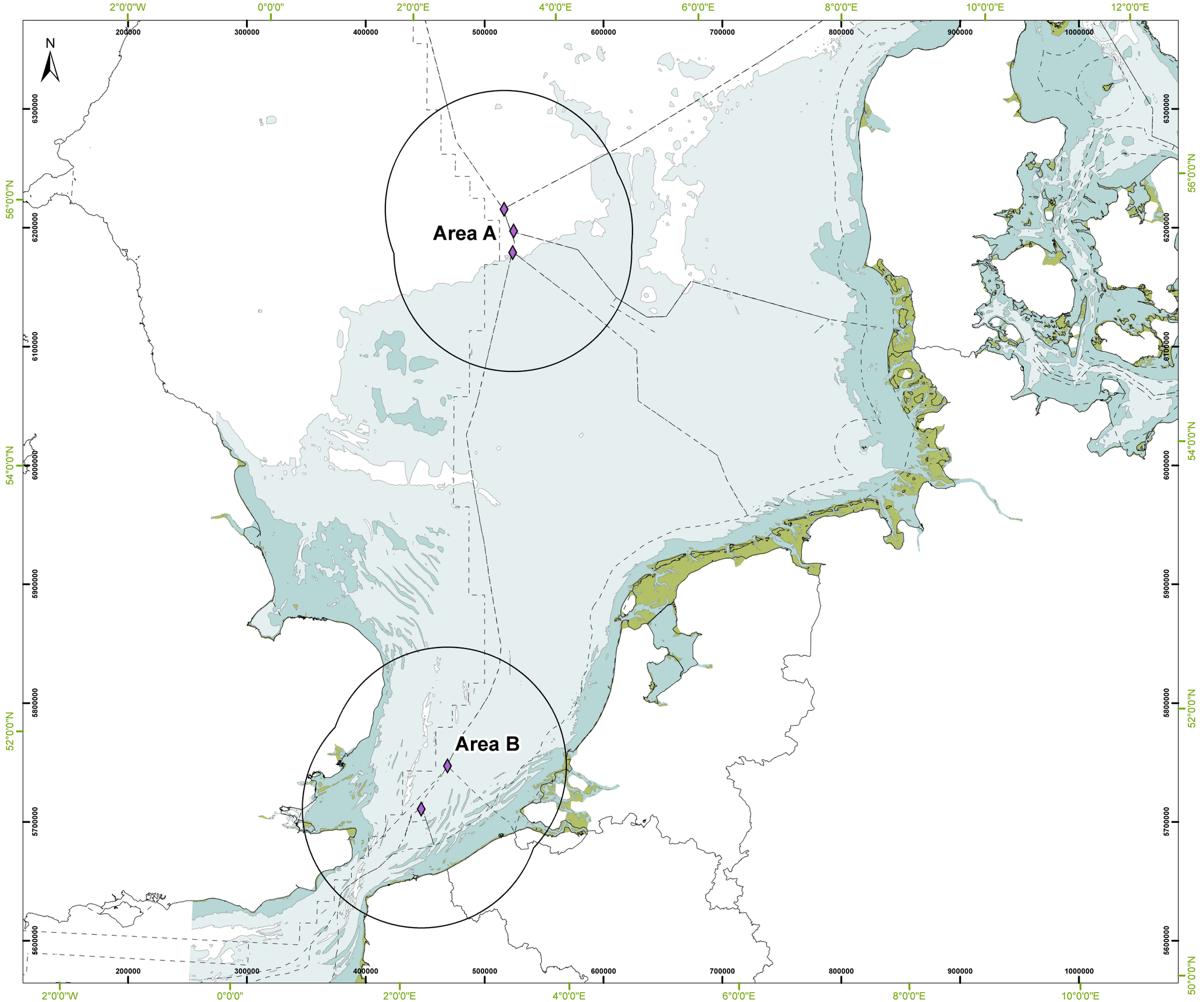
http://www.ewea.org/fileadmin/ewea_documents/documents/publications/reports/Seanergy_2020.pdf

Appendices

A. Figures



GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 25 50
KILOMETERS

SCALE: 1:3,000,000

PAPER SIZE: A3 (42 x 29.7 cm)

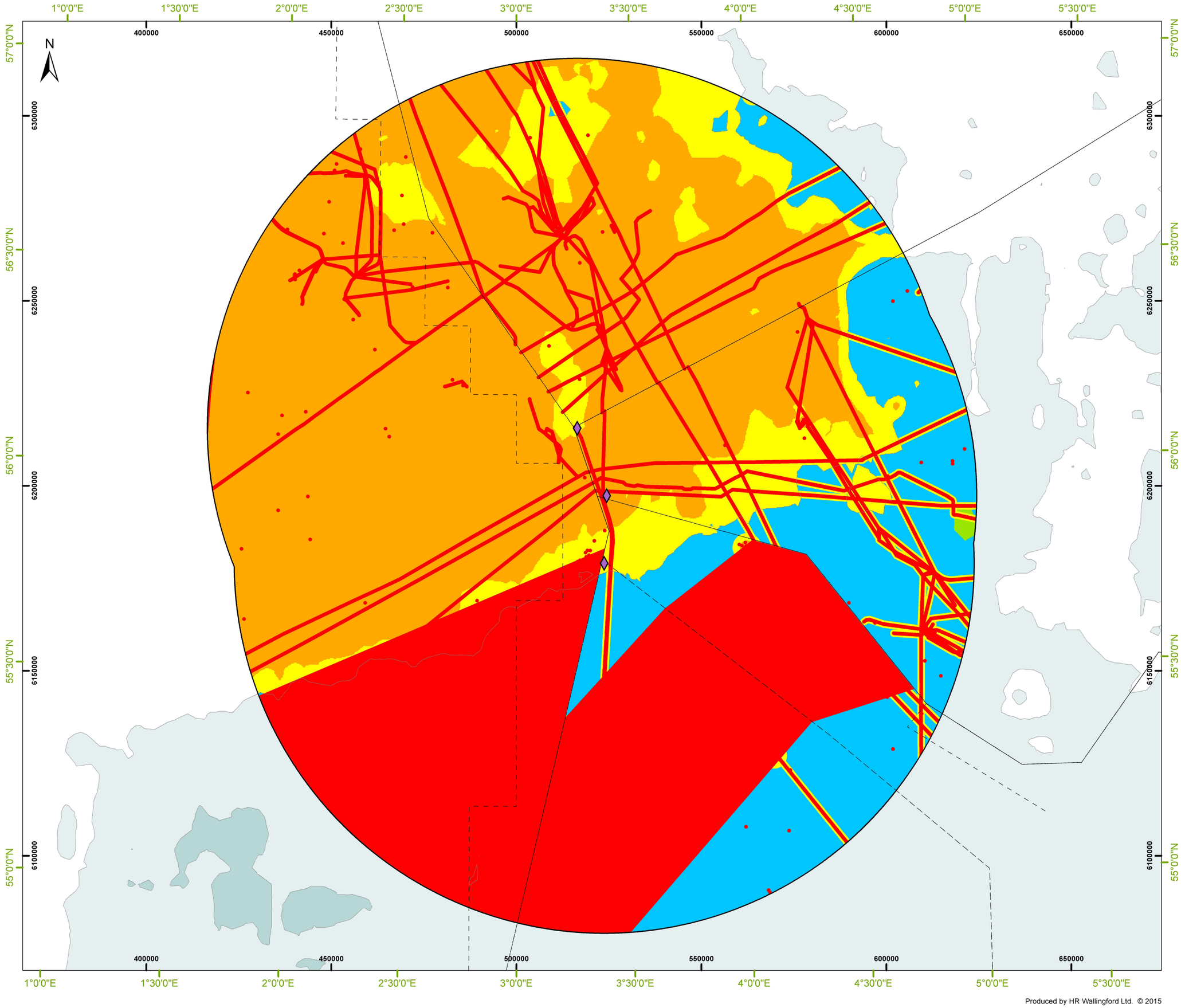
Figure 1: Wind Farm Siting Challenge Study Areas

HR Wallingford
Working with water

DATE: 25/03/2015	DRAWN: DDE	CHECKED: ONM

PROJECT REF: DLS0342

DRAWING: DLS0342-001-01-DDE



Study Area Location

Study Area 100km Buffer

EEA Maritime Boundaries

Bathymetry (m)

- -2 - 0
- -20 - -2
- -50 - -20
- Less than -50

Site Suitability Scoring Index

Level	Grade
Very High	5
High	4
Medium	3
Low	2
Very Low	1

- **Existing Infrastructure:**
  - Pipelines, submarine cables
  - Anchorage Areas
  - Disposal sites
  - Marine Aquaculture sites
  - Wind farm sites
  - Aggregate extraction areas
  - Military firing areas
- **Commercial Navigation:**
  - Shipping traffic regulation areas
  - Ferry routes
  - Motorways of the sea
- **Wrecks:**
  - 0.5 km buffer
- **Ordnance Disposal sites**
  - 0.5km buffer

- **Designated Conservation Areas:**
  - Natura 2000
  - MPAs
- **Bathymetry:**
  - Depth over 60m
- **Commercial Navigation:**
  - 1km buffer

- **Commercial Navigation:**
  - 3km buffer
- **Bathymetry:**
  - Depth between 50-60m
- **Existing infrastructure:**
  - Cables and pipelines (1 km buffer)

- **Bathymetry:**
  - Depth between 30-50m

- **Bathymetry:**
  - Depth between 0-30m

GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 10 20
KILOMETERS

SCALE: 1:950,000

PAPER SIZE: A3 (42 x 29.7 cm)

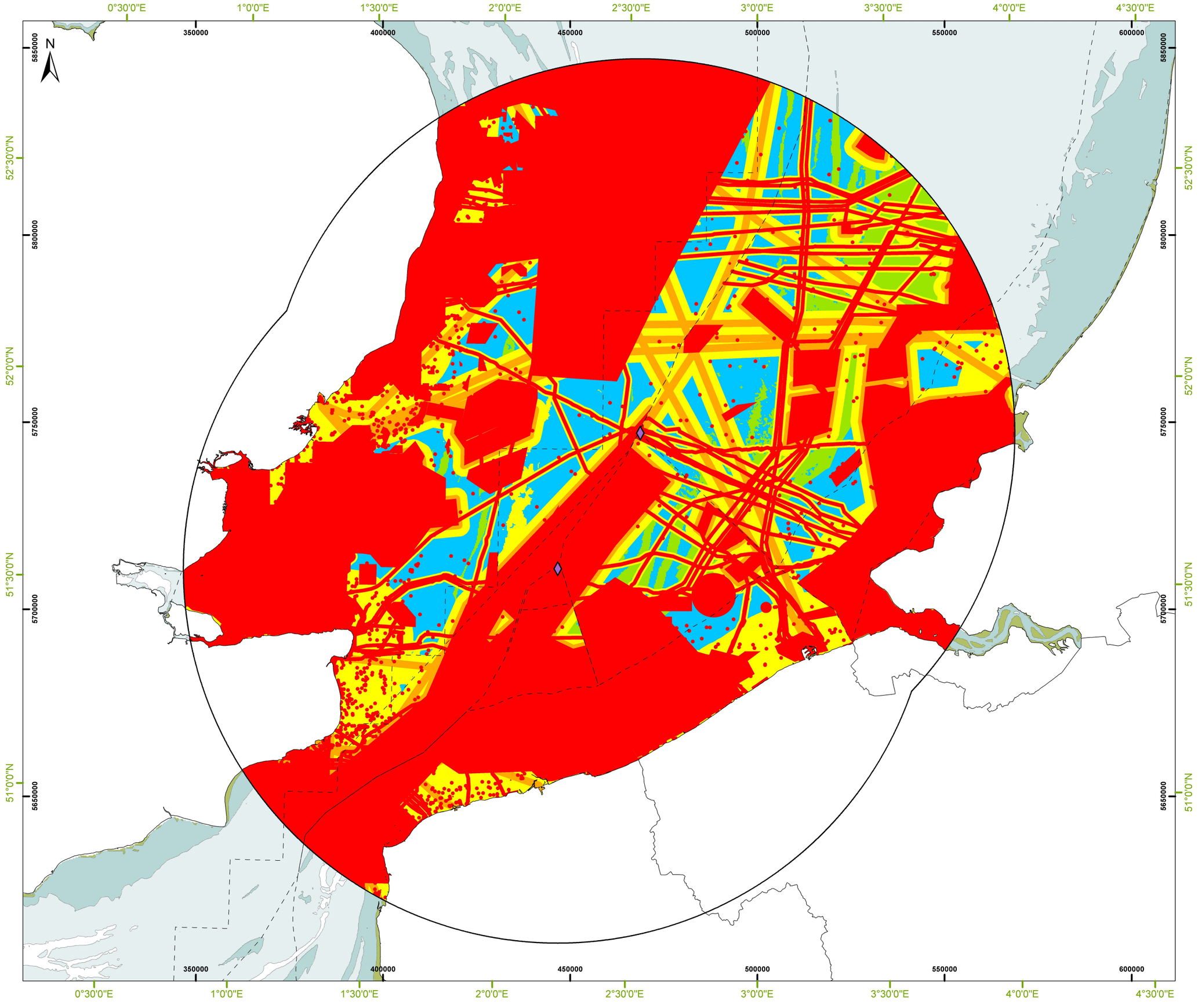
Figure 2a: Study Area A
Site Suitability Scoring Assessment

HR Wallingford
Working with water

DATE: 25/03/2015	DRAWN: DDE	CHECKED: ONM

PROJECT REF: DLS0342

DRAWING: DLS0342-002-A-01-DDE



Study Area Location

Study Area 100km Buffer

EEA Maritime Boundaries

Bathymetry (m)

- -2 - 0
- -20 - -2
- -50 - -20
- Less than -50

Site Suitability Scoring Index

Level	Grade
Very High	5
High	4
Medium	3
Low	2
Very Low	1

- **Existing Infrastructure:**
  - Pipelines, submarine cables
  - Anchorage Areas
  - Disposal sites
  - Marine Aquaculture sites
  - Wind farm sites
  - Aggregate extraction areas
  - Military firing areas
- **Ordnance Disposal sites**
  - 0.5km buffer
- **Commercial Navigation:**
  - Shipping traffic regulation areas
  - Ferry routes
  - Motorways of the sea
- **Wrecks:**
  - 0.5 km buffer

- **Designated Conservation Areas:**
  - Natura 2000
  - MPAs
- **Commercial Navigation:**
  - 1km buffer
- **Distance from shore:**
  - 0-16km
- **Bathymetry:**
  - Depth over 60m

- **Commercial Navigation:**
  - 3km buffer
- **Existing infrastructure:**
  - Cables and pipelines (1 km buffer)
- **Distance from shore:**
  - 16 - 29km buffer
- **Bathymetry:**
  - Depth between 50-60m

- **Bathymetry:**
  - Depth between 30-50m
- **Distance from shore:**
  - 29 - 40km buffer

- **Bathymetry:**
  - Depth between 0-30m
- **Distance from shore:**
  - Over 40km

GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 10 20
KILOMETERS

SCALE: 1:950,000

PAPER SIZE: A3 (42 x 29.7 cm)

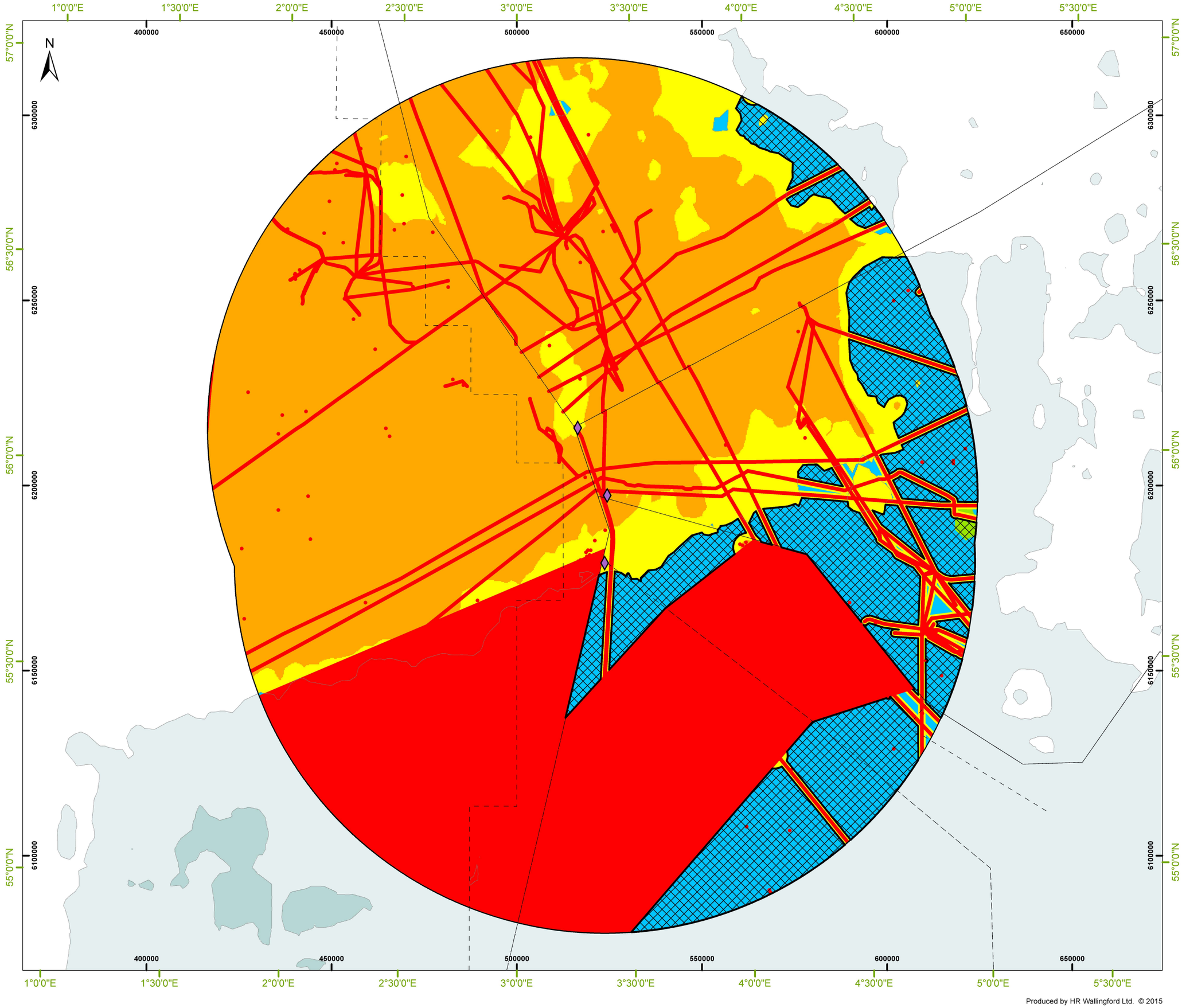
Figure 2b: Study Area B
Site Suitability Scoring Assessment

HR Wallingford
Working with water

DATE: 25/03/2015	DRAWN: DDE	CHECKED: ONM

PROJECT REF: DLS0342

DRAWING: DLS0342-002-B-01-DDE



Produced by HR Wallingford Ltd. © 2015

Study Area Location

Study Area 100km Buffer

EEA Maritime Boundaries

Possible Wind Farm Site (Greater than 20km Sq)

Bathymetry (m)

- -2 - 0
- -20 - -2
- -50 - -20
- Less than -50

Site Suitability Scoring Index

Level	Grade
Very High	5
High	4
Medium	3
Low	2
Very Low	1

- **Existing Infrastructure:**
  - Pipelines, submarine cables
  - Anchorage Areas
  - Disposal sites
  - Marine Aquaculture sites
  - Wind farm sites
  - Aggregate extraction areas
  - Military firing areas
- **Commercial Navigation:**
  - Shipping traffic regulation areas
  - Ferry routes
  - Motorways of the sea
- **Wrecks:**
  - 0.5 km buffer
- **Ordnance Disposal sites**
  - 0.5km buffer

- **Designated Conservation Areas:**
  - Natura 2000
  - MPAs
- **Bathymetry:**
  - Depth over 60m
- **Commercial Navigation:**
  - 1km buffer

- **Commercial Navigation:**
  - 3km buffer
- **Bathymetry:**
  - Depth between 50-60m
- **Existing infrastructure:**
  - Cables and pipelines (1 km buffer)

- **Bathymetry:**
  - Depth between 30-50m

- **Bathymetry:**
  - Depth between 0-30m

GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 10 20
KILOMETERS

SCALE: 1:950,000

PAPER SIZE: A3 (42 x 29.7 cm)

Figure 3a: Study Area A Site Suitability Scoring Assessment Results Showing Potential Wind Farm Areas

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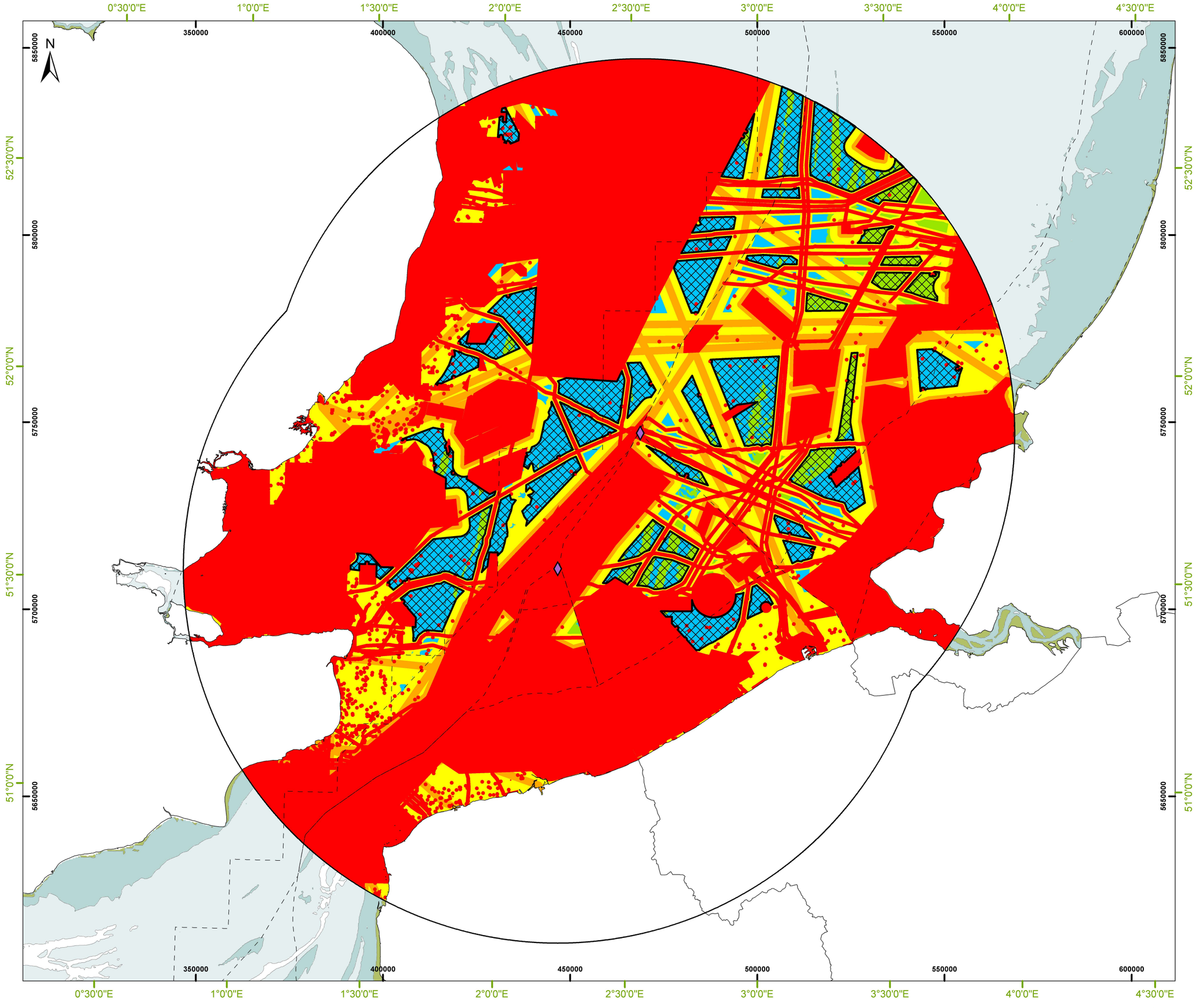
Working with water

DATE: 25/03/2015	DRAWN: DDE	CHECKED: ONM

PROJECT REF: DLS0342

DRAWING: DLS0342-003-A-01-DDE



Study Area Location

Study Area 100km Buffer

EEA Maritime Boundaries

Possible Wind Farm Site (Greater than 20km Sq)

Bathymetry (m)

- -2 - 0
- -20 - -2
- -50 - -20
- Less than -50

Site Suitability Scoring Index

Level	Grade
Very High	5
High	4
Medium	3
Low	2
Very Low	1

- **Existing Infrastructure:**
  Pipelines, submarine cables
  Anchorage Areas
  Disposal sites
  Marine Aquaculture sites
  Wind farm sites
  Aggregate extraction areas
  Military firing areas
- **Ordnance Disposal sites**
  0.5km buffer
- **Commercial Navigation:**
  Shipping traffic regulation areas
  Ferry routes
  Motorways of the sea
- **Wrecks:**
  0.5 km buffer

- **Designated Conservation Areas:**
  Natura 2000
  MPAs
- **Commercial Navigation:**
  1km buffer
- **Distance from shore:**
  0-16km
- **Bathymetry:**
  Depth over 60m

- **Commercial Navigation:**
  3km buffer
- **Existing infrastructure:**
  Cables and pipelines (1 km buffer)
- **Distance from shore:**
  16 - 29km buffer
- **Bathymetry:**
  Depth between 50-60m

- **Bathymetry:**
  Depth between 30-50m
- **Distance from shore:**
  29 - 40km buffer

- **Bathymetry:**
  Depth between 0-30m
- **Distance from shore:**
  Over 40km

GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 10 20
KILOMETERS

SCALE: 1:950,000

PAPER SIZE: A3 (42 x 29.7 cm)

Figure 3b: Study Area B Site Suitability Scoring Assessment Results Showing Potential Wind Farm Areas

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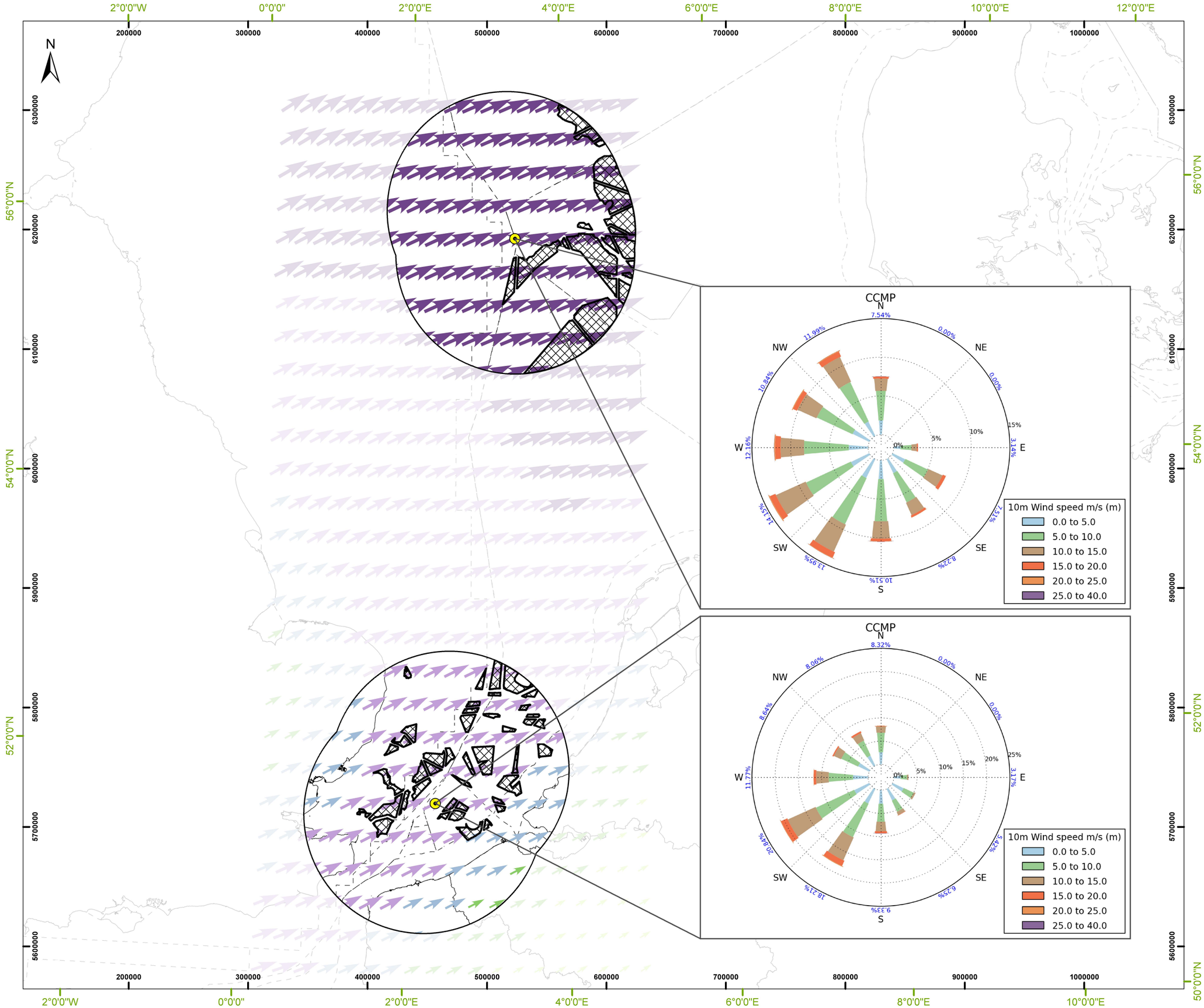
Working with water

DATE: 25/03/2015	DRAWN: DDE	CHECKED: ONM

PROJECT REF: DLS0342

DRAWING: DLS0342-003-B-01-DDE



Study Area Location

Study Area 100km Buffer

EEA Maritime Boundaries

Possible Wind Farm Site (Greater than 20km Sq)

CCMP Wind Data

Mean Speed (m/s)

4.03 - 5.00

5.00 - 6.00

6.00 - 7.00

7.001 - 8.00

8.00 - 9.00

GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 25 50

KILOMETERS

SCALE: 1:3,000,000

PAPER SIZE: A3 (42 x 29.7 cm)

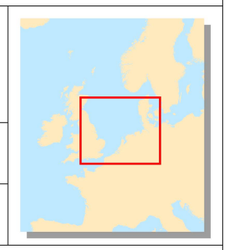
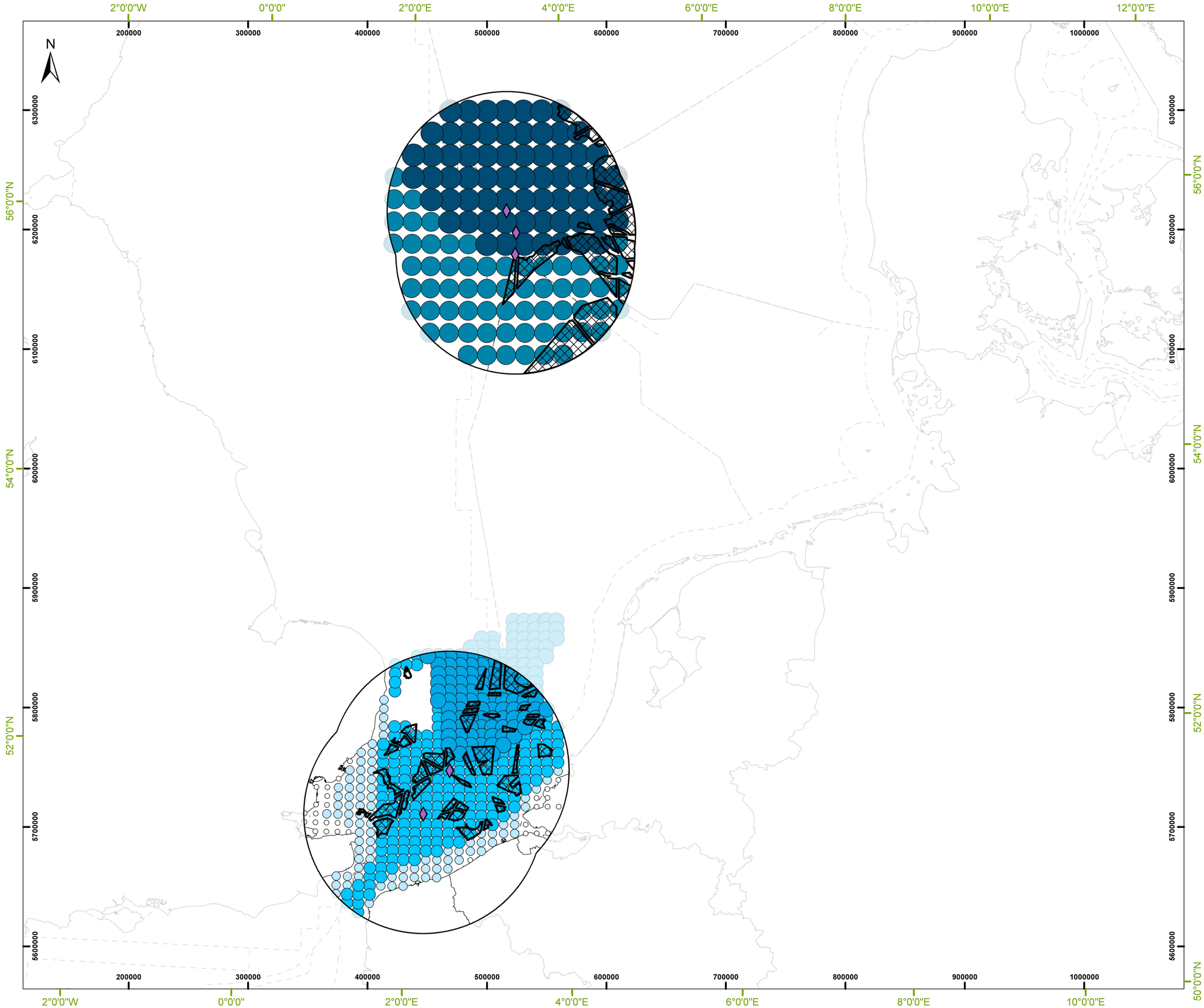


Figure 4: CCMP Wind Data Assessment

HR Wallingford
Working with water

DATE: 26/03/2015	DRAWN: DDE	CHECKED: ONM
PROJECT REF: DLS0342		
DRAWING: DLS0342-004-01-DDE		



Study Area Location

Study Area 100km Buffer

Possible Wind Farm Site (Greater than 20km Sq)

CFSR Wave Data

Mean Hs m

- 0.00 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00

GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 25 50
KILOMETERS

SCALE: 1:3,000,000

PAPER SIZE: A3 (42 x 29.7 cm)

Figure 5: CFSR Wave Data Assessment

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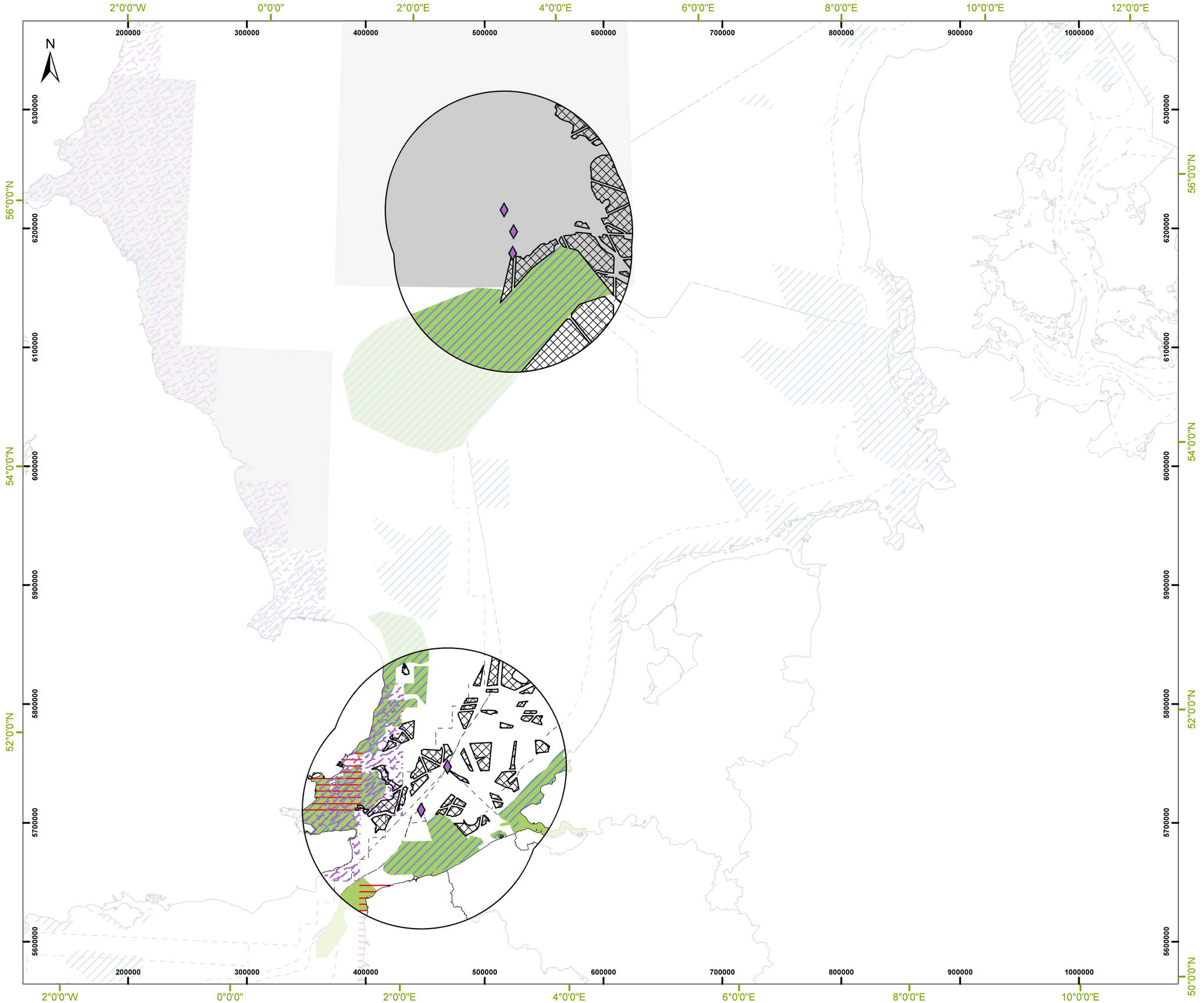
DATE: 25/03/2015	DRAWN: DDE	CHECKED: ONM

PROJECT REF: DLS0342

DRAWING: DLS0342-005-01-DDE



Study Area Location

Study Area 100km Buffer

Possible Wind Farm Site (Greater than 20km Sq)

Herring Nursery: High Intensity (CEFAS)

Sole Nursery: High Intensity (CEFAS)

Cod Nursery: High Intensity (CEFAS)

Marine Protected Area

European Environment Agency: Natura 2000 Sites

European Environment Agency: Maritime Boundaries

GEODETIC INFORMATION

PROJECTION: UTM 31 NORTH

SPHEROID: WGS 1984

DATUM: WGS 1984

0 25 50
KILOMETERS

SCALE: 1:3,000,000

PAPER SIZE: A3 (42 x 29.7 cm)

Figure 6: Assessment Of Protected Areas And Fishing Data

HR Wallingford
Working with water

DATE: 25/03/2015	DRAWN: DDE	CHECKED: ONM

PROJECT REF: DLS0342

DRAWING: DLS0342-006-01-DDE

B. Data Assessment

Valuation of the data to solving a challenge (a sheet per challenge)

NSC-001-Wind

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Wind.NS001-ENTSO-E electronic grid map	Used	Contribution	True	Map showing the locations of interconnected electrical network in Europe, including all sub-stations around the North sea
NSC-001-Wind		Location	True	All of Europe
		Commercial	True	Freely available - needed to be requested via an online form
		Attributes	True	Data was provided as a static map including a legend, showing plants, stations, existing high-voltage overhead lines and those under construction
		Delivery	True	Data was downloaded online via a link sent by email
		Usability	True	The map had to be georeferenced and the features of interest digitised. A shapefile or spreadsheet with co-ordinates would have been better.
DT.Wind.NS003-EMODNET Bathymetry Gridded Bathymetry	Considered	Contribution	True	Gridded bathymetry data need for windfarm siting
NSC-001-Wind		Location	True	Data set covers north sea region
		Commercial	True	Open government licence - no fee
		Attributes	True	Spatial resolution sufficient for windfarm citing
		Delivery	True	Data ca nbe downloaded from website
		Usability	True	XYZ files - bulky to use but ok
DT.Wind.NS004-National Grid Sub-station sites	Suitable	Contribution	True	Shapefiles containing data on electrical grid for the UK.
NSC-001-Wind		Location	False	Uk only. Better coverage was found via the information on the ENTSO-E website.
		Commercial	True	Freely available
		Attributes	True	Data included sub-stations, cables, gas sites, gas pipes, overhead lines and towers
		Delivery	True	Downloadable online
		Usability	True	Easy to use though when compared with the Entso-E data for the UK seemed incomplete
DT-NS007-23 Years of Wind Speed Observations	NotConsidered	Contribution	True	Wind speed data available via the 4C Offshore website
NSChlge-001-Windfarm Siting		Location	True	global range unsure how many for the North Sea
		Commercial	True	more detailed 6 monthly and 6 hourly data can be purchased.
		Attributes	True	Spatial resolution sufficient for windfarm citing
		Delivery	False	Data accessed via enquiries to individual ports
		Usability	False	Access difficulties meant that other wind data sources were easier to use
DT.Wind.NS006-Crown Estate Marine Data Exchange wind data	Considered	Contribution	True	Crown Estate Marine Data Exchange wind data. The Marine Data Exchange contains a wealth of raw, cleaned and modelled wind data from various meteorological masts, LiDAR systems and meteorological buoys around the UK. The data is good for general checks,may be useful where windfarm siting is taking place in close proximity to an existing wind farm licence area.
NSChlge-001-Windfarm Siting		Location	True	Uk
		Commercial	True	Login required. Once logged in data is freely available for download.
		Attributes	True	The database contains data, reports and surveys from a number of offshore windfarm developments and government funded initiatives such as Aggregate Levy Sustainability Fund data around the UK.
		Delivery	True	Data is requested via the website and an email containing download details can take up to 5 days to come through.
		Usability	True	Data is especially useful when working in proximity to an existing windfarm licence sitethough other data is also available,
DT-NS008-20 Months of Wind Data from the FINO3 (including FINO1 and 2 as well) Powerpoint	NotConsidered	Contribution	True	FINO1 & 3 masts are in the North sea hence directly relevant, they are also positioned in the middle of the sea not on the extremeties - general info and examples
NSChlge-001-Windfarm Siting		Location	True	North Sea (2) Baltic Sea (1)
		Commercial	True	Data held in downloadable powerpoint presentation
		Attributes	True	some graphical representations of data
		Delivery	True	online - can be saved as a pdf
		Usability	False	Extraction of trends in data from a pdf meant other sources of wind data were more helpful
DT-NS009-NorseWInD - Northern Seas Wind Index Database	NotConsidered	Contribution	True	wind data for the North Sea
NSChlge-001-Windfarm Siting		Location	False	The North Sea, Baltic and Irish Sea though data dowloaded only seems to cover the Eastern edge of the North Sea
		Commercial	True	Free access to user (you have to register and log in to get data)
		Attributes	True	10-year adjusted wind speed and direction value, annual and monthly long term corrected mean wind speed, standard deviation of annual values, weibull parameters (K&A), wind direction distribution, wind shear - α exponent, temperature, static stability, uncertainty in wind speed.
		Delivery	True	Once login was received, data could be downloaded online
		Usability	False	Data is designed for use by energy developers for preliminary siting calculations. The coverage of data downloaded did not appear to cover the area of interest although the project website stated that the data was to be gathered for the Baltic, North sea and Irish Sea.
DT-NS011-FINO Database	Considered	Contribution	True	FINO Database is accessible via the German Maritime and Hydrographic Agency (BSH).
NSChlge-001-Windfarm Siting		Location	True	North Sea
		Commercial	False	Access to the webpage for the database is in German only.
		Attributes	Null	no data was accessed
		Delivery	False	No registration page was found. It was therefore difficult to assess the contents of the database and access the data
		Usability	Null	
DT-NS012-Energy Industry Met Ocean Data around UK	NotConsidered	Contribution	True	data up to and including 31st July 1993. More recent data available
NSChlge-001-Windfarm Siting		Location	True	Around UK - some in North Sea (see maps in document)
		Commercial	True	Free and acccessible - there is a copy saved in literature review
		Attributes	True	Wind, wave, current and water level data in appendices B-E
		Delivery	True	saved as pdf
		Usability	False	Not easy to use as data would have to be drawn out of a pdf
DT.Wind.NS013-MMO fishing density grids 2008-2013	Suitable	Contribution	True	not useful in itself but for completeness this is for all hse OTI docs as mentioned in the energy Industry Metocean Data around Uk report.
NSChlge-001-Windfarm Siting		Location	True	UK waters and the North Sea
		Commercial	True	Freely available
		Attributes	True	summaries of fishing activity for UK commercial fishing vessels of 15m and over in length that are deemed to have been fishing within a specified calendar year. The data is referenced to a grid equal to a 0.05 degree sub-rectangle to provide a higher resolution
		Delivery	True	Dowloadable as a shapefile from the Environment Agency webstore
		Usability	False	Data easy to use although there are lots of attributes and no accompanying report to guide the best way to display the data.
DT-NS014-European Directory of Marine Environmental Data (EDMED)	Null	Contribution	True	Useful data discovery resource for identifying data. Provides links to data providers
NSChlge-001-Windfarm Siting		Location	True	Europe
		Commercial	True	The search facility is free. The cost of data and access restrictions will be dependent on data providers
		Attributes	True	Provides discovery metadata to help users identify data which will meet their needs.
		Delivery	True	Data is accessible via links to data providers
		Usability	Null	
DT.Wind.NS015-CEFAS spawning and nursery grounds	Used	Contribution	True	Data on spawning and nursery sites around UK waters and for the North Sea
NSChlge-001-Windfarm Siting		Location	True	UK waters and North Sea
		Commercial	True	Freely available to download from CEFAS website
		Attributes	True	Shows species and intensity levels for spawning and nursery survey results conducted in 2010 and spawning sites from 1998. Accompanying reports also available
		Delivery	True	Dowloaded from the website
		Usability	True	Though the data inot high resolution and was published in 2010, it is easily accessible and user-friendly and is commonly used in planning applications alongside ecological survey data
DT-NS017-Magic Map	NotConsidered	Contribution	False	Information on presence of protected areas or areas The website though still online has *NOT BEEN UPDATED SINCE 2004. Therefore it is not suitable for meeting the wind farm challenge.
NSChlge-001-Windfarm Siting		Location	False	UK only. Does not provide enough coverage for the wind farm siting exercise
		Commercial	True	freely downloadable
		Attributes	False	Provides access to a broad range of data including designated areas, species and habitat data, but have not recently been udates.
		Delivery	True	Dowloadable via the website.
		Usability	True	Datadownloaded is easy to use. There may be useful data, but will need comparing with more recent data to assess the usefulness of individual datasets. A useful alternative may be the data provided on the Environment Agency webstore T&Cs: http://magic.defra.gov.uk/Copyright_Information_Data_Download.htm Raw data download: http://magic.defra.gov.uk/Dataset_Download_Summary.htm
DT.Wind.NS019-Marine Life	NotConsidered	Contribution	False	collection of publications and reports on cetacean siting project results.
NSChlge-001-Windfarm Siting		Location	True	UK waters and North Sea
		Commercial	True	Free
		Attributes	True	cetacean and seabird data
		Delivery	True	No spatial data available to dowload beyond downloadable pdfs
		Usability	False	Data would need to be extracted from pdfs. This was not considered worthwhile for the wind farm siting exercise
DT-NS021-OSPAR map of protected areas	Suitable	Contribution	True	Very useful online map resource for viewing and downloading MPAs
NSChlge-001-Windfarm Siting		Location	True	North East Atlantic

		Commercial	True	Free
		Attributes	True	various protected site locations. Attributes are very useful and include hyperlinks to area descriptions on the website for the responsible organisation
		Delivery	True	download process was straightforwad, only requiring an email address. Downloadable as a shapefile, TAB, KML, MIF/MID
		Usability	True	easily loaded into a project GIS
DT.Wind.NS025-MESH - mapping European Seabed Habitats	Considered	Contribution	True	Several MESH datasets are available via the EMODnet Marine Habitat portal. These were downloaded but not used for the wind farm siting
NSChlge-001-Windfarm Siting		Location	True	North Sea, Irish Sea and North Atlantic
		Commercial	True	Freely available
		Attributes	True	Habitat classifications
		Delivery	True	Downloadable via EMODnet Marine Habitat portal
		Usability	True	Data was downloadable in an accessible format as shapefiles
DT.Wind.NS026-EUSeaMap - predicted seabed habitat for Celtic, North, Baltic and western Med	Suitable	Contribution	True	SeaMap website is active but data download is directed to the EMODnet portal. Seabed habitat mapping was used only for reference in the windfarm challenge.
NSChlge-001-Windfarm Siting		Location	True	Covers North Sea and parts of the North Atlantic. Excludes Baltic, Southern Atlantic and Mediterranean
		Commercial	True	Freely available
		Attributes	True	Extensive attribution of habitat classifications including EUNIS
		Delivery	True	Downloaded via the EMODnet portal
		Usability	True	Useful in characterising both seabed habitats and comparison with seabed sediment information (in the absence of other sediment data)
DT.Wind.NS027-One Geology - geology for European seabeds	Used	Contribution	True	Offshore sediment mapping viewable via the mapviewer through the EMODnet geology tab
NSChlge-001-Windfarm Siting		Location	True	Europe
		Commercial	True	Freely downloadable
		Attributes	True	Attribute information had to be extracted from reports
		Delivery	True	Data downloadable as kml for terrestrial and marine geology and sediment data
		Usability	True	kml data could be converted for use in GIS but only as an image, therefore loosing all attribute information. Data was used as no other freely available data could be found.
DT.Wind.NS029-EEA elevation map 1000m cell size	Suitable	Contribution	True	Raster map of elevation for EU land areas. Provided at several scales along with a hilshade dataset
NSChlge-001-Windfarm Siting		Location	True	Europe
		Commercial	True	data was freely available
		Attributes	True	Raster data provides gridded height values
		Delivery	True	Data downloaded as an Tiff with associated projection file and metadata
		Usability	True	Usable format. For the wind farm siting challenge, potential wind farm locations are too far from land areas for elevation data to be significant
DT.Wind.NS031-EMODNET Physics portal for waves and wind	Null	Contribution	Null	The EMODnet Physics provides access to physical data and metadata, and contributes to developing of the Global Monitoring for Environment and Security (GMES) marine core service. Wind and wave data is available as time series from the portal.
NSChlge-001-Windfarm Siting		Location	True	Europe
		Commercial	True	data from the past 60 days is freely available for download whileaccess to older data (monthly archives) can be made after registration.
		Attributes	Null	
		Delivery	False	Difficult as a non-expert to filter the portal for potentially useful information. No data was downloaded.
		Usability	Null	
DT.Wind.NS040-EMODNET Human Activities portal for main ports	Suitable	Contribution	True	Dataset showing the locations of coastal and inland portsprovided as point and polygon data. Very useful for background mapping.
NSChlge-001-Windfarm Siting		Location	True	Data available for all of the North Sea and beyond.
		Commercial	True	Freely available
		Attributes	True	Data includes both point and polygon data for both coastal and inland ports.
		Delivery	True	Downloaded from portal as shapefiles
		Usability	True	Data could be used for the wind farm siting, although was not really required as other data was used for background mapping
DT.Wind.NS041-EMODNET Human Activities portal for hydro-carbon extraction	Considered	Contribution	True	Useful providing extensive data on hydrocarbon extraction infrastructure. Useful in identifying areas with high levels of industrial activity
NSChlge-001-Windfarm Siting		Location	True	Extensive data was available for the North Sea Basin.
		Commercial	True	Freely available
		Attributes	True	Data is provided as point data with information on operators, distance from coast and water depth.
		Delivery	True	Downloaded as an ArcGIS geodatabase
		Usability	False	The data could be used in combination with hydrocarbon license areas in Hydrospatial Base.For the wind farm siting data would have been more usefulprovided as polygons showing licence area extents. Therefore Hydrospatial Base was used.
DT.Wind.NS042-EMODNET Human Activities portal for dredging	Considered	Contribution	True	All existing licence areas required for the wind farm siting. Data was therefore downloaded and reviewed.
NSChlge-001-Windfarm Siting		Location	False	Plenty of records in the Baltic, and the Channel, but the data looks incomplete for the North Sea Basin. No records wrere available off the Dutch and German coasts. Therefore the data was not used for the wind farm challenge.
		Commercial	True	Freely available
		Attributes	True	Data provided as centroids for licence areas. The license area polygons would provide much more useful information.
		Delivery	True	Downloaded as an ArcGIS shapefile
		Usability	False	Data was displayed as point data. Therefore the extents of licence areas were not provided. Polygons showing the extent would be more useful for marine planning projects
DT.Wind.NS043-EMODNET Human Activities portal for fisheries zones	Considered	Contribution	False	Statistical fisheries data from ICES and FAO available for viewing and download via the portal.
NSChlge-001-Windfarm Siting		Location	True	Europe
		Commercial	True	Freely available
		Attributes	True	Could not connect to geodatabase
		Delivery	True	Two of the datasets could not be downloaded using the download buttobn but could be accessed via the source link in the metadata.
		Usability	True	Data was used for reference when looking at fisheries data
DT.Wind.NS044-EMODNET Human Activities portal for protected areas	Considered	Contribution	False	Although protected areas are required for the wind farm challenge, it was not downloaded as it could be sourced from elsewhere as shapefile rather than a csv
NSChlge-001-Windfarm Siting		Location	Null	
		Commercial	True	Freely available
		Attributes	Null	
		Delivery	True	Data is available for dowload as a CSV file
		Usability	Null	
DT.Wind.NS045-EMODNET Human Activities portal for waste disposal	Considered	Contribution	True	The dataset provided separate shapefiles for dredged spoil disposal and munitions dumping. Both datasets are of high importance when undertaking a wind farm siting exercise.
NSChlge-001-Windfarm Siting		Location	False	Coverage is not complete. No data was provided for the UK, Belgium, Holland or Germany apparent for spoil dumping or for ordnance disposal.
		Commercial	True	Freely available
		Attributes	True	Polygons provided for both munitions and spoil. Point data also provided for spoil dumping
		Delivery	True	Downloaded via EMODnet portal as shapefiles
		Usability	True	Usable format, the data was compared with Hydrospatial Base and found to be less complete.
DT.Wind.NS047-EMODNET Human Activities portal for wind farms	Considered	Contribution	True	Dowloaded as important to know where existing license areas are
NSChlge-001-Windfarm Siting		Location	False	windfarm locations only available for the Baltic area
		Commercial	True	Freely available
		Attributes	True	--
		Delivery	True	Downloaded via EMODnet portal as ArcGIS shapefile
		Usability	Null	
DT.Wind.NS051-Marine Spatial Planning for the Baltic Sea	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS052-Marine Spatial Planning for the Baltic Sea - Borders	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS053-Marine Spatial Planning for the Baltic Sea - ecology Pollution	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--

		Delivery	Null	-
		Usability	Null	
DT.Wind.NS054-Marine Spatial Planning for the Baltic Sea- ecology salmon rivers	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS055-Marine Spatial Planning for the Baltic Sea - people	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS056-Marine Spatial Planning for the Baltic Sea maritime traffic Shipping	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS057-Marine Spatial Planning for the Baltic Sea - maritime traffic Risks for large spills	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS058-Marine Spatial Planning for the Baltic Sea - maritime traffic Risks for small medium spills	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS059-Marine Spatial Planning for the Baltic Sea - maritime traffic fairways	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS060-Marine Spatial Planning for the Baltic Sea - fishing - fish spawning grounds	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS061-Marine Spatial Planning for the Baltic Sea - fishing - hydroacoustics	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS062-Marine Spatial Planning for the Baltic Sea - fishing - quarterly catches	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS063-Marine Spatial Planning for the Baltic Sea - fishing - quarterly catches - herring 2007-2009	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS064-Marine Spatial Planning for the Baltic Sea - energy - wind	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS065-Marine Spatial Planning for the Baltic Sea - Energy - cables and pipelines	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS066-Marine Spatial Planning for the Baltic Sea - nature protection areas	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS067-Marine Spatial Planning for the Baltic Sea - defence and scientific research - monitoring - coastal fish	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS068-Marine Spatial Planning for the Baltic Sea - defence and scientific research - monitoring - MORS station	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS069-Marine Spatial Planning for the Baltic Sea - - defence and scientific research - monitoring - Gillnet surveyes	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS070-Marine Spatial Planning for the Baltic Sea - - defence and scientific research - monitoring - Military	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	

DT.Wind.NS071-Marine Spatial Planning for the Baltic Sea - sand and gravel extraction - dredging	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS072-Marine Spatial Planning for the Baltic Sea - tourism and recreation - fairways and harbours	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS073-Marine Spatial Planning for the Baltic Sea - cultural heritage - archeology	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS074-Marine Spatial Planning for the Baltic Sea - cultural heritage -cultural areas (Fin)	NotConsidered	Contribution	False	null - more just fyi
NSChlge-001-Windfarm Siting		Location	False	Did not cover windfarm siting study areas
		Commercial	Null	-
		Attributes	Null	--
		Delivery	Null	-
		Usability	Null	
DT.Wind.NS075-European Atlas of the Seas - Under sea relief names	Considered	Contribution	True	Reviewed as part of the European Atlas of the Seas website, could be relevant to windfarm siting for refering to sea area locations
NSChlge-001-Windfarm Siting		Location	True	Covers European waters
		Commercial	True	Freely available
		Attributes	True	Point data providing location names
		Delivery	True	Downloaded as shapefile. Also available as txt
		Usability	True	Usable format, could be useful for making reference to sea areas, although the data was not used for the challenge.
DT.Wind.NS076-European Atlas of the Seas - Natura 2000 sites	Suitable	Contribution	True	Location and extents of Natural 2000 site. Required for wind farm siting - The data source was The European Environment Agency (EEA)
NSChlge-001-Windfarm Siting		Location	True	Covers European waters
		Commercial	True	Freely available
		Attributes	True	Layer file - Shows Habitat Directive Sites (SCIs) and Bird directive Sites (SPAs). Some metadata was provided on the link webpage
		Delivery	True	Layer file could be downloaded via an EEA page though the dataset was an older version of the one available through EMODnet. There was an aleart letting users know that a more up-to-date version of the data existed.
		Usability	True	Useful, as a link was provided to the EEA website. The link to the source webpage was more useful than the link to the data download map server page which was not easy to use providing access to data is several formats including ArcGIS viewer, kmz. The dataset downloaded via EMODnet was used for the challenge.
DT.Wind.NS077-European Atlas of the Seas - Marine Protected Areas	Considered	Contribution	True	Location of Marine protected Areas. Required for windfarm siting. Source was WDPA
NSChlge-001-Windfarm Siting		Location	True	Covers European waters
		Commercial	True	Freely available
		Attributes	True	Shapefile containing extents of MPAs
		Delivery	False	It was not possible to download the shapefile as the link to EC website was broken. The data was also available as KMZ or CSV but these were less useful and therefore other sources of MPA data were identified.
		Usability	Null	Data was not downloaded therefore usability was not assessed.
DT.Wind.NS078-European Atlas of the Seas - Coastal geology	Considered	Contribution	False	Characterisation of coastal geology - Provided by Eurosion. The data contains polylines showing coastal geolomorphology. This was not expected to be useful in meeting the requirements of the challenge.
NSChlge-001-Windfarm Siting		Location	True	Covers European Coastlines. No offshore data
		Commercial	True	Freely available
		Attributes	True	The dataset contains polylines showing coastal geolomorphology.
		Delivery	True	Downloaded as shapefile
		Usability	True	polygons showing marine sediment types would be more useful.
DT.Wind.NS080-European Atlas of the Seas -tidal amplitude	Considered	Contribution	True	Tidal amplitude measured in meters along the coast - Provided by Eurosion
NSChlge-001-Windfarm Siting		Location	True	Covers European waters
		Commercial	True	Freely available
		Attributes	True	point data providing a single value of tidal amplitude from 2005.
		Delivery	True	Downloaded as part of a hydrodynamics and sea level rise dataset from the EEA website. Lots of supporting documents provided
		Usability	False	The data was considered to be too out of data for use on the challenge though it was provided in a useful format.
DT.Wind.NS081-European Atlas of the Seas - Sea level change per year (mm)	Considered	Contribution	True	Sea level change measured in milimeters per year - Provided via Eurosion
NSChlge-001-Windfarm Siting		Location	True	Covers European waters
		Commercial	True	Freely available
		Attributes	True	Point data providing a single value of sea level change measured in 2005. Lots of supporting documents are provided
		Delivery	True	The data was downloaded as part of a hydrodynamics and sea level rise dataset from the EEA website.
		Usability	False	The data was considered to be too out of data for use on the challenge though it was provided in a useful format.
DT.Wind.NS083-European Atlas of the Seas - Average coastal wave height and direction	Considered	Contribution	False	Shows significant wave height in all directions along the coast - provided by Eurosion. The data only provides measurements along the coast. As other wind and wave data was available and could be processed for use in meeting the challenge, this dataset was considered but not used.
NSChlge-001-Windfarm Siting		Location	True	Covers European Coastlines
		Commercial	True	Freely available
		Attributes	True	Point data providing measurements for cardinal and intercardinal compass directions measured in 2005
		Delivery	True	Downloaded as part of a hydrodynamics and sea level rise dataset from the EEA website. Lots of supporting documents provided
		Usability	True	Higher resolution data is available from other sources, though they require interpretation of raw data, while this is a derived dataset which can be loaded straight into GIS.
DT.Wind.NS084-European Atlas of the Seas - Ferry routes	Used	Contribution	True	The dataset shows all important regular international and national ferry routes. This dataset was recognised as being useful for the challenge as it provides an Important indicator of shipping traffic - Source:EuroGlobalMap 5.1
NSChlge-001-Windfarm Siting		Location	True	Covers European waters
		Commercial	True	Freely available
		Attributes	True	Provided as shapefiles showing ferry ports as point data and routes as polylines
		Delivery	True	Delivered as shapefiles via Eurographics website. Requires registration
		Usability	True	useful and usable
DT.Wind.NS085-European Atlas of the Seas - Motorways of the sea	Used	Contribution	True	The dataset shows motorways of the sea, designed by the EC to improve cohesion in freight traffic. It shows areas likely to experience high levels of shipping traffic
NSChlge-001-Windfarm Siting		Location	True	Covers European waters
		Commercial	True	Freely available
		Attributes	True	Shows main trans-European shipping routes. The data is accompanied by supporting documentation on the Europa.eu website
		Delivery	True	Downloaded as a shapefile showing polylines
		Usability	True	useful and usable
DT.Wind.NS086-European Atlas of the Seas - Offshore wind farms (existing and consented)	NotConsidered	Contribution	True	Data on the location of offshore windfarms, very relevant to windfarm siting as there is a minimum distance requirement from existing license areas.
NSChlge-001-Windfarm Siting		Location	False	The data did not cover windfarm siting study areas. The shapefiles downloaded only contained data from Denmark and Sweden
		Commercial	True	freely available
		Attributes	True	Information on windfarm name, country, distance from coast and link to project website
		Delivery	True	Downloaded from EMODnet portal as shapefile
		Usability	False	The data does not cover the study area, otherwise, it would have been useful
DT.Wind.NS086-European Atlas of the Seas - Offshore wind farms (existing and consented)	Considered	Contribution	True	Provides the location of windfarms, relevant to windfarm siting as part of existing infrastructure - Source is UWEA via the Europa.eu website
NSChlge-001-Windfarm Siting		Location	True	Covers the southern North Sea
		Commercial	True	Freely available

		Attributes	False	The data was provided as point data which can be displayed by number of turbines. Spatial extents would be more useful for marine planning projects.
		Delivery	False	Data delivered as shapefile but with no co-ordinate reference system (CRS) or metadata containing recommended CRS so data does not map in the right place
		Usability	False	The data lacks CRS information and doesn't show license area extents, making it unuseable for the wind farm challenge
DT.Wind.NS087-European Atlas of the Seas - Marine energy production facilities	Considered	Contribution	True	shows the marine energy production facilities in Europe (existing, under construction and projects). It includes tidal power (barrage and stream), current power, wave power, osmotic power, thermal conversion power. Source - Ocean Energy Association, EMEC
NSChlge-001-Windfarm Siting		Location	False	Covers mostly the English Channel and Irish Sea. Not much data was available in the North Sea. As there was little coverage for the wind farm challenge study area, the data was not used.
		Commercial	True	Freely available
		Attributes	True	Data provided as point data recording the type of energy production and power output
		Delivery	True	Downloaded via Europa.eu as a shapefile
		Usability	False	Data was displayed as point data. Therefore the extents of licence areas were not provided. Polygons showing the extent would be more useful in meeting the requirements for marine planning projects.
DT.Wind.NS088-European Atlas of the Seas - Seabed sediments	Considered	Contribution	True	Point data showing seabed sediments. Very relevant but very few records were provided for the North Sea
NSChlge-001-Windfarm Siting		Location	False	Although the coverage was expected to be the EU, there were not many records outside of the Irish Sea. Therefore the data was not used to meet the requirements of the wind farm challenge.
		Commercial	True	Freely available
		Attributes	True	Downloadable as layer file or KMZ via a webserver. Not very clear to use. Provides information on sediment type, depth, sampling device and source
		Delivery	True	Downloadable as layer file or KMZ via a webserver. Not very clear how it could be used.
		Usability	False	Looked to identify better sediment data with greater coverage and displayed as polygons as it was not possible to map offshore seabed sediments from the data
DT.Wind.NS089-European Environment Agency - Maritime boundaries	Used	Contribution	True	Data showing International maritime limits. Useful in defining search areas for windfarm siting
NSChlge-001-Windfarm Siting		Location	True	Europe
		Commercial	True	Freely available
		Attributes	True	Attributes only contain codes. Need to use supporting resources and pre-symbolised layer to identify bourndary types.
		Delivery	True	Delivered as a shapefile accompanied by supporting documents and a range of mxds and a layer file.
		Usability	True	Very helpful, though much of the data within the mxd have broken source paths. This had to be resolved in order to use the data.
DT.Wind.NS090-European Environment Agency - Natura 2000 - spatial data	Used	Contribution	True	Extents of Natura 2000 sites. Very relevant
NSChlge-001-Windfarm Siting		Location	True	Europe
		Commercial	True	Freely available
		Attributes	True	Downloadable as a shapefile. Includes site names, country and classification. The data covers designations on land and sea.
		Delivery	True	Downloadable as a shapefile. There were however two datasets, an online search for Natura 2000 data led to a dataset published in 2010 on the EEA website while access via EMODnet led to a more up-to-date dataset published in 2013.
		Usability	True	Relevant and useful format once the data had been found.
DT.Wind.NS091-EMODnet - Seabed habitats - OSPAR habitats 2013	Considered	Contribution	False	OSPAR habitat map, available via EMODnet marine habitats portal, alonside MESH, EUSeaMap , EUNIS data. It was decided that habitat mapping would not be interpreted for the purpose of the challenge.
NSChlge-001-Windfarm Siting		Location	True	Mostly Northern Europe (France, UK, Germany, Ireland, Sweden, Norway). No data apparent for Belgium, Denmark or Netherlands
		Commercial	True	Freely available
		Attributes	True	Data included point and polygon shapefiles and associate layer files. Attributes included habitat types, status and data owners.
		Delivery	True	Downloadable as shapefile after filling in personal details and data use
		Usability	True	Usable for reference in combination with other habitat maps.
DT.Wind.NS092-EMODnet - Seabed habitats - National Maritime Landscapes	Considered	Contribution	False	Series of national habitat maps. UK data is a simplified gridded vector version of UKSeaMap data, with less attribute information. It was decided that habitat mapping would not be interpreted for the purpose of the challenge.
NSChlge-001-Windfarm Siting		Location	True	Uk, Netherlands, Belgium, France
		Commercial	True	Freely available
		Attributes	True	Variation in attribute field names and categories making data difficult compare or to bring together
		Delivery	True	Delivered as a zip file containing a shapefile for each country and supporting documentation
		Usability	True	Data would be useful and was provided in an accessible and well documented format, but was not required for the challenge.
DT.Wind.NS093-Windspeed database	Considered	Contribution	True	Resource which calculate suitable windfarm locations using a series of parameters. Very useful
NSChlge-001-Windfarm Siting		Location	True	Belgium, Denmark, Germany, Netherlands, Norway, UK
		Commercial	True	Freely available, required to create login
		Attributes	True	Takes acount of a broad range of parameters such as distance to shore, depth, windfarm size, human activities to produce maps showing site suitsbility
		Delivery	True	Produces maps as output grading areas by their exclusion count
		Usability	False	Have not managed to get the web resource to produce any results
DT.Wind.NS094-EMODNET Human Activities portal for mariculture	Considered	Contribution	True	The data was provided as a database containing mariculture species data. This would have been useful in meeting the requirements of the challenge if the coverage had been greater.
NSChlge-001-Windfarm Siting		Location	False	Data provided only provided coverage for a proportion of the wind farm study area, inlcuding data for the UK and Italy only, with no data available for the other North Sea countries
		Commercial	True	Freely available
		Attributes	True	Atributes describe specias and provide a location reference such as a region or town. Table structures vary between providers
		Delivery	True	Downloadable as Access database via EMODnet portal. No way of displaying the data spatially.
		Usability	False	With no way of spatial display, the data was of limited value to the windfarm siting challenge
DT.Wind.NS095-EMODNET Human Activities portal for aggregate extraction	Considered	Contribution	True	Data on the locations of aggregate license areas.
NSChlge-001-Windfarm Siting		Location	True	Mostly Channel and Baltic (France, UK, Denmark, Belgium)
		Commercial	True	Freely available
		Attributes	True	Point data provides information on source, type of extraction and purpose. Also provides a year
		Delivery	True	Downloadable as zip file containing a shapefile
		Usability	False	Data was displayed as point data. Therefore the extents of licence areas were not provided. Polygons showing the extent would be more useful
DT.Wind.NS096-EMODNET Human Activities portal for ocean energy facilities	Considered	Contribution	True	Wave and tidal energy facilities, would be useful where license areas or infrastructure are present
NSChlge-001-Windfarm Siting		Location	False	Provided no coverage for the wind farm study area. Data provided for Italy Spain Portugal and France
		Commercial	True	Freely available
		Attributes	True	Contained no data relevant to the study areas
		Delivery	True	database, opens in Access but not as a geodatabase in ArcMap.
		Usability	False	No data found for the study area, the data did not open as it should have in ArcGIS
DT.Wind.NS097-ERA Interim	NotConsidered	Contribution	True	ERA-Interim represents a third generation re-analysis of atmospheric data from 1979 to 2013.
NSChlge-001-Windfarm Siting		Location	True	Global dataset
		Commercial	True	Free to download
		Attributes	False	75km resolution, too coarse to be useful in this challenge. Data is delivered either in a netCDF or GRIB format
		Delivery	True	Data can be downloaded directly from the website after sign in via account
		Usability	False	Although the data is available in self describing netCDF with accompanying documentation and papers, it was too coarse to meet the requirements of the wind farm challenge
DT.Wind.NS098-NOAA Climate Forcast System	Used	Contribution	True	CFS Re-analysis data is a fully coupled model representing the interaction between the Earth's atmosphere, oceans, land and sea ice. The resource is particularly good for wave data
NSChlge-001-Windfarm Siting		Location	True	Global and regional sub models
		Commercial	True	Freely available
		Attributes	True	50km and 5-15km cell size for data
		Delivery	True	Partially available at time of challenge due to NOAA server crash. Full data set archived at HR Wallingford.
		Usability	True	Grid format with idiosyncratic longitude convention that needs confirming with documentation authors but the data did meet the requirements of the wind farm challenge. Ref: Saha, Suranjana, and Co-authors, 2010: The NCEP Climate Forecast System Reanalysis. Bull. Amer. Meteor. Soc., 91, 1015.1057. doi: 10.1175/2010BAMS3001.1
DT.Wind.NS099-GlobWave satellite data	Considered	Contribution	True	Wind and wave satellite data which would be suitable in meeting the wind farm challenge. The data was however ot used as coverage is patchy.
NSChlge-001-Windfarm Siting		Location	False	Has global decadal coverage though is patchy in places.
		Commercial	True	Freely available to download

		Attributes	True	Resolution is sparse and irregular but can be used for the challenge
		Delivery	True	Downloadable from the website
		Usability	False	The data is useful using a rpgram written in-house to extract the data and use it
DT.Wind.NS100-NEXT from OceanWeather	Considered	Contribution	True	Wind and wave data time series providing multi-decadal and regional for the North Sea
NSChlge-001-Windfarm Siting		Location	True	Multi-decadal and regional for the North Sea. Worldwide coverage, depending on data products. Extents available via the website
		Commercial	False	Expensive to access and download, £25,000 per point. Data sold by points and T&Cs preclude comparison with any other data set therefore not able to validate externally.
		Attributes	False	Data would be expected to be sufficient as it uses standard metocean variables. However, comparison against other datasets or observations is prohibited in the terms and conditions.
		Delivery	True	Data can be purchase through email exchange with OceanWeather
		Usability	True	Well documented, simple format.
DT.Wind.NS101-Met Office	Suitable	Contribution	True	Virtual Met mast and Wind data time series providing 34 year re-analysis model covering the North Sea.Would be useful in solving the wind farm challenge
NSChlge-001-Windfarm Siting		Location	True	35 year re-analysis model covering North Sea. Global, European and UK models running at 25km, 4km and 1.5km respectively are available
		Commercial	False	Charge £5000 per data point for wind and wave data
		Attributes	True	approximately 10km resolution and have Virtual Met Mast data available at additional cost with Global, European and UK models running at 25km, 4km and 1.5km respectively
		Delivery	True	Data access through correspondance, not as fast as downloading directly from website
		Usability	True	Data is provided as self-describing time series, making it easy to use for wind data modelling
DT.Wind.NS102-NORA10	Considered	Contribution	True	Wind data time series providing 10km re-analysis of data, from 1957 to present. Would be useful in solving the wind farm challenge
NSChlge-001-Windfarm Siting		Location	True	Covers whole North Sea and 6 hour temporal resolution
		Commercial	False	The data was too expensive to be used in solving the wind farm challenge, costing approximately £1000 per data point
		Attributes	True	10km re-analysis of wind data, from 1957 to present
		Delivery	True	Not easy to find on internet, once located avaialble through correspondance with authors
		Usability	True	Self-explantory time series once downloaded
DT.Wind.NS103-CCMP wind data	Used	Contribution	True	easily acccesible and suitable for the challenge
		Location	True	Global six hourly data set
		Commercial	True	Free to access
		Attributes	True	25km resolution, publically validated
		Delivery	True	access via website and OpenDAP server
		Usability	True	Publically available and well documented
DT.Wind.NS104-SeaZone Hydrospatial One - Bathymetry	Suitable	Contribution	True	Vector data containing depth areas
		Location	True	Extracted for project search area. Full coverage of North Sea. Coverage shown on webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributesusing S57 standard for Electronic Navigational Charts (ENC)
		Delivery	True	deliveried via online download link
		Usability	True	Provided as a data package with an mxd, making the data easy to use for planning. Depth areas are based on resolution of chart bathymetry and depth area ranges do vary in resolution
DT.Wind.NS105-SeaZone Hydrospatial One - Wrecks	Used	Contribution	True	Vector data containing wreck and obstruction data
		Location	True	Extracted for project search area. Full coverage of North Sea. Coverage shown on webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as points and polygons
		Delivery	True	deliveried via online download link
		Usability	True	Comprehensive database of wreck and obstruction sites in an accessible format
DT.Wind.NS106-SeaZone Hydrospatial One - Navigational channels	Used	Contribution	True	Vector data showing charted navigational channels
		Location	True	Extracted for project search area. Full coverage of North Sea. Coverage shown on webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Comprehensive data on navigational channels in an accessible format
DT.Wind.NS107-SeaZone Hydrospatial One - Aquaculture and Fisheries	Suitable	Contribution	True	Vector data showing licenced and charted aquaculture and fisheriy sites
		Location	True	Extracted for project search area. Full coverage of North Sea. Coverage shown on webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted data on fisheries available in an accessible format
DT.Wind.NS109-SeaZone Hydrospatial One - Cable and Pipeline installations	Used	Contribution	True	Vector data showing charted cables and pipelines
		Location	True	Extracted for project search area. Full coverage of North Sea. Coverage shown on webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted data on cables and pipelines available in an accessible format. Appeared to be comprehensive
DT.Wind.NS110-SeaZone Hydrospatial One - Traffic Regulation	Used	Contribution	True	Vector data showing charted shipping traffic regulation areas such as traffic separation zones. Useful in mapping shipping routes
		Location	True	Extracted for project search area. Full coverage of North Sea. Coverage shown on webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted traffic regulation areas available in an accessible format. Appeared to be comprehensive
DT.Wind.NS111-SeaZone Hydrospatial One - Dredged Areas	Suitable	Contribution	True	Vector data showing maintenance dredging areas. Useful in combination with depth areas.
		Location	True	Extracted for project search area. Full coverage of North Sea. Coverage shown on webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted dredged areas in an accessible format.
DT.Wind.NS112-SeaZone Hydrospatial One - Licenced Areas	Used	Contribution	True	Contains all licence areas for aggregate extraction and oil and gas licence areas
		Location	True	Extracted for project search area. The product provided full coverage of North Sea. The available coverage of data for Hydrospatial Base is shown on the SeaZone product webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted licence areas in an accessible format.
DT.Wind.NS113-SeaZone Hydrospatial One - Oil and Gas Activity	Suitable	Contribution	True	Contains all oil and gas licence installations as charted to S57 standard
		Location	True	Extracted for project search area. The product provided full coverage of North Sea. The available coverage of data for Hydrospatial Base is shown on the SeaZone product webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted oil and gas installations in an accessible format.
DT.Wind.NS114-SeaZone Hydrospatial One - Renewable energy activity	Suitable	Contribution	True	Contains all licence areas for renewable energy activity
		Location	True	Extracted for project search area. The product provided full coverage of North Sea. The available coverage of data for Hydrospatial Base is shown on the SeaZone product webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted renewable energy licence areas in an accessible format.
DT.Wind.NS115-SeaZone Hydrospatial One - Military activity	Used	Contribution	True	Contains all licence areas for military practice areas
		Location	True	Extracted for project search area. The product provided full coverage of North Sea. The available coverage of data for Hydrospatial Base is shown on the SeaZone product webpage
		Commercial	True	chargeable commercial product
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	deliveried via online download link
		Usability	True	Charted military practice areas in an accessible format.

DT.Wind.NS117-EEA Europe Coastline for analysis	Used	Contribution	True	The EEA coastline for analysis is created for highly detailed analysis, e.g. 1:100 000, for geographical Europe. The criteria for defining the coastline is the line separating water from land. The EEA coastline is a product derived from two sources: EU-Hydro and GSHHG. This was a suitable resolution for analysis and background mapping
		Location	True	Datasets covered the EU coastline
		Commercial	True	Data is freely downloadable from the EEA website
		Attributes	True	broad range of attributes using S57 standard for Electronic Navigational Charts (ENC). Data provided as polygons
		Delivery	True	Dowloadable as a zip file containing a polygon shapefile and a polyline shapefile
		Usability	True	High resolution land area data in an accessible format.
DT.Wind.NS118-The Crown Estate Windfarm Licence Areas	Used	Contribution	True	The Crown Estate supply maps and GIS data for all offshore activities within their remit. Data is very useful for planning and is kept up-to-date
		Location	True	UK only
		Commercial	True	Data is freely downloadable from the Crown Estate website
		Attributes	True	Broad range of data provided as a shapefiles including all licence and licence application areas, cables, meteorological equipment, and piplelines
		Delivery	True	Dowloadable as a zip file containing a series of shapefiles
		Usability	True	Useful data and had been regularly updated.
DT.Wind.NS121-UK Tidal Gauge Network Tidal predictions	Used	Contribution	True	Uk National Tidal Gauge Network data real time data, site information, highest recorded measurements and tidal range predictions are provided in tables on the National oceanogaphy Centre website.
		Location	True	UK only
		Commercial	True	Data is viewable on the NOCS website and dowwnloadable from the BODC website
		Attributes	True	Provide useful predictions of mean maximum and minimum tidal ranges for spring and neap tide at 44 coastal locations
		Delivery	False	Data can be viewed but not downloaded from the NOCS website
		Usability	True	Useful data afor documentary research
DT.Wind.NS120-BODC Tidal Gauge Network data	Used	Contribution	True	Uk National Tidal Gauge Network data providing values and residuals, extremes, surges and mean data monthly and annually for 44 locations around the UK coast.
		Location	True	UK only
		Commercial	True	Data is dowwnloadable from the BODC website free of charge for raw data while a charge will be made for processed data.
		Attributes	True	Provide useful predictions of mean maximum and minimum tidal ranges for spring and neap tide at 44 coastal locations
		Delivery	True	Data downloadable from BODC website following registration. Data is delivered as a zip file containing a series of .txt files accompanied by a licence agreement and supporting information
		Usability	True	Useful data afor documentary research

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A.3. Marine Protected Areas

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Growth & Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report - Marine Protected Areas

DLS0342-RT006-R02-00 August 2015

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Executive Summary

This document summarises the findings of the Marine Protected Areas challenge, conducted as part of the North Sea Checkpoint project (NSCP). This is the second of the project challenges to be completed.

This report is the sixth deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work for this Marine Protected Areas (MPA) Challenge was undertaken by MacAlister Elliot & Partners (MEP). This document is the second Data Adequacy Report (DAR) presenting the findings for a completed challenge.

Points for EMODnet

Bathymetry portal - If more complex larval connectivity analyses were to be conducted by a marine user, bathymetry datasets may prove to be very useful when modelling larval movement over certain ocean features.

Seabed Habitats portal - Datasets in this portal were useful the MPA Challenge. The broad scale habitats dataset (EUSeaMap) was downloaded for use in the 'Features and Representivity' aspect of the Challenge (see Section 5.1.2). The OSPAR habitat data set is also available for download from this portal. Both datasets were selected for use as they allowed full (albeit coarse) coverage of the North Sea basin.

- The EUSeaMap predictive habitat map did not fully cover the extent of the study area, whereas the OSPAR dataset did.
- The types of habitats represented are different: The EUSeaMap data set is based on EUNIS habitat classification and OSPAR has its own habitat classification
- The resulting 'Features and Representivity' statistics differed depending on the dataset. The majority of the OSPAR threatened and/or declining habitats were well represented within the MPA network, all having a significant number of replicates in MPAs, whereas the EUNIS habitats showed a more mixed picture. Many of the named habitats without a EUNIS code were bathyal (c. 1000-4000 meters depth) or deep sea habitats located around the coast of Norway or north of Shetland/Orkney, which are areas with relatively poor MPA coverage.

Biology portal - Generally, the data sets provided by the Biology Portal relate to data collected over short time periods or in relation to specific species in target locations, which was not useful for basin-wide analysis. Species distribution datasets were not at a useful level of detail for the MPA analysis. The species distribution datasets display the whole species range, and although some datasets are available for some species listed under Annex I and II and OSPAR, mapping their general range overlap with MPA distribution is too coarse a scale. More pertinently, not all species featured in the North Sea MPA network have datasets. Therefore, the type of dataset that would have been useful for this challenge would be have been a spatial data layer file, containing point data of the locations of Annex I and II and OSPAR species listed in North Sea MPAs. This would allow a marine user to easily identify to what extent the MPA network might protected these species. Most data is point occurrence, without consideration of species movements, even when seasonal distributions are known to alter.

Points for EMODnet

Human Activities portal - This provides a very useful data service for marine users wanting to get a general idea of the size of the North Sea MPA network. Some improvements could be made to variety of fisheries datasets that are available through this Portal. Data on fishing catches is useful, but in the context of MPAs, a more useful dataset for the future might be a data layer of seabed impact and/or fishing effort by various fishing gears. We acknowledge that this portal is still at an early state and has not yet fully populated its data catalogue.

Contents

Tables

1. Introduction

This report is the sixth deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work for this Marine Protected Areas (MPA) Challenge was undertaken by MacAlister Elliot & Partners (MEP). This document is the second Data Adequacy Report (DAR) presenting the findings for a completed challenge.

The Marine Protected Areas Challenge has addressed the stages of work required for a desk-based assessment to analyse the existing European (and Norwegian) network of marine protected areas, both for national and international sites, and to determine whether the network constitutes a representative and coherent network as described in article 13 in the Marine Strategy Framework Directive[1]. The assessment was made using publically available data or data provided upon request to national and international authorities.

All data gathered have been recorded in the data adequacy assessment database, providing a searchable record of each of the datasets reviewed for specific challenges. Although each of the challenges requires some form of technical analysis to be produced (in this case, one aspect is to produce statistics quantifying how ecologically connected MPAs are to each other), it is the process of data gathering, data appraising and final selection of datasets to undertake that analysis which is the most important aspect informing the overall objectives of the North Sea Checkpoint project.

In this context, the technical analysis presented here is a direct representation of the data available to a marine data user, who might wish to produce the outputs presented in this challenge, such as ecological statistics and Geographical Information System (GIS) maps.

2. Aim

The primary aim of the MPA challenge is to assess whether the data currently available from national and international organisations spanning the 8 focus countries in the North Sea are appropriate to determine whether the MPA network constitutes a representative and coherent network as described in article 13 of the Marine Strategy Framework Directive[1].

It was intended that the network of MPAs in the North Sea was analysed in terms of OSPAR's guidelines. As such, the main aims as specified in the project brief are as follows:

- **GeoDatabase.** Create a database designed to allow the creation of GIS outputs and the calculation of statistics. The database should show the following information for the North Sea MPA network:
  - Geographic locations (latitude and longitude) and sizes (km²) of MPAs.
  - Features of each MPA (Habitat Directive Annex I & II habitats and species, and OSPAR list of threatened and List of Threatened and/or Declining Species and Habitats).
  - Management of each site (i.e. designation status, fishing restrictions etc.).

[1] Marine Strategy Framework Directive: http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32008L0056&from=EN [Accessed: 14.04.2015].

- **Statistics & analysis.** Analyse the North Sea MPA network for ecological coherence in terms of the OSPAR guidelines[2]:
  - Features and Representivity: calculate how represented a particular feature (species or habitat) is in the network (i.e. how many times intertidal mudflat habitat appears in the North Sea MPA network).
  - Resilience: calculate the overall size of the North Sea MPA network and the proportion of each feature protected within the boundaries of each site.
  - Connectivity: using proximity as a proxy for connectivity, calculate how closely connected particular features are to each other in neighbouring MPAs.
  - Management: review the marine management for the study area to determine if the MPA network operates as part of a wider management structure.
- **GIS outputs**. Create GIS outputs from the database, including:
  - An interactive webmap, displaying all designated MPAs in the project area. Users should be able to click on a specific MPA to discover information about that site, such as that entered into the database.
  - Broad-scale overview GIS maps, highlighting MPAs from different countries in the project area.
  - Broad-scale overview GIS maps displaying the connectivity analysis.
- **Data adequacy**. Assess how well Aims 1-3 have been met based on the quality and availability of the data, analysed by the Data Screen Excel sheet (Appendix C), specific to the MPA challenge.

3. Context

European Union countries are currently implementing a network of Marine Protected Areas (MPAs) both in territorial and international waters. Norway is also implementing its own MPA network, as well as contributing to international MPA networks such as OSPAR. These networks are the combined result of ad hoc designation of protected areas for specific conservation requirements and a more structured effort in line with international, EU and national obligations.

International obligations include establishing a representative network of MPAs by 2012 (World Summit on Sustainable Development and Convention on Biological Diversity (CBD)) and an agreement between HELCOM and OSPAR to create a joint network, ecologically coherent with the Natura 2000 network by 2012. By 2016, this network should be well managed (OSPAR, 2013).

The EU has a number of directives including the Habitats Directive (92/43/EEC), Birds Directive (2009/147/EC) and Marine Strategy Framework Directive (2008/56/EC) that require the designation of MPAs in line with the 2012 CBD commitments.

[2] Since OSPAR's 2006 paper 'Guidance on developing an ecologically coherent network of OSPAR marine protected areas' (Ref number 2006-3), the way users have analysed ecological coherence has moved on from the simple 5 criteria.

The Marine Strategy Framework Directive states that:

'Programmes of measures established pursuant to this Article shall include spatial protection measures, contributing to coherent and representative networks of marine protected areas, adequately covering the diversity of the constituent ecosystems, such as special areas of conservation pursuant to the Habitats Directive, special protection areas pursuant to the Birds Directive, and marine protected areas as agreed by the Community or Member States concerned in the framework of international or regional agreements to which they are parties.'

This ambitious Directive aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend (EC, 2015).

This challenge is concerned largely with the term 'ecologically coherent' which is a principle also used in the European Directives and OSPAR literature. Although it has not been officially defined it is a principle that is now often used in MPA policy (Ardron, 2008). Increased focus has recently been directed at defining ecological coherence and developing methods to test it within MPA networks (OSPAR, 2008, OSPAR, 2006, Catchpole, 2012, Johnson *et al.,* 2014, Liberknecht *et al.,* 2014).

The principle of a representative and ecologically coherent MPA network is one that represents the full range of habitats and species in the target region; it is a solution to the problem of protecting whole ecosystems whilst having minimal disruption to marine industries. The full definition as perceived in the European Directives extends beyond just ensuring the whole range of habitats and species are protected. The network of MPA's should be spatially designed so that they allow for protection:

- across a target species range and migration;
- have sufficient coverage to allow for a viable population of the target species; and
- are connected in such a way that larval and juvenile dispersal is possible between sites.

They should also represent a suitable proportion of habitat or population of a species to make them resilient to disturbance or damage and lead to improvements towards a favourable conservation status.

To help member research institutions and marine users assess the ecological coherence of an MPA network, OSPAR (2006) defined a set of criteria that can each be examined[2]:

- **Features** – Purpose for which a site is designated (i.e. habitat, species or ecological processes);
- **Representivity** – The network represents the range of species and habitats present within the defined area (in this case, the North Sea basin and project area);
- **Connectivity** – How different sites are connected by ecological processes (migration, larval/juvenile exchange);
- **Resilience** – This is the ability of an ecosystem to recover from natural and anthropogenic disturbances. The level of protection allocated to a site, the size of each site and the number of replicates for a specific habitat or species will contribute to the resilience of the network;
- **Management** – The MPA network should operate within a wider strategy for ecosystem management that informs the specific management of the sites and promotes additional conservation measures that support the MPA network.

Member states are working towards Achieving Good Environmental Status (GES) in European and Norwegian waters, and marine users and managers can monitor progress via regularly published reports on new MPA designations (such as OSPAR's MPA Status Reports), and various interrogations of the ever-increasing pool of marine data (such as tests for ecological coherence).

In 2012, the latest status update from OSPAR revealed that the OSPAR MPA Network comprised a total of 333 sites, covering 5.17% of the OSPAR maritime area in the North-East Atlantic. The Greater North Sea region was the best represented, with MPA coverage of 10.39% (OSPAR, 2013). The next OSPAR update is due in 2015.

This challenge aims to assess ecological coherence (albeit at a relatively coarse level) over the MPA network of the North Sea using the latest marine data available from international institutions and national institutions from the U.K, Germany, France, the Netherlands, Sweden, Norway, Belgium and Denmark. The political will to meet the objectives of international marine goals, the drivers to gather and archive marine data, and the methods of data gathering, delivery and formatting will vary greatly between countries.

This project aims not only to make marine data relating to MPAs more accessible, but aims to highlight gaps in the MPA data network that might restrict marine users in assessing whether GES or ecological coherency is being achieved. Method.

There are three separate stages to this challenge, including data gathering, data analysis and a data adequacy assessment. These are detailed below.

3.1. Data gathering

Several MPA data categories had been identified from which to gather information, in order to provide information for an assessment of ecological coherence. These included:

- Geolocation of MPAs;
- Size of MPAs;
- Annex 1 & 2 habitats and species (and non-EU classified protected species and habitats – for Norway) present in MPAs;
- Management measures relevant to each MPA.

(Note: larval data has been removed from the MPA analysis as it was too sporadic to apply to a basin-wide test. Other measures of connectivity have been used, as detailed below).

It was decided that data should be collected at the international level initially (e.g. the European Environment Agency's Natura 2000 MPA list or OSPAR's MPA list) for MPAs that were relevant to this project, and then at the national level, in order to account for country-specific MPA plans and designations. It was hoped that this would create the most comprehensive list of MPAs in the North Sea Basin. The 8 countries of focus include the UK, France, the Netherlands, Denmark, Belgium, Sweden, Germany and Norway.

The first stage was to identify all relevant MPAs that have been designated in the project area, which facilitated the identification of each data category thereafter.

Desk-based internet searches were conducted initially, followed by direct contact with national agencies in Member States and other agencies including the OSPAR Secretariat in an attempt to fill data gaps during data collection. A list of the contacts made is included in Appendix A.

3.2. Data analysis

Several outputs for this challenge were required (as detailed in Section 2) and the method adopted to produce them was as follows:

GeoDatabase:

Relevant marine protected areas within the study area were identified and acquired. The OSPAR set of MPAs was used as a starting point and some components were replaced where a newer source was identified (e.g. UK SACs). Nationally designated MPAs were added and the data checked against countries national spatial datasets where they were identified and also compared to the world database on protected areas.

Once identified, any geographic projections were removed from the various datasets and the datums converted to WGS84. This was chosen as a suitable base for distributing the data. Prior to statistics being generated, the data were projected to Albers equal area conic (ESRI WKID: 102013) using the European 1950 datum (ESRI WKID: 4230).

Common fields (MPA name, designation, source, date/version code, status, contracting party, Natura ID, any other IDs, licensing information) were populated for each dataset and any MPAs that had been provided as multiple single parts were combined into multi-polygon features. The data were then amalgamated into a single feature class and assessed, checking for duplicates, geometry errors and typographical issues (e.g. malformed Unicode characters).

An ESRI layer file package was produced. This contains the MPA data and some basic background mapping (land and maritime boundaries). ESRI ArcGIS users can use this directly to map the data and others can use the free ArcGIS Explorer software (for Microsoft Windows operating systems) which can be freely downloaded from the ESRI website.

The data were also provided as a SpatiaLite database, chosen for its compatibility with Open Source GIS software as well as newer versions of ESRI ArcGIS.

Interactive web map:

A web map was produced to allow users to interactively explore and query the data at multiple spatial scales. The website uses the Django and Leaflet libraries to display and query data rendered by GeoServer. On querying an MPA, information is provided in a pop-up, including any management information found and, for OSPAR MPAs, species and habitats mentioned in the OSPAR database and/or provided in the GeoDatabase.

Broad-scale overview maps:

Broad-scale overview maps were produced from the data in the GeoDatabase, highlighting MPAs from different countries. These were only produced at a large scale as the sheer number of MPAs would have required a significant number of maps to be of any use at small scales.

Ecological coherency analysis:

The method used for this challenge is based on the approach suggested by OSPAR to assess ecological coherence[2], described above. Full details are available from OSPAR (2006).

Prior to statistics being generated, the data from the GeoDatabase were projected to Albers equal area conic (ESRI WKID: 102013) using the European 1950 datum (ESRI WKID: 4230).

- Features and Representivity:

  Features can either be habitats or species (an aspect for which an MPA might be designated). Calculations for this OSPAR criterion have only taken into consideration habitats, as georeferenced species data was not available for the entire study area, whereas they were for habitats.

Two habitat data layers were used in this part of the analysis, the OSPAR threatened and/or declining habitat layer and the EUSeaMap predictive habitat map (at EUNIS level 2) for comparison. The EUSeaMap predictive map does not fully cover the study area.

The flattened MPA layer[3] was intersected with the data layers. Any resulting sections of habitat that were smaller than 0.24km^2 were then removed (Piekainen and Korpinen (2008) in HELCOM (2010) and Johnson *et al*. (2013)). HELCOM (2010) also didn't consider habitat sections that were less than 3% of the habitat within the MPA. The volume of MPAs assessed here precluded this being calculated in the time available. The HELCOM threshold was chosen as a coarse viability cut-off. Another option, for broad-scale habitats, is the threshold given in the English MCZ Ecological Network Guidance (Natural England and Joint Nature Conservation Committee, 2010) of a 5km^2 minimum patch size.

Replicates were colour coded at two thresholds. The English MCZ project set minimum criteria of two replicates for each broad-scale habitat present in each regional project (Natural England and Joint Nature Conservation Committee, 2010) and HELCOM sets a minimum of three examples of a representative habitat in each region (HELCOM, 2010).

- Resilience:

Calculating overall size of MPA network: overall area covered by MPAs was calculated using the ArcGIS dissolve function to flatten the MPA layer into a single multi-part polygon[3]. This was then clipped to the study area.

Calculating MPA size diversity in network: the MPAs were grouped by area (geometrically increasing with a factor of 2) and a histogram produced, the whole MPA boundaries were used for this, so some of the area represented falls outside of the study area.

- Connectivity:

The flattened MPA layer was buffered to 40km, equivalent to a maximum distance of 80km between sites. This threshold is based on the maximum recommended distance in Roberts *et al.* (2010) used in the English MCZ project.

Coarse proximity tests: The use of buffers is a coarse proxy for connectivity. The flattened MPA layer was buffered to 40km, equivalent to a maximum distance of 80km between sites. This threshold is based on the maximum recommended distance in Roberts *et al.* (2010) used in the English MCZ project. The results were then mapped on GIS.

A small protected area has the same buffer applied as does a large one so other connectivity tests were conducted.

Kernel density analysis: this is used to show the effect of MPA size and density, using a linear decay function to highlight proximity and the biggest spatial gaps in the MPA network (Johnson *et al.*, 2014). For each OSPAR habitat, a kernel density analysis was performed with a search radius of 40km. 40km was chosen from Roberts *et al*. (2010), where the movements for 67 different species were modelled and spacing of 40-80km recommended. The density analysis takes into account the amount of existing protected habitats (within the specified search radius). The results were then mapped on GIS.

[3] Sites were further processed for the purposes of this analysis by flattening them into contiguous polygons (ArcGIS dissolve function, limited to single part polygons), this ensures that areas and replicates are only counted once. This is referred to below as the 'flattened MPA layer'.

- Management assessment:

  In addition to internet searches, direct contact with national agencies in Member States and other agencies including the OSPAR Secretariat in an attempt to fill data gaps during data collection. The data on management collected was collated and presented in a spreadsheet attached (Annex B). An initial assessment of the management data available in terms of its adequacy and usability for assessment of ecological coherence is provided below. Challenges and constraints in data collection and usability are also discussed.

3.3. Data adequacy assessment

This process of data gathering, data screening and final selection of datasets to undertake that analysis is core to the aims of the North Sea Checkpoint project and is described in detail in Section 6.2. The methodology for this process, designed by HR Wallingford, is detailed in DLS0342-RT002-R1-00 Growth and Innovation in the Ocean Economy: North Sea Checkpoint: Data Adequacy Report 01, including literature survey, August 2014.

4. Data

A broad range of data has been identified, downloaded where possible and reviewed for the challenge. The data was sourced primarily through online resources including:

- International: EU websites: European Environment Agency, EUNIS, EMODnet;
- International: IUCN World Database of Protected Areas;
- International: OSPAR Marine Protected Areas;
- International: Ramsar Sites Information Service (RSIS);
- UK: JNCC, Scottish Natural Heritage, Natural England;
- Denmark: Danish Nature Agency (Naturstyrelsen);
- Belgium: Management Unit of the North Sea Mathematical Models (MUMM), Belgium Coastal Atlas, VLIZ (Flanders Marine Institute);
- France: French Agency for Marine Protected Areas (Agence des aires marines protégées – AAMP), Inventaire National du Patrimoine Naturel (INPN);
- Germany: Federal Agency for Nature Conservation (BFN), Federal Maritime and Hydrographic Agency (The Bundesamt für Seeschifffahrt und Hydrographie – BSH);
- Norway: Norwegian Environment Agency;
- Sweden: Swedish Environmental Protection Agency, Geodata Sweden, Swedish Agency for Marine and Water Management;
- The Netherlands: IMARES, National Government Nordzeeloket.

All data identified has been recorded in the data register (Appendix C).

Following an initial assessment of data accessibility and fitness for purpose, a small number of datasets have been used in the analysis for the challenge. The data considered suitable for use in the challenge is listed in Table 4.1. Details of the datasets reviewed and either excluded or considered but not-used are provided in Appendix C.

Table 4.1: Datasets considered suitable in the marine protected areas challenge

Data	Inspire theme	Sources Suitable
Species data	3.19 Species distribution 1.9 Protected sites	DT.Mari.NS004-Natura 2000 European database: directive species table DT.Mari.NS011-Natura 2000 European database: other species table DT.Mari.NS012-Natura 2000 European database: species table
Habitats data	3.18 Habitats and biotopes 1.9 Protected sites	DT.Mari.NS005-Natura 2000 European database: habitat class table DT.Mari.NS006-Natura 2000 European database: habitats table
Management information	1.9 Protected sites 3.11 Area management/ restriction/ regulation zones & reporting units	DT.Mari.NS016-Natura 2000 barometer statistics DT.Mari.NS018-EEA Nationally designated areas (CDDA) database: designations table DT.Mari.NS038-UK MCZ formal designation orders DT.Mari.NS039-Scotland MPA designation orders DT.Mari.NS056-French Marine Natura 2000 Designation Plan DT.Mari.NS058-French Marine Natura 2000 Designation Information (Beyond Territorial) DT.Mari.NS073-Norwegian Environment Agency Naturebase: Marine Protection Plan DT.Mari.NS081-Netherlands Marine Management Information DT.Mari.NS091-Swedish Regulation of Fishing in MPAs report. DT.Mari.NS094-UK MCZ designation update DT.Mari.NS100-Belgian Royal Decree for the creation of protected areas
MPA boundary spatial data	1.9 Protected sites	DT.Mari.NS015-Natura 2000 metadata DT.Mari.NS024-EEA Nationally designated areas (CDDA): GIS data DT.Mari.NS034-GIS map of Denmark Natura 2000 sites DT.Mari.NS042-Scotland GIS Shape files for both the Inshore and Offshore MPAs DT.Mari.NS076-Belgian Interactive Coastal Map: Downloadable GIS files. DT.Mari.NS090-Swedish Geodata Interactive Map Portal.

Data	Inspire theme	Sources Suitable
MPA information (i.e. size, area, location)	1.9 Protected sites	DT.Mari.NS010-Natura 2000 European database: Natura2000 sites table DT.Mari.NS013-Natura 2000 European database - CSV format DT.Mari.NS019-EEA Nationally designated areas (CDDA) database: sites table DT.Mari.NS022-EEA Nationally designated areas (CDDA) database: national overview table DT.Mari.NS023-EEA Nationally designated areas (CDDA) database - CSV format DT.Mari.NS035-Denmark list of habitats and birds each Natura 2000 site covers
Interactive maps	1.9 Protected sites	DT.Mari.NS017-Public Natura 200 Network Viewer Map DT.Mari.NS037-UK JNCC Interactive MPA map DT.Mari.NS046-OSPAR MPAs visual interactive network map DT.Mari.NS061-French Protected Areas Online Interactive Map DT.Mari.NS064-French Protected Areas Online Interactive Map via AAMP DT.Mari.NS076-Belgian Interactive Coastal Map: Downloadable GIS files. DT.Mari.NS090-Swedish Geodata Interactive Map Portal
Informative websites	1.9 Protected sites	DT.Mari.NS057-French Marine Sites: Various Protection Measures DT.Mari.NS063-Information & Contacts: Implementation of MSFD in France DT.Mari.NS094-UK MCZ designation update

Table 4.2: Datasets used in the marine protected areas challenge

Data	Inspire theme	Sources Used
Species data	1.9 Protected sites 3.11 Area management/ restriction/ regulation zones & reporting units 3.19 Species distribution	DT.Mari.NS044-OSPAR MPA Network Database DT.Mari.NS099-Belgian Birds Directive Information
Habitats data	3.18 Habitats and biotopes 1.9 Protected sites 3.11 Area management/ restriction/ regulation zones & reporting units	DT.Mari.NS044-OSPAR MPA Network Database DT.Mari.NS101-Belgian Habitats Directive Information DT.Mari.NS117-OSPAR threatened and/or declining habitats GIS data DT.Mari.NS118-EUSeaMap Habitat GIS data
Management information		DT.Mari.NS060-AAMP: Information on French marine data collection programme. DT.Mari.NS065-French Natura 2000 Marine Site Implementation Information (AAMP) DT.Mari.NS083-Wadden Sea Information: 2010 Plan DT.Mari.NS087-German Natura 2000 Sites Designation Information DT.Mari.NS088-German North Sea Natura 2000 Sites Designation Information DT.Mari.NS099-Belgian Birds Directive Information DT.Mari.NS101-Belgian Habitats Directive Information DT.Mari.NS102-Germany Schleswig-Holstein Wadden Sea National Park Information DT.Mari.NS103-German Dogger Bank MPA Site Information DT.Mari.NS104-German Sylter Aussenriff / Oestliche Deutsche Bucht MPA Site Information DT.Mari.NS105-German Seevogelschutzgebiet Helgoland MPA Site Information DT.Mari.NS106-German Borkum-Riffgrund MPA Site Information DT.Mari.NS108-Danish Nature Agency Natura 2000 Marine Plans DT.Mari.NS109-German National Park Act DT.Mari.NS110-French law on national parks, marine parks and regional parks DT.Mari.NS112-French Iroise national marine park

Data	Inspire theme	Sources Used
		Information DT.Mari.NS113-Netherlands Natura 2000 site Information: management plans DT.Mari.NS114-Danish Nature Agency Natura 2000 Legislation Page
MPA boundary spatial data	1.9 Protected sites	DT.Mari.NS014-Natura 2000 GIS data DT.Mari.NS043-UK MPAs (SACs, SPAs, Ramsar, OSPAR) GIS data (& links to attribute data) DT.Mari.NS045-OSPAR MPAs Network GIS shapefile DT.Mari.NS047-IUCN WDPA Interactive map & downloadable GIS files DT.Mari.NS062-French Georeferenced data on Marine Habitats DT.Mari.NS067-UK Natural England GIS Datasets DT.Mari.NS069-Norwegian Environment Agency Naturebase Data DT.Mari.NS071-Norwegian Environment Agency: First 36 Marine Areas Dataset DT.Mari.NS072-Norwegian Environment Agency Naturebase: MPAs DT.Mari.NS116-RAMSAR sites webviewer & GIS downloads
MPA information (i.e. area, location)	1.9 Protected sites	DT.Mari.NS044-OSPAR MPA Network Database DT.Mari.NS086-German Natura 2000 Sites Information
Informative websites	1.9 Protected sites 3.11 Area management/ restriction/ regulation zones & reporting units	DT.Mari.NS060-AAMP: Information on French marine data collection programme. DT.Mari.NS065-French Natura 2000 Marine Site Implementation Information (AAMP) DT.Mari.NS077-Netherlands Information About MPAs DT.Mari.NS083-Wadden Sea Information: 2010 Plan DT.Mari.NS086-German Natura 2000 Sites Information DT.Mari.NS102-Germany Schleswig-Holstein Wadden Sea National Park Information DT.Mari.NS103-German Dogger Bank MPA Site Information DT.Mari.NS104-German Sylter Aussenriff /

Data	Inspire theme	Sources Used
		Oestliche Deutsche Bucht MPA Site Information DT.Mari.NS105-German Seevogelschutzgebiet Helgoland MPA Site Information DT.Mari.NS106-German Borkum-Riffgrund MPA Site Information DT.Mari.NS107-EUNIS MPA Site Information Summaries DT.Mari.NS112-French Iroise national marine park Information DT.Mari.NS114-Danish Nature Agency Natura 2000 Legislation Page DT.Mari.NS115-UK MPA Information Pages
Other spatial data	1.2 Geographical grid systems	DT.Mari.NS119-Maritime EEZ boundaries (v8) spatial data

The MPA challenge is primarily based on spatial analysis and for the production of an interactive MPA map, GeoDatabase and other GIS maps of MPA distribution and connectivity, the challenge required data to be made available in formats which could be easily manipulated in GIS systems. 13 spatial data sets (including 10 MPA boundary datasets, 2 habitat datasets and 1 maritime boundary dataset) were selected for the final analysis and were easily obtainable via national and international data portals. The datasets were available without cost and were easily edited in GIS software to be relevant to the study area.

It is of note that the sources of these datasets, OSPAR and the EEA, have lags in updating their MPA databases. It is recommended prior to the completion of this challenge, updates are taken into account on the GeoDatabase. This will ensure EMODnet is displaying the most representative dataset for the North Sea MPA network.

The spatial datasets were supplemented with information required for other aspects of the MPA analysis, such as MPA management plans and relevant legislative tools. The discoverability and accessibility, format and usability of these supplementary data varied. This is due to the numerous organisations from which data were sourced. EU data standards were helpful for basic information on designations of MPAs but countries will implement MPA management plans at different paces and so availability of these data varies. Language was also a restriction when locating national information in some countries.

As the study area includes the waters of 8 countries, data need to be sourced from separate national organisations. These datasets were used to supplement and update those obtained from international organisations such as OSPAR. All datasets were found by internet search, rather than provided via request to organisations. In terms of cost, most data were free download and often immediately available, without registration.

A full data adequacy assessment is provided in Section 6.2 but some general trends and trends for each datatype are summarised below.

Species data:

There was a paucity of spatial species data (i.e. abundance of a particular species per square metre) for the entire project area. However, there are regions of the study area and North Sea basin that do have detailed species data that are available in spatial format, such as Annex II species data in UK territorial waters. With

more time to collect available detailed spatial species datasets (or more pertinently, with more time for organisations to create them), ecological coherence could be more robustly assessed. For this challenge, ecological coherence calculations therefore focus on habitats data.

The species data presented in this challenge include the species listed under an MPA designation, from the OSPAR and EEA databases. This information can be easily extracted and uploaded to GIS outputs such as interactive MPA maps with dropdown menus. Species include those listed under Annex II of the Habitats Directive, under the Birds Directive and under OSPAR's list of threatened declining species and habitats.

Habitats data:

Spatial habitats datasets were available from OSPAR and EUSeaMap, with OSPAR habitat data covering the entire project area, allowing the calculation of various ecological coherency criteria. The GIS files were readily available from the respective websites and easily edited to fit the project area. The datasets are available free of charge but may be a few years out-of date. The EUSeaMap dataset was version 201208. As coherency and connectivity between MPAs is being assessed over the entire North Sea basin, these habitat datasets are deemed to be appropriate for a coarse assessment, as used in this challenge. More detailed spatial datasets are available for particular habitats where research has been focused, such as for seagrass habitats, but were not appropriate for a basin wide analysis. The OSPAR and EEA MPA databases list habitats for which MPAs have been designated, which has been subsequently incorporated into the GeoDatabase and interactive webmap.

The habitats included in this MPA challenge include those listed under Annex I of the Habitats Directive, and under OSPAR's list of threatened declining species and habitats.

Management information:

There are many MPA designations in the study area but in most cases it appears that detailed management information is unavailable. Ideally for this challenge, management information would be provided in entries to the EU and OSPAR databases, including information such as links to management plans, legislative instruments and restrictions. Individual searches through organisations was therefore required. Management plans were available for some countries but language barriers restricted searches. In very few cases were activity and extraction restrictions published which is likely a product of slow progress in implementing management measures for MPAs. The interactive web map collates the most up-to-date information found and represents the current status of management of the North Sea MPA network. See Appendix B for all management information collected.

MPA boundary spatial data:

Appropriate spatial datasets for MPA boundaries (including information such as size/area, geographic location) were available from EU and OSPAR data portals, supplemented by datasets from UK organisations such as the JNCC and Natural England, from the French Marine Protected Areas Agency (AAMP), from the Norwegian Environment Agency, and from the IUCN's World Database on MPAs. These datasets were used for specific types of MPAs that were not covered by the EU and OSPAR databases, such as Special Protected Areas (SPAs), Marine Nature Reserves (MNRs), Ramsar sites, Sites of Special Scientific Interest (SSSIs) and National Marine Parks. These datasets will need to be updated in line with new designations and updates to national and international databases.

Temporal resolution of the EU and OSPAR databases and associated GIS files cover to the end of 2013. It is expected that databases will be updated in 2015. Metadata are available for most datasets along with

automatically downloaded licences. UK spatial datasets vary in their temporal resolution, from 2011-2014. However, these are the most comprehensive datasets for UK MPAs. Maritime EEZ boundaries are version 8.

5. Results

5.1. Challenge output

5.1.1. Introduction

This analysis presents the results of a basin wide data collection exercise that aimed to provide the most up-to-date information relating to designated and classified Marine Protected Areas in the North Sea, for the 8 countries specified in the project brief. The MPA challenge has been successful in collating this information, although large gaps were seen in certain data categories, such as information relating to the management of MPAs.

The data are analysed with a view to discover whether the North Sea MPA network constitutes a representative and coherent network as described in Article 13 of the Marine Strategy Framework Directive. This analysis presents the results of a series of spatial and statistical tests of the ecological coherence of the North Sea's MPA network, based as far as possible on OSPAR's ecological coherence criteria. These tests are one of many ways marine users can test for representative and coherent network. These tests include coarse and fine proximity tests determined by the quality and availability of the data available for each test.

5.1.2. Analysis

Analysis was split into several parts. An overall picture of the network is first presented, which includes an interactive MPA map explorer. Analyses of ecological coherence are subsequently undertaken.

It is of note here that due to the lack of spatial species data for the North Sea basin, ecological coherency tests have been run on habitat data only. This is particularly pertinent to Annex I and II European habitats and species, as there is no spatial data available for these, so we were not able to assess (using ecological coherency statistics & GIS) to what extent these features were covered in the North Sea MPA network.

OSPAR guidance recognises that the network cannot reasonably be expected to be designed to incorporate the movements and life histories of all species so the habitat analysis presented for ecological coherency here comes with this caveat

The North Sea MPA Network:

Relevant marine protected areas within the study area were identified and acquired. The OSPAR set of MPAs was used as a starting point and some components were replaced where a newer source was identified (e.g. UK SACs). Nationally designated MPAs were added and the data checked against countries national spatial datasets where they were identified and also compared to the IUCN's World Database on Protected Areas.

Broad-scale overview maps were produced, highlighting MPAs from different countries. These were only produced at a large scale as the sheer number of MPAs would have required a significant number of maps to be of any use at small scales.

Figure 1 (see Appendix E) shows all MPAs in the study area from various designations including Marine National Parks, Marine Nature Reserves, SACs, SPAs with marine components, RAMSAR sites, SSSIs and

MCZs (all UK only). 444 MPAs have been identified, which cover 10.9% (91,151km²) of the 833,179 km² of the study area. This list is not exhaustive as regional and local designations are not included so actual coverage of MPAs is likely to be higher.

In 2010, contracting parties of the Convention on Biological Diversity adopted the Aichi biodiversity targets, including Aichi target 11[4]:

'By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.''

Without considering any management of the included MPAs, this area meets Aichi target 11. However, note that the distribution of MPAs is somewhat uneven, skewed towards the south of the study area and coastal regions. The Norwegian Sea shows the least MPA coverage. Aichi target 11 also highlights that areas of particular importance for biodiversity and ecosystem services be covered, something has not been assessed as part of this coarse statistic.

Figures 2-5 show more zoomed versions of Figure 1, showing MPA distribution in more detail in the English Channel, the North Sea, Norwegian Sea and Scandinavia in more detail.

To better enable end users to explore the data, two products were produced:

- An ESRI layer file package was produced. This contains the MPA data and some basic background mapping (land and maritime boundaries). ESRI ArcGIS users can use this directly to map the data and others can use the free ArcGIS Explorer software (for Microsoft Windows operating systems) which can be freely downloaded from the ESRI website.
- A web map was also produced to allow users to interactively explore and query the data at multiple spatial scales. The website uses the Django and Leaflet libraries to display and query data rendered by GeoServer. On querying an MPA, information is provided in a pop-up, including any management information found and, for OSPAR MPAs, species and habitats mentioned in the OSPAR database. This can be found here: http://dgm.marinemapping.com/ .

The data were also provided as a SpatiaLite database, chosen for its compatibility with Open Source GIS software as well as newer versions of ESRI ArcGIS. The databases can be found here: http://data.marinemapping.com/dgm/ .

Ecological Coherency in the North Sea MPA Network:

The concept of ecological coherence arose out of the recognition that a network of protected areas should ideally be regarded as a whole, greater than the sum of its individual protected areas (Lieberknecht *et al.,* 2014). Achieving ecological coherence has become part of international marine policy and is being used in this challenge to gauge (at a very coarse level) whether the North Sea MPA network is meeting international obligations. Such international obligations have already been mentioned in this report, primarily focusing on the idea of a representative and coherent network, as described in article 13 of the Marine Strategy Framework Directive.

[4] Aichi target 11: www.cbd.int/sp/targets/default.shtml

OSPAR (2008) gives guidance on testing ecological coherence, which has been built on since (Johnson *et al.,* 2014) and can be tested using a series of coarse and fine filter tests. The results of these tests are provided below.

Disclaimer: all statistics are only accurate in so much as they reflect the accuracy of the data. Reasonable effort has been made to use the best available data that is consistent over the project area. However, known major data gaps and inaccuracies are inevitable in data covering such large areas and in multi-national jurisdictions.

Coarse filter tests:

These provide a rapid, simple and general assessment of whether or not there are big gaps in the MPA spatial network structure. They tend to overestimate the ecological coherence of the network, only identifying the largest and most significant gaps (Lieberknecht *et al.,* 2014). These tests are relatively simple to complete, and do not require species or habitat distribution data and as such, they are a suitable first step, especially in data-limited situations or in this case, where the study encompasses 8 countries and is basin-wide. The coarse filter tests used in this challenge include **Resilience** and **Connectivity**.

- Resilience:

The first test for resilience looked at the size of the network (explained above) where the criterion, covering 10.9% of the study area, meets Aichi target 11[4].

The second resilience tests looks at the diversity of MPAs in the network, such as the number, size and size distribution.

The total number of MPAs that intersect the study area is **444**. It is likely that some relevant MPAs have been excluded, as the coastal component of the study area polygon (provided by HR Wallingford) is particularly coarse. As such, a larger number of potentially interesting MPAs have been provided as part of the data supply. Of these 444, they range from **0.007 km^2** (Dyer's Quarry SSSI) to **12,337 km^2** (Dogger Bank SAC). The median size is **21.8 km^2** and the mean **259.1 km^2**.

The MPAs were then grouped by area (geometrically increasing with a factor of 2) and a histogram produced (see Figure 6). The whole MPA boundaries were used for this, so some of the area represented falls outside of the study area. The histogram shows that the majority of MPAs are relatively small, 1km^2 and under.

- Connectivity:

Connectivity, the ecological links between different areas, is primarily important for two reasons: minimising risk of local extinction in isolated sites and maintaining genetic diversity. It is particularly challenging to apply the principles of connectivity in practice as it requires an understanding of larval dispersal and adult movements, which are dependent on hydrographic conditions. These then have to be assessed for each of the different species being considered (different species may have wildly different rates and ranges of movement and dispersal).

Within the study area, Moksnes *et al.,* (2014) evaluated the effects of larval connectivity in benthic communities within MPA networks in the Kattegat-Skagerrak area of the North Sea. They concluded that most MPAs in the area are sub-optimally located and too small to allow self-recruitment for the targeted organisms.

While it is desirable to take connectivity into account when designing and designating MPAs, it is challenging to apply in practice. Knowledge of oceanographic conditions in both the local and wider area will be necessary and, for each species considered, an understanding of larval dispersal and, potentially, adult movements. As a result, rules of thumb around the size and spacing of MPAs have been developed. These

aim to ensure that individual reserves are large enough to contain the ranges of species with low levels of movement and dispersal and to locate reserves containing similar habitat types close enough to allow for the exchange of mobile species and larva (Lieberknecht *et al.,* 2014).

The use of buffers in spatial analysis is a coarse proxy for species connectivity. The limitation of this is that a small protected area has the same buffer applied as does a large one, even though it is unlikely that the smaller site is contributing as much to connectivity. See 'fine filter tests' to see how this was accounted for.

For the spatial analysis, the flattened MPA layer[5] was buffered to 40km, equivalent to a maximum distance of 80km between sites. This threshold is based on the maximum recommended distance in Roberts *et al.,* (2010) used in the English MCZ project.

Figure 7 shows the result of buffering the MPAs to 40km. At the map scale, there are significant gaps, particularly in the northern part of the study area. This is a result of the limited number of MPAs in the centre of the basin. Notably, some of the more topographically diverse areas around Norway and between the Faroe Islands and Shetland/Orkney are particularly limited in coverage.

Other significant gaps fall between south-west England and the Finistère to Manche departments of France, offshore of Grimsby in England, a large section running parallel to the coast of southern Norway and a large section south of Dogger bank.

When considering species primarily found in inshore areas, some of these gaps may not be considered significant. The obvious exception to this is the lack of MPAs around the coast of Norway.

Fine filter tests:

Fine filter tests are designed to be more stringent, and to identify gaps that the coarse filter may fail to identify. By their nature, fine-filter tests are more time-consuming, and require more data to yield meaningful results. The fine filter tests used in this challenge include **Features and Representivity** and **Connectivity.**

- Features and Representivity:

Advancing from this test originally named by OSPAR (2008) it is more accurate to say that fine filter tests like this also measure the adequacy of an MPA network and also the replication of particular features inside an MPA network, such as habitats.

Two habitat data layers were used in this part of the analysis, the OSPAR threatened and/or declining habitat layer and the EUSeaMap predictive habitat map (at EUNIS level 2). The latter did not fully cover the extent of the study area. See Section 4 for a full description of how this test was run.

The total area of habitats represented within MPAs was tested at different thresholds between 5% and 40%. The lowest ranges of 5% and 10% are intended as basic thresholds, 20%, 30% and 50% to reflect ranges identified in the literature or used in similar adequacy assessments (Johnson *et al.*, 2013).

Replicates were colour coded at two thresholds. The English MCZ project set minimum criteria of two replicates for each broad-scale habitat present in each regional project (Natural England and Joint Nature Conservation Committee, 2010) and HELCOM sets a minimum of three examples of a representative habitat in each region (HELCOM, 2010). The results of these analyses are detailed in Appendix D.

The majority of the OSPAR threatened and/or declining habitats are well represented within the MPA network. All have a significant number of replicates, with the exception of Maërl beds and *Modiolus modiolus* beds. 35% of the maërl beds in the dataset are inside of an MPA. Sea-pen and burrowing megafauna

[5] Flattening ensures that areas and replicates are only counted once in a GIS file.

communities is the least well represented OSPAR habitat, with less than 10% of that present in the data being covered by an MPA. The other habitats are all more than 40% inside an MPA, sometimes significantly more (e.g. intertidal mudflats, 91.8%).

In terms of data coverage, the OSPAR threatened/declining habitat dataset does not likely represent the full extent of those habitats as there are more detailed habitat datasets around, such as those for seagrass. However, the OSPAR habitats dataset is adequate for a basin-wide assessment.

The EUSeaMap habitats show a more mixed picture. Many of the named habitats without a EUNIS code are bathyal (c. 1000-4000 meters depth) or deep sea habitats located around the coast of Norway or north of Shetland/Orkney, areas with relatively poor MPA coverage, which is reflected in the statistics.

Aside from the deeper habitats, most have at least 10% coverage inside MPAs, though only a few have more. Replication for these other habitats is generally high.

- Connectivity:

To help overcome the limitation of small protected areas having the same buffer applied as large ones, even though it is unlikely that the smaller site is contributing as much to connectivity, a 'kernel density analysis' was used to show the effect of MPA size and density, using a linear decay function to highlight proximity and the biggest spatial gaps in the MPA network (see Johnson *et al.,* 2014).

This fine filter proximity test was used to highlight gaps in the network (as used by Johnson *et al.*, 2014 and Lieberknecht *et al.*, 2014). For each OSPAR habitat, a kernel density analysis was performed with a search radius of 40km. 40km was chosen from Roberts *et al*. (2010), where the movements for 67 different species were modelled and spacing of 40-80km recommended.

The density analysis takes into account the amount of existing protected habitats (within the specified search radius). The result of this is that isolated, small protected areas of habitat (low density) have less effect than clusters of protected habitat (higher density). Figure 4.5 (page 44) in Lieberknecht *et al.* compares the results of a buffer to a kernel analysis.

The results of the kernel density analysis are shown in Figures 8-16.

The kernel density maps illustrate the lack of a specific cut-off distance in connectivity. The *Sabellaria spinulosa* reefs map in particular highlights this more nuanced representation, highlighting those areas where both large areas of habitat are protected and in close proximity.

Each habitat type assessed shows some spatial gaps, this is of particular interest when compared to the coverage statistics that imply these habitats are generally well represented. This illustrates the complexity of the ecological coherence concept, no single test can establish that ecological coherence has been met and conversely, gaps in a given test may not be significant in the context of the whole network.

The Maërl and *Modiolus modiolus* maps expand on the low replication scores seen in the earlier analysis – both show very limited distribution within the study area, limiting the number of possible replicates. It is recommended that further data is sourced for these (and potentially all of the habitats in this dataset) habitats and these maps considered in view of the limited data.

While the distribution of littoral chalk data is localised to the French coast, the habitats in the dataset are generally protected in large areas in close proximity. This is highlighted on the map, where the high density areas are almost all contiguous.

The intertidal mudflats map suggests that as you move away from the inshore region, there is a lack of connectivity between different habitat patches. The majority of areas have a low density and there are many

gaps. A notable exception is the Wash in Eastern England, where a large area of this habitat is found in protected areas.

Mytilus edulis beds are another habitat with patchy distribution. Most of the habitat in the dataset is found around the north-west German coastal region, where much is protected in close proximity. This is highlighted in the kernel analysis. Other habitat found around the coast of England shows no connections, though there is significant distance between the habitat patches.

Sabellaria spinulosa reef habitat within the dataset/in the study area is only found around the coast of England and Scotland. The two largest patches appear to be within protected areas and well connected within themselves.

The coverage of sea-pen and burrowing megafauna is limited (8.7% of the habitat inside the study area is inside protected areas), this is skewed by a particularly large patch west of Denmark. The remaining habitat inside the study area appears around the coast of Scotland and Northern England. This is generally within protected areas, and each cluster appears to exhibit good potential connectivity, though they are distant from each other.

The *Zostera* bed map shows various clusters of habitat throughout the study area. Some of these exhibit high kernel density (north-west German coast), the others are spaced too far apart for the search radius to take them into account.

All of these maps are conservative, in that they only take that specific habitat into account. A kernel density analysis of the protected areas themselves paints a potentially more connected picture (Figure 17) where there are larger areas of high density and fewer gaps.

Management of the North Sea MPA Network:

In order to yield environmental benefits, such as improved fish stocks and reduced environmental pollution, evidence suggests that protected marine sites have to be well-managed and enforced (Edgar *et al.* 2014), and the more comprehensive and stringent the protection level, the higher the benefit (Halpern, 2014). Without effective and well-enforced management measures, MPAs are merely paper parks and markings on a map.

In 2003, the OSPAR Commission adopted recommendation 2003/3 which aimed to establish the OSPAR Network of MPAs and to ensure that by 2010 it was an ecologically coherent network that was well-managed. The recommendation was supported by two sets of guidelines on: (i) identification and selection of MPAs in the OSPAR maritime area (OSPAR, 2003a) and (ii) management of MPAs in the OSPAR maritime area (OSPAR, 2003b)). Further guidance from OSPAR (2006) stipulates that 'the MPA network should operate should operate within a wider strategy for ecosystem management that informs the specific management of the sites and promotes additional conservation measures that support the MPA network'.

Thus a key aspect of the MPA Challenge was to review the marine management for the MPAs in the study area and to determine whether the MPA network operates as part of a wider management structure. The type of information required to make this assessment included, for example:

- Designation orders, designation date and designation status;
- MPA management plans;
- Information on the legislative frameworks applicable to each MPA (i.e. national park acts);
- Conservation objectives;
- Spatial management measures (i.e. exclusions or limitations of damaging activities).

In addition to internet searches, direct contact with national agencies in Member States and other agencies including the OSPAR Secretariat were conducted in an attempt to fill data gaps during data collection. A list of the contacts made is included in Appendix A. The information collected was collated and included in the GeoDatabase, which has been exported to an Excel spreadsheet, provided as a supplementary sheet to this report (Appendix B).

Most of the MPAs currently designated by the countries in the North Sea are national MPAs (within territorial waters and the respective EEZs), with very few designations in adjacent waters or waters beyond national jurisdiction. All sites listed have either been classified or designated as types of Marine Protected Area (Marine National Parks, Marine Nature Reserves, SACs, SPAs with marine components, RAMSAR sites, SSSIs and MCZs), many under the EU's Natura 2000 policy framework.

Information on the designation status of the sites was available on the international databases, national data bases and confirmed by national contacts via email in the case of France, Germany, Denmark, the Netherlands and Sweden. The status of sites varies between countries. Norway, as a non-EU Member State has established MPAs according to national legislation. France and UK have a number of sites which have been classified but not designated; France, UK, Germany, Sweden, Belgium, Denmark and the Netherlands have sites which have been designated and for which management plans are in process. Denmark, the Netherlands and Sweden have designated sites and are in the process of implementation. Germany, Netherlands and Sweden, and Norway are implementing fisheries restrictions according to national legislative acts.

Linkages to the legal basis, management structure and conservation objectives for EU-designated MPAs were easily found due to EU level standards in data reporting and presentation, although accessibility to this information varied between countries due to language restraints when searching or countries being at different stages of management implementation. Typical information obtained from an MPA designated under Natura 2000 includes basic information such as the designation date and responsible management authority. This is usually extracted from the site specific Standard Data Form or Designation Order. The Standard Data Form should ideally provide more than basic information on management (see http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011D0484&from=EN) such as a management plan and conservation measures but this heavily depends on the date of designation and the subsequent progress of the responsible authority in forming and publishing these. Many MPAs designated under the European framework in this study did publish conservation objectives.

Conservation objectives, such as suggestions of restricted fishing activity are a good first step towards developing management structures in the MPA network, as they indicate that some form of management measure(s) may be required or further measures may need to be developed where actions are already in force. See an example for the Dogger Bank MPA: http://jncc.defra.gov.uk/PDF/DoggerBank_ConservationObjectivesAdviceonOperations_6.0.pdf. However, the advice is indicative and does not remove the need for formal consultation on individual plans and projects. It appears that the majority (~95%) of the MPAs in the North Sea network have not reached this stage of planning and as a result, management information only exists at a basic level.

The small proportion of MPAs in the study region that have published spatial restriction management measures tended to be national parks (either fully marine or with marine sectors) in Germany, France and Norway. The types of restrictions found in this study included restrictions on certain fishing practices such as bottom trawling, limits to water sport activity and restrictions on mooring and permanent anchoring. Separate local management authorities, often a dedicated national park authority, are responsible for the management of these protected areas and this focused conservation effort has resulted in a more rigorous management

structure. This is in comparison to management authorities that are responsible for many more MPAs (such as the UK's JNCC) where the planning and consultation process with stakeholders is much slower and there are requirements to meet regional and international policy objectives.

In Belgium, the fragmentation in the management of MPAs at a national level with competencies for different aspects of management split between various government departments also led to other challenges in accessing all relevant information, demonstrating that several responsible authorities within one country can also be problematic to transparency.

Linkages *between* countries towards management of the MPAs sites in the North Sea are not very well defined, except in the case of the Wadden Sea Trilateral Management Plan[6] which suggests that North Sea MPA network does not operate as part of a wider management structure.

5.1.3. Outcome

The primary aim of the MPA challenge was to assess whether the data currently available from national and international organisations spanning the 8 focus countries in the North Sea are appropriate to determine whether the MPA network constitutes and representative and coherent network as described in article 13 of the Marine Strategy Framework Directive.

The various tests of ecological coherence (based on those defined by OSPAR) conducted in this study had to include a mix of fine filter and coarse filter tests, due to the lack of basin-wide spatial data for species and larval data, and due to time constraints. Fine filter tests were conducted where basin-wide data were available.

Tests for resilience looked at the size of the North Sea MPA network. In total 444 MPAs are presented, covering 10.9% of the study area and meeting Aichi target 11.

Tests for representivity using the OSPAR habitats dataset revealed that the majority of the OSPAR threatened and/or declining habitats are well represented within the MPA network but this dataset does not represent the full extent of those habitats that have more detailed information available for them, so the analyses presented in this study are only at a very basic level.

Tests for connectivity between the OSPAR habitats of the North Sea revealed some spatial gaps, in contrast to the representivity statistics that imply these habitats are generally well represented. This illustrates the complexity of the ecological coherence concept.

The North Sea MPA network does not operate as part of a wider management framework due to differences in paces of national governments in implementing rigorous management measures.

As also concluded by Lieberknecht *et al.* (2014) it is very difficult to assess ecological coherence with significant data gaps in a network. Despite this, the interactive web map represents an updated picture of the North Sea MPA network, including links to sites where users can keep up-to-date with developments in the management progress.

[6] http://www.waddensea-secretariat.org/management/wadden-sea-plan-2010

5.2. Data Adequacy

This section reports on the data adequacy to deliver the challenge. Data adequacy is reported under the six value assessments used for screening the data.

It is important to re-visit the main objective of the MPA Challenge here:

To gain *'…an understanding of whether the available data are sufficient to predict the ecological coherence of a network of MPAs and how representative they might be of the wider North Sea environment'*

To do this, specific outputs were decided upon (see p.7-8. 'Data Analysis'). Table 2 below summarises the data needed for each output. Each dataset discovered was then assessed by the 5 criteria in Table 1. This has been the basis for the analysis of data adequacy.

Table 5.1: Datasets considered suitable in the marine protected areas challenge

Output	Datasets required	Preferences
Interactive web map	GIS MPA boundaries from all 8 countries	✓ Must include all types of MPA designations (MCZ, SSSI etc.) ✓ Preferably the most recent designations ✓ Must open in GIS software ✓ Must be editable for NSCP boundary
	Species and habitat data for each MPA	✓ Must be linkable to MPAs in GIS files
	Management data for each MPA	✓ Must be linkable to MPAs in GIS files ✓ Preferably the most recent management plans
Ecological coherence statistics	'Features & Representivity': species and habitat data	✓ Species and habitats information must be linked to name of MPA
	'Resilience' (replication, MPA size diversity): species, habitat and MPA size data	✓ Species and habitats information must be linked to name of MPA
	'Management': management data	✓ Management data must be linked to name of MPA ✓ Preferably information relates to the specific 'features' of the MPA (i.e. species or habitat for which MPA was designated)
	'Connectivity': larval and physical data	✓ Larval data (dispersal rates and duration in plankton) preferably available for North Sea ✓ Physical data must be specific to North Sea

Currently, 119 datasets or links to information have been assessed by the NSCP MPA Data Screen, 35 of which have been selected for use in the challenge. See Appendix C for the full list of datasets assessed.

5.2.1. Contribution – Does the data contain the right parameters?

This aspect of the data screen related to whether or not the dataset was able to contribute to the challenge. Many datasets found during the process were considered (i.e. most of the criteria were at the correct resolution for the challenge and were readily available) but selection of datasets for use came as a result of downloading and testing them first on GIS software. As such, the range of data considered, downloaded and reviewed was much broader than the data selected for the challenge.

Datasets that did not contain the correct parameters included:

- Non-relevant files such as metadata files that were not needed to create the webmap or calculate ecological statistics;
- Standalone tables, such as contact details of management authorities that came with datasets such as the EEA Natura 2000 database;
- MPA web-maps where data could not be extracted;
- Links that had expired or the data were offline;
- Reports that did not provide usable information for uploading to the database or webmap;
- Online databases that were searched for species or larval data but yielded nothing relevant;
- Data that were not marine specific (i.e. for general Natura 2000 sites).

The main data used to populate the GeoDatabase (which in turn allowed the creation of the interactive web map and the calculation of ecological statistics) was sourced from OSPAR's database of MPAs and associated spatial GIS data, and the EEA's Natura 2000 site database which was at an equally useful resolution for the challenge. The type of data obtained from these portals provided the geographical boundaries of sites (from the GIS shape files) and the size, location and area of sites (from the databases).

As the OSPAR database also noted the codes of Natura 2000 sites (often N2000 sites and OSPAR sites share the same designation), the OSPAR list was selected as the base for data collection in the study area. The NSCP boundary file provided by HR Wallingford was used to filter out MPAs outside of the study area in the creation of the web maps and overview maps (see Figures).

The base list was subsequently supplemented by national MPA designations not included in the OSPAR or Natura 2000 portals. This ensured good MPA coverage of the North Sea basin. Supplementary data has been sourced from the JNCC (for UK SPAs), Natural England (for UK MCZs and SSSIs), Ramsar portal (for Ramsar sites), France's AAMP (for national marine parks), the Norwegian Environment Agency (for national marine parks) and the IUCN World Database on Protected Areas for any other gaps.

Most of the species data that have been included in the drop-down menus on the webmap have been sourced from individual management authority webpages specific to each MPA, where these features are listed in the site plans. However, species data have also been extracted from the OSPAR MPA databases as these datasets cover the project area, albeit in point not spatial format. These display OSPAR's threatened or declining species and habitats in tables that can be easily linked to MPA sites names and included on the interactive map.

In the original brief, ecological coherency tests were meant to be conducted on both species and habitats data. As the species data for the project area was not available in geo-enabled form (i.e. not converted into usable shapefiles), statistics focused on spatial habitats data from OSPAR and EUSeaMap.

Also originally proposed was an assessment of ecological connectivity between sites, where larval dispersal data might be modelled in combination with physical oceanographic data. There was a paucity of data on

larval dispersal for the species listed under the selected group of MPAs and thus connectivity was assessed by other means (see Section 6.1.2). Even if more data had been available, the complexity of modelling larval movements over such a large area with so many physical influences, was not in the scope of this challenge.

Information on the management of MPAs by nature is more difficult to source as it is not spatial and heavily relies on the level of political will in governments to form plans and publish these. The challenge had to focus on at least 8 sources of information (8 countries in the project brief) which led to inconsistencies and uncertainty in what information should be relevant to include on the GeoDatabase.

Often international MPA designations, such as the EU's Natura 2000 policy provided the most information on management across countries, where users could access similarly structured lists of conservation objectives and management plans, although these data were at a very coarse level. EUNIS and OSPAR provide very useful protected site summaries which gives basic designation information and the responsible management authority.

More detailed management information such as relevant legislative instruments and activity restrictions were simply not available for the majority of MPAs. Only where long-established national marine parks are present, have management plans been formed and made publically available.

5.2.2. Location – Does the data cover the correct time / space location?

In general the data selected for use in the MPA challenge covered the correct spatial, but often not the ideal temporal resolution.

Spatial resolution:

For a dataset to be at the correct spatial resolution for the challenge, it needed to provide the MPA boundary data layers for the MPAs listed inside the study area. GIS shape files (often downloaded in ESRI format) were easily editable in GIS programmes and could be clipped to fit the project boundary if datasets lay outside this zone. The OSPAR MPA spatial layer was used as a base file as it was provided via the portal in a form that was specific to marine sites and included Norway's MPAs (as opposed to the Natura 2000 sites layer which included terrestrial designations and EU-only designations).

As previously mentioned, these datasets were supplemented with those specifically relating to national MPA designations such as the UK MCZ dataset and global datasets useful for cross-checking the final list such the IUCN World Database on Protected Areas marine extract dataset. Supplementing the OSPAR dataset was essential in providing full MPA coverage for this challenge, as national data providers had not submitted new designations to international organisations, such as OSPAR or the IUCN.

Species and habitat data (in point form) included in the data-popups on the webmap were sourced from the OSPAR MPA database and OSPAR threatened or declining habitats dataset. Annex I and II EU data were not available for the entire study area. Supplementary MPA boundary layers were even more difficult to source species from.

Spatial habitat data from OSPAR and EUSeaMap (albeit at a relatively coarse scale) was available for the study area and allowed the calculation of ecological coherence statistics. Other more detailed spatial habitat datasets are available online – for example local coastal segrass habitat datasets – but they were not at the correct spatial resolution for this basin-wide, more general study of connectivity and ecological coherence.

Temporal resolution:

The more up-to-date the dataset, the more representative the outputs of this challenge would be of the North Sea MPA network. Often, temporal information was not provided with datasets. The OSPAR and EEA datasets are currently at least a year out-of-date (time of writing 17/04/2015; datasets represent end of 2013). Discussions with OSPAR have revealed the data will be updated (to display 2014 MPA data) mid-way through 2015 so it is recommended that the geodatabase provided in this challenge should be updated when this becomes available[7]. The EEA Natura 2000 datasets should also be due for an update.

It is the nature of the MPA designation process that creates time lags in the updating of datasets, as national bodies must submit information to international bodies, and more pertinently, MPA designations often come in tranches, such as the process seen in the UK's MCZ designation process. This also explains that lack of management information; the majority of new designations simply have not had management measures formulated for them.

5.2.3. Commercial – Are the commercial terms acceptable?

Yes, the commercial terms for addressing the challenge were acceptable; all data sets used for the challenge were free to download from various data portals. There are a significant amount of data relating to MPAs that is freely available to marine users and members of the public.

The only cost associated with the analysis presented in Section 6.1.2 is the use of a GIS software package to create GIS map outputs. The products presented in this report were created using ArcGIS software, although open source, free software is available to use, such as QGIS.

As the MPA challenge was mainly focused on the adequacy and quality of the data, the analysis component of the challenge was only ever meant to assess ecological coherence at a very coarse scale. More technical, detailed analyses of ecological coherence have been conducted on smaller groups of MPAs where detailed spatial datasets held by Non-Governmental Organisations (NGOs) and smaller data collection organisations are required and will only be released at cost.

5.2.4. Attributes – Does the data have the correct attributes?

During data collection the OSPAR set of MPAs was used as a starting point and some components were replaced where a newer source was identified (e.g. UK MCZs). During this process it was found that there were considerable overlaps between data providers such as the EEA and the IUCN. However, this was easily dealt with in GIS processing and avoided major gaps in the MPA network of the North Sea. The attributes of the MPA boundary layers discovered during this challenge were generally appropriate, as they are simple spatial files that can be edited to fit a user's needs.

Some data were too coarse to be able to conduct even the simplest tests of ecological coherence, such as connectivity of species between MPAs. Larval data from sporadic sampling locations could not be applied to the whole North Sea basin with accuracy, and point species data from the OSPAR and EEA databases did not cover the whole network and more relevantly, were not in spatial format. Coarse, spatial habitats data from OSPAR did have the correct attributes to conduct simple connectivity tests although it must be noted that the coarse OSPAR habitats data are not likely to be fully representative of the habitat distribution in the

[7] Please contact tom.mullier@marinemapping.org for details instructions to use this database.

North Sea and the maximum 80km buffers applied will fully account for environmental variability and habitat diversity.

Detailed management information was sparse and unlike for species, geographical and habitat data, was not provided in MPA databases. Management data is currently available is a very general form for the network, such as webpages introducing general conservation objectives under Natura 2000.

5.2.5. Delivery - Can the data be provided to match the timeframe of the challenge?

Generally there were very few issues with data delivery. Various data sets, when found, were often immediately downloadable (in a few cases users were required to register with the data provider), without cost, and in a format that was readable on most basic computer systems (e.g. Excel sheets, GIS programmes). Metadata for GIS data sets was almost always available.

However some issues were identified:

1. Management data, such as management plans for MPAs, and details other than the legislative authorities for the MPAs, were very difficult to find. This information was not provided on the OSPAR and Natura databases. Information was also often not provided upon request.
2. The Belgian GIS data (provided by the MUMM) is currently offline which may have provided more up-to-date local MPA designations.
3. Websites providing data assume that the user has the correct IT systems to read and use the data, such as GIS programmes and basic Microsoft programmes. The OSPAR MPA database is also relatively complex, with many functions, queries and tables available to edit. There appears to be no instruction guide and again, the website assumes the user is competent in database manipulation.
4. Searching the various EMODnet portals, it was difficult to find specific information relating to MPAs but this is mainly due to the coarse nature of the analysis in the MPA Challenge and many of the complex datasets available in these portals were not needed.

5.2.6. Usability – Is the data format and supporting information suitable?

Most of the datasets used for the MPA Challenge are spatial (mostly ESRI shape files) and in order to view these files, the user has to have access to GIS software to do this. Open access, free GIS programmes like QGIS are an option for this. Opening the files is not the main issue, however. Specialist knowledge is required to correctly use and edit the GIS data to create the desired maps. Nevertheless, when the spatial datasets collected for this Challenge were opened, they were generally in the correct projection for editing.

Other data formats encountered during data gathering were easily handled, such as Microsoft Excel and Access files.

Another issue is that many websites are not in English and as a result, it took time to navigate pages to obtain data and inevitably some important information will have been missed. However, Google Translate provides enough accuracy to do this and several languages are spoken in the project team so this is not a major issue.

5.3. Key Data Gaps

Through the OSPAR and Natura databases, portals and spatial GIS files, most of the basic (such as point species and habitats data and MPA boundary files) data needed for this challenge have been obtained. The spatial files could be easily filtered for the study area and the OSPAR MPA boundary layer was supplemented with layers for national MPA designations (such as the UK MCZ boundary layer) and as such, good spatial coverage was obtained.

There were however, gaps in management information. This is not readily available on a site by site basis from any country. Information is only available at a very basic level stating designation level, some conservation objectives and a statement of the relevant management authority. In very few cases was information available relating to spatial restrictions within a protected site, such as fishing restrictions and activity limitations, although this is likely a product of slow progress of national governments in implementing management measures for MPAs as many are still in the planning and stakeholder consultation phases.

Requests for information from national agencies aimed to fill these gaps and while these proved successful in some cases such as France, Sweden and the Netherlands where the agency responsible for designation of the site at either a national and federal level was available, access to data from Norway, Denmark and Belgium proved difficult. In Belgium for example, the fragmentation in the management of MPAs at a national level with competencies for different aspects of management split between various governments departments led to challenges in accessing all relevant data.

There are also large gaps in spatial species distribution data at a basin-wide level, particularly for the Annex I and II species listed in the MPAs relevant to the challenge. Spatial species distribution data are available at this level of detail for some regions in the study area, such as CEFAS fish spawning ground data in the UK, as dedicated research projects and data collection programmes have made these datasets available. The patchiness in these types of data for the majority of the study area restrict an assessments of ecological coherence for species.

The MPA challenge originally intended to assess connectivity (one test of ecological coherence) through the collection of larval data, and used in combination with physical oceanographic data to model the connectivity of certain species between protected sites. In the very first stages of data collection it became apparent that larval data for the species relevant to this study are very patchy. More importantly however, it is particularly challenging to apply the principles of connectivity in practice as hydrographic conditions are naturally highly variable and are too complex for the level of assessment in this study.

Ecological coherence test statistics used in this challenge have used EUSeaMap and OSPAR sourced spatial habitat data which although cover the study area, are at quite low resolution and do not likely represent the full extent of those habitats, there being more detailed habitat data available.

5.4. Country MPA Information Points

Table 5.2: Datasets from individual countries

Country	Central information source?	Data accessible?	Provided to international bodies?	Which international body?	Main MPA data/info sources used for Challenge
Belgium	No. The EC lists at least 5 sites for Natura 2000 site information[8].	No. Only basic information on the network.	Yes – European Commission and OSPAR are sent information and data by Member States.	European Commission, OSPAR	Coastalatlas.be[9] and health.belgium[10]
Denmark	Yes. Naturstyrelsen.dk[11]	Some. Management information available but GIS data provided via other portals.	"	"	Geodatastyrelsen[12] and Naturstyrelsen.dk[11]
France	Yes. Agence des aires marines protégées[13]	Yes.	"	"	Cartographie.aires-marines[14]
Germany	Yes. German Federal Agency for Nature	No. Only basic information	"	"	Bundesamt für Naturschutz (BfN)[15]

[8] European Commission Natura 2000 links to Member States' Natura 2000 webpages: http://ec.europa.eu/environment/nature/natura2000/db_gis/index_en.htm

[9] http://www.coastalatlas.be/map/?lan=en&theme_id=30

[10] http://www.health.belgium.be/eportal/Environment/MarineEnvironment/TheMarineEnvironPolicy/WorkingInAnInternational/BirdsAndHabitats/AreaPolicy/BirdsDirectiveAreas/19087529_EN?ie2Term=North%20Sea&ie2section=83#.VbtCRflVikr

[11] http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/

[12] http://download.kortforsyningen.dk/content/natura2000-basisanalyse-2013

[13] http://www.aires-marines.fr/

[14] http://cartographie.aires-marines.fr/viewer/index.php

	Conservation (BfN)[15]	on the network.			
Norway	Yes. Norwegian Environment Agency[16]	Yes.	Yes	OSPAR	Kartkatalog[17]
Sweden	Yes. Havochvatten.se[18]	Some. Management information available but GIS data provided via other portals.	Yes – European Commission and OSPAR are sent information and data by Member States.	European Commission, OSPAR	Geodata.se[19]
The Netherlands	Yes. Noordzeeloket[20]	No. Only basic information on the network.	"	"	Synbiosys[21]
UK	Yes. JNCC[22].	Yes.	"	"	JNCC[23]

Table 5.2 above shows that most countries do have a central information point for protected areas but this often does not provide access to GIS data, or links to the portals which did eventually provide it. EU Member States (not including Norway) must provide information on their Natura 2000 sites. It is unknown which international organisations collect nationally designated MPA information from European countries.

The analysis of the OSPAR Network of MPAs is based upon the data and information that has been provided by Contracting Parties (including Norway) in the process of nominating their MPAs to the OSPAR Commission and subsequently to the OSPAR database of Marine Protected Areas held at the German Federal Agency for Nature Conservation (BfN). As many of the MPAs designated and proposed are under European legislation and Natura 2000, Member States will be providing very similar information and data to OSPAR.

[15] http://www.bfn.de/0316_natura2000.html

[16] http://www.miljodirektoratet.no/no/Tjenester-og-verktoy/Database/Naturbase/

[17] http://kartkatalog.miljodirektoratet.no/map_catalog_dataset.asp?datasetid=502&download=yes

[18] https://www.havochvatten.se/hav/fiske--fritid/skyddade-omraden.html

[19] https://www.geodata.se/GeodataExplorer/GetMetaData?UUID=a80bf3d7-e70c-42d1-9b8d-8148e53e011d

[20] http://www.noordzeeloket.nl/functies-en-gebruik/natuur_en_biodiversiteit/index.aspx

[21] http://www.synbiosys.alterra.nl/natura2000/

[22] http://jncc.defra.gov.uk/marineprotectedareas

[23] http://jncc.defra.gov.uk/protectedsites/SACselection/gis_data/terms_conditions.asp

6. Discussion and Conclusions

6.1. Discussion

The key question of the MPA challenge was:

'Are the available data sufficient to predict the ecological coherence of a network of MPAs and how representative they might be of the wider North Sea environment'

In summary, the available data are not sufficient to *fully* predict the ecological coherence of the North Sea MPA network, yet single aspects of ecological coherency, such as representivity (see Section 3) can be assessed, and the geographic mapping of the network can be completed using the data available.

The quality assessment of data was an ongoing process, based on the accessibility of data, costs, relevance, usability and usefulness via the data gathering, mapping and analysis stages of the challenge.

Some key points regarding the data adequacy for the North Sea have been identified through the completion of the MPA challenge:

- Around 30% of datasets screened in this challenge were used in the analysis. Datasets that did not contain the correct parameters included standalone tables in MPA databases listing irrelevant information such as contact details, some metadata files that are used solely for reference, spatial species or habitat distribution data that are localised and not basin-wide, MPA webmaps without download functions, shapefiles in the wrong projection, management information that was over 5 years out of date and datasets that included terrestrial protected sites. **Contribution**
- There is no single updated set of spatial MPA boundaries for the North Sea so a base list from OSPAR needed to be supplemented with other datasets, including international RAMSAR sites and national UK MCZs, amongst others. These are all up-to-date to different years. The NSCP MPA Challenge dataset is assumed to be the most complete and up-to-date list of MPAs in the North Sea. **Contribution and Location**
- Most of the species data used in this challenge (more specifically, listed in the drop-down menus on the webmap) have been sourced from webpages specific to each MPA, such as the individual information pages the RAMSAR site information service provides. Spatial species data were not available basin-wide, so ecological coherency statistics could not be calculated for species. Spatial data were available for the entire study region and North Sea for OSPAR and EUNIS level habitat classifications. These datasets contributed more significantly to the MPA ecological coherency analysis. **Contribution**
- There was a paucity of basin-wide larval data on which to base ecological coherency connectivity analyses, so connectivity analyses have been based on the spatial habitat datasets, using much simpler connectivity tests. **Contribution**
- There were a paucity of detailed management measures (including information such as closed off conservation areas, fishing restrictions and marine user limitations) for the majority of MPAs, due to the slow progress of designation and consultation that leads to such measures being created. Where a separate authority has been assigned to manage an MPA, such as for marine national parks, processes are faster, management measures are actively implemented on the site and have been published. Apart from this, only basic management information has been provides for other types of MPA designation, which is provided on sites such as EUNIS, protected planet and national conservation bodies such as Natural England or the AAMP (the French Marine Protected Areas Agency). **Contribution**

- In general, datasets were at the correct spatial resolution for the challenge. MPA boundary shapefiles are easily edited in GIS software, when adding new supplementary layers to base layers, when clipping files to the study area, and when removing overlaps. **Location**
- Not all datasets were up-to-date (to within a year) as organisations such as the EEA and OSPAR tend to update their databases and associated shape files every two years. However, the designation process (which often happens over a number of years in batches) is slow and our database is assumed to be a good representation of the current network. **Temporal**
- All 35 datasets and information pages used for the challenge were free to download or view from various data portals and websites. MPA related data are freely available to marine users wishing to conduct basic analyses. **Commercial**
- Generally datasets and information were delivered in a few clicks and only in a handful of cases, were users required to register with an organisation to obtain data. However, getting to these data was often a more difficult process, particularly in the case of management and specific feature information (species and habitats) where individual MPA webpages must be found, often in a variety of languages. **Delivery**
- Most spatial datasets available for North Sea MPAs are readable in GIS software, providing the user is trained in these systems. Other datasets were compatible with spreadsheet and database software. Other information required for this challenge was just from websites or reports, although needed translation in some cases. **Usability**

6.2. Conclusions

The main conclusion for this Challenge was that general information on Marine Protected Areas in the North Sea basin is good, particularly if sites are subject to European legislation, whereas it is more difficult to determine whether the MPA network is well connected. Other key conclusions have been made:

- Some aspects of ecological coherency could be assessed using the data available from the 8 countries in the North Sea, such a representivity, connectivity and features and representivity, which relied on a basin-wide habitat distribution dataset. These could not be conducted for the species listed in the MPAs in the study area. The additional lack of detailed information on the management of sites means that it remains impossible at this time to comprehensively conclude on the extent to which OSPAR MPAs are well-managed. While in general a number of sites are subject to management regimes, including conservation objectives, management plans and specific regulatory measures, no evidence on their effectiveness in achieving the goals for which these were established has been provided. Management plans and measures for many sites are still being prepared and it is recommended that a dedicated data collection exercise is conducted on this network, using this study as a base, to identify progress and gaps in the creation of management plans and implementation of management measures resulting from these.
- The data available for MPAs in the North Sea have been collated into an interactive webmap, containing links to management authority website enabling users to keep up-to-date with progress.
- To conduct basic analyses of ecological coherency in an MPA network, the information required appears to be very accessible to marine users as data are without cost, immediately available and analysable, providing the users has training in GIS software and calculations from its manipulation.
- There are a plethora of national and international data sources provided through national and international organisations in the North Sea, and with more time dedicated to updating EMODnet and EU data portals, on the basis of challenges like this, we could obtain a representative picture of the network.

7. References

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Appendices

A. List of organisations contacted

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Netherlands	Ton Ijlstra	Department of Nature conservation and Biodiversity	A.H.Ijlstra@minez.nl
Sweden	Lena Tingstrom	Department for Marine and Water Management	lena.tingstrom@havochvatten.se
UK	Mark Tasker	JNCC	mark.tasker@jncc.gov.uk
International	Emily Corcoran	OSPAR Secretariat	Emily.corcoran@ospar.org

B. GeoDatabase metadata export

ME_UID	mpa_name	mpa_designation	mpa_ source	mpa_date_or_ version	mpa_status	mpa_cp	mpa_n2k_id	mpa_other_id	mpa_data_license	mgmt_MPA_OSPAR_ID	mgmt_MPA_Name	mgmt_Natura_2000_Site_Code	mgmt_Country
ME_UID_1	S-H Wadden sea National Park	National Park	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		DE	DE0916491		No license provided with download	DE0916491	National Park "S-H Wadden Sea"	DE0916491	Germany
ME_UID_2	Doggerbank	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		DE	DE1003301		No license provided with download	DE1003301	Doggerbank	DE1003301	Germany
ME_UID_3	Sylt.Aussenr.-Oestl.Dt.Bucht	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		DE	DE1209301		No license provided with download	DE1209301	Sylter Aussenriff / Oestliche Deutsche Bucht	DE1209301	Germany
ME_UID_4	S-H Seabird Protection Area	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		DE	DE1813491		No license provided with download	DE1813491	Seabird protection area "Seevogelschutzgebiet Helgoland" - Helgoland and adjacent waters	DE1813491	Germany
ME_UID_5	Borkum-Riffgrund	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		DE	DE2104301		No license provided with download	DE2104301	Borkum-Riffgrund	DE2104301	Germany
ME_UID_6	Nationalpark Niedersächsisches Wattenmeer	Marine park	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		DE	DE2306301		No license provided with download	DE2306301	National Park "Lower Saxony Wadden Sea"	DE2306301	Germany
ME_UID_7	Iroise	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR009		No license provided with download	FR009	Iroise marine Natural Park	<Null>	France
ME_UID_8	Baie de Somme	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR2210068		No license provided with download	FR2210068	Reserve Naturelle Nationale de la Baie de Somme	FR2210068	France
ME_UID_9	Domaine de Beauguillot	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR2510046		No license provided with download	FR2510046	Réserve Naturelle Nationale du Domaine de Beauguillot	FR2510046	France
ME_UID_10	Baie de Saint-Brieuc	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR5300066		No license provided with download	FR5300066	Réserve Naturelle de la baie de Saint Brieuc	FR5300066	France
ME_UID_11	Noordzeekustzone	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		NL	NL2003062		No license provided with download	NL2003062	Noordzee Kustzone	NL2003062	Netherlands
ME_UID_12	Doggerbank	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		NL	NL2008001		No license provided with download	NL2008001	Doggersbank	NL2008001	Netherlands
ME_UID_13	Klaverbank	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		NL	NL2008002		No license provided with download	NL2008002	Klaverbank	NL2008002	Netherlands
ME_UID_14	Vlakte van de Raan	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		NL	NL2008003		No license provided with download	NL2008003	Vlakte van de Raan	NL2008003	Netherlands
ME_UID_15	Voordelta	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		NL	NL4000017		No license provided with download	NL4000017	Voordelta	NL4000017	Netherlands
ME_UID_16	Kungsbackafjorden	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0510058		No license provided with download	SE0510058	Kungsbacka fjord	SE0510058	Sweden
ME_UID_17	Lilla Middelgrund	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0510126		No license provided with download	SE0510126	Lilla Middelgrund	SE0510126	Sweden
ME_UID_18	Fladen	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0510127		No license provided with download	SE0510127	Fladen	SE0510127	Sweden
ME_UID_19	Stora Middelgrund och Röde bank	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0510186		No license provided with download	SE0510186	Stora Middelgrund and Röde bank	SE0510186	Sweden
ME_UID_20	Morups bank	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0510187		No license provided with download	SE0510187	Morups bank	SE0510187	Sweden
ME_UID_21	Nordre älvs estuarium	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0520043		No license provided with download	SE0520043	Nordre älv estuary	SE0520043	Sweden
ME_UID_22	Kosterfjorden-Väderöfjorden	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0520170		No license provided with download	SE0520170	Koster-Väderö archipelago	SE0520170	Sweden
ME_UID_23	Gullmarsfjorden	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0520171		No license provided with download	SE0520171	Gullmarn fjord	SE0520171	Sweden
ME_UID_24	Vlaamse Banken , SBZ 1 and SBZ2	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		BE	BEMNZ00123		No license provided with download	BEMNZ00123	Vlaamse Banken , SBZ 1 and SBZ2	BEMNZ123	Belgium
ME_UID_25	SBZ3	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		BE	BEMNZ0004		No license provided with download	BEMNZ0004	SBZ3	BEMNZ0004	Belgium
ME_UID_26	Estuaire de la Seine	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR2300121		No license provided with download	FR2300121	Reserve Naturelle de l'Estuaire de la Seine	FR2300121	France
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ME_UID_28	Récifs et marais arrière-littoraux du cap Lévi à la Pointe de Saire	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR2500085		No license provided with download	FR2500085	Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire	FR2500085	France
ME_UID_29	Tatihou - Saint-Vaast-la-Hougue	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR2500086		No license provided with download	FR2500086	Tatihou - Saint-Vaast-la-Hougue	FR2500086	France
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ME_UID_31	Baie de Seine occidentale	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR2502020		No license provided with download	FR2502020	Baie de Seine occidentale	FR2502020	France
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ME_UID_36	Abers - Côtes des légendes	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR5300017		No license provided with download	FR5300017	Abers - Côtes des légendes	FR5300017	France
ME_UID_37	Falaise du Bessin Occidental	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR2510099		No license provided with download	FR2510099	Falaise du Bessin Occidental	FR2510099	France
ME_UID_38	Côte de Granit Rose-Sept Iles	SPA	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR5310011		No license provided with download	FR5310011	Réserve Naturelle Nationale des Sept Îles	FR5310011	France
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ME_UID_40	Bratten	SCI	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		SE	SE0520189		No license provided with download	SE0520189	Bratten	SE0520189	Sweden
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ME_UID_42	Breisunddjupet		OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		N	N014		No license provided with download	N014	Breisunddjupet	n/a	Norway
ME_UID_43	Dornoch Firth and Loch Fleet	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001622		UK Open Government License	UK9001622	Cromarty Firth SPA	UK9001622	United Kingdom
ME_UID_44	Cromarty Firth	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001623		UK Open Government License	UK9001623	Inner Moray Firth SPA	UK9001623	United Kingdom
ME_UID_45	Inner Moray Firth	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001624		UK Open Government License	UK9001624	Moray and Nairn Coast SPA	UK9001624	United Kingdom
ME_UID_46	Moray and Nairn Coast	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001625		UK Open Government License	UK9001625	Hermaness, Saxa Vord and Valla Field SPA	UK9001625	United Kingdom
ME_UID_47	East Sanday Coast	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002331		UK Open Government License	UK9002331	Rousay SPA	UK9002331	United Kingdom
ME_UID_48	Firth of Tay & Eden Estuary	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9004121		UK Open Government License	UK9004121	St Abb`s Head to Fast Castle SPA	UK9004121	United Kingdom
ME_UID_49	Lindisfarne	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9006011		UK Open Government License	UK9006011	Humber Estuary SPA	UK9006011	United Kingdom
ME_UID_50	Teesmouth and Cleveland Coast	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9006061		UK Open Government License	UK9006061	The Wash SPA	UK9006061	United Kingdom
ME_UID_51	Humber Estuary	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9006111		UK Open Government License	UK9006111	Gibraltar Point SPA	UK9006111	United Kingdom
ME_UID_52	The Wash	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9008021		UK Open Government License	UK9008021	North Norfolk Coast SPA	UK9008021	United Kingdom
ME_UID_53	Gibraltar Point	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9008022		UK Open Government License	UK9008022	Alde - Ore Estuary SPA	UK9008022	United Kingdom
ME_UID_54	Alde-Ore Estuary	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009112		UK Open Government License	UK9009112	Hamford Water SPA	UK9009112	United Kingdom
ME_UID_55	Stour and Orwell Estuaries	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009121		UK Open Government License	UK9009121	Benfleet and Southend Marshes SPA	UK9009121	United Kingdom
ME_UID_56	Hamford Water	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009131		UK Open Government License	UK9009131	Breydon Water SPA	UK9009131	United Kingdom
ME_UID_57	Benfleet and Southend Marshes	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009171		UK Open Government License	UK9009171	Dengie (Mid-Essex Coast Phase 1) SPA	UK9009171	United Kingdom
ME_UID_58	Dengie (Mid-Essex Coast Phase 1)	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009242		UK Open Government License	UK9009242	Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA	UK9009242	United Kingdom
ME_UID_59	Colne Estuary (Mid-Essex Coast Phase 2)	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009243		UK Open Government License	UK9009243	Blackwater Estuary (Mid-Essex Coast Phase 4) SPA	UK9009243	United Kingdom
ME_UID_60	Crouch and Roach Estuaries (Mid-Essex Coast Phase 3)	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009244		UK Open Government License	UK9009244	Foulness (Mid-Essex Coast Phase 5) SPA	UK9009244	United Kingdom
ME_UID_61	Blackwater Estuary (Mid-Essex Coast Phase 4)	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009245		UK Open Government License	UK9009245	Deben Estuary SPA	UK9009245	United Kingdom
ME_UID_62	Exe Estuary	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9010081		UK Open Government License	UK9010081	The Swale SPA	UK9010081	United Kingdom
ME_UID_63	Tamar Estuaries Complex	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9010141		UK Open Government License	UK9010141	Thames Estuary and Marshes SPA	UK9010141	United Kingdom
ME_UID_64	The Swale	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9012011		UK Open Government License	UK9012011	Medway Estuary and Marshes SPA	UK9012011	United Kingdom
ME_UID_65	Thames Estuary and Marshes	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9012021		UK Open Government License	UK9012021	Pagham Harbour SPA	UK9012021	United Kingdom
ME_UID_66	Medway Estuary and Marshes	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9012031		UK Open Government License	UK9012031	Thanet Coast and Sandwich Bay SPA	UK9012031	United Kingdom
ME_UID_67	Buchan Ness to Collieston Coast	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002491		UK Open Government License	UK9002491	Sumburgh Head SPA	UK9002491	United Kingdom

ME_UID_68	Calf of Eday	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002431		UK Open Government License	UK9002431	Troup, Pennan and Lion`s Heads SPA	UK9002431	United Kingdom
ME_UID_69	Copinsay	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002151		UK Open Government License	UK9002151	Sule Skerry and Sule Stack SPA	UK9002151	United Kingdom
ME_UID_70	East Caithness Cliffs	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001182		UK Open Government License	UK9001182	East Caithness Cliffs SPA	UK9001182	United Kingdom
ME_UID_71	Fair Isle	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002091		UK Open Government License	UK9002091	West Westray SPA	UK9002091	United Kingdom
ME_UID_72	Fetlar	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002031		UK Open Government License	UK9002031	Foula SPA	UK9002031	United Kingdom
ME_UID_73	Forth Islands	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9004171		UK Open Government License	UK9004171	Firth of Forth SPA	UK9004171	United Kingdom
ME_UID_74	Foula	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002061		UK Open Government License	UK9002061	Noss SPA	UK9002061	United Kingdom
ME_UID_75	Fowlsheugh	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002271		UK Open Government License	UK9002271	East Sanday Coast SPA	UK9002271	United Kingdom
ME_UID_76	Hermaness, Saxa Vord and Valla Field	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002011		UK Open Government License	UK9002011	Fetlar SPA	UK9002011	United Kingdom
ME_UID_77	Hoy	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002141		UK Open Government License	UK9002141	Copinsay SPA	UK9002141	United Kingdom
ME_UID_78	Marwick Head	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002121		UK Open Government License	UK9002121	Hoy SPA	UK9002121	United Kingdom
ME_UID_79	North Caithness Cliffs	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001181		UK Open Government License	UK9001181	North Caithness Cliffs SPA	UK9001181	United Kingdom
ME_UID_80	Noss	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002081		UK Open Government License	UK9002081	Fair Isle SPA	UK9002081	United Kingdom
ME_UID_81	Rousay	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002371		UK Open Government License	UK9002371	Calf of Eday SPA	UK9002371	United Kingdom
ME_UID_82	St Abb`s Head to Fast Castle	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9004271		UK Open Government License	UK9004271	Upper Solway Flats and Marshes SPA	UK9004271	United Kingdom
ME_UID_83	Sule Skerry and Sule Stack	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002181		UK Open Government License	UK9002181	Fowlsheugh SPA	UK9002181	United Kingdom
ME_UID_84	Troup, Pennan and Lion`s Heads	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002471		UK Open Government License	UK9002471	Buchan Ness to Collieston Coast SPA	UK9002471	United Kingdom
ME_UID_85	West Westray	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002101		UK Open Government License	UK9002101	Marwick Head SPA	UK9002101	United Kingdom
ME_UID_86	Farvandet nord for Anholt	SPA	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00DX032	<Null>	No license provided with download	DK00DX032	Farvandet nord for Anholt	DK00DX032	Denmark
ME_UID_87	Læsø, sydlige del	SPA	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00FX345	<Null>	No license provided with download	DK00FX345	Læsø, sydlige del	DK00FX345	Denmark
ME_UID_88	Sydlige Nordsø	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA347	<Null>	No license provided with download	DK00VA347	Sydlige Nordsø	DK00VA347	Denmark
ME_UID_89	Hesselø med omliggende stenrev	SPA	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK003X202	<Null>	No license provided with download	DK003X202	Hesselø med omliggende stenrev SAC	DK003X202	Denmark
ME_UID_90	Anholt og havet nord for	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00DX146	<Null>	No license provided with download	DK00DX146	Anholt og havet nord for	DK00DX146	Denmark
ME_UID_91	Strandenge på Læsø og havet syd herfor	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00FX010	<Null>	No license provided with download	DK00FX010	Strandenge på Læsø og havet syd herfor	DK00FX010	Denmark
ME_UID_92	Havet omkring Nordre Rønner	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00FX257	<Null>	No license provided with download	DK00FX257	Havet omkring Nordre Rønner	DK00FX257	Denmark
ME_UID_93	Herthas Flak	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA248	<Null>	No license provided with download	DK00VA248	Herthas Flak	DK00VA248	Denmark
ME_UID_94	Læsø Trindel og Tønneberg Banke	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA249	<Null>	No license provided with download	DK00VA249	Læsø Trindel and Tønneberg Banke	DK00VA249	Denmark
ME_UID_95	Kims Top og den Kinesiske Mur	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA247	<Null>	No license provided with download	DK00VA247	Kims Ryg	DK00VA247	Denmark
ME_UID_96	Knudegrund	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA302	<Null>	No license provided with download	DK00VA302	Knudegrund	DK00VA302	Denmark
ME_UID_97	Schultz og Hastens Grund samt Briseis Flak	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA303	<Null>	No license provided with download	DK00VA303	Hastens Grund	DK00VA303	Denmark
ME_UID_98	Lønstrup Rødgrund	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA301	<Null>	No license provided with download	DK00VA301	Lønstrup Rødgrund	DK00VA301	Denmark
ME_UID_99	Sandbanker ud for Thorsminde	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA341	<Null>	No license provided with download	DK00VA341	Sandbanker ud for Thorsminde	DK00VA341	Denmark
ME_UID_100	Lysegrund	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA299	<Null>	No license provided with download	DK00VA299	Lysegrund	DK00VA299	Denmark
ME_UID_101	Sandbanker ud for Thyborøn	SAC	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA340	<Null>	No license provided with download	DK00VA340	Sandbanker ud for Thyborøn	DK00VA340	Denmark
ME_UID_102	Tregor Goëlo	SPA with marine component(s)	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		FR	FR5310070		No license provided with download	<Null>	Tregor Goëlo	<Null>	France

ME_UID_103	Studland to Portland SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Studland to Portland SAC	<Null>	UK
ME_UID_104	Lands End and Cape Bank SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Lands End and Cape Bank SAC	<Null>	UK
ME_UID_105	Lyme Bay and Torbay SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Lyme Bay and Torbay SAC	<Null>	UK
ME_UID_106	Margate and Long Sands SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Margate and Long Sands SAC	<Null>	UK
ME_UID_107	Lizard Point SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Lizard Point SAC	<Null>	UK
ME_UID_108	Berwickshire and North Northumberland Coast SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Berwickshire and North Northumberland Coast SAC	<Null>	UK
ME_UID_109	Dornoch Firth and Morrich More SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Dornoch Firth and Morrich More SAC	<Null>	UK
ME_UID_110	Faray and Holm of Faray SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Faray and Holm of Faray SAC	<Null>	UK
ME_UID_111	Firth of Tay and Eden Estuary SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Firth of Tay and Eden Estuary SAC	<Null>	UK
ME_UID_112	Isle of May SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Isle of May SAC	<Null>	UK
ME_UID_113	Loch Laxford SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Loch Laxford SAC	<Null>	UK
ME_UID_114	Mousa SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Mousa SAC	<Null>	UK
ME_UID_115	Papa Stour SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Papa Stour SAC	<Null>	UK
ME_UID_116	Sanday SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Sanday SAC	<Null>	UK
ME_UID_117	Sullom Voe SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Sullom Voe SAC	<Null>	UK
ME_UID_118	Moray Firth SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Moray Firth SAC	<Null>	UK
ME_UID_119	Yell Sound Coast SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Yell Sound Coast SAC	<Null>	UK
ME_UID_120	Plymouth Sound & Estuaries SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Plymouth Sound & Estuaries SAC	<Null>	UK
ME_UID_121	Fal & Helford SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Fal & Helford SAC	<Null>	UK
ME_UID_122	Chesil & The Fleet SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Chesil & The Fleet SAC	<Null>	UK
ME_UID_123	Solent Maritime SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Solent Maritime SAC	<Null>	UK
ME_UID_124	South Wight Maritime SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	South Wight Maritime SAC	<Null>	UK
ME_UID_125	Flamborough Head SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Flamborough Head SAC	<Null>	UK
ME_UID_126	Tweed Estuary SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Tweed Estuary SAC	<Null>	UK
ME_UID_127	Thanet Coast SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Thanet Coast SAC	<Null>	UK
ME_UID_128	Essex Estuaries SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Essex Estuaries SAC	<Null>	UK
ME_UID_129	The Wash & North Norfolk Coast SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	The Wash & North Norfolk Coast SAC	<Null>	UK
ME_UID_130	Alde-Ore & Butley Estuaries SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Alde-Ore & Butley Estuaries SAC	<Null>	UK
ME_UID_131	Humber Estuary SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Humber Estuary SAC	<Null>	UK
ME_UID_132	Start Point to Plymouth Sound and Eddystone SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Start Point to Plymouth Sound and Eddystone SAC	<Null>	UK
ME_UID_133	Wight-Barfleur Reef SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Wight-Barfleur Reef SAC	<Null>	UK
ME_UID_134	Solan Bank Reef SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Solan Bank Reef SAC	<Null>	UK
ME_UID_135	Pobie Bank Reef SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Pobie Bank Reef SAC	<Null>	UK
ME_UID_136	Braemar Pockmarks SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Braemar Pockmarks SAC	<Null>	UK
ME_UID_137	Scanner Pockmark SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Scanner Pockmark SAC	<Null>	UK

ME_UID_138	North Norfolk Sandbanks and Saturn Reef SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	North Norfolk Sandbanks and Saturn Reef SAC	<Null>	UK
ME_UID_139	Inner Dowsing, Race Bank and North Ridge SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Inner Dowsing, Race Bank and North Ridge SAC	<Null>	UK
ME_UID_140	Haisborough, Hammond and Winterton SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Haisborough, Hammond and Winterton SAC	<Null>	UK
ME_UID_141	Bassurelle Sandbank SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Bassurelle Sandbank SAC	<Null>	UK
ME_UID_142	Dogger Bank SAC	SAC	OSPAR	Download 'end date' 20130218, downloaded from OSPAR website 01-2015		UK			No license provided with download	<Null>	Dogger Bank SAC	<Null>	UK
ME_UID_143	Pagham Harbour	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477575	UK Open Government License	<Null>	Pagham Harbour	<Null>	UK
ME_UID_144	Chesil Beach and Stennis Ledges	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477640	UK Open Government License	<Null>	Chesil Beach and Stennis Ledges	<Null>	UK
ME_UID_145	Folkestone Pomerania	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477565	UK Open Government License	<Null>	Folkestone Pomerania	<Null>	UK
ME_UID_146	Kingmere	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477568	UK Open Government License	<Null>	Kingmere	<Null>	UK
ME_UID_147	Poole Rocks	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477635	UK Open Government License	<Null>	Poole Rocks	<Null>	UK
ME_UID_148	North East of Farnes Deep	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1481473	UK Open Government License	<Null>	North East of Farnes Deep	<Null>	UK
ME_UID_149	Skerries Bank and Surrounds	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477646	UK Open Government License	<Null>	Skerries Bank and Surrounds	<Null>	UK
ME_UID_150	South Dorset	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477637	UK Open Government License	<Null>	South Dorset	<Null>	UK
ME_UID_151	Swallow Sand	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1481481	UK Open Government License	<Null>	Swallow Sand	<Null>	UK
ME_UID_152	Tamar Estuary Sites	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477649	UK Open Government License	<Null>	Tamar Estuary Sites	<Null>	UK
ME_UID_153	Thanet Coast	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477559	UK Open Government License	<Null>	Thanet Coast	<Null>	UK
ME_UID_154	The Manacles	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477653	UK Open Government License	<Null>	The Manacles	<Null>	UK
ME_UID_155	Torbay	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477643	UK Open Government License	<Null>	Torbay	<Null>	UK
ME_UID_156	Upper Fowey and Pont Pill	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477651	UK Open Government License	<Null>	Upper Fowey and Pont Pill	<Null>	UK
ME_UID_157	Whitsand and Looe Bay	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477650	UK Open Government License	<Null>	Whitsand and Looe Bay	<Null>	UK
ME_UID_158	Blackwater, Crouch, Roach and Colne Estuaries	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477556	UK Open Government License	<Null>	Blackwater, Crouch, Roach and Colne Estuaries	<Null>	UK
ME_UID_159	Beachy Head West	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477567	UK Open Government License	<Null>	Beachy Head West	<Null>	UK
ME_UID_160	Aln Estuary	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477587	UK Open Government License	<Null>	Aln Estuary	<Null>	UK
ME_UID_161	Medway Estuary	MCZ (tranche 1)	JNCC	Downloaded 13-01-2015	Designated	uk		1477558	UK Open Government License	<Null>	Medway Estuary	<Null>	UK
ME_UID_162	Ythan Estuary, Sands of Forvie and Meikle Loch	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002221		UK Open Government License	<Null>	Ythan Estuary, Sands of Forvie and Meikle Loch	<Null>	UK
ME_UID_163	Coquet Island	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9006031		UK Open Government License	<Null>	Coquet Island	<Null>	UK
ME_UID_164	North Norfolk Coast	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009031		UK Open Government License	<Null>	North Norfolk Coast	<Null>	UK
ME_UID_165	Minsmere - Walberswick	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009101		UK Open Government License	<Null>	Minsmere - Walberswick	<Null>	UK
ME_UID_166	Foulness (Mid-Essex Coast Phase 5)	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009246		UK Open Government License	<Null>	Foulness (Mid-Essex Coast Phase 5)	<Null>	UK
ME_UID_167	Deben Estuary	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009261		UK Open Government License	<Null>	Deben Estuary	<Null>	UK
ME_UID_168	Benacre to Easton Bavents	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9009291		UK Open Government License	<Null>	Benacre to Easton Bavents	<Null>	UK
ME_UID_169	Chesil Beach and The Fleet	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9010091		UK Open Government License	<Null>	Chesil Beach and The Fleet	<Null>	UK
ME_UID_170	Poole Harbour	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9010111		UK Open Government License	<Null>	Poole Harbour	<Null>	UK
ME_UID_171	Chichester and Langstone Harbours	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9011011		UK Open Government License	<Null>	Chichester and Langstone Harbours	<Null>	UK
ME_UID_172	Portsmouth Harbour	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9011051		UK Open Government License	<Null>	Portsmouth Harbour	<Null>	UK

ME_UID_173	Solent and Southampton Water	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9011061		UK Open Government License	<Null>	Solent and Southampton Water	<Null>	UK
ME_UID_174	Pagham Harbour	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9012041		UK Open Government License	<Null>	Pagham Harbour	<Null>	UK
ME_UID_175	Thanet Coast and Sandwich Bay	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9012071		UK Open Government License	<Null>	Thanet Coast and Sandwich Bay	<Null>	UK
ME_UID_176	Dungeness to Pett Level	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9012091		UK Open Government License	<Null>	Dungeness to Pett Level	<Null>	UK
ME_UID_177	Cape Wrath	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001231		UK Open Government License	<Null>	Cape Wrath	<Null>	UK
ME_UID_178	Handa	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9001241		UK Open Government License	<Null>	Handa	<Null>	UK
ME_UID_179	Sumburgh Head	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9002511		UK Open Government License	<Null>	Sumburgh Head	<Null>	UK
ME_UID_180	Outer Thames Estuary	SPA with marine component(s)	JNCC	Version 20131023b, downloaded 01-2015	Designated	UK	UK9020309		UK Open Government License	<Null>	Outer Thames Estuary	<Null>	UK
ME_UID_181	Lista Wetlands System	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Norway			No license provided with download	<Null>	Lista Wetlands System	<Null>	Norway
ME_UID_182	Giske Wetlands System	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Norway			No license provided with download	<Null>	Giske Wetlands System	<Null>	Norway
ME_UID_183	Caithness & Sutherland Peatlands	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Caithness & Sutherland Peatlands	<Null>	UK
ME_UID_184	Pevensey Levels	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Pevensey Levels	<Null>	UK
ME_UID_185	Cromarty Firth	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Cromarty Firth	<Null>	UK
ME_UID_186	Inner Moray Firth	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Inner Moray Firth	<Null>	UK
ME_UID_187	Poole Harbour	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Poole Harbour	<Null>	UK
ME_UID_188	Northumbria Coast	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Northumbria Coast	<Null>	UK
ME_UID_189	Thames Estuary and Marshes	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Thames Estuary and Marshes	<Null>	UK
ME_UID_190	Firth of Tay and Eden Estuary	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Firth of Tay and Eden Estuary	<Null>	UK
ME_UID_191	The New Forest	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	The New Forest	<Null>	UK
ME_UID_192	Medway Estuary & Marshes	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Medway Estuary & Marshes	<Null>	UK
ME_UID_193	Stodmarsh	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Stodmarsh	<Null>	UK
ME_UID_194	Benfleet and Southend Marshes	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Benfleet and Southend Marshes	<Null>	UK
ME_UID_195	Abberton Reservoir	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Abberton Reservoir	<Null>	UK
ME_UID_196	The Swale	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	The Swale	<Null>	UK
ME_UID_197	Chesil Beach & The Fleet	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Chesil Beach & The Fleet	<Null>	UK
ME_UID_198	Loch Eye	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Loch Eye	<Null>	UK
ME_UID_199	Chichester and Langstone Harbours	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Chichester and Langstone Harbours	<Null>	UK
ME_UID_200	The Wash	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	The Wash	<Null>	UK
ME_UID_201	Pagham Harbour	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Pagham Harbour	<Null>	UK
ME_UID_202	Oosterschelde	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Netherlands			No license provided with download	<Null>	Oosterschelde	<Null>	Netherlands
ME_UID_203	Träslövsläge-Morups Tånge	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Sweden			No license provided with download	<Null>	Träslövsläge-Morups Tånge	<Null>	Sweden
ME_UID_204	Stour & Orwell Estuaries	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Stour & Orwell Estuaries	<Null>	UK
ME_UID_205	Humber Estuary	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Humber Estuary	<Null>	UK
ME_UID_206	Thanet Coast & Sandwich Bay	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Thanet Coast & Sandwich Bay	<Null>	UK
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ME_UID_209	Crouch & Roach Estuaries	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Crouch & Roach Estuaries	<Null>	UK
ME_UID_210	Teesmouth & Cleveland Coast	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Teesmouth & Cleveland Coast	<Null>	UK
ME_UID_211	Dersingham Bog	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Dersingham Bog	<Null>	UK
ME_UID_212	Hirsholmene	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Hirsholmene	<Null>	Denmark
ME_UID_213	Ringkobing Fjord	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Ringkobing Fjord	<Null>	Denmark
ME_UID_214	Nordre Ronner	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Nordre Ronner	<Null>	Denmark
ME_UID_215	Stadil and Veststadil Fjords	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Stadil and Veststadil Fjords	<Null>	Denmark
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ME_UID_217	Nissum Bredning with Harboore and Agger Tange	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Nissum Bredning with Harboore and Agger Tange	<Null>	Denmark
ME_UID_218	Vejlerne and Logstor Bredning	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Vejlerne and Logstor Bredning	<Null>	Denmark
ME_UID_219	Ulvedybet and Nibe Bredning	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Ulvedybet and Nibe Bredning	<Null>	Denmark
ME_UID_220	Læsø	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Læsø	<Null>	Denmark
ME_UID_221	Randers and Mariager Fjords and the adjacent sea	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Randers and Mariager Fjords and the adjacent sea	<Null>	Denmark
ME_UID_222	Waters north of Anholt	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Denmark			No license provided with download	<Null>	Waters north of Anholt	<Null>	Denmark
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ME_UID_224	Deben Estuary	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Deben Estuary	<Null>	UK
ME_UID_225	Moray and Nairn Coast	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Moray and Nairn Coast	<Null>	UK
ME_UID_226	Dornoch Firth and Loch Fleet	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Dornoch Firth and Loch Fleet	<Null>	UK
ME_UID_227	Ronas Hill - North Roe & Tingon	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Ronas Hill - North Roe & Tingon	<Null>	UK
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ME_UID_229	Avon Valley	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Avon Valley	<Null>	UK
ME_UID_230	Caithness Lochs	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Caithness Lochs	<Null>	UK
ME_UID_231	Ythan Estuary & Meikle Loch	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Ythan Estuary & Meikle Loch	<Null>	UK
ME_UID_232	Dorset Heathlands	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Dorset Heathlands	<Null>	UK
ME_UID_233	Solent and Southampton Water	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Solent and Southampton Water	<Null>	UK
ME_UID_234	Stigfjorden	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Sweden			No license provided with download	<Null>	Stigfjorden	<Null>	Sweden
ME_UID_235	Baie de Somme	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	France			No license provided with download	<Null>	Baie de Somme	<Null>	France
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ME_UID_237	Nordre älv estuary	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Sweden			No license provided with download	<Null>	Nordre älv estuary	<Null>	Sweden
ME_UID_238	Skälderviken	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Sweden			No license provided with download	<Null>	Skälderviken	<Null>	Sweden
ME_UID_239	Lindisfarne	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Lindisfarne	<Null>	UK
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ME_UID_245	Minsmere - Walberswick	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Minsmere - Walberswick	<Null>	UK
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ME_UID_248	Voornes Duin	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Netherlands			No license provided with download	<Null>	Voornes Duin	<Null>	Netherlands
ME_UID_249	Ora	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Norway			No license provided with download	<Null>	Ora	<Null>	Norway
ME_UID_250	Kurefjorden	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Norway			No license provided with download	<Null>	Kurefjorden	<Null>	Norway
ME_UID_251	Ilene and Presterodkilen Wetland System	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Norway			No license provided with download	<Null>	Ilene and Presterodkilen Wetland System	<Null>	Norway
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ME_UID_256	Loch of Strathbeg	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Loch of Strathbeg	<Null>	UK
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ME_UID_262	Lauwersmeer	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Netherlands			No license provided with download	<Null>	Lauwersmeer	<Null>	Netherlands
ME_UID_263	Markermeer	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Netherlands			No license provided with download	<Null>	Markermeer	<Null>	Netherlands
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ME_UID_265	Waddeneilanden,Noordzeekustzone,Breebaart	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Netherlands			No license provided with download	<Null>	Waddeneilanden,Noordzeekustzone,Breebaart	<Null>	Netherlands
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ME_UID_267	Grevelingen	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	Netherlands			No license provided with download	<Null>	Grevelingen	<Null>	Netherlands
ME_UID_268	Foulness	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Foulness	<Null>	UK
ME_UID_269	Alde-Ore Estuary	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Alde-Ore Estuary	<Null>	UK
ME_UID_270	Loch Spynie	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Loch Spynie	<Null>	UK
ME_UID_271	Gibraltar Point	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Gibraltar Point	<Null>	UK
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ME_UID_274	Blackwater Estuary	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	UK			No license provided with download	<Null>	Blackwater Estuary	<Null>	UK
ME_UID_275	Baie du Mont Saint-Michel	Ramsar	//rsis.ramsar.org	Downloaded 28-01-2015	Designated	France			No license provided with download	<Null>	Baie du Mont Saint-Michel	<Null>	France
ME_UID_276	Adur Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ208055	UK Open Government License	<Null>	Adur Estuary	<Null>	UK
ME_UID_277	Aire Point to Carrick Du	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW413361	UK Open Government License	<Null>	Aire Point to Carrick Du	<Null>	UK

ME_UID_278	Alde-Ore Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM437490	UK Open Government License	<Null>	Alde-Ore Estuary	<Null>	UK
ME_UID_279	Alnmouth Saltmarsh and Dunes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU247097	UK Open Government License	<Null>	Alnmouth Saltmarsh and Dunes	<Null>	UK
ME_UID_280	Arne	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY966877	UK Open Government License	<Null>	Arne	<Null>	UK
ME_UID_281	Arun Banks	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ027101	UK Open Government License	<Null>	Arun Banks	<Null>	UK
ME_UID_282	Arundel Park	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ010088	UK Open Government License	<Null>	Arundel Park	<Null>	UK
ME_UID_283	Avon Valley (Bickton to Christchurch)	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU146026	UK Open Government License	<Null>	Avon Valley (Bickton to Christchurch)	<Null>	UK
ME_UID_284	Axmouth to Lyme Regis Under Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY299902	UK Open Government License	<Null>	Axmouth to Lyme Regis Under Cliffs	<Null>	UK
ME_UID_285	Babbacombe Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX927655	UK Open Government License	<Null>	Babbacombe Cliffs	<Null>	UK
ME_UID_286	Bamburgh Coast and Hills	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU170360	UK Open Government License	<Null>	Bamburgh Coast and Hills	<Null>	UK
ME_UID_287	Barnby Broad & Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM477910	UK Open Government License	<Null>	Barnby Broad & Marshes	<Null>	UK
ME_UID_288	Baulk Head to Mullion	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW658206	UK Open Government License	<Null>	Baulk Head to Mullion	<Null>	UK
ME_UID_289	Bawdsey Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM346386	UK Open Government License	<Null>	Bawdsey Cliff	<Null>	UK
ME_UID_290	Beeston Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG169433	UK Open Government License	<Null>	Beeston Cliffs	<Null>	UK
ME_UID_291	Bembridge Down	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ628854	UK Open Government License	<Null>	Bembridge Down	<Null>	UK
ME_UID_292	Bembridge School and Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ642866	UK Open Government License	<Null>	Bembridge School and Cliffs	<Null>	UK
ME_UID_293	Benfleet and Southend Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ859842	UK Open Government License	<Null>	Benfleet and Southend Marshes	<Null>	UK
ME_UID_294	Berry Head to Sharkham Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX934545	UK Open Government License	<Null>	Berry Head to Sharkham Point	<Null>	UK
ME_UID_295	Blackstone Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX537461	UK Open Government License	<Null>	Blackstone Point	<Null>	UK
ME_UID_296	Blackwater Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TL975098	UK Open Government License	<Null>	Blackwater Estuary	<Null>	UK
ME_UID_297	Bognor Reef	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ905979	UK Open Government License	<Null>	Bognor Reef	<Null>	UK
ME_UID_298	Bolt Head to Bolt Tail	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX698372	UK Open Government License	<Null>	Bolt Head to Bolt Tail	<Null>	UK
ME_UID_299	Bonchurch Landslips	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ582786	UK Open Government License	<Null>	Bonchurch Landslips	<Null>	UK
ME_UID_300	Boscawen	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW424230	UK Open Government License	<Null>	Boscawen	<Null>	UK
ME_UID_301	Bouldnor and Hamstead Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ389910	UK Open Government License	<Null>	Bouldnor and Hamstead Cliffs	<Null>	UK
ME_UID_302	Bracklesham Bay	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ827948	UK Open Government License	<Null>	Bracklesham Bay	<Null>	UK
ME_UID_303	Brading Marshes to St. Helen's Ledges	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ629882	UK Open Government License	<Null>	Brading Marshes to St. Helen's Ledges	<Null>	UK
ME_UID_304	Breydon Water	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG493072	UK Open Government License	<Null>	Breydon Water	<Null>	UK
ME_UID_305	Brighton to Newhaven Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ390014	UK Open Government License	<Null>	Brighton to Newhaven Cliffs	<Null>	UK
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ME_UID_307	Budleigh Salterton Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY063817	UK Open Government License	<Null>	Budleigh Salterton Cliffs	<Null>	UK
ME_UID_308	Caerthillian to Kennack	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW712117	UK Open Government License	<Null>	Caerthillian to Kennack	<Null>	UK
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ME_UID_310	Castle Point to Cullernose Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU256219	UK Open Government License	<Null>	Castle Point to Cullernose Point	<Null>	UK
ME_UID_311	Cayton, Cornelian and South Bays	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA060856	UK Open Government License	<Null>	Cayton, Cornelian and South Bays	<Null>	UK
ME_UID_312	Chapel Point to Wolla Bank	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TF560741	UK Open Government License	<Null>	Chapel Point to Wolla Bank	<Null>	UK

ME_UID_313	Chesil & The Fleet	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY611805	UK Open Government License	<Null>	Chesil & The Fleet	<Null>	UK
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ME_UID_316	Clacton Cliffs & Foreshore	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM156134	UK Open Government License	<Null>	Clacton Cliffs & Foreshore	<Null>	UK
ME_UID_317	Climping Beach	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ021010	UK Open Government License	<Null>	Climping Beach	<Null>	UK
ME_UID_318	Colne Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM062161	UK Open Government License	<Null>	Colne Estuary	<Null>	UK
ME_UID_319	Colwell Bay	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ328880	UK Open Government License	<Null>	Colwell Bay	<Null>	UK
ME_UID_320	Compton Chine to Steephill Cove	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ463787	UK Open Government License	<Null>	Compton Chine to Steephill Cove	<Null>	UK
ME_UID_321	Compton Down	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ370855	UK Open Government License	<Null>	Compton Down	<Null>	UK
ME_UID_322	Coquet Island	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU293046	UK Open Government License	<Null>	Coquet Island	<Null>	UK
ME_UID_323	Corton Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM546967	UK Open Government License	<Null>	Corton Cliffs	<Null>	UK
ME_UID_324	Coverack Cove & Dolor Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW783182	UK Open Government License	<Null>	Coverack Cove & Dolor Point	<Null>	UK
ME_UID_325	Coverack to Porthoustock	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW790192	UK Open Government License	<Null>	Coverack to Porthoustock	<Null>	UK
ME_UID_326	Cowpen Marsh	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ504252	UK Open Government License	<Null>	Cowpen Marsh	<Null>	UK
ME_UID_327	Cresswell and Newbiggin Shores	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ299930	UK Open Government License	<Null>	Cresswell and Newbiggin Shores	<Null>	UK
ME_UID_328	Cresswell Ponds	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ283943	UK Open Government License	<Null>	Cresswell Ponds	<Null>	UK
ME_UID_329	Crouch and Roach Estuaries	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ891968	UK Open Government License	<Null>	Crouch and Roach Estuaries	<Null>	UK
ME_UID_330	Cuckoo Rock to Turbot Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW990406	UK Open Government License	<Null>	Cuckoo Rock to Turbot Point	<Null>	UK
ME_UID_331	Cudden Point to Prussia Cove	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW551277	UK Open Government License	<Null>	Cudden Point to Prussia Cove	<Null>	UK
ME_UID_332	Daddyhole	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX926627	UK Open Government License	<Null>	Daddyhole	<Null>	UK
ME_UID_333	Dawlish Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX972775	UK Open Government License	<Null>	Dawlish Cliffs	<Null>	UK
ME_UID_334	Dawlish Warren	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX984796	UK Open Government License	<Null>	Dawlish Warren	<Null>	UK
ME_UID_335	Deben Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM296434	UK Open Government License	<Null>	Deben Estuary	<Null>	UK
ME_UID_336	Dengie	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM042032	UK Open Government License	<Null>	Dengie	<Null>	UK
ME_UID_337	Dibden Bay	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU409093	UK Open Government License	<Null>	Dibden Bay	<Null>	UK
ME_UID_338	Dimlington Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA389219	UK Open Government License	<Null>	Dimlington Cliff	<Null>	UK
ME_UID_339	Dover to Kingsdown Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR356428	UK Open Government License	<Null>	Dover to Kingsdown Cliffs	<Null>	UK
ME_UID_340	Dungeness, Romney Marsh and Rye Bay	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR005203	UK Open Government License	<Null>	Dungeness, Romney Marsh and Rye Bay	<Null>	UK
ME_UID_341	Durham Coast	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ383665	UK Open Government License	<Null>	Durham Coast	<Null>	UK
ME_UID_342	Dyer's Quarry	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX922627	UK Open Government License	<Null>	Dyer's Quarry	<Null>	UK
ME_UID_343	East Runton Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG199429	UK Open Government License	<Null>	East Runton Cliffs	<Null>	UK
ME_UID_344	Eglarooze Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX344539	UK Open Government License	<Null>	Eglarooze Cliff	<Null>	UK
ME_UID_345	Eling and Bury Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU371126	UK Open Government License	<Null>	Eling and Bury Marshes	<Null>	UK
ME_UID_346	Erme Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX621488	UK Open Government License	<Null>	Erme Estuary	<Null>	UK
ME_UID_347	Exe Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX980835	UK Open Government License	<Null>	Exe Estuary	<Null>	UK

ME_UID_348	Felpham	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ949992	UK Open Government License	<Null>	Felpham	<Null>	UK
ME_UID_349	Ferry Cliff, Sutton	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM278486	UK Open Government License	<Null>	Ferry Cliff, Sutton	<Null>	UK
ME_UID_350	Filey Brigg	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA128815	UK Open Government License	<Null>	Filey Brigg	<Null>	UK
ME_UID_351	Flamborough Head	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA199684	UK Open Government License	<Null>	Flamborough Head	<Null>	UK
ME_UID_352	Folkestone Warren	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR256382	UK Open Government License	<Null>	Folkestone Warren	<Null>	UK
ME_UID_353	Folly Rocks	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW573280	UK Open Government License	<Null>	Folly Rocks	<Null>	UK
ME_UID_354	Foulness	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR022902	UK Open Government License	<Null>	Foulness	<Null>	UK
ME_UID_355	Froward Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX905497	UK Open Government License	<Null>	Froward Point	<Null>	UK
ME_UID_356	Geldeston Meadows	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM396916	UK Open Government License	<Null>	Geldeston Meadows	<Null>	UK
ME_UID_357	Gerrans Bay to Camels Cove	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW911378	UK Open Government License	<Null>	Gerrans Bay to Camels Cove	<Null>	UK
ME_UID_358	Gibraltar Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TF565592	UK Open Government License	<Null>	Gibraltar Point	<Null>	UK
ME_UID_359	Gilkicker Lagoon	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ608977	UK Open Government License	<Null>	Gilkicker Lagoon	<Null>	UK
ME_UID_360	Great Yarmouth North Denes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG532099	UK Open Government License	<Null>	Great Yarmouth North Denes	<Null>	UK
ME_UID_361	Gristhorpe Bay and Red Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA084840	UK Open Government License	<Null>	Gristhorpe Bay and Red Cliff	<Null>	UK
ME_UID_362	Hadston Links	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ275994	UK Open Government License	<Null>	Hadston Links	<Null>	UK
ME_UID_363	Hallsands-Beesands	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX818382	UK Open Government License	<Null>	Hallsands-Beesands	<Null>	UK
ME_UID_364	Ham Common	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY981909	UK Open Government License	<Null>	Ham Common	<Null>	UK
ME_UID_365	Hamford Water	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM230253	UK Open Government License	<Null>	Hamford Water	<Null>	UK
ME_UID_366	Happisburgh Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG381312	UK Open Government License	<Null>	Happisburgh Cliffs	<Null>	UK
ME_UID_367	Hartlepool Submerged Forest	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ520314	UK Open Government License	<Null>	Hartlepool Submerged Forest	<Null>	UK
ME_UID_368	Harwich Foreshore	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM263320	UK Open Government License	<Null>	Harwich Foreshore	<Null>	UK
ME_UID_369	Hastings Cliffs to Pett Beach	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ866111	UK Open Government License	<Null>	Hastings Cliffs to Pett Beach	<Null>	UK
ME_UID_370	Hayburn Wyke	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA012968	UK Open Government License	<Null>	Hayburn Wyke	<Null>	UK
ME_UID_371	Headon Warren and West High Down	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ315851	UK Open Government License	<Null>	Headon Warren and West High Down	<Null>	UK
ME_UID_372	Highcliffe to Milford Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ239928	UK Open Government License	<Null>	Highcliffe to Milford Cliffs	<Null>	UK
ME_UID_373	Holborough to Burham Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ712616	UK Open Government License	<Null>	Holborough to Burham Marshes	<Null>	UK
ME_UID_374	Holehaven Creek	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ751829	UK Open Government License	<Null>	Holehaven Creek	<Null>	UK
ME_UID_375	Holton and Sandford Heaths	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY953913	UK Open Government License	<Null>	Holton and Sandford Heaths	<Null>	UK
ME_UID_376	Hope's Nose to Wall's Hill	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX939643	UK Open Government License	<Null>	Hope's Nose to Wall's Hill	<Null>	UK
ME_UID_377	Howick to Seaton Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU267145	UK Open Government License	<Null>	Howick to Seaton Point	<Null>	UK
ME_UID_378	Humber Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA232155	UK Open Government License	<Null>	Humber Estuary	<Null>	UK
ME_UID_379	Hunstanton Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TF677423	UK Open Government License	<Null>	Hunstanton Cliffs	<Null>	UK
ME_UID_380	Hurst Castle and Lymington River Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ331930	UK Open Government License	<Null>	Hurst Castle and Lymington River Estuary	<Null>	UK
ME_UID_381	Hythe to Calshot Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU456052	UK Open Government License	<Null>	Hythe to Calshot Marshes	<Null>	UK
ME_UID_382	Iron Scar and Hundale Point to Scalby Ness	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA029928	UK Open Government License	<Null>	Iron Scar and Hundale Point to Scalby Ness	<Null>	UK

ME_UID_383	Isle of Portland	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY698711	UK Open Government License	<Null>	Isle of Portland	<Null>	UK
ME_UID_384	Kennack to Coverack	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW745167	UK Open Government License	<Null>	Kennack to Coverack	<Null>	UK
ME_UID_385	King's Quay Shore	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ543939	UK Open Government License	<Null>	King's Quay Shore	<Null>	UK
ME_UID_386	Kingsand to Sandway Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX439508	UK Open Government License	<Null>	Kingsand to Sandway Point	<Null>	UK
ME_UID_387	Ladram Bay to Sidmouth	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY101855	UK Open Government License	<Null>	Ladram Bay to Sidmouth	<Null>	UK
ME_UID_388	Landguard Common	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM285318	UK Open Government License	<Null>	Landguard Common	<Null>	UK
ME_UID_389	Langstone Harbour	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU695025	UK Open Government License	<Null>	Langstone Harbour	<Null>	UK
ME_UID_390	Lee-on-the Solent to Itchen Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU510034	UK Open Government License	<Null>	Lee-on-the Solent to Itchen Estuary	<Null>	UK
ME_UID_391	Leiston - Aldeburgh	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM463597	UK Open Government License	<Null>	Leiston - Aldeburgh	<Null>	UK
ME_UID_392	Lewes Brooks	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ427071	UK Open Government License	<Null>	Lewes Brooks	<Null>	UK
ME_UID_393	Lincegrove and Hackett's Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU487087	UK Open Government License	<Null>	Lincegrove and Hackett's Marshes	<Null>	UK
ME_UID_394	Lindisfarne	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU107414	UK Open Government License	<Null>	Lindisfarne	<Null>	UK
ME_UID_395	Loe Pool	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW648248	UK Open Government License	<Null>	Loe Pool	<Null>	UK
ME_UID_396	Lord's Wood	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX872539	UK Open Government License	<Null>	Lord's Wood	<Null>	UK
ME_UID_397	Low Hauxley Shore	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU289020	UK Open Government License	<Null>	Low Hauxley Shore	<Null>	UK
ME_UID_398	Lower Fal & Helford Intertidal	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW862345	UK Open Government License	<Null>	Lower Fal & Helford Intertidal	<Null>	UK
ME_UID_399	Lower Test Valley	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU364144	UK Open Government License	<Null>	Lower Test Valley	<Null>	UK
ME_UID_400	Luscombe Valley	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ048897	UK Open Government License	<Null>	Luscombe Valley	<Null>	UK
ME_UID_401	Lynher Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX398557	UK Open Government License	<Null>	Lynher Estuary	<Null>	UK
ME_UID_402	Malpas Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW836429	UK Open Government License	<Null>	Malpas Estuary	<Null>	UK
ME_UID_403	Meadfoot Sea Road	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX933633	UK Open Government License	<Null>	Meadfoot Sea Road	<Null>	UK
ME_UID_404	Medina Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ505914	UK Open Government License	<Null>	Medina Estuary	<Null>	UK
ME_UID_405	Medway Estuary and Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ849710	UK Open Government License	<Null>	Medway Estuary and Marshes	<Null>	UK
ME_UID_406	Meneage Coastal Section	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW794250	UK Open Government License	<Null>	Meneage Coastal Section	<Null>	UK
ME_UID_407	Merthen Wood	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW730262	UK Open Government License	<Null>	Merthen Wood	<Null>	UK
ME_UID_408	Minsmere-Walberswick Heaths and Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM471733	UK Open Government License	<Null>	Minsmere-Walberswick Heaths and Marshes	<Null>	UK
ME_UID_409	Morston Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TF990441	UK Open Government License	<Null>	Morston Cliff	<Null>	UK
ME_UID_410	Mucking Flats and Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ698791	UK Open Government License	<Null>	Mucking Flats and Marshes	<Null>	UK
ME_UID_411	Mullion Cliff to Predannack Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW663160	UK Open Government License	<Null>	Mullion Cliff to Predannack Cliff	<Null>	UK
ME_UID_412	Mundesley Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG324358	UK Open Government License	<Null>	Mundesley Cliffs	<Null>	UK
ME_UID_413	Newton Links	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU231268	UK Open Government License	<Null>	Newton Links	<Null>	UK
ME_UID_414	Newtown Harbour	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ425913	UK Open Government License	<Null>	Newtown Harbour	<Null>	UK
ME_UID_415	North Bay to South Toll House Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA049894	UK Open Government License	<Null>	North Bay to South Toll House Cliff	<Null>	UK
ME_UID_416	North Norfolk Coast	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TF891452	UK Open Government License	<Null>	North Norfolk Coast	<Null>	UK
ME_UID_417	North Solent	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ440983	UK Open Government License	<Null>	North Solent	<Null>	UK

ME_UID_418	Northumberland Shore	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU250096	UK Open Government License	<Null>	Northumberland Shore	<Null>	UK
ME_UID_419	Orwell Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM221380	UK Open Government License	<Null>	Orwell Estuary	<Null>	UK
ME_UID_420	Otter Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY075825	UK Open Government License	<Null>	Otter Estuary	<Null>	UK
ME_UID_421	Overstrand Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG236415	UK Open Government License	<Null>	Overstrand Cliffs	<Null>	UK
ME_UID_422	Pagham Harbour	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ872968	UK Open Government License	<Null>	Pagham Harbour	<Null>	UK
ME_UID_423	Pakefield to Easton Bavents	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM523823	UK Open Government License	<Null>	Pakefield to Easton Bavents	<Null>	UK
ME_UID_424	Penlee Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW473268	UK Open Government License	<Null>	Penlee Point	<Null>	UK
ME_UID_425	Pevensey Levels	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ647076	UK Open Government License	<Null>	Pevensey Levels	<Null>	UK
ME_UID_426	Pitsea Marsh	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ741869	UK Open Government License	<Null>	Pitsea Marsh	<Null>	UK
ME_UID_427	Plymouth Sound Shores and Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX490517	UK Open Government License	<Null>	Plymouth Sound Shores and Cliffs	<Null>	UK
ME_UID_428	Polruan to Polperro	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX188503	UK Open Government License	<Null>	Polruan to Polperro	<Null>	UK
ME_UID_429	Poole Harbour	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY978872	UK Open Government License	<Null>	Poole Harbour	<Null>	UK
ME_UID_430	Porthcew	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW593269	UK Open Government License	<Null>	Porthcew	<Null>	UK
ME_UID_431	Porthgwarra to Pordenack Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW360228	UK Open Government License	<Null>	Porthgwarra to Pordenack Point	<Null>	UK
ME_UID_432	Porthleven Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW622257	UK Open Government License	<Null>	Porthleven Cliffs	<Null>	UK
ME_UID_433	Porthleven Cliffs East	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW633249	UK Open Government License	<Null>	Porthleven Cliffs East	<Null>	UK
ME_UID_434	Portland Harbour Shore	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY677777	UK Open Government License	<Null>	Portland Harbour Shore	<Null>	UK
ME_UID_435	Portsmouth Harbour	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU617034	UK Open Government License	<Null>	Portsmouth Harbour	<Null>	UK
ME_UID_436	Prawle Point and Start Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX791364	UK Open Government License	<Null>	Prawle Point and Start Point	<Null>	UK
ME_UID_437	Purbeck Ridge (East)	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ022811	UK Open Government License	<Null>	Purbeck Ridge (East)	<Null>	UK
ME_UID_438	Rame Head & Whitsand Bay	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX374533	UK Open Government License	<Null>	Rame Head & Whitsand Bay	<Null>	UK
ME_UID_439	Ramsholt Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM297427	UK Open Government License	<Null>	Ramsholt Cliff	<Null>	UK
ME_UID_440	Redcar Rocks	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ611252	UK Open Government License	<Null>	Redcar Rocks	<Null>	UK
ME_UID_441	Rempstone Heaths	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ010852	UK Open Government License	<Null>	Rempstone Heaths	<Null>	UK
ME_UID_442	River Avon System	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ141985	UK Open Government License	<Null>	River Avon System	<Null>	UK
ME_UID_443	River Coquet and Coquet Valley Woodlands	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU023019	UK Open Government License	<Null>	River Coquet and Coquet Valley Woodlands	<Null>	UK
ME_UID_444	River Frome	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY756906	UK Open Government License	<Null>	River Frome	<Null>	UK
ME_UID_445	River Test	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU378386	UK Open Government License	<Null>	River Test	<Null>	UK
ME_UID_446	Robin Hood's Bay: Maw Wyke to Beast Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ989012	UK Open Government License	<Null>	Robin Hood's Bay: Maw Wyke to Beast Cliff	<Null>	UK
ME_UID_447	Roman River	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM001207	UK Open Government License	<Null>	Roman River	<Null>	UK
ME_UID_448	Rosemullion	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW792274	UK Open Government License	<Null>	Rosemullion	<Null>	UK
ME_UID_449	Roundham Head	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX895598	UK Open Government License	<Null>	Roundham Head	<Null>	UK
ME_UID_450	Runswick Bay	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ808169	UK Open Government License	<Null>	Runswick Bay	<Null>	UK
ME_UID_451	Ryde Sands and Wootton Creek	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ615926	UK Open Government License	<Null>	Ryde Sands and Wootton Creek	<Null>	UK
ME_UID_452	Salcombe to Kingsbridge Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX745405	UK Open Government License	<Null>	Salcombe to Kingsbridge Estuary	<Null>	UK

ME_UID_453	Saltern Cove	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX895585	UK Open Government License	<Null>	Saltern Cove	<Null>	UK
ME_UID_454	Saltfleetby - Theddlethorpe Dunes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TF481908	UK Open Government License	<Null>	Saltfleetby - Theddlethorpe Dunes	<Null>	UK
ME_UID_455	Sandwich Bay to Hacklinge Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR352592	UK Open Government License	<Null>	Sandwich Bay to Hacklinge Marshes	<Null>	UK
ME_UID_456	Seaford to Beachy Head	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TV519985	UK Open Government License	<Null>	Seaford to Beachy Head	<Null>	UK
ME_UID_457	Seal Sands	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ527258	UK Open Government License	<Null>	Seal Sands	<Null>	UK
ME_UID_458	Seaton Dunes and Common	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ533281	UK Open Government License	<Null>	Seaton Dunes and Common	<Null>	UK
ME_UID_459	Selsey, East Beach	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ860925	UK Open Government License	<Null>	Selsey, East Beach	<Null>	UK
ME_UID_460	Sheppey Cliffs and Foreshore	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ993730	UK Open Government License	<Null>	Sheppey Cliffs and Foreshore	<Null>	UK
ME_UID_461	Sidestrand and Trimingham Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG275392	UK Open Government License	<Null>	Sidestrand and Trimingham Cliffs	<Null>	UK
ME_UID_462	Sidmouth to Beer Coast	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY182880	UK Open Government License	<Null>	Sidmouth to Beer Coast	<Null>	UK
ME_UID_463	Sinah Common	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ695979	UK Open Government License	<Null>	Sinah Common	<Null>	UK
ME_UID_464	Slapton Ley	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX828441	UK Open Government License	<Null>	Slapton Ley	<Null>	UK
ME_UID_465	South Dorset Coast	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY879795	UK Open Government License	<Null>	South Dorset Coast	<Null>	UK
ME_UID_466	South Gare & Coatham Sands	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ570264	UK Open Government License	<Null>	South Gare & Coatham Sands	<Null>	UK
ME_UID_467	South Thames Estuary and Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ805794	UK Open Government License	<Null>	South Thames Estuary and Marshes	<Null>	UK
ME_UID_468	Sprat's Water and Marshes, Carlton Colville	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM506922	UK Open Government License	<Null>	Sprat's Water and Marshes, Carlton Colville	<Null>	UK
ME_UID_469	St John's Lake	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX429538	UK Open Government License	<Null>	St John's Lake	<Null>	UK
ME_UID_470	St Michael's Mount	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW513297	UK Open Government License	<Null>	St Michael's Mount	<Null>	UK
ME_UID_471	Staithes - Port Mulgrave	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ793184	UK Open Government License	<Null>	Staithes - Port Mulgrave	<Null>	UK
ME_UID_472	Stanley and Alder Carrs, Aldeby	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM433927	UK Open Government License	<Null>	Stanley and Alder Carrs, Aldeby	<Null>	UK
ME_UID_473	Stodmarsh	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR212613	UK Open Government License	<Null>	Stodmarsh	<Null>	UK
ME_UID_474	Stour Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM173327	UK Open Government License	<Null>	Stour Estuary	<Null>	UK
ME_UID_475	Studland & Godlingston Heaths	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ024839	UK Open Government License	<Null>	Studland & Godlingston Heaths	<Null>	UK
ME_UID_476	Studland Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ041824	UK Open Government License	<Null>	Studland Cliffs	<Null>	UK
ME_UID_477	Swanpool	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW800315	UK Open Government License	<Null>	Swanpool	<Null>	UK
ME_UID_478	Tamar - Tavy Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX438632	UK Open Government License	<Null>	Tamar - Tavy Estuary	<Null>	UK
ME_UID_479	Tater-Du	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW440230	UK Open Government License	<Null>	Tater-Du	<Null>	UK
ME_UID_480	Tees and Hartlepool Foreshore and Wetlands	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ514350	UK Open Government License	<Null>	Tees and Hartlepool Foreshore and Wetlands	<Null>	UK
ME_UID_481	Thanet Coast	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR283696	UK Open Government License	<Null>	Thanet Coast	<Null>	UK
ME_UID_482	The Cliff, Burnham-on-Crouch	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ921967	UK Open Government License	<Null>	The Cliff, Burnham-on-Crouch	<Null>	UK
ME_UID_483	The Farne Islands	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU218359	UK Open Government License	<Null>	The Farne Islands	<Null>	UK
ME_UID_484	The Lagoons	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA411175	UK Open Government License	<Null>	The Lagoons	<Null>	UK
ME_UID_485	The Naze	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM266236	UK Open Government License	<Null>	The Naze	<Null>	UK
ME_UID_486	The Swale	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TR001665	UK Open Government License	<Null>	The Swale	<Null>	UK
ME_UID_487	The Wash	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TF537402	UK Open Government License	<Null>	The Wash	<Null>	UK

ME_UID_488	Thorness Bay	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ457936	UK Open Government License	<Null>	Thorness Bay	<Null>	UK
ME_UID_489	Tower Hill to Cockham Wood	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ765715	UK Open Government License	<Null>	Tower Hill to Cockham Wood	<Null>	UK
ME_UID_490	Treen Cliff	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW396223	UK Open Government License	<Null>	Treen Cliff	<Null>	UK
ME_UID_491	Tremearne Par	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW609266	UK Open Government License	<Null>	Tremearne Par	<Null>	UK
ME_UID_492	Tweed Catchment Rivers - England: Lower Tweed and Whiteadder	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NT969516	UK Open Government License	<Null>	Tweed Catchment Rivers - England: Lower Tweed and Whiteadder	<Null>	UK
ME_UID_493	Tynemouth to Seaton Sluice	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ340762	UK Open Government License	<Null>	Tynemouth to Seaton Sluice	<Null>	UK
ME_UID_494	Upper Colne Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TM026226	UK Open Government License	<Null>	Upper Colne Marshes	<Null>	UK
ME_UID_495	Upper Fal Estuary and Woods	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW850403	UK Open Government License	<Null>	Upper Fal Estuary and Woods	<Null>	UK
ME_UID_496	Upper Hamble Estuary and Woods	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU500108	UK Open Government License	<Null>	Upper Hamble Estuary and Woods	<Null>	UK
ME_UID_497	Vange & Fobbing Marshes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TQ733839	UK Open Government License	<Null>	Vange & Fobbing Marshes	<Null>	UK
ME_UID_498	Warblington Meadow	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SU729052	UK Open Government License	<Null>	Warblington Meadow	<Null>	UK
ME_UID_499	Wareham Meadows	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY931871	UK Open Government License	<Null>	Wareham Meadows	<Null>	UK
ME_UID_500	Warkworth Dunes and Saltmarsh	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NU260058	UK Open Government License	<Null>	Warkworth Dunes and Saltmarsh	<Null>	UK
ME_UID_501	Wear River Bank	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ359577	UK Open Government License	<Null>	Wear River Bank	<Null>	UK
ME_UID_502	Wembury Point	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX525482	UK Open Government License	<Null>	Wembury Point	<Null>	UK
ME_UID_503	West Dorset Coast	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SY397922	UK Open Government License	<Null>	West Dorset Coast	<Null>	UK
ME_UID_504	West Lizard	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SW686149	UK Open Government License	<Null>	West Lizard	<Null>	UK
ME_UID_505	West Runton Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG187431	UK Open Government License	<Null>	West Runton Cliffs	<Null>	UK
ME_UID_506	Western King	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX461533	UK Open Government License	<Null>	Western King	<Null>	UK
ME_UID_507	Weybourne Cliffs	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG133435	UK Open Government License	<Null>	Weybourne Cliffs	<Null>	UK
ME_UID_508	Whitby-Saltwick	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		NZ911112	UK Open Government License	<Null>	Whitby-Saltwick	<Null>	UK
ME_UID_509	Whitecliff Bay and Bembridge Ledges	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ650868	UK Open Government License	<Null>	Whitecliff Bay and Bembridge Ledges	<Null>	UK
ME_UID_510	Winterton - Horsey Dunes	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TG494202	UK Open Government License	<Null>	Winterton - Horsey Dunes	<Null>	UK
ME_UID_511	Withow Gap, Skipsea	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		TA182546	UK Open Government License	<Null>	Withow Gap, Skipsea	<Null>	UK
ME_UID_512	Yar Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SZ353884	UK Open Government License	<Null>	Yar Estuary	<Null>	UK
ME_UID_513	Yealm Estuary	SSSI (where part of site falls below MHW)	Natural England	Downloaded 07-01-2015	Designated	UK		SX551501	UK Open Government License	<Null>	Yealm Estuary	<Null>	UK
ME_UID_514	Estuaires Picards et Mer D Opale	National Park	http://cartographie.aires-marines.fr/viewer/index.php	Downloaded 18-03-2015	Designated	FR			No license provided with download	<Null>	Estuaires Picards et Mer D Opale	<Null>	France
ME_UID_515	Færder	National Park	http://kartkatalog.miljodirektoratet.no/Map_catalog_dataset_download_overview.asp?Language=EN	Downloaded 18-03-2015		NOR			No license provided with download	<Null>	Færder	<Null>	Norway
ME_UID_516	Havet mellem Korshage og Hundested	SPA (with marine components)	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK005Y102	<Null>	No license provided with download	<Null>	Havet mellem Korshage og Hundested	<Null>	Denmark
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ME_UID_523	Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde	SCI	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00AY176	<Null>	No license provided with download	<Null>	Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde	<Null>	Denmark
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ME_UID_525	Skagens Gren og Skagerrak	SCI	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00FX112	<Null>	No license provided with download	<Null>	Skagens Gren og Skagerrak	<Null>	Denmark
ME_UID_526	Ålborg Bugt, Randers Fjord og Mariager Fjord	SCI	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00FX122	<Null>	No license provided with download	<Null>	Ålborg Bugt, Randers Fjord og Mariager Fjord	<Null>	Denmark
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ME_UID_533	Ebbeløkkerev	HELCOM Protected Area	EEA	EEA N2K download, version end2013 rev1	<Null>	DK	DK00VA330	<Null>	No license provided with download	<Null>	Ebbeløkkerev	<Null>	Denmark

ME_UID	mpa_name	mgmt_Responsible_Management	mgmt_Authority_ website	mgmt_EUNIS_Site_Information	mgmt_MPA_Status	mgmt_Date_MPA_Status_obtaine	mgmt_Restrictions	Natura 2000 Species	Natura 2000 Habitats	OSPAR Species	OSPAR habitats	Other species	Other habitats
ME_UID_1	S-H Wadden sea National Park	Schleswig-Holstein Wadden Sea National Park	http://www.nationalpark-wattenmeer.de/sh/overview-english	http://eunis.eea.europa.eu/sites/DE0916491	Designated and implemented as SPA	Sep-04	See restrictions at: http://www.nationalpark-wattenmeer.de/sh/overview-english						
ME_UID_2	Doggerbank	BfN-German Federal Agency for Nature Conservation	http://www.bfn.de/0314_doggerbank+M5054de7a952.html	http://eunis.eea.europa.eu/sites/DE1003301	Designated as SPA	May-04	NSRAC Fisheries Management: http://nsrac.org/wp-content/uploads/2012/07/NSRAC-1112-7-2012-04-09-Dogger-Bank-SACs-Position-Paper-FINAL.pdf	Annex II species: harbour porpoise and common seal. See: http://www.bfn.de/0314_doggerbank+M5054de7a952.html	Annex I habitats: sandbanks. See: http://www.bfn.de/0314_doggerbank+M5054de7a952.html				
ME_UID_3	Sylt.Aussenr.-Oestl.Dt.Bucht	BfN-German Federal Agency for Nature Conservation	http://www.bfn.de/0314_sylter-aussenriff+M5054de7a952.html and https://www.bfn.de/0314_oestliche-deutsche-bucht.html	http://eunis.eea.europa.eu/sites/DE1209301	Designated as SCI	May-04	<Null>	Annex II species: harbour porpoise, common seal, grey seal, river lamprey, twist shad. See: http://www.bfn.de/0314_sylter-aussenriff+M5054de7a952.html	Annex I habitats: sandbanks and reefs. See: http://www.bfn.de/0314_sylter-aussenriff+M5054de7a952.html				
ME_UID_4	S-H Seabird Protection Area	Ministry of Energy, Agriculture, the Environment and Rural Areas	http://www.bfn.de/0323_aba_id232.html	http://eunis.eea.europa.eu/sites/DE1813491	Designated as SPA	Sep-04	<Null>					Eider, common tern, arctic tern, black throated diver, red necked grebe, herring gull, red throated diver, common gull, black scroter and little gull. See: http://www.bfn.de/0323_aba_id232.html	
ME_UID_5	Borkum-Riffgrund	BfN- German Federal Agency for Nature Conservation	http://www.bfn.de/0314_borkum-riffgrund+M5054de7a952.html	http://eunis.eea.europa.eu/sites/DE2104301	Designated as SCI	May-04	<Null>						
ME_UID_6	Nationalpark Niedersächsisches Wattenmeer	Lower Saxon Wadden Sea National Park	http://www.nationalpark-wattenmeer.de/nds	http://eunis.eea.europa.eu/sites/DE2306301	Designated and implemented as SCI	Oct-98	See restrictions at: http://www.nationalpark-wattenmeer.de/nds/nationalpark/erlaubt-verboten/wassersport	Annex II species: shad, lampern, grey sea lamprey, grey seal, common seal, harbour porpoise. See: http://eunis.eea.europa.eu/sites/DE2306301	Annex I habitats: sandbanks, estuaries, sandflats, mudflats, lagoons, inlets and bays, reefs, salicornia, spartina swards, salt meadows, dunes with specific features. See: http://eunis.eea.europa.eu/sites/DE2306301				
ME_UID_7	Iroise	Agence des aires marines protégées	https://www.parc-marin-iroise.gouv.fr	<Null>	Designated as Marine Park	Sep-07	2015 Action Plan: http://www.parc-marin-iroise.fr/Le-Parc/Actions/Programme-d-actions	Annex II species: British storm-petrel, European shag, common tern, Arctic tern, sandwich tern, roseate tern and little tern, red-throated loon, Arctic loon and common loon, Cory's shearwater, Balearic shearwater, Leach's storm-petrel, Mediterranean gull, Dartford warbler, Eurasian marsh harrier, peregrine falcon, red-billed chough, and little egret, herring gull, lesser and great black-backed gulls, Eurasian oyster catcher, black-bellied plover, black scoter, common redshank, and Eurasian curlew, shore dock, Trichomanes speciosum, Eurasian otter, grey seal, common bottlenose dolphin, and Harbour porpoise.	Annex I habitats: sand banks, estuaries, mudflats, sandflats, inlets and bays, reefs, sea caves, intertidal Fucus habitats, turtle grass flats, honeycomb worm reefs, intertidal boulder fields, Laminaria, maerl beds.				
ME_UID_8	Baie de Somme	Syndicat Mixte Grand Baie de Somme coast Picard	http://www.reserves-naturelles.org/baie-de-somme	http://eunis.eea.europa.eu/sites/FR2210068	Classified as SPA	Oct-04	<Null>	Annex II species: Pintail, Shoveler, Teal, Wigeon, Mallard, Greylag Goose, Bean Goose, Short-eared Owl, Bittern, Barnacle Goose, Dunlin, Knot, Ringed Plover, White Stork, Black Stork, Great White Egret, Little Egret, Merlin, Oystercatcher, Black-winged Stilt, Mediterranean Gull, Bar-tailed Godwit, Smew, Curlew, Night Heron, Osprey, Ruff, Spoonbill, Grey Plover, Baillon's Crake, Avocet, Common Tern, Sandwich Tern, Shelduck, Redshank.					
ME_UID_9	Domaine de Beauguillot	Agence des aires marines protégées	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555544127&gid=1358	http://eunis.eea.europa.eu/sites/FR2510046	Classified as SPA	Mar-06	<Null>	Annex II species: see http://eunis.eea.europa.eu/sites/FR2510046					
ME_UID_10	Baie de Saint-Brieuc	Préfet, Conseil National pour la Protection de la Nature)	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555544128&gid=240	http://eunis.eea.europa.eu/sites/FR5300066	Confirmed as SCI	Jan-13	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR5300066	Annex II species: see: http://eunis.eea.europa.eu/sites/FR5300066				
ME_UID_11	Noordzeekustzone	Rijkswaterstaat (Water Management Agency)	http://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?subj=n2k&groep=8&id=n2k7&topic=introductie	http://eunis.eea.europa.eu/sites/NL9802001	Designated as SAC and implemented	Feb-09	<Null>	Annex II species. See: http://eunis.eea.europa.eu/sites/NL9802001					
ME_UID_12	Doggerbank	Rijkswaterstaat (Water Management Agency)	http://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?subj=n2k&groep=13&id=n2k164	http://eunis.eea.europa.eu/sites/NL2008001	Designated	Dec-09	<Null>	Annex II species: Harbour porpoise, harbour seal, grey seal. See: http://www.noordzeeloket.nl/en/projects/north-sea-natura-2000/sites/dogger-bank/protected-species/index.aspx	Annex I habitats: sandbanks. See: http://www.noordzeeloket.nl/en/projects/north-sea-natura-2000/sites/dogger-bank/habitat-type/index.aspx				

ME_UID_13	Klaverbank	Rijkswaterstaat (Water Management Agency)	http://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?subj=n2k&groep=13&id=n2k165	http://eunis.eea.europa.eu/sites/NL2008002	Designated	Dec-09	<Null>	Annex II species: Harbour porpoise, harbour seal, grey seal. See: http://www.noordzeeloket.nl/en/projects/north-sea-natura-2000/sites/cleaver-bank/protected-species/index.aspx	Annex I habitats: See: http://www.noordzeeloket.nl/en/projects/north-sea-natura-2000/sites/cleaver-bank/habitat-type/index.aspx				
ME_UID_14	Vlakte van de Raan	Rijkswaterstaat (Water Management Agency)	http://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?subj=n2k&groep=10&id=n2k163	http://eunis.eea.europa.eu/sites/NL2008003	Designated as SAC	Mar-11	<Null>	Annex II species: see http://eunis.eea.europa.eu/sites/NL2008003	Annex I habitats: see http://eunis.eea.europa.eu/sites/NL2008003				
ME_UID_15	Voordelta	Rijkswaterstaat (Water Management Agency)	http://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?subj=n2k&groep=10&id=n2k113	http://eunis.eea.europa.eu/sites/NL4000017	Designated as SAC	Mar-08	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/NL4000017	Annex I habitats: see: http://eunis.eea.europa.eu/sites/NL4000017				
ME_UID_16	Kungsbackafjorden	County Administration of Halland (regional); Swedish Agency for Marine and Water Management	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/Pages/Faststallda_bevarandeplaner.aspx,	http://eunis.eea.europa.eu/sites/SE0510058	Designated as SAC and implemented	Mar-11	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/SE0510058	Annex I habitats: see: http://eunis.eea.europa.eu/sites/SE0510058				
ME_UID_17	Lilla Middelgrund	County Administrative Board of Halland	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/Pages/Faststallda_bevarandeplaner.aspx,	http://eunis.eea.europa.eu/sites/SE0510126	Designated as SAC and implemented	Mar-11	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx	Annex II species: see: http://eunis.eea.europa.eu/sites/SE0510126	Annex I habitats: see: http://eunis.eea.europa.eu/sites/SE0510126				
ME_UID_18	Fladen	County Administrative Board of Halland	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/Pages/Faststallda_bevarandeplaner.aspx,	http://eunis.eea.europa.eu/sites/SE0510127	Designated as SAC and implemented	Mar-11	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx	Annex II species: see: http://eunis.eea.europa.eu/sites/SE0510127	Annex I habitats: see: http://eunis.eea.europa.eu/sites/SE0510127				
ME_UID_19	Stora Middelgrund och Röde bank	County Administrative Board of Halland	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/Pages/Faststallda_bevarandeplaner.aspx,	http://eunis.eea.europa.eu/sites/SE0510186	Designated	Dec-09	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx	Annex II species: common porpoise. See: http://eunis.eea.europa.eu/sites/SE0510186	Annex I habitats: sandbanks and reefs. See: http://eunis.eea.europa.eu/sites/SE0510186				
ME_UID_20	Morups bank	County Administrative Board of Halland	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/Pages/Faststallda_bevarandeplaner.aspx,	http://eunis.eea.europa.eu/sites/SE0510187	Designated	Dec-09	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx		Annex I habitats: sandbanks and reefs. See: http://eunis.eea.europa.eu/sites/SE0510187				
ME_UID_21	Nordre älvs estuarium	County Administrative Board of Vastra Gotaland (regional); Swedish Agency for Marine and Water Management (National)	www.lansstyrelsen.se/vastragotaland	http://eunis.eea.europa.eu/sites/SE0520043	Designated as SAC and implemented	Mar-11	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx	Annex II species: see: http://eunis.eea.europa.eu/sites/SE0520043	Annex I habitats: see: http://eunis.eea.europa.eu/sites/SE0520043				
ME_UID_22	Kosterfjorden-Väderöfjorden	Swedish Agency for Marine and Water Management?	http://eunis.eea.europa.eu/sites/SE0520170	http://eunis.eea.europa.eu/sites/SE0520170	Designated as SAC and implemented	Mar-11	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx	Annex II species: see: http://eunis.eea.europa.eu/sites/SE0520170	Annex I habitats: see: http://eunis.eea.europa.eu/sites/SE0520170				
ME_UID_23	Gullmarsfjorden	County Administrative Board of Vastra Gotaland (regional); Swedish Agency for Marine and Water Management (National)	www.lansstyrelsen.se/vastragotaland	http://eunis.eea.europa.eu/sites/SE0520171	Designated as SAC and implemented	Mar-11	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx	Annex II species: see: http://eunis.eea.europa.eu/sites/SE0520171	Annex I habitats: see: http://eunis.eea.europa.eu/sites/SE0520171				
ME_UID_24	Vlaamse Banken , SBZ 1 and SBZ2	Federal Public Service (FPS) Health, Food Chain Safety and Environment	http://www.health.belgium.be/eportal/Environment/MarineEnvironment/TheMarineEnvironPolicy/WorkingInAnInternational/BirdsAndHabitats/AreaPolicy/BirdsDirectiveAreas/19087529_EN?ie2Term=North Sea&ie2section=83#.VO2km2ezXIU	http://eunis.eea.europa.eu/sites/BEMNZ0002 and http://eunis.eea.europa.eu/sites/BEMNZ0003	Designated as SPA	Oct-05	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/BEMNZ0002 and http://eunis.eea.europa.eu/sites/BEMNZ0003	Annex I habitats: see: http://eunis.eea.europa.eu/sites/BEMNZ0002 and http://eunis.eea.europa.eu/sites/BEMNZ0003				
ME_UID_25	SBZ3	Federal Public Service (FPS) Health, Food Chain Safety and Environment	http://www.health.belgium.be/eportal/Environment/MarineEnvironment/TheMarineEnvironPolicy/WorkingInAnInternational/BirdsAndHabitats/AreaPolicy/BirdsDirectiveAreas/19087529_EN?ie2Term=North Sea&ie2section=83#.VO2km2ezXIU	http://eunis.eea.europa.eu/sites/BEMNZ0004	Designated as SPA	Oct-05	Permanenet mooring and anchoring; prohibited pole and line fishing	Annex II species: see: http://eunis.eea.europa.eu/sites/BEMNZ0004	Annex I habitats: see: http://eunis.eea.europa.eu/sites/BEMNZ0004				
ME_UID_26	Estuaire de la Seine	Association Maison de l'Estuaire	http://maisondelestuaire.net/reserve.html	http://eunis.eea.europa.eu/sites/FR2300121	Confirmed as SCI	Jan-13	See restrictions at: http://maisondelestuaire.net/reserve_gestion.html#hydraulique	Annex II species: see: http://eunis.eea.europa.eu/sites/FR2300121	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR2300121				
ME_UID_27	Littoral Cauchois	DREAL Haute-Normandie	www.haute-normandie.developpementdurable.gouv.fr	http://eunis.eea.europa.eu/sites/FR2300139	Confirmed as SCI	Jan-13	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR2300139	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR2300139				
ME_UID_28	Récifs et marais arrière-littoraux du cap Lévi à la Pointe de Saire	DIREN Basse-Normandie / MNHN-SPN	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555557135&gid=1810	http://eunis.eea.europa.eu/sites/FR2500085	Confirmed as SCI	Jan-13	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR2500085	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR2500085				
ME_UID_29	Tatihou - Saint-Vaast-la-Hougue	DIREN Basse-Normandie / SPN IEGB-MNHN	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555557196&gid=1932	http://eunis.eea.europa.eu/sites/FR2500086	Confirmed as SCI	Jan-13	<Null>		Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR2500086				

ME_UID_30	Marais du Cotentin et du Bessin - Baie des Veys	DIREN Basse-Normandie / SPN IEGB-MNHN	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555557079&gid=1698	http://eunis.eea.europa.eu/sites/FR2500088	Confirmed as SCI	Jan-13	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR2500088	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR2500088				
ME_UID_31	Baie de Seine occidentale	Agence des aires marines protégées	http://baiedeseine.n2000.fr/les-sites/baie-de-seine-occidentale-zpszsc	http://eunis.eea.europa.eu/sites/FR2502020	Confirmed as SCI	Jan-13	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR2500088	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR2500088				
ME_UID_32	Bancs des Flandres	DIREN Nord-Pas-de-Calais / MNHN-SPN	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555556925&gid=1392	http://eunis.eea.europa.eu/sites/FR3102002	Confirmed as SCI	Jan-13	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR3102002	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR3102002				
ME_UID_33	Côte de Granit rose-Sept-Iles	DREAL BRETAGNE / SPN-EGB-MNHN	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555556957&gid=1456	http://eunis.eea.europa.eu/sites/FR5300009	Designated as SAC	May-07	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR5300009	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR5300009				
ME_UID_34	Tregor Goëlo	DGALN/DEB/SDEN/Bureau Natura 2000	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555557212&gid=1964	http://eunis.eea.europa.eu/sites/FR5300010	Designated as SAC	May-07	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR5300010	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR5300010				
ME_UID_35	Baie de Morlaix	DREAL BRETAGNE / SPN-EGB-MNHN	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555556922&gid=1386	http://eunis.eea.europa.eu/sites/FR5300015	Designated as SAC	May-07	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR5300015	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR5300015				
ME_UID_36	Abers - Côtes des légendes	DGALN/DEB/SDEN/Bureau Natura 2000	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555556909&gid=1360	http://eunis.eea.europa.eu/sites/FR5300017	Designated as SAC	May-07	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR5300017	Annex I habitats: see: http://eunis.eea.europa.eu/sites/FR5300017				
ME_UID_37	Falaise du Bessin Occidental	Agence des aires marines protégées	http://baiedeseine.n2000.fr/les-sites/falaise-du-bessin-occidental-zps	http://eunis.eea.europa.eu/sites/FR2510099	Classified as SPA	Jan-05	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR2510099					
ME_UID_38	Côte de Granit Rose-Sept Iles	<Null>	http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_popup_en?wdpaid=555544129&gid=242	http://eunis.eea.europa.eu/sites/FR5310011	Classified as SPA	Jul-04	<Null>	Annex II species: see: http://eunis.eea.europa.eu/sites/FR5310011					
ME_UID_39	Havstensfjord	County Administrative Board of Vastra Gotaland (regional); Swedish Agency for Marine and Water Management (National)	www.lansstyrelsen.se/vastragotaland	http://eunis.eea.europa.eu/sites/SE0520173	Designated as SAC and implemented	Mar-11	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx	Annex II species: see: http://eunis.eea.europa.eu/sites/SE0520173					
ME_UID_40	Bratten	County Administrative Board of Vastra Gotaland (regional); Swedish Agency for Marine and Water Management (National)	www.lansstyrelsen.se/vastragotaland	http://eunis.eea.europa.eu/sites/SE0520189	designated but not implemented due to lack of means	Nov-13	http://www.lansstyrelsen.se/halland/Sv/djur-och-natur/skyddad-natur/natura-2000/om-tillstandsprovning-for-natura-2000-omraden/Pages/default.aspx		Annex I habitats: see: http://eunis.eea.europa.eu/sites/SE0520189				
ME_UID_41	Ytre Hvaler	Directorate of Fisheries	http://www.fiskeridir.no/english	http://www.ytrehvaler.no/	Designated as marine national park	<Null>	Marine management plan: http://www.ytrehvaler.no/Naturforvaltning/Forvaltningsplanen/Forvaltningsplan-for-sjoomradene/					http://www.ytrehvaler.no/Naturverdier-i-havet/Fisk-og-sjodyr/	
ME_UID_42	Breisunddjupet	Directorate of Fisheries	http://www.fiskeridir.no/english	n/a	<Null>	2010	Prohibited: Professional bottom trawling. See: http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_en?wdpaid=555556940&gid=1422&lg=0	Lophelia pertusa. See: http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_en?wdpaid=555556940&gid=1422&lg=0					
ME_UID_43	Dornoch Firth and Loch Fleet	Scotland	http://jncc.defra.gov.uk/page-1878-theme=default	http://eunis.eea.europa.eu/sites/UK9001622	Classified as SPA	Mar-97	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9001622					
ME_UID_44	Cromarty Firth	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1879	http://eunis.eea.europa.eu/sites/UK9001623	Classified as SPA	Mar-99	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9001623					
ME_UID_45	Inner Moray Firth	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1880	http://eunis.eea.europa.eu/sites/UK9001624	Classified as SPA	Mar-99	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9001624					
ME_UID_46	Moray and Nairn Coast	Scotland	http://jncc.defra.gov.uk/page-1891-theme=default	http://eunis.eea.europa.eu/sites/UK9001625	Classified as SPA	Mar-97	<Null>	Protected bird species listed at:http://eunis.eea.europa.eu/sites/UK9001625					
ME_UID_47	East Sanday Coast	Scotland	http://jncc.defra.gov.uk/page-1918-theme=default	http://eunis.eea.europa.eu/sites/UK9002331	Classified as SPA	Aug-97	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002331					
ME_UID_48	Firth of Tay & Eden Estuary	Scotland	http://jncc.defra.gov.uk/page-1974-theme=default	http://eunis.eea.europa.eu/sites/UK9004121	Classified as SPA	Feb-00	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9004121					
ME_UID_49	Lindisfarne	Defra	http://publications.naturalengland.org.uk/publication/5382184353398784	http://eunis.eea.europa.eu/sites/UK9006011	Classified as SPA	Mar-92	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9006011					
ME_UID_50	Teesmouth and Cleveland Coast	Defra	http://jncc.defra.gov.uk/default.aspx?page=2003	http://eunis.eea.europa.eu/sites/UK9006061	Classified as SPA	Aug-95	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9006061					
ME_UID_51	Humber Estuary	Defra	http://jncc.defra.gov.uk/page-2004	http://eunis.eea.europa.eu/sites/UK9006111	Classified as SPA	Aug-07	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9006111					
ME_UID_52	The Wash	Defra	http://jncc.defra.gov.uk/default.aspx?page=2008	http://eunis.eea.europa.eu/sites/UK9008021	Classified as SPA	Mar-88	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9008021					
ME_UID_53	Gibraltar Point	Defra	http://jncc.defra.gov.uk/page-2010	http://eunis.eea.europa.eu/sites/UK9008022	Classified as SPA	Mar-93	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9008022					

ME_UID_54	Alde-Ore Estuary	Defra	http://jncc.defra.gov.uk/page-2012-theme=default	http://eunis.eea.europa.eu/sites/UK9009112	Classified as SPA	Oct-96	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009112						
ME_UID_55	Stour and Orwell Estuaries	Defra	http://jncc.defra.gov.uk/page-2014-theme=default	http://eunis.eea.europa.eu/sites/UK9009121	Classified as SPA	Jul-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009121						
ME_UID_56	Hamford Water	Defra	http://jncc.defra.gov.uk/page-2015-theme=default	http://eunis.eea.europa.eu/sites/UK9009131	Classified as SPA	Jun-93	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009131						
ME_UID_57	Benfleet and Southend Marshes	Defra	http://jncc.defra.gov.uk/default.aspx?page=2017	http://eunis.eea.europa.eu/sites/UK9009171	Classified as SPA	Feb-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009171						
ME_UID_58	Dengie (Mid-Essex Coast Phase 1)	Defra	http://jncc.defra.gov.uk/default.aspx?page=2019	http://eunis.eea.europa.eu/sites/UK9009242	Classified as SPA	Mar-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009242						
ME_UID_59	Colne Estuary (Mid-Essex Coast Phase 2)	Defra	http://jncc.defra.gov.uk/default.aspx?page=2020	http://eunis.eea.europa.eu/sites/UK9009243	Classified as SPA	Jul-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009243						
ME_UID_60	Crouch and Roach Estuaries (Mid-Essex Coast Phase 3)	Defra	http://jncc.defra.gov.uk/default.aspx?page=2021	http://eunis.eea.europa.eu/sites/UK9009244	Classified as SPA	Jun-98	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009244						
ME_UID_61	Blackwater Estuary (Mid-Essex Coast Phase 4)	Defra	http://jncc.defra.gov.uk/default.aspx?page=2023	http://eunis.eea.europa.eu/sites/UK9009245	Classified as SPA	Mar-95	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9009245						
ME_UID_62	Exe Estuary	Defra	http://jncc.defra.gov.uk/page-2041-theme=default	http://eunis.eea.europa.eu/sites/UK9010081	Classified as SPA	Mar-92	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9010081						
ME_UID_63	Tamar Estuaries Complex	Defra	http://jncc.defra.gov.uk/page-2042	http://eunis.eea.europa.eu/sites/UK9010141	Classified as SPA	Jun-97	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9010141						
ME_UID_64	The Swale	Defra	http://jncc.defra.gov.uk/default.aspx?page=2043	http://eunis.eea.europa.eu/sites/UK9012011	Classified as SPA	Aug-82	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9012011						
ME_UID_65	Thames Estuary and Marshes	Defra	http://jncc.defra.gov.uk/default.aspx?page=2044	http://eunis.eea.europa.eu/sites/UK9012021	Classified as SPA	Mar-00	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9012021						
ME_UID_66	Medway Estuary and Marshes	Defra	http://jncc.defra.gov.uk/page-2045-theme=default	http://eunis.eea.europa.eu/sites/UK9012031	Classified as SPA	Dec-93	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9012031						
ME_UID_67	Buchan Ness to Collieston Coast	Scotland	http://jncc.defra.gov.uk/page-1923-theme=default	http://eunis.eea.europa.eu/sites/UK9002491	Classified as SPA	Mar-98	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002491						
ME_UID_68	Calf of Eday	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1921	http://eunis.eea.europa.eu/sites/UK9002431	Classified as SPA	Jun-98	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002431						
ME_UID_69	Copinsay	Scotland	http://jncc.defra.gov.uk/page-1905-theme=default	http://eunis.eea.europa.eu/sites/UK9002151	Classified as SPA	Mar-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002151						
ME_UID_70	East Caithness Cliffs	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1858	http://eunis.eea.europa.eu/sites/UK9001182	Classified as SPA	Aug-96	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9001182						
ME_UID_71	Fair Isle	Scotland	http://jncc.defra.gov.uk/page-1899-theme=default	http://eunis.eea.europa.eu/sites/UK9002091	Classified as SPA	Dec-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002091						
ME_UID_72	Fetlar	Scotland	http://jncc.defra.gov.uk/page-1896-theme=default	http://eunis.eea.europa.eu/sites/UK9002031	Classified as SPA	Mar-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002031						
ME_UID_73	Forth Islands	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1979	http://eunis.eea.europa.eu/sites/UK9004171	Classified as SPA	Apr-90	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9004171						
ME_UID_74	Foula	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1897	http://eunis.eea.europa.eu/sites/UK9002061	Classified as SPA	Nov-95	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002061						
ME_UID_75	Fowlsheugh	Scotland	http://jncc.defra.gov.uk/page-1916	http://eunis.eea.europa.eu/sites/UK9002271	Classified as SPA	Aug-92	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002271						
ME_UID_76	Hermaness, Saxa Vord and Valla Field	Scotland`	http://jncc.defra.gov.uk/page-1893-theme=default	http://eunis.eea.europa.eu/sites/UK9002011	Classified as SPA	Mar-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002011						
ME_UID_77	Hoy	Scotland	http://jncc.defra.gov.uk/page-1903-theme=default	http://eunis.eea.europa.eu/sites/UK9002141	Classified as SPA	Dec-00	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002141						
ME_UID_78	Marwick Head	Scotland	http://jncc.defra.gov.uk/page-1902-theme=default	http://eunis.eea.europa.eu/sites/UK9002121	Classified as SPA	Dec-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002121						
ME_UID_79	North Caithness Cliffs	Scotland	http://jncc.defra.gov.uk/page-1857-theme=default	http://eunis.eea.europa.eu/sites/UK9001181	Classified as SPA	Aug-96	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9001181						
ME_UID_80	Noss	Scotland	http://jncc.defra.gov.uk/page-1898-theme=default	http://eunis.eea.europa.eu/sites/UK9002081	Classified as SPA	Aug-96	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002081						
ME_UID_81	Rousay	Scotland	http://jncc.defra.gov.uk/page-1920-theme=default	http://eunis.eea.europa.eu/sites/UK9002371	Classified as SPA	Feb-00	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002371						
ME_UID_82	St Abb`s Head to Fast Castle	Defra	http://jncc.defra.gov.uk/default.aspx?page=1980	http://eunis.eea.europa.eu/sites/UK9004271	Classified as SPA	Aug-97	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9004271						

ME_UID_83	Sule Skerry and Sule Stack	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1912	http://eunis.eea.europa.eu/sites/UK9002181	Classified as SPA	Mar-94	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002181						
ME_UID_84	Troup, Pennan and Lion`s Heads	Scotland	http://jncc.defra.gov.uk/default.aspx?page=1922	http://eunis.eea.europa.eu/sites/UK9002471	Classified as SPA	Mar-97	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002471						
ME_UID_85	West Westray	Scotland	http://jncc.defra.gov.uk/page-1901-theme=default	http://eunis.eea.europa.eu/sites/UK9002101	Classified as SPA	Aug-96	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/UK9002101						
ME_UID_86	Farvandet nord for Anholt	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00DX032	Designated as SPA	May-83	<Null>	Protected bird species listed at: http://eunis.eea.europa.eu/sites/DK00DX032						
ME_UID_87	Læsø, sydlige del	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00FX345	Designated as SPA	May-83	<Null>	Protected bird species listed at:http://eunis.eea.europa.eu/sites/DK00FX345						
ME_UID_88	Sydlige Nordsø	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA347	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA347	See: http://eunis.eea.europa.eu/sites/DK00VA347					
ME_UID_89	Hesselø med omliggende stenrev	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK003X202	Designated as SPA	May-83	<Null>	See: http://eunis.eea.europa.eu/sites/DK003X202	See: http://eunis.eea.europa.eu/sites/DK003X202					
ME_UID_90	Anholt og havet nord for	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00DX146	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00DX146	See: http://eunis.eea.europa.eu/sites/DK00DX146					
ME_UID_91	Strandenge på Læsø og havet syd herfor	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00FX010	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00FX010	See: http://eunis.eea.europa.eu/sites/DK00FX010					
ME_UID_92	Havet omkring Nordre Rønner	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00FX257	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00FX257	See: http://eunis.eea.europa.eu/sites/DK00FX257					
ME_UID_93	Herthas Flak	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA248	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA248	See: http://eunis.eea.europa.eu/sites/DK00VA248					
ME_UID_94	Læsø Trindel og Tønneberg Banke	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA249	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA249	See: http://eunis.eea.europa.eu/sites/DK00VA249					
ME_UID_95	Kims Top og den Kinesiske Mur	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA247	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA247	See: http://eunis.eea.europa.eu/sites/DK00VA247					
ME_UID_96	Knudegrund	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA302	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA302	See: http://eunis.eea.europa.eu/sites/DK00VA302					
ME_UID_97	Schultz og Hastens Grund samt Briseis Flak	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA303	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA303	See: http://eunis.eea.europa.eu/sites/DK00VA303					
ME_UID_98	Lønstrup Rødgrund	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA301	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA301	See: http://eunis.eea.europa.eu/sites/DK00VA301					
ME_UID_99	Sandbanker ud for Thorsminde	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA341	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA341	See: http://eunis.eea.europa.eu/sites/DK00VA341					
ME_UID_100	Lysegrund	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA299	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA299	See: http://eunis.eea.europa.eu/sites/DK00VA299					
ME_UID_101	Sandbanker ud for Thyborøn	Danish Forest and Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	http://eunis.eea.europa.eu/sites/DK00VA340	Designated as SAC	Dec-11	<Null>	See: http://eunis.eea.europa.eu/sites/DK00VA340	See: http://eunis.eea.europa.eu/sites/DK00VA340					

ME_UID_102	Tregor Goëlo	Paimpol Cuadrilla de Goelo	http://www.cc-paimpol-goelo.com/	<Null>	Designated as SPA	2008	Management plan is implemented. See: http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_en?wdpaid=555539374&gid=286	See: http://mpa.ospar.org/home_ospar/mpa_datasheets/an_mpa_datasheet_en?wdpaid=555539374&gid=286						
ME_UID_103	Studland to Portland SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2012	<Null>		Annex I habitats: Reefs. Listed here: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030382					
ME_UID_104	Lands End and Cape Bank SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: Reefs. Listed here: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030376					
ME_UID_105	Lyme Bay and Torbay SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: Reefs and seacaves. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030372					
ME_UID_106	Margate and Long Sands SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Sandbanks. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030371					
ME_UID_107	Lizard Point SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: Reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030374					
ME_UID_108	Berwickshire and North Northumberland Coast SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>	Annex II species: grey seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0017072	Annex I habitats: Mudflats, sandflats, inlets and bays, reefs, seacaves. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0017072					
ME_UID_109	Dornoch Firth and Morrich More SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>	Annex II species: otter and harbour seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0019806	Annex I habitats: estuaries, mudflats, sandflats, salicornia, atlantic salt meadows, multiple dune types with specific features, sandbanks, reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0019806					
ME_UID_110	Faray and Holm of Faray SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1997	<Null>	Annex II species: grey seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0017096						
ME_UID_111	Firth of Tay and Eden Estuary SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2000	<Null>	Annex II species: harbour seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0030311	Annex I habitats: estuaries, sandbanks, sandflats, mudflats. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030311					
ME_UID_112	Isle of May SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2001	<Null>	Annex II species: grey seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0030172						
ME_UID_113	Loch Laxford SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2001	<Null>		Annex I habitats: shallow inlets and bays, reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030192					
ME_UID_114	Mousa SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1998	<Null>	Annex II species: harbour seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0012711	Annex I habitats: reefs, seacaves. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012711					
ME_UID_115	Papa Stour SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>		Annex I habitats: reefs and seacaves. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0017069					
ME_UID_116	Sanday SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1999	<Null>	Annex II species: harbour seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0030069	Annex I habitats: reefs, mudflats, sandbanks, sandflats. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030069					
ME_UID_117	Sullom Voe SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2001	<Null>		Annex I habitats: inlets and bays, lagoons, reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030273					
ME_UID_118	Moray Firth SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>	Annex II species: bottlenose dolphin. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0019808	Annex I species: sandbanks. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0019808					

ME_UID_119	Yell Sound Coast SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1998	<Null>	Annex II species: otter and harbour seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0012687					
ME_UID_120	Plymouth Sound & Estuaries SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>	Annex II species: shoredock and allis shad. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013111	Annex I habitats: sandbanks, estauries, inlets and bays, reefs, salt meadows, mudflats and sandflats. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013111				
ME_UID_121	Fal & Helford SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>	Annex II species: shoredock. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013112	Annex I habitats: estuaries, reefs, inlets and bays, salt meadows, mudlflats, sandflats and sandbanks. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013112				
ME_UID_122	Chesil & The Fleet SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1986	<Null>		Annex I habitats: lagoons, drift line vegetation, stony bank vegetation, scrubs and slat meadows. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0017076				
ME_UID_123	Solent Maritime SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1998	<Null>	Annex II species: Desmoulin's haul snail. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030059	Annex I habitats: estuaries, spartina swards, salt meadows, sandbanks, sandflats, mudflats, lagoons, drfit line vegetation, stony bank vegetations, salicornia and dunes. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030059				
ME_UID_124	South Wight Maritime SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>		Annex I habitats: reefs, vegetated seacliffs, seacaves. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030061				
ME_UID_125	Flamborough Head SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>		Annex I habitats: reefs, vegetated seacliffts, seacaves. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013036				
ME_UID_126	Tweed Estuary SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2001	<Null>	Annex II species: sea lamprey and river lamprey. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030292	Annex I habitats: estuaries, mudflats, sandflats. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030292				
ME_UID_127	Thanet Coast SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>		Annex I habitats: reefs and seacaves. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013107				
ME_UID_128	Essex Estuaries SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>		Annex I habitats: estuaries, mudflats, sandflats, salicornia, spartina swards, salt meadows, scrubs and sandbanks. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013690				
ME_UID_129	The Wash & North Norfolk Coast SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	1996	<Null>	Annex II species: harbour seal and otter. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0017075	Annex I habitats: sandbanks, mudflats, sandflats, inlets and bays, reefs, salicornia, salt meadows, scrubs and lagoons. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0017075				
ME_UID_130	Alde-Ore & Butley Estuaries SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2001	<Null>		Annex I habitats: estuaries, mudflats, sandflats, sandbanks, salt meadows. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030076				

ME_UID_131	Humber Estuary SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2004	<Null>	Annex II species: sea lamprey and river lamprey and grey seal. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030170	Annex I habitats: estuaries, mudflats, sandflats, sandbanks, lagoons, salicornia, salt meadows, dunes with specific features. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030170				
ME_UID_132	Start Point to Plymouth Sound and Eddystone SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030373				
ME_UID_133	Wight-Barfleur Reef SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2012	<Null>		Annex I habitats: reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030380				
ME_UID_134	Solan Bank Reef SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2012	<Null>		Annex I habitats: reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030386				
ME_UID_135	Pobie Bank Reef SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2012	<Null>		Annex I habitats: reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030385				
ME_UID_136	Braemar Pockmarks SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2008	<Null>		Annex I habitats: submarine structures made by leaking gases. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030357				
ME_UID_137	Scanner Pockmark SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2008	<Null>		Annex I habitats: submarine structures made by leaking gases. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030354				
ME_UID_138	North Norfolk Sandbanks and Saturn Reef SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: sandbanks and reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030358				
ME_UID_139	Inner Dowsing, Race Bank and North Ridge SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: sandbanks and reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030370				
ME_UID_140	Haisborough, Hammond and Winterton SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: sandbanks and reefs. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030369				
ME_UID_141	Bassurelle Sandbank SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2010	<Null>		Annex I habitats: sandbanks. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030368				
ME_UID_142	Dogger Bank SAC	JNCC	http://jncc.defra.gov.uk/page-1445	<Null>	Designated as SAC	2011	<Null>		Annex I habitats: sandbanks. See: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030352				
ME_UID_143	Pagham Harbour	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>		Annex I habitats: Seagrass beds. See: http://www.legislation.gov.uk/ukmo/2013/17/pdfs/ukmo_20130017_en.pdf				
ME_UID_144	Chesil Beach and Stennis Ledges	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					Defolin's lagoon snail and Lagoon sand shrimp. See: http://www.legislation.gov.uk/ukmo/2013/17/pdfs/ukmo_20130017_en.pdf	High energy intertidal rock, Intertidal coarse sediment. See: http://www.legislation.gov.uk/ukmo/2013/5/pdfs/ukmo_20130005_en.pdf
ME_UID_145	Folkestone Pomerania	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					Honeycomb worm (Sabellaria alveolata) reefs, Ross worm (Sabellaria spinulosa) reefs. See: http://www.legislation.gov.uk/ukmo/2013/8/pdfs/ukmo_20130008_en.pdf	High energy circalittoral rock, Subtidal coarse sediment , Subtidal sand, Fragile sponge and anthozoan communities on subtidal rocky habitats. See: http://www.legislation.gov.uk/ukmo/2013/8/pdfs/ukmo_20130008_en.pdf
ME_UID_146	Kingmere	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					Black seabream. See: http://www.legislation.gov.uk/ukmo/2013/11/pdfs/ukmo_20130011_en.pdf	Moderate energy infralittoral rock and thin mixed sediments, Subtidal chalk. See: http://www.legislation.gov.uk/ukmo/2013/11/pdfs/ukmo_20130011_en.pdf

ME_UID_147	Poole Rocks	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					Couch's goby (Gobius couchi) and Native oyster (Ostrea edulis) . See: http://www.legislation.gov.uk/ukmo/2013/18/pdfs/ukmo_20130018_en.pdf	Moderate energy circalittoral rock, Subtidal mixed sediments. See: http://www.legislation.gov.uk/ukmo/2013/18/pdfs/ukmo_20130018_en.pdf
ME_UID_148	North East of Farnes Deep	JNCC	http://jncc.defra.gov.uk/page-6557	<Null>	Designated	2013	<Null>						Subtidal caorse sediment, subtodal sand. See: http://jncc.defra.gov.uk/page-6557
ME_UID_149	Skerries Bank and Surrounds	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/19/pdfs/ukmo_20130019_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/19/pdfs/ukmo_20130019_en.pdf
ME_UID_150	South Dorset	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>						Subtidal coarse sediment and Subtidal chalk. See: http://www.legislation.gov.uk/ukmo/2013/20/pdfs/ukmo_20130020_en.pdf
ME_UID_151	Swallow Sand	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>						Subtidal coarse sediment and Subtidal chalk. See: http://jncc.defra.gov.uk/page-6558
ME_UID_152	Tamar Estuary Sites	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					Native oyster (Ostrea edulis) and Smelt (Osmerus eperlanus). See: http://www.legislation.gov.uk/ukmo/2013/23/pdfs/ukmo_20130023_en.pdf	Intertidal biogenic reefs, Intertidal coarse sediment, Blue mussel (Mytilus edulis) beds. See: http://www.legislation.gov.uk/ukmo/2013/23/pdfs/ukmo_20130023_en.pdf
ME_UID_153	Thanet Coast	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/24/pdfs/ukmo_20130024_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/24/pdfs/ukmo_20130024_en.pdf
ME_UID_154	The Manacles	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/13/pdfs/ukmo_20130013_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/13/pdfs/ukmo_20130013_en.pdf
ME_UID_155	Torbay	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/25/pdfs/ukmo_20130025_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/25/pdfs/ukmo_20130025_en.pdf
ME_UID_156	Upper Fowey and Pont Pill	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/26/pdfs/ukmo_20130026_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/26/pdfs/ukmo_20130026_en.pdf
ME_UID_157	Whitsand and Looe Bay	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/27/pdfs/ukmo_20130027_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/27/pdfs/ukmo_20130027_en.pdf
ME_UID_158	Blackwater, Crouch, Roach and Colne Estuaries	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					Native oyster (Ostrea edulis). See: http://www.legislation.gov.uk/ukmo/2013/3/pdfs/ukmo_20130003_en.pdf	Intertidal mixed sediments and Native oyster (Ostrea edulis) beds. See: http://www.legislation.gov.uk/ukmo/2013/3/pdfs/ukmo_20130003_en.pdf
ME_UID_159	Beachy Head West	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/2/pdfs/ukmo_20130002_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/2/pdfs/ukmo_20130002_en.pdf
ME_UID_160	Aln Estuary	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>						Coastal saltmarshes and saline reedbeds, Intertidal mud, Estuarine rocky habitats and Sheltered muddy gravels. See: http://www.legislation.gov.uk/ukmo/2013/1/pdfs/ukmo_20130001_en.pdf
ME_UID_161	Medway Estuary	JNCC	http://jncc.defra.gov.uk/page-4525	<Null>	Designated	2013	<Null>					See: http://www.legislation.gov.uk/ukmo/2013/14/pdfs/ukmo_20130014_en.pdf	See: http://www.legislation.gov.uk/ukmo/2013/14/pdfs/ukmo_20130014_en.pdf
ME_UID_162	Ythan Estuary, Sands of Forvie and Meikle Loch	JNCC	http://jncc.defra.gov.uk/default.aspx?page=1908	<Null>	Classified as SPA	1998	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=1908					
ME_UID_163	Coquet Island	JNCC	http://jncc.defra.gov.uk/page-1991	<Null>	Classified as SPA	1985	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/page-1991					
ME_UID_164	North Norfolk Coast	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2008	<Null>	Classified as SPA	1989	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2008					
ME_UID_165	Minsmere - Walberswick	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2009	<Null>	Classified as SPA	1992	See Natural England site improvement plan: http://publications.naturalengland.org.uk/publication/5674608288071680	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2009					
ME_UID_166	Foulness (Mid-Essex Coast Phase 5)	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2021	<Null>	Classified as SPA	1996	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2021					

ME_UID_167	Deben Estuary	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2023	<Null>	Classified as SPA	1996	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2023						
ME_UID_168	Benacre to Easton Bavents	JNCC	http://jncc.defra.gov.uk/page-2025-theme=default	<Null>	Classified as SPA	1996	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/page-2025-theme=default						
ME_UID_169	Chesil Beach and The Fleet	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2029	<Null>	Classified as SPA	1985	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2029						
ME_UID_170	Poole Harbour	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2031	<Null>	Classified as SPA	1999	See conservation advice package: http://publications.naturalengland.org.uk/publication/3152751?category=3229185	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2031						
ME_UID_171	Chichester and Langstone Harbours	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2034	<Null>	Classified as SPA	1987	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2034						
ME_UID_172	Portsmouth Harbour	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2036	<Null>	Classified as SPA	1995	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2036						
ME_UID_173	Solent and Southampton Water	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2037	<Null>	Classified as SPA	1998	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2037						
ME_UID_174	Pagham Harbour	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2044	<Null>	Classified as SPA	1988	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2044						
ME_UID_175	Thanet Coast and Sandwich Bay	JNCC	http://jncc.defra.gov.uk/page-2045-theme=default	<Null>	Classified as SPA	1994	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/page-2045-theme=default						
ME_UID_176	Dungeness to Pett Level	JNCC	http://jncc.defra.gov.uk/default.aspx?page=2046	<Null>	Classified as SPA	1999	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/default.aspx?page=2046						
ME_UID_177	Cape Wrath	JNCC	http://jncc.defra.gov.uk/page-1860	<Null>	Classified as SPA	1996	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/page-1860						
ME_UID_178	Handa	JNCC	http://jncc.defra.gov.uk/page-1861-theme=default	<Null>	Classified as SPA	1990	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/page-1861-theme=default						
ME_UID_179	Sumburgh Head	JNCC	http://jncc.defra.gov.uk/page-1923-theme=default	<Null>	Classified as SPA	1996	<Null>	Protected bird species listed at: http://jncc.defra.gov.uk/page-1923-theme=default						
ME_UID_180	Outer Thames Estuary	JNCC	http://publications.naturalengland.org.uk/publication/3233957	<Null>	Classified as SPA		<Null>	Protected bird species listed at: http://publications.naturalengland.org.uk/publication/3233957						
ME_UID_181	Lista Wetlands System	RAMSAR	https://rsis.ramsar.org/ris/804	<Null>	Designated as Ramsar site	1996	<Null>	Protected wetland species: https://rsis.ramsar.org/ris/804						
ME_UID_182	Giske Wetlands System	RAMSAR	https://rsis.ramsar.org/ris/805	<Null>	Designated as Ramsar site	1996	<Null>	Protected wetland species: https://rsis.ramsar.org/ris/805						
ME_UID_183	Caithness & Sutherland Peatlands	RAMSAR	https://rsis.ramsar.org/ris/971	<Null>	Designated as Ramsar site	1999	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/971						
ME_UID_184	Pevensey Levels	RAMSAR	http://jncc.defra.gov.uk/pdf/RIS/UK11053.pdf	<Null>	Designated as Ramsar site	1999	<Null>	Protected wetland species at: http://jncc.defra.gov.uk/pdf/RIS/UK11053.pdf						
ME_UID_185	Cromarty Firth	RAMSAR	https://rsis.ramsar.org/ris/1001	<Null>	Designated as Ramsar site	1999	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1001						
ME_UID_186	Inner Moray Firth	RAMSAR	https://rsis.ramsar.org/ris/1002	<Null>	Designated as Ramsar site	1999	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1002						
ME_UID_187	Poole Harbour	RAMSAR	https://rsis.ramsar.org/ris/1005	<Null>	Designated as Ramsar site	1999	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1005						
ME_UID_188	Northumbria Coast	RAMSAR	https://rsis.ramsar.org/ris/1019	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1019						
ME_UID_189	Thames Estuary and Marshes	RAMSAR	http://jncc.defra.gov.uk/page-2042	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: http://jncc.defra.gov.uk/page-2042						
ME_UID_190	Firth of Tay and Eden Estuary	RAMSAR	http://jncc.defra.gov.uk/default.aspx?page=1968	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: http://jncc.defra.gov.uk/default.aspx?page=1968						
ME_UID_191	The New Forest	RAMSAR	https://rsis.ramsar.org/ris/622	<Null>	Designated as Ramsar site	1993	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/622						
ME_UID_192	Medway Estuary & Marshes	RAMSAR	https://rsis.ramsar.org/ris/645?language=en	<Null>	Designated as Ramsar site	1993	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/645?language=en						
ME_UID_193	Stodmarsh	RAMSAR	https://rsis.ramsar.org/ris/646	<Null>	Designated as Ramsar site	1993	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/646						
ME_UID_194	Benfleet and Southend Marshes	RAMSAR	https://rsis.ramsar.org/ris/648	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/648						
ME_UID_195	Abberton Reservoir	RAMSAR	https://rsis.ramsar.org/ris/220	<Null>	Designated as Ramsar site	1981	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/220						
ME_UID_196	The Swale	RAMSAR	https://www.gov.uk/government/publications/marine-conservation-advice-for-special-protection-area-the-swale-uk9012011/the-swale-spa-site-information#the-swale-spa-site-information	<Null>	Designated as Ramsar site	1985	<Null>	Protected wetland species at: https://www.gov.uk/government/publications/marine-conservation-advice-for-special-protection-area-the-swale-uk9012011/the-swale-spa-site-information#the-swale-spa-site-information						
ME_UID_197	Chesil Beach & The Fleet	RAMSAR	https://rsis.ramsar.org/ris/300	<Null>	Designated as Ramsar site	1985	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/300						
ME_UID_198	Loch Eye	RAMSAR	https://rsis.ramsar.org/ris/340	<Null>	Designated as Ramsar site	1986	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/340						
ME_UID_199	Chichester and Langstone Harbours	RAMSAR	https://rsis.ramsar.org/ris/378	<Null>	Designated as Ramsar site	1987	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/378						

ME_UID_200	The Wash	RAMSAR	https://rsis.ramsar.org/ris/395	<Null>	Designated as Ramsar site	1988	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/395					
ME_UID_201	Pagham Harbour	RAMSAR	rsis.ramsar.org	<Null>	Designated as Ramsar site		<Null>	Protected wetland species at: rsis.ramsar.org					
ME_UID_202	Oosterschelde	RAMSAR	https://rsis.ramsar.org/ris/354	<Null>	Designated as Ramsar site	1987	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/354					
ME_UID_203	Träslövsläge-Morups Tånge	RAMSAR	https://rsis.ramsar.org/ris/430	<Null>	Designated as Ramsar site	1989	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/430					
ME_UID_204	Stour & Orwell Estuaries	RAMSAR	https://rsis.ramsar.org/ris/662	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/662					
ME_UID_205	Humber Estuary	RAMSAR	https://rsis.ramsar.org/ris/663	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/663					
ME_UID_206	Thanet Coast & Sandwich Bay	RAMSAR	https://rsis.ramsar.org/ris/664	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/664					
ME_UID_207	Colne Estuary	RAMSAR	https://rsis.ramsar.org/ris/665	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/665					
ME_UID_208	Portsmouth Harbour	RAMSAR	https://rsis.ramsar.org/ris/720	<Null>	Designated as Ramsar site	1995	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/720					
ME_UID_209	Crouch & Roach Estuaries	RAMSAR	https://rsis.ramsar.org/ris/721	<Null>	Designated as Ramsar site	1995	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/721					
ME_UID_210	Teesmouth & Cleveland Coast	RAMSAR	https://rsis.ramsar.org/ris/741	<Null>	Designated as Ramsar site	1995	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/741					
ME_UID_211	Dersingham Bog	RAMSAR	https://rsis.ramsar.org/ris/751	<Null>	Designated as Ramsar site	1995	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/751					
ME_UID_212	Hirsholmene	RAMSAR	https://rsis.ramsar.org/ris/147	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/147					
ME_UID_213	Ringkobing Fjord	RAMSAR	https://rsis.ramsar.org/ris/141	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/141					
ME_UID_214	Nordre Ronner	RAMSAR	https://rsis.ramsar.org/ris/148	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/148					
ME_UID_215	Stadil and Veststadil Fjords	RAMSAR	https://rsis.ramsar.org/ris/142	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/142					
ME_UID_216	Nissum Fjord	RAMSAR	https://rsis.ramsar.org/ris/143	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/143					
ME_UID_217	Nissum Bredning with Harboore and Agger Tange	RAMSAR	https://rsis.ramsar.org/ris/144	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/144					
ME_UID_218	Vejlerne and Logstor Bredning	RAMSAR	https://rsis.ramsar.org/ris/145	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/145					
ME_UID_219	Ulvedybet and Nibe Bredning	RAMSAR	https://rsis.ramsar.org/ris/146	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/146					
ME_UID_220	Læsø	RAMSAR	rsis.ramsar.org	<Null>	Designated as Ramsar site		<Null>	Protected wetland species at: rsis.ramsar.org					
ME_UID_221	Randers and Mariager Fjords and the adjacent sea	RAMSAR	https://rsis.ramsar.org/ris/150	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/150					
ME_UID_222	Waters north of Anholt	RAMSAR	https://rsis.ramsar.org/ris/151	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/151					
ME_UID_223	Getterön	RAMSAR	https://rsis.ramsar.org/ris/19	<Null>	Designated as Ramsar site	1974	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/19					
ME_UID_224	Deben Estuary	RAMSAR	https://rsis.ramsar.org/ris/794	<Null>	Designated as Ramsar site	1996	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/794					
ME_UID_225	Moray and Nairn Coast	RAMSAR	https://rsis.ramsar.org/ris/890	<Null>	Designated as Ramsar site	1997	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/890					
ME_UID_226	Dornoch Firth and Loch Fleet	RAMSAR	https://rsis.ramsar.org/ris/897	<Null>	Designated as Ramsar site	1997	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/897					
ME_UID_227	Ronas Hill - North Roe & Tingon	RAMSAR	https://rsis.ramsar.org/ris/916	<Null>	Designated as Ramsar site	1997	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/916					
ME_UID_228	East Sanday Coast	RAMSAR	https://rsis.ramsar.org/ris/917	<Null>	Designated as Ramsar site	1997	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/917					
ME_UID_229	Avon Valley	RAMSAR	https://rsis.ramsar.org/ris/926	<Null>	Designated as Ramsar site	1998	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/926					
ME_UID_230	Caithness Lochs	RAMSAR	https://rsis.ramsar.org/ris/928	<Null>	Designated as Ramsar site	1998	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/928					
ME_UID_231	Ythan Estuary & Meikle Loch	RAMSAR	https://rsis.ramsar.org/ris/939	<Null>	Designated as Ramsar site	1998	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/939					
ME_UID_232	Dorset Heathlands	RAMSAR	https://rsis.ramsar.org/ris/964	<Null>	Designated as Ramsar site	1998	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/964					
ME_UID_233	Solent and Southampton Water	RAMSAR	https://rsis.ramsar.org/ris/965	<Null>	Designated as Ramsar site	1998	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/965					
ME_UID_234	Stigfjorden	RAMSAR	https://rsis.ramsar.org/ris/431	<Null>	Designated as Ramsar site	1989	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/431					
ME_UID_235	Baie de Somme	RAMSAR	https://rsis.ramsar.org/ris/925	<Null>	Designated as Ramsar site	1998	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/925					
ME_UID_236	Fylleån	RAMSAR	https://rsis.ramsar.org/ris/1119	<Null>	Designated as Ramsar site	2001	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1119					
ME_UID_237	Nordre älv estuary	RAMSAR	https://rsis.ramsar.org/ris/1125	<Null>	Designated as Ramsar site	2001	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1125					
ME_UID_238	Skälderviken	RAMSAR	https://rsis.ramsar.org/ris/1127	<Null>	Designated as Ramsar site	2001	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1127					
ME_UID_239	Lindisfarne	RAMSAR	https://rsis.ramsar.org/ris/70	<Null>	Designated as Ramsar site	1976	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/70					
ME_UID_240	Filso	RAMSAR	https://rsis.ramsar.org/ris/140	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/140					
ME_UID_241	Sejro Bugt, Nekselo Bugt & Saltbæk Vig	RAMSAR	https://rsis.ramsar.org/ris/157	<Null>	Designated as Ramsar site	1977	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/157					
ME_UID_242	Vadehavet	RAMSAR	https://rsis.ramsar.org/ris/356	<Null>	Designated as Ramsar site	1987	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/356					

ME_UID_243	Cameron Reservoir	RAMSAR	https://rsis.ramsar.org/ris/650	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/650					
ME_UID_244	Dengie	RAMSAR	https://rsis.ramsar.org/ris/651	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/651					
ME_UID_245	Minsmere - Walberswick	RAMSAR	https://rsis.ramsar.org/ris/75	<Null>	Designated as Ramsar site	1976	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/75					
ME_UID_246	North Norfolk Coast	RAMSAR	//rsis.ramsar.org	<Null>	Designated as Ramsar site		<Null>	Protected wetland species at: //rsis.ramsar.org					
ME_UID_247	Voordelta	RAMSAR	https://rsis.ramsar.org/ris/1279	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1279					
ME_UID_248	Voornes Duin	RAMSAR	https://rsis.ramsar.org/ris/1280	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1280					
ME_UID_249	Ora	RAMSAR	https://rsis.ramsar.org/ris/305	<Null>	Designated as Ramsar site	1985	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/305					
ME_UID_250	Kurefjorden	RAMSAR	https://rsis.ramsar.org/ris/306	<Null>	Designated as Ramsar site	1985	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/306					
ME_UID_251	Ilene and Presterodkilen Wetland System	RAMSAR	https://rsis.ramsar.org/ris/308	<Null>	Designated as Ramsar site	1985	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/308					
ME_UID_252	Jaeren wetland system	RAMSAR	https://rsis.ramsar.org/fr/ris/309?language=fr	<Null>	Designated as Ramsar site	1985	<Null>	Protected wetland species at: https://rsis.ramsar.org/fr/ris/309?language=fr					
ME_UID_253	Boschplaat	RAMSAR	http://www.ramsar.org/boschplaat	<Null>	Designated as Ramsar site		<Null>	Protected wetland species at: http://www.ramsar.org/boschplaat					
ME_UID_254	Griend	RAMSAR		<Null>	Designated as Ramsar site		<Null>						
ME_UID_255	Waddenzee	RAMSAR	https://rsis.ramsar.org/ris/289?language=en	<Null>	Designated as Ramsar site	1984	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/289?language=en					
ME_UID_256	Loch of Strathbeg	RAMSAR	https://rsis.ramsar.org/ris/778	<Null>	Designated as Ramsar site	1995	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/778					
ME_UID_257	Zwanenwater	RAMSAR	https://rsis.ramsar.org/ris/400	<Null>	Designated as Ramsar site	1988	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/400					
ME_UID_258	Oostvaardersplassen	RAMSAR	https://rsis.ramsar.org/ris/427	<Null>	Designated as Ramsar site	1989	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/427					
ME_UID_259	Westerschelde & Saeftinghe	RAMSAR	https://rsis.ramsar.org/ris/748	<Null>	Designated as Ramsar site	1995	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/748					
ME_UID_260	IJmeer	RAMSAR	https://rsis.ramsar.org/ris/1245	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1245					
ME_UID_261	IJsselmeer	RAMSAR	https://rsis.ramsar.org/ris/1246	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1246					
ME_UID_262	Lauwersmeer	RAMSAR	https://rsis.ramsar.org/ris/1247	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1247					
ME_UID_263	Markermeer	RAMSAR	https://rsis.ramsar.org/ris/1249	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1249					
ME_UID_264	Veerse Meer	RAMSAR	https://rsis.ramsar.org/ris/1251	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1251					
ME_UID_265	Waddeneilanden,Noordzeekustzone,Breebaart	RAMSAR	https://rsis.ramsar.org/ris/1252	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1252					
ME_UID_266	Zoommeer	RAMSAR	https://rsis.ramsar.org/ris/1253	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1253					
ME_UID_267	Grevelingen	RAMSAR	https://rsis.ramsar.org/ris/1272	<Null>	Designated as Ramsar site	2000	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/1272					
ME_UID_268	Foulness	RAMSAR	https://rsis.ramsar.org/ris/861	<Null>	Designated as Ramsar site	1996	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/861					
ME_UID_269	Alde-Ore Estuary	RAMSAR	https://rsis.ramsar.org/ris/862?language=en	<Null>	Designated as Ramsar site	1996	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/862?language=en					
ME_UID_270	Loch Spynie	RAMSAR	https://rsis.ramsar.org/ris/569	<Null>	Designated as Ramsar site	1992	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/569					
ME_UID_271	Gibraltar Point	RAMSAR	https://rsis.ramsar.org/ris/589	<Null>	Designated as Ramsar site	1993	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/589					
ME_UID_272	Hamford Water	RAMSAR	https://rsis.ramsar.org/ris/607	<Null>	Designated as Ramsar site	1993	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/607					
ME_UID_273	Exe Estuary	RAMSAR	https://rsis.ramsar.org/ris/542	<Null>	Designated as Ramsar site	1992	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/542					
ME_UID_274	Blackwater Estuary	RAMSAR	https://rsis.ramsar.org/ris/543	<Null>	Designated as Ramsar site	1992	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/543					
ME_UID_275	Baie du Mont Saint-Michel	RAMSAR	https://rsis.ramsar.org/ris/709	<Null>	Designated as Ramsar site	1994	<Null>	Protected wetland species at: https://rsis.ramsar.org/ris/709					
ME_UID_276	Adur Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_277	Aire Point to Carrick Du	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_278	Alde-Ore Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_279	Alnmouth Saltmarsh and Dunes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_280	Arne	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_281	Arun Banks	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_282	Arundel Park	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_283	Avon Valley (Bickton to Christchurch)	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_284	Axmouth to Lyme Regis Under Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_285	Babbacombe Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_286	Bamburgh Coast and Hills	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_287	Barnby Broad & Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_288	Baulk Head to Mullion	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_289	Bawdsey Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_290	Beeston Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_291	Bembridge Down	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_292	Bembridge School and Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_293	Benfleet and Southend Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_294	Berry Head to Sharkham Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_295	Blackstone Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_296	Blackwater Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_297	Bognor Reef	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_298	Bolt Head to Bolt Tail	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_299	Bonchurch Landslips	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_300	Boscawen	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_301	Bouldnor and Hamstead Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_302	Bracklesham Bay	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_303	Brading Marshes to St. Helen's Ledges	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_304	Breydon Water	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_305	Brighton to Newhaven Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_306	Browndown	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_307	Budleigh Salterton Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_308	Caerthillian to Kennack	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_309	Carricknath Point to Porthbean Beach	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_310	Castle Point to Cullernose Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_311	Cayton, Cornelian and South Bays	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_312	Chapel Point to Wolla Bank	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_313	Chesil & The Fleet	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_314	Chichester Harbour	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_315	Christchurch Harbour	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_316	Clacton Cliffs & Foreshore	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_317	Climping Beach	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_318	Colne Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_319	Colwell Bay	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_320	Compton Chine to Steephill Cove	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_321	Compton Down	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_322	Coquet Island	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_323	Corton Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_324	Coverack Cove & Dolor Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_325	Coverack to Porthoustock	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_326	Cowpen Marsh	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_327	Cresswell and Newbiggin Shores	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_328	Cresswell Ponds	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_329	Crouch and Roach Estuaries	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_330	Cuckoo Rock to Turbot Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_331	Cudden Point to Prussia Cove	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_332	Daddyhole	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_333	Dawlish Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_334	Dawlish Warren	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_335	Deben Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_336	Dengie	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_337	Dibden Bay	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_338	Dimlington Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_339	Dover to Kingsdown Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_340	Dungeness, Romney Marsh and Rye Bay	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_341	Durham Coast	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_342	Dyer's Quarry	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_343	East Runton Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_344	Eglarooze Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_345	Eling and Bury Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_346	Erme Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_347	Exe Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_348	Felpham	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_349	Ferry Cliff, Sutton	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_350	Filey Brigg	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_351	Flamborough Head	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_352	Folkestone Warren	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_353	Folly Rocks	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_354	Foulness	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_355	Froward Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_356	Geldeston Meadows	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_357	Gerrans Bay to Camels Cove	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_358	Gibraltar Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_359	Gilkicker Lagoon	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_360	Great Yarmouth North Denes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_361	Gristhorpe Bay and Red Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_362	Hadston Links	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_363	Hallsands-Beesands	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_364	Ham Common	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_365	Hamford Water	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_366	Happisburgh Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_367	Hartlepool Submerged Forest	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_368	Harwich Foreshore	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_369	Hastings Cliffs to Pett Beach	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_370	Hayburn Wyke	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_371	Headon Warren and West High Down	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_372	Highcliffe to Milford Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_373	Holborough to Burham Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_374	Holehaven Creek	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_375	Holton and Sandford Heaths	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_376	Hope's Nose to Wall's Hill	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_377	Howick to Seaton Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_378	Humber Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_379	Hunstanton Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_380	Hurst Castle and Lymington River Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_381	Hythe to Calshot Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_382	Iron Scar and Hundale Point to Scalby Ness	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_383	Isle of Portland	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_384	Kennack to Coverack	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_385	King's Quay Shore	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_386	Kingsand to Sandway Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_387	Ladram Bay to Sidmouth	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_388	Landguard Common	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_389	Langstone Harbour	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_390	Lee-on-the Solent to Itchen Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_391	Leiston - Aldeburgh	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_392	Lewes Brooks	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_393	Lincegrove and Hackett's Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_394	Lindisfarne	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_395	Loe Pool	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_396	Lord's Wood	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_397	Low Hauxley Shore	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_398	Lower Fal & Helford Intertidal	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_399	Lower Test Valley	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_400	Luscombe Valley	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_401	Lynher Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_402	Malpas Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_403	Meadfoot Sea Road	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_404	Medina Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_405	Medway Estuary and Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_406	Meneage Coastal Section	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_407	Merthen Wood	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_408	Minsmere-Walberswick Heaths and Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_409	Morston Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_410	Mucking Flats and Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_411	Mullion Cliff to Predannack Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_412	Mundesley Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_413	Newton Links	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_414	Newtown Harbour	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_415	North Bay to South Toll House Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_416	North Norfolk Coast	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_417	North Solent	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_418	Northumberland Shore	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_419	Orwell Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_420	Otter Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_421	Overstrand Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_422	Pagham Harbour	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_423	Pakefield to Easton Bavents	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_424	Penlee Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_425	Pevensey Levels	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_426	Pitsea Marsh	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_427	Plymouth Sound Shores and Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_428	Polruan to Polperro	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_429	Poole Harbour	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_430	Porthcew	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_431	Porthgwarra to Pordenack Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_432	Porthleven Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_433	Porthleven Cliffs East	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_434	Portland Harbour Shore	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_435	Portsmouth Harbour	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_436	Prawle Point and Start Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_437	Purbeck Ridge (East)	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_438	Rame Head & Whitsand Bay	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_439	Ramsholt Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_440	Redcar Rocks	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_441	Rempstone Heaths	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_442	River Avon System	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_443	River Coquet and Coquet Valley Woodlands	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_444	River Frome	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_445	River Test	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_446	Robin Hood's Bay: Maw Wyke to Beast Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_447	Roman River	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_448	Rosemullion	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_449	Roundham Head	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_450	Runswick Bay	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_451	Ryde Sands and Wootton Creek	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_452	Salcombe to Kingsbridge Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_453	Saltern Cove	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_454	Saltfleetby - Theddlethorpe Dunes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_455	Sandwich Bay to Hacklinge Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_456	Seaford to Beachy Head	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_457	Seal Sands	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_458	Seaton Dunes and Common	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_459	Selsey, East Beach	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_460	Sheppey Cliffs and Foreshore	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_461	Sidestrand and Trimingham Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_462	Sidmouth to Beer Coast	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_463	Sinah Common	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_464	Slapton Ley	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_465	South Dorset Coast	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_466	South Gare & Coatham Sands	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_467	South Thames Estuary and Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_468	Sprat's Water and Marshes, Carlton Colville	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_469	St John's Lake	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_470	St Michael's Mount	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_471	Staithes - Port Mulgrave	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_472	Stanley and Alder Carrs, Aldeby	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_473	Stodmarsh	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_474	Stour Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_475	Studland & Godlingston Heaths	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_476	Studland Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_477	Swanpool	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_478	Tamar - Tavy Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_479	Tater-Du	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_480	Tees and Hartlepool Foreshore and Wetlands	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_481	Thanet Coast	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_482	The Cliff, Burnham-on-Crouch	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_483	The Farne Islands	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_484	The Lagoons	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_485	The Naze	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_486	The Swale	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_487	The Wash	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_488	Thorness Bay	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_489	Tower Hill to Cockham Wood	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_490	Treen Cliff	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_491	Tremearne Par	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_492	Tweed Catchment Rivers - England: Lower Tweed and Whiteadder	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_493	Tynemouth to Seaton Sluice	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_494	Upper Colne Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_495	Upper Fal Estuary and Woods	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_496	Upper Hamble Estuary and Woods	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_497	Vange & Fobbing Marshes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_498	Warblington Meadow	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_499	Wareham Meadows	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				

ME_UID_500	Warkworth Dunes and Saltmarsh	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_501	Wear River Bank	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_502	Wembury Point	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_503	West Dorset Coast	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_504	West Lizard	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_505	West Runton Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_506	Western King	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_507	Weybourne Cliffs	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_508	Whitby-Saltwick	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_509	Whitecliff Bay and Bembridge Ledges	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_510	Winterton - Horsey Dunes	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_511	Withow Gap, Skipsea	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_512	Yar Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_513	Yealm Estuary	Natural England	https://designatedsites.naturalengland.org.uk/	<Null>	Designated as SSSI	<Null>	Views about management (VAMs) listed under site pages. Select site using site name at: https://designatedsites.naturalengland.org.uk/	Search using site name at: https://designatedsites.naturalengland.org.uk/ where species are listed.	Search using site name at: https://designatedsites.naturalengland.org.uk/ where habitats are listed.				
ME_UID_514	Estuaires Picards et Mer D Opale	Agence des aires marines protégées	http://www.aires-marines.fr/L-Agence/Organisation/Parcs-naturels-marins/Parc-naturel-marin-des-estuaires-picards-et-de-la-mer-d-Opale	<Null>	Designated as national park	<Null>	Details of conservation objectives and advice at: http://www.aires-marines.fr/L-Agence/Organisation/Parcs-naturels-marins/Parc-naturel-marin-des-estuaires-picards-et-de-la-mer-d-Opale/Documents/Communique-Conseil-de-gestion-du-Parc-naturel-marin-des-estuaires-picards-et-de-la-mer-d-Opale2						

ME_UID_515	Færder	Ministry of Climate and Environment	http://prosjekt.fylkesmannen.no/faerdernasjonalpark/Organisering/	<Null>	Designated as national park	<Null>	See under 'information material' lobster conservation areas, minimum sizes for sea fishing, rules for watercraft and bird posters. At: http://prosjekt.fylkesmannen.no/faerdernasjonalpark/	Information on protected habitats and species: http://prosjekt.fylkesmannen.no/faerdernasjonalpark/Om-Farder-nasjonalpark/				See important species in the park here: http://www.aires-marines.fr/L-Agence/Organisation/Parcs-naturels-marins/Parc-naturel-marin-des-estuaires-picards-et-de-la-mer-d-Opale/Patrimoine-naturel2	See important habitats at the park here: http://www.aires-marines.fr/L-Agence/Organisation/Parcs-naturels-marins/Parc-naturel-marin-des-estuaires-picards-et-de-la-mer-d-Opale/Patrimoine-naturel2
ME_UID_516	Havet mellem Korshage og Hundested	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/	<Null>	Designated as SPA	1983	<Null>						
ME_UID_517	Nordre Rønner	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/20-nordre-roenner/	<Null>	Designated as SPA	1983	<Null>	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/20-nordre-roenner/	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/20-nordre-roenner/				
ME_UID_518	Ålborg Bugt, østlige del	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/245-aalborg/	<Null>	Designated as SPA	1983	<Null>	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/245-aalborg/	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/245-aalborg/				
ME_UID_519	Hirsholmene	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/4-hirsholmene/	<Null>	Designated as RAMRSAR site	1977	<Null>	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/4-hirsholmene/	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/4-hirsholmene/				
ME_UID_520	Ålborg Bugt, nordlige del	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/245-aalborg/	<Null>	Designated as SPA	1983	<Null>	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/245-aalborg/	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/245-aalborg/				
ME_UID_521	Randers og Mariager Fjorde og Ålborg Bugt, sydlige del	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/	<Null>			<Null>						
ME_UID_522	Havet og kysten mellem Hundested og Rørvig	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/153-hundested/	<Null>	Designated as SCI	1998	<Null>	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/153-hundested/	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/153-hundested/				
ME_UID_523	Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/89-vadehavet/	<Null>	Designated as SCI	1998	<Null>	See features listed in Wadden Sea site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/89-vadehavet/	See features listed in Wadden Sea site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/89-vadehavet/				
ME_UID_524	Hirsholmene, havet vest herfor og Ellinge Å?s udløb	The Danish Nature Agency	http://naturstyrelsen.dk/media/nst/68743/004Plan.pdf	<Null>	Designated as SCI	1998	<Null>	See features listed in site plan: http://naturstyrelsen.dk/media/nst/68743/004Plan.pdf	See features listed in site plan: http://naturstyrelsen.dk/media/nst/68743/004Plan.pdf				
ME_UID_525	Skagens Gren og Skagerrak	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/1-skagens-gren/	<Null>	Designated as SCI	1998	<Null>	See features listed in site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/1-skagens-gren/	See features listed in site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/1-skagens-gren/				
ME_UID_526	Ålborg Bugt, Randers Fjord og Mariager Fjord	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/14-%C3%A5lborg-bugt/	<Null>	Designated at SCI	1998	<Null>	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/14-%C3%A5lborg-bugt/	See features listed in site plans: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/14-%C3%A5lborg-bugt/				

ME_UID_527	Gilleleje Flak og Tragten	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/	http://eunis.eea.europa.eu/sites/DK00VA171	Designated as SCI & SAC	2009	<Null>	See features listed at: http://eunis.eea.europa.eu/sites/DK00VA171	See features listed at: http://eunis.eea.europa.eu/sites/DK00VA171				
ME_UID_528	Store Middelgrund	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/193-middelgrund/	<Null>	Designated as HELCOM Baltic Sea Protected Area	2005	<Null>	See features listed in site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/193-middelgrund/	See features listed in site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/193-middelgrund/				
ME_UID_529	Jyske Rev, Lillefiskerbanke	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/	http://eunis.eea.europa.eu/sites/DK00VA257	Designated as SCI	2009	<Null>	See features listed at: http://eunis.eea.europa.eu/sites/DK00VA257	See features listed at: http://eunis.eea.europa.eu/sites/DK00VA258				
ME_UID_530	Store Rev	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/	<Null>	<Null>	<Null>	<Null>						
ME_UID_531	Gule Rev	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/	<Null>	<Null>	<Null>	<Null>						
ME_UID_532	Thyborøn Stenvolde	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-1-125/	http://eunis.eea.europa.eu/sites/DK00VA348	Designated as SCI	2009	<Null>	See features listed at: http://eunis.eea.europa.eu/sites/DK00VA348	See features listed at: http://eunis.eea.europa.eu/sites/DK00VA348				
ME_UID_533	Ebbeløkkerev	The Danish Nature Agency	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/243-ebbeloekke/	<Null>	Designated as HELCOM Baltic Sea Protected Area	2009	<Null>	See features listed in site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/243-ebbeloekke/	See features listed in site plan: http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/plan-126-246/243-ebbeloekke/				

C. Data Assessment

NSC-002-Mari **Datasets Identified by the North Sea Checkpoin**

Data Category Group (MEP)	Full ID	Project ID	Requirement	URI	Name	Inspire	Citation	
MPA list EEA	DT.Mari.NS001-Natura 2000 European database: bioregions table	NS001		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: bioregions table	3.17 Bio-geographical regions	Each table of the database has several data categories that meet different inspire classes The most appropriate inspire class has been chosen for each separate table**Note: all tables in the database are linked by 'Sitecode'.**This table gives data on the ocean basin i.e. Marine Atlantic.	H5 used as a ref, if cells move, you need to change ref to h5 in the text
MPA list EEA	DT.Mari.NS002-Natura 2000 European database: contacts table	NS002		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: contacts table	1.5 Addresses	As above. This table gives data on the contact details of the organisation/person that gav the information for each Natura site.	
MPA list EEA	DT.Mari.NS003-Natura 2000 European database: designation status table	NS003		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: designation status table	1.9 Protected sites	See H5. Unknown which INSPIRE class these data might meet.	
MPA list EEA	DT.Mari.NS004-Natura 2000 European database: directive species table	NS004		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: directive species table	3.19 Species distribution	See H5.. Unknown if these data meet the INSPIRE requirements as not an actual grid o species distribution, rather, it is a presence of a species which can be linked to a certain site code. This table gives data on the presence or absence of various species under different annexes at the site.	
MPA list EEA	DT.Mari.NS005-Natura 2000 European database: habitat class table	NS005		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: habitat class table	3.18 Habitats and biotopes	See H5. Also: data may not meet the INSPIRE requirements fully as just name of habitat is given. This table gives data on the name of the habitat present at the site and the % cover it has at the site.	
MPA list EEA	DT.Mari.NS006-Natura 2000 European database: habitats table	NS006		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: habitats table	3.18 Habitats and biotopes	See H5. This table gives data on the name, priority, representivity, coverage (hectares an %), conservation degree etc of the habitat at each site.	
MPA list EEA	DT.Mari.NS007-Natura 2000 European database: impact table	NS007		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: impact table	3.7 Environmental monitoring facilities	See H5. This table gives data on pollution and rank of the impact.	
MPA list EEA	DT.Mari.NS008-Natura 2000 European database: management table	NS008		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: management table	3.11 Area management / restriction / regulation zones & reporting units	See H5. This table gives data on the bodies responsible for management of the site, the conservation measures, url links and contact details.	
MPA list EEA	DT.Mari.NS009-Natura 2000 European database: metadata table	NS009		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: metadata table			
MPA list EEA	DT.Mari.NS010-Natura 2000 European database: Natura2000 sites table	NS010		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: Natura2000 sites table	1.9 Protected sites	See H5. This table gives data on site name, country, the area in hectares, length i kilometres, what type of site it is, lat & long etc.	
MPA list EEA	DT.Mari.NS011-Natura 2000 European database: other species table	NS011		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: other species table	3.19 Species distribution	See H5. Unknown if these data meet the INSPIRE requirements as not an actual grid o species distribution, rather, it is a presence of a species group which can be linked to a certain site code.	
MPA list EEA	DT.Mari.NS012-Natura 2000 European database: species table	NS012		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database: species table	3.19 Species distribution	See H5. As above. This table also includes data on the species abundance and populatio size.	
MPA list EEA	DT.Mari.NS013-Natura 2000 European database - CSV format	NS013		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-european-data	Natura 2000 European database - CSV format		Same as database above, but in .csv format instead of .mdb.	
MPA list EEA	DT.Mari.NS014-Natura 2000 GIS data	NS014		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-gis-data	Natura 2000 GIS data	1.9 Protected sites	Shape files containing spatial data of Natura 2000 sites. Metadata, encoding and projectio files also included.	
MPA list EEA	DT.Mari.NS015-Natura 2000 metadata	NS015		http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-metadata	Natura 2000 metadata	1.9 Protected sites	Gives spatial and temporal resolution, the co-ordinate reference system and other useft pieces of information about the data sets.	
MPA list EEA	DT.Mari.NS016-Natura 2000 barometer statistics	NS016		http://www.eea.europa.eu/themes/biodiversity/document-library/natura-2000/natura-2000-network-statistics/natura-2000-barometer-statistics/statistics/barometer-statistics	Natura 2000 barometer statistics	1.9 Protected sites	Gives an evaluation on the progress made in establishing the Natura 2000 network, bot under the Birds and the Habitats Directives. It is based on information on number of sites and areas covered, as indicated by Member States and is published in the Natura 2000 Newsletter.	
MPA list EEA	DT.Mari.NS017-Public Natura 2000 Network Viewer	NS017		http://natura2000.eea.europa.eu/#	Public Natura 2000 Network Viewer Map	1.9 Protected sites	Map allows you to visually select the area of interest on the map, and view its details	
MPA list EEA	DT.Mari.NS018-EEA Nationally designated areas (CDDA) database: designations table	NS018		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-european-data	EEA Nationally designated areas (CDDA) database: designations table	3.11 Area management / restriction / regulation zones & reporting units	See H5. All tables in this database could also come under the '1.9 protected sites' INSPIRE class. Data provided: list of national designations with references to laws and number and total area of sites per designation.	
MPA list EEA	DT.Mari.NS019-EEA Nationally designated areas (CDDA) database: sites table	NS019		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-european-data	EEA Nationally designated areas (CDDA) database: sites table	1.1 Coordinate reference systems	See H5. Main information (name, location (lat & long), area, IUCN category etc) on eacl individual designated area at national level.	
MPA list EEA	DT.Mari.NS020-EEA Nationally designated areas (CDDA) database: designation boundaries table	NS020		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-european-data	EEA Nationally designated areas (CDDA) database: designation boundaries table	1.9 Protected sites	See H5. Inspire class unknown. A list of digital boundaries of protected areas not defined a sites. Provides information on resolution of source material from which the boundary has been derived. Instructs EEA regarding dissemination of boundaries.	NS020 & 21 referred to here, if change names need to change this ref
MPA list EEA	DT.Mari.NS021-EEA Nationally designated areas (CDDA) database: site boundaries table	NS021		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-european-data	EEA Nationally designated areas (CDDA) database: site boundaries table	1.9 Protected sites	See H5. Inspire class unknown. Information on whether digital boundaries have bee provided for the reported sites. Provides also information on resolution of source material from which the boundary has been derived. Instructs EEA regarding dissemination of boundaries.	
MPA list EEA	DT.Mari.NS022-EEA Nationally designated areas (CDDA) database: natonal overview table	NS022		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-european-data	EEA Nationally designated areas (CDDA) database: natonal overview table	1.9 Protected sites	See H5. National indicators for amount of national territory that is protected. Includes data on ecosystem type (which allows sorting by marine areas), total area protected etc.	
MPA list EEA	DT.Mari.NS023-EEA Nationally designated areas (CDDA) database - CSV format	NS023		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-european-data	EEA Nationally designated areas (CDDA) database - CSV format	1.9 Protected sites	Same as database above, but in .csv format instead of .mdb.	
MPA list EEA	DT.Mari.NS024-EEA Nationally designated areas (CDDA): GIS data	NS024		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-gis-data	EEA Nationally designated areas (CDDA): GIS data	1.9 Protected sites	Shape files and spatialo containing spatial data of CDDA sites. INSPIRE complian metadata set also included.	
MPA list EEA	DT.Mari.NS025-EEA Code lists and definitions for Nationally designated areas (CDDA)	NS025		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-additional-information	EEA Code lists and definitions for Nationally designated areas (CDDA)	1.9 Protected sites	Inspire class unknonwn. These data will help to define terms in the NS020 and NS02 datasets.	
MPA list EEA	DT.Mari.NS026-EEA Nationally designated areas (CDDA) metadata	NS026		http://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-8#tab-metadata	EEA Nationally designated areas (CDDA) metadata	1.9 Protected sites	Gives spatial and temporal resolution, the co-ordinate reference system and other useft pieces of information about the data sets.	
MPA list EEA	DT.Mari.NS027-EUNIS database files	NS027		http://www.eea.europa.eu/themes/biodiversity/eunis/eunis-db#tab-derived-datasets	EUNIS database files	1.9 Protected sites	See H5. Brings together European data from several databases and organisations int three interlinked modules on sites, species and habitat types. Will include data already presented above.	
MPA list EEA	DT.Mari.NS028-EUNIS database web application: sites data	NS028		http://eunis.eea.europa.eu/sites.jsp	EUNIS database web application: sites data	1.9 Protected sites	See H5. Brings together European data from several databases and organisations into three interlinked modules on sites, species and habitat types. Will include data already presented above. Relates to database files in NS027. Can search for sites by code or name. Basic search conducted was 'marine'. Other tabs for species and habitat searches.	NS027 ref
MPA list EEA	DT.Mari.NS029-EEA conservation status of habitats and species database	NS029		http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec#tab-european-data	EEA conservation status of habitats and species database	3.18 Habitats and biotopes	See H5. Includes information on the conservation status of the habitat types and species of community interest. Tables include various types of data relating to habitats and species of the habitats directive, including: the typical species associated with certain habitats, habita ranges, population, N2000 code. The data is grouped by general biogeographical region, e.g. MATL (marine atlantic) used for this study,	
MPA list EEA	DT.Mari.NS030-EEA conservation status of habitats and species GIS database	NS030		http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec#tab-gis-data	EEA conservation status of habitats and species GIS database	3.18 Habitats and biotopes	As above, but spatial data.	
MPA list EEA	DT.Mari.NS031-EEA conservation status of habitats and species metadata	NS031		http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec#tab-metadata	EEA conservation status of habitats and species metadata	3.18 Habitats and biotopes	Metadata for the above datasets.	
MPA list EEA	DT.Mari.NS032-EUNIS habitat classification data	NS032		http://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification#tab-european-data	EUNIS habitat classification data	3.18 Habitats and biotopes	Data on EUNIS habitat types and their descriptions.	
MPA list EEA	DT.Mari.NS033-European biogeographical regions Habitats Directive (92/43/EEC)	NS033		http://www.eea.europa.eu/data-and-maps/data/biogeographical-regions-europe-1#tab-gis-data	European biogeographical regions Habitats Directive (92/43/EEC)	3.17 Bio-geographical regions	2008-2011 biologeographical boundaries from EU member states & emerald network countries (includes norway). Contains GIS data (vestor ploygons), co-ordinate reference systems file (.prj), INSPIRE compliant dataset and region codelist.	
MPA list Denmark	DT.Mari.NS034-GIS map of Denmark Natura 2000 sites	NS034		http://miljoegis.mim.dk/cbkort?selectorgroups=themecontainer%20Natura2000%20fredning&mapext=27608%206024994.2%201064040%206422715.8&layers=theme-gst-dtkskaerm_daempet%20ef_fugle_bes_omr%20ramsar_omr%20ef_habitat_omr%20theme-pg-natura_2000_omraader&mapheight=969&mapwidth=1925&profile=miljoegis-natura2000	GIS map of Denmark Natura 2000 sites	1.9 Protected sites	Map gives numbers of Natura 2000 sites. Comes with a help guide (in Danish): http://miljoegis.mim.dk/fagtekster/helps/help_miljoegis.pdf	
MPA list Denmark	DT.Mari.NS035-Denmark list of habitats and birds each Natura 2000 site covers	NS035		http://naturstyrelsen.dk/media/nst/68127/Natura2000%20nr.pdf	Denmark list of habitats and birds each Natura 2000 site covers	1.9 Protected sites	List of numbered sites. Can link to the GIS map above. In Danish.	
MPA list Denmark	DT.Mari.NS036-Denmark list of plans for Natura 2000 sites	NS036		http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/.	Denmark list of plans for Natura 2000 sites	1.9 Protected sites	In danish. For each Natura 2000 site there has been a plan prepared. It sets the framewor for regional administration and management and to ensure that there will be favorable conservation status of species and habitats in the area. Provides links to possible measures, species included etc.	
MPA list UK	DT.Mari.NS037-UK JNCC Interactive MPA map	NS037		http://jncc.defra.gov.uk/page-5201	UK JNCC Interactive MPA map	1.9 Protected sites	Can select all types of MPAs in UK area (SACs, SPAs = Natura 2000 sites) SSSIs anc RAMSAR sites not yet included. Can right click on MPA when selected and map gives informationon size (ha), name and legislation. Map shows lat & long.	
MPA list UK	DT.Mari.NS038-UK MCZ formal designation orders	NS038		http://www.legislation.gov.uk/ukmo/2013	UK MCZ formal designation orders	3.11 Area management / restriction / regulation zones & reporting units	Formal designation orders for UK marine conservation zones.	
MPA list UK	DT.Mari.NS039-Scotland MPA designation orders	NS039		http://www.scotland.gov.uk/Topics/marine/marine-environment/mpanetwork/developing/DesignationOrders	Scotland MPA designation orders	3.11 Area management / restriction / regulation zones & reporting units	Formal designation orders for Scotland MPAs. Click on MPA name and takes you to downloadable document or summary map.	
MPA list UK	DT.Mari.NS040-Scotland MPA network map	NS040		http://www.scotland.gov.uk/Topics/marine/marine-environment/mpanetwork/MPAMap	Scotland MPA network map	3.11 Area management / restriction / regulation zones & reporting units	Provides visual representation of Scottish MPAs. Map is not interactive.	
MPA list UK	DT.Mari.NS041-Scotland MPA co-ordinates	NS041		http://www.scotland.gov.uk/Topics/marine/marine-environment/mpanetwork/pMPACo-ordinates	Scotland MPA co-ordinates	1.9 Protected sites	Excel files containing co-ordinates for designated MPAs	
MPA list UK	DT.Mari.NS042-Scotland GIS Shape files for both the Inshore and Offshore MPAs	NS042		https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=MPA	Scotland GIS Shape files for both the Inshore and Offshore MPAs	1.9 Protected sites	GIS files for designated MPAs. Requires registration before downloadable. Have to agree to a public sector (scotland) end user licence. Data stored on MEP system. ESRI shapefile, GML 3.1.1. file, Google earth kmz file.	

MPA list UK	DT.Mari.NS043-UK MPAs (SACs, SPAs, Ramsar, OSPAR) GIS data (& links to attribute data)	NS043	http://jncc.defra.gov.uk/protectedsites/SACselection/gis_data/terms_conditions.asp	UK MPAs (SACs, SPAs, Ramsar, OSPAR) GIS data (& links to attribute data)	1.9 Protected sites	Links to download GIS data. Have to register to obtain the data. Links to attribute data an also provided on the first page.
MPA list OSPAR	DT.Mari.NS044-OSPAR MPA Network Database	NS044	http://www.ospar.org/content/content.asp?menu=01511400000000_000000_000000	OSPAR MPA Network Database	1.9 Protected sites	Inspire class not assigned as multiple data classes in multi-table Microsoft Acces database. Contains links to Natura200 sites in tables and info on size, location, features. Almost all of the MPAs so far reported to OSPAR by EU Member States largely overlap existing Natura 2000 sites. Only a limited number of marine Natura 2000 sites have not ye been included in the OSPAR Network of MPAs so this database may be the most useful. Norway also included here.
MPA list OSPAR	DT.Mari.NS045-OSPAR MPAs Network GIS shapefile	NS045	http://www.ospar.org/content/content.asp?menu=01511400000000_000000_000001	OSPAR MPAs Network GIS shapefile	1.9 Protected sites	Shape file providing boundaries of OSPAR MPAs.
MPA list OSPAR	DT.Mari.NS046-OSPAR MPAs visual interactive network map	NS046	http://carto.mpa.ospar.org/1/ospar.map	OSPAR MPAs visual interactive network map	1.9 Protected sites	Visual representation of OSPAR MPAs. Can select country in toolbar and relevant MPA will appear, you can then choose an MPA and zoom to it on the map. Linked information (i.e. size) is not immediately available on this map.
MPA list WDPA	DT.Mari.NS047-IUCN WDPA Interactive map & downloadable GIS files	NS047	http://www.protectedplanet.net/	IUCN WDPA Interactive map & downloadable GIS files	1.9 Protected sites	Can use a viewable map or users can select 'download all' from the database and filter search by country. Users must register. The search consisted of the following filters 'Europ then 'marine' then 'country'. The files can be downloaded in .shp, .kmz and .csv files. Downloaded files are stored on the 'The Box' sharing site between IMARES and MEP.
EMOD net data	DT.Mari.NS048-EMODnet Bathymetry Portal	NS048	http://portal.emodnet-bathymetry.eu/	EMODnet Bathymetry Portal	2.1 Elevation	Provides services for discovery and requesting access to bathymetric data (survey data sets and composite DTMs) . The portal also provides a service for viewing and downloadin a harmonised Digital Terrain Model (DTM) for the European sea regions that is generated by the EMODnet Bathymetry partnership on the basis of the gathered data sources. Is an interactive online tool where layers including survey tracks, depth contours, underwater features and global coastline can be turned on/off and dowloaded.
EMOD net data	DT.Mari.NS049-EMODnet Geology Portal	NS049	http://onegeology-europe.brgm.fr/geoportal/viewer.jsp	EMODnet Geology Portal	2.4 Geology	The geology data available includes:sea-bed substrate, sediment accumulation rate, sea-floor geology etc. The data can be downloaded from the portal on an interactive map tool.
EMOD net data	DT.Mari.NS050-EMODnet Seabed Habitats Portal	NS050	http://www.emodnet-seabedhabitats.eu/default.aspx?page=1974	EMODnet Seabed Habitats Portal	3.18 Habitats and biotopes	Data on modelled seabed habitats based on seadbed substrate, energy , biological zone and salinity. Multiple INSPIRE classes can be met.
EMOD net data	DT.Mari.NS051-EMODnet Chemistry Portal	NS051	http://gher-diva.phys.ulg.ac.be/emodnet/	EMODnet Chemistry Portal	3.18 Habitats and biotopes	Data on the concentrations of chemicals (pesticides, heavy metals, antifoulants) in wate sediments and biota. Unkown INSPIRE class.
EMOD net data	DT.Mari.NS052-EMODnet Biology Portal	NS052	http://www.emodnet-biology.eu/portal/index.php	EMODnet Biology Portal	3.19 Species distribution	Data on temporal and spatial distribution of species abundance and biomass from severa taxa.Unkown INSPIRE class.
EMOD net data	DT.Mari.NS053-EMODnet Physics Portal	NS053	http://www.emodnet-physics.eu/map/	EMODnet Physics Portal	3.15 Oceanographic geographical features	Data on salinity, temperature, waves, currents, sea-level, light attenuation, and FerryBoxes.
EMOD net data	DT.Mari.NS054-EMODnet Human Activities Portal	NS054	http://www.emodnet-humanactivities.eu/view-data.php	EMODnet Human Activities Portal	3.11 Area management / restriction / regulation zones & reporting units	Data on the intensity and spatial extent of human activities at sea. Includes CDDA an Natura 2000 protected areas. EEA's data have been filtered by Cogea to show only maritime areas (i.e. areas entirely at sea), and coastal areas (internal areas that intersect and/or ar tangent to the coast).This dataset cover the whole EU (except Crotia) in the case of Natura 2000 data.
MPA Management France	DT.Mari.NS055-French Marine Natura 2000 Designation Information	NS055	http://www.developpement-durable.gouv.fr/Designation-des-sites-Natura-2000.html	French Marine Natura 2000 Designation Information	1.9 Protected sites	Page has various links to information on the process of designating marine Natura 2000 sites in France. Includes final reports maps and links to other sites. Useful for information and may help find management information.
MPA Management France	DT.Mari.NS056-French Marine Natura 2000 Designation Plan	NS056	http://www.developpement-durable.gouv.fr/IMG/pdf/ppt_processus_designation_sites_N2000_large-3.pdf	French Marine Natura 2000 Designation Plan	1.9 Protected sites	Includes presentation of the general approach and steps in designating marine Natura 2000 sites in France, including scientific methodology and planned locations of sites on a mapp. Useful for information and may help find management information.
MPA Management France	DT.Mari.NS057-French Marine Sites: Various Protection Measures	NS057	http://www.developpement-durable.gouv.fr/Les-outils-de-la-protection.html	French Marine Sites: Various Protection Measures	1.9 Protected sites	Useful for information and may helped direct searches.
MPA Management France	DT.Mari.NS058-French Marine Natura 2000 Designation Information (Beyond Territorial)	NS058	http://www.developpement-durable.gouv.fr./IMG/pdf/Rapport_GS_Oiseaux-Mammiferes_marins.pdf	French Marine Natura 2000 Designation Information (Beyond Territorial)	1.9 Protected sites	Outlines the approach for the extension of the Natura 2000 network beyond the territoria sea in France for birds and marine mammals. Includes the methodology and results of the identification of " key sectors " important for the conservation of marine mobile species of Community interest beyond the sea land, where it would be appropriate to designate new Natura 2000 sites, respecting in general the concept of a coherent European ecological network .
MPA General Information France	DT.Mari.NS059-The French Marine Protected Areas Agency Homepage (Agence des aires marines protegees - AAMP)	NS059	http://www.aires-marines.com/	The French Marine Protected Areas Agency Homepage (Agence des aires marines protegees - AAMP)	1.9 Protected sites	For information. The AAMP is responsible for supporting the creation and management of marine protected areas no matter their type. It federates marine protected area managers.
French MPA Management	DT.Mari.NS060-AAMP: Information on French marine data collection programme.	NS060	http://www.aires-marines.fr/Connaitre/Habitats-et-especes-pelagiques/Oiseaux-et-mammiferes-marins-en-metropole	AAMP: Information on French marine data collection programme.	1.9 Protected sites	Information on the data collection program on birds and marine mammals in French waters to address two issues in the context of the implementation of the network Natura 2000 at sea: 1) identify important areas for seabirds and marine mammals of Community interest beyond 12 nautical miles, to fill gaps and designation and propose new Natura 2000 sites f the European Commission by autumn 2015, and 2) develop an initial biological status of Natura 2000 already designated sites for these species to feed documents of objectives of N2000 sites and propose management actions for the conservation of these species. Useful for information and may help find management information.
MPA list France	DT.Mari.NS061-French Protected Areas Online Interactive Map	NS061	http://inpn.mnhn.fr/carto/metropole/celrl	French Protected Areas Online Interactive Map	1.9 Protected sites	Interactive map showing French protected areas where layers can be turned on and off.
MPA list France	DT.Mari.NS062-French Georeferenced data on Marine Habitats	NS062	http://cartographie.aires-marines.fr/viewer/index.php	French Georeferenced data on Marine Habitats	3.18 Habitats and biotopes	The table below lists some of georeferenced data on marine habitats and metadata associated maps in marine Natura 2000 sites and marine parks available to the Agency. The data comes from several studies DREAL and the Agency for marine protected areas (including the program CARTHAM).
French MPA Management	DT.Mari.NS063-Information & Contacts: Implementation of MSFD in France	NS063	http://www.developpement-durable.gouv.fr/IMG/pdf/11021-3_DCSMM_Brochure-8p_GB_MA2 septembre-2013-2.pdf	Information & Contacts: Implementation of MSFD in France	1.9 Protected sites	Useful for information and may help find management information. Last page contains contacts in various marine organisations in France.
MPA list France	DT.Mari.NS064-French Protected Areas Online Interactive Map via AAMP	NS064	http://www.aires-marines.fr/Les-aires-marines-protegees/Carte-interactive	French Protected Areas Online Interactive Map via AAMP	1.9 Protected sites	Interactive map showing French marine protected areas where layers can be turned on an off.
French MPA Management	DT.Mari.NS065-French Natura 2000 Marine Site Implementation Information (AAMP)	NS065	http://baiedeseine.n2000.fr/les-sites	French Natura 2000 Marine Site Implementation Information (AAMP)	1.9 Protected sites	Website dedicated to the implementation of Natura 2000 in the following marine or mixe sites designated under the Habitats Directive-fauna-flora (DHFF) and Birds Directive (OD). Includes a 'latest news' section.
MPA list France	DT.Mari.NS066-French Natura 2000 site GIS layers	NS066	http://inpn.mnhn.fr/telechargement/cartes-et-information-geographique/nat/natu	French Natura 2000 site GIS layers	1.9 Protected sites	Can select specific shapefiles to download.
MPA list UK	DT.Mari.NS067-UK Natural England GIS Datasets	NS067	http://www.gis.naturalengland.org.uk/pubs/gis/GIS_Register.asp	UK Natural England GIS Datasets	1.9 Protected sites	Downloadable UK specific shapefiles of MPAs such as MCZs.
MPA list Norway	DT.Mari.NS068-Norwegian Environment Agnecy Naturebase Info	NS068	http://www.miljodirektoratet.no/no/Tjenester-og-verktoy/Database/Naturbase/	Norwegian Environment Agnecy Naturebase Info	1.9 Protected sites	Information relating to the download of Norway's marine data.
MPA list Norway	DT.Mari.NS069-Norwegian Environment Agnecy Naturebase Data	NS069	http://karteksport.miljodirektoratet.no/#page=tab1	Norwegian Environment Agnecy Naturebase Data	1.9 Protected sites	Can select by region of norway on map, select 'proposed protected areas' , choose eithe ESRI geodatabase format or SOSI format
MPA list Norway	DT.Mari.NS070-Norwegian Environment Agnecy Datasets page	NS070	http://kartkatalog.miljodirektoratet.no/Map_catalog_dataset_download_overview.asp	Norwegian Environment Agnecy Datasets page	1.9 Protected sites	Information relating to the download of Norway's marine data.
MPA list Norway	DT.Mari.NS071-Norwegian Environment Agnecy: First 36 Marine Areas Dataset	NS071	http://kartkatalog.miljodirektoratet.no/map_catalog_dataset.asp?datasetid=502&download=yes	Norwegian Environment Agnecy: First 36 Marine Areas Dataset	1.9 Protected sites	Shapefiles of first 36 areas that are proposed to be included in national marine conservatio plan. Metadata: http://www.geonorge.no/geonetwork/srv/nor/main.home?uuid=6054b750-cf39-4de3-bc65-fb75e4a0c40a
MPA list Norway	DT.Mari.NS072-Norwegian Environment Agnecy Naturebase: MPAs	NS072	http://wms.miljodirektoratet.no/geoserver/marin_verneplan/ows?service=WFS&version=1.0.0 equest=GetFeature&typeName=marin_vp_oppstart,marin_vp_ikke_oppstart&outputformat=SH APE-ZIP	Norwegian Environment Agnecy Naturebase: MPAs	1.9 Protected sites	Polygons of Norway MPAs. Includes ones with plans in process and ones without.
MPA Management Norway	DT.Mari.NS073-Norwegian Environment Agnecy Naturebase: Marine Protection Plan	NS073	http://www.miljodirektoratet.no/no/Tema/Verneomrader/Marin-verneplan/	Norwegian Environment Agnecy Naturebase: Marine Protection Plan	1.9 Protected sites	Updates on progress of information of implementation of MPAs.
MPA list Belgium	DT.Mari.NS074-Belgian MUMM: Marine Management Data	NS074	http://www.mumm.ac.be/datacentre/Catalogues/datathemelayers.php	Belgian MUMM: Marine Management Data	1.9 Protected sites	Belgian site that used to have all data available (GIS) which is urrently off-line (for geo-data due to legislative issues
MPA Management Belgium	DT.Mari.NS075-Belgian MPA International Framework Report	NS075	www.vliz.be/imisdocs/publications/57792.pdf	Belgian MPA International Framework Report	1.9 Protected sites	Information on legislative information relating to Belgian MPAs.
MPA list Belgium	DT.Mari.NS076-Belgian Interactive Coastal Map: Downloadable GIS files.	NS076	http://www.coastalatlas.be/map/?lan=en&theme_id=30	Belgian Interactive Coastal Map: Downloadable GIS files.	1.9 Protected sites	Interactive map of Belgian coast where layers can be turned on and off and downloaded.
MPA Management Netherlands	DT.Mari.NS077-Netherlands Information About MPAs	NS077	http://www.noordzeeloket.nl/en/projects/north-sea-natura-2000/sites/index.aspx	Netherlands Information About MPAs	1.9 Protected sites	
MPA Species and Habitats Norway	DT.Mari.NS078-Norwegian Interactive Map: Marine Biodiversity Data	NS078	http://www.mareano.no/en/start	Norwegian Interactive Map: Marine Biodiversity Data	3.19 Species distribution	Can meet several inspire classes depending on the data. Can obtain various species and habitat distrubutions, and bathymetric data. URL links can be opened in GIS programmes.
Basic Map Data Netherlands	DT.Mari.NS079-Netherlands Basic Map Viewer	NS079	http://www.rijkswaterstaat.nl/apps/geoservices/mapviewer2i/?lang=en	Netherlands Basic Map Viewer	1.9 Protected sites	Interactive map viewer, no downloads.
Basic Biogeographical Data Netherlands.	DT.Mari.NS080-Netherlands Biogegraphical Data Viewer	NS080	http://www.noordzeeatlas.nl/index/index.htm#	Netherlands Biogegraphical Data Viewer	1.9 Protected sites	Interactive map viewer, no downloads.
MPA Management Netherlands	DT.Mari.NS081-Netherlands Marine Management Information	NS081	http://www.noordzeeloket.nl/projecten/europese-kaderrichtlijn-mariene-strategie/	Netherlands Marine Management Information	3.11 Area management / restriction / regulation zones & reporting units	Information on marine management (EU MFSD) in the Netherlands part of the North Sea.

General habitat data Wadden Sea	DT.Mari.NS082-Wadden Sea (Denmark, Germany, Netherlands) Information	NS082	http://www.waddensea-secretariat.org/monitoring-tmap/tmap-databases	Wadden Sea (Denmark, Germany, Netherlands) Information	1.9 Protected sites	Information on how to obtain data relating to various biological, geological and chemical parameters recorded in the Wadden Sea, through the TMAP (common monitoring programme for the Wadden Sea carried out by The Netherlands, Germany and Denmark) databases.
MPA Management Wadden Sea	DT.Mari.NS083-Wadden Sea Information: 2010 Plan	NS083	http://www.waddensea-secretariat.org/sites/default/files/downloads/wsp-v2-11-02-03-finalowres.pdf	Wadden Sea Information: 2010 Plan	1.9 Protected sites	Information on management information in the region, includes Natura 2000 specifi objectives and plans.
MPA list Germany	DT.Mari.NS084-Federal Agency for Nature Conservation (BFN): Interactive Protected Area Map	NS084	http://www.geodienste.bfn.de/schutzgebiete/#?centerX=3875512.094?centerY=5889326.066?scale=5000000?layers=515	Federal Agency for Nature Conservation (BFN): Interactive Protected Area Map	1.9 Protected sites	Interactive map viewer for Germany's protected areas. Includes Natura 2000 marine sites.
MPA list Germany	DT.Mari.NS085-German North Sea Natura 2000 Site Map	NS085	http://www.bsh.de/en/Marine_uses/Industry/CONTIS_maps/NorthSeaSuitableAreasAndNatureConservation.pdf	German North Sea Natura 2000 Site Map	1.9 Protected sites	Pdf map of Natiure 2000 marine sites in Germany. Not interactive.
MPA Management Germany	DT.Mari.NS086-German Natura 2000 Sites Information	NS086	http://www.bfn.de/0314_meeresschutzgebiete+M52087573ab0.html	German Natura 2000 Sites Information	1.9 Protected sites	Information and links relating to Germany's Natura 2000 sites. Four sites in the North Sea: http://www.bfn.de/0314_daten-meeresflaeche+M52087573ab0.html
MPA Management Germany	DT.Mari.NS087-German Natura 2000 Sites Designation Information	NS087	http://www.bfn.de/0316_meldeverfahren+M52087573ab0.html	German Natura 2000 Sites Designation Information	1.9 Protected sites	Natura 2000 site designation information , includes links to implmentation schedules at side.
MPA Management Germany	DT.Mari.NS088-German North Sea Natura 2000 Sites Designation Information	NS088	http://www.bfn.de/0314_nordsee_meeresschutzgebiete+M52087573ab0.html	German North Sea Natura 2000 Sites Designation Information	1.9 Protected sites	North Sea specific Natura 2000 site designation information , includes links to implmentation schedules at side.
MPA List Sweden	DT.Mari.NS089-Swedish Environmental Protection Agency Interactive Protected Sites Map	NS089	http://skyddadnatur.naturvardsverket.se/	Swedish Environmental Protection Agency Interactive Protected Sites Map	1.9 Protected sites	Interactive map viewer for Sweden's protected areas. Includes Natura 2000 marine sites.
MPA List Sweden	DT.Mari.NS090-Swedish Geodata Interactive Map Portal	NS090	https://www.geodata.se/GeodataExplorer/GetMetaData?UUID=a80bf3d7-e70c-42d1-9b8d-8148e53e011d	Swedish Geodata Interactive Map Portal	1.9 Protected sites	Interactive map with downloadable geographical data. Can select Natura 2000 SCIs an SPAs to download with associated metadata.
MPA Management Sweden	DT.Mari.NS091-Swedish Regulation of Fishing in MPAs report.	NS091	https://www.havochvatten.se/download/18.571a313c1331de20a5f8000680/1348912842573/rapport-nv-6416-2011-regelering-fiske-skyddade-havsomraden.pdf	Swedish Regulation of Fishing in MPAs report.	3.11 Area management / restriction / regulation	Information on management for Swedish MPAs. In Swedish.
MPA list Denmark	DT.Mari.NS095-Danish Nature Agency Natura 2000 Sites GIS data	NS095	http://download.kortforsyningen.dk/content/natura2000-basisanalyse-2013	Danish Nature Agency Natura 2000 Sites GIS data	1.9 Protected sites	Downloadable GIS data for Danish Natura 2000 sites.
MPA list Sweden	DT.Mari.NS096-Swedish List of National Marine Reserves	NS096	https://www.havochvatten.se/hav/fiske--fritid/skyddade-omraden/marina-naturreservat.html	Swedish List of National Marine Reserves	1.9 Protected sites	List of Swedish national MPAs. In the 'state' column, Halland and Västra Götaland are the areas relevant to this project.
MPA list UK	DT.Mari.NS094-UK MCZ designation update	NS094	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/285304/pb14143-mcz-update-201402.pdf	UK MCZ designation update	1.9 Protected sites	Regular monthly update from Defra relating to designation and plans for UK MCZs.
Habitat data	DT.Mari.NS095-OSPAR habitats distrubution GIS files	NS095	http://www.ospar.org/content/content.asp?menu=01511400000000_000000_000000	OSPAR habitats distrubution GIS files	1.9 Protected sites	OSPAR habitats in NE atlantic region - may need for habitats base layer. Point and polygo layers showing distribution and extent of threatened and/or declining habitats in the OSPAR area. Dataset last updated February 2014. Data available to download either as an ESRI File Geodatabase or as ESRI Shapefiles.
Species data	DT.Mari.NS096-DASSH UK Marine Species Data Archive	NS096	http://www.dassh.ac.uk/search-catalogues	DASSH UK Marine Species Data Archive	3.19 Species distribution	Species abundance data collated from various surveys in the UK.
Species data	DT.Mari.NS097-Marlin UK Marine Species Data Archive	NS097	http://www.marlin.ac.uk/species.php	Marlin UK Marine Species Data Archive	3.19 Species distribution	Archive of information on the biology, distribution, life history and likely sensitivity to human activities and natural events,of various UK marine species.
Species data	DT.Mari.NS098-ESDM UK Marine Species Database: Data gateway	NS098	https://data.nbn.org.uk/Search?q=marine	ESDM UK Marine Species Database: Data gateway	3.18 Habitats and biotopes	Data includes surveys and samples, species, habitats and biotopes, environment variables, such as salinity and temperature, physical variables, such as substrate, depth, inclination, sediment type. Can filter search to marine species by typing 'marine' to see all available datasets, or by typing specific species names.
MPA Management Belgium	DT.Mari.NS099-Belgian Birds Directive Information	NS099	http://www.health.belgium.be/eportal/Environment/MarineEnvironment/TheMarineEnvironPolicWorkingInAnInternational/BirdsAndHabitats/AreaPolicy/BirdsDirectiveAreas/19087529_EN?ie2Term=North%20Sea&ie2section=83#.VSTpSvnF-RZ	Belgian Birds Directive Information	1.9 Protected sites	Provides info on what species the sites were designated for.
MPA Management Belgium	DT.Mari.NS100-Belgian Royal Decree for the creation of protected areas	NS100	http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=2005101435&table_name=loi	Belgian Royal Decree for the creation of protected areas	1.9 Protected sites	Royal Decree creating special protection areas and special conservation areas in marin areas under Belgian jurisdiction. Also defines some framework under which conservation and protection measures can be set.
MPA Management Belgium	DT.Mari.NS101-Belgian Habitats Directive Information	NS101	http://www.health.belgium.be/eportal/Environment/MarineEnvironment/TheMarineEnvironPolicWorkingInAnInternational/BirdsAndHabitats/AreaPolicy/HabitatsDirectiveAreas/index.htm#.VST0v_nF-RY	Belgian Habitats Directive Information	1.9 Protected sites	Provides info on what habitats the sites were designated for.
MPA Management Germany	DT.Mari.NS102-Germany Schleswig-Holstein Wadden Sea National Park Information	NS102	http://www.nationalpark-wattenmeer.de/sh/overview-english	Germany Schleswig-Holstein Wadden Sea National Park Information	1.9 Protected sites	Provides basic info on the site and who manages it.
MPA Management Germany	DT.Mari.NS103-German Dogger Bank MPA Site Information	NS103	http://www.bfn.de/0314_doggerbank+M5054de7a952.html	German Dogger Bank MPA Site Information	1.9 Protected sites	Includes information on conservation objectives set for the site and links to EU Standar Data Forms.
MPA Management Germany	DT.Mari.NS104-German Sylter Aussenriff / Oestliche Deutsche Bucht MPA Site Information	NS104	http://www.bfn.de/0314_sylter-aussenriff+M5054de7a952.html	German Sylter Aussenriff / Oestliche Deutsche Bucht MPA Site Information	1.9 Protected sites	Includes information on conservation objectives set for the site and links to EU Standar Data Forms.
MPA Management Germany	DT.Mari.NS105-German Seevogelschutzgebiet Helgoland MPA Site Information	NS105	http://eunis.eea.europa.eu/sites/DE1813491	German Seevogelschutzgebiet Helgoland MPA Site Information	1.9 Protected sites	Includes information on conservation objectives set for the site and links to EU Standar Data Forms.
MPA Management Germany	DT.Mari.NS106-German Borkum-Riffgrund MPA Site Information	NS106	http://www.bfn.de/0314_borkum-riffgrund+M5054de7a952.html	German Borkum-Riffgrund MPA Site Information	1.9 Protected sites	Includes information on conservation objectives set for the site and links to EU Standar Data Forms.
MPA Management All	DT.Mari.NS107-EUNIS MPA Site Information Summaries	NS107	http://eunis.eea.europa.eu/sites.jsp	EUNIS MPA Site Information Summaries	1.9 Protected sites	User must type in site name or code (Nature 2000 code) and information on the MPA appears, including size, area, species and habitats protected, designation date etc.
MPA Management Denmark	DT.Mari.NS108-Danish Nature Agency Natura 2000 Marine Plans.	NS108	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/	Danish Nature Agency Natura 2000 Marine Plans.	1.9 Protected sites	Information on management goals and conservation objectives for Danish Natura 200 sites.
MPA Management Germany	DT.Mari.NS109-German National Park Act	NS109	http://www.nds-voris.de/portal/?quelle=purl&query=WattenmeerNatPG%20ND&psml=bsvorisprod.psml&doktyp=Gesetze&max=true	German National Park Act	1.9 Protected sites	Online German National Park Act.
MPA Management France	DT.Mari.NS110-French law on national parks, marine parks and regional parks.	NS110	http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000609487&dateTexte&categorieLien=id	French law on national parks, marine parks and regional parks.	1.9 Protected sites	Online link to the act relating to France's national parks.
MPA Management France	DT.Mari.NS111-OSPAR MPA Site Information pages	NS111	http://mpa.ospar.org/home_ospar/mpa_datasheets/	OSPAR MPA Site Information pages	1.9 Protected sites	French MPA info sheets
MPA Management France	DT.Mari.NS112-French Iroise national marine park Info	NS112	http://www.parc-marin-iroise.fr/	French Iroise national marine park Information	1.9 Protected sites	Iroise marine Natural Park information.
MPA Management Netherlands	DT.Mari.NS113-Netherlands Natura 2000 site Information: management plans	NS113	http://www.synbiosys.alterra.nl/natura2000/	Netherlands Natura 2000 site Information: management plans	1.9 Protected sites	Info on netherlands natura 2000 sites, including management plans
MPA Management Denmark	DT.Mari.NS114-Danish Nature Agency Natura 2000 Legislation Page	NS114	http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/lovgivning/	Danish Nature Agency Natura 2000 Legislation Page	1.9 Protected sites	Info on legislation relevant to Netherlands Natura 2000 sites
MPA Management UK	DT.Mari.NS115-UK MPA Information Pages	NS115	http://jncc.defra.gov.uk/protectedsites/sacselection/	UK MPA Information Pages	1.9 Protected sites	Info on designations dates, MPA type etc for UK MPAs
MPA list Global	DT.Mari.NS116-RAMSAR sites webviewer & GIS downloads	NS116	https://rsis.ramsar.org/	RAMSAR sites webviewer & GIS downloads	1.9 Protected sites	Interactive web map with ability to download RAMSAR sites.
Habitat spatial data OSPAR	DT.Mari.NS117-OSPAR threatened and/or declining habitats GIS data	NS117	http://www.ospar.org/content/content.asp?menu=01511400000000_000000_000000	OSPAR threatened and/or declining habitats GIS data	3.18 Habitats and biotopes	GIS habitat data for assessing ecological coherancy
Habitat spatial data EU	DT.Mari.NS118-EUSeaMap Habitat GIS data	NS118	http://www.emodnet-seabedhabitats.eu/webgis	EUSeaMap Habitat GIS data	3.18 Habitats and biotopes	GIS habitat data for assessing ecological coherancy
Maritime EEZ boundaries	DT.Mari.NS119-Maritime EEZ boundaries (v8) spatial data	NS119	http://www.marineregions.org/	Maritime EEZ boundaries (v8) spatial data	1.2 Geographical grid systems	maritime EEZ boundaries for countries in study area to put on maps as base layers

Valuation of the data to solving a challenge (a sheet per challenge)

NSC-002-Mari

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Mari.NS001-Natura 2000 European database bioregions table	Considered	Contribution	True	Parts of the data sets may be useful, can pick out sites in bioregions such as 'Marine Atlantic'. Needs to be used in conjunction with other tables in the database and likely other data sets.
NSC-002-Mari		Location	Null	Can select sites for Marine Atlantic but spatial resolution alone is not to the level of specific MPA sites. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway. Needs to be used in conjunction with other tables in the database and likely other data sets.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS002-Natura 2000 European database: contacts table	NotConsidered	Contribution	False	Not relevant for MPA challenge.
NSC-002-Mari		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Mari.NS003-Natura 2000 European database: designation status table	Considered	Contribution	True	Parts of the data sets may be useful, can pick out names of designated site with unique codes at a national level.
NSC-002-Mari		Location	Null	Will need to filter out those that are specific MPA sites. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS004-Natura 2000 European database: directive species table	Suitable	Contribution	True	Will be useful for assigning species listed under Natura sites but only latin names are given and marine species will have to be filtered out.
NSC-002-Mari		Location	True	Will need to filter out those that are specific to MPA sites. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway. Data will still be relevant for use.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS005-Natura 2000 European database: habitat class table	Suitable	Contribution	True	Parts of the data sets will be useful, such as the type of habitat (marine) and % of cover the habitat contributes to the site. Can be used in answering the 'resilience' question.
NSC-002-Mari		Location	True	Will need to filter out those that are specific MPA sites. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS006-Natura 2000 European database: habitats table	Suitable	Contribution	True	Parts of data set useful, such as the name of the habitat present at the site and the % cover (in hectares) it has at the site. May be useful for 'representivity' part of the challenge.
NSC-002-Mari		Location	True	Will need to filter out those that are specific MPA sites. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.

DT.Mari.NS007-Natura 2000 European database: impact table	Considered	Contribution	True	Pollution data may be useful when considering management associated with MPAs. This is uncertain.
NSC-002-Mari		Location	Null	Will need to filter out those that are specific MPA sites. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS008-Natura 2000 European database: management table	Considered	Contribution	True	Parts of data set useful, such as the name of conservation measures of some sites. May contribute to management challenge.
NSC-002-Mari		Location	Null	Will need to filter out those that are specific MPA sites in specific countries. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Some sites do not have fields filled in. May become a problem when results are filtered by those that are MPAs only. Information provided in tables is not specific or detailed enough per site.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS009-Natura 2000 European database: metadata table	NotConsidered	Contribution	False	Not relevant for MPA challenge.
NSC-002-Mari		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Mari.NS010-Natura 2000 European database: Natura2000 sites table	Suitable	Contribution	True	Once the data is filtered for MPAs (which may be difficult due to the column ''Marine_area_percentage' fields only giving a percentage of the site which site is marine) then the dataset will be very useful for the challenge. Data needed will be site name, country, the area in hectares, length in kilometres, what type of site it is, lat & long etc.
NSC-002-Mari		Location	True	Will need to filter out those that are specific MPA sites in specific countries. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Much information. Once filtered, it should be very useful.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS011-Natura 2000 European database: other species table	Suitable	Contribution	True	Data set will need to be filtered for 'marine' species and for other species that exist in those sites that are MPAs before they are used for the challenge.
NSC-002-Mari		Location	True	Will need to filter out those that are specific MPA sites in specific countries. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS012-Natura 2000 European database: species table	Suitable	Contribution	True	Data set will need to be filtered for 'marine' species and for other species that exist in those sites that are MPAs before they are used for the challenge.
NSC-002-Mari		Location	True	Will need to filter out those that are specific MPA sites in specific countries. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS013-Natura 2000 European database - CSV format	Suitable	Contribution	True	Data set will need to be filtered for 'marine' species and for other species that exist in those sites that are MPAs before they are used for the challenge.

NSC-002-Mari		Location	True	Will need to filter out those that are specific MPA sites in specific countries. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Separate excel spreadsheets will need to be anaylysed in conjunction with other sheets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	.csv format.
DT.Mari.NS014-Natura 2000 GIS data	Used	Contribution	True	File will need to be edited for marine areas in the focus countries but these data will eventually be very useful for the mapping task, if the shapefile can be edited. The borders of sites are given.
NSC-002-Mari		Location	True	Currently displays all Natura Sites. Up-to-date for the end of 2013. Once selected for the right sites, the data will be compatible for the challenge. Norway not included.
		Commercial	True	Free - downloadable from the EEA. If you intend to use the UK data you must read the End User Licence: http://jncc.defra.gov.uk/pdf/GIS_Data_End_User_Licence_NATURA_20110905.pdf
		Attributes	True	Resolution correct. Data is fit for purpose when MPAs are selected out.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Various files in .prj, .cpg and shapefile format. Need a GIS programme to open it.
DT.Mari.NS015-Natura 2000 metadata	Suitable	Contribution	True	Metadata used to give spatial and temporal resolutions to other datasets above.
NSC-002-Mari		Location	True	n/a
		Commercial	True	n/a
		Attributes	True	n/a
		Delivery	True	n/a
		Usability	True	n/a
DT.Mari.NS016-Natura 2000 barometer statistics	Suitable	Contribution	True	Gives the number of Natura 2000 sites and their areas by member state. Will be useful when cross-checking with other MPA records, such as OSPAR. Sites having a marine area component covering more than 5% of their total area were counted as a marine sites. Also gives state of designation.
NSC-002-Mari		Location	True	Not at resolution for challenge - not split per area.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Resolution is not fit for purpose.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Excel file.
DT.Mari.NS017-Public Natura 2000 Network Viewer Map	Suitable	Contribution	True	Very useful for challenge. Useful for visually finding MPAs from all Natura 2000 sites. Selecting a site also provides links to the EU standard data form which provides information on species included, area (hectares), lat and long and whether proposed management plans exist yet. Tool lets you measure areas also.
NSC-002-Mari		Location	True	Includes all but Norway's areas. May not be up-to-date. Still very useful.
		Commercial	True	Free - access granted immediately.
		Attributes	True	At correct precision and accuracy for challenge.
		Delivery	True	Access provided via weblink.
		Usability	True	Interactive GIS map.
DT.Mari.NS018-EEA Nationally designated areas (CDDA) database: designations table	Suitable	Contribution	True	Once the data is filtered for marine areas (can do using 'major_ecosystem' column in 'national_overview' table of database), data may be useful challenge. Will have some overlap with Natura 2000 sites.
NSC-002-Mari		Location	True	For all countries but Norway. However, the EEA does not have permission to distribute some or all sites for the Netherlands. Will need to use data from national websites here. Temporal coverage is up-to-date to 2013. Still useful.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS019-EEA Nationally designated areas (CDDA) database: sites table	Suitable	Contribution	True	Once the data is filtered for marine areas (can do using 'major_ecosystem' column in 'national_overview' table of database), data shoild be very useful for challenge. Will have some overlap with Natura 2000 sites.
NSC-002-Mari		Location	True	For all countries but Norway. However, the EEA does not have permission to distribute some or all sites for the Netherlands. Will need to use data from national websites here. Temporal coverage is up-to-date to 2013. Still useful.
		Commercial	True	Free - downloadable from the EEA.

		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS020-EEA Nationally designated areas (CDDA) database: designation boundaries table	Considered	Contribution	True	Unsure if will be useful for challenge and in mapping. Gives information on how to obtain boundaries. **Need to use in conjunction with NS025 dataset for definitions and country codes.**
NSC-002-Mari		Location	Null	For all countries but Norway. However, the EEA does not have permission to distribute some or all sites for the Netherlands. Will need to use data from national websites here. Temporal coverage is up-to-date to 2013. Still useful.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS021-EEA Nationally designated areas (CDDA) database: site boundaries table	Considered	Contribution	True	Unsure if will be useful for challenge and in mapping. Gives information on how to obtain boundaries. **Need to use in conjunction with NS025 dataset for definitions and country codes.**
NSC-002-Mari		Location	Null	For all countries but Norway. However, the EEA does not have permission to distribute some or all sites for the Netherlands. Will need to use data from national websites here. Temporal coverage is up-to-date to 2013. Still useful.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS022-EEA Nationally designated areas (CDDA) database: natonal overview table	Suitable	Contribution	True	Data can be filteted for marine areas, can then link this filtered information to other tables in the database. Should be useful for challenge.
NSC-002-Mari		Location	True	For all countries but Norway. However, the EEA does not have permission to distribute some or all sites for the Netherlands. Will need to use data from national websites here. Temporal coverage is up-to-date to 2013. Still useful.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS023-EEA Nationally designated areas (CDDA) database - CSV format	Suitable	Contribution	True	Data set will need to be filtered for 'marine' species and for other species that exist in those sites that are MPAs before they are used for the challenge.
NSC-002-Mari		Location	True	Will need to filter out those that are specific marine sites in specific countries. Needs to be used in conjunction with other tables in the database and likely other data sets. Temporal coverage relates to 2013 so not fully up-to-date. Does not cover Norway.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Separate excel spreadsheets will need to be anaylysed in conjunction with other sheets.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	.csv format (unzipped folder contains several excel files).
DT.Mari.NS024-EEA Nationally designated areas (CDDA): GIS data	Suitable	Contribution	True	File will need to be edited for marine areas in the focus countries but these data will eventually be very useful for the mapping task, if the shapefile can be edited. The borders of sites are given.
NSC-002-Mari		Location	True	For all countries but Norway. However, the EEA does not have permission to distribute some or all sites for the Netherlands. Will need to use data from national websites here. Temporal coverage is up-to-date to 2013. Still useful.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	True	Resolution correct. Data is fit for purpose when marine areas are selected out.
		Delivery	True	Directly downloadable from EEA.
		Usability	True	Shape file, spatial lite file, INSPIRE compliant dataset.
DT.Mari.NS025-EEA Code lists and definitions for Nationally designated areas (CDDA)	Considered	Contribution	True	Unsure if will be useful for challenge and in mapping. Defines terms in NS020 nand NS021 datasets.
NSC-002-Mari		Location	Null	For all countries but Norway. However, the EEA does not have permission to distribute some or all sites for the Netherlands. Will need to use data from national websites here. Temporal coverage is up-to-date to 2013. Still useful.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Table needs to be used in conjunction with other data sets.
		Delivery	True	Directly downloadable from EEA.

		Usability	True	Excel tables.
DT.Mari.NS026-EEA Nationally designated areas (CDDA) metadata	NotConsidered	Contribution	False	Not needed to complete challenge.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS027-EUNIS database	Considered	Contribution	True	Likely to be very useful but could not open files. Data have been taken directly from the EUNIS web application.
NSC-002-Mari		Location	Null	For all countries but Norway. Temporal coverage is updated regularly. Last upload May 2014.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	Null	Many. Likely to be suitable for challenge but cannot open.
		Delivery	True	Directly downloadable from EEA.
		Usability	False	Could not open RDF/XML files on system. Notepad and Excel just show coded letters. Data have been taken directly from the EUNIS web application.
DT.Mari.NS028-EUNIS database web application: sites data	Considered	Contribution	True	May help when cross-checking data for overlapping sites under Natura, CDDA and European Nature Diploma Areas (Council of Europe).
NSC-002-Mari		Location	True	Spatial data at correct resolution, assumed to be updated regularly.
		Commercial	True	Freely searchable from EEA website.
		Attributes	True	Gives details of size (hectares), lat and long, designation type and country so resolution of the data for the challenge may be sufficient to contribute to the challenge.
		Delivery	True	Available immediatley from EEA website.
		Usability	True	Website search function is easy to use and resulting data are downloadable. Basic searches of 'marine' were used, yielding 506 results. **However, there is a risk that the search may have missed some marine sites that did not have 'marine' in the name.**
DT.Mari.NS029-EEA conservation status of habitats and species database	Considered	Contribution	True	Some data may be useful for reference and when analysing whether an ecologically coherant network exists. However, it is assumed the data is not at the correct resolution for the challenge.
NSC-002-Mari		Location	False	Spatial resolution is too low for the challenge (data grouped by large biogeographical region - marine atlantic, and not per MPA).
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Resolution not suitable for challenge.
		Delivery	True	Immediatley available from EEA
		Usability	True	Requires reading of the pdf manual before the database is understood. Format easily downloadable (.mdb file).
DT.Mari.NS030-EEA conservation status of habitats and species GIS database	Considered	Contribution	True	Some data may be useful for reference and when analysing whether an ecologically coherant network exists. However, it is assumed the data is not at the correct resolution for the challenge.
NSC-002-Mari		Location	False	Spatial resolution is too low for the challenge (data grouped by large biogeographical region - marine atlantic, and not per MPA).
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Resolution not suitable for challenge.
		Delivery	True	Immediatley available from EEA
		Usability	True	Zipped shapefile, vector polygon - easily readable if you have GIS software.
DT.Mari.NS032-EEA conservation status of habitats and species metadata	NotConsidered	Contribution	False	Not relevant for MPA challenge.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS032-EUNIS habitat classification data	Considered	Contribution	True	May be useful when defining habitats generally in reports but not correct resolution for challenge.
NSC-002-Mari		Location	True	Data is up-to-date according to the metadata.
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Metadata available but data not at level needed for challenge
		Delivery	True	Immediatley available from EEA
		Usability	True	Easily downloadable excel file.

DT.Mari.NS033-European biogeographical regions Habitats Directive (92/43/EEC)	Considered	Contribution	True	May be useful when defining habitat boundaries generally in reports but not likely at correct resolution for challenge.
NSC-002-Mari		Location	False	Not up-to-date, data is for 2008-2011
		Commercial	True	Free - downloadable from the EEA.
		Attributes	False	Resolution not suitable for challenge.
		Delivery	True	Immediatley available from EEA
		Usability	True	GIS data available in spatial lite format or shapefile format. Co-ordinate reference system .prj gile (ESRI friendly)
DT.Mari.NS034-GIS map of Denmark Natura 2000 sites	Suitable	Contribution	True	Useful for visually finding MPAs from Danish Natura 2000 sites. Numbers given on map so can link to list of sites and information about them. May overlap with original Natura 2000 data.
NSC-002-Mari		Location	True	Includes all Danish Natura 2000 sites.
		Commercial	True	Free - access granted immediately.
		Attributes	True	Correct accuracy - sizes of areas given, can pick out MPAs
		Delivery	True	Access provided via weblink.
		Usability	True	Interactive GIS map allows links to number, which may help to solve the challenge, despite the data not actually being linked to this map for download.
DT.Mari.NS035-Denmark list of habitats and birds each Natura 2000 site covers	Suitable	Contribution	True	Useful as will link numbers on GIS map to information about sites. May overlap with original Natura 2000 data.
NSC-002-Mari		Location	True	Includes all Danish Natura 2000 sites.
		Commercial	True	Free - access granted immediately.
		Attributes	True	Correct accuracy - sizes of areas given, can pick out MPAs
		Delivery	True	Access provided directly through Danish Nature Agency website.
		Usability	True	Pdf, easily downloadable.
DT.Mari.NS036-Denmark list of plans for Natura 2000 sites	Considered	Contribution	True	May be useful when extracting information about legislation or species associated with habitat. **Needs translation.**
NSC-002-Mari		Location	True	At correct resolution as information given per site.
		Commercial	True	Free - access granted immediately.
		Attributes	Null	Correct accuracy, information may be able to be extracted to solve parts of the challenge.
		Delivery	True	Access provided directly through Danish Nature Agency website.
		Usability	True	Pdf, easily downloadable.
DT.Mari.NS037-UK JNCC Interactive MPA map	Suitable	Contribution	True	Useful for visually finding MPAs in UK. Includes all MPAs (not just Natura 2000). May overlap with original Natura 2000 data.
NSC-002-Mari		Location	True	Includes all UK MPAs
		Commercial	True	Free online map
		Attributes	True	Lat and long given, sizes and names when you right click on checked MPAs.
		Delivery	True	Access provided via weblink.
		Usability	True	Interactive map allows identification of MPAs and thei size which may help to solve the challenge
DT.Mari.NS038-UK MCZ formal designation orders	Suitable	Contribution	True	Useful for finding 'features' or protected habitats and species associated with UK MCZs.
NSC-002-Mari		Location	True	At correct resolution as information given per site. Just applies to MCZs however.
		Commercial	True	Free - access granted immediately.
		Attributes	True	At correct resolution for the MCZs given but needs to be used in combination with other MPAs.
		Delivery	True	Access provided via weblink.
		Usability	True	Downloadable pdfs.
DT.Mari.NS039-Scotland MPA designation orders	Suitable	Contribution	True	Useful for finding 'features' or protected habitats and species associated with Scottish MPAs
NSC-002-Mari		Location	True	At correct resolution as information given per site. Just applies to Scottish MPAs however.
		Commercial	True	Free - access granted immediately.
		Attributes	True	At correct resolution for the MPAs given but needs to be used in combination with other MPAs
		Delivery	True	Access provided via weblink.
		Usability	True	Downloadable pdfs.
DT.Mari.NS040-Scotland MPA network map	Considered	Contribution	True	Useful for visually finding MPAs in UK but no data are provided.
NSC-002-Mari		Location	Null	Includes all Scottish MPAs but may need to be used in conjunction with other maps.
		Commercial	Null	Free online map
		Attributes	Null	Just an image. Useful for reference.
		Delivery	True	Access provided via weblink.
		Usability	Null	Interactive map allows identification of MPAs.
DT.Mari.NS041-Scotland MPA co-ordinates	Considered	Contribution	True	Useful for providing co-ordinates for Scottish MPAs. May be replication with other datasets so may not need to be used.

NSC-002-Mari		Location	Null	Includes all Scottish MPAs but will need to be used in conjunction with other data sets if this set is used.
		Commercial	True	Free to download from Scottish government
		Attributes	Null	At correct resolution for the MPAs given but needs to be used in combination with other MPAs to make a full dataset as only for Scotland.
		Delivery	True	Immediatley available from Scottish governemnt
		Usability	True	Easily downloadable excel file.
DT.Mari.NS042-Scotland GIS Shape files for both the Inshore and Offshore MPAs	Suitable	Contribution	True	Useful for providing spatial datas for Scottish MPAs. May be replication with other datasets so may not need to be used.
NSC-002-Mari		Location	True	Includes all Scottish MPAs but will need to be used in conjunction with other data sets if this set is used.
		Commercial	True	Free to download but must register with Scottish government and accept a public sector end user agreement
		Attributes	True	At correct resolution for the MPAs given but needs to be used in combination with other MPAs to make a full dataset as only for Scotland.
		Delivery	True	After registration, data are delivered immediatley.
		Usability	True	GIS data available in ESRI shapefile, GML 3.1.1. file, Google earth kmz file. Have to have approproate software.
DT.Mari.NS043-UK MPAs (SACs, SPAs, Ramsar, OSPAR) GIS data (& links to attribute data)	Used	Contribution	True	Useful for providing spatial datas for all UK MPAs. May be replication with other datasets.
NSC-002-Mari		Location	True	Includes all UK MPAs but will need to be used in conjunction with other data sets if this set is used. Temporal coverage varies from 2011-2014 depending on the type of MPA. It is the comprehensive dataset for UK MPAs however.
		Commercial	True	Free to download but must register with UK government.
		Attributes	True	At correct resolution for the MPAs.
		Delivery	True	After registration, data are delivered immediatley.
		Usability	True	GIS data available as shapefiles.
DT.Mari.NS044-OSPAR MPA Network Database	Used	Contribution	True	Not considering national designations, this list should make the base MPA list for the challenge as links to Natura 2000 site codes, considers all countries and includes all required data bar management and larval data.
NSC-002-Mari		Location	True	Temporal coverage only up to 2013 but is the most up-to-date comprehensive and official MPA list we have.
		Commercial	True	Free - downloadable from OSPAR.
		Attributes	True	At correct resolution for challenge. However, when compared to the visual OSPAR map tool (several MPAs on the map did not appear in the database, despite their status year being before the data of the database (2013)).
		Delivery	True	Directly downloadable from OSPAR.
		Usability	True	Separate tables in an .mdb format.
DT.Mari.NS045-OSPAR MPAs Network GIS shapefile	Used	Contribution	True	Very useful to mapping task. The base shape file used in the geodatabase.
NSC-002-Mari		Location	True	Temporal coverage only up to 2013 but may be the most up-to-date comprehensive and official MPA list we have.
		Commercial	True	Free - downloadable from OSPAR.
		Attributes	True	At correct resolution for challenge.
		Delivery	True	Directly downloadable from OSPAR.
		Usability	True	.shp file, opens in GIS programme.
DT.Mari.NS046-OSPAR MPAs visual interactive network map	Suitable	Contribution	True	Useful when needing to identify if OSPAR MPAs are in NSCP basin boundary. Gives lists of OSPAR MPAs under each country and their names. Can click on information button that gives the name of the MPA. In most cases these could be matched to the OSPAR MPA database and therefore the database could be manually filtered for the NSCP area.
NSC-002-Mari		Location	False	Temporal coverage only up to 2013.
		Commercial	True	Free - viewable on OSPAR web tool.
		Attributes	True	At correct resolution for challenge in terms of location anyway.
		Delivery	True	Immediately viewable on web tool.
		Usability	True	Easily usable interactive map.
DT.Mari.NS047-IUCN WDPA Interactive map & downloadable GIS files	Used	Contribution	True	Useful when needing to identify if MPAs in each country overlap with other MPA data sets found on study. Ovewrlapped onto geodatabase to identify gaps.
NSC-002-Mari		Location	True	Data is presumably up-to-date.
		Commercial	True	Free - downloadable from the web link but users must register first.

		Attributes	True	At correct resolution for challenge - in terms of location anyway. Licence at: http://www.protectedplanet.net/terms
		Delivery	True	Immediately viewable on web tool.
		Usability	True	.shp file, opens in GIS programme/ easily usage interactive map.
DT.Mari.NS048-EMODnet Bathymetry Portal	Considered	Contribution	True	May be useful for base layers on map, such as the depth contour, depth average.
NSC-002-Mari		Location	False	Data will need filtering for North Sea basin area. Unknown if data is current.
		Commercial	True	Free to dowload.
		Attributes	False	Metadata not available.
		Delivery	Null	Immediately viewable on web tool but data was not downloadable.
		Usability	False	The 'add layer' and dowload tool does not work: when the OGC Web Map Service URL' box is open, nothing happens when 'add layer' is pressed.
DT.Mari.NS049-EMODnet Geology Portal	NotConsidered	Contribution	False	Not relevant for MPA challenge.
NSC-002-Mari		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Mari.NS050-EMODnet Seabed Habitats Portal	Considered	Contribution	True	Some data may be useful as base map layers for the connectivity challenge, such as current/wave energy, surface wave exposure and salinity.
NSC-002-Mari		Location	False	Data will need filtering for North Sea basin area. Unknown if data are current.
		Commercial	True	Free to download from EUSeaMap but must provide email address.
		Attributes	True	Metadata provided with downloadable dataset.
		Delivery	True	Immediatley downloadable from interactive map tool.
		Usability	Null	.adf files for ESRI ArcInfo Binary Grid Format. Opens in Q GIS as a raster file. Without GIS knowledge, may be hard to find which way to open on GIS. Need GIS programme.
DT.Mari.NS051-EMODnet Chemistry Portal	NotConsidered	Contribution	False	Not relevant for MPA challenge.
NSC-002-Mari		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Mari.NS052-EMODnet Biology Portal	Considered	Contribution	True	Some data may be useful for connectivity challenge such as zooplankton abundance, phytoplankton colour index, fish/mammals/bird/reptile distribtion, chlorophyll (in pigments).
NSC-002-Mari		Location	False	Data will need filtering for North Sea basin area. Data are out-of-date.
		Commercial	Null	Some layers are available to download. Users must fill out a download form asking for what purpose are the data being downloaded.
		Attributes	False	Unknown if data types are correct for the challenege. Metadata do not come as part of some of the downloadable datasets.
		Delivery	Null	Immediatley downloadable from interactive map tool.
		Usability	True	Users can choose the file type of their download.
DT.Mari.NS053-EMODnet Physics Portal	Considered	Contribution	True	Some data may be useful for connectivity part of the challenge such as sea water temperature, salinity, water currents, turbidity, wind speed and direction.
NSC-002-Mari		Location	Null	Data are from point locations from platorms, data would somehow need to be combined to cover the study area.
		Commercial	True	Data can be freely downloaded from the portal.
		Attributes	False	Metadata does not appear to be provided with some data sets. Dataset may not be at right level of precision to solve the challenge.
		Delivery	True	Immediately downloadable via interactiev web tool.
		Usability	True	Data in various formats but generally very usable.
DT.Mari.NS054-EMODnet Human Activities Portal	Considered	Contribution	True	Data from EEA may be visually useful as has been filtered for martitime areas from the EEA dataset (provided above). Not downloadable however, only gives link to EEA Natura site.
NSC-002-Mari		Location	Null	Data are available for study area. Unknown if up-to-date.
		Commercial	True	Data can be freely downloaded from the portal but users must fill in details before downloading. However, these can be accessed directly from the EEA site anyway.
		Attributes	Null	Metadata is provided with the dataset, via the EEA. Actual downloadable data is not filtered for marine areas.
		Delivery	True	Immediately downloadable via EEA and viewable on interactive map.
		Usability	True	Interactive map easily usable,downloadable data is GIS/database format.

DT.Mari.NS055-French Marine Natura 2000 Designation Information	NotConsidered	Contribution	False	Link expired
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS056-French Marine Natura 2000 Designation Plan	Suitable	Contribution	True	Useful for information and helped direct searches.
NSC-002-Mari		Location	True	Just for information.
		Commercial	True	Just for information.
		Attributes	True	Just for information.
		Delivery	True	Just for information.
		Usability	True	Just for information.
DT.Mari.NS057-French Marine Sites: Various Protection Measures	Suitable	Contribution	True	Useful for information and helped direct searches.
NSC-002-Mari		Location	True	Just for information.
		Commercial	True	Just for information.
		Attributes	True	Just for information.
		Delivery	True	Just for information.
		Usability	True	Just for information.
DT.Mari.NS058-French Marine Natura 2000 Designation Information (Beyond Territorial)	Suitable	Contribution	True	Useful for information and helped direct searches.
NSC-002-Mari		Location	True	Just for information.
		Commercial	True	Just for information.
		Attributes	True	Just for information.
		Delivery	True	Just for information.
		Usability	True	Just for information.
DT.Mari.NS060-AAMP: Information on French marine data collection programme.	Used	Contribution	True	Provided links to information for individual sites.
NSC-002-Mari		Location	True	French specific information.
		Commercial	True	Free to view online
		Attributes	True	Just for information
		Delivery	True	Immediately available.
		Usability	True	Weblink.
DT.Mari.NS061-French Protected Areas Online Interactive Map	Suitable	Contribution	True	Useful when needing to identify if French MPAs are in NSCP basin boundary. Does not have associated information on drop down menus like other online map tools included in this spreadhseet, so not considered to be as useful.
NSC-002-Mari		Location	True	Temporal coverage only up to 2013 but most uptodate dataset we have.
		Commercial	True	Free - viewable on web tool.
		Attributes	True	At correct resolution for challenge in terms of location anyway.
		Delivery	True	Immediately viewable on web tool.
		Usability	True	Easily usable interactive map.
DT.Mari.NS062-French Georeferenced data on Marine Habitats	Used	Contribution	True	Georeferenced data on marine habitats and metadata, associated maps in marine Natura 2000 sites and marine parks.
NSC-002-Mari		Location	True	French MPA specific.
		Commercial	True	Freely downloadable from tool.
		Attributes	True	At correct resolution for the challenge.
		Delivery	True	Immediately available.
		Usability	True	Download formar is ESRI shapefile, MapInfo tab file or kml, data unprojected in WGS84.
DT.Mari.NS063-Information & Contacts: Implementation of MSFD in France	Suitable	Contribution	True	Useful for information of the various relevant management agencies.
NSC-002-Mari		Location	True	French specific information.
		Commercial	True	Free to view online
		Attributes	True	Just for information
		Delivery	True	Immediately available.
		Usability	True	Weblink.

DT.Mari.NS064-French Protected Areas Online Interactive Map via AAMP	Suitable	Contribution	True	Useful when needing to identify if French MPAs are in NSCP basin boundary. Does have associated information on drop down menus, such as designation status.
NSC-002-Mari		Location	True	Presumed to be up to date.
		Commercial	True	Free - viewable on web tool.
		Attributes	True	At correct resolution for challenge in terms of location anyway.
		Delivery	True	Immediately viewable on web tool.
		Usability	True	Easily usable interactive map. Web viewer with good options for selecting a range of physical and administrative data for download on a layer by layer basis.
DT.Mari.NS065-French Natura 2000 Marine Site Implementation Information (AAMP)	Suitable	Contribution	True	Yes, there was information about impact assessments and also some information on compliance with measures which pointed to legal basis for action.
NSC-002-Mari		Location	True	French specific information.
		Commercial	True	Free to view online
		Attributes	True	Just for information
		Delivery	True	Immediately available.
		Usability	True	Weblink.
DT.Mari.NS066-French Natura 2000 site GIS layers	NotConsidered	Contribution	False	May be useful when adding French MPAs specifically to database/map, good when updating nationally designated MPAs to lists such as OSPAR but dataset became redundant as dataset 62 was used on web map.
NSC-002-Mari		Location	True	Appears to be regularly updated.
		Commercial	True	Free - downloable from website.
		Attributes	False	Unknown if data types were useful.
		Delivery	True	Immediately downloadable shape files from webiste.
		Usability	True	.shp files available, also .prj etc. Readable if user has GIS software.
DT.Mari.NS067-UK Natural England GIS Datasets	Used	Contribution	True	Useful for official UK MPA list.
NSC-002-Mari		Location	True	Tempral resolution is up to date for 2015.
		Commercial	True	Free but users must register and accept terms of use agreements before downloading.
		Attributes	True	At correct resolution for UK list
		Delivery	True	Datasets immediately downloadable.
		Usability	True	.shp files available, readable if user has GIS software.
DT.Mari.NS068-Norwegian Environment Agnecy Naturebase Info	Null	Contribution	True	Just for information
NSC-002-Mari		Location	Null	Just for information
		Commercial	Null	Just for information
		Attributes	Null	Just for information
		Delivery	Null	Just for information
		Usability	Null	Just for information
DT.Mari.NS069-Norwegian Environment Agnecy Naturebase Data	Used	Contribution	True	Protected area boundaries could be downloaded from site.
NSC-002-Mari		Location	True	Only a few datasets will be included in the project boundary but can remove these.
		Commercial	True	Free but users have to state purpose for which they are going to use the data and give name and organisation. Users have to place an order, comes within a matter of minutes but folder was empty for two tested areas.
		Attributes	True	Need to choose datasets that are within the project boundary . Data in local UTM Zone 33N projection.
		Delivery	True	Data available for immediate download.
		Usability	True	Data available in several formats, including ESRI shapefile. Clear and well laid out site for accessing data.
DT.Mari.NS070-Norwegian Environment Agnecy Naturebase Datasets page	Null	Contribution	Null	Just for information
NSC-002-Mari		Location	Null	Just for information
		Commercial	Null	Just for information
		Attributes	Null	Just for information
		Delivery	Null	Just for information
		Usability	Null	Just for information
DT.Mari.NS071-Norwegian Environment Agnecy: First 36 Marine Areas Dataset	Used	Contribution	True	Provides shapefiles for Norway's MPAs that are in progess and not in progress.

NSC-002-Mari		Location	True	Assumed to be the most up to date shapefiles. Area specifically represents Norway so very useful.
		Commercial	True	Free.
		Attributes	True	Appears to be at correct precision for challenge. Metadata link in available on download page. Data in local UTM Zone 33N projection.
		Delivery	True	Immediately downloadale from link at bottom of the page.
		Usability	True	Data available in several formats, including ESRI shapefile. Clear and well laid out site for accessing data.
DT.Mari.NS072-Norwegian Environment Agnecy Naturebase: MPAs	Used	Contribution	True	Provides shapefiles for Norway's MPAs that are in progess and not in progress.
NSC-002-Mari		Location	True	Assumed to be the most up to date shapefiles. Area specifically represents Norway so very useful.
		Commercial	True	Free.
		Attributes	True	Appears to be at correct precision for challenge. Data in local UTM Zone 33N projection.
		Delivery	True	Immediately downloadale from link.
		Usability	True	Data available in several formats, including ESRI shapefile. Clear and well laid out site for accessing data.
DT.Mari.NS073-Norwegian Environment Agnecy Naturebase: Marine Protection Plan	Suitable	Contribution	True	Just for information
NSC-002-Mari		Location	Null	Just for information
		Commercial	Null	Just for information
		Attributes	Null	Just for information
		Delivery	Null	Just for information
		Usability	Null	Just for information
DT.Mari.NS074-Belgian MUMM: Marine Management Data	NotConsidered	Contribution	False	Data is offline.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS075-Belgian MPA International Framework Report	NotConsidered	Contribution	False	Did not provide useful information
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS076-Belgian Interactive Coastal Map: Downloadable GIS files.	Suitable	Contribution	True	Provides geo data for Belgium's MPAs.
NSC-002-Mari		Location	True	Specific to Belgium, presumably up to date.
		Commercial	True	Free to download from inteactive map tool.
		Attributes	True	Provides size and names of MPAs, Natura 2000 codes. At correct prcision for challenge.
		Delivery	True	Immediatley available.
		Usability	True	Downloadable .shp files, readable on GIS systems.
DT.Mari.NS077-Netherlands Information About MPAs	Used	Contribution	True	Useful in getting information for management measures and legislative instruments for Danish MPAs.
NSC-002-Mari		Location	True	Netherlands specific, up to date.
		Commercial	True	Free weblink
		Attributes	True	Just for information.
		Delivery	Null	Just information
		Usability	True	Website
DT.Mari.NS078-Norwegian Interactive Map: Marine Biodiversity Data	Considered	Contribution	True	May provide habitats and species distributions
NSC-002-Mari		Location	True	Norway specific. Presumably up-to-date.
		Commercial	True	Free to download.
		Attributes	False	Not specific to MPAs of Norway.
		Delivery	True	Immediately downloadable.

		Usability	False	Complicated to get layers to show in GIS. Not immediatley obvious. Have to right click on the layer >> select layer properties >> copy the data link >> open in GIS programme. Note that this is an xml file so might need to be pasted into Notepad first before adding to GIS programme.
DT.Mari.NS079-Netherlands Basic Map Viewer	NotConsidered	Contribution	False	Does not appear to show marine specific data.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS080-Netherlands Biogegraphical Data Viewer	NotConsidered	Contribution	False	Viewable data on maps but not downloadable.
NSC-002-Mari		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Mari.NS081-Netherlands Marine Management Information	Suitable	Contribution	True	General Useful info on the national implementation of MSFD.
NSC-002-Mari		Location	True	Netherlands specific, up to date.
		Commercial	True	Free to view
		Attributes	True	At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Immediately viewable info
		Usability	True	Website
DT.Mari.NS082-Wadden Sea (Denmark, Germany, Netherlands) Information	NotConsidered	Contribution	False	Link did not work.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS083-Wadden Sea Information: 2010 Plan	Used	Contribution	True	Very useful information on the implementation and the cooperation between the three countries towards the management of the Conservation area.
NSC-002-Mari		Location	True	MPA specific, up to date.
		Commercial	True	Free to view
		Attributes	True	At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Immediately viewable info
		Usability	True	Website
DT.Mari.NS084-Federal Agency for Nature Conservation (BFN): Interactive Protected Area Map	Considered	Contribution	True	Viewable data on maps but not downloadable, although clicking on MPAs provide links to website with useful species and habitat information.
NSC-002-Mari		Location	True	Germany specific, presumably up-to-date.
		Commercial	True	Free to view
		Attributes	False	Not downlaodable.
		Delivery	True	Immediatley viewable.
		Usability	True	Easily usable but in German.
DT.Mari.NS085-German North Sea Natura 2000 Site Map	NotConsidered	Contribution	False	Viewable information on German Natura 2000 marine sites but not downloadable.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS086-German Natura 2000 Sites Information	Used	Contribution	True	Useful for finding management information.
NSC-002-Mari		Location	True	Germany specific, presumably up-to-date.
		Commercial	True	Free to view
		Attributes	True	At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Immediately viewable info
		Usability	True	Website
DT.Mari.NS087-German Natura 2000 Sites Designation Information	Used	Contribution	True	Useful for finding management information.

NSC-002-Mari		Location	True	Germany specific, presumably up-to-date.
		Commercial	True	Free to view
		Attributes	True	At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Immediately viewable info
		Usability	True	Website
DT.Mari.NS088-German North Sea Natura 2000 Sites Designation Information	Used	Contribution	True	Useful for finding management information.
NSC-002-Mari		Location	True	Germany specific, presumably up-to-date.
		Commercial	True	Free to view
		Attributes	True	At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Immediately viewable info
		Usability	True	Website
DT.Mari.NS089-Swedish Environmental Protection Agency Interactive Protected Sites Map	Considered	Contribution	True	Viewable data on maps but not downloadable, although clicking on MPAs provide links to website with useful species and habitat information.
NSC-002-Mari		Location	True	Sweden specific, presumably up-to-date.
		Commercial	True	Free to view
		Attributes	False	Not downlaodable.
		Delivery	True	Immediatley viewable.
		Usability	True	Easily usable interactive map.
DT.Mari.NS090-Swedish Geodata Interactive Map Portal	Suitable	Contribution	True	Downloadable .shp files, readable on GIS systems, for Sweden's Natura 2000 SCIs and SPAs. Will be used to see if same as the Natura 2000 shapefiles from the EEA.
NSC-002-Mari		Location	True	Sweden specific, presumably up-to-date.
		Commercial	True	Free to download from Geoportal.
		Attributes	True	Metadata available. At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Immediatley available when download button is clicked.
		Usability	True	Users are promted to read the instructions before they use the geoportal to download data, then download is easy. Search criteria included 'Natura 2000'.
DT.Mari.NS091-Swedish Regulation of Fishing in MPAs report.	Suitable	Contribution	True	Useful when finding management information for Swedish MPAs.
NSC-002-Mari		Location	True	Just information
		Commercial	True	Just information
		Attributes	True	Just information
		Delivery	True	Just information
		Usability	True	Just information
DT.Mari.NS095-Danish Nature Agency Natura 2000 Sites GIS data	Considered	Contribution	True	Downloadable .shp files, readable on GIS systems, for Denmark's Natura 2000 sites. Will be used to see if same as the Natura 2000 shapefiles from the EEA.
NSC-002-Mari		Location	True	Denmark specific, presumably up-to-date.
		Commercial	True	Free to download but users have to register.
		Attributes	True	At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Users have to regsiter but data is then delivered immediatley.
		Usability	True	.shp files readable in GIS software.
DT.Mari.NS096-Swedish List of National Marine Reserves	Considered	Contribution	True	Lists national MPAs with information relating to whether sites are Natura 2000 sites and links to other pages detailing regulations at provincial level.
NSC-002-Mari		Location	True	Swedish national MPA information provided.
		Commercial	True	Free to view
		Attributes	True	At correct resolutiom to contribute to solving the challenge.
		Delivery	True	Immediatley viewable
		Usability	True	User friendly links.
DT.Mari.NS094-UK MCZ designation update	Suitable	Contribution	True	Updates of plans for designation of UK MCZs. Useful for management information
NSC-002-Mari		Location	True	UK national MPA information provided.
		Commercial	True	Free to view
		Attributes	True	At correct resolution for UK part of the challenge.
		Delivery	True	Immediatley viewable
		Usability	True	Pdf information.
DT.Mari.NS095-OSPAR habitats distrubution GIS files	NotConsidered	Contribution	False	Just useful for identying habitats.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a

		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS096-DASSH UK Marine Species Data Archive	NotConsidered	Contribution	False	Larval data was not found for the species listed in the MPA sites relevant to this study.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS097-Marlin UK Marine Species Data Archive	NotConsidered	Contribution	False	Larval data was not found for the species listed in the MPA sites relevant to this study. However, it must be noted that MarLIN information is widely cited in peer reviewed journals, reports and conference papers and MarLIN information and sensitivity reviews form the basis of much of the advice currently in use for SACs, MCZs and marine plans.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS098-ESDM UK Marine Species Database: Data gateway	NotConsidered	Contribution	False	Larval data was not found for the species listed in the MPA sites relevant to this study. However, species distribution data is available and may be useful for more in-depth MPA analysis.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a
DT.Mari.NS099-Belgian Birds Directive Information	Used	Contribution	True	Useful information link to include on drop down menu on the interactive map. Provides info on the implementation of the Birds Directive for the specific national MPA.
NSC-002-Mari		Location	True	Specific to Belgium, presumably up to date.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS100-Belgian Royal Decree for the creation of protected areas	Suitable	Contribution	True	Useful information link to framework surrounding conservation measures at protected sites in Belgium.
NSC-002-Mari		Location	True	Specific to Belgium, presumably up to date.
		Commercial	True	Information free to view.
		Attributes	True	Country specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS101-Belgian Habitats Directive Information	Used	Contribution	True	Useful information link to include on drop down menu on the interactive map. Provides info on the implementation of the Birds Directive for the specific national MPA.
NSC-002-Mari		Location	True	Specific to Belgium, presumably up to date.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS102-Germany Schleswig-Holstein Wadden Sea National Park Information	Used	Contribution	True	Useful information link on which bodies manage this MPA which can be added to the interactive map.
NSC-002-Mari		Location	True	Specific to German MPA.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS103-German Dogger Bank MPA Site Information	Used	Contribution	True	Useful information provided includes conservation objectives set for site and which body manages it. Includes links to standard data forms and official conservation opbjectives.
NSC-002-Mari		Location	True	Specific to German MPA.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.

		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS104-German Sylter Aussenriff / Oestliche Deutsche Bucht MPA Site Information	Used	Contribution	True	Useful information provided includes conservation objectives set for site and which body manages it. Includes links to standard data forms and official conservation opbjectives.
NSC-002-Mari		Location	True	Specific to German MPA.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS105-German Seevogelschutzgebiet Helgoland MPA Site Information	Used	Contribution	True	Useful information provided includes conservation objectives set for site and which body manages it. Includes links to standard data forms and official conservation opbjectives.
NSC-002-Mari		Location	True	Specific to German MPA.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS106-German Borkum-Riffgrund MPA Site Information	Used	Contribution	True	Useful information provided includes conservation objectives set for site and which body manages it. Includes links to standard data forms and official conservation opbjectives.
NSC-002-Mari		Location	True	Specific to German MPA.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS107-EUNIS MPA Site Information Summaries	Used	Contribution	True	Useful information provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	Information is available for most sites and each site has its own web page.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS108-Danish Nature Agency Natura 2000 Marine Plans.	Used	Contribution	True	Useful information provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	Information is available for Danish Natura 2000 sites.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website but in Danish. Have to reply on google translating pages to navigate.
DT.Mari.NS109-German National Park Act	Used	Contribution	True	Useful legal and management information provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	Specific to german national park MPAs.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	In German language
DT.Mari.NS110-French law on national parks, marine parks and regional parks.	Used	Contribution	True	Useful legal and management information provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	Specific to french national park MPAs.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	In French language
DT.Mari.NS111-OSPAR MPA Site Information pages	Null	Contribution	False	Useful lbasic information about MPAs but just for information.
NSC-002-Mari		Location	Null	n/a
		Commercial	Null	n/a
		Attributes	Null	n/a
		Delivery	Null	n/a
		Usability	Null	n/a

DT.Mari.NS112-French Iroise national marine park Information	Used	Contribution	True	Useful information provided including link to annual management action plan.
NSC-002-Mari		Location	True	Specific to Frech MPA.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website.
DT.Mari.NS113-Netherlands Natura 2000 site Information: management plans	Used	Contribution	True	Useful information on management plans provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	Information is available for Dutch Natura 2000 sites.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website but in Dutch. Have to rely on google translating pages to navigate.
DT.Mari.NS114-Danish Nature Agency Natura 2000 Legislation Page	Used	Contribution	True	Useful information on legislation relating to Natura 2000 sites provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	Information is available for Danish Natura 2000 sites.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website but in Danish. Have to rely on google translating pages to navigate.
DT.Mari.NS115-UK MPA Information Pages	Used	Contribution	True	Useful information on legislation relating to Natura 2000 sites provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	Information is available for Danish Natura 2000 sites.
		Commercial	True	Information free to view.
		Attributes	True	Site specific information so at correct precision level for challenge.
		Delivery	True	Immediately available.
		Usability	True	Easily viewable on website but in Danish. Have to rely on google translating pages to navigate.
DT.Mari.NS116-RAMSAR sites webviewer & GIS downloads	Used	Contribution	True	Useful information on legislation relating to Natura 2000 sites provided can be included in drop down menus on interactive tool.
NSC-002-Mari		Location	True	No temporal information on data but only data source for RAMSAR sites available so used. Covers whole world and can be edited to our area.
		Commercial	True	Information free to view.
		Attributes	True	Sites correct precision level for challenge. No licence provided with data.
		Delivery	True	Immediately available.
		Usability	True	Download format: ESRI shapefile. Can open in GIS programmes.
DT.Mari.NS117-OSPAR threatened and/or declining habitats GIS data	Used	Contribution	True	Used to conduct connectiivity and resilience ecological coherance tests.
		Location	True	Data available for study area. Up to date to 2013 but most up-to-date we have so used.
		Commercial	True	Free
		Attributes	True	At correct resolution for challenege and for assessing ecological coherancy tests.
		Delivery	True	Immediately available.
		Usability	True	Download format: ESRI shapefile. Can open in GIS programmes.
DT.Mari.NS118-EUSeaMap Habitat GIS data	Used	Contribution	True	Used to conduct connectiivity and resilience ecological coherance tests.
		Location	True	Data available for study area. Up to date to 2 version 201208. Most uptodate we have.
		Commercial	True	Free
		Attributes	True	At correct resolution for challenege and for assessing ecological coherancy tests.
		Delivery	True	Immediately available.
		Usability	True	Download format: ESRI shapefile. Can open in GIS programmes.
DT.Mari.NS119-Maritime EEZ boundaries (v8) spatial data	Used	Contribution	True	Used as basemap for GIS maps.
		Location	True	Trimmed to study area and is version 8.
		Commercial	True	Free.
		Attributes	True	Correct precision for base file to GIS maps.
		Delivery	True	Immediately available.
		Usability	True	Download format: ESRI shapefile. Can open in GIS programmes.

Challenges

Reference	ProjectID	name	uri	outputs
NSC-000-Lite	NSC-000	Literature Review	http://www.emodnet.net/northsea/challenge/literature	
NSC-001-Wind	NSC-001	Windfarm Siting	http://www.emodnet.net/northsea/challenge/windfarm	
NSC-002-Mari	NSC-002	Marine Protected Areas	http://www.emodnet.net/northsea/challenge/mpa	
NSC-003-Oil	NSC-003	Oil Platform Leaks	http://www.emodnet.net/northsea/challenge/oil	
NSC-004-Clim	NSC-004	Climate and Coastal Protection	http://www.emodnet.net/northsea/challenge/climate	
NSC-005-Fish	NSC-005	Fisheries Management	http://www.emodnet.net/northsea/challenge/fisheries	
NSC-006-Mari	NSC-006	Marine Environment	http://www.emodnet.net/northsea/challenge/environment	
NSC-007-Rive	NSC-007	River Inputs	http://www.emodnet.net/northsea/challenge/river	

unlock:dgmare

InspireClass	Consideration	ValueCriteriaFlag
1.1 Coordinate reference systems	Null	Null
1.2 Geographical grid systems	NotConsidered	False
1.3 Geographical names	Considered	True
1.4 Administrative units	Suitable	
1.5 Addresses	Used	
1.6 Cadastral parcels		
1.7 Transport networks		
1.8 Hydrography	**Requirement**	
1.9 Protected sites	TRUE	
2.1 Elevation		
2.2 Land cover		
2.3 Orthoimagery		
2.4 Geology		
3.1 Statistical units		
3.2 Buildings		
3.3 Soil		
3.4 Land use		
3.5 Human health and safety		
3.6 Utility and Government services		
3.7 Environmental monitoring facilities		
3.8 Production and industrial facilities		
3.9 Agricultural and aquaculture facilities		
3.10 Population distribution – demography		
3.11 Area management / restriction / regulation zones & reporting units		
3.12 Natural risk zones		
3.13 Atmospheric conditions		
3.14 Meteorological geographical features		
3.15 Oceanographic geographical features		
3.16 Sea regions		
3.17 Bio-geographical regions		
3.18 Habitats and biotopes		
3.19 Species distribution		
3.20 Energy resources		
3.21 Mineral resources		

Value Criteria	
Contribution	TRUE If the data set parameters are useful to solving then callenge, otherwise FALSE
Location	TRUE if the temporal and spatial location of the datasets are relevant to solving the challenge, otherwise FALSE
Commercial	TRUE if the commercial terms (prices, licences) are compatible for solving the challenge, otherwise FALSE. A data does not need to be free to be used, but price proportionate to the challenge
Attributes	TRUE if accuracy, precision and resolution etc. of the data are sufficient to solve the challenge, otherwise FALSE. Note temporal and spatial coverage is dealt with in Location
Delivery	TRUE is the data can be delivered in time to solve the challenge. Otherwise FALSE. Includes continuation of supply
Usability	TRUE if the data can be readily used in systems to solve the challenge. FALSE otherwise. Note condition is normally false when the data is in an obscure or legacy encoding or has a non-intuitive or incorrect data structure.

Note:
If any criteria is unknown then it must be FALSE

Value Criteria Reason	
	The information given for the value Value Criteria Reason should be a sentence that enables the user to understand why the value criteria flag is either true or false. If the VCR contains little or no information then the flag must be FALSE

D. Results of the fine filter replication and representation tests for habitats in the North Sea MPA Network

D: Results of the fine filter replication and representation tests for habitats in the North Sea MPA Network

Habitat	Area in Study Area (km^2)	Area in MPAs (km^2)	% in MPAs	5% in MPAs	10%	20%	30%	40%	Replicates
OSPAR									
Intertidal mudflats	561.3	515.2	91.8	Yes	Yes	Yes	Yes	Yes	28
Intertidal *Mytilus edulis* beds on mixed and sandy sediments	18.1	16.2	89.6	Yes	Yes	Yes	Yes	Yes	8
Littoral chalk communities	17.0	12.8	75.2	Yes	Yes	Yes	Yes	Yes	8
Maërl beds	56.2	19.9	35.4	Yes	Yes	Yes	Yes	No	2
Modiolus modiolus horse mussel beds	23.9	20.0	83.3	Yes	Yes	Yes	Yes	Yes	2
Sabellaria spinulosa reefs	412.5	222.1	53.8	Yes	Yes	Yes	Yes	Yes	6
Sea-pen and burrowing megafauna communities	797.1	69.2	8.7	Yes	No				4
Zostera beds	282.1	224.2	79.5	Yes	Yes	Yes	Yes	Yes	22
EUSeaMap – EUNIS level 3									
A3.1 - High energy infralittoral rock	3309.4	1110.9	33.6	Yes	Yes	Yes	Yes	No	46
A3.2 - Moderate energy infralittoral rock	3254.1	929.8	28.6	Yes	Yes	Yes	No		60
A3.3 - Low energy infralittoral rock	300.6	27.4	9.1	Yes	No				10
A4.1 - High energy circalittoral rock	2329.1	614.1	26.4	Yes	Yes	Yes	No		32
A4.2 - Moderate energy circalittoral rock	22376.9	2477.8	11.1	Yes	Yes	No			46
A4.3 - Low energy circalittoral rock	9386.0	560.9	6.0	Yes	No				14
A5.1 - Sublittoral coarse sediment	114608.1	14750.0	12.9	Yes	Yes	No			72
A5.2 - Sublittoral sand	379604.4	47155.8	12.4	Yes	Yes	No			73
A5.3 - Sublittoral mud	59682.1	4003.8	6.7	Yes	No				44
A5.4 - Sublittoral mixed sediments	17106.9	2611.7	15.3	Yes	Yes	No			33
A6.1 - Deep-sea rock and artificial hard substrata	1008.5	2.2	0.2	No					1
A6.2 - Deep-sea mixed substrata	4089.6		0.0	No					0
A6.3 or A6.4 - Deep-sea sand or Deep-sea muddy sand	15591.2		0.0	No					0

A6.5 - Deep-sea mud	71945.0	1135.9	1.6	No					3
Deep circalittoral mixed hard sediments	5285.2	7.3	0.1	No					1
Deep circalittoral seabed	4216.5	37.3	0.9	No					12
High energy circalittoral mixed hard sediments	105.0	5.6	5.3	Yes	No				3
High energy circalittoral seabed	741.9	65.1	8.8	Yes	No				17
High energy infralittoral mixed hard sediments	535.6	21.5	4.0	No					4
High energy infralittoral seabed	4284.4	2502.9	58.4	Yes	Yes	Yes	Yes	Yes	40
Low energy circalittoral mixed hard sediments	740.2		0.0	No					0
Low energy circalittoral seabed	729.4	9.7	1.3	No					7
Low energy infralittoral mixed hard sediments	0.3		0.0	No					0
Low energy infralittoral seabed	272.8	49.9	18.3	Yes	Yes	No			5
Mid bathyal coarse sediment	730.6		0.0	No					0
Mid bathyal seabed	1432.0		0.0	No					0
Moderate energy circalittoral mixed hard sediments	3505.0	380.1	10.8	Yes	Yes	No			6
Moderate energy circalittoral seabed	1830.7	108.7	5.9	Yes	No				15
Moderate energy infralittoral mixed hard sediments	489.0	119.8	24.5	Yes	Yes	Yes	No		3
Moderate energy infralittoral seabed	873.5	104.7	12.0	Yes	Yes	No			19
Upper bathyal coarse sediment	3170.5		0.0	No					0
Upper bathyal seabed	714.1		0.0	No					0
Upper slope coarse sediment	8907.1		0.0	No					0
Upper slope mixed hard sediments	3922.5		0.0	No					0
Upper slope seabed	2881.0		0.0	No					0

E. Figures

Figure 1: Designated MPAs in the study area

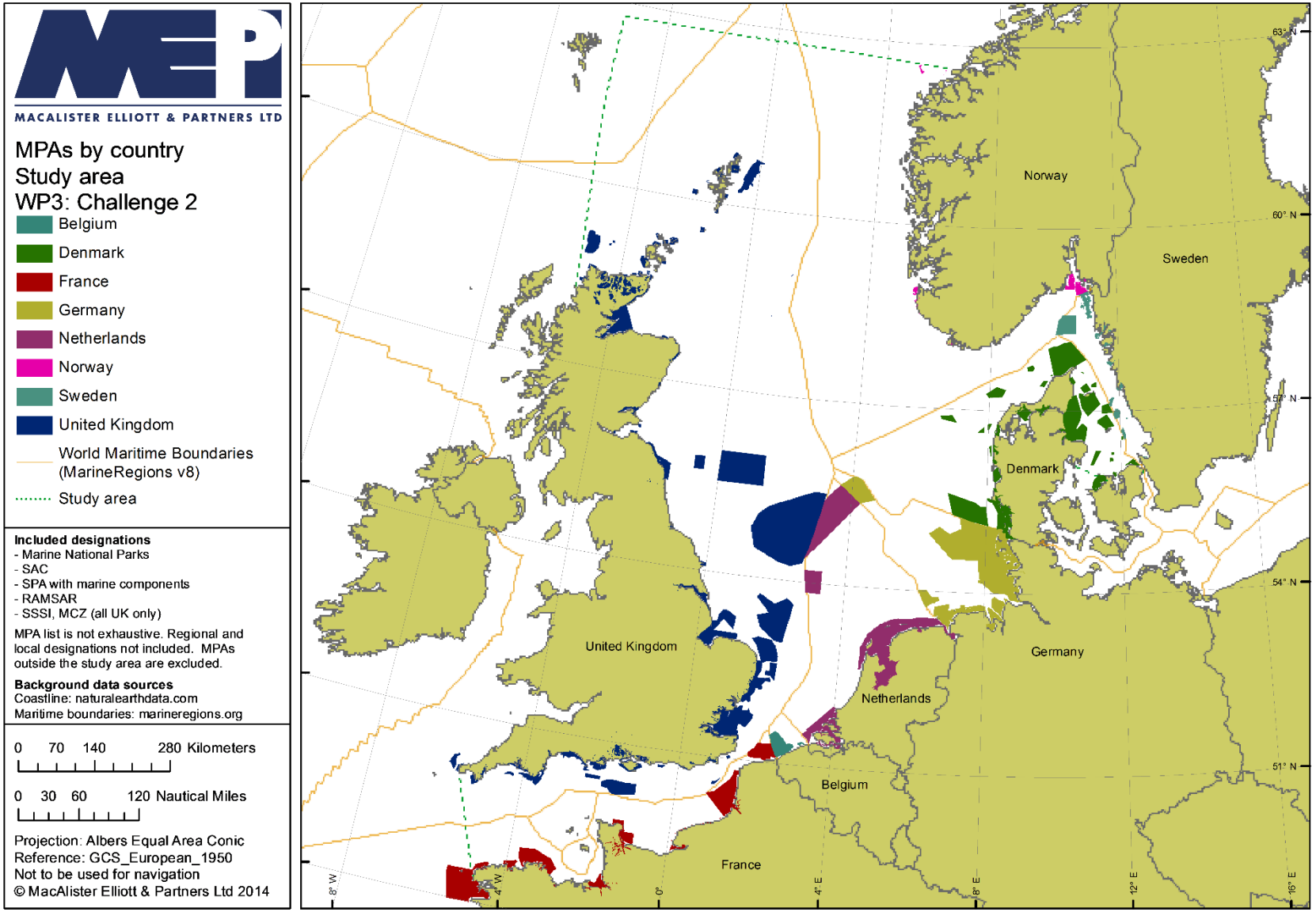


Figure 2: Designated MPAs in the English Channel

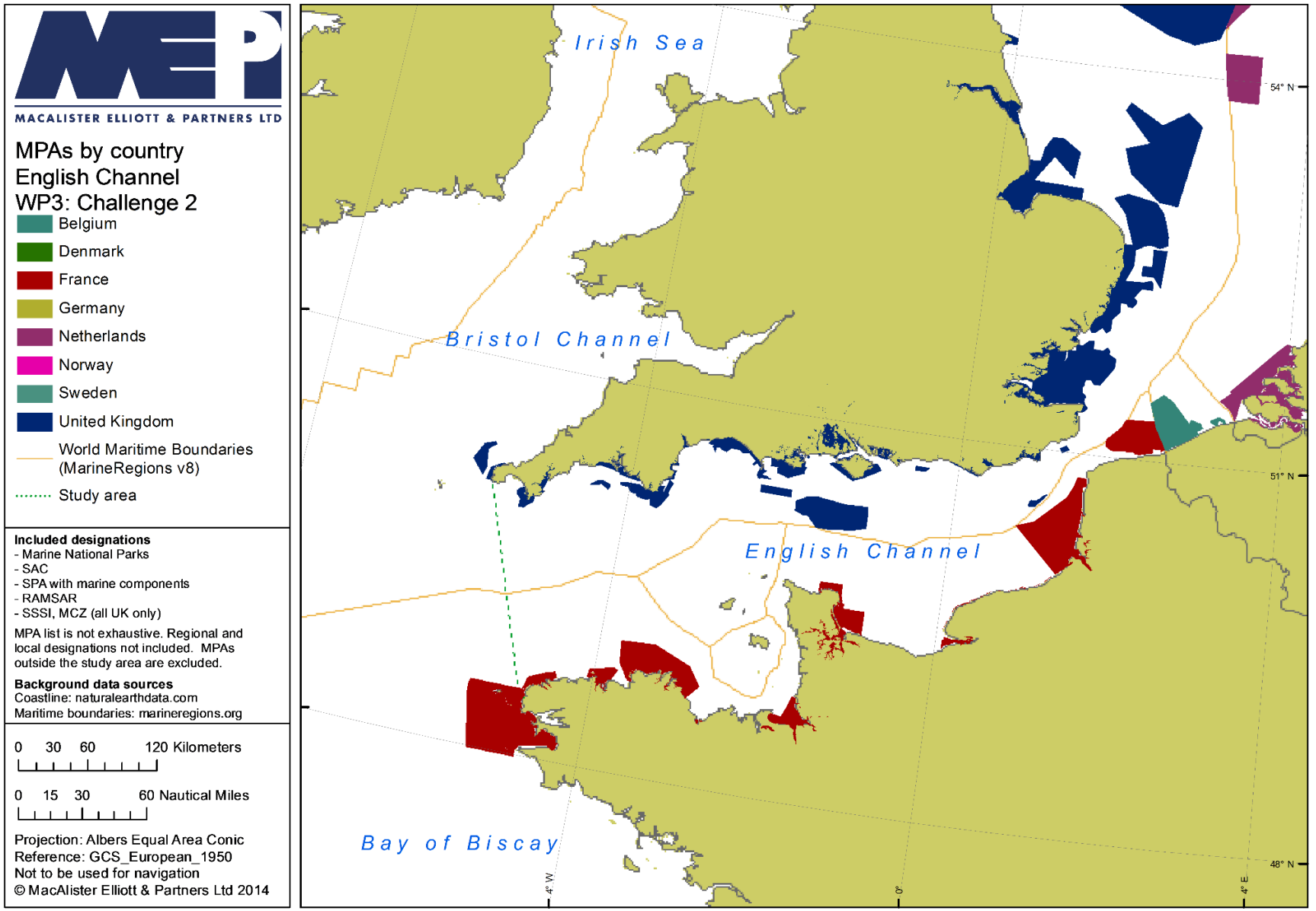


Figure 3: Designated MPAs in the North Sea

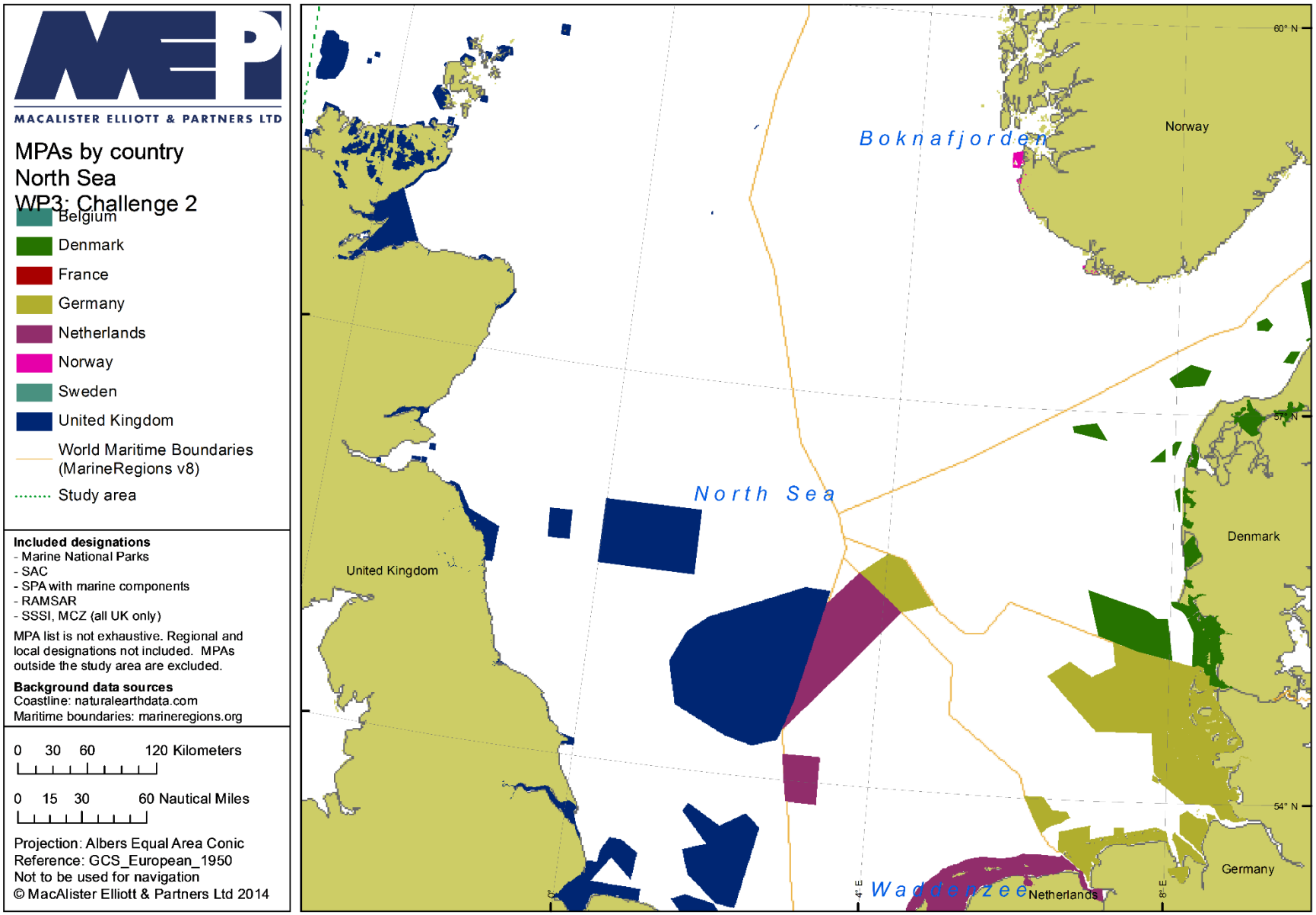


Figure 4: Designated MPAs in the Norwegian Sea

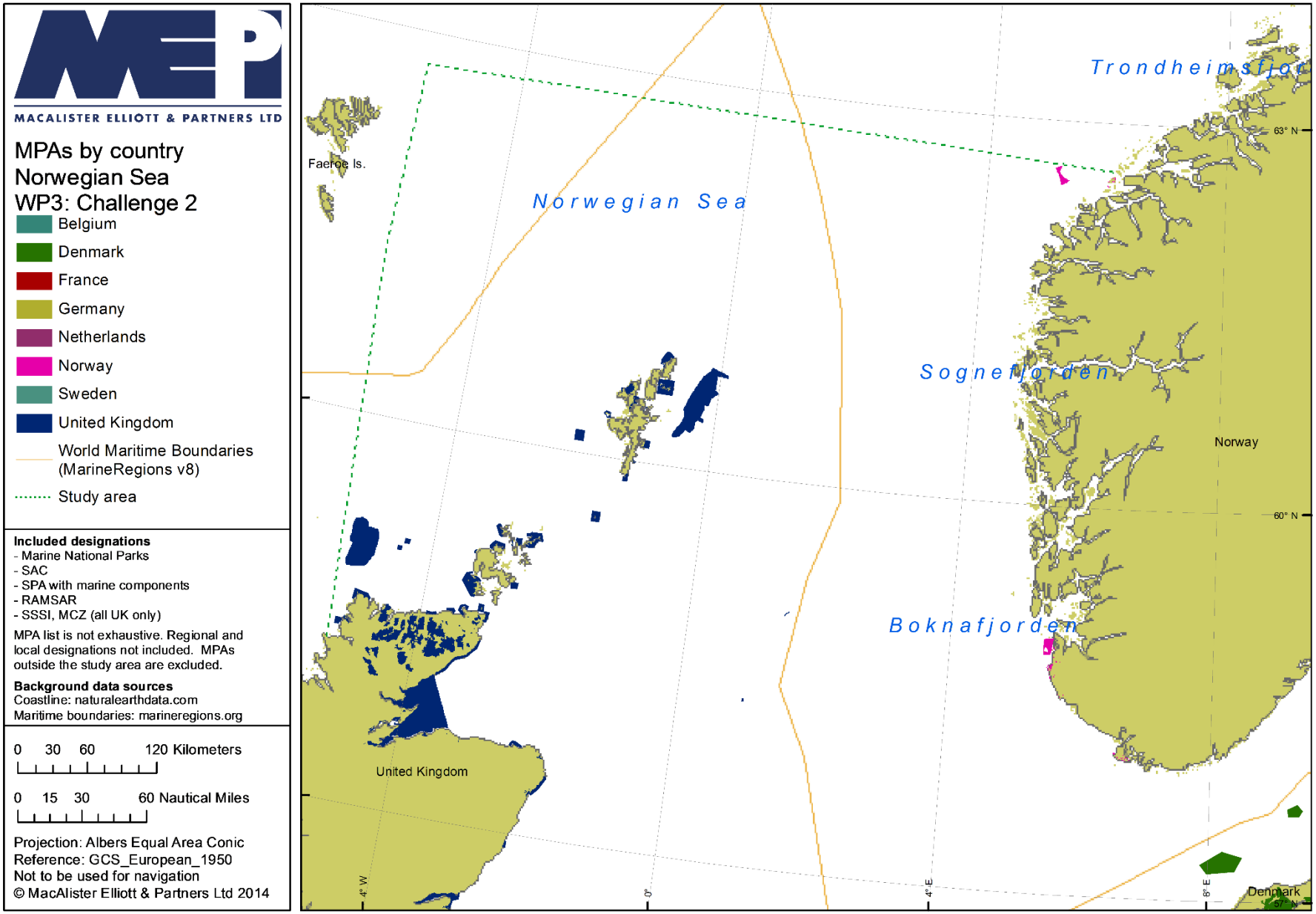


Figure 5: Designated MPAs in Scandinavia

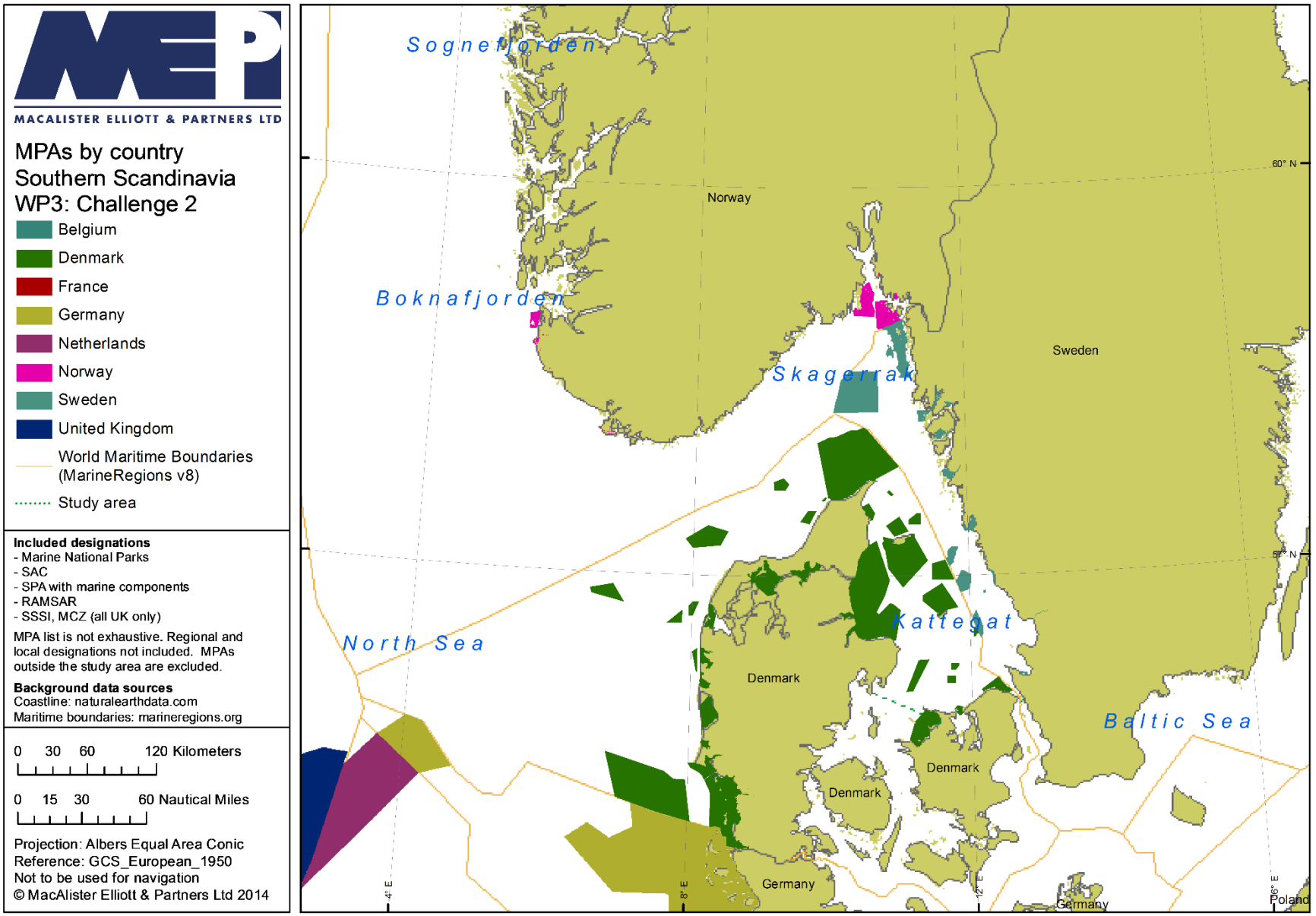


Figure 6: Histogram of MPA sizes in the North Sea MPA network

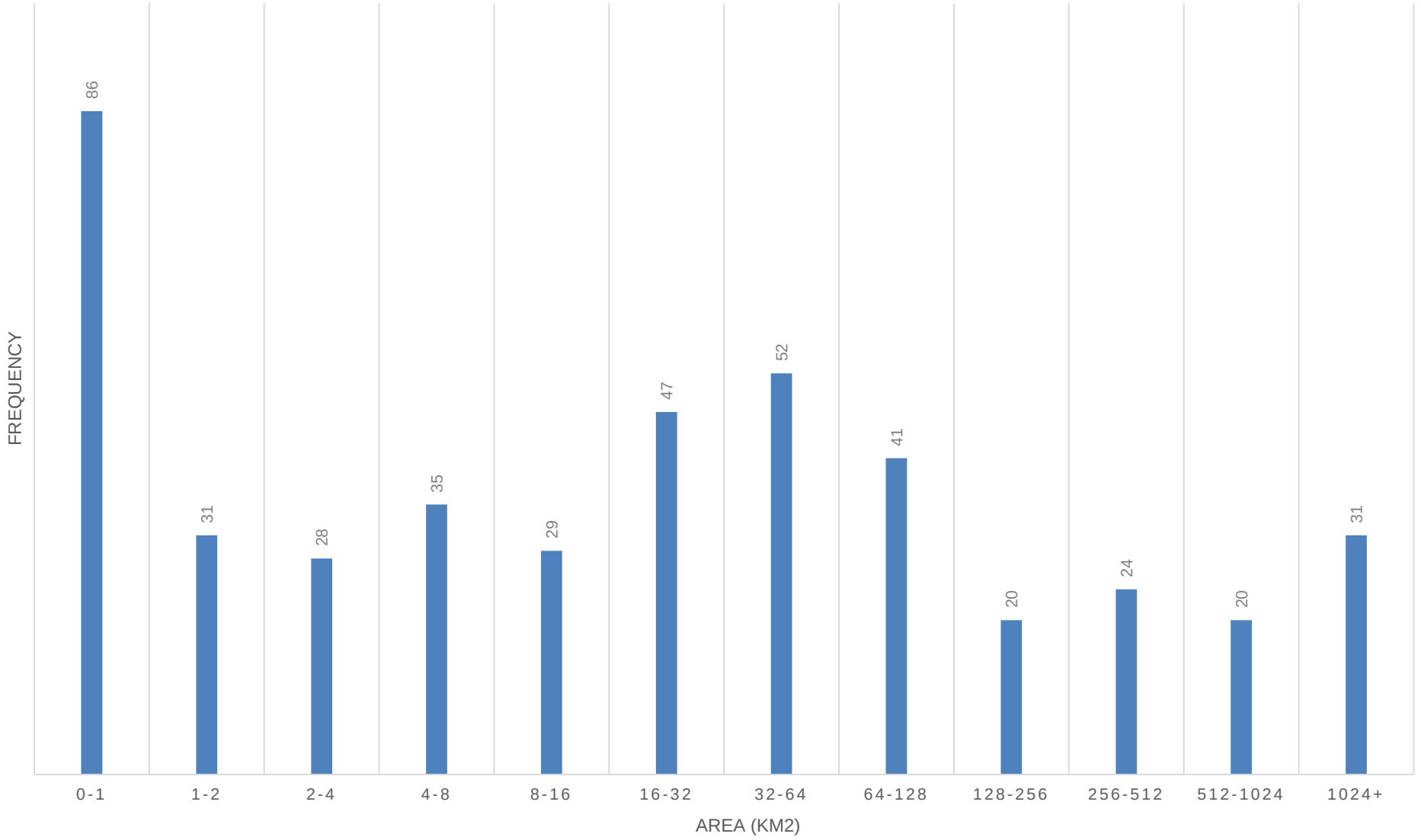


Figure 7: Coarse proximity map for North Sea MPAs: testing connectivity

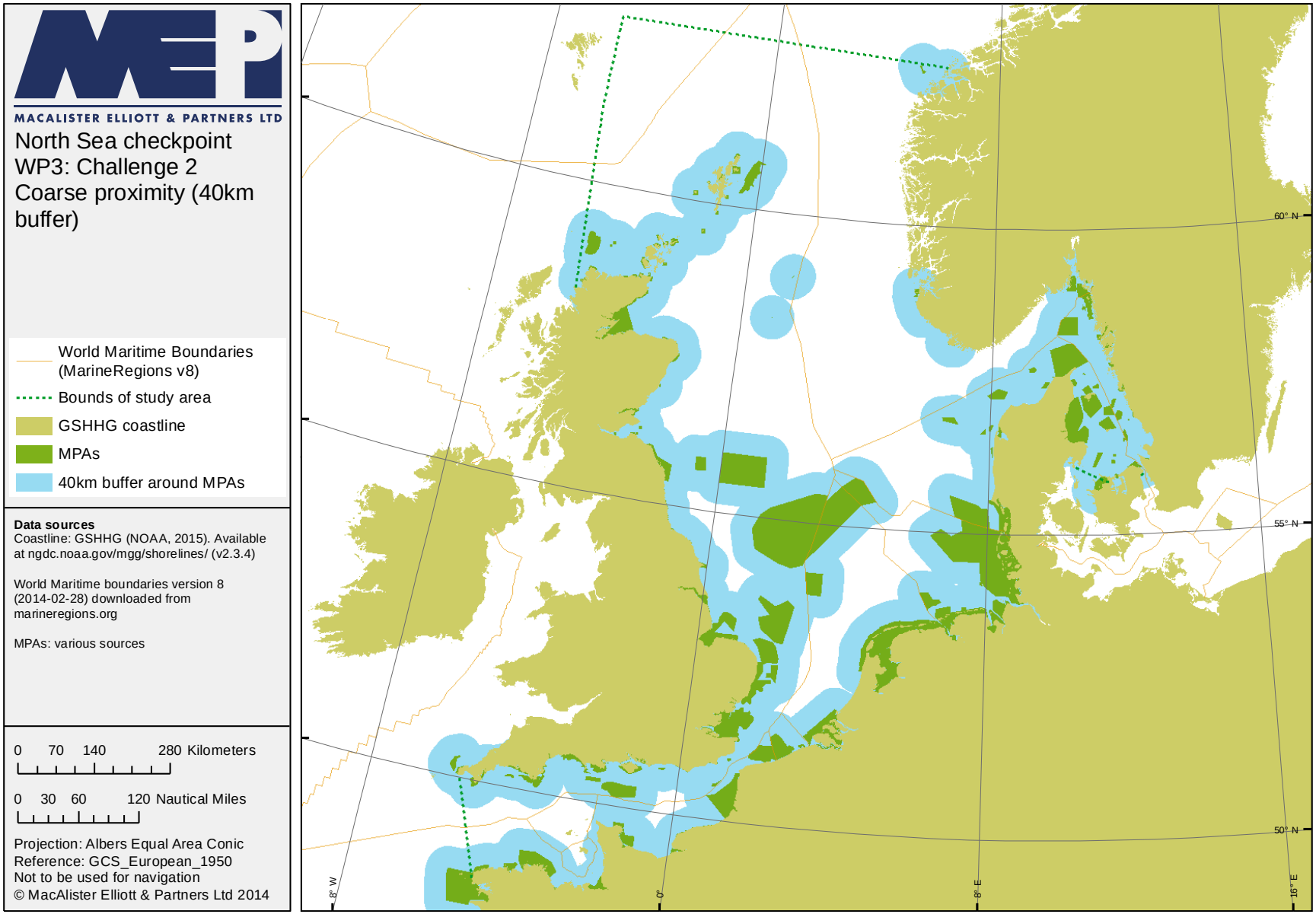


Figure 8: Kernel density proximity map for littoral chalk bed habitat

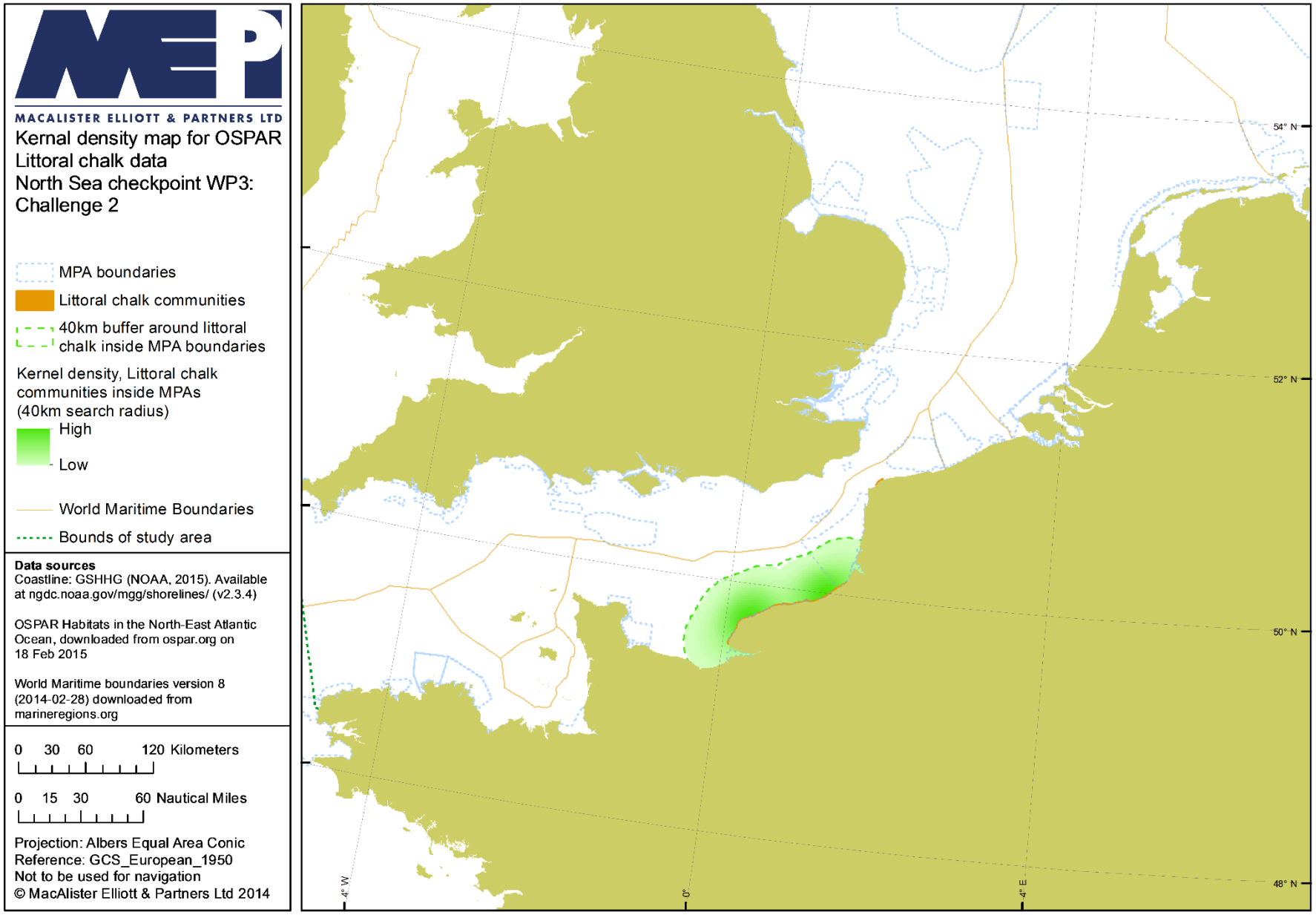


Figure 9: Kernel density proximity map for Maërl bed habitat

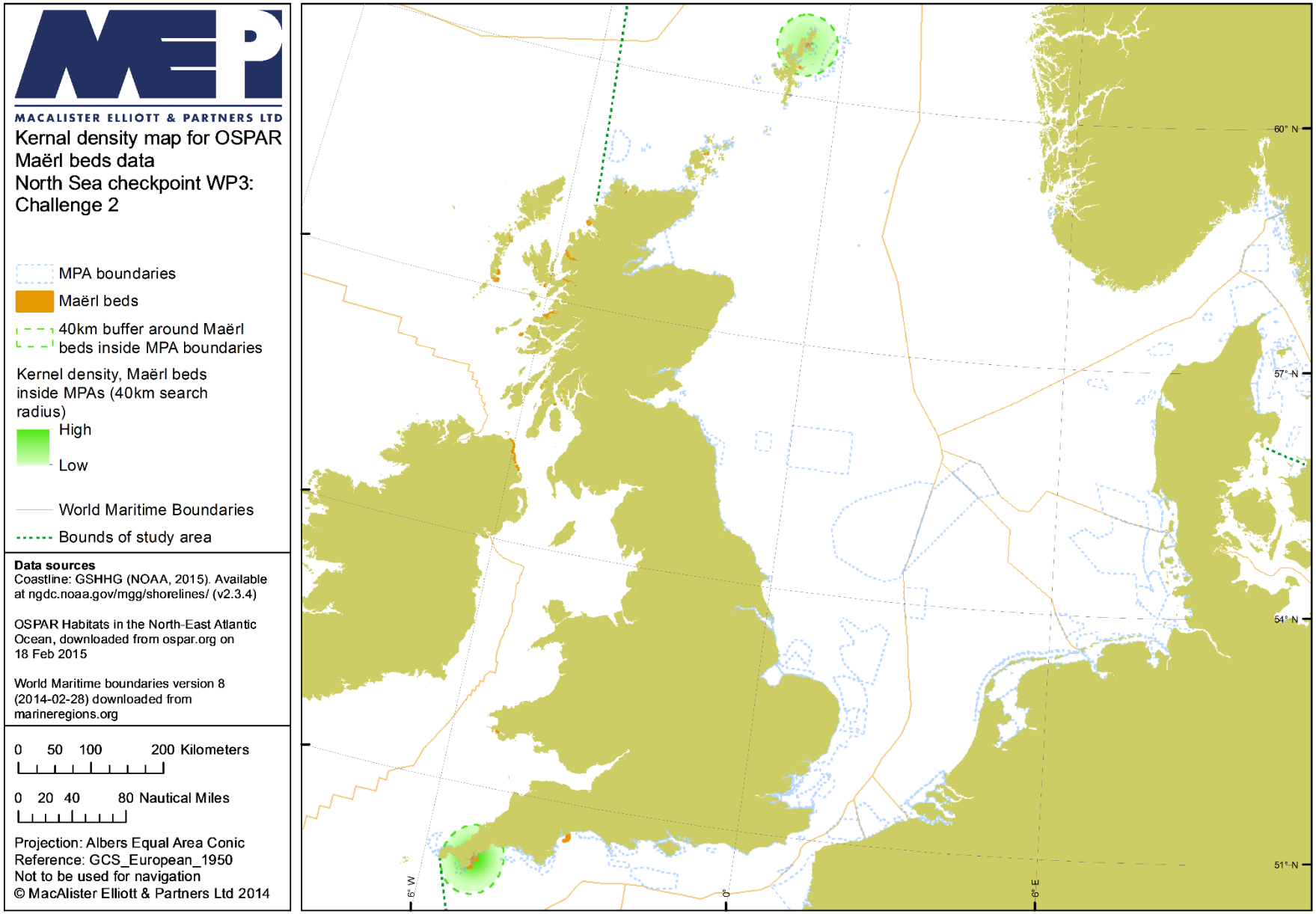


Figure 10: Kernel density proximity map for *Modiolus modiolus* bed habitat

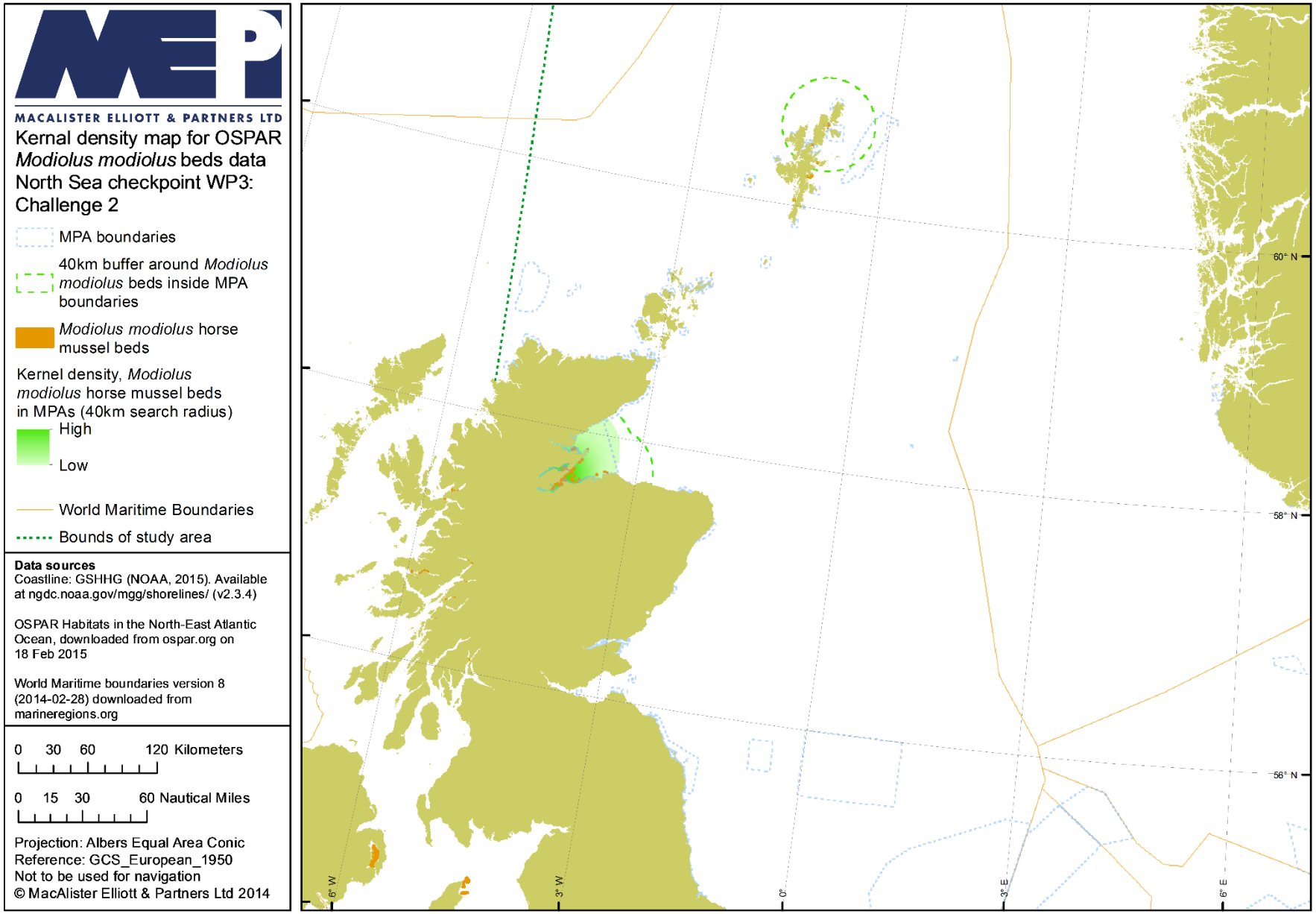


Figure 11: Kernel density proximity map for intertidal mudflat habitat

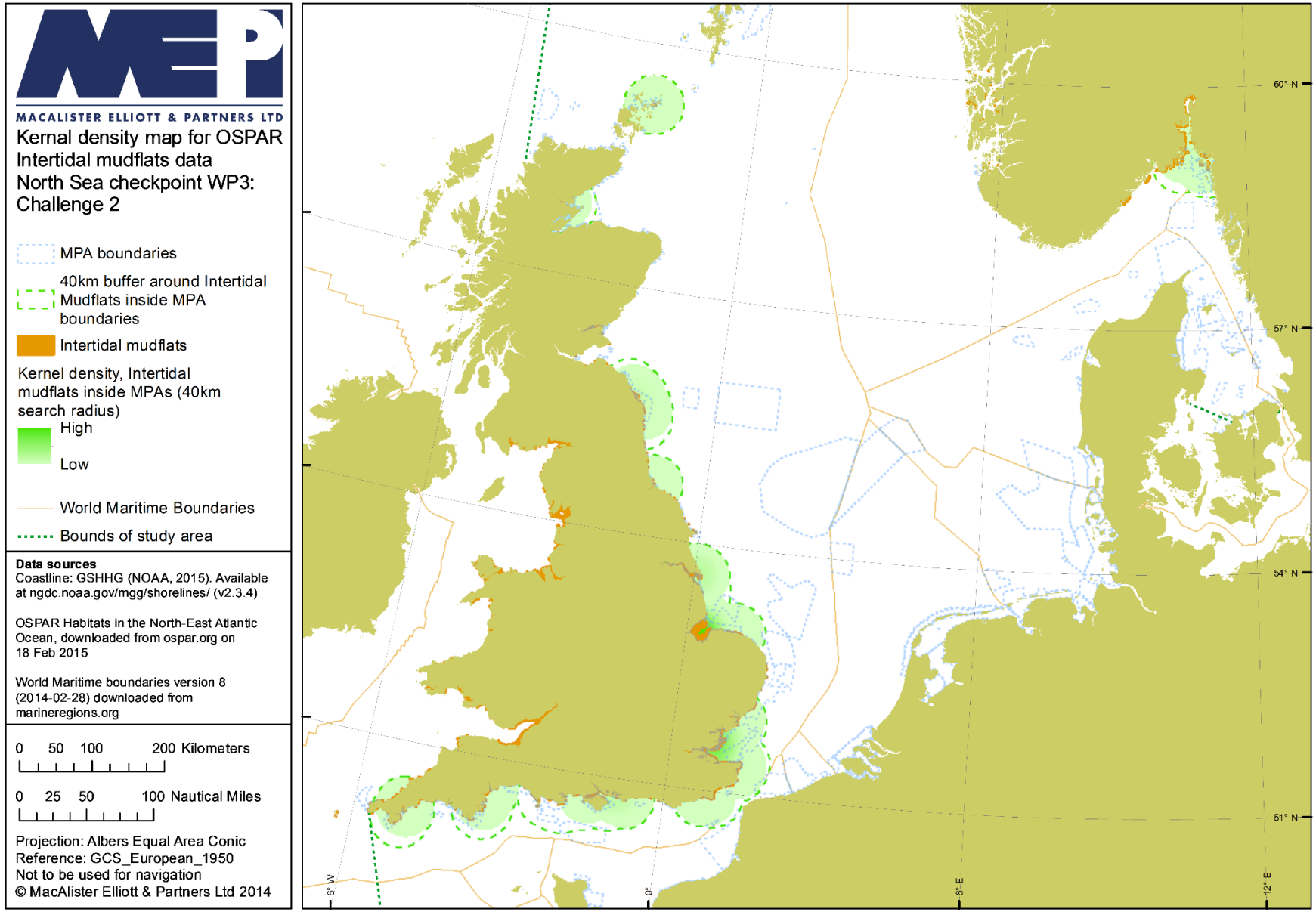


Figure 12: Kernel density proximity map for intertidal *Mytilus edulis* bed habitat

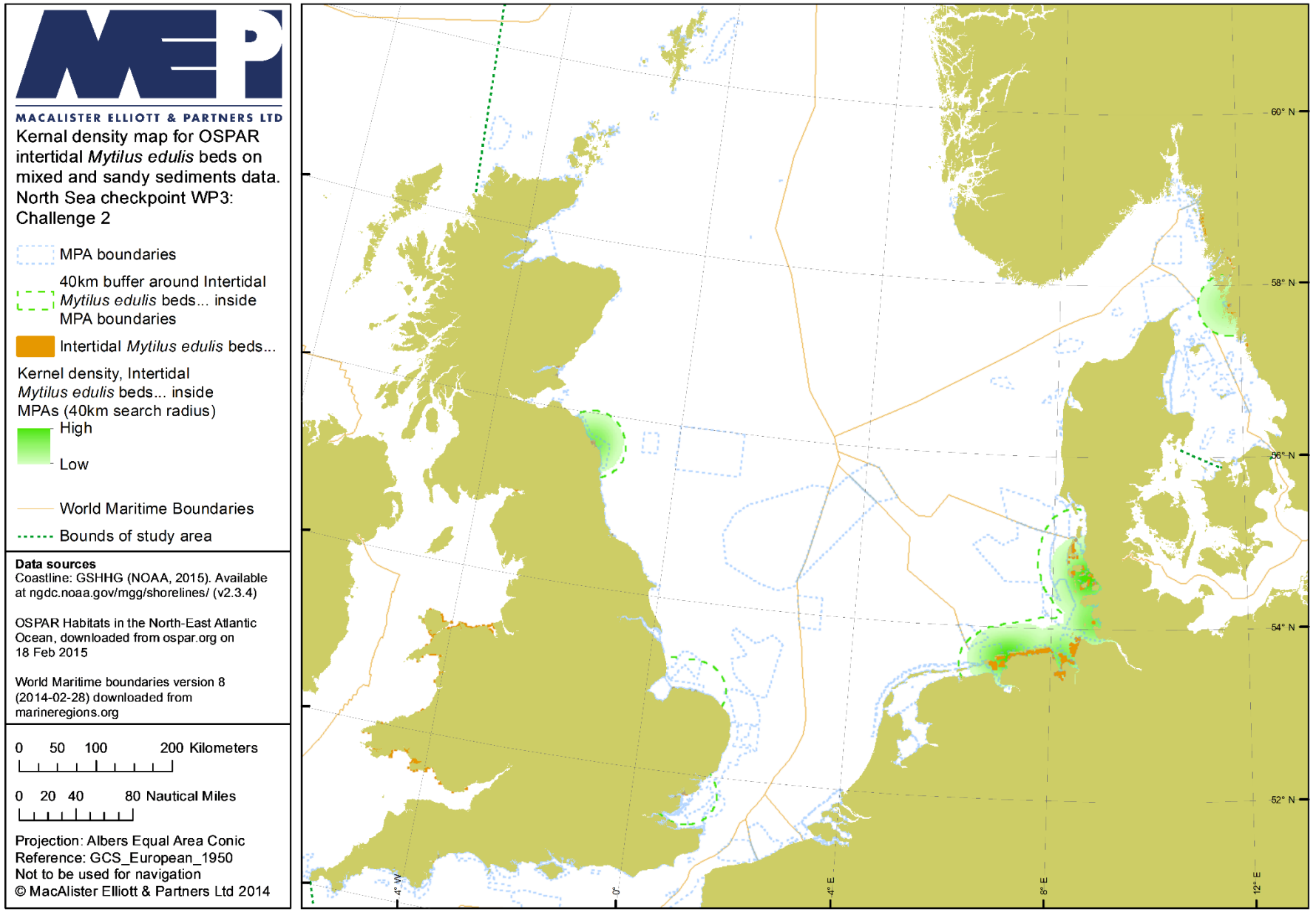


Figure 13: Kernel density proximity map for *Sabellaria spinulosa* reef habitat

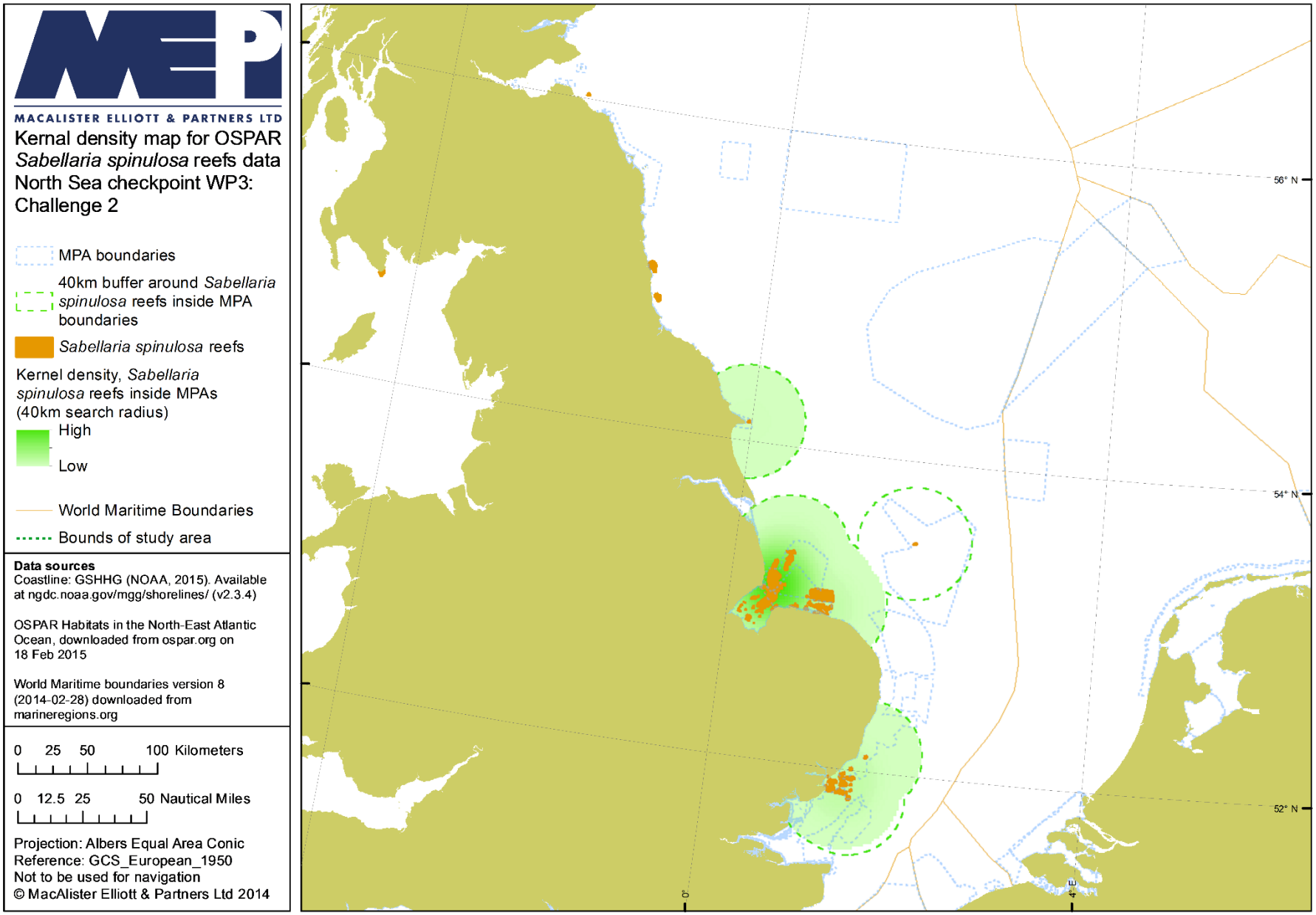


Figure 14: Kernel density proximity map for sea-pen and burrowing megafauna communities habitat

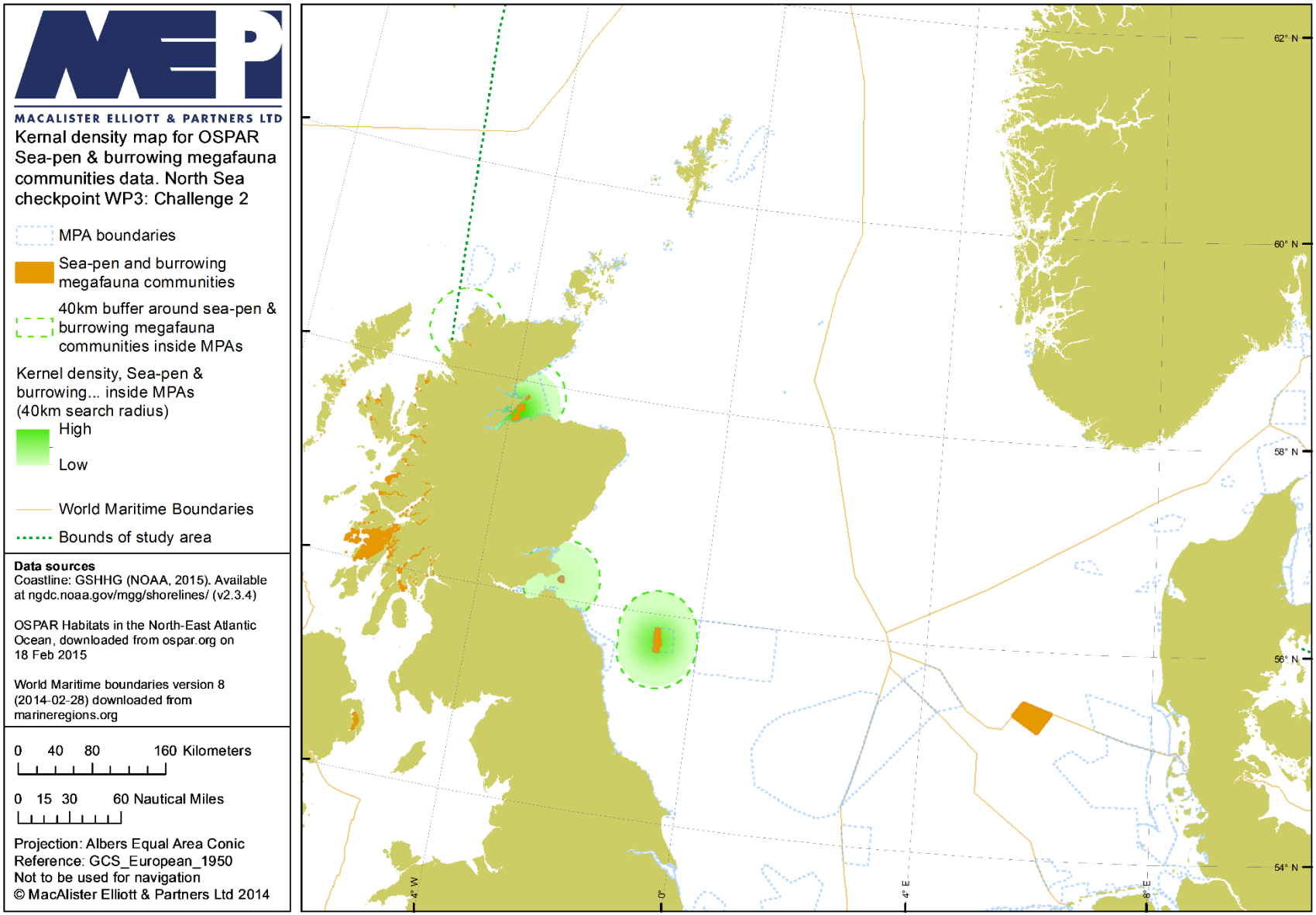


Figure 15: Kernel density proximity map for *Zostera* beds habitat

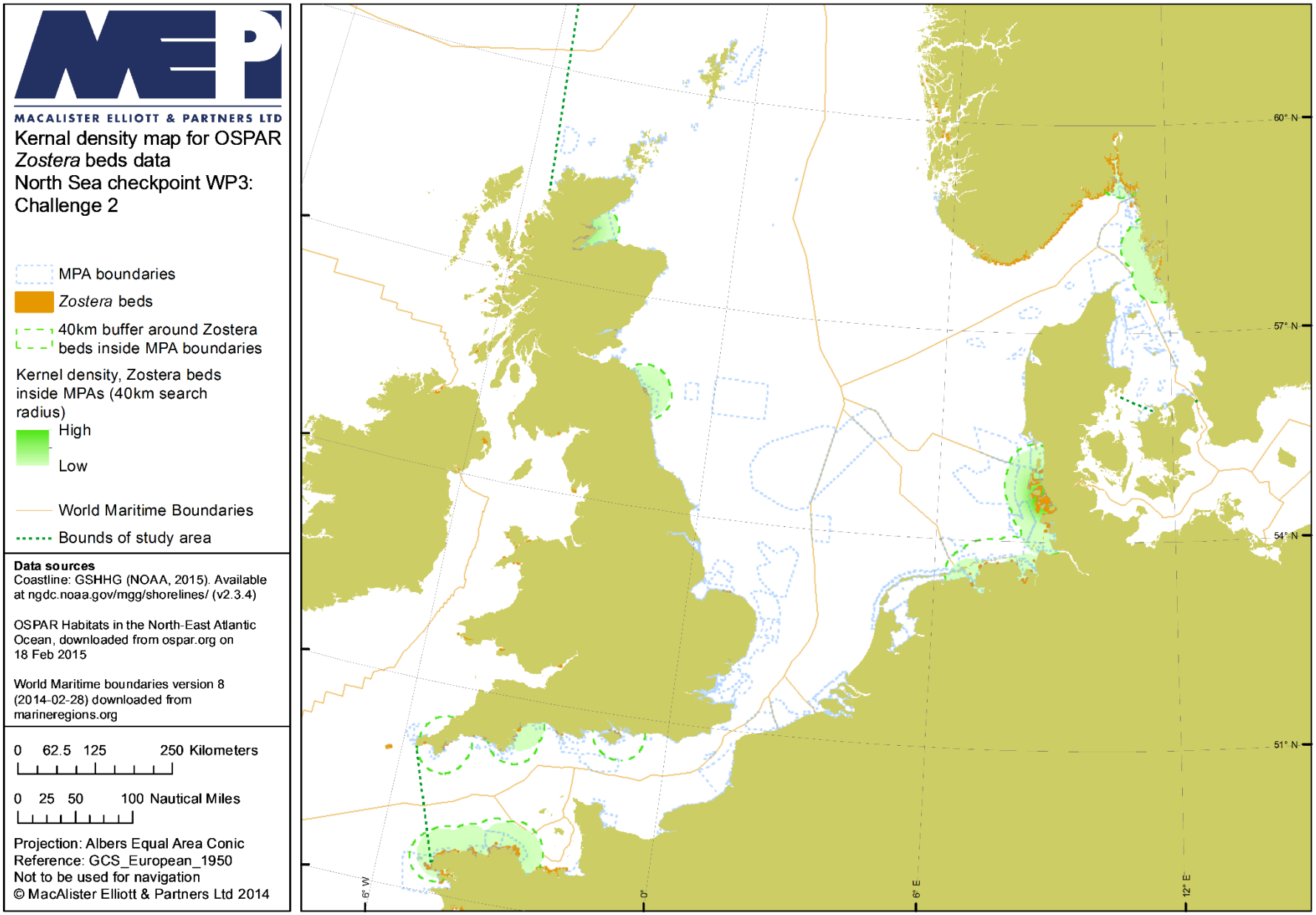
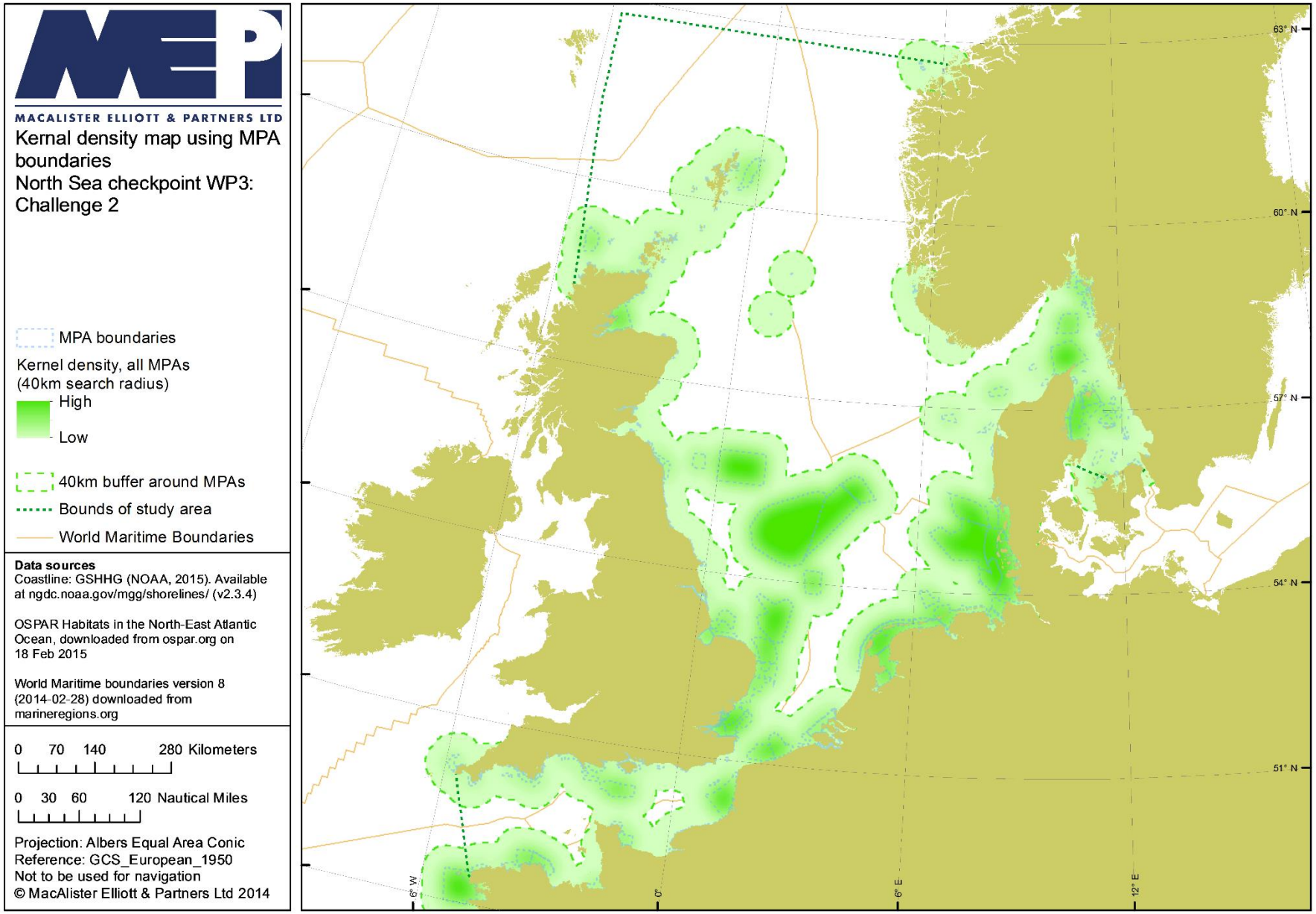


Figure 16: Kernel density proximity map for all MPA boundaries in study area



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www.hrwallingford.com

FS 516431
EMS 558310
OHS 595357

A.4. Oil Platform Leak

A.4.1. Data Adequacy Report (DAR)

A.4.2. Initial response (24hr) oil leak report

A.4.3. Detailed response (72hr) oil leak report

Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report – Oil Platform Leak Challenge

Authors: J.T. van der Wal, P. de Vries, J.E. Tamis

Wageningen University &
Research Report C095/16

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Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report – Oil Platform Leak Challenge

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Client: European Commission DG MARE
Attn.: Iain Shepherd

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Contents

Summary

This Data Adequacy Report (DAR) of the Oil Platform Leak Challenge is a deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. This challenge has addressed the stages of work required to provide input for emergency response to pollution incidents, including limitations of severe time pressures. The results of the first emergency response (within 24 hours) and refined assessment (within 72 hours) have been reported separately (van der Wal *et al.*, 2016a&b) and are summarised in this report. The assessment was made using available data in order to provide an understanding of whether suitable data sets are available. All data gathered has been recorded in the data adequacy assessment database, made available via the project website (http://www.emodnet.eu/northsea/data) and listed in this DAR.

The simulated oil leak involved an accident at the Brent Delta Platform (on 10/05/2016, 8:15 CET) causing a leak of about 5000 m^3 of oil per day at a depth 229ft, which was to be sealed after 48 hours. The oil spill trajectory was modelled by GNOME. A geographical information system (ESRI ArcMap) was used to ascertain whether the trajectory of the spill came near features such as shipping routes, other oil and gas infrastructure, bathing beaches and marine protected areas. All data sets were assessed based on the following criteria: contribution; location; commercial; attributes; delivery; usability. The way in which these criteria are to be understood is explained in Table 3. Twenty eight data sets were used for this challenge. Most of these data sets passed all criteria. For nine data sets not all criteria were true, of which seven were related to the usability (i.e. could not be readily used in systems to solve the challenge). The available data was sufficient to predict the fate/trajectory of the oil, even within 24 hours. For both winds and water currents data covering the region of interest was available. However, both lacked information in some grid cells near the coast. This information had to be interpolated from the available information. Also, there is no single winds data source covering the region with both a hind- and a forecast, publicly available and free of charge. Therefore different sources had to be used and combined for hind- and forecast winds data .For the 72 hours assessment there was sufficient time and data available to validate some assumptions made for the preliminary assessment regarding the time for the oil to reach the sea surface and the platform structure.

The information available on the locations under threat, i.e. nature values and/or tourist beaches was limited, even after 72 hours. Tourist beach locations were not available within 24 hours. Data was retrieved within 72 hours but was limited (especially at the Shetland Islands). Details on Natura 2000 areas could not be retrieved within 24 hours but could be retrieved within the time frame of 72 hours. However, information remained limited and experts had to be consulted. Although not specifically required as output for the preliminary assessment, it could not be predicted whether the oil would reach main shipping routes because the spatial coverage of shipping route locations did not completely match the affected area. There was a lack of fishery data and/or importance of areas at sea to fisheries. Again, experts were consulted to address data limitations.

In summary, the following limitations to data availability and adequacy have been identified: spatial coverage of shipping lanes; fisheries activities; distribution data of birds, sea mammals, fish and benthic species; winds and currents data near shore; single hind- and forecast winds data source (publicly available and free of charge); data format; time frame of current forecasts; frequency of updates; and the reliability of the availability of required data.

1 Introduction

This report is a deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work was undertaken by IMARES with input from the project members HR Wallingford Ltd and McAllister-Elliot & Partners (MEP). This report is part of a series of Data Adequacy Report (DAR) presenting the findings for a completed challenge, in this case the Oil Platform Leak Challenge. Other challenges are: Wind farm; Marine protected areas; Climate and coastal protection; Fisheries management; River inputs; and Marine environment.

The Oil Platform Leak Challenge has addressed the stages of work required to provide input for emergency response to pollution incidents, including limitations of severe time pressures. The assessment was made using available data in order to provide an understanding of whether suitable data sets are available.

All data gathered has been recorded in the data adequacy assessment database, providing a searchable record of each of the data sets reviewed and the results of its evaluation were considered for one or more challenges. The database is in the process of being made available via the project website (http://www.emodnet.eu/northsea/data).

Although each of the challenges requires a result to be produced from the exercises being undertaken, it is the process of gathering, appraising and using the data to meet that outcome which is most important in informing the overall objectives of the North Sea Checkpoint project.

In this context it should be noted that assessing data quality within a challenge is a continuous process through each stage of a challenge: data gathering, initial appraisal of the data, analysis and quality assurance of results, providing different insights into the accessibility and usefulness of a data sets at each stage.

2 Aim

The Oil Platform Leak challenge will serve as a case study for the availability of data, the required response time for a preliminary (within 24 hrs) and complete impact assessment (within 72 hours) and to aid in identifying possible data and knowledge gaps. The expected outcome of this challenge is an understanding of whether suitable data sets are available to provide sufficient input for emergency response to pollution incidents, including an appreciation of the conditions of severe time pressures and the constraints that may put on data availability.

The main aim of this challenge as specified in the project brief was to:

1. Determine the likely trajectory of the slick resulting from a (simulated) leak at an oil platform and the statistical likelihood that sensitive coastal habitats or species or tourist beaches will be affected;
2. Provide a preliminary assessment of the likely impact of the oil within 24 hours of the start of the challenge;
3. Provide a refined assessment within 72 hours;
4. Provide a post-challenge critique of the data availability and suitability for use within the reporting of the challenge.

This report describes the fourth and final aim of this challenge; the data adequacy. The three other parts have already been performed and are reported in van der Wal *et al.* (2016 a,b).

3 Context

The location and severity of a simulated oil leak at an oil platform has been provided to IMARES by DG Mare via email on Tuesday, May 10, 2016 11:24 AM, with the following notification: “At 8:15 CET this morning (10/05/2016), an accident took place while dismantling the Brent Delta Platform. About 5000 m^3 of oil per day leaked from the platform at a depth 229ft. It is anticipated that the leak will be sealed after 48 hours.”

The result of the first emergency response within 24 hours has been reported separately (van der Wal *et al.*, 2016a) and describes the likelihood of sensitive coastal habitats and/or tourist beaches being hit by oil contamination (executive summary of the 24h report is included in Appendix A). A second response, within 72 hours, was also reported separately (van der Wal *et al.*, 2016b) and provides improved predictions and other relevant details that cannot be determined within the first 24 hours (executive summary of the 72h report is included in Appendix B). This DAR addresses the final aim of this challenge and evaluates the data availability and suitability for emergency response to oil pollution incidents considering the time pressures related to the first and second assessment.

4 Modelling and analysis method

4.1 Trajectory modelling and geographic analysis

The methodology that we arrived at for the Oil Spill Challenge was a two-phase approach consisting of first modelling the oil spill trajectory using dynamic and forecasted data and second performing a geographical analysis to determine whether the trajectory of the oil spill endangered critical components of natural environment or areas important to human activities. The geographical analysis relies on static data sets.

4.1.1 Oil spill trajectory modelling

The GNOME (General NOAA Operational Modeling Environment) model was selected for the North Sea “oil platform leak challenge”. The main selection criteria were 1) suitable for the task, 2) not already used in other Sea Basin Checkpoint Projects and 3) affordable (in this case free of charge). In this report, we briefly describe the model. For a more in depth description of GNOME we refer to the technical documentation provided with the model (Zelenke *et al.*, 2012a and 2012b; NOAA 2002, Lehr *et al.* 2000). GNOME was developed by the Emergency Response Division of NOAA's Office of Response and Restoration to predict the possible route, or trajectory, a pollutant might follow in or on a body of water, such as an oil spill. GNOME calculates a "best estimate" where the oil spill is likely to end up and a "minimum regret" using conservative assumptions that cause it to spread over a much wider area. It includes output as a movie and this was used to visualise the results. Because GNOME does not cover all the aims of the challenge considering potential impacts on ecology or human activities, post-analysis of the oil spill track information as modelled by GNOME is performed in GIS (ArcGIS).

GNOME is an Eulerian/Lagrangian model, i.e. represents spilled oil as so-called Lagrangian particles, where each particle reflects a certain amount of oil. The particles are simulated to move around in space, driven by wind, current and random processes (i.e., diffusion). By tracing these particles, information about the fate of oil can be obtained. For such simulations in GNOME and post-analysis, the following four elements are essential:

- Model settings;
- Map data;
- Movers (driving the movement of simulated oil particles);
- Spill information.

The required data to model the movement of the oil (trajectory) was wind (speed and direction) and water current. This type of data was retrieved from the MyOcean website (currently available as Copernicus Marine Environment Monitoring Service at http://marine.copernicus.eu/ and augmented with forecasted wind data from Global Marine Net.

4.1.2 Geographical analysis

In order to produce a map to simulate an oil spill, data sets are required for geographical information:

- A geographical information system (ESRI ArcMap) was used to ascertain whether the trajectory of the spill came near features such as shipping routes, other oil and gas infrastructure, bathing beaches and marine protected areas.
- Shipping lanes locations and densities were available from an earlier EU-project “Windspeed” (http://www.windspeed.eu/).
- European data sets were used to indicate bathing beaches and Natura 2000 sites, available from the European Environment Agency (EEA) website (http://www.eea.europa.eu/data-and-maps).
- Bathymetry was taken from the European Marine Observation and Data Network (EMODnet), (www.emodnet-hydrography.eu)
- And several more data sets also depending on the location of the challenge can be added (see also Table 1).

Further details on the model setup and the simulated oil spill can be found in the Challenge reports that were put out at 24 and 72 hours (van der Wal *et al*.,2016a, 2016b), available from the project website (http://www.emodnet.eu/northsea/data).

4.2 Data adequacy assessment

Data adequacy is reported under the six value assessments used for screening the data.

1. Contribution – Does the data contain the right parameters?
2. Location – Does the data cover the correct time / space location?
3. Commercial – Are the commercial terms acceptable?
4. Attributes – Does the data have the correct attributes?
5. Delivery - Can the data be provided to match the timeframe of the challenge?
6. Usability – Is the data format and supporting information suitable for the purpose?

The methodology for this process, designed by HR Wallingford, is described in detail in HR-Wallingford 2014 and 2015).

The results of the screening are presented in section 6.2.

5 Data

An overview of the data sets used in the oil platform leak challenge is given in Table 1. As appendix C to the report a list of all evaluated data sets has been made available.

Table 1: *Summary of data used for the oil platform leak challenge (in near chronological order of decisions being made and data sets being identified).*

Inspire Theme	Name	Source URI
	GNOME	http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/response-tools/gnome.html
2.1 Elevation	EMODNET Gridded Bathymetry	http://portal.emodnet-bathymetry.eu/
3.15 Oceanographic geographical features	GSHHG, A Global Self-consistent, Hierarchical, High-resolution Geography Database	http://www.soest.hawaii.edu/pwessel/gshhg/
1.8 Hydrography	NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b	http://www.myocean.eu/web/69-myocean-interactive-catalogue.php?option=com_csw&view=details&product_id=NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b
3.13 Atmospheric conditions	WIND_GLO_WIND_L4_NRT_OBSERVATIONS_012_004	http://www.myocean.eu/web/69-myocean-interactive-catalogue.php?option=com_csw&view=details&product_id=WIND_GLO_WIND_L4_NRT_OBSERVATIONS_012_004
3.13 Atmospheric conditions	GRIB Files from GMN Marine Weather Services	http://www.globalmarinenet.com/grib_downloads.php
3.5 Human health and safety	Bathing Water Directive - Status of bathing water (EEA)	http://www.eea.europa.eu/data-and-maps/data/bathing-water-directive-status-of-bathing-water-5#tab-european-data
3.11 Area management / restriction / regulation zones & reporting units	Natura 2000 data - the European network of protected sites (EEA)	http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-gis-data
3.11 Area management / restriction / regulation zones & reporting units	Natural England, GIS Digital Boundary Datasets	http://www.gis.naturalengland.org.uk/pubs/gis/GIS_Register.asp
3.11 Area management / restriction / regulation zones & reporting units	Marine Protected Areas, Norwegian Environment Agency	http://kartkatalog.miljodirektoratet.no/map_catalog_service.asp?servicename=vern
	R Project for Statistical Computing	https://www.r-project.org/
	R Studio	https://www.rstudio.com/
	Python	https://www.python.org/
	ArcGIS - ESRI	http://www.esri.com/
	ncBrowse	http://www.epic.noaa.gov/java/ncBrowse/
2.1 Elevation	European Coastline 2013 (updated 2015)	http://www.eea.europa.eu/data-and-maps/data/eea-coastline-for-analysis-1

Inspire Theme	Name	Source URI
3.11 Area management / restriction / regulation zones & reporting units	Maritime Boundaries 2005	http://www.eea.europa.eu/data-and-maps/data/maritime-boundaries
3.18 Habitats and biotopes	EU SeaMap - Seabed Habitat	http://www.emodnet-seabedhabitats.eu/
3.11 Area management / restriction / regulation zones & reporting units	NoordzeeLoket - Natura2000 Noordzee	http://www.noordzeeloket.nl/projecten/noordzee-natura-2000/
3.4 Land use	ICES Working Group on Spatial Fisheries Data	http://www.ices.dk/community/groups/Pages/WGSFD.aspx
1.7 Transport networks	FerryTravel.com	https://www.ferrytravel.com/ferries-ferry-to-norway.htm
1.7 Transport networks	MarineTraffic.com (AIS)	https://www.marinetraffic.com/en/ais/
3.19 Species distribution	Obis SeaMap	http://seamap.env.duke.edu/
	VisitNorway.com	https://www.visitnorway.com/maps/
3.4 Land use	RegionStavanger-Attractions-BeachesAndBathing	http://www.regionstavanger.com/en/Attractions/Beaches-and-bathing/
3.11 Area management / restriction / regulation zones & reporting units	Jærstrendene (ProtectedArea)	http://www.miljodirektoratet.no/old/dirnat/attachment/28/Rapport%202007-1b%20Emerald%20rapport%20engelsk.pdf
3.11 Area management / restriction / regulation zones & reporting units	NationalMPA_Norway_background	http://www.naturbase.no
3.19 Species distribution	Seabird distribution	http://library.wur.nl/WebQuery/wurpubs/482985
3.4 Land use	Benthis-TrawlingImpactAssessment	http://www.benthis.eu/en/benthis/Results.htm
3.4 Land use	Shetland.org-Beaches	http://www.shetland.org/things/explore-nature/beaches
	ListOfCrudeOilProducts-WikiPedia.org	http://en.wikipedia.org/wiki/List_of_crude_oil_products
	CrudeOilAssays-EkofiskBlend-StatOil	http://www.statoil.com/en/OurOperations/TradingProducts/CrudeOil/Crudeoilassays/Pages/EkofiskBlend.aspx

6 Results

6.1 Challenge output

The result of the first emergency response within 24 hours has been reported separately and describes the likelihood of sensitive coastal habitats and/or tourist beaches being hit by oil contamination (van der Wal *et al*., 2016a, executive summary included in Appendix A). A second response, within 72 hours, was reported and provides improved predictions and other relevant details that could not be determined within the first 24 hours (van der Wal *et al*., 2016b, executive summary included in Appendix B). This underlying report, the DAR, addresses the final aim of this challenge and evaluates the data availability and suitability for emergency response to oil pollution incidents considering the time pressures related to the first and second assessment.

6.1.1 Oil spill trajectory

An overview of the impacted location during 120 hours after the beginning of the Brent Delta spill is shown in Figure 1**.**

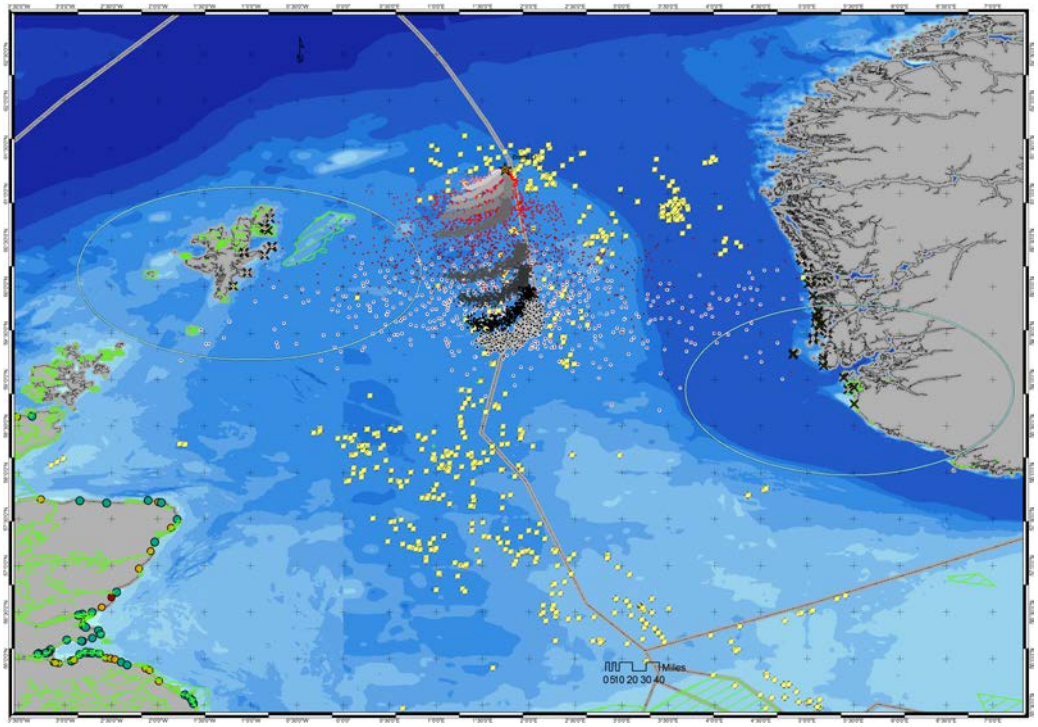

Figure 1: *Overview of the impacted location during 120 hours after the beginning of the Brent Delta spill (best guess and no regret simulation). Star indicates position of spill. Line indicates EEZ boundary between Norway and UK. Light grey dots indicate position of oil after 6 hours, darker grey dots are later. Final predicted position of oil (at 15 May, 14:15 CEST) has a light grey halo (best guess) or a white halo (no regret). The rings showing around the Shetland Islands and on the Norwegian Coast indicate a distance of 100 km that foraging seabirds nesting at Noss or Kjørholmane may travel. Yellow squares are oil and gas platforms.*

6.1.2 Geographical analyses

The location of the challenge was close to the northern edge of the area that we needed to be prepared for and as a result a few additional data sources and data sets were needed. Below these are presented in some detail: Presence of ships (Figure 2), Fishing activity (Figure 3), Expected ecological impact on sea mammals, birds and habitats, Marine and coastal protected areas under threat, Tourist beaches and bathing facilities at risk. More details are available in van der Wal *et al.* (2016b).

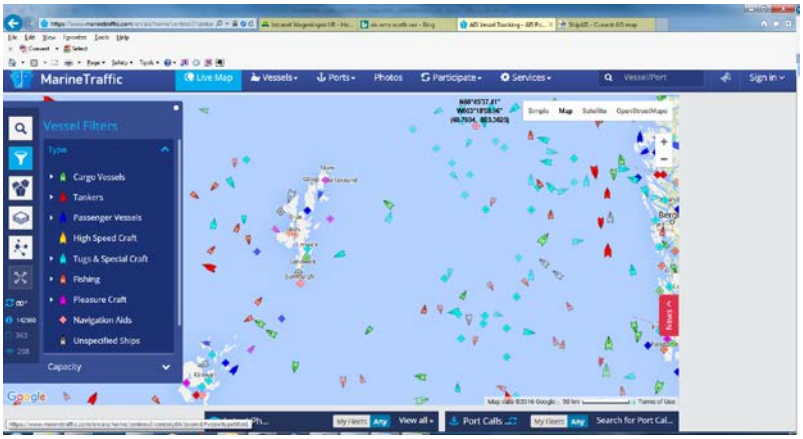

Figure 2: *Screenshot showing presence of ships at an arbitrary point in time during the challenge, based on AIS-data, in the area of the simulated oil spill around Brent Delta. (https://www.marinetraffic.com/en/ais/).*

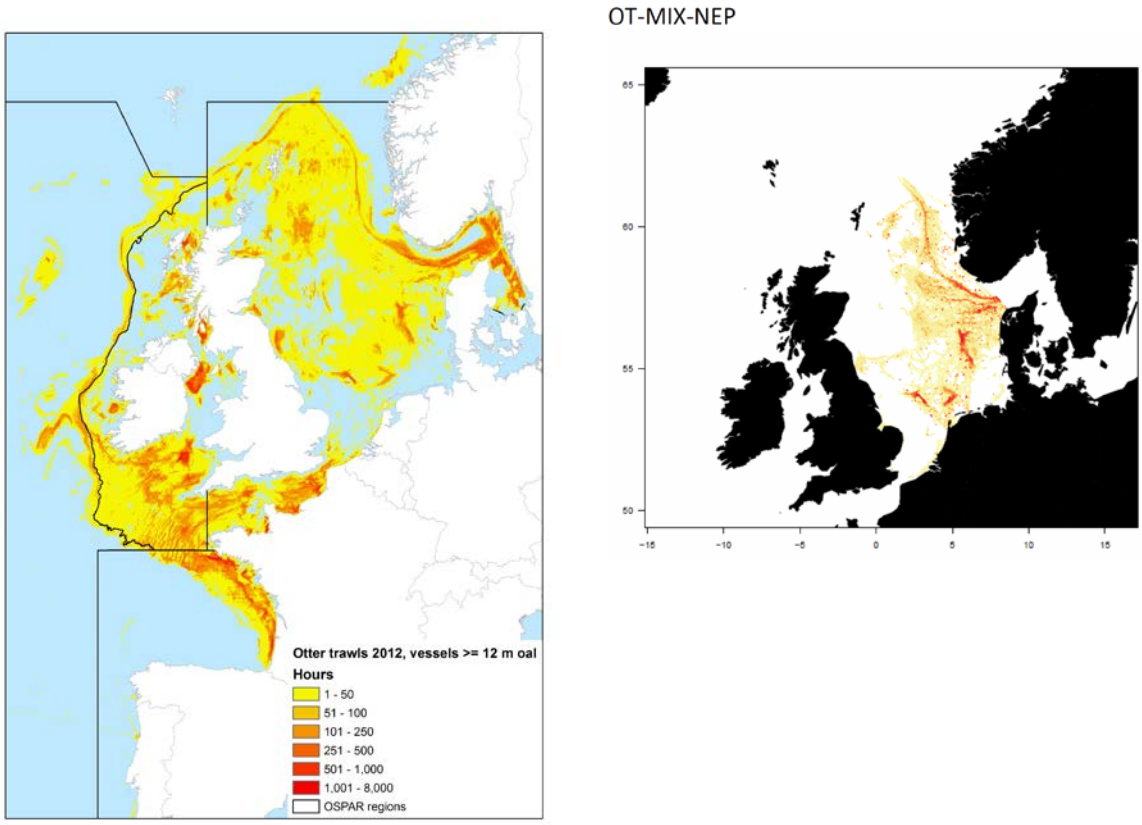

Figure 3: *Spatial distribution of different fisheries: left Otter trawls, 2012 (ICES-WGSFD, 2012) hours fishing as per the legend shown, right mixed fisheries targeting a.o. Nephrops (Nielsen et al., 2014) swept area increasing from yellow to red. Data as shown represents a whole year.*

Expected ecological impact has been considered for marine mammals based on information from OBIS SeaMap (http://seamap.env.duke.edu/) as well as consulting with co-workers (outside the challenge team) with specific expertise. For seabirds the assessment was made using information on seabird species listed as protected and e.g. breeding in protected areas. Again specific co-workers were consulted a.o. to get an estimated range for how far out at sea the majority of seabirds might travel to

gather food. Sea bed habitats were assessed based on the EModNet Seabed Habitat map, while coastal habitats were mainly assessed based on information gleaned from coastal protected areas.

Threats to protected areas were assessed using already available data sets on protected areas, marine as well as coastal. The available data was added to by checking with national websites on nature conservation areas for both Norway as well as the Shetlands to ensure that no vital protected areas would be missed.

Risk to tourist beaches and bathing facilities needed further information as the Norwegian coast is not covered by the EEA data set on water quality at such locations (Blue Flag). There are tourist beaches situated at the Norwegian coast (Figure 4). These could potentially be impacted by the spill. Shetland also has tourist beaches which can also be impacted, for which we could not find a map. However, it is unlikely that the tourist beaches are used intensively at this time of year (May). Further information on tourist beaches can a.o. be found on the website of the Region Stavanger (http://www.regionstavanger.com/en/Attractions/Beaches-and-bathing/). Bathing water quality is monitored in Norway, most often by the municipality and reported by these also on the internet. However there are many municipalities with beaches and they assume local knowledge.

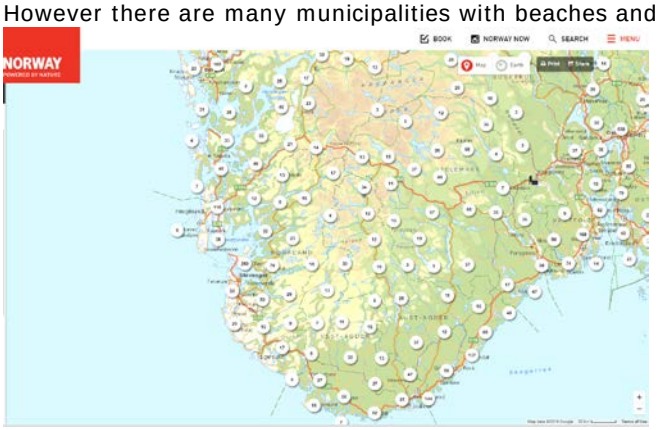

Figure 4: *Locations of tourist beaches as listed at https://www.visitnorway.com/maps/. The numbers showing inside the white circles indicate the number bathing locations/beaches in that area.*

6.2 Data adequacy

6.2.1 Overview

The data used for the oil platform leak challenge is summarised in Table 2. All data sets have been evaluated based on 6 criteria, which are listed in Table 3. An evaluation of all data sets considered or used for this challenge is presented in Annex D. This Annex also includes additional reasoning for the values.

Table 2: *Summary of data used for the oil platform leak challenge.*

	Value Criteria					
Data set	**Contribution**	**Location**	**Commercial**	**Attributes**	**Delivery**	**Usability**
RQ.Wind.OS001-GNOME	True	True	True	True	True	True
DT.Oil .OS002-EMODNET Gridded Bathymetry	True	True	True	True	True	True
RQ.Oil .OS003-GSHHG, A Global Self-consistent, Hierarchical, High-resolution Geography Database	True	True	True	True	True	True
RQ.Oil .OS004-NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b	True	True	True	True	True	True
RQ.Oil .OS005-WIND_GLO_WIND_L4_NRT_OBSERVATIONS_012_004	True	True	True	True	True	True
RQ.Oil .OS006-GRIB Files from GMN Marine Weather Services	True	True	True	True	True	True
RQ.Oil .OS008-Bathing Water Directive - Status of bathing water (EEA)	True	True	True	True	True	True
RQ.Oil .OS009-Natura 2000 data - the European network of protected sites (EEA)	True	True	True	True	True	True
DT.Oil .OS013-Oil and Gas Production in Denmark 2013 and Subsoil Use	True	True	True	True	True	True
DT.Oil .OS014-SubSeaIQ website, page specific to South Arne	True	True	True	True	True	True
RQ.Oil .OS036-R Project for Statistical Computing	n.a.	True	True	True	True	True
DT.Oil .OS037-R Studio	n.a.	True	True	True	True	True
RQ.Oil .OS038-Python	n.a.	True	True	True	True	True
RQ.Oil .OS039-ArcGIS - ESRI	True	n.a.	False	True	False	True
DT.Oil .OS040-ncBrowse	n.a.	True	True	True	True	True
DT.Oil .OS041-European Coastline 2013 (updated 2015)	True	True	True	True	True	True
RQ.Oil .OS043-EU SeaMap - Seabed Habitat	True	True	True	True	True	True
DT.Oil .OS045-ICES Working Group on Spatial Fisheries Data	True	True	True	True	True	True
DT.Oil .OS048-Obis SeaMap	True	True	True	True	True	False
DT.Oil .OS049-VisitNorway.com	True	True	True	True	True	False
DT.Oil .OS050-RegionStavanger-Attractions-BeachesAndBathing	True	True	True	True	True	False
DT.Oil .OS051-Jærstrendene (ProtectedArea)	True	True	True	True	True	False
DT.Oil .OS052-NationalMPA_Norway_background	True	True	True	True	True	False
DT.Oil .OS053-Seabird distribution	True	True	True	True	False	True
DT.Oil .OS054-Benthis-TrawlingImpactAssessment	True	True	True	True	True	False
DT.Oil .OS055-Shetland.org-Beaches	True	True	True	True	True	False
DT.Oil .OS057-ListOfCrudeOilProducts-WikiPedia.org	True	Null	True	True	True	Null
DT.Oil .OS058-CrudeOilAssays-EkofiskBlend-StatOil	True	Null	True	True	True	Null

Table 3: *Criteria as defined for the data adequacy evalutaion, including guidance on how to set as either true or false.*

Criteria	Value
Contribution	TRUE If the data set parameters are useful to solving then challenge, otherwise FALSE
Location	TRUE if the temporal and spatial location of the data sets are relevant to solving the challenge, otherwise FALSE
Commercial	TRUE if the commercial terms (prices, licences) are compatible for solving the challenge, otherwise FALSE. A data does not need to be free to be used, but price proportionate to the challenge
Attributes	TRUE if accuracy, precision and resolution etc. of the data are sufficient to solve the challenge, otherwise FALSE. Note temporal and spatial coverage is dealt with in Location
Delivery	TRUE is the data can be delivered in time to solve the challenge. Otherwise FALSE. Includes continuation of supply
Usability	TRUE if the data can be readily used in systems to solve the challenge. FALSE otherwise. Note condition is normally false when the data is in an obscure or legacy encoding or has a non-intuitive or incorrect data structure.

Note:

If any criteria is unknown then it must be FALSE. In a few cases n.a. for not applicable or NULL have been used where neither TRUE nor FALSE were deemed applicable.

Data sourcing (includes accessibility, availability of metadata, data standards, costs)

Sources for the data required to feed into and run the model to generate an oil spill track (i.e. currents and wind predictions) have been identified. The following sources were used as input:

- Water current: EU's Copernicus marine service forecasting system (www.MyOcean.eu), providing forecasts for five days every 6 hours.
  Water current data are retrieved from the MyOcean.eu[1], website and are based on the Forecasting Ocean Assimilation Model 7km Atlantic Margin model (FOAM AMM7). This is a coupled hydrodynamic-ecosystem model, nested in a series of one-way nests to the Met Office global ocean model. FOAM has been recommended as a hydrodynamic model of interest for the North Sea basin (Actimar, 2015). The hydrodynamics are supplied by the Nucleus for European Modelling of the Ocean (NEMO) with an Analysis Correction (AC) data assimilation scheme for sea surface temperature. This is coupled to the European Regional Seas Ecosystem Model (ERSEM), developed at Plymouth Marine Laboratory (PML). The hourly instantaneous water current data (product id: NORTHWESTSHELF ANALYSIS FORECAST PHYS 004 001 b; METO NWS PHYS HI AGG) holds a top, bottom and middle layer with a 1/15° latitudinal resolution and 1/9° longitudinal resolution (approximately 7km square). The model was validated with data measured near Liverpool. The validation showed that the model was better at predicting hourly instantaneous currents, rather than residual currents. The data can be downloaded free of charge.
- Wind: EU's Copernicus marine service forecasting system (www.MyOcean.eu), providing hindcasts for 6 hour intervals; the satellite communication company Global Marine Net (GMN, www.globalmarinenet.com) for wind forecasts.
  In contrast to the water current data, it was challenging to retrieve wind data with complete spatial coverage for both hind- and forecasts. Surely there are commercial products available, however, in the current project we chose to work with publically available information. This means that the hind- and forecast had to be retrieved from different sources. Hindcast wind data is estimated from observations and from ECMWF operational wind analysis with a horizontal resolution of 0.25x0.25 degrees and 6 hours in time. Other free product available for the North Sea area are e.g. HIRLAM

[1] MyOcean (http://www.myocean.eu.org/) was a European project which provides ocean data from Mercator-Ocean forecasting. The MyOcean information includes observations, analysis, reanalysis and forecasts describing the physical state of the ocean and its primary biogeochemical parameters. It also contributes to research on climate by providing long time-series of reanalysed parameters. Currently Copernicus Marine Environment Monitoring Service (CMEMS) is the successor to MyOcean and can be reached at http://marine.copernicus.eu .

(FMI or MetNo) and SKIRON (Actimar, 2015). Because forecast wind data is not provided by MyOcean, use is made of the automated mailing service provided by GMN. This service automatically mails a seven day forecasts on a daily basis. The data can be downloaded free of charge.

The data provided by MyOcean is easily accessible from the website. However, some of the data on MyOcean was unavailable at one point in time (although not during the rehearsal nor the challenge). Although this was observed only once, this is an important issue because in real spill response events, the reliability of the availability of required data is vital.

The main data sources used for the geographical (post-)analysis were an earlier project WindSpeed (http://www.windspeed.eu) and data available from the EMODnet Data Portals (www.emodnet.eu) and the EEA Data Catalogue (http://www.eea.europa.eu/data-and-maps). The latter two are free to access. The data collected for the WindSpeed project is not freely available, but was sourced predominantly from public sources as well. Further information on data sources can be found in Table 1 and in Appendix C.

Key findings data sourcing

The required data for the assessment is available from different publically available sources. Two sources have been used: MyOcean and Global Marine Net

Data on MyOcean was unavailable at one point in time

There is no single winds data source covering the region with both a hind- and a forecast, publicly available and free of charge

Required data can be downloaded free of charge

Spatial coverage (Data gaps/conflicts)

For both winds and water currents data covering the region of interest was available. However, both lacked information in some grid cells near the coast, this information had to be interpolated from the available information. This process is described in the next section (data applicability).

The GIS data sets as used has sufficient data coverage for most of the study area. They were somewhat lacking for the location where the real challenge was located.

Key findings spatial coverage

The North Sea is sufficiently covered

Data lacked information in some grid cells near the coast

Data Applicability to challenge (fitness for purpose, covering data formats, resolution, …)

The data may need some (minor) modifications before it can be used in the model considering the format of the available data versus the required data format (i.e. file type, variable names). R (The R Foundation for Statistical Computing, Vienna) scripts are used for extracting and modification of data.

Water current data

The hourly instantaneous water current data are retrieved from the MyOcean.eu website (product id: NORTHWESTSHELF ANALYSIS FORECAST PHYS 004 001 b; METO NWS PHYS HI AGG). The data holds a top, bottom and middle layer with a 1/15° latitudinal resolution and 1/9° longitudinal resolution (approximately 7km square). The data is in a netcdf file format and needs some minor modifications before it can be used in the GNOME model (which also requires a netcdf file). An R script is used to extract the required variables (northward and eastward components of the currents in the top layer) from the original file and rename the variable names to what the GNOME model expects.

The water current data only provides data for grid cells that are situated in the water body (left in Figure 513). Note that there are some grid cells near the coastline without water current data. This will pose a problem in the GNOME model as simulated oil particles that end up in these grid cells (without current data), will no longer move (i.e., the simulated particles get trapped in those grid cells). Therefore the function ‘na.approx’ from the ‘zoo’ library in R is used for simple inter- and extrapolation of the water current data to grid cells with missing data. This extrapolation step also produces current data on land (right in Figure 513). Although this is not realistic, this is not a problem as simulated particles are not able to move further on land once they are beached. Furthermore, it is a necessity to inter- and interpolate the currents, to avoid particles getting trapped in void grid cells. It should be noted that the water currents near the coast and estuaries are not very reliable.

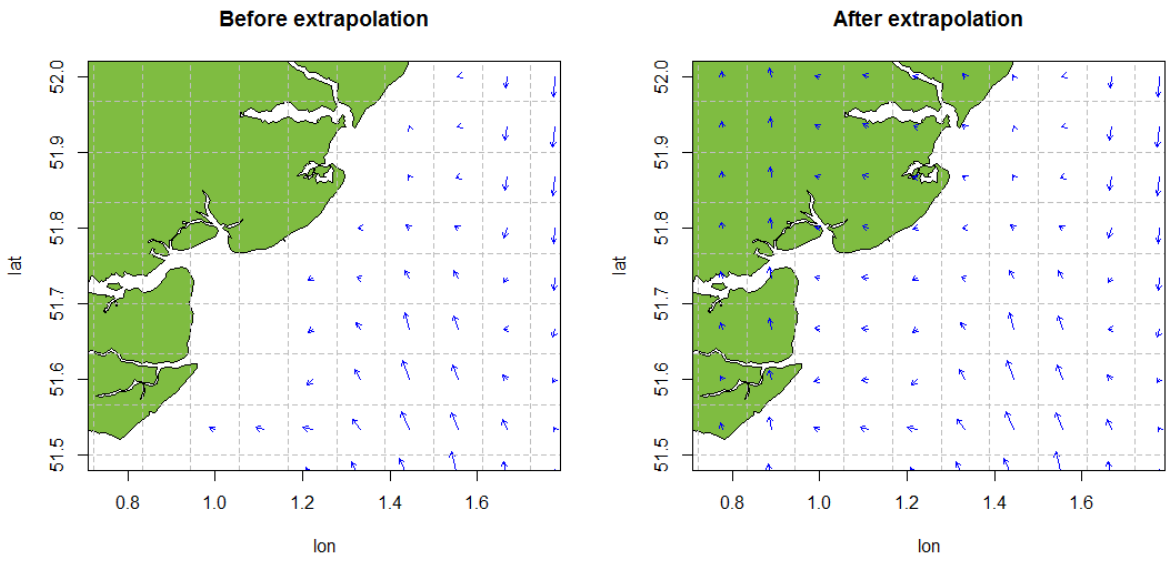

Figure 5: *An example of the extrapolation of current data. Green represents land, white represents water. Dashed grey lines mark the grid cells. The blue arrows in the left panel represent the data as extracted from MyOcean.eu. The blue arrows in the right panel represent the data after extrapolation.*

Wind data

The wind hindcast data is retrieved from www.myocean.eu (product identifier: WIND GLO WIND L4 NRT OBSERVATIONS 012 004). This Global Ocean winds product is based on the IFREMER CERSAT Global Blended Mean Wind Fields and includes wind components (meridional and zonal), wind module, wind stress. They are estimated from scatterometers ASCAT and OSCAT retrievals and from ECMWF operational wind analysis with a spatial resolution of 0.25° by 0.25° and a 6 hour time interval. The data is provided as a netcdf file.

The wind forecast data are provided in the GRIB file format and are based on the National Weather Service, NOAA, Wave Watch III model yielding 7 days forecasts at 6 hour intervals and at a 1.25° by 1° (longitude and latitude) spatial resolution. To read the GRIB file format third party software (WGRIB v1.8.1.2a) is used together with the 'rgdal' package in R.

The following steps (implemented in R) are executed in order to combine and pre-process the hindcast and forecast wind data for the use in the simulation (details are given below this list):

- Resample the forecast data to higher resolution to match the hindcast data resolution
- Merge the hindcast data with the most recent forecast data file
- Fill gaps in time between hind- and most recent forecast data with older forecast data
- Inter- and extrapolate wind data onto land
- Save the data in a netcdf format conform GNOME's requirements

The spatial resolution of the forecast data is artificially increased to 0.25° by 0.25° to match the resolution of the hindcast, using the 'resample' function from the 'raster' package in R. After merging the hindcast with the most recent forecast file, there is a gap of approximately a day in the wind data. This is because the most recent hindcast is approximately a day old. This gap is filled with older forecast files. As with the water current data, where data is only provided in the water body, wind data is only given above seawater. In order to avoid simulated particles to get trapped in grid cells with no wind data, a

procedure (identical to that applied to water current data, see above) is applied to inter- and extrapolate the data to those cells.

Finally, the variable names are adjusted to match what the GNOME model expects and the file is saved as a netcdf file.

Current forecasts as available from MyOcean are currently limiting the length of time the simulation of an oil spill can be taken into the future.

Data sets both at MyOcean.eu as well as at GlobalMarineNet.com are updated once per day (around 11:00 in the morning). These processes rely on other models being run and completing their updates and reporting. This is important to consider when attempting an update of the assessment e.g. from the 24 hours to the 72 hours assessment (no new forecasts can be made till afternoon). As mentioned before, in real spill response events, the reliability of the availability of required data is vital.

Lack of data on location of fishery effort and/or importance of areas at sea to fisheries is limiting the possibility to assess the impact that an oil spill accident may have on fisheries in general.

The GIS data sets as selected for the challenge have a content that makes them applicable for the challenge. For the Brent Delta location the shipping data as well as data on fisheries was found to be not as good as could be wished for.

Key findings data applicability

The data needed some (minor) modifications before it can be used considering the format of the available data versus the required data format (i.e. file type, variable names)

Winds and currents data are limited near shore (see also data coverage) and had to be processed before use to generate full coverage

The hind- and forecast wind data had to be retrieved from different sources (see also data coverage) which led to the following implications:
Spatial resolution of the forecast data had to be artificially increased to match the resolution of the hindcast
Merging the data left a gap of approximately a day which had to be filled with previous forecast files

Time limitations:
Available data is updated only once per day (around 11:00 in the morning) which limits the possibilities for updating the assessment
The data allows a prediction of impact for up to 7 days in the future, thus limits the time frame of the oil spill response

Lack of data on location of fishery effort and/or importance of areas at sea to fisheries

6.2.2 Contribution – Does the data contain the right parameters?

For the modelling of the oil spill trajectory the combined current and wind data sets each had the correct parameters, although the naming of variables had to be adjusted to match the fixed assumption from the GNOME model. These two data sets as combined and interpolated from two separate sources are key to making the chosen approach work. In addition a set of spatial data sets on human activities, including marine and coastal protected areas as well as on some additional physical and biological characteristics of the North Sea, have been selected, because they deliver useful information about relevant issues with respect to assessing an oil spill.

6.2.3 Location – Does the data cover the correct time / space location?

Spatial
For both winds and water currents, data covering the region of interest was available. However, both lacked information in some grid cells near the coast, this information had to be interpolated from the available information. This process has already been explained in an earlier paragraph.

Temporal
Current forecasts as available from MyOcean are currently limiting the length of time the simulation of an oil spill can be taken into the future.

6.2.4 Commercial - Are the commercial terms acceptable?

The commercial terms are considered acceptable. All data could be downloaded free of charge.
In contrast to the water current data, it was challenging to retrieve wind data with complete spatial coverage for both hind- and forecasts. Surely there are commercial products available, however, in the current project we chose to work with publically available information. This means that the hind- and forecast had to be retrieved from different sources.

6.2.5 Attributes – Does the data have the correct attributes?

Sources for the data required to feed into and run the model to generate an oil spill track (i.e. currents and wind predictions) have been identified. The following sources were used as input:

- Water current: EU's Copernicus marine service forecasting system (www.MyOcean.eu), providing forecasts for five days every 6 hours.
  Water current data are retrieved from the MyOcean.eu[2], website.

- Wind: EU's Copernicus marine service forecasting system (www.MyOcean.eu), providing hindcasts for 6 hour intervals; the satellite communication company Global Marine Net (GMN, www.globalmarinenet.com) for wind forecasts.

The data provided by MyOcean is easily accessible from the website, however, some of the data on MyOcean was unavailable at one point in time (although not during the rehearsal). Although this was observed only once, this is an important issue because in real spill response events, the reliability of the availability of required data is key.

The majority of the GIS data sets used come with an attribute table, that allows for filtering the data based on criteria that matter to the oil spill challenge as well as other issues. As such the available

[2] MyOcean (http://www.myocean.eu/) is a European project which provides ocean data from Mercator-Ocean forecasting. The MyOcean information includes observations, analysis, reanalysis and forecasts describing the physical state of the ocean and its primary biogeochemical parameters. It also contributes to research on climate by providing long time-series of reanalysed parameters. It has changed name since the start of the North Sea Checkpoint Project and is currently available as Copernicus Marine Environment Monitoring Service (CMEMS) at http://marine.copernicus.eu/ .

attribute data is generally adequate. In some cases a dataset may provide a link or information that aids in locating additional information available from external data source (mostly web sites).

6.2.6 Delivery - Can the data be provided to match the timeframe of the challenge?

Data sets both at MyOcean.eu as well as at GlobalMarineNet.com are updated once per day (around 11:00 in the morning). These processes are themselves reliant on other models being run and completing their updates and reporting. This is important to consider when attempting an update of the assessment e.g. from the 24 hours to the 72 hours assessment (no new forecasts can be made till afternoon).

The data provided by MyOcean is easily accessible from the website, however, some of the data on MyOcean was unavailable at one point in time (although not during the rehearsal or the real challenge). Although this was observed only once, this is an important issue because in real spill response events, the reliability of the availability of required data is vital.

For the GIS data sets the delivery model is not as critical as for the wind and current data. For those the daily updates were vital and more frequent would have been beneficial. Updates of GIS data are mostly available about once a year and the on-demand access as provide by the web sites is mote than adequate.

6.2.7 Usability – Is the data format and supporting information suitable?

The data may need some (minor) modifications before it can be used in the model considering the format of the available data versus the required data format (i.e. file type, variable names). The computer language R (The R Foundation for Statistical Computing, Vienna) has been used to build scripts used for extracting and modifying data.

Water current data
The hourly instantaneous water current data are retrieved from the MyOcean.eu website (product id: NORTHWESTSHELF ANALYSIS FORECAST PHYS 004 001 b; METO NWS PHYS HI AGG). The provided data was extracted and modified (a.o. renamed and interpolated) using R script to prepare it for use with GNOME. Further details on this have already been supplied in 6.2.1 under Current data

Wind data
The wind hindcast data (product identifier: WIND GLO WIND L4 NRT OBSERVATIONS 012 004) is provided as a netcdf file, whereas the wind forecast data are provided in the GRIB file format. To read the GRIB file format third party software (WGRIB v1.8.1.2a) is used. The hindcast and forecast data are combined using an R script; the steps involved have explained in more detail in 6.2.1 under Wind data.

The selected GIS data sets were –in general- found to be usable for the challenge. A few data sets were identified that would benefit from improvements: a.o. shipping density, fisheries effort (by type of fishery, seasonality). Also for some ecological data (fish, seabirds, marine mammals) improvement on both location as well as seasonality would be welcome. However there are limitations on this that also need to be considered. The distribution of organisms and the timing of ecological events (like hatching of chicks, spawning) are heavily influence by weather/climate conditions and thus difficult to predict reliably. This is true when extrapolating previous observations into the future as well as applying modelling approaches. Returning to fisheries, the limited predictability of the ecology of fish is something that fishermen must cope with. It is something that puts a limit on how predictable maps of fisheries intensity can be.

6.3 Key data gaps

Key findings data sourcing

- The required data for the assessment is available from different publicly available sources. Two sources have been used: MyOcean and Global Marine Net
- Data on MyOcean was unavailable at one point in time
- There is no single winds data source covering the region with both a hind- and a forecast, publicly available and free of charge
- Required data can be downloaded free of charge

Key findings spatial coverage

- The North Sea is sufficiently covered
- Data lacked information in some grid cells near the coast

Key findings data applicability

- The data needed some (minor) modifications before it can be used considering the format of the available data versus the required data format (i.e. file type, variable names)
- Winds and currents data are limited near shore (see also data coverage) and had to be processed before use to generate full coverage
- The hind- and forecast wind data had to be retrieved from different sources (see also data coverage) which led to the following implications:
    - Spatial resolution of the forecast data had to be artificially increased to match the resolution of the hindcast
    - Merging the data left a gap of approximately a day which had to be filled with previous forecast files
- Time limitations:
    - Available data is updated only once per day (around 11:00 in the morning) which limits the possibilities for updating the assessment
    - The data allows a prediction of impact for up to 7 days in the future, thus limits the time frame of the oil spill response
- Lack of data on location of fishery effort and/or importance of areas at sea to fisheries

The following has been identified as a first/ indication of data gaps limiting the preliminary assessment (24h report):

- Tourist beaches
- Shipping lanes
- Details on the Natura 2000 areas are not yet addressed

After additional effort was made in retrieving missing data for the refined assessment (72h report), the following has been identified as final data gaps:

- Tourist beaches (especially the locations of tourist beaches at the Shetlands)
- Shipping lanes
- Fisheries activity on a time scale shorter than a whole year
- Distribution data of seabirds and marine mammals. Possibly also other biological distribution data on e.g. fish and benthic species. This is not caused by absence of survey data (which may be scarce nonetheless), but is caused by the non-existence of (geographically explicit) data sets that are prepared and ready for use. However as the usefulness of such data is also strongly dependent on the specifics of e.g. an oil spill incident, getting the details right for both the geographical detail and the correct time scale will remain difficult.

Spatial coverage

For both winds and water currents, data covering the region of interest was available. However, both lacked information in some grid cells near the coast, this information had to be interpolated from the available information. Also, there is no single winds data source covering the region with both a hind- and a forecast, publicly available and free of charge. Therefore different sources had to be used and combined for hind- and forecast winds data.

- Applicability

- The data needed some (minor) modifications before it could be used in the model considering the format of the available data versus the required data format (i.e. file type, variable names). R scripts were used for extracting and modification of data.
- Winds and currents data are limited near shore.
- Current forecasts as available from MyOcean are currently limiting the length of time the simulation of an oil spill can be taken into the future.
- Lack of data on location of fishery effort and/or importance of areas at sea to fisheries is limiting the possibility to assess the impact that an oil spill accident may have on fisheries in general.
- Data sets both at MyOcean.eu as well as at GlobalMarineNet.com are updated once per day.This limits the frequency with which updates of oil spill trajectories can be made available.

7 Discussion

7.1 Model selection

There are several models that can be used to simulate an oil spill. Some highly sophisticated models are available for this purpose, but come with a commercial license. As for the present exercise a preference for publically available data exists, a publicly available model was selected. MEDSLIK would qualify, but is already selected for the Mediterranean challenge. In contrast the GNOME model was selected for the North East Atlantic challenge. De Jong (2004) is one of the sources that helped in the selection process.

The GNOME model is a straightforward instrument with easy to use graphical user interface. As a down-side, the nice interface does not allow for case specific modifications of the model and some predefined settings (such as oil composition) have to be used.

The GNOME model is two-dimensional (2-D) in space. The third dimension (depth) is currently not included, limiting the model mostly to surface drift of the oil. Accurate near field modelling (including jet characteristics of momentum flux, buoyancy flux, and outfall geometry) of a spill (e.g., resulting from a blow-out) is not possible with the GNOME model. Third party (commercial) software (such as CORMIX) could be used to achieve this. This was considered out of scope for the present rapid response challenge and was therefore not included.

To get the overall movement the u (east-west) and v (north-south) velocity components from currents, wind, diffusion, and any other movers are added together at each time-step using a forward Euler scheme (a first-order Runge-Kutta method). Although higher order approaches are more accurate (and require more computational time), the uncertainty in input data is expected to be the limiting factor for the model output certainty.

Temperature of neither water nor air is a parameter in the model. However, temperature is an important factor that affects oil behaviour (such as evaporation rate). In that respect the GNOME model is limited as it does not address effects of temperature. By applying ADIOS 2, a corrected mass balance can be calculated, taking into account the water temperature. The ADIOS 2 model was applied to the current case.

7.2 Data

The OGP IPIECA Oil Spill JIP published a series of reports, available on the project website at: http://oilspillresponseproject.org/ . One of these reports (Actimar, 2015) provides information and recommendations on modelling and metocean databases. Based on selection criteria, hydrodynamic and wind models and metocean data for oil spill modelling were recommended for 25 different marine regions. For the North Sea basin the recommended hydrodynamic models of interest are (Actimar, 2015):

- Forecast:
  MIKE (DHI, Denmark); FOAM AMM Shelf Sea (UK MetOffice); OPTOS/COHERENS (MUMM, Belgium);
- Hindcast:
  POLCOMS; FOAM AMM (UK MetOffice).

Atmospheric models of interest for the North Sea basin are (Actimar, 2015):

- Forecast:
  Unified Model (UK MetOffice); HIRLAM (Denmark, Finland, Netherland, Norway);

- Hindcast:
  NORA-10 (Met Norway); Global (e.g. ERA-Interim, ECMWF).

Useful meteocean observation databases for the North Sea basin are BODC and MyOCEAN (Actimar, 2015a).
Please note that the main source of wind and current data MyOcean (currently known as Copernicus Marine Environmental Monitoring Service / CMEMS) makes use of some of the same source as identified by Actimar (2015a).

The data sets as available from MyOcean were adequate for the task, but during the preparation phase it was observed that spill trajectories rarely reached the shores. A solution was implemented that interpolated the current data to a higher resolution (quadrupled). Thanks to pre-existing experience in handling and converting data, this was an achievable fix. A fix that was comparable to the approach that was required to combine the observed winds from MyOcean with the forecasted winds source from GlobalMarine.

The majority of data sets that were used in the post-analysis in GIS is or comes from sources that can be considered official. Access and accuracy of the data is easy and good. In a number of cases the update frequency is low at once a year or less. On the other hand unless on-line, real-time access is available a continuously updating data set is not practical as well. For one reason it complicates repeating an analysis, unless a fresh archive copy is made of the used data sets with each iteration. The level of on-line access that organisations currently prefer to offer is that of the Web Mapping Service (WMS). It allows outside viewing of a ready-made representation of the data, but a WMS does not expose the attributes of the data for analysis. This is what a Web Feature Service (WFS) does offer. Thus for outside uses that require analysis of geographical data sets a WFS option should be made available. This could be on request, with either a limit on the period or with a – preferably low - fee .

7.3 Spill information

Oil characterization data is usually a requirement for spill trajectory and fate models. The Oil Spill Response Joint Industry Project has developed guidelines on oil characterization (IPIECA-OGP, 2013). However, considering oil properties, the GNOME model uses a limited number of predefined oil types. When more specific results on weathering of the oil spill is required, this can be achieved by using separate weathering modelling afterwards.

7.4 Timeline of the Oil Spill Challenge

7.4.1 Phase 1: Preparation

From the start of the project a 6 month period was available to prepare for the oil spill challenge. This period was used to select the proper tools and make these operational. That included ensuring having suitable data sets available on human activities, like locations of oil and gas platforms, pipelines, cables, ports, shipping activity, tourist beaches, protected areas etc.. These are more or less static. Access to the dynamic and forecasted data sets needed to feed into the oil spill trajectory model needed to be ensured and tested also for reliability. Scripts were written and tested to smoothly prepare that data.
At the end of phase 1 a rehearsal was held to check that the level of preparedness was sufficient to meet the timelines and requirements of the challenge.
The rehearsal results are published on the project website. It was successful.

7.4.2 Phase 2: Waiting for the challenge and maintenance

The next phase was planned to last about 18 months during which the challenge could come at any time – where DG-MARE kindly co-operated in agreeing to have a challenge fit mostly within normal business hours and outside of peak holidays. The project team at IMARES was after all small and not part of an organisation that is fully geared towards 24/7/365 true responsiveness to full-blown oil spills.

Data availability

During the approx. 22 months until the challenge, the availability of the main data streams (winds and currents) had to be checked and repaired a couple of times.

In some cases My Ocean (nowadays: Copernicus Marine Environmental Monitoring Service or CMEMS) gave notice that data sets would be updated. In almost all cases this was not disruptive to the challenge. As advertised the technical improvements made by Copernicus in preparing the data did not lead to changes to the downloads that were made available. However tests were required to ensure this. One or two times the download scripts needed to adjusted slightly due to minor changes in the naming of the data sets. On a few occasions CMEMS has had unexpected outages as well as some planned ones. Luckily these did not coincide with the challenge.

The forecasted winds were sourced from Global Marine Net and delivered by an e-mail-bot. This delivery system proved to somewhat susceptible to disruption, the steady delivery of nearly the same message is picked up by spam hauses and on three occasions this has led to a break-down. The disruption has gone unnoticed for a few weeks on one occasion; the others were picked up on much sooner. After noticing the disruption it took another week to restore normal flow of data. This meant checking that the e-mail reception was not blocked within our own organisation, then notifying the webmaster at Global Marine Net. After some mails had been exchanged between the involved parties, this has always led to a solution.

Data updates

The most static data sets were also checked ca. two times during the maintenance period whether better or updated versions had become available. As a result a.o. the Natura 2000-data and the oil and gas platforms data set were updated.

8 Conclusions and recommendations

This Oil Platform Leak challenge answers to the following question:
Are suitable data sets available to provide sufficient input for emergency response to pollution incidents, including an appreciation of the conditions of severe time pressures and the constraints that may put on data availability? In the text below this question will be answered in detail.

Data availability and adequacy under severe time pressure (within 24 hours)
First part of emergency response to pollution incidents is a predicted oil spill trajectory on the one hand and an indication of the type of the threatened location as e.g. coastal habitat or species or tourist beach on the other hand within 24 hours.

- Predicted oil trajectory:
    - The available data was sufficient to predict the trajectory/fate of the oil.
    - For both winds and water currents data covering the region of interest was available. However, both lacked information in some grid cells near the coast, this information had to be interpolated from the available information.
    - Also, there is no single winds data source covering the region with both a hind- and a forecast, publicly available and free of charge. Therefore different sources had to be used and combined for hind- and forecast winds data.
- Type of threatened locations:
    - The information available on the locations under threat, i.e. nature values and/or tourist beaches was limited.
    - Tourist beach locations were not available within 24 hours and details on Natura 2000 areas could not be retrieved within the limited time frame.
    - Although not specifically required as output for the preliminary assessment, it could not be predicted whether the oil would reach main shipping lanes because the spatial coverage of shipping lane locations did not completely match the affected area.

Data availability and adequacy with extended time (within 72 hours)
Next part is to describe the locations that are most likely to be under threat, based on an improved predicted trajectory of the oil slick and a more detailed description of the areas, within 72 hours after the oil spill incident.

- Predicted oil trajectory:
    - The trajectory of the oil slick was predicted using the same data sources providing updated data sets. Thus the same limitations as for the 24 hours report remained for the refined assessment (i.e. lack of winds and water currents data near the coast and different sources had to be used and combined for hind- and forecast winds data).
    - There was sufficient time and data available to validate some assumptions made for the preliminary assessment regarding the time for the oil to reach the surface and the platform structure.
- Type of threatened locations:
    - The information available on the locations under threat remained limited.
    - Although information on tourist beaches could be retrieved (the Blue Flag data set as available from the EEA), data was lacking, especially at the Shetland Islands.
    - The spatial coverage of shipping lanes was still incomplete.
    - Lack of data on location of fishery effort and/or importance of areas at sea to fisheries. Some information on fisheries activities could be retrieved (mainly by consulting fisheries experts).
    - Information on Natura 2000 areas was available and could be retrieved within the time frame of 72 hours. Additionally, information on the importance of the potentially affected area for seabirds and marine mammals during that time of year could be retrieved (mainly by consulting seabird- and marine mammal experts).

The following is recommended to address identified data gaps:

- Spatial coverage of shipping lanes: Provide locations of shipping lanes with complete coverage of the North Sea, publically available and free of charge.
- Fisheries activity on a time scale shorter than a whole year: Provide Vessel Monitoring Systems (VMS) for the North Sea, publically available and free of charge. Acknowledging that this type of information could be confidential thus requiring care and thorough consideration.
- Distribution data of seabirds, marine mammals, fish and benthic species: Make better use of available survey data, i.e. identify existing monitoring data and convert this information into available and suitable data sets.
- Winds and currents data are limited near shore: This should be addressed by the data provider or other suitable data sets should be made publically available and free of charge.

The following limitations to data availability and adequacy have been identified:

- There is no single winds data source covering the region with both a hind- and a forecast, publicly available and free of charge: This should be addressed by the data provider or other suitable data sets should be made publically available and free of charge.
- The data needed some (minor) modifications before it could be used in the model considering the format of the available data versus the required data format (i.e. file type, variable names): This should be addressed by the data provider or other suitable data sets should be made publically available and free of charge. Another option would be to provide suitable R scripts for such data extraction and modification to the public.
- Current forecasts as available from MyOcean[3] are currently limiting the length of time the simulation of an oil spill can be taken into the future: This should be addressed by the data provider or other suitable data sets should be made publically available and free of charge. However, this may be a limitation that cannot be easily solved. The current forecast is dependent on the meteorological forecasts (wind) and with the changeable character of the weather of the North Sea an improvement in weather forecasting will have to be achieved first.
- Data sets both at MyOcean.eu as well as at GlobalMarineNet.com are updated once per day: A higher frequency of updates could be considered as this would ease limitations when acting under severe time pressures.
- The reliability of the availability of required data is key. Some of the data on MyOcean was unavailable at one point in time (although not during the challenge): the access to data should be ensured at all time. As was the delivery by mailer-bot of the GlobalMarine wind predictions.

[3] Presently Copernicus Marine Enviroment Monitoring Servcme (CMEMS, http://marine.copernicus.eu/) is successor of the MyOcean website.

9 Quality Assurance

IMARES utilises an ISO 9001:2008 certified quality management system (certificate number: 187378-2015-AQ-NLD-RvA). This certificate is valid until 15 September 2018. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Fish Division has NEN-EN-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 1th of April 2017 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation. The scope can be found at the website of the Council for Accreditation (www.rva.nl).

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Justification

Report C095/16
Project Number: 430.52051.01

The scientific quality of this report has been peer reviewed by the a colleague scientist and the head of the department of IMARES.

Approved: Dr. Ruud Jongbloed
Researcher

Signature:

Date: 06-10-2016

Approved: Drs. Jakob Asjes
Manager Integration

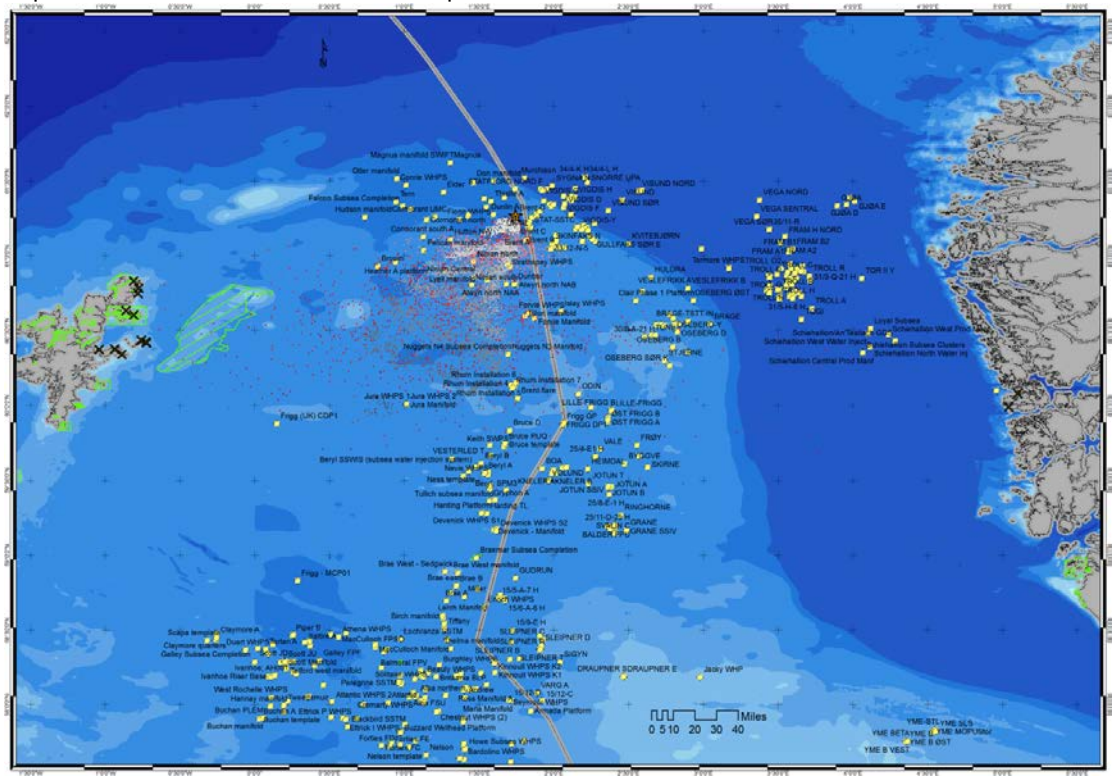
Signature:

Date: 06-10-2016

Appendix A Preliminary assessment (24h)

Executive Summary

An “Oil Platform leak” challenge was performed by IMARES with the objective to test the adequacy of data currently available for the North Sea basin for impact assessment of an oil spill as part of emergency response. On Tuesday, May 10, 2016 11:24 AM, we received an email from DG MARE with the notification that about 5000m^3 of oil per day leaked from the Brent Delta Platform with an expected duration of 48 hours.
The GNOME model was used to simulate the oil spill. At the end of the simulation (90 hours after the spill) 36% is evaporated and dispersed, and 64% is floating. As a worst case, only 1% of the total amount of spilled oil could beach, posing a threat to coastal habitat/species in the UK and Norway, as indicated by the crosses (beached oil) in the figure below. Identified data gaps limiting this preliminary assessment are a lack of data on tourist beaches and shipping lanes in the area of concern and details on the Natura 2000 areas are not yet addressed. These issues will be addressed within the complete impact assessment and/or the main report.

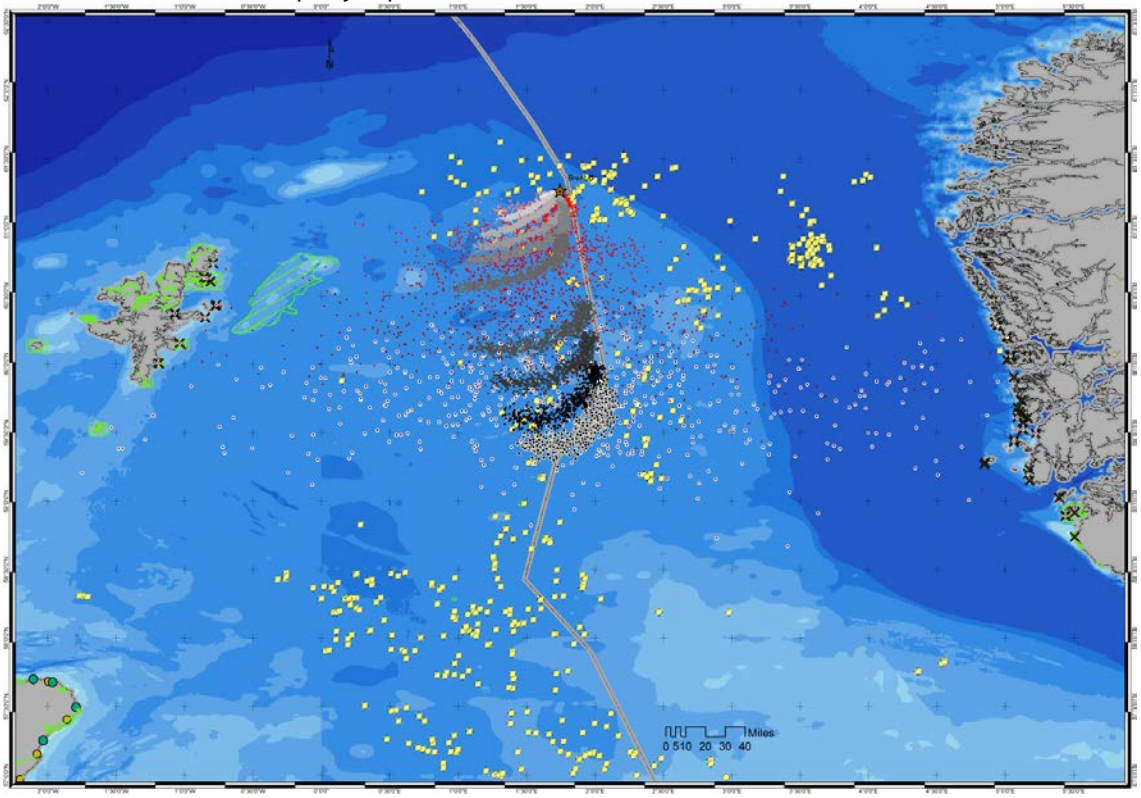


Overview of the impacted location after the Brent Delta spill according to the best guess and no regret simulation.

Appendix B Refined assessment (72h)

Executive Summary

An “Oil Platform leak” challenge was performed by IMARES with the objective to test the adequacy of data currently available for the North Sea basin for impact assessment of an oil spill as part of emergency response. On Tuesday, May 10, 2016 11:24 AM, we received an email from DG MARE with the notification that about 5000m^3 of oil per day leaked from the Brent Delta Platform with an expected duration of 48 hours. A preliminary impact assessment was provided 24h after the spill. Here we provide a 72hh update of the assessment.
Based on model simulations, it is expected that (132 hours after the spill) 42% is evaporated and dispersed, and 58% is floating. As a worst case, 4% (400 m^3) of the total amount of spilled oil could beach, posing a threat to coastal habitat/species in the UK and Norway, as indicated by the black crosses on the coast lines (beached oil) in the figure below. Main identified gaps limiting this refined assessment are: Tourist beaches (especially the locations of tourist beaches at the Shetlands); Shipping lanes; Fisheries activity on a time scale shorter than a whole year; Distribution data of birds and sea mammals, and possibly other biological distribution data. These issues will be addressed within the main data adequacy report.



Overview of the impacted location after the Brent Delta spill according to the best guess and no regret simulation.

Appendix C List of identified data sets

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
RQ.Oil .NS005-Bird feeding and migration	NS005			Bird feeding and migration	3.19 Species distribution	
RQ.Oil .OS001-GNOME	OS001	TRUE	http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/response-tools/gnome.html	GNOME		
DT.Oil .OS002-EMODNET Gridded Bathymetry	OS002		http://portal.emodnet-bathymetry.eu/	EMODNET Gridded Bathymetry	2.1 Elevation	
RQ.Oil .OS003-GSHHG, A Global Self-consistent, Hierarchical, High-resolution Geography Database	OS003	TRUE	http://www.soest.hawaii.edu/pwessel/gshhg/	GSHHG, A Global Self-consistent, Hierarchical, High-resolution Geography Database	3.15 Oceanographic geographical features	
RQ.Oil .OS004-NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b	OS004	TRUE	http://www.myocean.eu/web/69-myocean-interactive-catalogue.php?option=com_csw&view=details&product_id=NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b	NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b	1.8 Hydrography	

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
RQ.Oil .OS005-WIND_GLO_WIND_L4_NRT_OBSERVATIONS_012_004	OS005	TRUE	http://www.myocean.eu/web/69-myocean-interactive-catalogue.php?option=com_csw&view=details&product_id=WIND_GLO_WIND_L4_NRT_OBSERVATIONS_012_004	WIND_GLO_WIND_L4_NRT_OBSERVATIONS_012_004	3.13 Atmospheric conditions	
RQ.Oil .OS006-GRIB Files from GMN Marine Weather Services	OS006	TRUE	http://www.globalmarinenet.com/grib_downloads.php	GRIB Files from GMN Marine Weather Services	3.13 Atmospheric conditions	
DT.Oil .OS007-MEDSLIK-II, oil spill model	OS007		http://gnoo.bo.ingv.it/MEDSLIKII/	MEDSLIK-II, oil spill model		
RQ.Oil .OS008-Bathing Water Directive - Status of bathing water (EEA)	OS008	TRUE	http://www.eea.europa.eu/data-and-maps/data/bathing-water-directive-status-of-bathing-water-5#tab-european-data	Bathing Water Directive - Status of bathing water (EEA)	3.5 Human health and safety	
RQ.Oil .OS009-Natura 2000 data - the European network of protected sites (EEA)	OS009	TRUE	http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-gis-data	Natura 2000 data - the European network of protected sites (EEA)	3.11 Area management / restriction / regulation zones & reporting units	
DT.Oil .OS010-Natural England, GIS Digital Boundary Datasets	OS010		http://www.gis.naturalengland.org.uk/pubs/gis/GIS_Register.asp	Natural England, GIS Digital Boundary Datasets	3.11 Area management / restriction / regulation zones & reporting units	

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
DT.Oil .OS011-Marine Protected Areas, Norwegian Environment Agency	OS011		http://kartkatalog.miljodirektoratet.no/map_catalog_service.asp?servicename=vern	Marine Protected Areas, Norwegian Environment Agency	3.11 Area management / restriction / regulation zones & reporting units	
DT.Oil .OS012-DREAM-ParTrack	OS012		http://www.sintef.no/home/SINTEF-Materials-and-Chemistry/About-us/Departments/Environmental-Monitoring-and-Modelling/	DREAM-ParTrack		
DT.Oil .OS013-Oil and Gas Production in Denmark 2013 and Subsoil Use	OS013		http://www.ens.dk/en/info/publications/oil-gas-production-denmark-subsoil-use-2013	Oil and Gas Production in Denmark 2013 and Subsoil Use		
DT.Oil .OS014-SubSeaIQ website, page specifc to South Arne	OS014		http://www.subseaiq.com/data/PrintProject.aspx?project_id=776&AspxAutoDetectCookieSupport=1	SubSeaIQ website, page specifc to South Arne		
DT.Oil .OS015-Review of models and metocean databases	OS015		http://oilspillresponseproject.org/sites/default/files/uploads/WP3%20and%20WP4%20REVIEW%20OF%20MODELS%20AND%20METOCEAN%20DATABASES.pdf	Review of models and metocean databases		Actimar (2015a): OSR-JIP Review of models and metocean databases, Report № MOC-0970-01, V1.2 – 2015/02/23, OGP-IPIECA
DT.Oil .OS016-Validation of models and recommendations for their use in oil spill response	OS016		http://oilspillresponseproject.org/sites/default/files/uploads/WP3%20and%20WP4%20RECOMMENDATIONS%20ON%20VALIDATION.pdf	Validation of models and recommendations for their use in oil spill response		Actimar (2015b) OSR-JIP, Recommendations on validation Techniques, Report No. MOC-0970-02 - V3.1 – Feb. 23, 2015, OGP-IPIECA

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
DT.Oil .OS017-Common Operating Picture	OS017		http://oilspillresponseproject.org/sites/default/files/uploads/OGP-IPIECA%20RP%20for%20COP%20architecture%20-%20release%202.2%20plus%20annexes.pdf	Common Operating Picture		IPIECA–IOGP (2015): Work Package 5: Common Operating Picture, Recommended practice for Common Operating Picture architecture for oil spill response, final report. IPIECA–IOGP Oil Spill Response Joint Industry Project
DT.Oil .OS018-Guidelines on Oil Characterization	OS018		http://oilspillresponseproject.org/sites/default/files/uploads/JIP%2019%20-%20Oil%20characterization%20Final.pdf	Guidelines on Oil Characterization		IPIECA-OGP (2013): Guidelines on oil characterization to inform spill response decisions. IPIECA-OGP Oil Spill Response Joint Industry Project
DT.Oil .OS019-Sensitivity mapping Guide	OS019		http://oilspillresponseproject.org/sites/default/files/uploads/Sensitivity%20Mapping%20revised%20preface.pdf	Sensitivity mapping Guide		PIECA/IMO/OGP (2012): Sensitivity mapping for oil spill response. OGP Report Number 477, July 2012.
DT.Oil .OS020-Wildlife response preparedness	OS020		http://oilspillresponseproject.org/sites/default/files/uploads/Wildlife%20response%20preparedness.pdf	Wildlife response preparedness		IPIECA-OGP (2014): Wildlife response preparedness, Good practice guidelines for incident management and emergency response personnel. OGP Report Number 516, October 2014
DT.Oil .OS021-DMI BSHcmod	OS021			DMI BSHcmod	1.8 Hydrography	
DT.Oil .OS022-DMI HBM	OS022			DMI HBM	1.8 Hydrography	
DT.Oil .OS023-OPTOS/COHERENS	OS023			OPTOS/COHERENS	1.8 Hydrography	
DT.Oil .OS024-DHI MIKE forecast	OS024			DHI MIKE forecast	1.8 Hydrography	
DT.Oil .OS025-POLCOMS (AMM, MRCS, Irish Sea)	OS025			POLCOMS (AMM, MRCS, Irish Sea)	1.8 Hydrography	
DT.Oil .OS026-HIROMB	OS026			HIROMB	1.8 Hydrography	

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
DT.Oil .OS027-FOAM AMM	OS027			FOAM AMM	1.8 Hydrography	
DT.Oil .OS028-ALADIN (Meteo-France)	OS028			ALADIN (Meteo-France)	3.13 Atmospheric conditions	
DT.Oil .OS029-HIRLAM (Manufacturer FMI, DMI, KNMI or MET-Norway)	OS029			HIRLAM (Manufacturer FMI, DMI, KNMI or MET-Norway)	3.13 Atmospheric conditions	
DT.Oil .OS030-UKV and EURO4 (MetOffice UK)	OS030			UKV and EURO4 (MetOffice UK)	3.13 Atmospheric conditions	
DT.Oil .OS031-COSMO EU (DWD)	OS031			COSMO EU (DWD)	3.13 Atmospheric conditions	
DT.Oil .OS032-COSMO (IMGW, Poland)	OS032			COSMO (IMGW, Poland)	3.13 Atmospheric conditions	
DT.Oil .OS033-SKIRON (Univ. of Athens, Greece)	OS033			SKIRON (Univ. of Athens, Greece)	3.13 Atmospheric conditions	
DT.Oil .OS034-NEXTRA (Ocean weather inc.)	OS034			NEXTRA (Ocean weather inc.)	3.13 Atmospheric conditions	
DT.Oil .OS035-NORA10 (MET-Norway)	OS035			NORA10 (MET-Norway)	3.13 Atmospheric conditions	

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
RQ.Oil .OS036-R Project for Statistical Computing	OS036	TRUE	https://www.r-project.org/	R Project for Statistical Computing		R, The R Foundation for Statistical Computing, Vienna
DT.Oil .OS037-R Studio	OS037		https://www.rstudio.com/	R Studio		
RQ.Oil .OS038-Python	OS038	TRUE	https://www.python.org/	Python		
RQ.Oil .OS039-ArcGIS - ESRI	OS039	TRUE	http://www.esri.com/	ArcGIS - ESRI		
DT.Oil .OS040-ncBrowse	OS040		http://www.epic.noaa.gov/java/ncBrowse/	ncBrowse		
DT.Oil .OS041-European Coastline 2013 (updated 2015)	OS041		http://www.eea.europa.eu/data-and-maps/data/eea-coastline-for-analysis-1	European Coastline 2013 (updated 2015)	2.1 Elevation	
DT.Oil .OS042-Maritime Boundaries 2005	OS042		http://www.eea.europa.eu/data-and-maps/data/maritime-boundaries	Maritime Boundaries 2005	3.11 Area management / restriction / regulation zones & reporting units	
RQ.Oil .OS043-EU SeaMap - Seabed Habitat	OS043	TRUE	http://www.emodnet-seabedhabitats.eu/	EU SeaMap - Seabed Habitat	3.18 Habitats and biotopes	
DT.Oil .OS044-NoordzeeLoket - Natura2000 Noordzee	OS044		http://www.noordzeeloket.nl/projecten/noordzee-natura-2000/	NoordzeeLoket - Natura2000 Noordzee	3.11 Area management / restriction / regulation zones & reporting units	

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
DT.Oil .OS045-ICES Working Group on Spatial Fisheries Data	OS045		http://www.ices.dk/community/groups/Pages/WGSFD.aspx	ICES Working Group on Spatial Fisheries Data	3.4 Land use	
DT.Oil .OS046-FerryTravel.com	OS046		https://www.ferrytravel.com/ferries-ferry-to-norway.htm	FerryTravel.com	1.7 Transport networks	
DT.Oil .OS047-MarineTraffic.com (AIS)	OS047		https://www.marinetraffic.com/en/ais/	MarineTraffic.com (AIS)	1.7 Transport networks	
DT.Oil .OS048-Obis SeaMap	OS048		http://seamap.env.duke.edu/	Obis SeaMap	3.19 Species distribution	
DT.Oil .OS049-VisitNorway.com	OS049		https://www.visitnorway.com/maps/	VisitNorway.com		
DT.Oil .OS050-RegionStavanger-Attractions-BeachesAndBathing	OS050		http://www.regionstavanger.com/en/Attractions/Beaches-and-bathing/	RegionStavanger-Attractions-BeachesAndBathing	3.4 Land use	
DT.Oil .OS051-Jærstrendene (ProtectedArea)	OS051		http://www.miljodirektoratet.no/old/dirnat/attachment/28/Rapport%202007-1b%20Emerald%20rapport%20engelsk.pdf	Jærstrendene (ProtectedArea)	3.11 Area management / restriction / regulation zones & reporting units	
DT.Oil .OS052-NationalMPA_Norway_background	OS052		http://www.naturbase.no	NationalMPA_Norway_background	3.11 Area management / restriction / regulation zones & reporting units	

Full ID	Project ID	Requirement	URI	Name	Inspire	Citation
DT.Oil .OS053-Seabird distribution	OS053		http://library.wur.nl/WebQuery/wurpubs/482985	Seabird distribution	3.19 Species distribution	Leopold, M.F.; Boonman, M.; Collier, M.P.; Davaasuren, N.; Jongbloed, R.H.; Lagerveld, S.; Wal, J.T. van der; Scholl, M.M. 2014. A first approach to deal with cumulative effects on birds and bats of offshore wind farms and other human activities in the southern North Sea. Den Burg : IMARES (Report / IMARES Wageningen UR C166/14) - 188 p.
DT.Oil .OS054-Benthis-TrawlingImpactAssessment	OS054		http://www.benthis.eu/en/benthis/Results.htm	Benthis-TrawlingImpactAssessment	3.4 Land use	Rasmus Nielsen, Francois Bastardie, Lene Buhl-Mortensen, Ole Eigaard, Aysun Gümüş, Niels Hintzen, Stefanos Kavadas, Pascal Laffargue, Baptiste Mengual , Emilio Notti, Nadia Papadoupoulou, Hans Polet, David Reid, Adriaan D. Rijnsdorp, Marie-Joëlle Rochet, Alexandre Robert, Antonello Sala, Chris Smith, Massimo Virgili, Mustafa Zengin . 2014. Report on assessing trawling impact in regional seas, Benthis, Deliverable 7.6 (September 2014), IMARES, IJmuiden, the Netherlands.
DT.Oil .OS055-Shetland.org-Beaches	OS055		http://www.shetland.org/things/explore-nature/beaches	Shetland.org-Beaches	3.4 Land use	
DT.Oil .OS057-ListOfCrudeOilProducts-WikiPedia.org	OS057		http://en.wikipedia.org/wiki/List_of_crude_oil_products	ListOfCrudeOilProducts-WikiPedia.org		
DT.Oil .OS058-CrudeOilAssays-EkofiskBlend-StatOil	OS058		http://www.statoil.com/en/OurOperations/TradingProducts/CrudeOil/Crudeoilassays/Pages/EkofiskBlend.aspx	CrudeOilAssays-EkofiskBlend-StatOil		

Appendix D Data valuation

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
RQ.Wind.OS001-GNOME	Used	Contribution	True	Model selected to calculate oil spill trajectory
NSC-003-Oil		Location	True	Model is applicable to any location provided it is fed the correct inputs
		Commercial	True	Open government licence - no fee
		Attributes	True	Shoreline, currents and wind observed and/or predicted are the basic data requirements
		Delivery	True	
		Usability	True	
DT.Wind.OS007-MEDSLIK-II, oil spill model	Suitable	Contribution	True	Alternative model, suitable but already known to be in use for the Med.
NSC-003-Oil		Location	True	Model adaptable to Norh Sea, but appeared more difficult than first choice
		Commercial	True	Code available/accessible for free
		Attributes	True	
		Delivery	True	
		Usability	True	
DT.Oil .OS002-EMODNET Gridded Bathymetry	Used	Contribution	True	Gridded bathymetry data needed to refine coastline data (a.o. emerging sand banks/mud flats)
NSC-003-Oil		Location	True	Data set covers north sea region
		Commercial	True	Open government licence - no fee
		Attributes	True	Spatial resolution sufficient for oil spill challenge
		Delivery	True	Data can be downloaded from website
		Usability	True	GIS format, suited for post-analysis as per design of Oil Spill Challenge
RQ.Oil .OS003-GSHHG, A Global Self-consistent, Hierarchical, High-resolution Geography Database	Used	Contribution	True	Required data (as input) for running the GNOME model
NSC-003-Oil		Location	True	North Sea is available (global cover)
		Commercial	True	Open source

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
		Attributes	True	
		Delivery	True	
		Usability	True	
RQ.Oil .OS004-NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b	Used	Contribution	True	Current data set (strength and direction)
NSC-003-Oil		Location	True	North Sea is covered, as part of the Northwest Atlantic Shelf, forecast is 5 days into the future.
		Commercial	True	MyOcean.EU is free of cost
		Attributes	True	Conversion required for use with GNOME (r-script written for this purpose)
		Delivery	True	Registration required, but free of cost and quick
		Usability	True	
RQ.Oil .OS005-WIND_GLO_WIND_L4_NRT_OBSERVATIONS_012_004	Used	Contribution	True	Wind data set (strength and direction), observed!
NSC-003-Oil		Location	True	North Sea is covered, as part of the Northwest Atlantic Shelf, observations upto 1 day in the past.
		Commercial	True	MyOcean.EU is free of cost
		Attributes	True	Conversion and merging required for use with GNOME (r-script written for this purpose)
		Delivery	True	Registration required, but free of cost and quick
		Usability	True	
RQ.Oil .OS006-GRIB Files from GMN Marine Weather Services	Used	Contribution	True	Wind data set (strength and direction), observed!
NSC-003-Oil		Location	True	North Sea is covered (global cover available), forecast is 5 days into the future
		Commercial	True	free service
		Attributes	True	Conversion and merging required for use with GNOME (r-script written for this purpose)
		Delivery	True	online - can be saved as a pdf
		Usability	True	can be used? - FINO conference slides from Hamberg 2011
RQ.Oil .OS008-Bathing Water Directive - Status of bathing water (EEA)	Used	Contribution	True	EEA collated data set on bathing water quality across Europe, based on reporting by member states.

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
NSC-003-Oil		Location	True	Europe-wide, so North Sea covered.
		Commercial	True	Freely downloadable from EEA-website
		Attributes	True	
		Delivery	True	
		Usability	True	
RQ.Oil .OS009-Natura 2000 data - the European network of protected sites (EEA)	Used	Contribution	True	EEA collate data set on Natura 2000 protected area, including Marine Protected Ares in the North Sea.
NSC-003-Oil		Location	True	Europe-wide including North Sea
		Commercial	True	Freely downloadable from EEA-website
		Attributes	True	comprehensive set of attributes available from companion database (species, habitats etc.)
		Delivery	True	
		Usability	True	
DT.Oil .OS010-Natural England, GIS Digital Boundary Datasets	Considered	Contribution	True	used to evaluate completeness of MPA's as per Natura2000 for England.
NSC-003-Oil		Location	True	England and English waters
		Commercial	True	free
		Attributes	True	
		Delivery	True	downloadable gis-data sets
		Usability	True	
DT.Oil .OS011-Marine Protected Areas, Norwegian Environment Agency	Considered	Contribution	True	used to evaluate completeness of MPA's as per Natura2000 for Norway, based on pre-existing data sets collated for the WindSpeed-project
NSC-003-Oil		Location	True	Norway and Norwegian waters, including the North Sea
		Commercial	True	free
		Attributes	True	
		Delivery	True	download
		Usability	True	easy?
DT.Oil .OS012-DREAM-ParTrack	Suitable	Contribution	True	Alternative model, suitable and original choice, but too expensive due to licensing changes.

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
NSC-003-Oil		Location	True	IMARES has used DREAM (as part of MEMW) in earlier projects in the North Sea
		Commercial	False	Annual license was introduced 1-1-2014 @ € 25.000,00, which was prohibitive for use in this project.
		Attributes	True	-
		Delivery	True	-
		Usability	True	-
DT.Oil .OS013-Oil and Gas Production in Denmark 2013 and Subsoil Use	Used	Contribution	True	Data from regular national report used to determine oil spill amount for rehearsal of oil spill challenge.
NSC-003-Oil		Location	True	
		Commercial	True	-
		Attributes	True	-
		Delivery	True	-
		Usability	True	-
DT.Oil .OS014-SubSeaIQ website, page specifc to South Arne	Used	Contribution	True	Information used to determine oil type for South Arne, not taken at fac value, but substantiated with information from other web sources (API, WIKIpedia etc.). The geology mentioned here also links to the Danish reporting on oil and gas production (OS013).
NSC-003-Oil		Location	True	-
		Commercial	True	-
		Attributes	True	-
		Delivery	True	-
		Usability	True	-
DT.Oil .OS015-Review of models and metocean databases	Considered	Contribution	True	The review is used to check the selected databases and models. Because models and databases were already selected for the challenge at the time the report was published, the information was only used to evaluate out choices
NSC-003-Oil		Location	True	The report has a global coverage; the North Sea is one of the regions considered
		Commercial	True	Free
		Attributes	False	-

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
		Delivery	True	Report can be downloaded from the Oil Spill Response Joint Industry Project website
		Usability	False	-
DT.Oil .OS016-Validation of models and recommendations for their use in oil spill response	Considered	Contribution	True	This report could be relevant for this challenge but is not used because it was published after our modelling work
NSC-003-Oil		Location	False	-
		Commercial	True	Free
		Attributes	False	-
		Delivery	True	Report can be downloaded from the Oil Spill Response Joint Industry Project website
		Usability	False	-
DT.Oil .OS017-Common Operating Picture	Considered	Contribution	True	This report describes a common picture of an oil spill situation for different organizations that have different views of the spill so that they all can deal with it collectively. The report also describes a COP from an information viewpoint thus describing information that should be included when addressing an oil spill. The list of information is acknowledged but there was no need to include (additional) information
NSC-003-Oil		Location	True	Not location specific
		Commercial	True	Free
		Attributes	False	-
		Delivery	True	Report can be downloaded from the Oil Spill Response Joint Industry Project website
		Usability	False	-
DT.Oil .OS018-Guidelines on Oil Characterization	Considered	Contribution	True	This report describes guidelines on oil characterization. However, the GNOME model which is used in this challenge uses a number predefined oil types thus characterisation guidelines are not relevant
NSC-003-Oil		Location	True	Not location specific
		Commercial	True	Free
		Attributes	False	-
		Delivery	True	Report can be downloaded from the Oil Spill Response Joint Industry Project website
		Usability	False	-

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Oil .OS019-Sensitivity mapping Guide	Considered	Contribution	True	This report is used to check the characteristics of the map produced by the challenge
NSC-003-Oil		Location	True	Not location specific
		Commercial	True	Free
		Attributes	False	-
		Delivery	True	Report can be downloaded from the Oil Spill Response Joint Industry Project website
		Usability	False	-
DT.Oil .OS020-Wildlife response preparedness	NotConsidered	Contribution	False	Wildlife response is not part of the oil platform leak challenge
NSC-003-Oil		Location	False	-
		Commercial	True	Free
		Attributes	False	
		Delivery	True	Report can be downloaded from the Oil Spill Response Joint Industry Project website
		Usability	False	-
DT.Oil .OS021-DMI BSHcmod	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS022-DMI HBM	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS023-OPTOS/COHERENS	NotConsidered	Contribution	False	

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS024-DHI MIKE forecast	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS025-POLCOMS (AMM, MRCS, Irish Sea)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS026-HIROMB	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Oil .OS027-FOAM AMM	Suitable	Contribution	False	Not used or considered as such but included in model chain of selected Copernicus (CMEMS) product
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS028-ALADIN (Meteo-France)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS029-HIRLAM (Manufacturer FMI, DMI, KNMI or MET-Norway)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS030-UKV and EURO4 (MetOffice UK)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Oil .OS031-COSMO EU (DWD)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS032-COSMO (IMGW, Poland)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS033-SKIRON (Univ. of Athens, Greece)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS034-NEXTRA (Ocean weather inc.)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
DT.Oil .OS035-NORA10 (MET-Norway)	NotConsidered	Contribution	False	
NSC-003-Oil		Location	True	Selected for the North Sea region by the Oil Spill Response Joint Industry Project
		Commercial	False	-

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
		Attributes	False	-
		Delivery	False	-
		Usability	False	-
RQ.Oil .OS036-R Project for Statistical Computing	Used	Contribution	True	Programming language (Open Source) used to prepare input files for GNOME (trajectory modelling)
NSC-003-Oil		Location	Null	Not applicable
		Commercial	True	Open source, free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
DT.Oil .OS037-R Studio	Used	Contribution	True	IDE for R, gives a more convenient and appealling user interface to R
NSC-003-Oil		Location	Null	Not applicable
		Commercial	True	Open source, free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
RQ.Oil .OS038-Python	Used	Contribution	True	Scripting language, CMEMS download client uses this, as does ArcGIS
NSC-003-Oil		Location	Null	Not applicable
		Commercial	True	Open source, free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
RQ.Oil .OS039-ArcGIS - ESRI	Used	Contribution	True	Geographical Information System
NSC-003-Oil		Location	Null	Not applicable
		Commercial	False	Licensed, commercial software, high cost (but already available and well-known)
		Attributes	True	-
		Delivery	False	Regularly in use at IMARES and WUR, already installed. New buy and install could require a bit of time.

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
		Usability	True	-
DT.Oil .OS040-ncBrowse	Used	Contribution	True	Program to view and diagnose NetCDF files (delivery format from a.o. Copernicus (CMEMS)
NSC-003-Oil		Location	False	Not applicable
		Commercial	True	Open source, free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
DT.Oil .OS041-European Coastline 2013 (updated 2015)	Used	Contribution	True	EEA-data set, including Norway of coastlines
NSC-003-Oil		Location	True	Data set covers North Sea region, and wider area of Europe
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
DT.Oil .OS042-Maritime Boundaries 2005	Considered	Contribution	True	EEA-data set, maritime boundaries not an issue during challenge
NSC-003-Oil		Location	True	Data set covers North Sea region, and wider area of Europe
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
RQ.Oil .OS043-EU SeaMap - Seabed Habitat	Used	Contribution	True	Seabed habitats provided by EmodNet
NSC-003-Oil		Location	True	Data set covers North Sea region, and more of Europe
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
DT.Oil .OS044-NoordzeeLoket - Natura2000 Noordzee	Considered	Contribution	True	Not needed as no oil spills in this area were part of the challenge
NSC-003-Oil		Location	True	Data set covers part (Dutch sector) of the North Sea

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	Direct download
		Usability	True	-
DT.Oil .OS045-ICES Working Group on Spatial Fisheries Data	Used	Contribution	True	Deployed to confirm presence of fishing activity in the area of the oil spill
NSC-003-Oil		Location	True	Data set covers North Sea region, and wider area of Europe
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	Direct download, not easy to find
		Usability	True	-
DT.Oil .OS046-FerryTravel.com	Suitable	Contribution	True	Website used to confirm presence of ferry route(s) near oil spill
NSC-003-Oil		Location	True	Covers the area of interest
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	-
		Usability	False	Not available as geographical data set
DT.Oil .OS047-MarineTraffic.com (AIS)	Suitable	Contribution	True	Website used to demonstrate presence of shipping in the area
NSC-003-Oil		Location	True	Global coverage
		Commercial	False	Actual AIS-data is not available for free, viewing of website is.
		Attributes	True	-
		Delivery	True	-
		Usability	False	Not available as geographical data set
DT.Oil .OS048-Obis SeaMap	Used	Contribution	True	WebMapping capabilities used
NSC-003-Oil		Location	True	-
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	WebMapping capabilities used

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
		Usability	False	Not available as geographical data set
DT.Oil .OS049-VisitNorway.com	Used	Contribution	True	WebMap used to illustrate presence of bathing location
NSC-003-Oil		Location	True	Norway and Norwegian waters, including the North Sea
		Commercial	True	Free
		Attributes	True	Relevant information on location and presence of bathing locations along the Norwegian coast
		Delivery	True	WebMap used to illustrate presence of bathing location
		Usability	False	Not available as geographical data set
DT.Oil .OS050-RegionStavanger-Attractions-BeachesAndBathing	Used	Contribution	True	WebMap used to illustrate presence of bathing location
NSC-003-Oil		Location	True	Website with local information on bathing locations, near Stavanger
		Commercial	True	Free
		Attributes	True	Relevant information on location and presence of bathing locations along the Norwegian coast
		Delivery	True	WebMap used to illustrate presence of bathing location
		Usability	False	Not available as geographical data set
DT.Oil .OS051-Jærstrendene (ProtectedArea)	Used	Contribution	True	Background information on the protected values at this site
NSC-003-Oil		Location	True	Website with local information
		Commercial	True	Free
		Attributes	True	Relevant information to assess vulnerability to oil spills
		Delivery	True	-
		Usability	False	Not available as geographical data set
DT.Oil .OS052-NationalMPA_Norway_background	Used	Contribution	True	Background information on the protected values at this site
NSC-003-Oil		Location	True	Website with local information
		Commercial	True	Free
		Attributes	True	Relevant information to assess vulnerability to oil spills
		Delivery	True	-
		Usability	False	Not available as geographical data set

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Oil .OS053-Seabird distribution	Used	Contribution	True	Seabird distribution data set (29 species), covering ICES area IV and III, data from ESAS and NL-government (Min.I&M)
NSC-003-Oil		Location	True	North Sea mostly covered, English Channel and northern most areas required for this particular challenge not covered.
		Commercial	True	Data set generated at IMARES, processed with data from third parties (ESAS, Min. I&M)
		Attributes	True	-
		Delivery	False	Currently not downloadable for outside parties
		Usability	True	Data set shows density distribution of several seabirds species, for 6 bimonthly periods (ca. 25 yrs. of data included)
DT.Oil .OS054-Benthis-TrawlingImpactAssessment	Used	Contribution	True	Report with valuable printed maps showing presence of fishing vessels in the area of the challenge.
NSC-003-Oil		Location	True	Much larger area of North-East Atlantic covered in report
		Commercial	True	Free
		Attributes	True	-
		Delivery	True	Report is available for direct download
		Usability	False	Not available as geographical data set
DT.Oil .OS055-Shetland.org-Beaches	Used	Contribution	True	Background information indicating presence of bathing location on the Shetland islands
NSC-003-Oil		Location	True	Website with local information
		Commercial	True	Free
		Attributes	True	Relevant information on location and presence of bathing locations along the Shetland islands
		Delivery	True	-
		Usability	False	Not available as geographical data set
DT.Oil .OS056-Oil and Gas Production in Denmark 2013	Null	Contribution	Null	same as DT.Oil.OS013
NSC-003-Oil		Location	Null	-
		Commercial	Null	-
		Attributes	Null	-
		Delivery	Null	-

NSC-003-Oil

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
		Usability	Null	-
DT.Oil .OS057-ListOfCrudeOilProducts-WikiPedia.org	Used	Contribution	True	Background information on characteristics of the oil type being spilled
NSC-003-Oil		Location	Null	Not data that is geographic by nature
		Commercial	True	Free
		Attributes	True	Relevant attributes found and used for selecting best matching oil type in GNOME
		Delivery	True	Website
		Usability	Null	-
DT.Oil .OS058-CrudeOilAssays-EkofiskBlend-StatOil	Used	Contribution	True	Background information on characteristics of the oil type being spilled
NSC-003-Oil		Location	Null	Not data that is geographic by nature
		Commercial	True	Free
		Attributes	True	Relevant attributes found and used for selecting best matching oil type in GNOME
		Delivery	True	Website
		Usability	Null	-

Appendix E r scripts

The following section presents the source code of both r scripts as used for the project. They are working code, with minor adjustments made before inclusion in this appendix. The main adjustment made has been a change of path references to <yourpathgoeshere>

Script 1: merge grib-forecast with MyOcean hindcast to netCDF v03.r
Script 2: convert MyOcean netCDF to GNOME netCDF.r

Script 1: merge grib-forecast with MyOcean hindcast to netCDF v03.r

```
#http://www.globalmarinenet.com/grib_downloads.php
require(raster)

require(rgdal)
require(zoo)
require(maps)
require(RNetCDF)
require(abind)

#setwd("D:/IMARESfiles/GapsSeaBasinObservation/WP4 Oil Spill Challenge/Data en
conversie/wind")
setwd("<yourpathgoeshere>")

# Filenames of forecasts from http://www.globalmarinenet.com/grib_downloads.php
# These names should start with date: yyyy-mm-dd
#fnameFore      <- c("2014-05-11 NorthEurope.wind.7day.grb",
#                    "2014-05-12 NorthEurope.wind.7day.grb",
#                    "2014-05-13 NorthEurope.wind.7day.grb",
#                    "2014-05-14 NorthEurope.wind.7day.grb")
fnameFore      <- c("wind-NorthEurope.7day_20151025.grb",
                   "wind-NorthEurope.7day_20151026.grb",
                   "wind-NorthEurope.7day_20151027.grb",
                   "wind-NorthEurope.7day_20151028.grb")

# Filename of hindcast from MyOcean
#fnameHind      <- "GLO-BLENDED_WIND_L4-V3-OBS_FULL_TIME_SERIE_1400138598849
2014-05-15.nc"
fnameHind      <- "GLO-BLENDED_WIND_L4-V3-OBS_FULL_TIME_SERIE_20151029.nc"

# Filename for the merged output file
fnameMerged    <- "Wind_merged.nc"

# define the desired origin for the time object in the output file
# A relatevely recent date is used here, as GNOME can't handle origings far in
the past
des_orig       <- c(2011,1,1)
desired_origin <- as.numeric(as.POSIXct(0, "UTC", origin=sprintf("%i-%02i-%02i",
des_orig[1], des_orig[2], des_orig[3])))

fill_NA <- function(m)
{
  select1      <- apply(m, 1, function(x) sum(is.na(x)) != length(x))
  select2      <- apply(m, 2, function(x) sum(is.na(x)) != length(x))
  m1           <- m
  m2           <- m
  m1[select1,] <- t(na.approx(t(m[select1,]), rule = 2))
  m2[,select2] <-   na.approx(  m[,select2],  rule = 2)
  return (m1 + m2)/2
}

# read the hindcast file:
nc_in          <- open.nc(fnameHind)
timeHind       <- var.get.nc(nc_in, "time")
tOriginHind    <- unlist(strsplit(att.get.nc(nc_in, "time", "units"), "[ ]"))
```

```
tFactHind      <- switch(which(tOriginHind[1] == c("days", "hours", "minutes",
"seconds")), 24*60*60, 60*60, 60, 1)
tOriginHind    <- paste(tOriginHind[-1:-2], collapse = " ")
timeHind       <- as.numeric(as.POSIXct(timeHind*tFactHind, tz = "UTC", origin =
tOriginHind))
lonHind        <- var.get.nc(nc_in, "longitude")
latHind        <- var.get.nc(nc_in, "latitude")
air_u_Hind     <- var.get.nc(nc_in, "eastward_wind")
air_v_Hind     <- var.get.nc(nc_in, "northward_wind")

#close the hind cast file as all required data is read
close.nc(nc_in)

#Extract time series from the forecast files
timeFore <- NULL
for (fname in fnameFore)
{
  meta_dat <- NULL
  meta_dat <- system(paste("\"", gsub("[/]", "\\\\", getwd()), "\\grib to
asc\\wgrib.exe\" \"", gsub("[/]", "\\\\", getwd()), "\\", fname, "\"", sep = ""),
intern = T)
  meta_dat <- meta_dat[unlist(lapply(gregexpr("[:]", meta_dat), length)) > 2]
  meta_dat <- t(matrix(unlist(strsplit(meta_dat, "[:]")), ncol =
length(meta_dat)))
  ref      <- paste("20", substr(meta_dat[,3], 3, 4), "-", substr(meta_dat[,3],
5, 6), "-",
                    substr(meta_dat[,3], 7, 8), " ", substr(meta_dat[,3], 9, 10),
":00:00", sep = "")
  print(paste(fname, ref[1]))
  tm       <- as.numeric(gsub("anl", "0", gsub("hr fcst", "", meta_dat[,13])))
  # time is UTC
  timeFore <- cbind(timeFore, unique(as.POSIXct(tm*60*60, "UTC", origin=ref)))
}

# order filenames by the last date in the forecast:
fnameFore <- fnameFore[order(timeFore[nrow(timeFore),])]
timeFore  <- timeFore[,order(timeFore[nrow(timeFore),])]

# loop the forecast files (from most recent to least recent) and include only the
data
# to be used (i.e., remove overlapping time data). It is assumed that the grids
in all
# forecast files are identical
timeForeTemp   <- timeFore
timeFore       <- NULL
lonFore        <- NULL
latFore        <- NULL
air_u_Fore     <- NULL
air_v_Fore     <- NULL
for (i in length(fnameFore):1)
{
  grib <- NULL
  grib <- readGDAL(fnameFore[i])
  grib@data[grib@data > 1000] <- NA
  lonFore <- grib@grid@cellcentre.offset[1] + ((1:grib@grid@cells.dim[1]) -
0.5)*grib@grid@cellsize[1]
```

```
  latFore <- grib@grid@cellcentre.offset[2] + ((1:grib@grid@cells.dim[2]) -
0.5)*grib@grid@cellsize[2]
  grib_udat     <- array(unlist(grib@data[(1:(length(names(grib))/2))*2 - 1]),
dim = c(length(lonFore), length(latFore), nrow(timeForeTemp)))
  grib_udat     <- grib_udat[,length(latFore):1,]

  grib_vdat     <- array(unlist(grib@data[(1:(length(names(grib))/2))*2]), dim =
c(length(lonFore), length(latFore), nrow(timeForeTemp)))
  grib_vdat     <- grib_vdat[,length(latFore):1,]

  if (is.null(timeFore))
  {
    timeFore   <- timeForeTemp[,i]
    air_u_Fore <- grib_udat
    air_v_Fore <- grib_vdat
  } else
  {
    selection  <- (timeForeTemp[,i] < min(timeFore))
    timeFore   <- c(timeForeTemp[selection, i], timeFore)
    air_u_Fore <- abind(grib_udat[,,selection], air_u_Fore, along = 3)
    air_v_Fore <- abind(grib_vdat[,,selection], air_v_Fore, along = 3)
  }
}
selection  <- (timeFore > max(timeHind))
air_u_Fore <- air_u_Fore[,,selection]
air_v_Fore <- air_v_Fore[,,selection]
timeFore   <- timeFore[selection]

# Fill the NA gaps with values through inter- and extrapolation
for (i in 1:length(timeHind))
{
  air_u_Hind[,,i] <- fill_NA(air_u_Hind[,,i])
  air_v_Hind[,,i] <- fill_NA(air_v_Hind[,,i])
}
for (i in 1:length(timeFore))
{
  air_u_Fore[,,i] <- fill_NA(air_u_Fore[,,i])
  air_v_Fore[,,i] <- fill_NA(air_v_Fore[,,i])
}

# Resample the forecast to the same grid (with higher resolution) as the hind
cast,
# for this purpose, the timesteps have to be looped
air_u_merged <- array(dim = c(dim(air_u_Hind)[1:2], dim(air_u_Fore)[3]))
air_v_merged <- array(dim = c(dim(air_v_Hind)[1:2], dim(air_v_Fore)[3]))
# create a raster of hind cast
rasterHind   <- raster(matrix(NA, length(latHind), length(lonHind)),
                       min(lonHind), max(lonHind), min(latHind), max(latHind),
                       crs = CRS("+proj=longlat +datum=WGS84"))
for (i in 1:(dim(air_u_Fore)[3]))
{
  raster_u          <- raster(t(air_u_Fore[,dim(air_u_Fore)[2]:1, i]),
                              min(lonFore), max(lonFore), min(latFore),
max(latFore),
                              crs = CRS("+proj=longlat +datum=WGS84"))
  air_u_merged[,,i] <- t(as.matrix(resample(raster_u,
rasterHind)))[,dim(air_u_Hind)[2]:1]
```

```
  raster_v          <- raster(t(air_v_Fore[,dim(air_v_Fore)[2]:1, i]),
                              min(lonFore), max(lonFore), min(latFore),
max(latFore),
                              crs = CRS("+proj=longlat +datum=WGS84"))
  air_v_merged[,,i] <- t(as.matrix(resample(raster_v,
rasterHind)))[,dim(air_v_Hind)[2]:1]
  print(i)
}

# Now that we've got both sets in the same grid, we can merge the two sets:
# also, the hindcast from MyOcean appears to be a factor 100 too high, and needs
to be negated
air_u_merged <- abind(-air_u_Hind/100, air_u_merged, along = 3)
air_v_merged <- abind(-air_v_Hind/100, air_v_merged, along = 3)
timeMerged   <- c(timeHind, timeFore)
lonMerged    <- lonHind
latMerged    <- latHind

# Now save the merged data in a format that GNOME can work with:
nc <- create.nc(fnameMerged)
dim.def.nc(nc, "time", length(timeMerged))
var.def.nc(nc, "time", "NC_DOUBLE", "time")
var.put.nc(nc, "time", (as.numeric(timeMerged) - desired_origin)/(60*60), 1,
length(timeMerged))
att.put.nc(nc, "time", "units",               "NC_CHAR", paste("hours since",
sprintf("%i-%02i-%02i", des_orig[1], des_orig[2], des_orig[3]), "00:00:00.0
00:00"))
att.put.nc(nc, "time", "_CoordinateAxisType", "NC_CHAR", "Time")
att.put.nc(nc, "time", "axis",                "NC_CHAR", "T")
att.put.nc(nc, "time", "long_name",           "NC_CHAR", "time in UTC")
att.put.nc(nc, "time", "standard_name",       "NC_CHAR", "time")

dim.def.nc(nc, "lon", length(lonMerged))
var.def.nc(nc, "lon", "NC_DOUBLE", "lon")
var.put.nc(nc, "lon", lonMerged, 1, length(lonMerged))
att.put.nc(nc, "lon", "standard_name",        "NC_CHAR", "longitude")
att.put.nc(nc, "lon", "long_name",            "NC_CHAR", "longitude")
att.put.nc(nc, "lon", "units",                "NC_CHAR", "degrees_east")
att.put.nc(nc, "lon", "axis",                 "NC_CHAR", "X")
att.put.nc(nc, "lon", "_CoordinateAxisType",  "NC_CHAR", "Lon")

dim.def.nc(nc, "lat", length(latMerged))
var.def.nc(nc, "lat", "NC_DOUBLE", "lat")
var.put.nc(nc, "lat", latMerged, 1, length(latMerged))
att.put.nc(nc, "lat", "standard_name",        "NC_CHAR", "latitude")
att.put.nc(nc, "lat", "long_name",            "NC_CHAR", "latitude")
att.put.nc(nc, "lat", "units",                "NC_CHAR", "degrees_north")
att.put.nc(nc, "lat", "axis",                 "NC_CHAR", "Y")
att.put.nc(nc, "lat", "_CoordinateAxisType",  "NC_CHAR", "Lat")

att.put.nc(nc, "NC_GLOBAL", "grid_type", "NC_CHAR", "REGULAR")
att.put.nc(nc, "NC_GLOBAL", "base_date", "NC_INT", des_orig)

var.def.nc(nc, "air_u", "NC_DOUBLE", c("lon", "lat", "time"))
att.put.nc(nc, "air_u", "_FillValue",         "NC_DOUBLE", -32767)
att.put.nc(nc, "air_u", "missing_value",      "NC_DOUBLE", -32767)
att.put.nc(nc, "air_u", "long_name",          "NC_CHAR", "Eastward Air Velocity")
```

```
att.put.nc(nc, "air_u", "units",              "NC_CHAR", "m/s")
att.put.nc(nc, "air_u", "scale_factor",       "NC_DOUBLE", 1)
att.put.nc(nc, "air_u", "add_offset",         "NC_DOUBLE", 0)

var.put.nc(nc, "air_u", air_u_merged)

var.def.nc(nc, "air_v", "NC_DOUBLE", c("lon", "lat", "time"))
att.put.nc(nc, "air_v", "_FillValue",         "NC_DOUBLE", -32767)
att.put.nc(nc, "air_v", "missing_value",      "NC_DOUBLE", -32767)
att.put.nc(nc, "air_v", "units",              "NC_CHAR", "m/s")
att.put.nc(nc, "air_v", "scale_factor",       "NC_DOUBLE", 1)
att.put.nc(nc, "air_v", "add_offset",         "NC_DOUBLE", 0)

var.put.nc(nc, "air_v", air_v_merged)

close.nc(nc)

# Show the maximum gap found in time in the merged dataset
cat(paste("Maximum gap found in time in the merged dataset:\n",
          max(diff(as.POSIXlt(timeMerged, "1970-01-01", tz = "UTC"))), "\n",
          "Should be no more than 6 hours if everything went OK\n", sep = ""))
```

Script 2: convert MyOcean netCDF to GNOME netCDF.r

```
#http://data.ncof.co.uk/mis-gateway-
servlet/Motu?action=listcatalog&service=http://purl.org/myocean/ontology/service/
database%23NORTHWESTSHELF_ANALYSIS_FORECAST_PHYS_004_001_b
require(RNetCDF)
require(zoo)
#setwd("D:/IMARESfiles/GapsSeaBasinObservation/WP4 Oil Spill Challenge/Data en
conversie")
setwd("<yourpathgoeshere>")

#file.in  <- "currents/MetO-NWS-PHYS-hi-Agg_1376387950724.nc"
#file.in  <- "currents/MetO-NWS-PHYS-hi-Agg_1396362741576.nc"
#file.in  <- "currents/MetO-NWS-PHYS-hi-Agg_1399964136635.nc"
#file.out <- "currents/convertedMay2014w1.nc"
file.in  <- "currents/Meto-NWS-PHYS-hi-Agg_20151029.nc"
file.out <- "currents/convertedOct2015w4.nc"

file.copy(file.in, file.out, T)

nc <- open.nc(file.out, write = T)

#as a check show the dimensios and variables:
print.nc(nc)

# The original ncdf also has a dimension depth, which is not expected by GNOME.
# If this poses a problem then adjust to select only the top layer.

# The following global attributes are set for GNOME
att.put.nc(nc, "NC_GLOBAL", "grid_type", "NC_CHAR", "REGULAR")

var.rename.nc(nc, "vozocrtx", "water_u")
var.rename.nc(nc, "vomecrty", "water_v")

#Inter- and extrapolate u-currents near coastlines
temp <- var.get.nc(nc, "water_u")

#loop depth-dimension
for (i in 1:dim(temp)[3])
{
  #loop time-dimension
  for (j in 1:dim(temp)[4])
  {
    m <- temp[,,i,j]
    sel_col <- apply(m, 2, function(x) sum(is.na(x))!=length(x))
    sel_row <- apply(m, 1, function(x) sum(is.na(x))!=length(x))
    m1 <- na.approx(m[,sel_col], rule = 2)
    m2 <- t(na.approx(t(m[sel_row,]), rule = 2))
    m3 <- m
    m4 <- m
    m3[,sel_col] <- m1
    m4[sel_row,] <- m2
    m5 <- (m3 + m4)/2

    temp[,,i,j] <- m5
  }
}
```

```
var.put.nc(nc, "water_u", temp)

#Inter- and extrapolate v-currents near coastlines
temp <- var.get.nc(nc, "water_v")

#loop depth-dimension
for (i in 1:dim(temp)[3])
{
  #loop time-dimension
  for (j in 1:dim(temp)[4])
  {
    m <- temp[,,i,j]
    sel_col <- apply(m, 2, function(x) sum(is.na(x))!=length(x))
    sel_row <- apply(m, 1, function(x) sum(is.na(x))!=length(x))
    m1 <- na.approx(m[,sel_col], rule = 2)
    m2 <- t(na.approx(t(m[sel_row,]), rule = 2))
    m3 <- m
    m4 <- m
    m3[,sel_col] <- m1
    m4[sel_row,] <- m2
    m5 <- (m3 + m4)/2

    temp[,,i,j] <- m5
  }
}

var.put.nc(nc, "water_v", temp)

close.nc(nc)
```

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Wageningen Marine Research is the Netherlands research institute established to provide the scientific support that is essential for developing policies and innovation in respect of the marine environment, fishery activities, aquaculture and the maritime sector.

The Wageningen Marine Research vision

'To explore the potential of marine nature to improve the quality of life'

The Wageningen Marine Research mission

- To conduct research with the aim of acquiring knowledge and offering advice on the sustainable management and use of marine and coastal areas.
- Wageningen Marine Research is an independent, leading scientific research institute

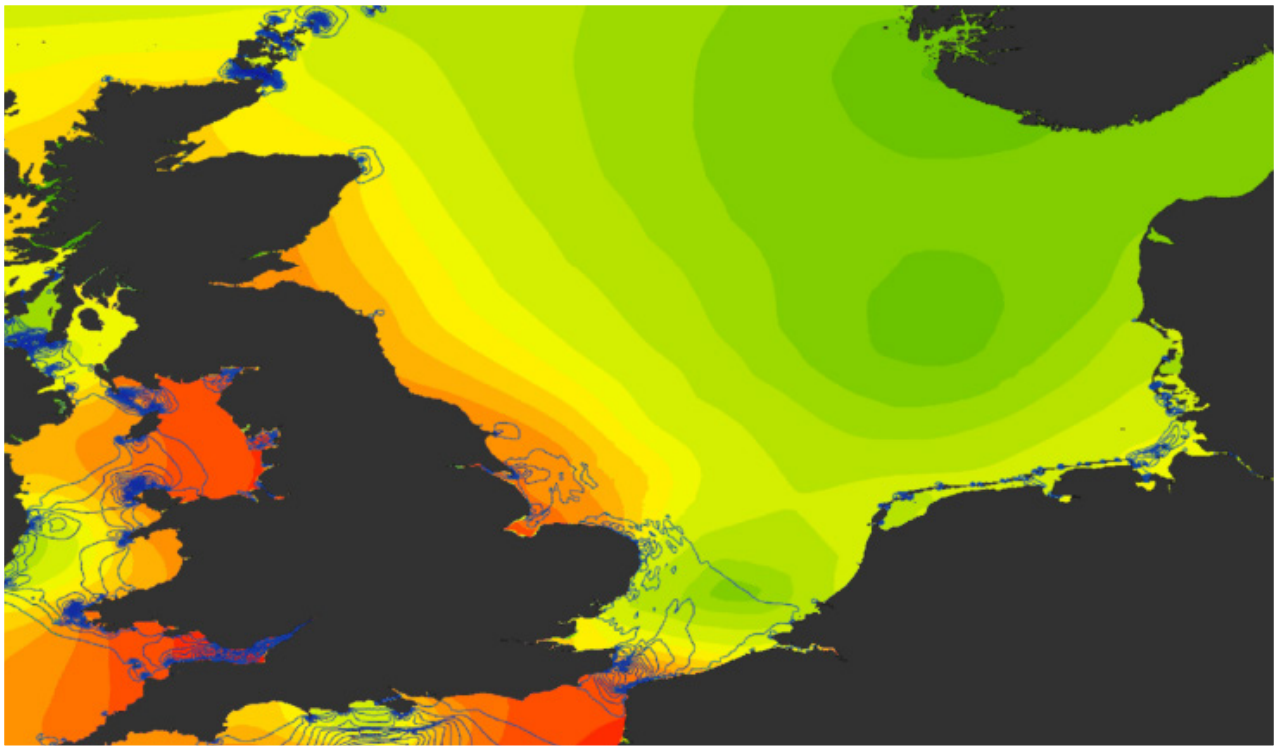
Wageningen Marine Research is part of the international knowledge organisation Wageningen UR (University & Research centre). Within Wageningen UR, nine specialised research institutes of the DLO Foundation have joined forces with Wageningen University to help answer the most important questions in the domain of healthy food and living environment.

A.5. Climate and Coastal Protection

HR Wallingford
Working with water

Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report - Climate and Coastal Protection Challenge



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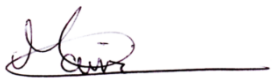
		

Executive Summary

This document summarises the findings of the Climate and Coast Protection challenge, conducted as part of the North Sea Checkpoint Project (NSCP)

This report constitutes deliverable 09 to DG Mare, under the North Sea Checkpoint Project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in Sea Basin and Observation Data MARE/2012/11: North Sea) contract reference SI2.658142. The work was undertaken by HR Wallingford with input from the project members, IMARES and McAllister-Elliot & Partners (MEP) in particular.

It should be stressed that, although this document reports on the data challenge for assessing marine climate and coast protection, this does not give measureable results nor definite conclusions on climate change nor advice on coast protection. Figures presented are for illustration of purpose of data accessibility only.

Points for EMODnet

Physics portal –The zip file of tidal gauge information appeared to download but couldn't be opened, hence it was not used.

General – It was not possible to fully meet the challenge aims. Whilst metadata provide some information, it is rarely sufficient to appraise 'fitness for purpose' and data is available from multiple sources, which took time to appraise in terms of being definitive and most up-to-date. .The time series of measurements is in most cases historically insufficient and geographically patchy, e.g. tidal gauges are limited to coasts and islands with only occasional mid-basin information where structures had been placed, such as rigs. Since the historic record deemed appropriate for the challenge was a singular dataset, no validation of the results was achieved. More recent data, such as the satellite observations are far more comprehensive, but their time series is not yet sufficiently long for deriving climate change considerations.

On the scale of the North Sea basin, no sediment data was discovered that could address the challenge. Usable data for non-experts is rare, as the datasets available require expert processing.

Contents

Figures

Tables

1. Introduction

This report constitutes the ninth deliverable to DG Mare under the North Sea Checkpoint Project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work was undertaken by HR Wallingford with input from the project members, IMARES and McAllister-Elliot & Partners (MEP) in particular. This document is the Data Adequacy Report (DAR) presenting the findings for the Climate and Coastal Protection Challenge. A number of other challenges are presented in separate reports.

The Climate and Coastal Protection Challenge addresses the stages of work required for desk-based assessments intended to calculate variables such as annual sea level rise, annual change in temperature and annual sediment mass balance over the North Sea Basin. The assessment was made using data when and where it was appropriately accessible. On several occasions, the data assessment exercise has resulted in a figure or a map being produced by way of a thorough trial of the entire process. It must be stressed, however, that it is the process of gathering, appraising and using the data to meet a certain challenge which is being evaluated here to inform the overall objectives of the North Sea Checkpoint project and not the result itself. Nonetheless, the creation of a number of results for key variables has allowed the assessment of data quality through each stage of a challenge (data gathering, initial appraisal of the data, analysis and quality assurance of results), therefore providing different insights into the accessibility and usefulness of a datasets at each stage.

Finally, all data gathered has been itemised in the Data Adequacy Assessment Database (DAAD), providing a searchable record of each of the datasets reviewed and the results of its evaluation when considered for one or more challenges. Separately, the DAAD is being transformed to be made available via the project website.

2. Aim

The primary aim of the Climate and Coastal Protection Challenge is to assess the possibility of producing very specific spatial data layers and time history plots for selected climate and coastal variables for the study area of the North Sea Basin. The challenge is to be carried out on the basis of existing data in order to assess whether the availability, consistency and resolution of the data are sufficient. Information gathered during this challenge provides a detailed assessment of the data gaps and priorities of observations and data on climate and coastal parameters required for coastal protection in the North Sea Basin.

This challenge was split into two sets of assessments: (1) to produce spatial data layers for the past 10, 50 and 100 years and; (2) to produce time history plots averaged over the whole Basin of selected climate and coastal process variables for different depths and geographic locations.

1. The spatial data layers produced are:
    a. Average annual sea-level rise[1] at the coast (absolute and relative to the land);
    b. Average annual change in temperature at surface, midwater (also referred to and interpreted as mid-depth) and sea-bottom (also referred to and interpreted as near-bed);

[1] Terminology from the project definition has been used for these variables, but it is noted that this, and other similar variables listed here, are also commonly referred to as ‘annual average’.

   c. Sediment mass balance at the coast.
2. The time history plots (at least 50 years of data) are produced as:
   a. Average annual sea temperature over sea-basin at surface, midwater column (mid-depth) and bottom (near-bed);
   b. Average annual changes in internal energy of sea;
   c. Average annual sea-level rise relative to the land for each NUTS3 region along North Sea coast;
   d. Annual sediment balance along North Sea coast for each NUTS3 region along North Sea coast.

Also, the challenge is to be undertaken from the perspective of a data user or a consultancy company requiring easy access and interpretation of sea level, sea temperature and sediment data. The challenge is not to be undertaken from the perspective of a scientist looking to predict future marine climate or to reconstruct past climate. In particular, it should be highlighted that climate scientists often refer to longer periods of time or epochs than those defined in the Climate and Coastal Protection Challenge.

3. Context

Sea temperature and internal energy of the sea

Sea Surface Temperature is most often collected via remote sensing and is not measured directly but is inferred from the radiance of various wavelength bands which are then used to calculate an inferred temperature. The relationship between the measured wavelength and the inferred temperature is dependent on the exact method used to calculate the temperature and the instrumentation on the carrier (e.g. satellite), which collected the wavelength data. Midwater and sea bottom temperatures are usually not collected using satellite data and where direct measurements have not been collected these temperatures are inferred using the sea surface temperature data.

Internal energy is a thermodynamic property which is a function of kinetic and potential energy. In the case of the sea, the variables required to estimate the internal energy are the water temperature and salinity.

Sea level rise and sediment mass balance

Sea level rise is influenced by changes in atmospheric pressure and temperature, melting of sea ice and the polar ice caps and water temperature. Past measurements of sea level rise have been carried out at select locations since the 18th Century and have indicated an average sea level rise of 1.5mm/year in the North Sea since 1850 (Permanent Service for Mean Sea Level, 2012). Both relative sea level rise (i.e. the change relative to land) and absolute sea level rise (i.e. the change in sea level if land were not a factor) are plotted for the spatial data layers in this study. Given the ranges of period defined in the aim of the study (see Section 2) the assessment of historical sea level rise are considered as annual averages for the 10-, 50- and 100-year periods when possible.

Sediment mass balance for the purpose of this project has been interpreted as the type of sediment present and its repartition along the North Sea coast. This will include inorganic suspended sediment, small particles, sand, silts and gravels. There is no comprehensive dataset available to draw conclusions on sediment budget (or the quantity of sediment in movement) in the North Sea Basin overall. An extensive literature review would be necessary to gather all site specific information available in various forms from the published literature.

4. Method

Firstly, a very broad literature review was carried out to determine the available datasets, their cost and licensing agreements, their documentation and quality check procedures and their appropriateness to compute each of the following parameters:

- Sea level;
- Sea surface temperature;
- Mid and bottom sea water temperature;
- Sediment type.

All data gathered were itemised in the DAAD.

Once available datasets were identified, their appropriateness for the challenge was evaluated, as far as the documentation allowed, in term of their accuracy and consistency, and was further filtered with different criteria as follows:

- Spatial Coverage;
- Temporal coverage;
- Data access or delivery;
- Data use.

That dataset evaluation allows the best data to be selected to meet the challenge objectives outlined in Section 2**Error! Reference source not found.**. More details about the criteria are given in Section 6.2. All conclusions drawn from the above were added to the DAAD.

5. Data

A wide range of data types and sources were identified, downloaded when possible and reviewed for the challenge. The primary sources of the larger sets of data seem to be split into two online resources categories:

- EU funded websites (EMODnet portals, MyOcean); and
- National government funded resources (BODC, NOC resources, NASA).

Table 5.1, below, lists those datasets deemed suitable to answer the objectives of the Climate and Coastal Protection Challenge. It gives the full dataset names and information on the type of data. Table 5.2, below, lists the suitable datasets and the corresponding objectives the dataset can meet. Datasets are assigned codes such as ‘DT.Clim.NS016’ where ‘Clim’ refers to the ‘Climate and Coastal Protection Challenge’, NS ‘North Sea’ and 016 a sequential number. Please refer to the DAAD for more information.

Table 5.1: Data suitable in meeting the Climate and Coastal Protection Challenge

Data	Inspire theme	Sources Suitable
Sea Level Tide gauges	3.15 Oceanographic geographical features	DT.Clim.NS016-The Permanent Service for Mean Sea Level Rise
Sea Level Satellite Altimetry	3.15 Oceanographic geographical features	DT.Clim.NS017-MyOcean - Global Ocean Along-Track Sea Level Anomalies Reprocessed (1993-Ongoing)
Models SSH, Sea Water Potential Temperature and Salinity	3.15 Oceanographic geographical features	DT.Clim.NS024-MyOcean - Global Ocean Physics Reanalysis GLORYS2V3 (1993-2013) DT.Clim.NS026-MyOcean - Global Ocean Physics Reanalysis ECMWF ORAP5.0 (1979-2013)
Reconstructed Sea Level	3.15 Oceanographic geographical features	DT.Clim.NS042-PODAAC - Reconstructed Sea Level Version 1
Reconstructed SST	3.15 Oceanographic geographical features	DT.Clim.NS043-PODAAC - Smith and Reynolds NCDC Level 4 Historical Reconstructed SST Monthly Version 3b NetCDF

Table 5.2: Data suitable in meeting the Climate and Coastal protection Challenge with corresponding objectives

Objectives		Spatial layer for the past 10 years	Spatial layer for the past 50 years	Spatial layer for the past 100 years	Time plot for the Sea Basin	Time plot for each NUTS3 Regions
Annual Change in Sea Level Rise		DT.Clim.NS017 DT.Clim.NS024 DT.Clim.NS026	DT.Clim.NS042	-	X	DT.Clim.NS042
Annual Change in Temperature	Surface	DT.Clim.NS024 DT.Clim.NS026 DT.Clim.NS043	DT.Clim.NS043	DT.Clim.NS043	DT.Clim.NS043	DT.Clim.NS043
	Midwater	DT.Clim.NS024 DT.Clim.NS026	-	-	-	-
	Bottom	DT.Clim.NS024 DT.Clim.NS026	-	-	-	-
Annual Change in Sediment mass Balance		-	-	-	X	-
Annual Change in Internal Energy of the sea		X	X	X	-	X

X: Not an Objective

Only two datasets were found to provide records combining both a long period of time and a fairly resolved geographical coverage of the North Sea Basin: DT.Clim.NS042 and DT.Clim.NS043. Those datasets are readily available, with documentation, related scientific articles available and data hosted on a well maintained data server (at PODAAC). Both datasets are distributed free of charge as NetCDF files.

The dataset DT.Clim.NS042 is a reconstructed sea level from 1950 to 2009, with a 0.5 degree spatial coverage and a yearly mean temporal resolution. Tide gauge data from the PSMSL (DT.Clim.NS016) and satellite altimetry data are both combined to reconstruct the sea level using cyclostationary empirical orthogonal functions ([1] *Hamlingdon et al.*, 2011). The dataset DT.Clim.NS043 used the same type of method. Sea Surface Temperature from 1854 to nowadays is reconstructed from *in situ* SST data combined with statistical methods ([2] Smith *et al.*, 2008).

The other two datasets identified in Table 5.1, DT.Clim.NS024 and DT.Clim.NS026, were downloaded from the MyOcean website after registering to the website. Both datasets are modelling results from different versions of the global model based on the NEMO software, reanalysed and corrected on the basis observations from different sources. Output variables from those models are daily mean of the Sea Surface Height (SSH), the sea water potential temperature and the salinity. Spatial coverage is 0.25 degree, the vertical grid consists in 75 levels from the surface to the bottom (near 6,000 m deep). DT.Clim.NS024 gives data from 1993 to 2013 and DT.Clim.NS026, from 1979 to 2013.

6. Results

6.1. Challenge output

6.1.1. Introduction

The Climate and Coastal Protection Challenge has presented difficulties, not least because data availability for the past 50 and 100 years – and in some cases for most recent years - is limited.

Tide gauges are the principal sources of data for long historical sea level measurements. However, the spatial coverage is restricted to single points situated on coastlines, islands and offshore platforms. Satellite altimetry has been providing continuous, near global sea level measurements but only for the past 25 years.

It is noted that recent research initiatives established methods to reconstruct historical sea level maps by combining historical measurements from tide gauges and satellite altimetry data. The output of one of these recent research initiatives was made available through the NASA website. It gives a reconstructed sea level from 1950 to 2009. Information and sea level rise computed from this dataset is presented in Section 6.1.2.

It is worth noting that in climate science, a typical time-step (“epoch”) is considered to be thirty years, thus highlighting the short timescales being considered here. A thirty year period is used, as it is long enough to filter out any inter-annual variation or anomalies, but also short enough to be able to show longer climatic trends ([3] WMO).

6.1.2. Trends calculated from reconstructed Sea Level (PODAAC)

[1] *Hamlingdon et al.*, 2011, used cyclostationary empirical orthogonal functions, derived from satellite altimetry, and combined with historical sea level measurements from tide gauges to create the Reconstructed Absolute Sea Level dataset spanning from 1950 through to 2009. Combining the altimetric

and tide gauge records alleviates the difficulties caused by the short record length and poor spatial distribution of the satellite altimetry and tide gauges, respectively.

This dataset (DT.Clim.NS042) is freely downloadable from the NASA website and easy to use (standard NetCDF format). The dataset covers the globe with a spatial resolution of 0.5 degree and a 7 days temporal resolution from June 1950 to June 2009. Of course, this does not allow the analysis of tidal constituents but it does provide a global trend over several decades.

In order to test computation of the average annual sea-level rise for the challenge using this source, applications were developed to acquire, read, interpret and further transform the dataset (from a NetCDF form). The annual Mean Sea Level (MSL) (the average sea level in one year) was computed for each point, to which a linear regression analysis was applied. The resulting trend is the annual sea level rise.

The result of the process is illustrated in the Figure 6.1 for a given point. The data from DT.Clim.NS042 is in blue, the annual absolute MSL is in black, and the trend calculated by linear regression is in red.

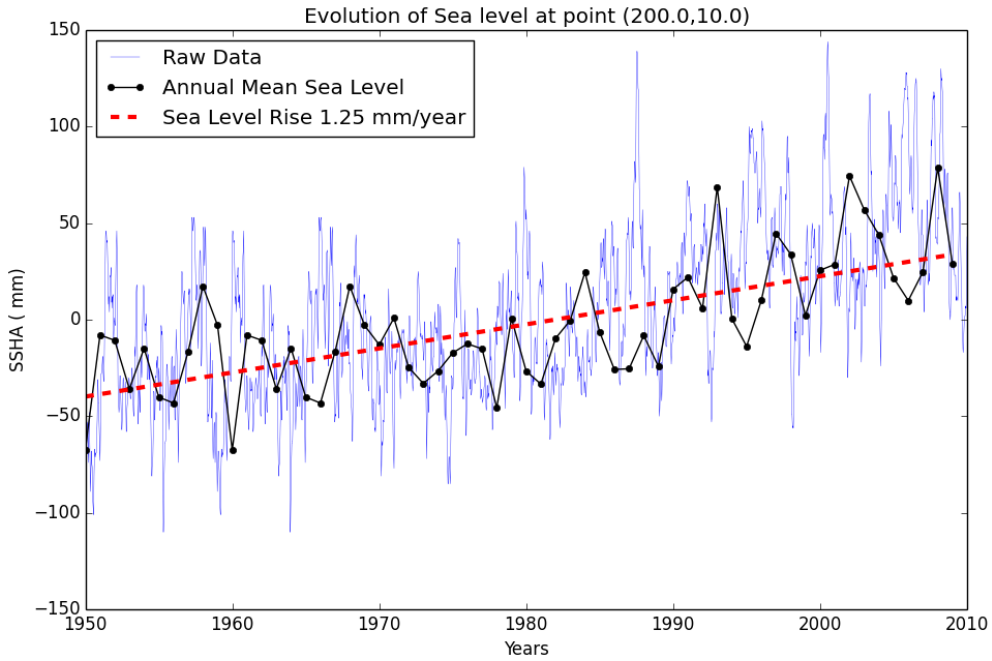


Figure 6.1: Example of Method used to calculate the annual absolute Sea Level Rise from the dataset DT.Clim.NS042

Once the analysis had been carried out at all locations, the data was interpolated to produce an isocontour map covering the North Sea (Figure 6.2).

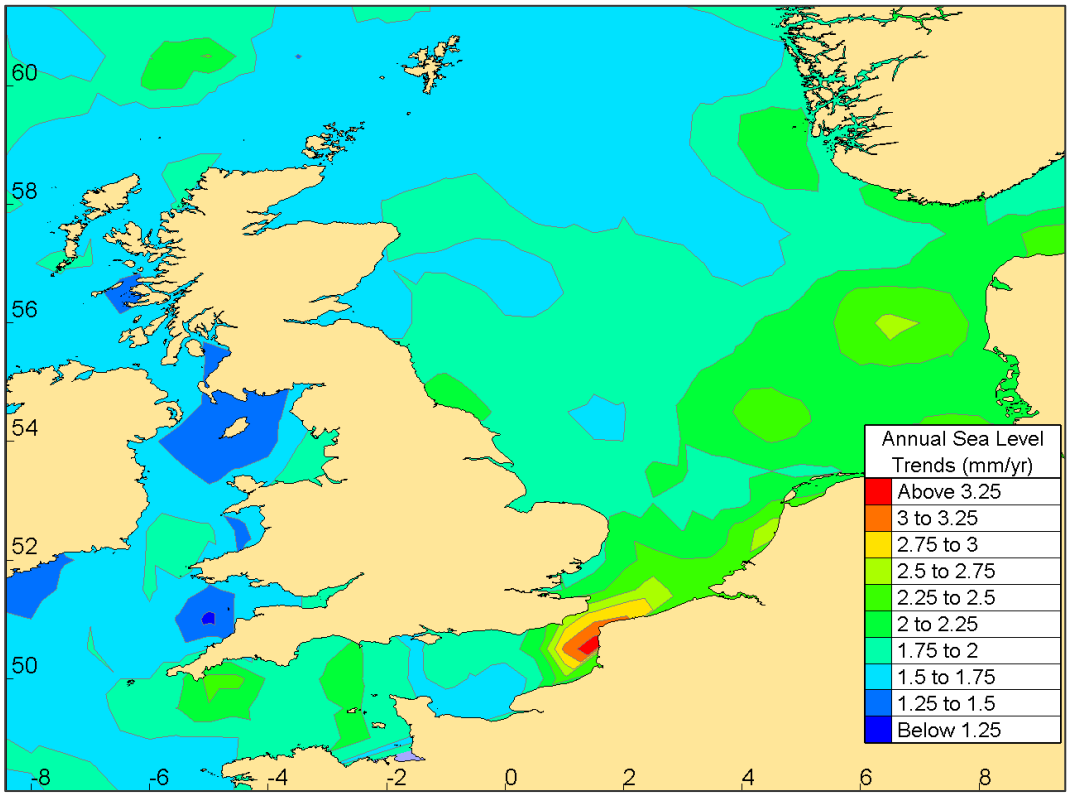


Figure 6.2: Absolute Annual Sea Level Rise from 1950 to 2009, computed from the dataset DT.Clim.NS042

It is noted that the results given by the Figure 6.2 are extracted from DT.Clim.NS042, and as such, may include undocumented assumptions which could explain possible differences with other datasets. Again, the purpose of the challenge is to assess the availability and accessibility of the data over a complete scientific assessment of the results obtained. Following that objective, the dataset DT.Clim.NS042 is concluded to be suitable to assess the annual absolute MSL Rise for the past 50 years, although validating results such as those obtained here requires further assessment.

The reader is asked to refer to the documentation and article delivered with that dataset. The article gives a large amount of details about methods and data sources used to compute the reconstructed sea levels, but it may be too complex to be valuable for non-expert users. As result, it is advised to use this dataset with caution.

6.1.3. Outcome

It is important to note that the past 6 years are missing from the data source which compromises the computation of the requested MSL Rise for the last 10-year period (as a deliverable to the Climate and Coastal Protection Challenge). Therefore the map of the annual sea level rise from 1950 to 2009 produced is probably suitable to assess the average annual sea level rise for the past 50 years, but is not suitable for the deliverable covering the past 10 years.

Finally, the same method can be used to compute the average annual change in the Sea Surface Temperature, from the dataset DT.Clim.NS043 and for the past 10, 50 and 100 years or even for the past 150 years as the dataset provides data from 1854.

6.2. Data adequacy

Data adequacy for the Climate and Coastal Protection Challenge is reported under the six value assessments used for screening the data.

6.2.1. Contribution – Does the data contain the right parameters?

At first sight there is a large amount of data sources and data types available that can contribute to solving the Climate and Coastal Protection Challenge. The difficulties arise when investigating deeper into these datasets to actually produce one of the variables. It is difficult to appraise the precise contribution that data sources can make unless the data is processed and used from the perspective of a data user or a consultancy company. For example, the metadata may be too imprecise to rule data in or out and there may be no lineage information to verify the provenance of the data and hence the value of its contribution. As a result, the range of data considered, downloaded and reviewed was much broader than the data deemed appropriate for use.

The most frequently found parameters are sea level and sea surface temperature. Temperature profiles and salinity are slightly less common datasets. The rarest parameter is information on sediment balance, which is non-existent at the scale of the North Sea Basin.

6.2.2. Location – Does the data cover the correct time / space location?

As previously mentioned in the specific case of tide gauges, measurements and observations give the longest data history but their spatial coverage is restricted to single points usually situated at the coast. Satellite altimetry data has near global spatial coverage but only from the 1990s.

Therefore, datasets including SSH and SST for the past 10 years with a spatial coverage from 2km to 50km are relatively accessible from satellite data. However, to construct long history records and near global spatial coverage, scientists had to calculate and extrapolate SSH and SST from measurements and satellite data with mathematical methods.

Reconstructed sea water potential temperature does not exist, nor does reconstructed sea water salinity. Only Global models with reanalysis give this data for the past 10 to 30 years.

6.2.3. Commercial – Are the commercial terms acceptable?

All gathered data for the Climate and Coastal Protection Challenge is freely available. No commercial product was identified as appropriate for the long term data, which could imply that there is no market for historical data outside research.

6.2.4. Attributes – Does the data have the correct attributes?

During the review of possible data sources, it was found that there were considerable overlaps between websites, particularly for National Government and EU funded data. In many cases, the same data source was available through different websites but presented differently, raising questions on which was the most up-to-date and definitive version. There were similarly themed datasets also available through different government funded resources, although the data needed to be compared and metadata reviewed thoroughly before being able to decide whether the datasets were the same or not.

Where the same data was available from more than one source, and the metadata seemed similar but different, the data had to be downloaded from both sources for comparison purposes to ensure that the most up-to-date version was used. Data from multiple sources was grouped by type and assessed to identify the sources best suited to meet the challenge. For example, tide gauge data was downloaded from BODC (DT.Clim.NS011) and from PSMSL (DT.Clim.NS016) and compared to one another. In the end, while the two tide gauge datasets were exactly the same in the UK, the data from the PSMSL was used because the website assembles tide gauge data from all around the world and hence more comprehensively covers the North Sea Basin.

Regarding the accuracy of the data, it was difficult to identify if the data was sufficiently accurate for the purpose of the Challenge before downloading and processing. It is particularly complex to find the right dataset in MyOcean or PODAAC products, for instance. While many products seem to be appropriate to the Challenge requirements (the spatial and the temporal coverages, the assumptions made for each parameter), measuring instruments, numerical models or data sources are very different between different sources.

For instance, one of the MyOcean products, DT.CLim.NS030 from NERCPOL, was considered and seemed suitable for the challenge (and would be for a data user or consultancy company) until the annual sea level trends were calculated (Figure 6.3). From those results we notice that the sea level seemed to decrease all around the Northwest shelf, which is not correct compared to tide gauge data or published sea level research. After reading the product documentation in detail and other articles about sea level rise research, it was found that the MyOcean product, DT.CLim.NS030 from NERCPOL does not consider the melting of the ice caps, which is essential for sea level trend research.

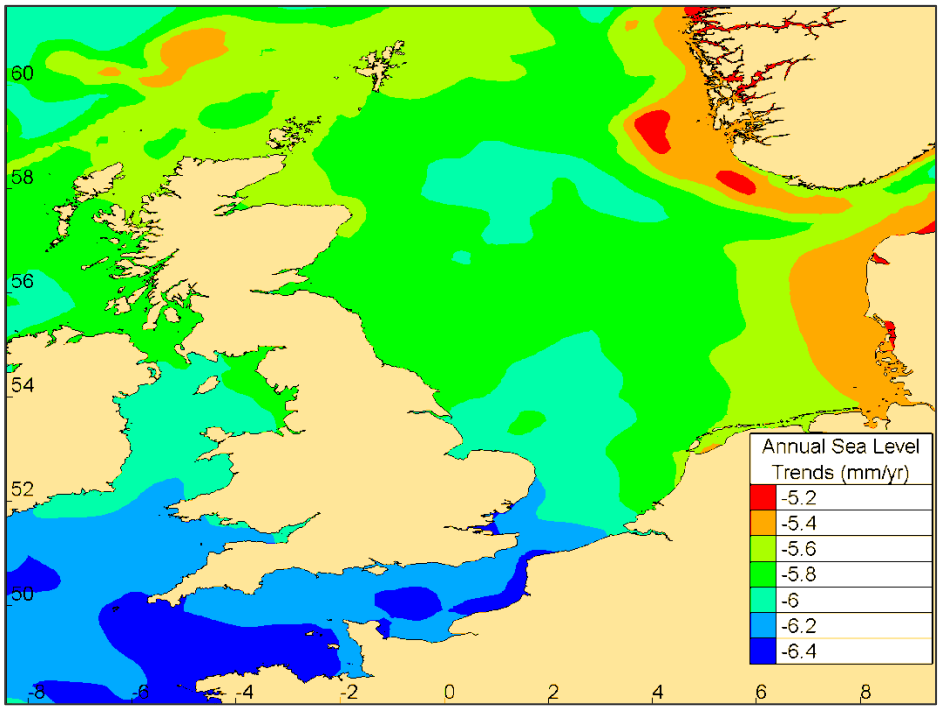


Figure 6.3: Absolute annual sea level trends calculated from DT.CLim.NS030

In conclusion, whilst data sources are typically appropriately attributed and accompanied by additional metadata, this is often not sufficient to easily determine the fitness for purpose. For example, the coverage or accuracy of modelling data sources is difficult to assess since the accuracy assessment may require unpacking the raw dataset itself. For observations, which are only available at single locations, the datasets are more manageable and the accuracy or the appropriateness of the dataset is easier to establish.

6.2.5. Delivery - Can the data be provided to match the timeframe of the challenge?

The majority of the datasets reviewed for the challenge were easily accessible, downloaded from the internet, sometimes following registration to a website. This was the case for all of the freely available resources assessed. The requirement for registration was not considered to be a barrier to data access, although in some instances, where the registration process was not automated, the response from the data provider could be slower.

Datasets could be up to several gigabytes in size causing long download times and high processing demand. This is particularly true for datasets computed from models, such as potential temperature output. Indeed, the size of a dataset increases with increasing two-dimensional spatial resolution, increasing temporal resolution and when a vertical dimension is also incorporated.

Moreover, there were instances when downloading a large amount of data would fail. For example, on the NOOS website (DT.Clim.NS045), when downloading the temperature, salinity and water level data within one request, the download would fail randomly, or appear to be successful, but for the zip file to be corrupted and impossible to read.

6.2.6. Usability – Is the data format and supporting information suitable?

Most of datasets identified for the Climate and Coast Protection Challenge are either time series delivered in ASCII format or numerical model results delivered as NetCDF files. Those two formats are standard and easy to visualise. However, the variables required by the challenge need processing of the datasets before being computed. For instance, monthly or yearly mean sea level or average temperature are available. Specific processing tailored to individual datasets is needed to obtain the annual change in temperature or the annual sea level trends, for instance. Consequently, those datasets would not be readily suitable for non-expert users.

Usable data for non-expert users is rare and mainly for informative purposes only. For example, NOAA (DT.Clim.NS046) provides maps and downloadable tables of sea level trends. Other data for non-expert users includes maps of annual change in sea surface temperature and mean sea level, produced from published researches like [1] *Hamlingdon et al.*, 2011 and, [2] Smith *et al.*, 2008.

6.3. Key Data gaps

As underlined so far in this report, the Climate and Coastal Protection Challenge has identified many useful and appropriate datasets, but also significant limitations in that available.. Significant gaps exist in the requested datasets. The main gaps are a lack of long time history and an absence of sediment data.

6.3.1. Mean sea level rise

As highlighted in Section 6.1.1, tide gauge data is the principal source of data for long history sea level measurements. However, the spatial coverage is restricted to single points situated on islands, offshore platforms and coastlines. Still, very long time history is rare, particularly for 50 or 100 years.

Figure 6.4 shows the progressive history of the presence of tide gauges in time. There are intermittent records of sea level at Amsterdam from 1700 and three more sites in Northern Europe starting after 1770. Figure 6.5 gives more details about tide gauge data in Northern Europe from the PSMSL (DT.Clim.NS016). It is noted that tide gauges are unequally spread. For example, many more tide gauges are located on the coast of France, Belgium and the Netherlands than on the English coast. Tide gauges are even more irregularly spread when looking at long historical records (50 and 100 years).

When calculating annual sea level trends at different locations (method in section 6.1.2), no pattern appears and trends seem different from one location to another (Appendix A).

Considering all those variances (scattered spatial coverage, lack of long historical records and the difference between trends), it is impossible to obtain accurate sea level trends whether at the coast, or for each NUTS3 zone.

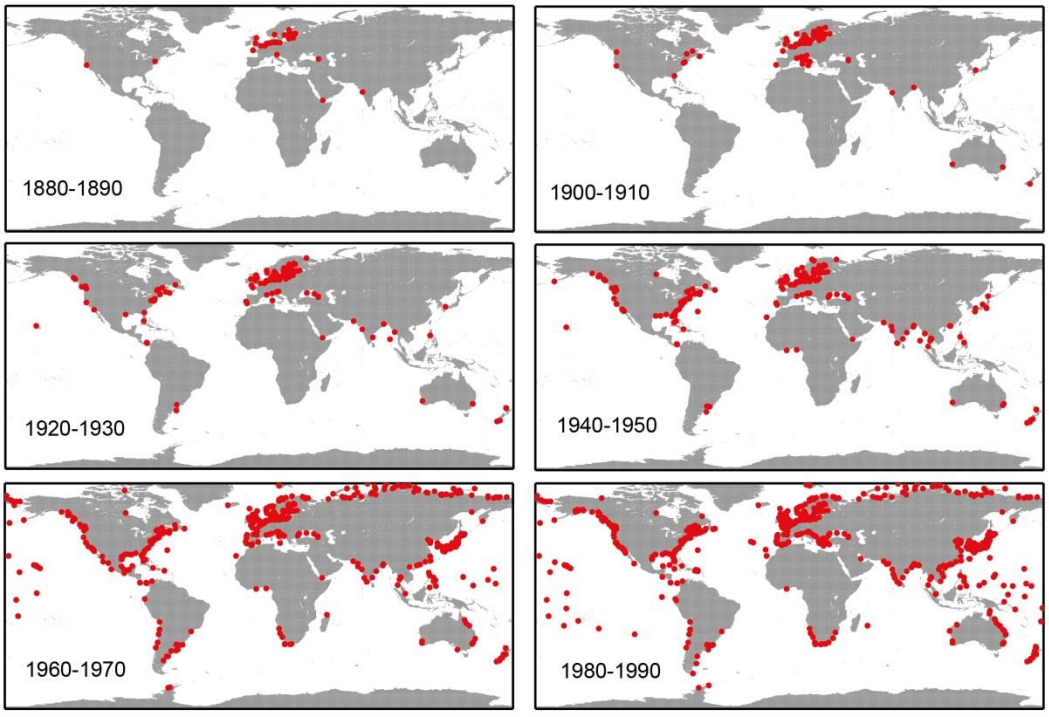


Figure 6.4: Location of tide gauges (red dots) with at least one year of observations within the decade indicated

Source: IPPC, Climate change 2013: The Physical Science Basis

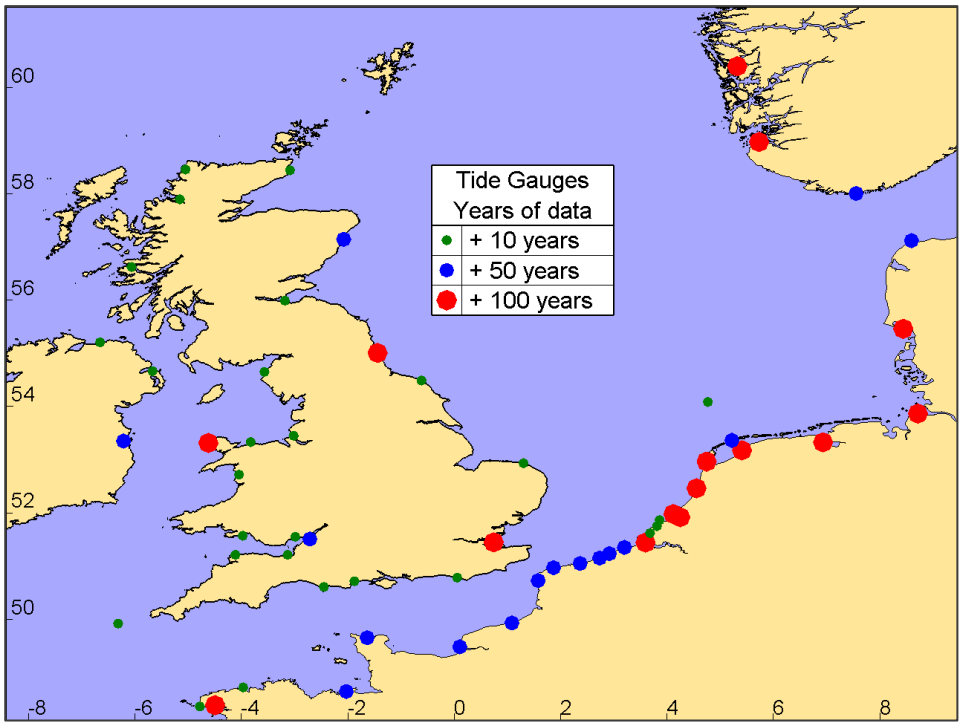


Figure 6.5: PSMSL Tide gauge data – Number of years of observations

Since the 1990s, satellite altimetry has provided accurate measurements of the SSH with near global coverage. These relatively short records, however, provide no information about the state of the ocean prior to this time. Furthermore, the earlier satellite altimetry data has a coarse resolution (20km to 50km).

A reconstruction of the mean sea level was carried out from both tide gauges (longer time records) and satellite altimetry data (larger geographical coverage). This was done in the dataset (DT.Clim.NS042) used for the Climate and Coastal Protection Challenge (see Section 6.1.2). However, it only provides a relatively short window in time, from 1950 to 2009, which is not long enough to compute the requested MSL Rise for the last 100-year period (as a deliverable to the Climate and Coastal Protection Challenge).

6.3.2. Average annual change in Temperature

Sea Surface Temperature

Sections 5 and 6.1.3 explain how the dataset DT.ClimNS043 (a reconstructed sea surface temperature from 1854 to today) has been found to be suitable to compute the average annual change in sea surface temperature, for the past 10, 50 and 100years.

However, for the observed data the dataset is reconstructed from, the gaps are similar as those identified for sea level datasets. Long history records (ships, moorings, buoys) are at singular locations and satellite data has a short and recent historical record.

Mid-depth and near-bed temperature

The only sources of data for mid-water and sea-bottom temperature seem to be from global numerical models with reanalysis (DT.Clim NS024 and DT.Clim NS026). These datasets have been corrected with available observations. However, those model results provide only data for the past 10 to 35 years. No

suitable dataset was found to assess the average annual change in temperature at mid- depth and at near-bed for the past 50 and 100 years.

6.3.3. Sea internal energy

The sea's internal energy is calculated from the temperature and salinity profiles. Therefore the same conclusions apply as for the average annual change in temperature at midwater and at sea bottom. There is insufficient data available to assess the average annual change in the sea's internal energy for the past 50 and 100 years.

6.3.4. Sediment mass balance

The geology data available from the EMODnet portal, OneGeologyal or the European Atlas of the Seas provided only a rough indication of sediments near the coast. No datasets were found to compute the sediment mass balance and no historical sediment data was found.

7. Discussion and Conclusions

7.1. Discussion

The Climate and Coastal Protection Challenge has been partially met, identifying many useful and appropriate datasets but also encountering significant limitations, especially because data availability for the past 50 and 100 years – and in some cases for most recent years – is limited.

Tide gauges are the principal sources of data for long history sea level measurements. However, the spatial coverage is restricted to single points situated on islands, offshore platforms and coastlines. On the other hand, satellite altimetry has been providing continuous, near global sea level measurements albeit only for the past 25 years.

The quality assessment of data was a step-by-step process, based on assessing accessibility of data, relevance, usability and usefulness. Processing the data to compute variables and mapping also highlighted issues with data quality and suitability, all of which varied widely between datasets.

The following key points regarding data adequacy for the North Sea have been identified through the completion of the Climate and Coastal Protection Challenge.

- Data **Usability:**

  Data identified is delivered in two main formats: ASCII and NetCDF. Those formats are standard and, as such, typically easy to use. However it is only relatively easy to use for engineers or scientists and not straightforward to use or even read for non-expert users.

- Data **Delivery:**

  Most data available was simple to download. Download times could be a bit long for global datasets, but it was not a major issue as data was accessible through FTP websites.

- Data **Location:**

  Data location was an issue with long history data. The spatial coverage for long record observations (50 and 100 years) is really poor. Since the 1990s satellite altimetry provides near global measurements of sea level and sea surface temperature. Therefore it is not possible to have long history observations and

a regular spatial coverage at the same time. Reconstructed maps using both observations and satellite data can fill some gaps but many remain.

- Data **Attributes:**

  A large proportion of the data identified is observations or measurements, which are sufficiently attributed and accurate for climate change assessment. Another large proportion are numerical model results. For those, it is more difficult to ascertain suitability from the attributes and supporting information. Some North Sea models with reanalysis are not considering important climate drivers such as the effect of the ice cap melting.

- Data **Contribution:**

  In many cases, similar datasets, referred to from common sources, were available through different websites, raising questions on which was the most up-to-date and definitive version. There were similarly themed datasets also available through different government funded resources. Thorough comparison of the data and its metadata were necessary to decide whether these were, indeed, the same. Such comparison consumed a large amount of time.

- Data **Access:**

  All data identified and used for the climate challenge is freely available, with a fair amount accessible after registering through a website.

7.2. Conclusions

The key conclusions for the Climate and Coastal Protection Challenge are as follows:

- The Climate and Coastal Protection Challenge was partially met with the data available. While one spatial layer was produced (the annual absolute sea level rise for the past 50 years, for illustration purposes), the following spatial layers and time history plots **can be produced** from suitable datasets identified in the Table 5.1:
  - Spatial layer of the annual mean sea level rise for the past 10 and 50 years;
  - Spatial layers of the annual change in sea surface temperature for the past 10, 50 and 100 years;
  - Spatial layers of the annual change in temperature at mid-depth and near-bed for the past 10 years;
  - Time plot of the annual mean sea level rise for each NUTS3 region;
  - Time plot of the annual change in sea surface temperature over the North Sea Basin.
- The main gaps identified were the lack of long historical observations and the poor spatial coverage of measurements. Only satellite data allows a near global spatial coverage. Sediment mass balance data also seems to be non-existent. Consequently, the following spatial layers and time plots **cannot be produced**:
  - Spatial layer of the annual mean sea level rise for the past 100 years;
  - Spatial layers of the annual change in temperature at mid-depth and near-bed for the past 50 and 100 years;
  - Spatial layers of the annual sea temperature at midwater and sea bottom over the North Sea Basin;
  - Spatial layer of the sediment mass balance at the coast;
  - Time plot of the annual change in temperature at midwater and sea bottom;
  - Time plot of the sediment mass balance for each NUTS3 region;
  - Time plot of the average annual change in internal energy of sea.

- Some of the outputs necessary for the Climate and Coastal Protection Challenge had to be computed from available datasets. Time spent on writing scripts to process specific and unique datasets, to compute variables and display them is non negligible and needs be considered for any research or project. As a result, a large amount of data identified by this challenge is not usable for non-expert users.
- There is a plethora of EU-level websites offering data that would be appropriate to the project. These data sources are, however, often derived from a combination of the same sources. The interpretation and the investigation into this combination of sources remains difficult and requires investigative analysis to determine the true value of each of the datasets. There is a need to adopt persistent signposting services (like that being proposed by North Sea Check Point) to broker the right data to the right application.

8. References

1. Hamlington, B. D., Leben, R. R., Strassburg, M. W. and Kim, K.-Y. (2014), Cyclostationary empirical orthogonal function sea-level reconstruction. Geoscience Data Journal. doi: 10.1002/gdj3.6.
2. Smith, T.M., R.W. Reynolds, T.C. Peterson, and J. Lawrimore, 2008: Improvements NOAAs Historical Merged Land–Ocean Temp Analysis (1880–2006). Journal of Climate, 21, 2283–2296.
3. World Meteorological Organisation (WMO), Climate Data and Data Related Products, Web link: http://www.wmo.int/pages/themes/climate/climate_data_and_products.php.

Appendices

A. Annual Relative Mean Sea Level trends from PSMSL tide gauge data

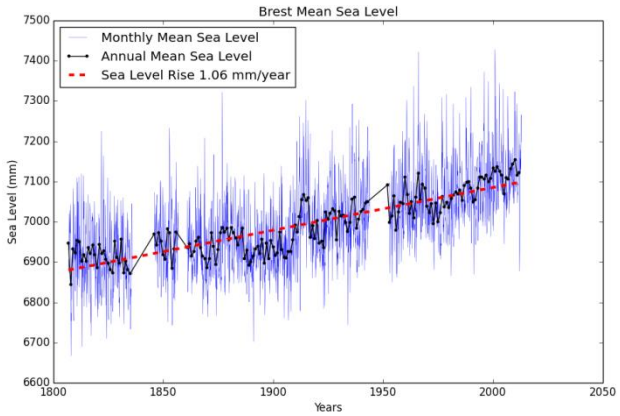


Figure A.1: Brest MSL

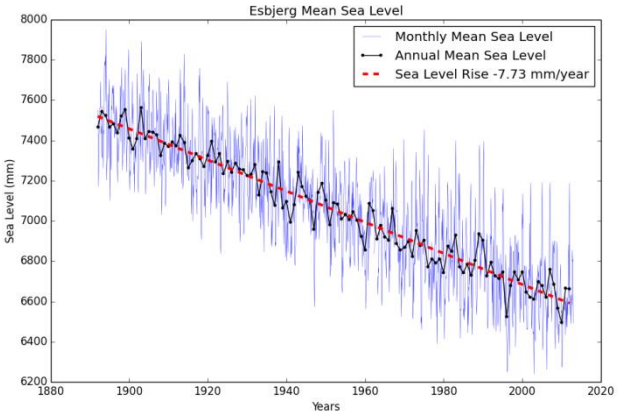


Figure A.2: Esbjerg MSL

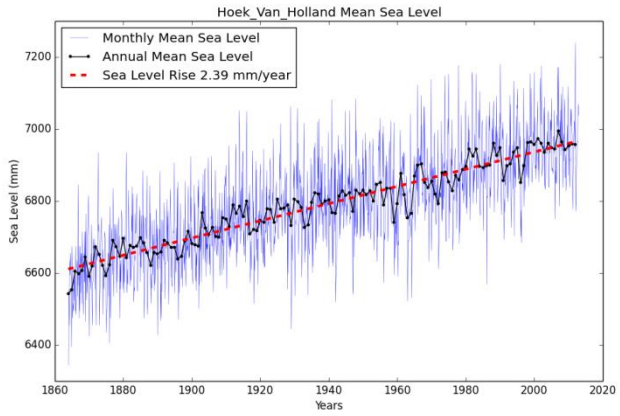


Figure A.3: Hoek Van Holland MSL

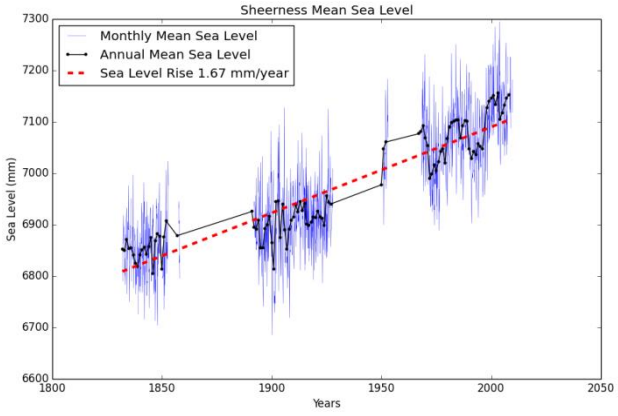


Figure A.4: Sheerness MSL

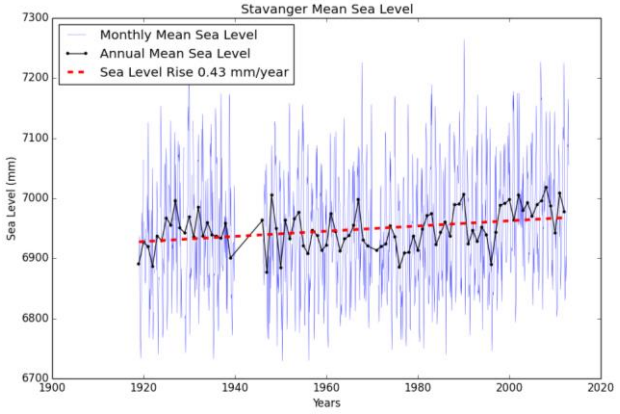


Figure A.5: Stavanger MSL

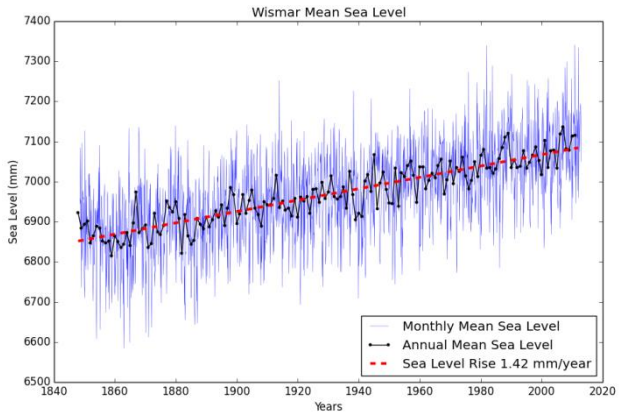


Figure A.6: Wismar MSL

B. Data Assessment

Valuation of the data to solving a challenge (a sheet per challenge)

NSC-004-Clim

Data Set	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
DT.Clim.NS001-EMODNET Physics portal for water temperature	NotConsidered	Contribution	True	point data, good for calibration/validation
NSC-004-Clim		Location	True	
		Commercial	True	free
		Attributes	True	many
		Delivery	False	can download many datasets at the same time, but download files sometimes wouldn't open
		Usability	True	a lot of post processing needed
DT.Clim.NS002-EMODNET Physics portal for sea level	NotConsidered	Contribution	True	point data, good for calibration/validation
NSC-004-Clim		Location	True	
		Commercial	True	free
		Attributes	True	many
		Delivery	False	can download many datasets at the same time, but download files sometimes wouldn't open
		Usability	True	a lot of post processing needed
DT.Clim.NS003-EMODNET Physics portal for currents	NotConsidered	Contribution	True	point data, good for calibration/validation
NSC-004-Clim		Location	True	
		Commercial	True	free
		Attributes	True	many
		Delivery	False	can download many datasets at the same time, but download files sometimes wouldn't open
		Usability	True	a lot of post processing needed
DT.Clim.NS004-European Atlas of the Seas - Coastal geology	NotConsidered	Contribution	True	
NSC-004-Clim		Location	False	info about geological nature of the coasts (include sediment types)
		Commercial	True	
		Attributes	True	many
		Delivery	False	clickable maps (no download)
		Usability	True	for model setup
DT.Clim.NS005-European Atlas of the Seas -tidal amplitude	NotConsidered	Contribution	True	points
NSC-004-Clim		Location	False	just points around coasts (100km away)
		Commercial	True	
		Attributes	True	many
		Delivery	False	clickable maps (no download)
		Usability	True	for model validation
DT.Clim.NS006-European Atlas of the Seas - Sea level change per year (mm)	NotConsidered	Contribution	True	points
NSC-004-Clim		Location	False	just points around coasts (100km away)
		Commercial	True	
		Attributes	True	many
		Delivery	False	clickable maps (no download)
		Usability	True	for model validation
DT.Clim.NS007-European Atlas of the Seas - Seabed sediments	NotConsidered	Contribution	True	
NSC-004-Clim		Location	False	very few samples
		Commercial	True	
		Attributes	True	many
		Delivery	False	clickable maps (no download)
		Usability	True	for model validation
DT.Clim.NS008-EUSeaMap	Considered	Contribution	True	SeaMap website is active but data download is directed to the EMODnet portal.
NSC-004-Clim		Location	True	Covers North Sea and parts of the North Atlantic. Excludes Baltic, Southern Atlantic and Mediterranean
		Commercial	True	Freely available
		Attributes	True	Extensive attribution of habitat classifications including EUNIS

Data Set	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
		Delivery	True	Downloaded via the EMODnet portal
		Usability	True	Useful in characterising both seabed habitats and comparison with seabed sediment information (in the absence of other sediment data)
DT.Clim.NS009-One Geology	Considered	Contribution	True	Offshore sediment mapping viewable via the mapviewer through the EMODnet geology tab
NSC-004-Clim		Location	True	Europe
		Commercial	True	Freely downloadable
		Attributes	True	Attribute information had to be extracted from reports
		Delivery	True	Data downloadable as kml for terrestrial and marine geology and sediment data
		Usability	True	kml data could be converted for use in GIS but only as an image, therefore losing all attribute information. Data was used as no other freely available data could be found.
DT.Clim.NS010-Vannstand	NotConsidered	Contribution	True	Tide gauges
NSC-004-Clim		Location	False	Norway
		Commercial	True	
		Attributes	True	
		Delivery	True	
		Usability	True	different format available
DT.Clim.NS011-British Oceanographic Data Centre	NotConsidered	Contribution	True	mean sea level and CTD
NSC-004-Clim		Location	False	UK
		Commercial	True	need to be registered as a BODC web user
		Attributes	True	
		Delivery	True	zip files to download
		Usability	True	ASCII
DT.Clim.NS012-University of Hawai Sea Level Center	NotConsidered	Contribution	True	daily, hourly, sea level
NSC-004-Clim		Location	False	only few stations
		Commercial	True	
		Attributes	True	
		Delivery	True	
		Usability	True	csv or NetCDF
DT.Clim.NS013-COSNYA	NotConsidered	Contribution	True	
NSC-004-Clim		Location	False	mainly around Germany, with few data in the North Sea
		Commercial	True	
		Attributes	True	
		Delivery	True	download zip files for many sets
		Usability	True	NetCDF and xml files to be post processed
DT.Clim.NS014-REFMAR	NotConsidered	Contribution	True	Tide gauge data
NSC-004-Clim		Location	False	only in France
		Commercial	True	need to register (not automatic)
		Attributes	True	
		Delivery	True	request
		Usability	True	ASCII
DT.Clim.NS015-Previmer	NotConsidered	Contribution	True	
NSC-004-Clim		Location	False	France
		Commercial	True	Need to fill up form and send by email
		Attributes	True	
		Delivery	True	??
		Usability	True	
DT.Clim.NS016-The Permanent Service for Mean Sea Level Rise	Suitable	Contribution	True	
NSC-004-Clim		Location	True	worldwide but only point data, not suitable for spatial layer
		Commercial	True	
		Attributes	True	
		Delivery	True	
		Usability	True	

Data Set	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
DT.Clim.NS017-MyOcean - GLOBAL OCEAN ALONG-TRACK SEA LEVEL ANOMALIES REPROCESSED (1993-ONGOING)	Suitable	Contribution	True	SSH
NSC-004-Clim		Location	True	20km , 1993- present
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS018-MyOcean - GLOBAL OCEAN GRIDDED SEA LEVEL ANOMALIES REFERENCE CHANGE CORRECTION	Considered	Contribution	True	SSH
NSC-004-Clim		Location	True	0.25 degrees , 1993- present
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS019-MyOcean - GLOBAL OCEAN GRIDDED SEA LEVEL ANOMALIES NOISE NRT	NotConsidered	Contribution	True	SSH
NSC-004-Clim		Location	True	2 degrees , 1993- present
		Commercial	True	need to register
		Attributes	False	resolution considered too poor, given that better was available
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS020-MyOcean - GLOBAL OCEAN GRIDDED SEA LEVEL ANOMALIES NOISE REPROCESSED	Considered	Contribution	True	SSH
NSC-004-Clim		Location	True	20km , 1993- present
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS021-MyOcean - Global Ocean Mean Dynamic Topography	Considered	Contribution	True	SSH
NSC-004-Clim		Location	True	0.25 degrees , 1993- present
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS022-MyOcean - Global Ocean Mean Sea Surface	Considered	Contribution	True	SSH
NSC-004-Clim		Location	True	0.03 degrees , 1993- present
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS023-MyOcean - Global Ocean- CORA- In-situ Observations Yearly Delivery in Delayed Mode (1950-2013)	Considered	Contribution	True	Sea water Temperature Salinity
NSC-004-Clim		Location	True	spatial resolution: none , 1950 - present, -6000m to 0
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF

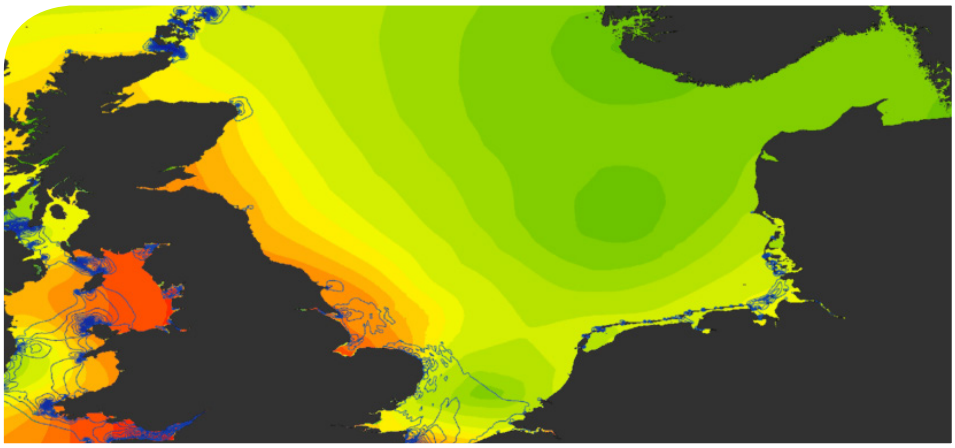
Data Set	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
DT.Clim.NS024-MyOcean - Global Ocean Physics Reanalysis GLORYS2V3 (1993-2013)	Considered	Contribution	True	SSH and Sea water potential temperature, Salinity
NSC-004-Clim		Location	True	0.25 degrees , 1993 - 2013, -5500m to 0
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS025-MyOcean - Global Ocean Physics Reanalysis CGLORS (1982-2012)	Considered	Contribution	True	SSH and Sea water potential temperature, salinity
NSC-004-Clim		Location	True	0.25 degrees , 1982- 2012, -5500m to 0
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS027-MyOcean - Global Ocean OSTIA Sea Surface Temperature and Sea Ice Reprocessed (1985-2007)	NotConsidered	Contribution	True	SST
NSC-004-Clim		Location	False	0.25 degrees , 1985- 2007 (missing the past 8 years)
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS028-MyOcean - Global Ocean- Delayed Mode gridded CORA- In-situ Observations objective analysis in Delayed Mode (1990-2013)	Considered	Contribution	True	Sea water temperature, salinity
NSC-004-Clim		Location	True	0.5 degrees , 1990- 2013, -2000m to 0
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS029-MyOcean - Atlantic - European North West Shelf - Ocean Physics Analysis and Forecast	NotConsidered	Contribution	True	SSH, Sea water temperature, Velocity, salinity
NSC-004-Clim		Location	False	7km, 2011 - present (not enough years)
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS030-MyOcean - Atlantic - European North West Shelf-Ocean Physics NON ASSIMILATIVE Hindcast from NERCPOL (1960-2004)	Considered	Contribution	True	SSH, Sea water temperature, Velocity, salinity
NSC-004-Clim		Location	True	12km, 1960 - 2004 (suitable for the past 50 years)
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS031-MyOcean - Atlantic- European North West Shelf-Ocean Physics NON ASSIMILATIVE Hindcast from IMR (1985-2008)	NotConsidered	Contribution	True	SSH, Sea water temperature, Velocity, salinity
NSC-004-Clim		Location	False	12km, 1985-2008 (missing the past 7 years)
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF

	Data Set	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
	DT.Clim.NS032-MyOcean - Atlantic- European North West Shelf-Ocean In-Situ Near Real Time observations	NotConsidered	Contribution	True	Temperature, Salinity
	NSC-004-Clim		Location	False	spatial resolution: none (point data, buoys, ships) , time coverage depends on the files/location/instruments
			Commercial	True	need to register
			Attributes	True	
			Delivery	True	ftp
			Usability	False	NetCDF (important amount of files)
	DT.Clim.NS033-MyOcean - EUROPEAN OCEAN ALONG-TRACK SEA LEVEL ANOMALIES NRT	NotConsidered	Contribution	True	SST
	NSC-004-Clim		Location	False	1985-2008 (missing the past 7 years)
			Commercial	True	need to register
			Attributes	True	
			Delivery	True	ftp
			Usability	True	NetCDF
	DT.Clim.NS034-MyOcean - European North West Shelf- Ocean Physics REANALYSIS from METOFFICE (1985-2012)	Considered	Contribution	True	Sea water temperature, Velocity, salinity
	NSC-004-Clim		Location	True	7km, 1985 -2012, -5000m to 0m
			Commercial	True	need to register
			Attributes	True	
			Delivery	True	ftp
			Usability	True	NetCDF
Ignored	DT.Clim.NS035-MyOcean - Atlantic- European North West Shelf-Ocean Physics NON ASSIMILATIVE Hindcast from IMR (1985-2008)	Null	Contribution	True	
	NSC-004-Clim		Location	True	
Entered Twice			Commercial	True	
			Attributes	True	
			Delivery	True	
			Usability	True	
	DT.Clim.NS036-MyOcean - Atlantic- European North West Shelf-Ocean Physics Reanalysis from IMR (1993-2012)	Considered	Contribution	True	SSH, Sea water temperature, Velocity, salinity
	NSC-004-Clim		Location	True	8km, 1993-2012 , -3000m to 0
			Commercial	True	need to register
			Attributes	True	
			Delivery	True	ftp
			Usability	True	NetCDF
	DT.Clim.NS037-MyOcean - European Ocean- Sea Surface Temperature Multi Sensor L4 three-hourly Observations	NotConsidered	Contribution	True	SST
	NSC-004-Clim		Location	False	2km , from 2014
			Commercial	True	need to register
			Attributes	True	
			Delivery	True	ftp
			Usability	True	NetCDF
	DT.Clim.NS038-MyOcean - European Ocean- Sea Surface Temperature Multi-Sensor L3 Observations	NotConsidered	Contribution	True	SST
	NSC-004-Clim		Location	False	2km , from 2012
			Commercial	True	need to register
			Attributes	True	
			Delivery	True	ftp

Data Set	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
		Usability	True	NetCDF
DT.Clim.NS039-MyOcean - European Ocean- Sea Surface Temperature Mono-Sensor L3 Observations	NotConsidered	Contribution	True	SST
NSC-004-Clim		Location	False	2km , from 2014
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS040-MyOcean - Atlantic European North West Shelf Ocean - ODYSSEA Sea Surface Temperature Analysis	NotConsidered	Contribution	True	SST
NSC-004-Clim		Location	False	2km , from 2010
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS041-MyOcean - Atlantic-European North West Shelf- In-situ Observations Yearly Delivery in Delayed Mode (1990-2011)	NotConsidered	Contribution	True	Temperature, Salinity
NSC-004-Clim		Location	False	spatial resolution: none (mooringsm drifters, ships), 1990-2013
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS042-PODAAC - Reconstructed Sea Level Version 1	Used	Contribution	True	SSH
NSC-004-Clim		Location	True	0.5 degrees , 1950 - 2009
		Commercial	True	
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS043-PODAAC - Smith and Reynolds NCDC Level 4 Historical Reconstructed SST Monthly Version 3b netCDF	Suitable	Contribution	True	SST
NSC-004-Clim		Location	True	2 degrees , 1854 - present, only surface
		Commercial	True	
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS026-MyOcean - Global Ocean Physics Reanalysis ECMWF ORAP5.0 (1979-2013)	Considered	Contribution	True	SSH, Sea water temperature, salinity
		Location	True	0.25 degrees, 1979-2013 , -5500m to 0
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS044-MyOcean - Atlantic Iberian Biscay- In-situ Observations Yearly Delivery in Delayed Mode (1990-2013	Considered	Contribution	True	Sea water temperature, salinity
		Location	True	spatial resolution: none , 1990-2013 , -6000m to 0
		Commercial	True	need to register
		Attributes	True	
		Delivery	True	ftp
		Usability	True	NetCDF
DT.Clim.NS045-NOOS	NotConsidered	Contribution	True	Temperature, Salinity, water level
		Location	True	North west shelf

Data Set	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
		Commercial	True	free
		Attributes	True	
		Delivery	False	download zip files(not always working for many datasets)
		Usability	False	zip file corrupted
DT.Clim.NS046-NOAA - Sea Level Trends	NotConsidered	Contribution	True	Sea Level Trends (calculated from the PSMSL)
		Location	True	Global (point Data)
		Commercial	True	Free
		Attributes	True	
		Delivery	False	clickable maps, downloadable table
		Usability	False	tables don't have coordinates just city names

HR Wallingford
Working with water



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A.6. Fisheries Management

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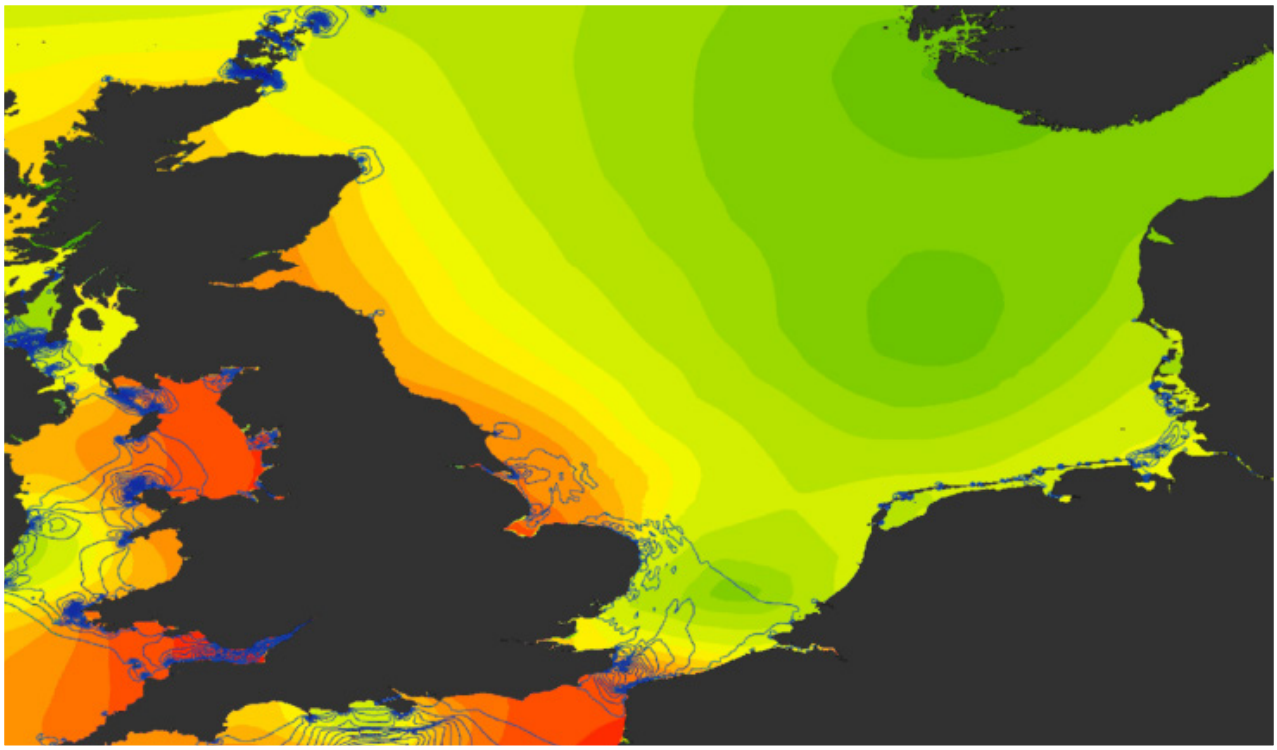
Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report - Fisheries Management Challenge



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Executive Summary

This document summarises the findings of the Fisheries Management Challenge, conducted as part of the North Sea Checkpoint project.

This report is the fourteenth deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142.

The aim of this challenge was to develop an understanding of whether the data are available and are sufficient to describe the extent of fisheries activities and their impact on the North Sea environment.

The datasets obtained and analysed describe the extent of fisheries activity in the North Sea Basin. Major characteristics of the fleets utilising the area can be identified, including:

- the most important species caught and discarded;
- the most heavily used gears;
- the most heavily used areas; and
- the distribution of effort between different countries.

The spatial data on fishing effort obtained also allow temporal changes in the activity of fleets to be studied. The overall picture between available datasets is generally coherent in terms of the scale of discard ratio for gears that are likely to be well-sampled, such as bottom trawls and seines.

The level of detail provided by some datasets was sufficient to allow a detailed analysis and mapping of fishing activities over the project area and, in fact, at a much higher (geographical) resolution than the North Sea Checkpoint was challenged to do.

A significant amount of landings and fishing effort data have been collated and analysed to show:

- Major characteristics in the fleets utilising the area, including the most important species caught and discarded, the most heavily used gears, the most heavily used areas, and the distribution of effort between different countries.
- Temporal changes in the fishing activity of these fleets over the whole area for at least a 4 year period and in some cases for particular areas such as Scotland, for a decade.

There are fewer discard and bycatch data and therefore, there is not enough information to fully describe the impact of fisheries on those species caught and discarded in fishing fleets over the whole area.

The Fisheries Management Challenge has been successful in collating much of the information needed thanks to the international organisations such as the EU's JRC and ICES. However, there are some gaps in data reporting and data provision, particularly at a national level and especially for the fisheries discards, bycatch and spatial activity data.

Additional datasets were identified, used, and sourced from national fisheries research institutes to minimise these gaps. However, some of the required data, in the format and detail that was originally desired from a geographical aspect, were not available. These data are considered to be sensitive, by the holders of the original data. The tabular data that the team were able to collect were mostly landings data but the distinction between the categories catch and by-catch or discards is mostly lost when the fish are landed. Whether caught as catch (target species) or by-catch (non-target species), is a characteristic that is not retained by the EU.

Generally, landing statistics per country do not offer a very long historical record. ICES does have a dataset on landings that goes back more than a century, but it was not available in the required units, however, these data might prove useful for different analyses. This would require access to the landings statistics at a more detailed level than were available at regarding the gear type associated with a given catch, together with the quarter or month of the catch. Discards are currently not logged in a way that allowed the creation useful tables or accurate statistics. The multi-year tables of discards that are available are not standardised between countries.

It is concluded that the datasets obtained and analysed give a high level view of fisheries activity in the North Sea Basin, but this view is incomplete. These descriptions give an overview, as datasets are not representative of all fishing activity in the area. The landings datasets only include EU Member States and the basin-wide fishing activity datasets only represent ten countries' fishing over four years.

The work was undertaken assembled by HR Wallingford Ltd with input directly from analyses performed by the project members subcontractors MacAllister-Elliot & Partners (MEP) and Wageningen IMARES.

Points for EMODnet

Bathymetry portal - datasets are generally required for planning marine installations and infrastructure such as wind turbines, coastal defences, oil platforms and pipelines. The portal contains datasets on mean depth, depth contours and marine topography which are useful as reference base maps for GIS images. As ocean base maps are already part of Arc-GIS software packages (the software used to create the maps for this Challenge), EMODnet bathymetry datasets were not required although many could be used.

Geology portal - complex geological feature datasets, often specific to particular areas and processes (e.g. sediment accumulation rates) were deemed inappropriate for the Fisheries Management Challenge.

Seabed habitats – the Fisheries Management Challenge does not require as assessment of the impacts on seabed habitats so datasets were not utilised. Bathymetry datasets are also available from this portal (discussed above).

Chemistry portal - the data provided by this portal were not deemed relevant to the Fisheries Management Challenge. The data sets are mainly related to eutrophication, contaminants and readings from oceanographic monitoring instruments.

Biology portal - the data sets provided by the Biology Portal are those of species distribution and not related to fisheries, so were not utilised for the Challenge.

Physics portal – the datasets provided by this Portal, such as sea water temperature, salinity, waves, winds and light attenuation are useful for analyses more complex than that of the Fisheries Management Challenge.

Human activities portal - datasets in this portal were not utilised for the challenge as mainly, human activity data related to aquaculture, dredging, aggregate extraction, waste disposal and marine energy usage, rather than fishing activity. The FAO capture production dataset available from this portal is useful for users wanting a general overview of catches landed into the region over a long time series, but data are not available by ICES area, or gear type, so were not utilised for the challenge. It would be useful if some form of fishing activity data (such as kW hour activity data, or other aggregated VMS or AIS fishing activity data) were provided as part of this portal.

Contents

Tables

1. Introduction

This report is the fourteenth deliverable to DG Mare under the North Sea Check Point Project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work was assembled by HR Wallingford Ltd directly from analyses performed by the project subcontractors MacAllister-Elliot & Partners (MEP) and Wageningen IMARES. This document is a Data Adequacy Report (DAR) presenting the findings for the completed Fisheries Management Challenge.

The Fisheries Management Challenge has addressed the work required to carry out a desk-top evaluation of the data available to assess if they are sufficient to describe the extent of fisheries activities and their impact on the North Sea environment. The assessment was made using publically available data, or data provided upon request by national and international authorities.

All data gathered have been recorded in the data adequacy assessment database, providing a searchable record of each of the datasets reviewed for specific challenges. Although each of the challenges requires some form of technical analysis to be produced, in this case, one aspect was to produce gridded data layers showing the extent of demersal fisheries impact on the seafloor, it is the process of data gathering, appraising and final selection to undertake that analysis which is the most important aspect, informing the overall objectives of the North Sea Checkpoint Project.

In this context, the technical analysis presented here is a representation of the data available to an end user, to produce the outputs presented in this challenge, such as maps of distribution of fishing effort over the entire basin.

2. Aims

The primary aim of the Fisheries Management Challenge is to assess whether the data currently available from national and international organisations from the 11 relevant countries in the North Sea are sufficient to describe the extent of fisheries activities and their impact on the North Sea environment.

The scope of the Fisheries Management Challenge includes countries fishing in the North Sea and English Channel, in ICES Areas IVa, IVb, IVc, VIId, VIIe and IIIa (Figure 2.1). These countries included the UK, Sweden, Ireland, the Faroe Islands, Norway, France, Finland, Belgium, Denmark, the Netherlands, and Germany.

Figure 2.1: North Sea Basin study area, as defined based on the combination of ICES areas, IV a,b,c; IIIa and VII d,e

It was intended that the extent of fisheries activities in the North Sea Basin was analysed using several indicators, including fisheries landings, bycatch, discards and effort data. As such, the main objectives as specified in the project brief and proposal are as follows:

Landings, discards and bycatch tables

Produce tables for the whole sea basin of:

- The mass and number of fish by species and year:

The mass and number of discards and bycatch of fish, mammals, reptiles and seabirds by species and year.

These should include data from before and after the Data Collection Framework [1] came into force, that is. since 2000. The time series should be as long as possible and the length would clearly vary between species and countries.

Gridded data layers of fisheries impact

Produce gridded data layers showing the extent of fisheries impact on the seafloor, including:

- Areas where bottom habitat has been disturbed by bottom trawling number of disturbances per month or kW hours of fishing effort.

[1] Data Collection Framework, EC Regulation 199/2008

- Change in the level of disturbance over the past ten years.

Data adequacy

Assess how well the objectives have been met based on the quality and availability of the data, analysed by the Fisheries Management Challenge Data Screen (Appendix A).

3. Context

Data from fishing fleets in Europe have traditionally been collected by the state where the fish were landed. Data collection programmes vary with country and have been in place for many years. Over the last 20 years, the European Union has been working to bring these data collection programmes by Member States (MS) into a standardised format. This process resulted in the establishment of the Data Collection Framework (DCF) in 2009.

The DCF was developed to standardise fisheries data across the EU and ensure that MS operate fisheries data collection programmes that will meet the objectives of the Common Fisheries Policy (CFP). MS are now required to compile a wide range of biological and ecological data including:

- Fleet size and fishing effort broken down by time, fleet, stock and area;
- Biological data for landings by area and species and stock related data from sampling programmes;
- Economic data on fish processing and aquaculture;
- Research surveys at sea;
- Data to evaluate the environmental impacts of fishing activity.

The data are collected on the basis of national programmes in which the MS indicate which data are collected, the resources they allocate for the collection and how data are collected. MS must report annually on the implementation of their national programmes and the Scientific, Technical and Economic Committee for Fisheries (STECF) evaluates these annual reports.

The standardisation of fisheries related data on an international level is overseen by the Coordinating Working Party in Fisheries Statistics (FAO) and also by ICES who have been publishing fishing statistics for the North East Atlantic since 1904. ICES along with EUROSTAT hold fisheries data for the North Sea Basin which follow the regulations of the DCF. Countries that are not EU MS, such as Norway and the Faroe Islands, submit data to organisations such as ICES, but have their own fisheries data collection and reporting requirements.

Each of the nations involved in fishing in the North Sea are either bound by the EC fishing regulations or have agreements to follow similar reporting processes. Vessels over 15 metres must carry vessel monitoring systems (VMS) and produce logbook data on all fishing activities. Vessels under 12 metres are considered inshore vessels and do not need to report landings, however their catches are recorded by the registered fish traders who document their purchase at first sale.

Vessels over 15m, carry VMS equipment that records their locations periodically. These data are held by the flag state of the vessel and often subject to data protection regulations. As such they can be difficult to obtain.

Definitions of discards, bycatch and catch:

For clarity in this report, the definitions for discards, bycatch and catch have been obtained from Kelleher (2005). The definitions of discards used in this study are also adapted from FAO Fisheries Report No. 547 (FAO, 1996b)[2].

Discards, or **discarded catch** is that portion of the total organic material of animal origin in the catch, which is thrown away, or dumped at sea for whatever reason. It does not include plant materials and post-harvest waste such as offal. The discards may be dead, or alive.

Discarding is considered to be an act of volition requiring a decision by fishers to reject or dump the fish. Discards include slipped fish, i.e. fish caught in a net and subsequently released into the sea without being brought on board the vessel. Discards do not include dead corals or empty shells. The release of fish by recreational fishers is not considered as a discard for the purposes of this project.

Bycatch is the total catch of non-target animals. Discards are not a subset of bycatch since the target species is often discarded. Discarding of marketable species of fish is no longer allowed in many fisheries (e.g. discard ban/ aanlandplicht).

Discard rate is the proportion (percentage) of the total catch that is discarded.

Catch includes all living biological material retained or captured by the fishing gear, including corals, jellyfish, tunicates, sponges and other non-commercial organisms, whether brought on board the vessel or not. Plant material are not considered part of the catch for the purposes of this project.

Discard data are not always reported and it is currently not a requirement for MS to collect them. Since 2009, Norway has had an obligation to land all catches and since January 2015 fishermen in certain parts of the EU do the same. By 2019, all fishermen within the EU will have the same obligation[3].

Bycatch data are not often reported by fishermen in the North Sea Basin so this information is not readily available. In 2005, the EU commissioned an observer programme to identify cetacean mortality in pelagic trawl fisheries in the English Channel and southern North Sea[4] and other studies have used strandings data to model cetacean bycatch[5]. The team have contacted international and national agencies to determine what data were available for bycatch of fish, mammals, reptiles and seabirds. The data and gaps in the data will be assessed and published in excel data sheets.

This challenge aims to assess fisheries impact and collect fisheries landings, discards and bycatch data over the entire North Sea Basin using the latest marine data available from international institutions and national institutions from the UK, Sweden, Ireland, the Faroe Islands, Norway, France, Finland, Belgium, Denmark, the Netherlands and Germany.

[2] FAO (1996) Technical consultation on reduction of wastage in fisheries, Tokyo, 28 October – 1 November 1996. FAO Fisheries Report No. 547, Rome, 27 pp.
[3] http://ec.europa.eu/fisheries/cfp/fishing_rules/landing-obligation/index_en.htm
[4] Northridge, S., Morizur, Y., Souami, Y., can Canneyt, O. 2006. Project EC/FISH/2003/09 'Petracet' Final Report to the European Commission. 1735R07D. MacAlister Elliott and Partners Ltd. Accessed on 13 February 2010. http://www.macalister-elliott.com/media/reports/1_reports.pdf
[5] Mannocci L, Dabin W, Augeraud-Véron E, Dupuy JF, Barbraud C, and Ridoux V, 2012. Assessing the Impact of Bycatch on Dolphin Populations: The Case of the Common Dolphin in the Eastern North Atlantic. PLoS One. 7 (2)

This project aims not only to make data relating to fisheries effort more accessible, but also highlights any gaps found in data collection within and between organisations in the North Sea Basin that might restrict end users in assessing the risk of impact on the seafloor from demersal fisheries, for example:

4. Method

There are three separate stages to this challenge:

- data gathering;
- data analysis; and
- data adequacy assessment.

These are detailed below:

4.1. Data gathering

Several data categories were identified about which to gather information, in order to produce basin-wide tables and maps of fishing effort, landings, discards and bycatch. These included:

- Landings data;
- Discards data;
- Bycatch data;
- Spatial fishing effort data.

Initially, international and national fisheries data collection agencies were identified to target requests and searches for data. It was decided that fisheries data should be collected at the international level initially (e.g. the EU Joint Research Centre (JRC) and ICES) and then at the national level, in order to work with international standards of data reporting, these datasets were then supplemented with country-specific data. It was hoped that this would create the most comprehensive fisheries datasets for the North Sea Basin.

Desk-based internet searches were conducted initially, followed by direct contact with national agencies and other agencies including ICES and the JRC. Agencies were contacted so that the project could assess the process by which end users could request data. A list of the contacts was made and the successes are included in Appendix B.

The 11 countries of focus included the UK, Sweden, Ireland, the Faroe Islands, Norway, France, Finland, Belgium, Denmark, the Netherlands and Germany.

Data received and/or found online were downloaded onto the MEP and IMARES data servers and uploaded to ‘Box’ – an online secure content and sharing resources for businesses.

4.2. Data analysis

The output for this challenge, as detailed in Section 2, and the method adopted to produce them are described in Sections 4.2.1 and 4.2.2.

4.2.1. Landings, discards and bycatch tables

Through contacting DG MARE, the project team was directed to the European Commission's JRC databases. The data included are the result of the DCF data call in 2015 to support fishing effort regime evaluations.

These datasets were chosen as they covered the most countries' fishing in the project area out of all assessed datasets. The dataset structure closely resembled the data format required by the challenge.

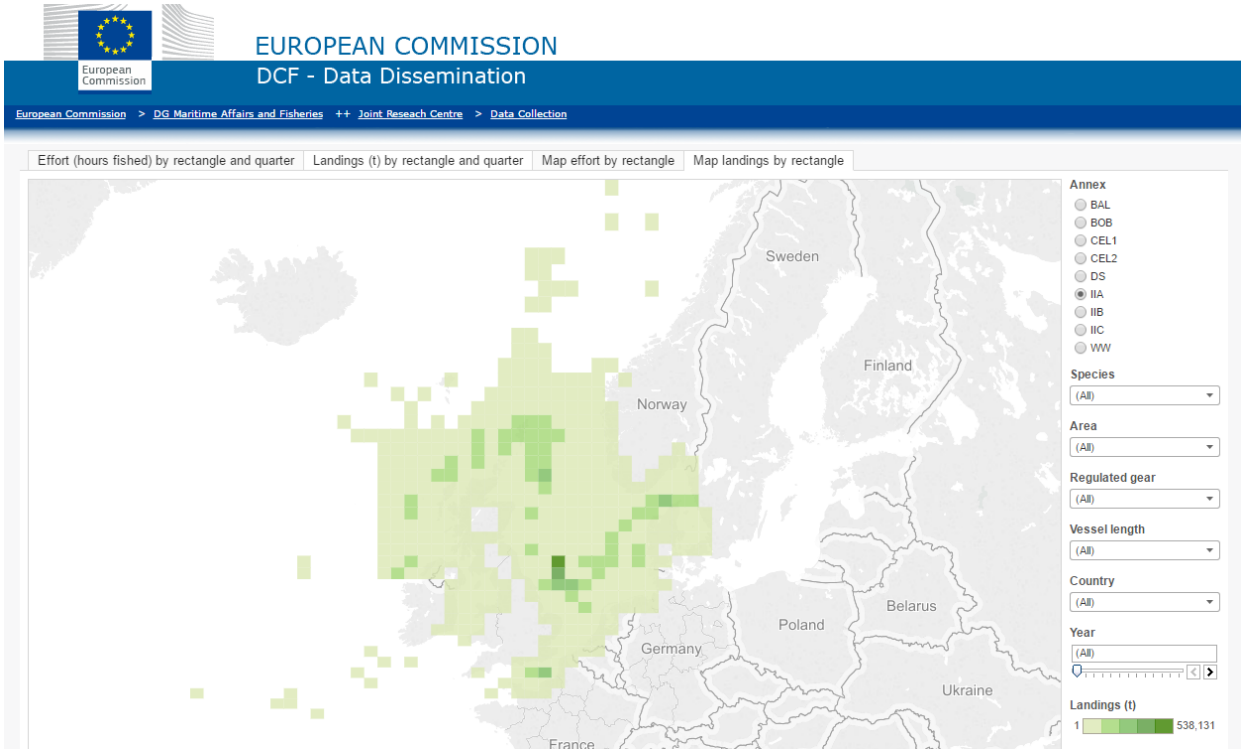


Figure 4.1: JRC landings and effort database and interactive map

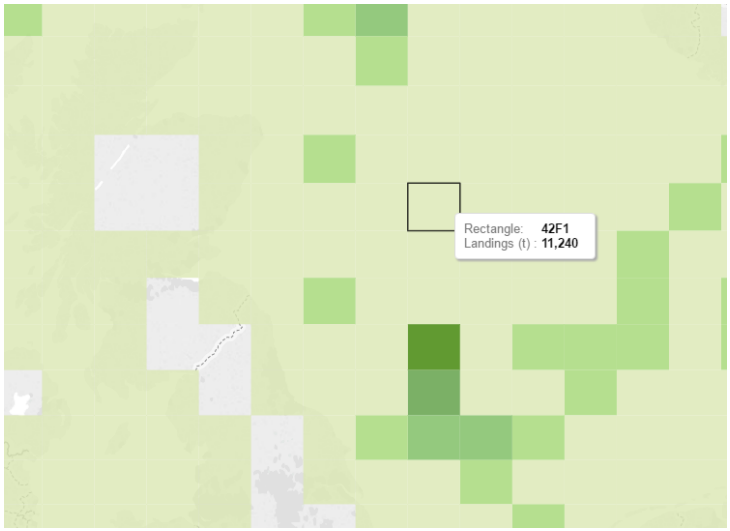


Figure 4.2: Zoomed map of JRC map to show how data are grouped by ICES rectangle

Figure 4.1 and Figure 4.2 show how landings and effort data are presented by the JRC. Data are grouped by ICES rectangle (Figure 4.2) which provided the correct spatial resolution for the challenge. Figure 4.3 shows that data can be sorted by species, area, gear, vessel length, country and year – all parameters that match the data format required by the challenge.

Note that there is no record of discards data, as these are not collected by ICES rectangle. However, discards data are available in another branch of the data portal, by Area (Figure 4.2), and therefore some processing was required to match discards to landings data, per rectangle.

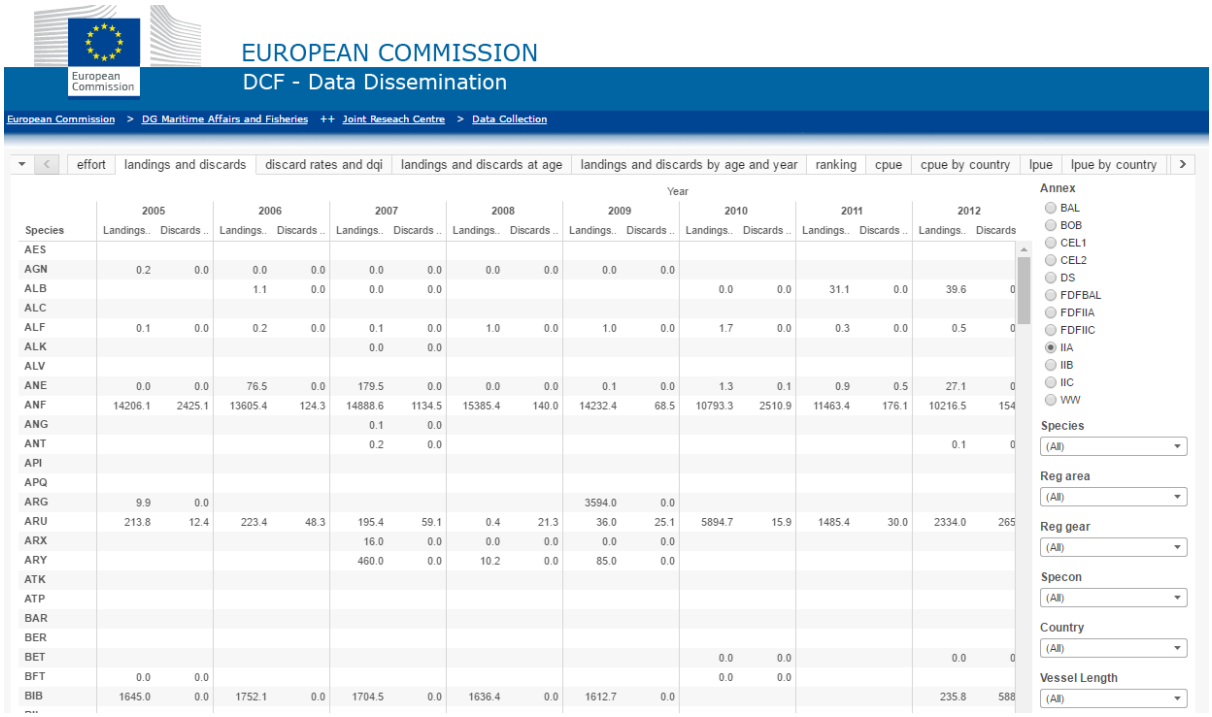


Figure 4.3: JRC landings, discards and effort database

Since the ICES Areas required for the challenge (IVa, IVb, IVc, VIId, VIIe, IIIa) are found under different (Effort management) Regimes (or 'Annex') codes, data were downloaded by selecting Annex IIA (cod recovery zone) and IIC (sole western channel). Tables of effort (hours_fished) and landings (t) by rectangle and quarter were downloaded from 2005 up to 2014 (Figure 4.1) with the following table columns:

- Country
- Measure Names
- Quarter
- Rectangle
- Regulated area
- Regulated gear
- Special condition Vessel length
- Year
- Measure Values.

Tables of landings and discards (tonnes) by year were downloaded from 2005 up to 2014 (Figure 4.2) with the following table columns:

- Country
- Measure Names
- Registration area

- Reg gear
- Species
- Specon
- Vessel
- Length
- Year
- Measure value.

After downloading, the landings tables were aggregated to year, gear, vessel length, species and area, and merged with the landings and discards tables to check if both contained similar landings for year, gear, vessel length, species and area.

Next, the discards information per area was included in the landings by quarter and rectangle tables (Figure 2.1), using the ratio of landings by quarter and rectangle to landings by area as weight factor. The resulting tables per quarter and rectangle were combined and merged with the effort tables and aggregated to years. Based on the ICES rectangles, the ICES area code was determined and the records with relevant codes were selected.

The final tables contain effort, landings and discards per species, rectangle, year, gear, vessel length and ICES rectangle.

The landings and discards data provided by individual countries were then assessed against the JRC dataset. However, as data overlapped significantly, many years were the same as those provided by JRC, the national datasets were provided alongside the main tables in separate tables for comparison only. Figure 4.4 shows the layout of the final tables.

Example	ICES_Area	ICES_rectangle	Country	Vessel_Size	Gear	Species	Year	Landings_t	discards_t	Effort_hr
1	IVc	31F2	BEL	O10T15M	BEAM	LEM	2003	0.006	NA	1437
2	IVc	31F2	BEL	O10T15M	BEAM	DAB	2003	3.272	NA	1437
3	IVc	31F2	BEL	O10T15M	BEAM	RAJ	2003	0.002	NA	1437
4	IVc	31F2	BEL	O10T15M	BEAM	PLE	2003	6.433	NA	1437
5	IVc	31F2	BEL	O10T15M	BEAM	SOL	2003	0.997	NA	1437
6	IVc	31F2	BEL	O10T15M	BEAM	TUR	2003	0.107	NA	1437
7	IVc	31F2	BEL	O10T15M	BEAM	COD	2003	2.147	NA	1437
8	IVc	31F2	BEL	O10T15M	BEAM	WHG	2003	4.958	NA	1437
9	IVc	31F3	BEL	O10T15M	BEAM	PLE	2003	0.003	NA	111
10	IVc	31F1	BEL	O10T15M	BEAM	TUR	2004	0.002	NA	6
11	IVc	31F2	BEL	O10T15M	BEAM	RAJ	2004	0.038	NA	1811
12	IVc	31F2	BEL	O10T15M	BEAM	COD	2004	2.276	NA	1811
13	IVc	31F2	BEL	O10T15M	BEAM	SOL	2004	1.148	NA	1811
14	IVc	31F2	BEL	O10T15M	BEAM	TUR	2004	0.115	NA	1811
15	IVc	31F2	BEL	O10T15M	BEAM	WHG	2004	1.968	NA	1811
16	IVc	31F2	BEL	O10T15M	BEAM	PLE	2004	2.039	NA	1811
17	IVc	31F2	BEL	O10T15M	BEAM	BLL	2004	0.007	NA	1811
18	IVc	31F2	BEL	O10T15M	BEAM	DAB	2004	2.948	NA	1811
19	IVc	31F3	BEL	O10T15M	BEAM	WHG	2004	0.008	NA	22
20	IVc	31F3	BEL	O10T15M	BEAM	DAB	2004	0.27	NA	22
21	IVc	31F3	BEL	O10T15M	BEAM	SOL	2004	0.003	NA	22
22	IVc	31F3	BEL	O10T15M	BEAM	COD	2004	0.009	NA	22
23	IVc	31F1	BEL	O10T15M	BEAM	SOL	2005	0.012	NA	42
24	IVc	31F1	BEL	O10T15M	BEAM	WHG	2005	0.005	7.00E-04	42
25	IVc	31F1	BEL	O10T15M	BEAM	DAB	2005	0.22	0.3076	42
26	IVc	31F1	BEL	O10T15M	BEAM	TUR	2005	0.002	NA	42
27	IVc	31F1	BEL	O10T15M	BEAM	COD	2005	0.009	0	42
28	IVc	31F1	BEL	O10T15M	BEAM	PLE	2005	0.123	0.0011	42
29	IVc	31F2	BEL	O10T15M	BEAM	DAB	2005	1.217	1.7018	1149

EC JRC Landings_discards_effort | Sweden Landings | Sweden Effort | Ireland | UK landings | Denmark Landings | Norway Landings | Scottish Landings

Figure 4.4: Layout of final landings, effort and discards tables. The first table shows the JRC dataset and the other 7 tables contain data provided by national agencies

Finally, the data were grouped into pivot tables and general trends analysed using graphs and statistical analyses.

4.2.2. Gridded data layers of fisheries impact:

Several spatial datasets were chosen to represent fishing effort over the project area (Section 6.1.2) and these were provided by Sweden, ICES and the UK (both the Marine Management Organisation (MMO) and Marine Scotland).

As for the landings, effort and discard tables, fishing activity datasets provided required some processing and were analysed and displayed on a grid.

Swedish fishing activity data

The project team data received from Sweden, upon request, were in a format that closely resembled that specified. The dataset contained some replicate records for the same vessel in some of the ICES-rectangle so a query was written within the database to remove the replicates.

A new table was created that contained the number of unique trips per month per ICES-rectangle. The gear types were kept separate.

The prepared tabular data were imported into a geodatabase file, where a join operation gave the data a geographical dimension using the shared attribute, the ICES-rectangle. With this preparation, maps from the Swedish data were produced, using ArcGIS software, that matched with the original request.

UK MMO fishing activity data

Contacts within the MMO directed the project team to detailed geographical datasets on fisheries distribution, stored at the GeoStore-website of the Environment Agency[6]. The most recent (2014) datasets were downloaded as shapefiles in kW hours (kiloWatt*Hours).

To display the data in the GIS application, ArcGIS, a field was added (MareGaps, shortint) to each dataset and a flag was set to 1 for each part of the dataset that was inside the NSCP project area (Select by Location).

Finally, two sets of maps were presented based on the MMO datasets, a total kW hours of fishing activity for the years 2011-2014 and total, mobile and passive fishing activity for 2014. Tables and graphs were also created to further analyse trends in the data.

UK Marine Scotland fishing activity data

The Marine Scotland data portal (National Marine Plan Active) allows end users to view effort data spatially. Links to the data sources are provided but data are not directly downloadable. Shapefiles are generally not available for fishing effort data and link to spreadsheets or pdfs.

However, several screen shots of spatial effort data were taken from the portal to show fishing effort distribution in this part of the project area, Figure 4.5.

Under the layer selection panel, 'Productive' was selected, followed by 'Fishing' which subsequently displayed layers of:

- fishing activity;
- number of vessels;
- VMS intensity for certain gear types over a number of years;
- gridded effort by vessels using different gear types;
- changes in effort over years for different gear types;
- average effort (kW days) and number of days.

Screen shots were taken of displayed data. Figure 4.5 shows an example of this.

Where links to spreadsheets of fishing effort data were found, some basic graphical analyses were carried out to look for changes in demersal fishing effort over time, as required by the challenge.

[6] http://www.geostore.com/environment-agency/survey.html#/survey

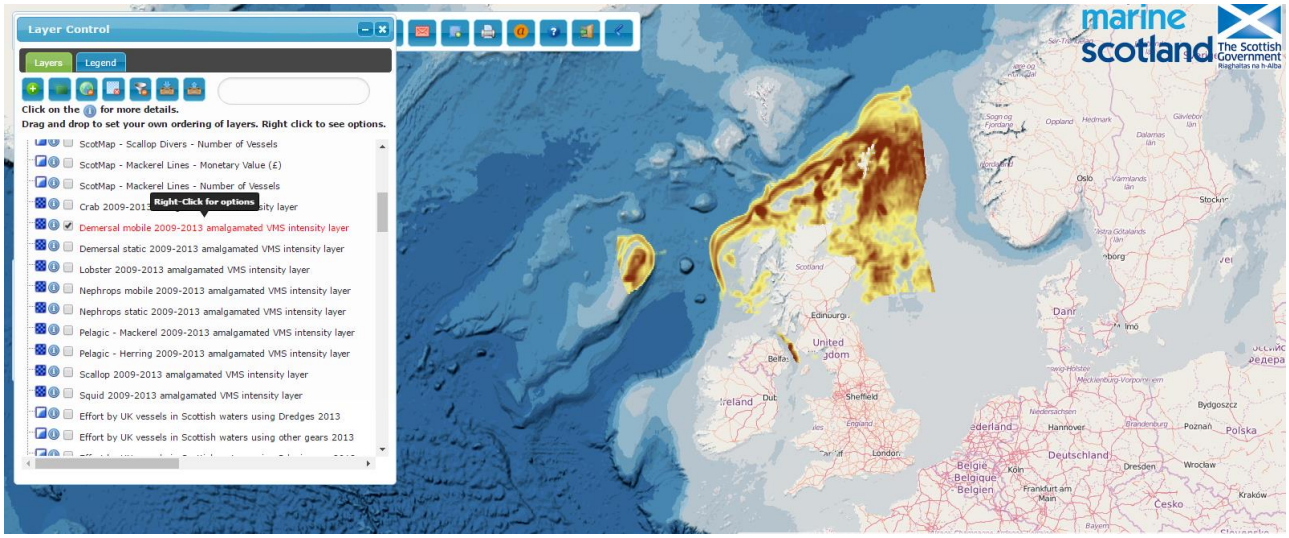


Figure 4.5: Example of map displaying options for fishing effort data on the National Marine Plan Active. Data displayed here is demersal mobile gear activity from amalgamated VMS data from 2009-2013

ICES fishing activity dataset

These datasets were available for download from the ICES website. They were prepared by the Working Group on Spatial Fisheries Data (WGSFD) and were collected by a specific data call.

The first dataset was available as set of spreadsheets (ICES dataset 2014[7]), that included spatial information as a c-Square-codes. C-squares is a system for storage, querying, display, and exchange of spatial data locations and extents in a simple, text-based, human- and machine- readable format. This is a global coding system that is well documented (http://www.marine.csiro.au/csquares/) and was downloaded or generated using specialist scripts at IMARES to generate grids.

The second dataset was available as a set of shapefiles (ICES dataset 2015[8]) displaying surface and subsurface intensity (of seabed interaction).

Effort was calculated from the ICES dataset 2014 and a series of maps was created from each of the two datasets. The total effort per gear type and year was estimated based on counts per class and the geometric mean of the class limits as follows:

$$\Sigma(\text{count per class} * \text{geometric mean of class limits}).$$

The unit for the class is hours fishing per c-square per year. With this estimated effort a comparison could be made with trends in the summation of effort from the shapefile (ICES dataset which is expressed in Swept Area Ratio (SAR) for surface and subsurface interaction of fishing gear with the seabed).

[7] ICES. (2014). Second Interim Report of the Working Group on Spatial Fisheries Data Second Interim Report of the (WGSFD). Copenhagen. Retrieved from http://archimer.ifremer.fr/doc/00223/33378/31806.pdf

[8] ICES. (2015). ICES WGSFD REPORT 2015 Report of the Working Group on Spatial Fisheries Data (WGSFD) 8-12 June 2015. Copenhagen. Retrieved from http://ices.dk/sites/pub/Publication Reports/Expert Group Report/SSGEPI/2015/01 WGSFD - Report of the Working Group on Spatial Fisheries Data.pdf

Data were clipped to the project area as described for the MMO data. A similar approach was used for the ICES 2014 dataset but the data from the Excel spreadsheets were imported into a geodatabase file, indices were added, and using the c-Squares information shared between the geographical c-Squares dataset and the data from the tables, maps were created.

4.3. Data adequacy assessment

This process of data gathering, data screening and final selection of datasets to undertake that analysis is core to the aims of the North Sea Checkpoint Project and is described in detail in Section 6.2. The methodology for this process, designed by HR Wallingford, is detailed in DLS0342-RT002-R1-00 Growth and Innovation in the Ocean Economy: North Sea Checkpoint: Data Adequacy Report 01, including a literature survey, August 2014.

5. Data

A broad range of data has been identified, downloaded where possible and reviewed for the challenge. The data were sourced primarily through online resources including:

- International: EC JRC data;
- International: ICES, catch and stock assessment datasets and fishing activity datasets;
- International : EMODnet Portals;
- International: Food and Agricultural Organisation (FAO) capture production database;
- UK: MMO landings data, Environment Agency Geostore, Marine Scotland data portal;
- Germany: Federal Office for Agriculture and Food (Bundesanstalt für Landwirtschaft und Ernährung – BLE) fisheries landings data;
- Belgium: Department of Agriculture and Fisheries (Vlaanderen Landbouw and Visserij) Sea Fisheries Publications;
- France: Ifremer and Obsmer fishing fleet data;
- Norway: Norwegian Directorate of Fisheries fisheries data;
- Sweden: Swedish Agency Marine and Water Management (Hav och vatten) fisheries data;
- Ireland: Sea Fisheries Protection Authority (SFPA) fisheries data;
- The Netherlands: LEI research institute (at Wageningen University and Research Centre – WUR) Agrimate fisheries data;
- Denmark: Danish Nature Agency (Naturstyrelsen) Agrifish datasets.

All data identified have been included in the data register (Appendix A).

Following an initial assessment of data accessibility and fitness for purpose, a small number of datasets has been used in the analyses for the challenge. The data considered suitable and those used in the challenge are listed in Table 5.1 and Table 5.2, respectively. Details of the datasets reviewed and either excluded or considered but not-used are provided in Appendix A. A full data adequacy assessment is provided in Section 6.2 that justifies and discusses the selection of datasets for use in the challenge.

Table 5.1: Datasets considered suitable in the Fisheries Management Challenge

Data	Inspire theme	Sources Suitable
Bathymetry	1.8 Hydrography	DT.Wind.NS003-EMODNET Bathymetry Gridded Bathymetry. 1 arc second resolution DT.Wind.NS104-SeaZone Hydrospatial One – Bathymetry

Table 5.2: Datasets used in the Fisheries Management Challenge

Data	Inspire theme	Sources Suitable
Fisheries landings data	3.1 Statistical Units	DT.Fish.NS002-EC Landings Data 1: 2003-2014 DT.Fish.NS004-EC Landings and Discards Data: 2003-2014
Fisheries effort data (spreadsheet)	3.1 Statistical Units	DT.Fish.NS001-European Commission Effort Data 1: 2000-2014 DT.Fish.NS003-EC Effort Data 2: 2003-2014 DT.Fish.NS007-Swedish Fishing Activity Data
Fisheries effort data (spatial)	1.2. Geographical Grid Systems	DT.Fish.NS011-OSPAR & ICES VMS Fishing Activity Data DT.Fish.NS013-UK Geostore Fishing Activity Data: 2007-2014 DT.Fish.NS034-Scotland National Marine Plan Interactive: Geodataportal DT.Fish.NS035-Scotland VMS intensity layers by gear type: 2009-2013 DT.Fish.NS036-Scotland effort distribution maps: 2010-2012
Fisheries discards data	3.1 Statistical Units	DT.Fish.NS004-EC Landings and Discards Data: 2003-2014

6. Results

6.1. Challenge output

6.1.1. Introduction

The results of a basin wide data collection exercise that aims to provide an updated and complete picture of fishing effort in the North Sea are presented. The Fisheries Management Challenge has been successful in collating this information thanks to the provision of data from international organisations such as the EU's JRC and ICES. However, there are large gaps in data reporting and data provision, particularly at a national level and particularly for fisheries discards, bycatch and spatial activity data.

The data were analysed with a view to describe the extent of fisheries activities and their impact on the North Sea environment. The results of the analyses for a series of spatial and graphical analyses on the available

data are shown and are just some of the many ways end users could assess the impact and distribution of fishing effort in the North Sea Basin.

6.1.2. Analysis

As detailed in the Section 4, several outputs for this challenge were required. First, the analyses from basin-wide tables of fisheries landings and discards data are presented, followed by the spatial mapping of fishing effort over the project area.

Landings, bycatch and discards

Joint Research Committee (JRC)

The data presented below are those collected as a result of the DCF data call in 2015 to support fishing effort regime evaluations. Landings data are received by the JRC from EU MS based on the information recorded in fishing logbooks. The landings data include landings of both quota and non-quota species.

Any number of graphs, statistics and analyses can be presented from this dataset and will vary depending on the needs of the end user. General basin-wide analyses are presented here to provide an example of how these data can be manipulated to show trends in EU fisheries in the North Sea Basin.

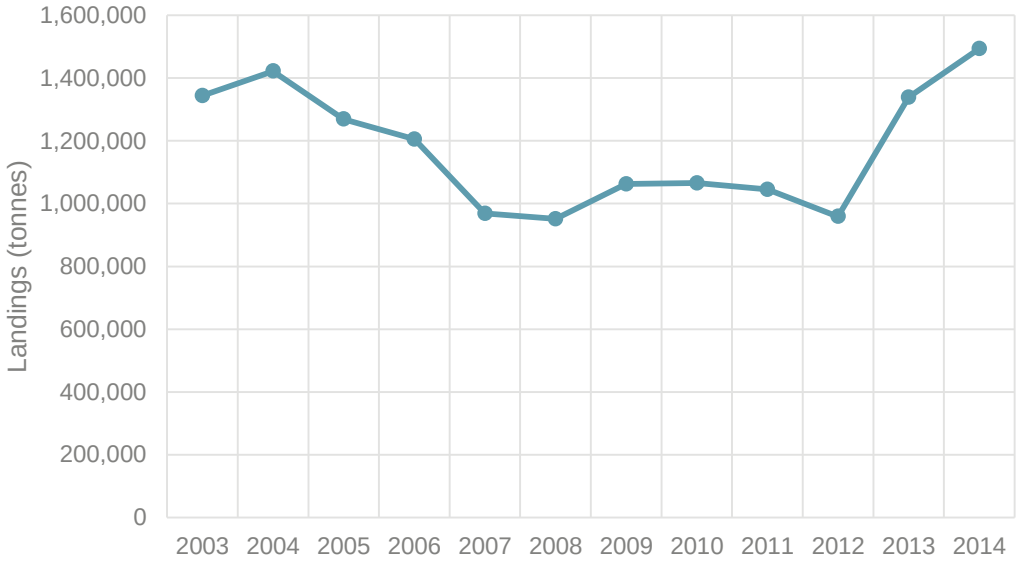


Figure 6.1: Total fish landings of EU fishing fleets between 2003-2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa

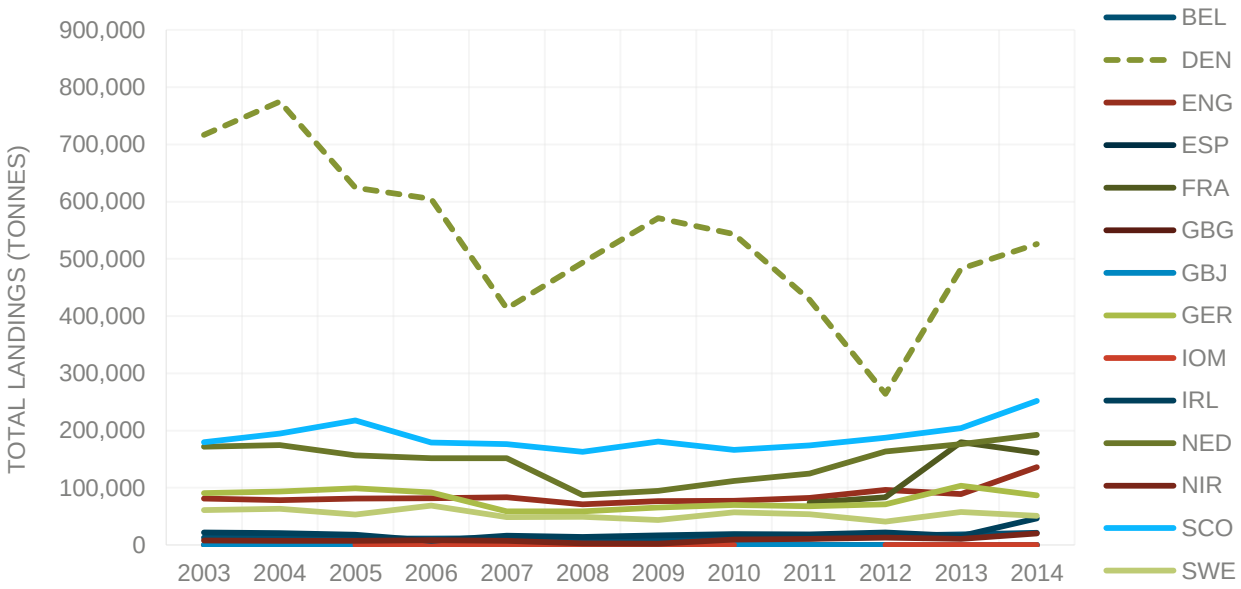


Figure 6.2: Total fish landings of EU fishing fleets by country between 2003 and 2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa.

BEL: Belgium, DEN: Denmark, ENG: England, ESP: Spain, FRA: France, GBG: Guernsey, GBJ: Jersey, IOM: Isle of Man, NIR: Northern Ireland, GER: Germany, IRL: Ireland, NED: Netherlands, SCO: Scotland, SWE: Sweden

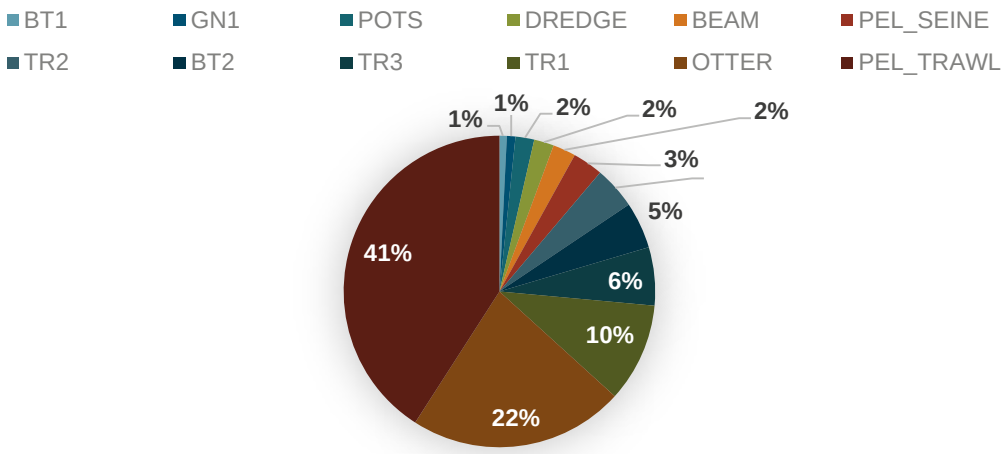


Figure 6.3: Total fish landings (≥100,000 tonnes) EU fishing fleets by gear type between 2003 and 2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa.

BT1:Beam trawl mesh ≥120mm, BT2: Beam trawls mesh ≥ 80mm and <120mm, GN1: Gillnets or entangling nets, TR1: Bottom trawls and seines mesh ≥100mm, TR2: Bottom trawls and seines mesh ≥70mm and <100mm, TR3: Bottom trawls and seines mesh ≥ 16mm and < 32mm

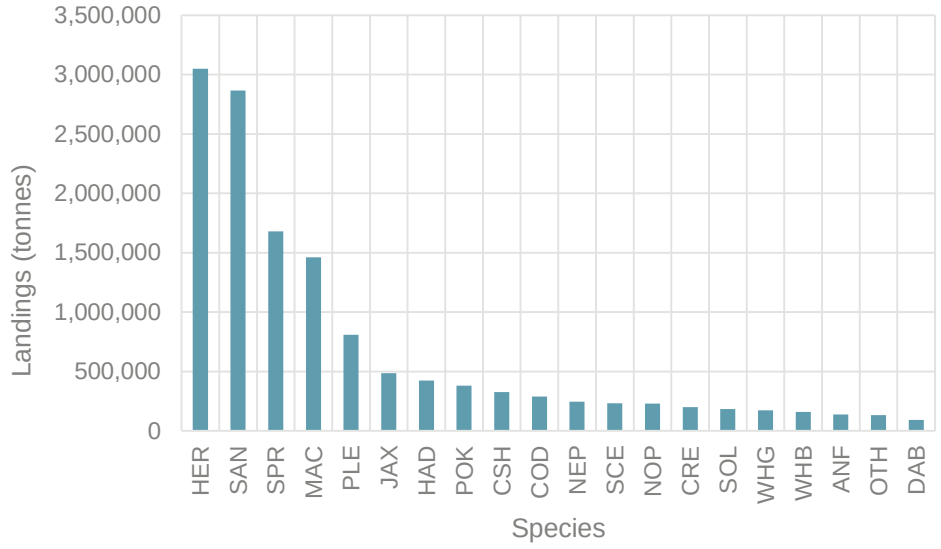


Figure 6.4: Total fish landings of EU fishing fleets by species between 2003 and 2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa

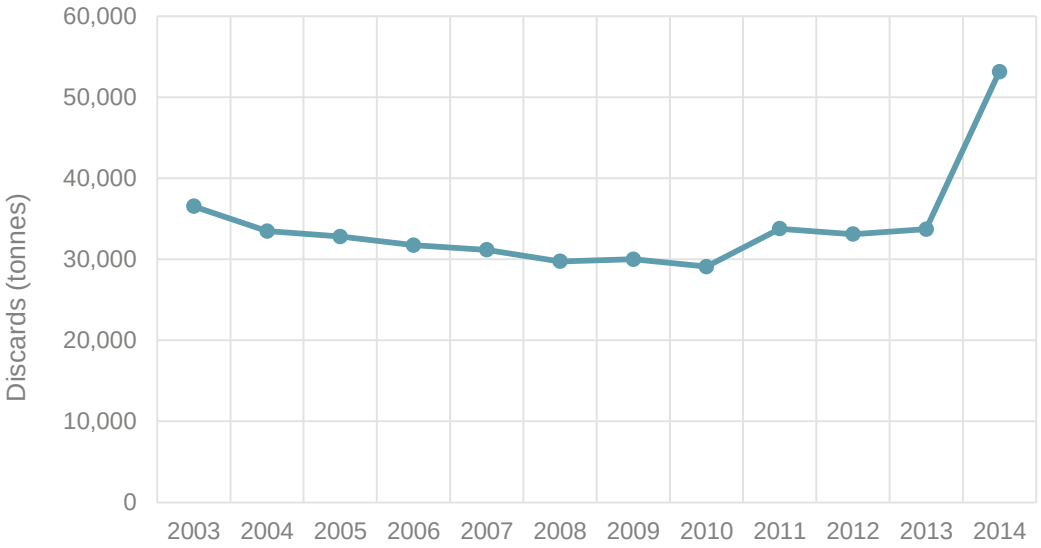


Figure 6.5: Total fish discards of EU fishing fleets from 2003-2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa

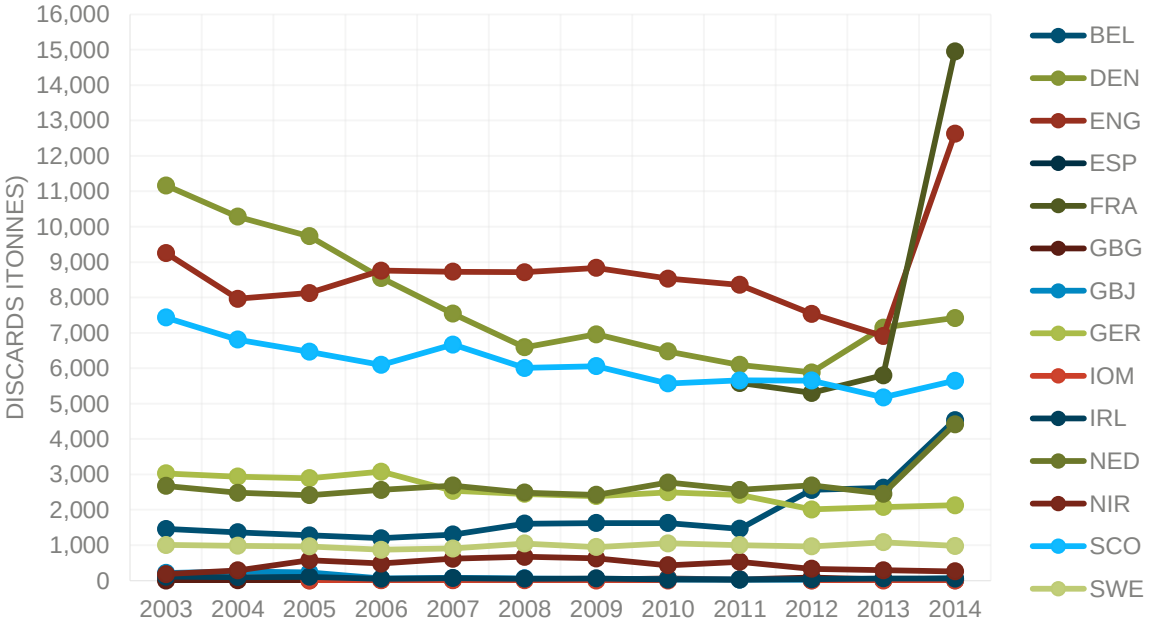


Figure 6.6: Total discards of EU fishing fleets by country between 2003 and 2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa.

BEL: Belgium, DEN: Denmark, ENG: England, ESP: Spain, FRA: France, GBG: Guernsey, GBJ: Jersey, IOM: Isle of Man, NIR: Northern Ireland, GER: Germany, IRL: Ireland, NED: Netherlands, SCO: Scotland, SWE: Sweden

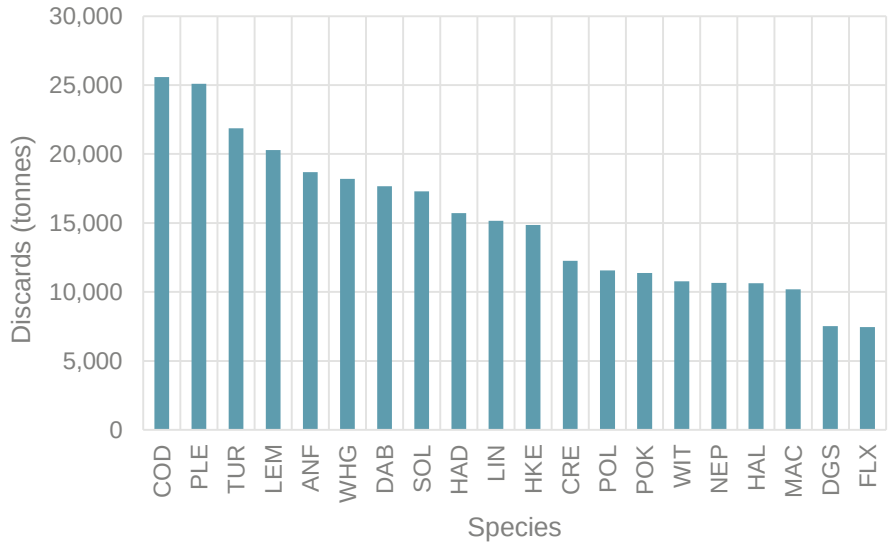


Figure 6.7: Total discards of EU fishing fleets by species6 between 2003 and 2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa

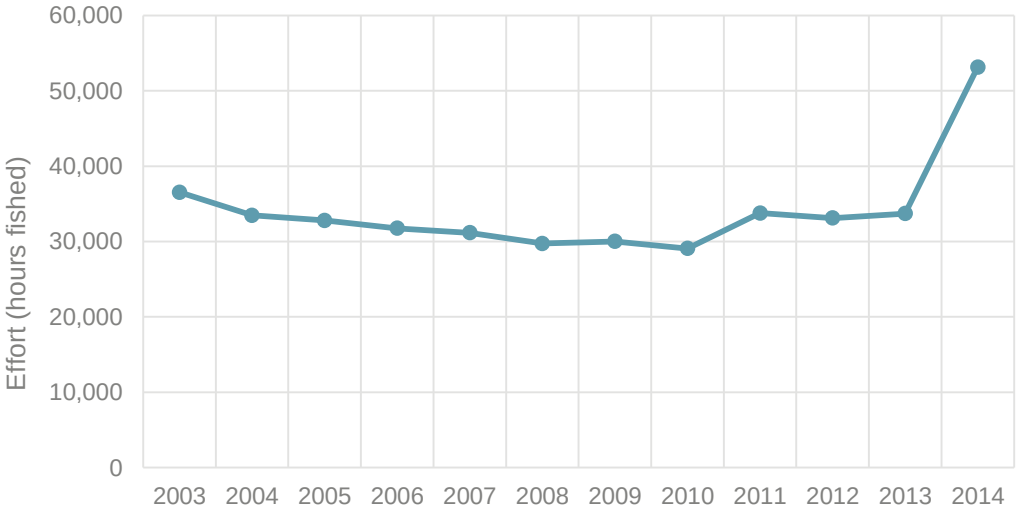


Figure 6.8: Total fishing effort (hours fished) EU fishing fleets from 2003-2014 from ICES Areas IVa, IVb, IVc, VIId, VIIe, IIIa

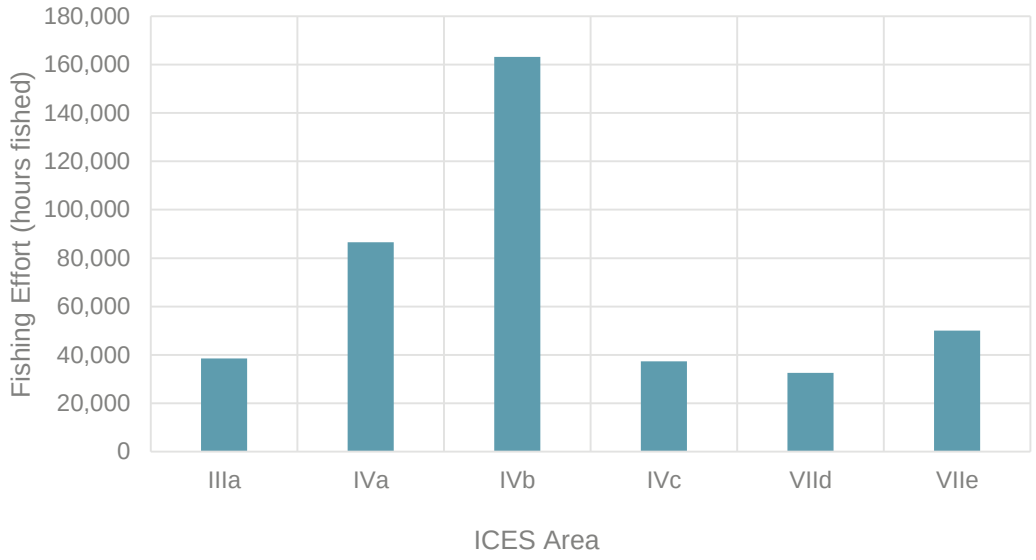


Figure 6.9: Variations in fishing effort (hours fished) by ICES Area

Various characteristics of the EU fleets fishing in the North Sea and English Channel and changes in fishing practice over time can be easily ascertained from these data. In recent years, landings, discards and effort have all increased (Figure 6.1, Figure 6.5 and Figure 6.8). The landings increase from 2013-2014 (Figure 6.4) may be due to large increases in the landings of mackerel at this time[9].

Denmark lands significantly more catches than other fleets, followed by Scotland and the Netherlands (Figure 6.2). Generally, it is the over 15m vessels that land the most catch and these are mainly using pelagic trawls with mesh sizes of less than 90mm (Figure 6.3). Herring and sandeel show the greatest volumes of landings but landings of sprat, mackerel and plaice are also significant (Figure 6.4).

England, Denmark and Scotland discard the most catch (Figure 6.5) which is caught mainly by bottom trawls and seines (otter trawls, pair trawls, Danish seines and pair seines) with mesh sizes of 70-100mm. Cod, plaice, lemon sole, turbot and anglerfish are the most discarded species in terms of volume (Figure 6.7).

Other discards information

Discards data collected in the North Sea Basin:
Whilst these landings data are considered to be relatively accurate[10] for fishing effort, as MS are required to regularly submit information to a certain standard, this is not the case for discards.

In Europe, estimating the amount of discards is legislated via the Data Collection Framework (DCF; EEC, 2000). As part of nationally adopted on-board observer programmes, trained personnel collect the biomass, length, age, and species compositions of discards from their most important commercial fisheries (EEC,

[9] http://www.seafish.org/research-economics/market-insight/market-summary
[10] The data and indicators presented in these web sites have been produced after extensive data validation procedures by JRC and assessment by STECF no warranty is made regarding the quality and completeness which is under the responsibility of the MS. In-depth analyses of data coverage are available in the JRC coverage reports for the respective data calls.

2009), with the main aim to feed these data into stock assessments. This is done via at-sea sampling (ICES, 2011), and all the data are stored and administered by the respective national authorities.

Each year, all MS are required to report their efforts spent collecting discard information under the DCF. The discards data are often then stored in a database and not shared EU-wide due to the lack of a common data exchange format and storage facility. National regulations also preclude sharing of detailed commercial catch data (Hinz et al., 2013); however, in some cases, national institutions may summarise their discard collection results in an annual report. This is the case for the Netherlands, where IMARES has made an annual report on their discard monitoring programme since 2002.

However, even though the control regulation prescribes that fisheries have to report all discards above 50 kg per species per trip, only very limited information on discards is actually registered in logbooks. Observer programmes have the potential to provide good quality data, but they are also costly and often have relatively low coverage; typically around 1% of the fishing activities[11].

ICES also estimate discard values through the Working Group on Mixed Fisheries Advice (WGMIXFISH) and while on the stock level, there is globally a fairly good agreement between the EU (STECF) and ICES discards ratios, this can however hide major discrepancies at the fleet and country level[11]. Discard data are only sampled for a fraction of the national fleets and the way the discard data are raised within a nation can be affected by the grouping of vessels in a fleet specific data call. Also, once an expert group receives the data, they have several options on how to assign a discard ratio to un-sampled fleets. The assignment process for un-sampled fleets differs between WGMIXFISH and STECF such as having different rules for assigning discards metrics

The overall picture is coherent in terms of the scale of discards ratio for gears that are likely to be well-sampled, such as bottom trawls and seines (TR1-TR2). Discards and discards ratio estimates for less important gears are obviously less sampled. Extrapolating data will introduce uncertainty and bias in discards datasets.

A strict and uniform protocol for sampling at-sea does not currently exist in the North Sea Basin and the differences in protocol result in a diversity in the on-board sampling practices which are further influenced by the volume of the catch and the diversity of the catch composition.

Policies for eliminating discards

The new CFP in the waters of the EU will eliminate the practice of discarding through the introduction of a landing obligation. This change in regime will serve as a driver for more selectivity and will provides a more reliable catch dataset. To allow fishermen to adapt to the change, the landing obligation is being introduced gradually, which started in 2015 and will continue until 2019 for all commercial fisheries (species under Total allowable catches TACs, or under minimum sizes) in European waters.

Under the landing obligation all catches have to be kept on board, landed and counted against the quotas. Undersized fish cannot be marketed for human consumption purposes. Details of the implementation will be included in multi-annual plans. These details include the species covered, provisions on catch documentation, minimum conservation reference sizes, and exemptions. In October 2015 the EC adopted discard plans for the North Sea and English Channel (Commission Delegated Regulation 2015/2440 and 2015/2438).

In Norway a discard ban on several species has been in place since 1987. In order to improve exploitation patterns and reduce the problem of discards in fisheries, Norway has established a suite of regulations and

[11] http://www.nsrac.org/wp-content/uploads/2014/11/discardatlas_northsea_demersalfisheries_2014.pdf

management measures. The main objective has been to promote an exploitation pattern where fish below minimum legal size are spared and where unwanted bycatch can be minimised. Over the years this has been achieved through several interconnected measures, which can be referred to as the "Discard Ban Package" (Gullestad et al. (2015)[12].

Since the practice of discarding will be illegal in some instances under the new EC landing obligation, there is an expectation that this landing obligation will have serious implications for the collection of discards data and the subsequent reporting of discards.

It will therefore be important for networks such as EMODnet to monitor changes against current discards datasets, such as those provided in this study.

Other bycatch information

For this study, bycatch is considered to be the total catch of non-target animals. Discards are not a subset of bycatch since the target species is often discarded. However, in some cases these values also include undersize or over quota species and this may confuse real estimates.

The DCF discard sampling programme undertaken by MS will include all fish and also other species such as mammals, birds and reptiles, so bycatch estimates would be collected but the JRC do not appear to publish these figures as they do for discards and landings. Organisations such as BirdLife International and Seas at Risk have identified this as a problem, stating that the DCF:

> ….nowadays falls short of delivering adequate and reliable data necessary for an effective and ecosystem-based approach to fisheries management in the EU as required by the Common Fisheries Policy. In particular, we believe that the following should be important environmental data that needs to be collected: bycatch rates of non-fish species, impacts of different types of gear on marine habitats (particularly those protected under the Habitats Directive and in other MPAs, e.g. under the regional seas conventions), and impacts of fisheries on marine food webs.

However, some bycatch studies and data collection initiatives are present in the North Sea Basin. In 2005, the EU commissioned an observer programme to identify cetacean mortality in pelagic trawl fisheries in the English Channel and Southern North Sea[13]. Other studies have used stranding data to model cetacean bycatch[14] . Defra has also funded the Cetacean Bycatch Observer Monitoring System (MB5203)[15] since 2004 (run by the Sea Mammal Research Unit in St Andrews, Scotland) the results of which are published online[15].

6.1.3. Gridded data layers of fisheries impact:

Several datasets representing demersal fishing activity in the project area have been selected for presentation as together they provide examples of the different resolutions of spatial fishing activity data that

[12] Gullestad, Peter, Geir Blom, Gunnstein Bakke, and Bjarte Bogstad. "The "Discard Ban Package": Experiences in efforts to improve the exploitation patterns in Norwegian fisheries." Marine Policy 54 (2015): 1-9.

[13] Northridge, S., Morizur, Y., Souami, Y., can Canneyt, O. 2006. Project EC/FISH/2003/09 'Petracet' Final Report to the European Commission. 1735R07D. MacAlister Elliott and Partners Ltd. Accessed on 13 February 2010. http://www.macalister-elliott.com/media/reports/1_reports.pdf

[14] Mannocci L, Dabin W, Augeraud-Véron E, Dupuy JF, Barbraud C, and Ridoux V, 2012. Assessing the Impact of Bycatch on Dolphin Populations: The Case of the Common Dolphin in the Eastern North Atlantic. PLoS One. 7 (2)

15 http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=18535

can be obtained. ICES provided gridded data layers that covered the entire project area, including data from non EU Member States. Sweden, Marine Scotland and the MMO for the UK provided national datasets representing fishing effort in their own national jurisdictions, demonstrating the level of data that could be presented for the project area, if individual countries had provided VMS and fishing activity data for this study.

Nevertheless, the level of detail provided by ICES alone has allowed a detailed analysis and mapping of fishing activities over the project area.

6.1.4. ICES fishing activity dataset

These data represent fishing effort from 2009-2013 from various demersal gear types (see Table 6.2) collected from Belgium, Denmark, France, the UK, Germany, Ireland, the Netherlands, Norway, Portugal and Sweden.

Initially, summary tables are presented indicating what type of data were available for which years, Table 6.1. To demonstrate that the available data are useful for mapping fisheries distribution, a series of maps were made that focus on the NSCP area.

Table 6.1: Overview of available data containing ICES reports of the geographical distribution of fishing effort from Belgium, Denmark, France, the UK, Germany, Ireland, the Netherlands, Norway, Portugal and Sweden

2014 ICES dataset	2009	2010	2011	2012	cSquare	Unit of effort
Beam trawls	✓	✓	✓	✓	link 2 GIS	hours per 0.05° cSquare and year
Demersal seines	✓	✓	✓	✓	link 2 GIS	hours per 0.05° cSquare and year
Dredges	✓	✓	✓	✓	link 2 GIS	hours per 0.05° cSquare and year
Otter trawls	✓	✓	✓	✓	link 2 GIS	hours per 0.05° cSquare and year
Format	XLS*	XLS	XLS	XLS		
2015 ICES dataset	**2009**	**2010**	**2011**	**2012**	**2013**	**Unit of effort**
Surface	✓	✓	✓	✓	✓	Swept Area Ratio (SAR)
Subsurface	✓	✓	✓	✓	✓	Swept Area Ratio (SAR)
Format	SHP*	SHP	SHP	SHP	SHP	

*Source: *XLS: Excel spreadsheet, SHP: Shapefile, ✓ data available*

Table 6.2: Gear group and associated gear type as used in the report of ICES-WGSFD

Gear group	Gear types included
Beam trawls	Beam trawls (TBB)
Demersal seines	Danish seines (SDN)
	Pair seines (SPR)
	Scottish seines (SSC)
Dredges	Boat dredges (DRB)
	Hand dredges (DRH)
	Mechanized dredge (HMD)
Otter trawls	Otter trawls (not specified) (OT)

Gear group	Gear types included
	Otter bottom trawls (OTB)
	Otter twin trawls (OTT)
	Pair trawls (PTB)
	Nephrops trawls (TBN)
	Bottom trawls (not specified) (TB)
	Shrimp bottom trawls (TBS)

Estimations of effort were calculated as detailed in Section 4.2 and the final values from each ICES dataset presented here in Table 6.3 and Table 6.4 and Figure 6.10 and Figure 6.11.

Table 6.3: Estimated effort per gear type class based on the ICES 2014 dataset[7]

	2009	2010	2011	2012
∑(count per class * geometric mean of class limits)				
		Hours		
Beam trawls	**970,036**	**120,5543**	**1,001,704**	**1,152,876**
Demersal seines	60,462	68,623	90,163	72,639
Dredges	136,677	119,685	131,311	193,138
Otter trawls	1,271,132	1,211,138	1,089,622	1,167,798

Table 6.4: Total effort per year for surface and subsurface seabed interaction (summed Swept Area Ratio) based on the ICES 2015[8] dataset

∑ Swept Area Ratio (km²)	2009	2010	2011	2012	2013
Surface	42,092	42,991	43,094	42,557	43,506
Subsurface	13,978	13,978	14,477	14,743	15,515

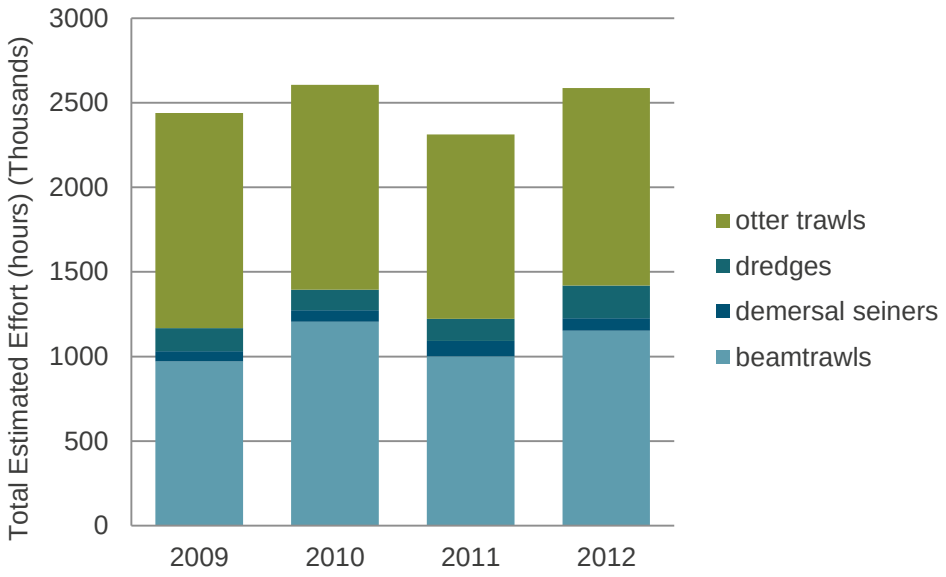


Figure 6.10: Trend and spread across gear types of fishing effort, North Sea Basin, based on the ICES 2014 dataset[7]

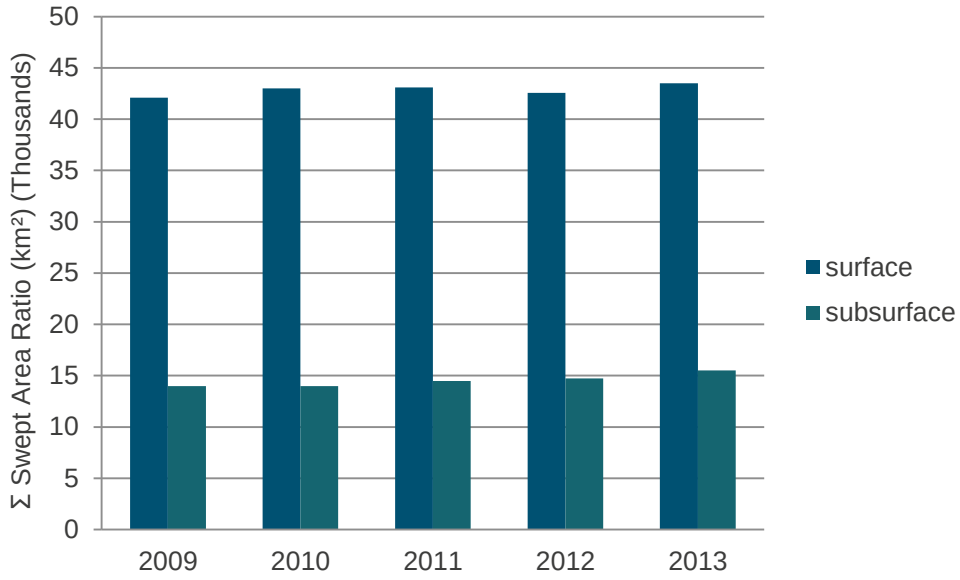


Figure 6.11: Trend for fishing disturbance of the seabed (surface, subsurface) in the North Sea Basin, based on the ICES 2015 dataset[8]

For the ICES 2014 dataset map series, four sets were created, one for each of the gear groups, dredges, demersal seiners, otter trawls and beam trawls. All four years (2009-2012) are presented for each gear group.

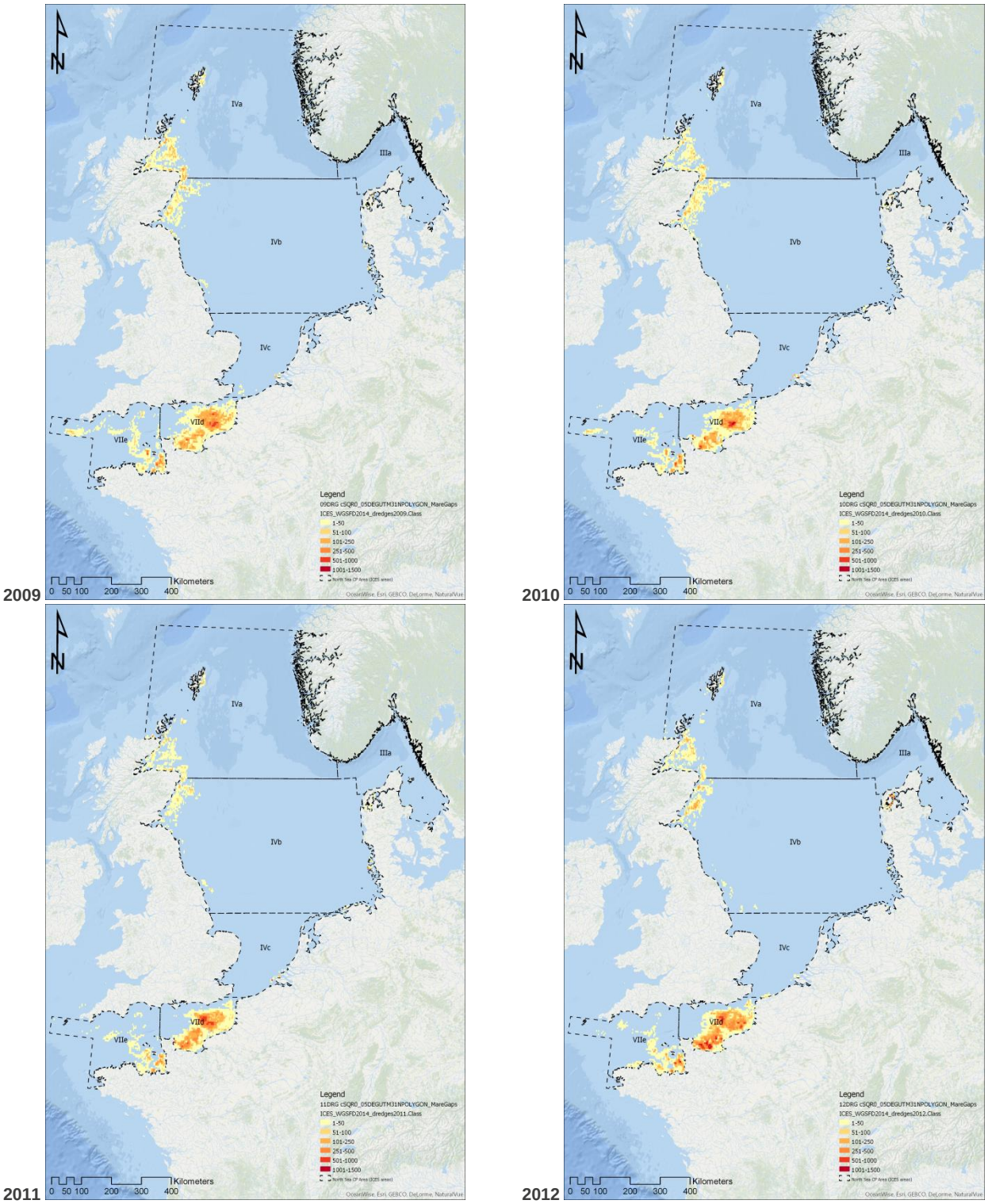


Figure 6.12: Fishing effort of dredges (hours per 0.05° c-square and year) from 2009-2012

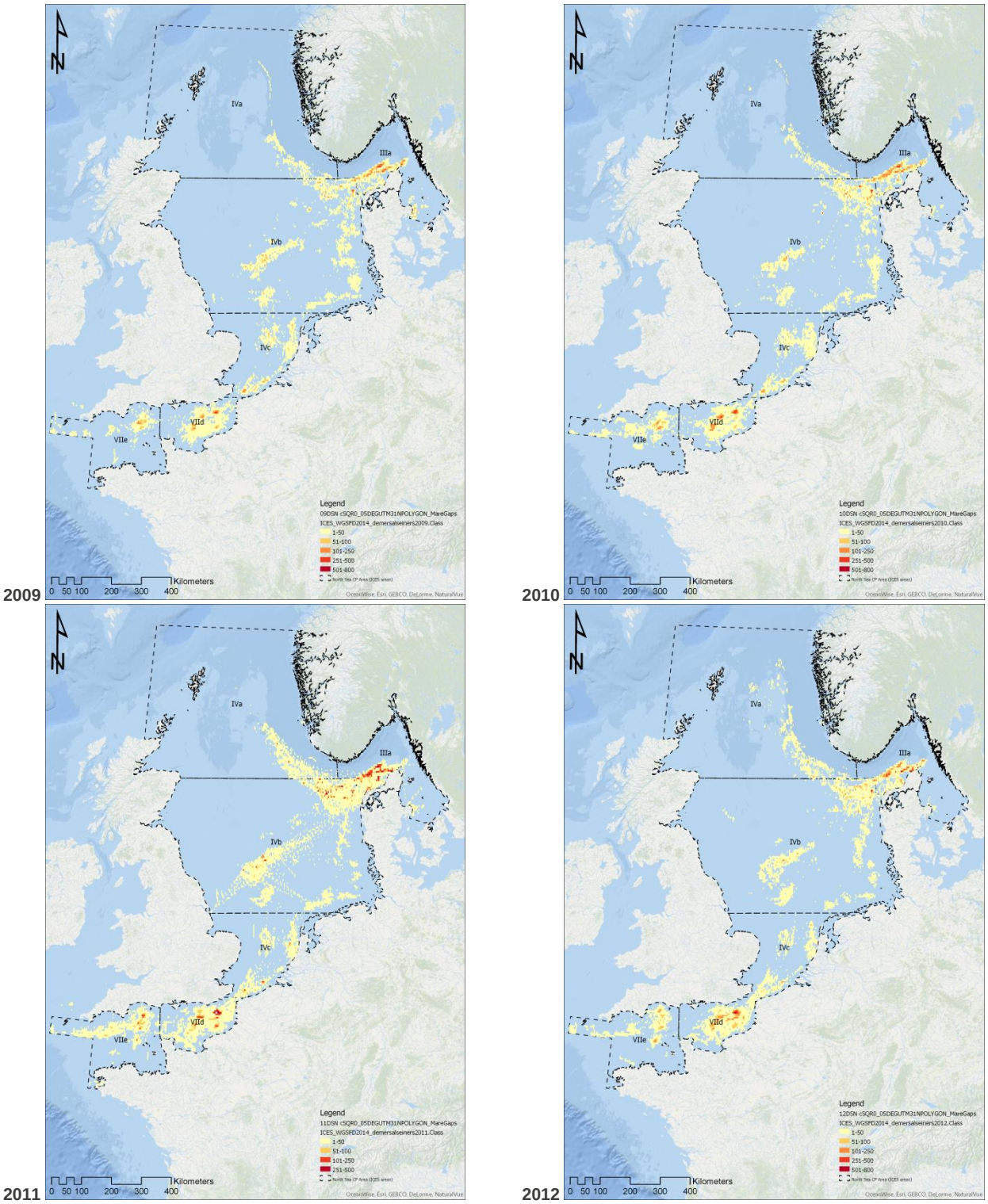


Figure 6.13: Fishing effort of demersal seiners (hours per 0.05° c-square and year) from 2009-2012

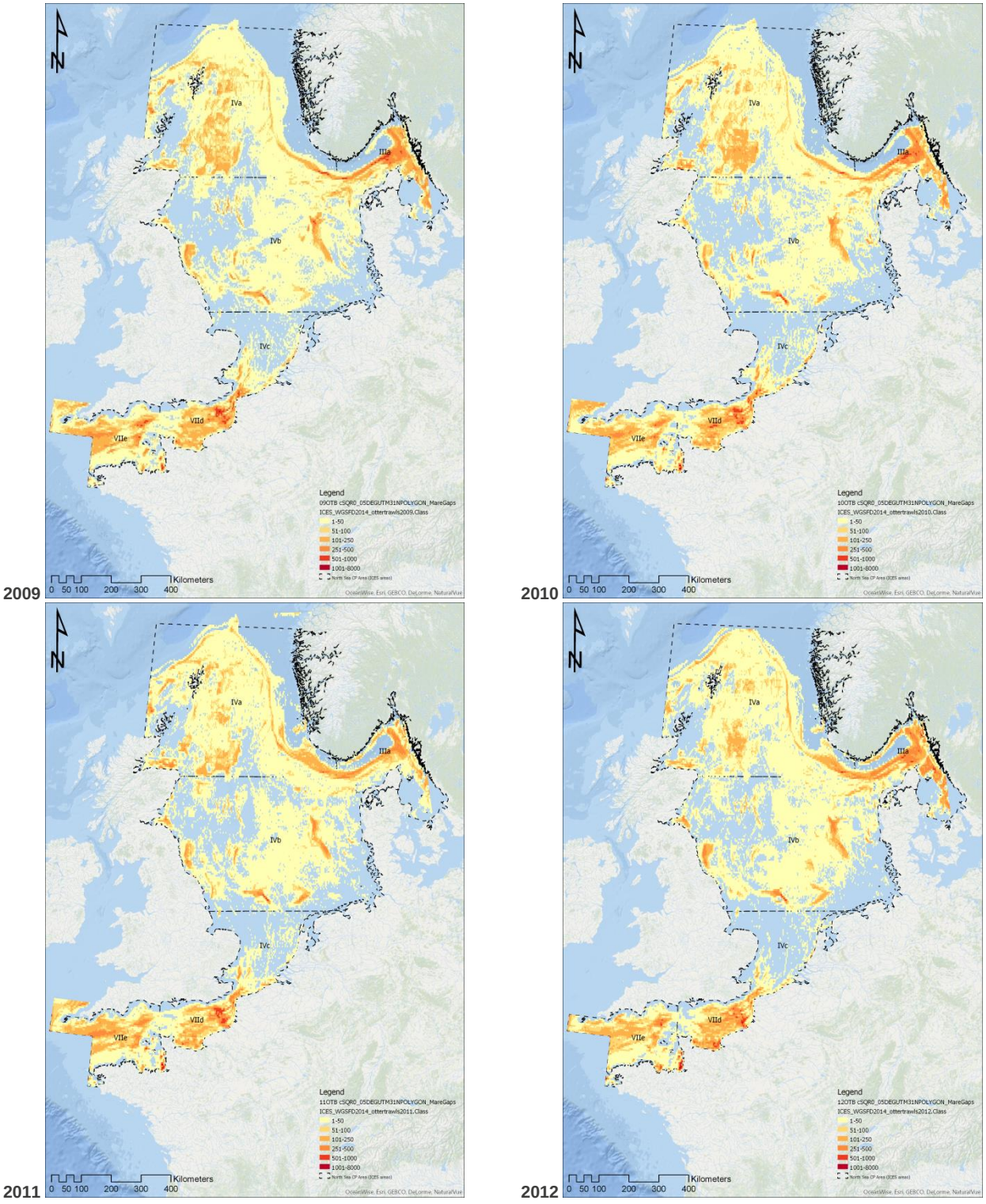


Figure 6.14: Fishing effort of otter trawls (hours per 0.05° c-square and year) from 2009-2012

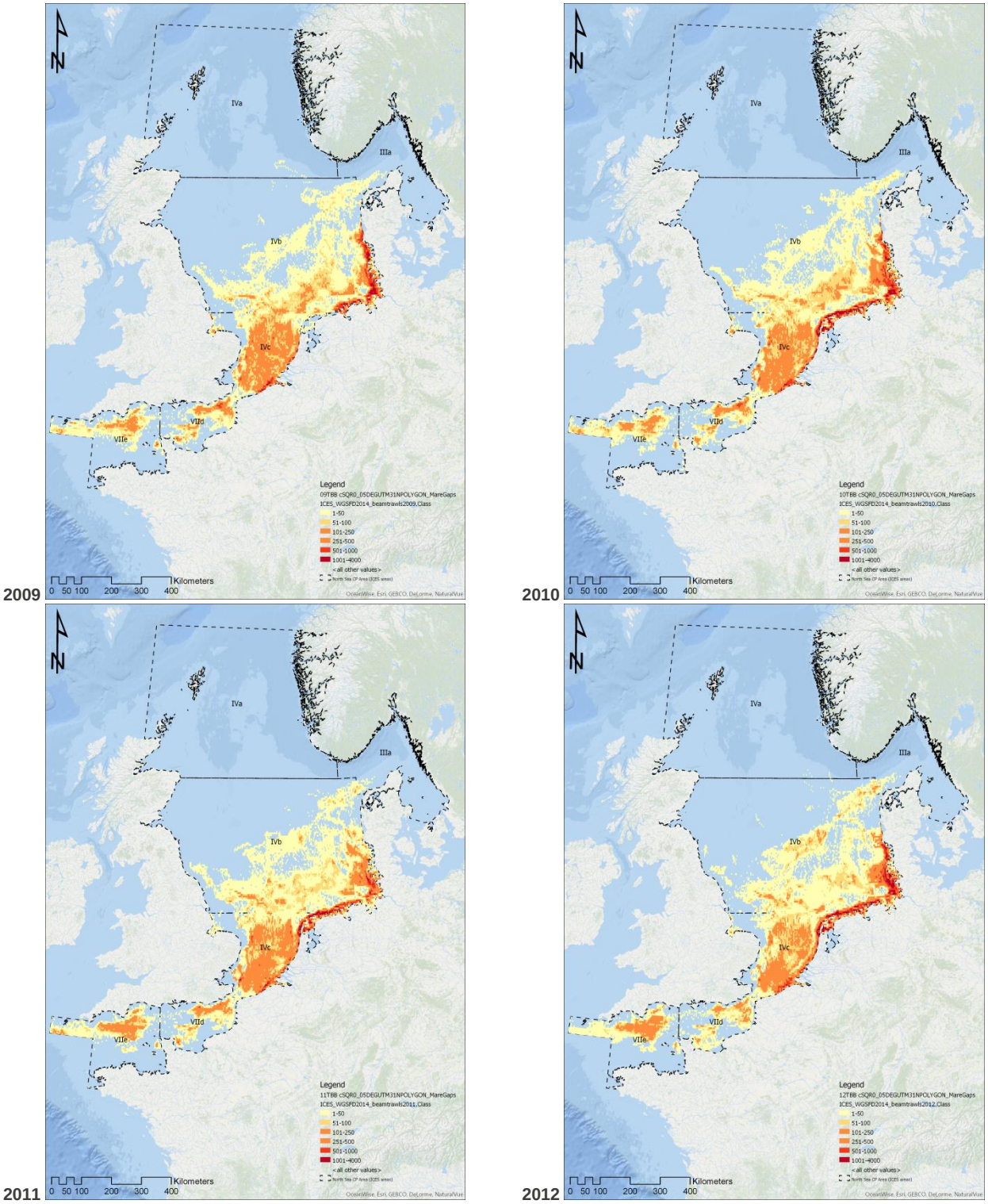
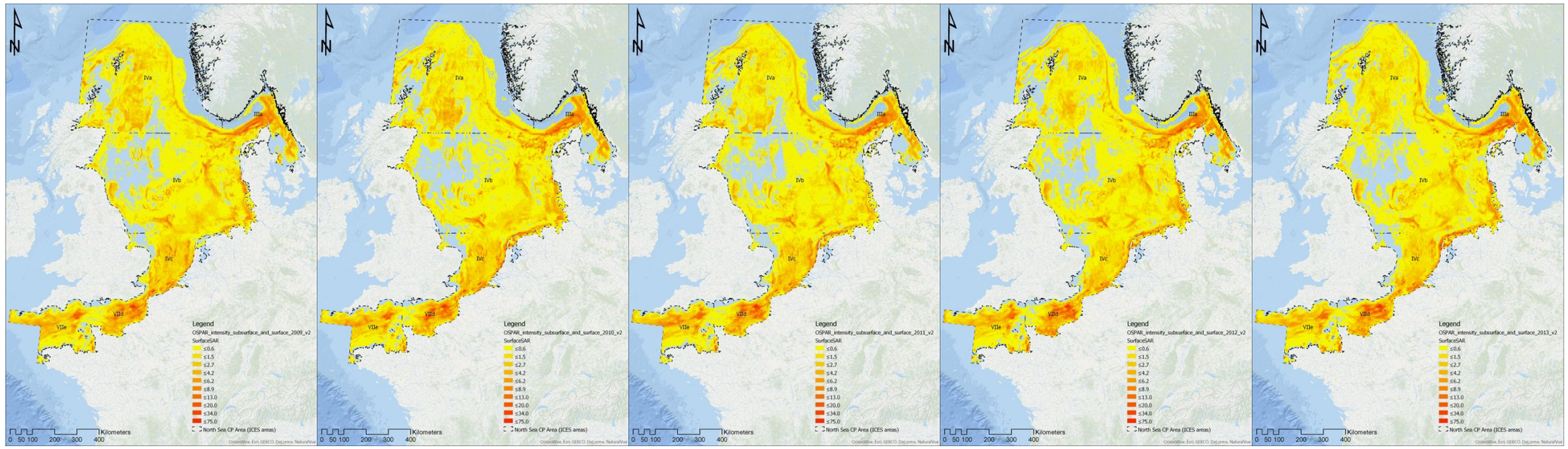


Figure 6.15: Fishing effort of beam trawls (hours per 0.05° c-square and year) from 2009-2012

ICES 2015 map series

The following maps shows another unit of effort. The surface (left) and subsurface (right) intensity of fishing as Swept Area Ratio (SAR) for the NSCP area, for the years 2009 to 2013 is shown here. All surface maps are mapped using the unit intensity classes (max: 75.0). Further details can be found in this footnote[8].



2009 2010 2011 2012 2013

Figure 6.16: Fishing effort (Swept Area Ratio) of surface (upper) and subsurface (lower) fisheries from 2009-2013 of EU fleets

Analysis of the data from ICES shows otter trawls and beam trawls to be the most important gear group in the area for most fleets (Figure 6.10). Fishing effort is clearly not uniformly distributed in the area.

Surface fishing intensity (or, the average number of times the seabed in each grid cell was contacted) is higher than subsurface fishing intensity over the whole area (Figure 6.11). Although subsurface fishing intensity shows higher effort concentrated in specific areas, such as along the northwest coast of France, Belgium, the Netherlands and Germany (**Error! Reference source not found.**). This area is where beam trawling for shrimps takes place (in <100 m depth) and is an artefact created by the inability to separate these lighter beam trawls, that do not penetrate the sediment, from the heavier offshore beam trawls.

Dredges are used heavily in the channel for blue mussels and oysters and off the east coast of Scotland where offshore dredging for scallops takes place (Figure 6.12). The effort of demersal seines is more widespread over the area (Figure 6.13). Otter trawls are the most widely used towed gear, but high intensity use is confined to a small proportion of the area (Figure 6.14), with highest use in areas. such as Skagerrak and Kattegat, and in central ICES Area IVa, where crustaceans such as Nephrops or Pandalus are targeted.

The overall pattern of fishing was relatively consistent over the period (2009-2012) particularly in relation to the areas of higher fishing effort.

Swedish fishing activity data

These data represent ten years of fishing effort from Swedish fleets from 2005-2015, for four demersal gear types (otter trawls - OTB, pair trawls and bottom trawls – PTB, beam trawls for nephrops – TBN, and beam trawls for shrimp - TSBS). These data were provided on request to the Swedish Fishing Authorities.

The data are initially summarised below in Table 6.5 and Figure 6.16 to Figure 6.19 give insight in the year-on-year variation in fishing effort of the Swedish fleet for each of the gear types and how this is distributed over the months of the year.

Table 6.5: Number of visits per month per ICES Area by Swedish vessels operating various demersal gear types, from 2005-2015

Gear	Year	Total of ICES Area	JAN	FEB	MAR	APR	MAJ	JUN	JUL	AUG	SEP	OKT	NOV	DEC
OTB	2005	12691	509	748	1355	1295	1587	1534	796	1350	1010	969	952	586
OTB	2006	12094	909	859	1169	869	1327	1333	717	1571	1112	1090	692	446
OTB	2007	10919	553	668	790	727	961	1051	690	1398	1171	1559	831	520
OTB	2008	14050	782	715	918	1829	1941	1167	1152	1477	1556	614	851	1048
OTB	2009	11725	1166	896	883	1199	1043	1333	844	1146	1016	975	540	684
OTB	2010	8689	680	273	775	783	946	992	497	843	824	656	666	754
OTB	2011	7904	633	268	643	695	907	761	534	937	716	631	813	366
OTB	2012	9553	852	463	834	899	1029	855	686	1096	640	919	783	497
OTB	2013	13375	1071	1150	1099	1307	1622	1281	1053	1208	1071	896	952	665
OTB	2014	13267	997	961	1157	1379	1505	1156	929	964	1292	1053	1154	720
OTB	2015	10386	920	840	1176	1306	1336	1022	882	1178	1303	423		
PTB	2009	50				12	16	22						
TBN	2005	6546	195	454	552	273	516	881	517	1022	652	621	392	471
TBN	2006	8275	422	483	608	237	619	1025	761	1575	954	810	465	316
TBN	2007	9216	529	1242	970	684	1045	903	703	1574	630	409	296	231
TBN	2008	6063	192	599	607	535	846	480	645	820	538	93	302	406

Gear	Year	Total of ICES Area	JAN	FEB	MAR	APR	MAJ	JUN	JUL	AUG	SEP	OKT	NOV	DEC
TBN	2009	7586	467	665	102	201	418	1130	804	1499	813	564	298	625
TBN	2010	7762	312	98	429	396	860	1271	667	1245	1135	547	449	353
TBN	2011	7150	123	132	222	132	505	1093	1090	1700	733	478	740	202
TBN	2012	9119	639	522	223	488	1163	877	929	1694	793	744	446	601
TBN	2013	8399	489	448	353	247	896	802	1017	1479	1272	686	484	226
TBN	2014	8789	430	451	429	495	1058	1104	1140	1134	1225	486	521	316
TBN	2015	6131	203	355	331	215	525	777	1077	1557	911	180		
TBS	2005	5414	262	379	511	568	644	635	367	341	433	393	514	367
TBS	2006	4720	400	417	469	441	531	528	275	353	339	445	322	200
TBS	2007	3785	251	216	278	334	400	471	285	324	262	396	350	218
TBS	2008	4158	263	281	289	473	439	347	282	268	341	458	355	362
TBS	2009	3909	345	369	344	628	515	104	77	181	237	388	283	438
TBS	2010	5273	351	325	526	667	534	478	318	351	499	413	361	450
TBS	2011	5236	425	350	530	635	536	580	300	377	448	363	453	239
TBS	2012	3267	267	229	311	360	464	379	233	314	237	261	212	
TBS	2013	106				25	80					1		
TBS	2014	5			4								1	

N.B. 1: PTB only for a few months in 2009.

N.B. 2: TBS possibly incomplete for 2013, 2014 and no data included for 2015.

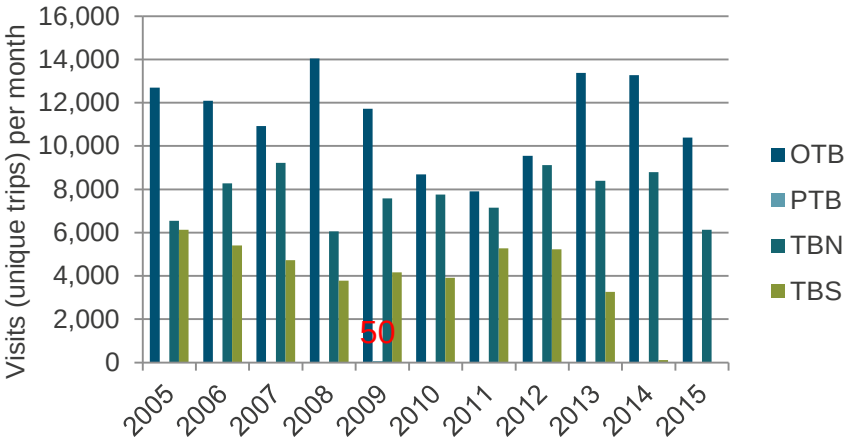


Figure 6.16: Year on year variation of fishing effort for unique trips to an ICES-rectangle by Swedish fishing vessels, by gear type. Label (50) indicates value for PTB, 2009

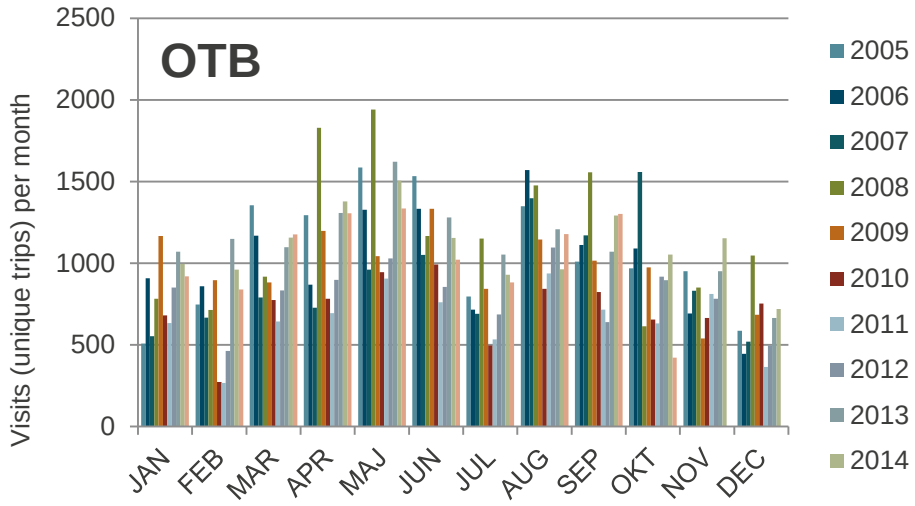


Figure 6.17: Monthly variation of fishing effort for unique trips to an ICES-rectangle by Swedish fishing vessels using otter trawls from 2005-2015

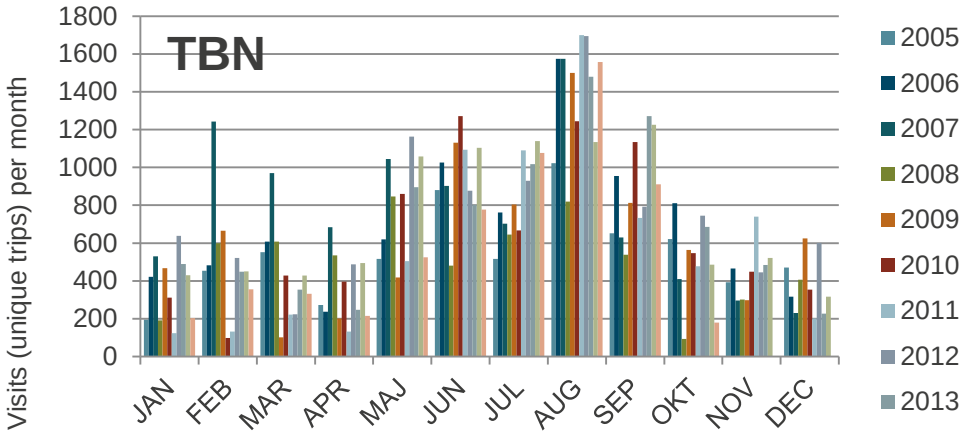


Figure 6.18: Monthly variation of fishing effort for unique trips to an ICES-rectangle by Swedish fishing vessels using beam trawls targeting nephrops from 2005-2015

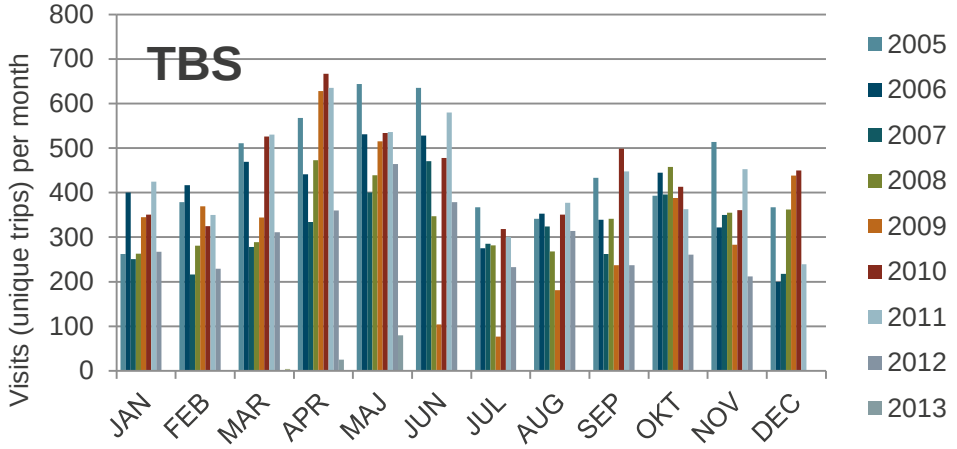
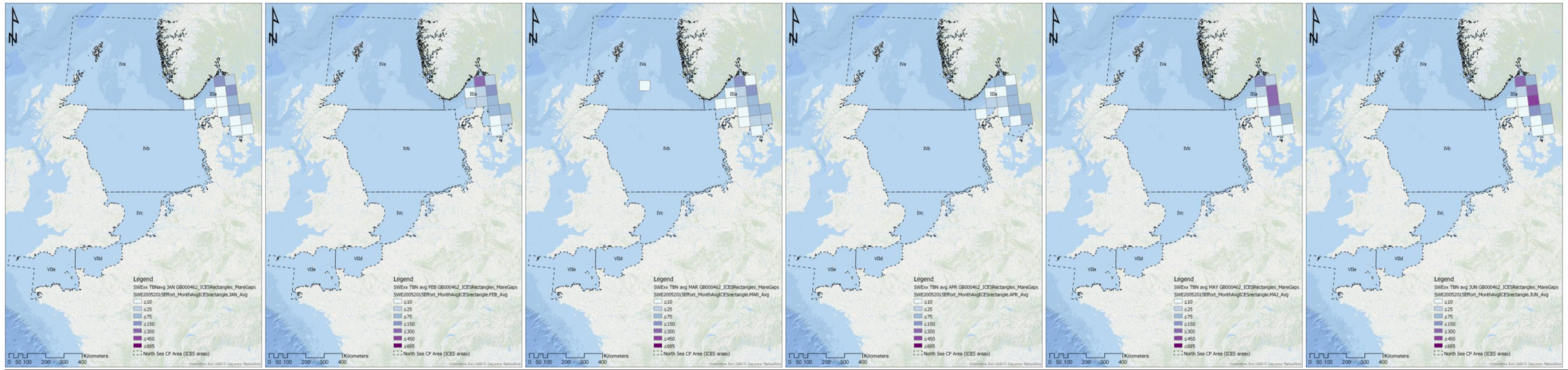
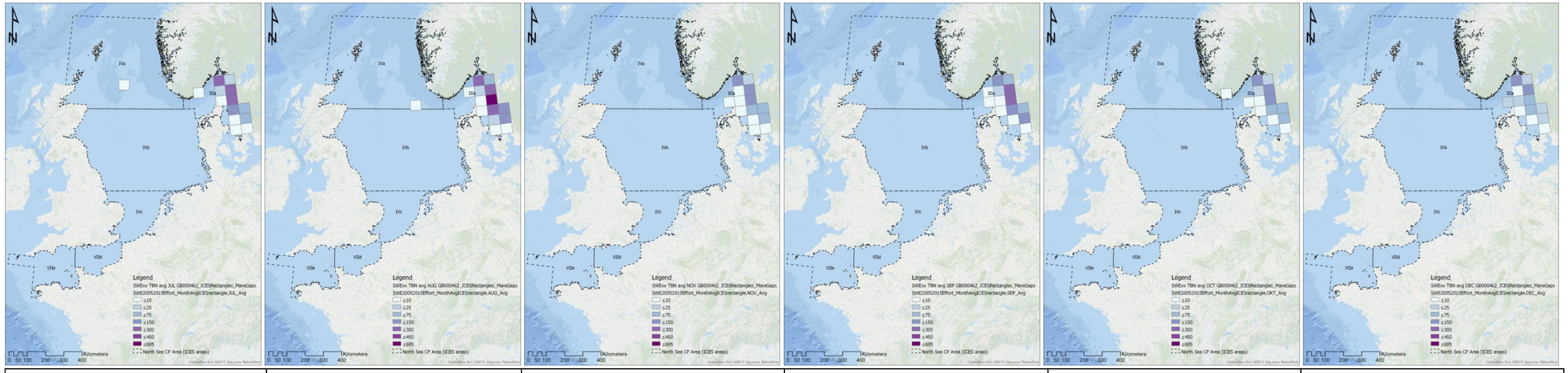


Figure 6.19: Monthly variation of fishing effort for unique trips to an ICES-rectangle by Swedish fishing vessels using Beam trawls to target shrimp (TBS), from 2005-2015

As an example of how these data can be manipulated, the effort of Swedish vessels using beam trawls to target nephrops is mapped for each separate month. Each map displays data from 2005-2010.



January	February	March	April	May	June



july	August	September	October	November	December

Figure 6.21: Average number of visits per month per ICES Area by Swedish vessels operating beam trawls to target nephrops, from 2005-2015

In the Swedish fleet, otter trawls show the highest fishing effort of all gears, followed by beam trawls used to target nephrops (Figure 6.16). Beam trawling for shrimp also takes place although there was no recorded effort in 2014 and 2015.

Over the 10 year period analysed (2005-2015) fishing effort of these gears has fluctuated, with effort being highest in 2008, 2013 and 2014 (Figure 6.16). Looking at seasonality, otter trawling shows the higher effort between April and May and also between August and October (Figure 6.17). This change in effort can be seen spatially where it shifts from the north of ICES Area IIa to the northeast over the year (Figure 6.18). Trawling for nephrops is greatest between May and September (Figure 6.18) whereas shrimp trawl shows more consistent fishing effort for all years (Figure 6.19).

UK MMO fishing activity data

In the following section the data provided by the UK's MMO dataset is summarised in Table 6.6 to

Table 6.8 and the trend over the available period (2007-2014) is illustrated with Figure 6.20.

Table 6.6: Fishing effort for the UK fleet within the NSCP (ICES area IVabc, VIIde) as total time spent fishing (in minutes) and as total kW*hours (based on data from MMO)

	Time (minutes)		kW*Hours	
Year	Mobile	Passive	Mobile	Passive
2007	36133266	1831699	-	-
2008	35936409	1951461	-	-
2009	35644468	2410670	-	-
2010	34905534	2242186	-	-
2011	30911168	2381957	288662843	18233586
2012	27059519	1762020	253220383	12572247
2013	25627610	1869657	241868825	12373046
2014	27482335	2287642	262993322	13867006

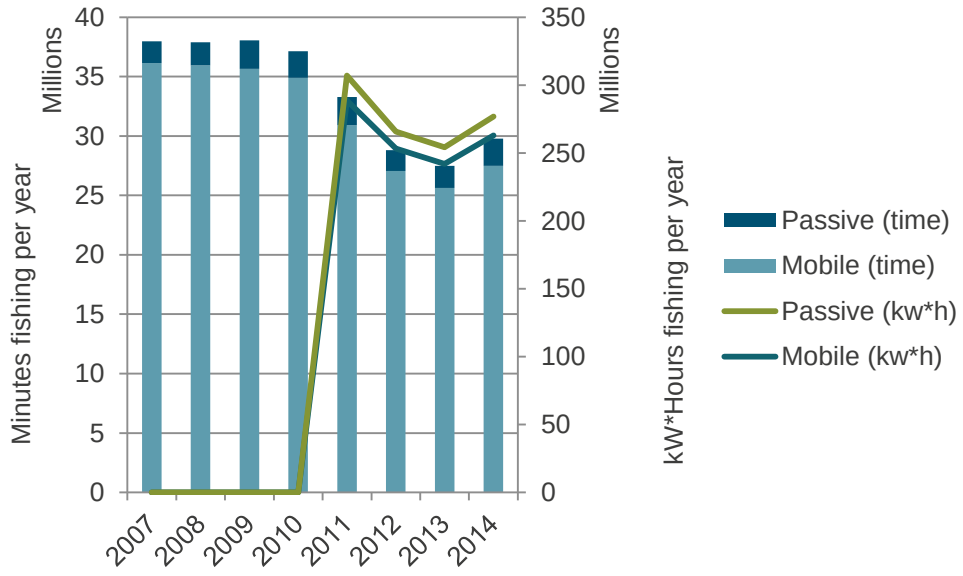


Figure 6.20: Fishing effort as expressed as time fishing and as kW*hours for the UK fleet (based on data from MMO)

Table 6.7: Overview of information contained in the geographical datasets from the MMO on Fishing Activities for the years 2007-2014

		2007	2008	2009	2010	2011	2012	2013	2014	
Format		SHP*	SHP	SHP	SHP	SHP	SHP	SHP	SHP	Unit
Time	Total	✓	✓	✓	✓	✓	✓	✓	✓	minutes per year per 0.05° cSquare
	Mobile	✓	✓	✓	✓	✓	✓	✓	✓	
	Passive	✓	✓	✓	✓	✓	✓	✓	✓	
Quantity	Total	✓	✓	✓	✓	✓	✓	✓	✓	Tonnes live weight fish landed per year
	Mobile	✓	✓	✓	✓	✓	✓	✓	✓	

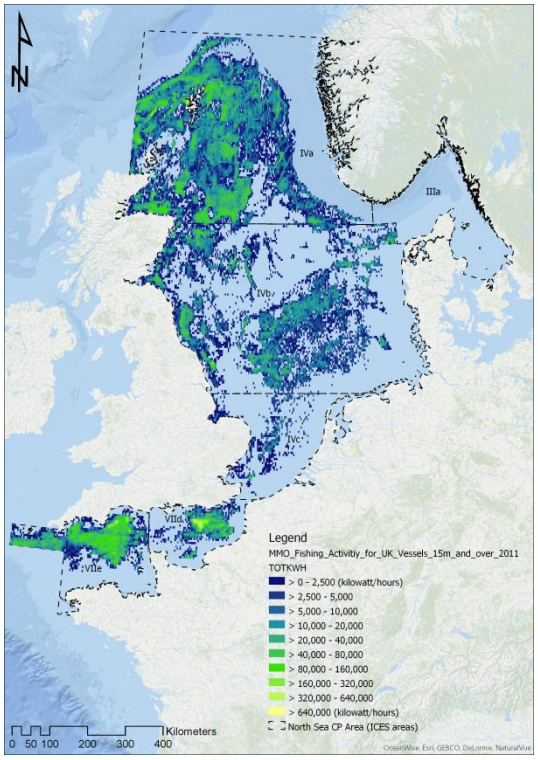
		2007	2008	2009	2010	2011	2012	2013	2014	Unit
	Passive	✓	✓	✓	✓	✓	✓	✓	✓	per 0.05° cSquare
Value	Total	✓	✓	✓	✓	✓	✓	✓	✓	Value £ of landed fish per year per 0.05° cSquare
	Mobile	✓	✓	✓	✓	✓	✓	✓	✓	
	Passive	✓	✓	✓	✓	✓	✓	✓	✓	
Effort	Total	x	x	x	x	✓	✓	✓	✓	kW hours per year per 0.05° cSquare
	Mobile	x	x	x	x	✓	✓	✓	✓	
	Passive	x	x	x	x	✓	✓	✓	✓	

SHP: shapefile, ✓ data available,* **x no data

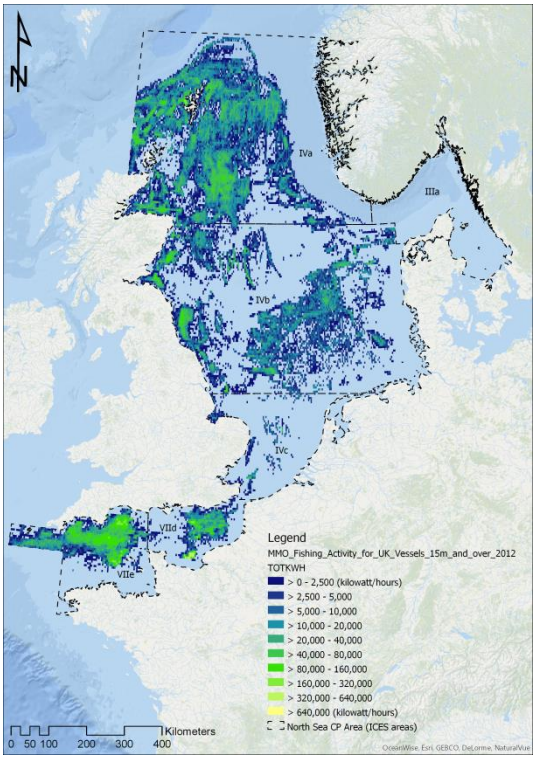
Table 6.8: Gear types included in the UK MMO data sets on Fishing Activity, with assumed classification into the categories Mobile and Passive gears

Gear types	Mobile	Passive
boat dredges	-	+
traps (not specified)	x	✓
pots	x	✓
gillnets and entangling nets (not specified)	x	✓
gillnets (not specified)	x	✓
driftnets	x	✓
set gillnets (anchored)	x	✓
trammel nets	x	✓
hand fishing	x	✓
mechanized dredges	x	✓
hand lines and pole-lines (hand-operated)	x	✓
long lines (not specified)	x	✓
set long lines	x	✓
hooks and lines (not specified)	x	✓
otter trawls (not specified)	✓	x
otter trawls – bottom	✓	x
otter trawls – midwater	✓	x
otter twin trawls	✓	x
with purse lines (purse seines)	✓	x
pair trawls – bottom	✓	x
pair trawls – midwater	✓	x
Danish seines	✓	x
pair seines	✓	x
Scottish seines	✓	x
seine nets not elsewhere specified	✓	x
beam trawls	✓	x
nephrops trawls	✓	x
midwater trawls not elsewhere specified	✓	x
shrimp trawls – midwater	✓	x
other trawls not specified)	✓	x

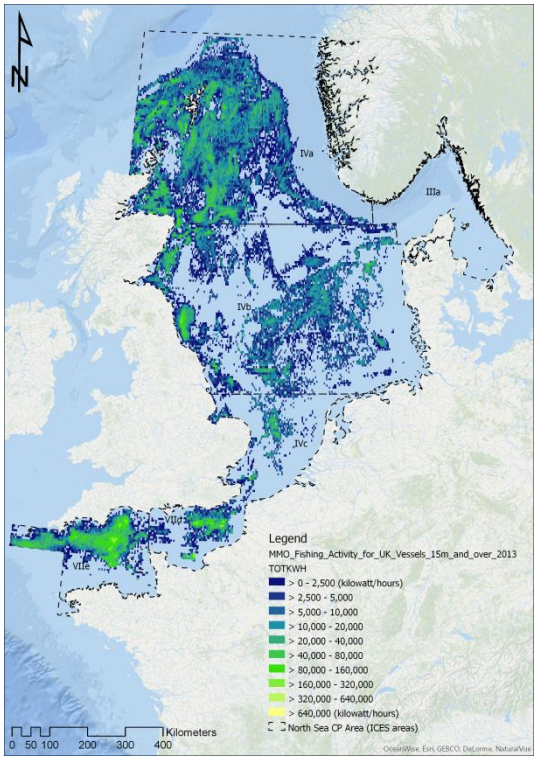
Two sets of maps are now presented based on the MMO datasets. Firstly, total kW hours fishing activity for the years 2011-2014 and secondly, total mobile and passive fishing activity for the latest year of data, 2014.



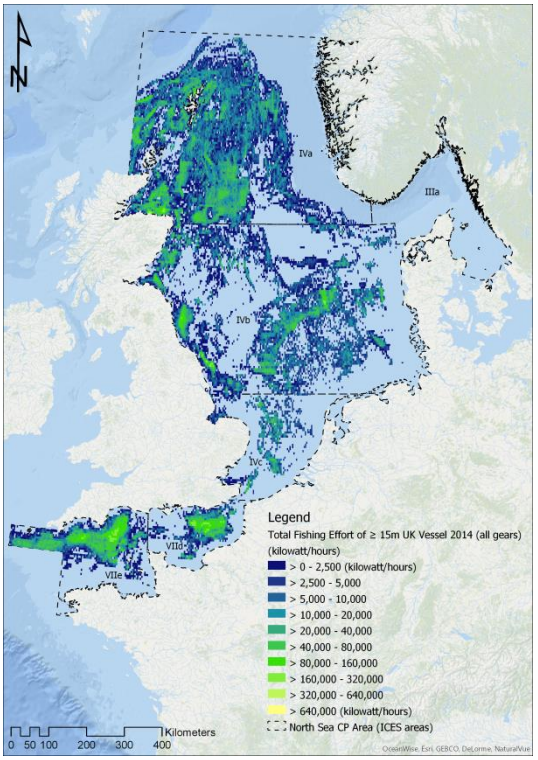
2011



2012

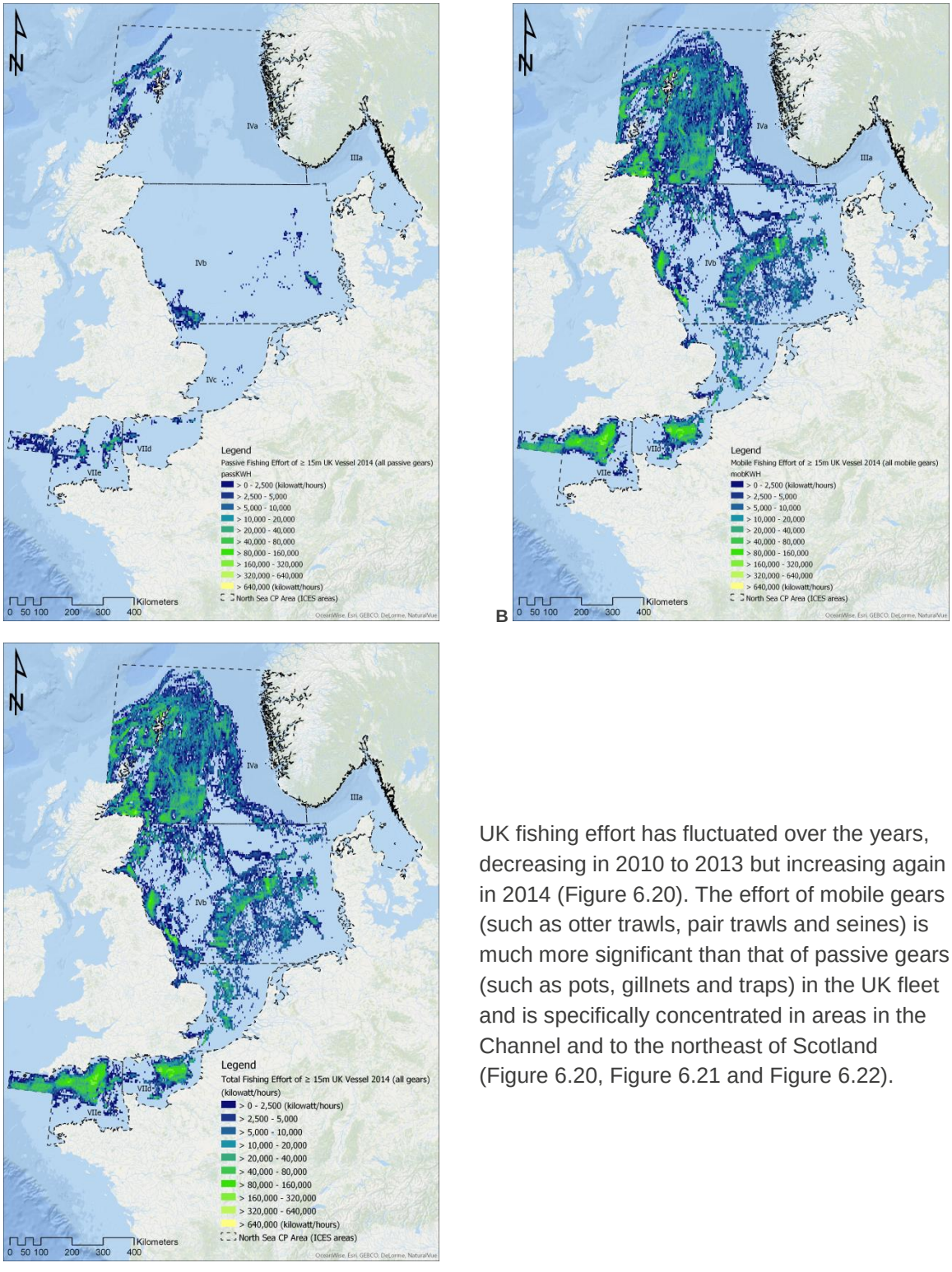


2013



2014

Figure 6.21: MMO fishing activity of the UK fishing fleet (total kwH) for the years 2011-2014



UK fishing effort has fluctuated over the years, decreasing in 2010 to 2013 but increasing again in 2014 (Figure 6.20). The effort of mobile gears (such as otter trawls, pair trawls and seines) is much more significant than that of passive gears (such as pots, gillnets and traps) in the UK fleet and is specifically concentrated in areas in the Channel and to the northeast of Scotland (Figure 6.20, Figure 6.21 and Figure 6.22).

Figure 6.22: Fishing activity (kwH) of UK fleets using passive (A), mobile (B) and all (C) gears in 2014

UK Marine Scotland fishing activity data

The final presentation of fishing activity in the project area are some examples from the Marine Scotland data portal (National Marine Plan Active). As spatial fishing activity data were not directly downloadable as shapefiles, screen shots were taken to provide an example of what this tool can show in terms of Scottish fishing effort.

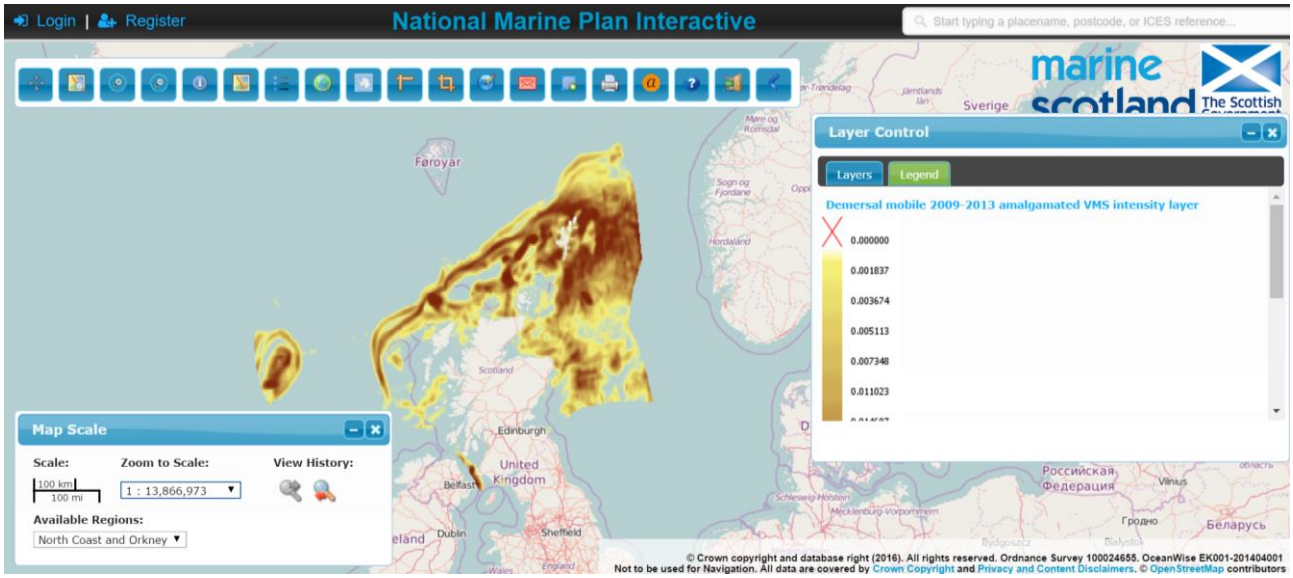


Figure 6.23: Demersal mobile gear fishing effort of UK vessels in Scottish waters (amalgamated VMS intensity) from 2009-2015

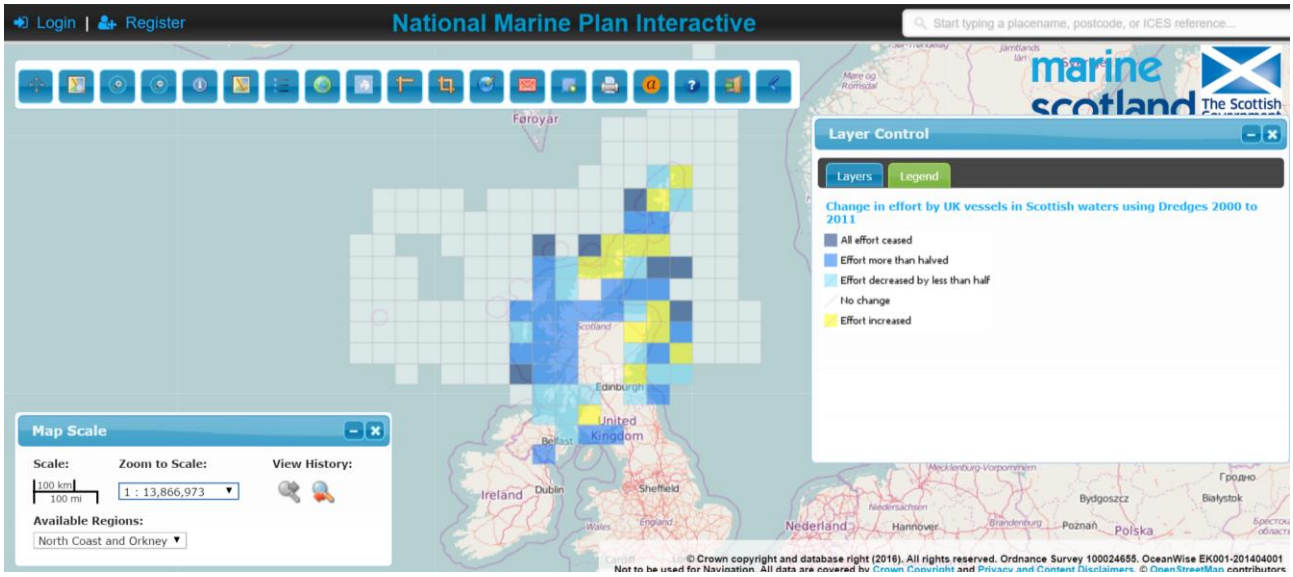


Figure 6.24: Change in effort by UK vessels in Scottish waters using Dredges 2000 to 2011

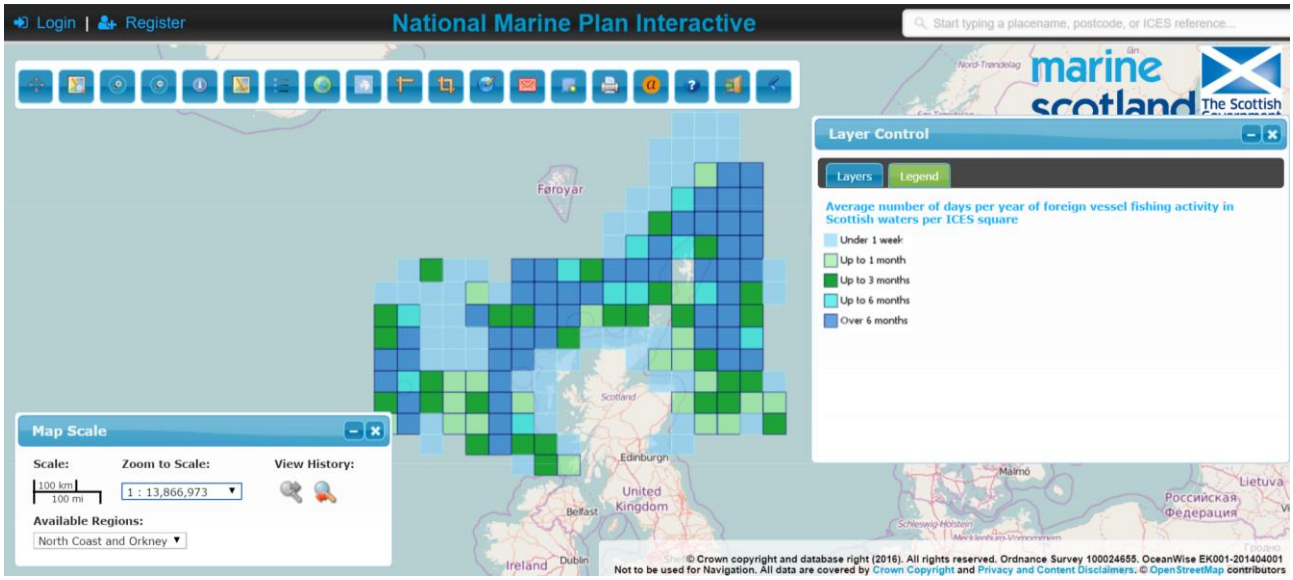


Figure 6.25: Average number of days per year of foreign vessel fishing activity in Scottish waters per ICES square

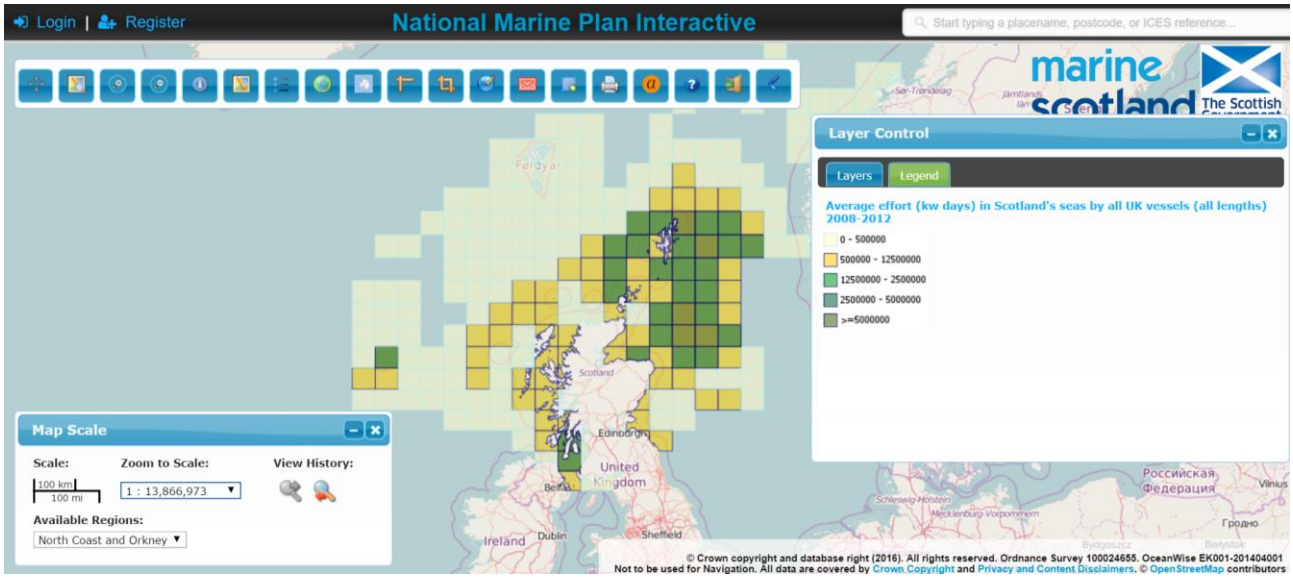


Figure 6.26: Average effort (in kW days) in Scotland's seas by all UK vessels (all lengths) 2008 - 2012

Finally, spreadsheets of fishing effort (days) data were downloaded from 2001-2014 for bottom touching gears (dredges, harvesting machines, seine nets and trawls) and analysed, in order to see changes in the Scottish fleet's activity over time.

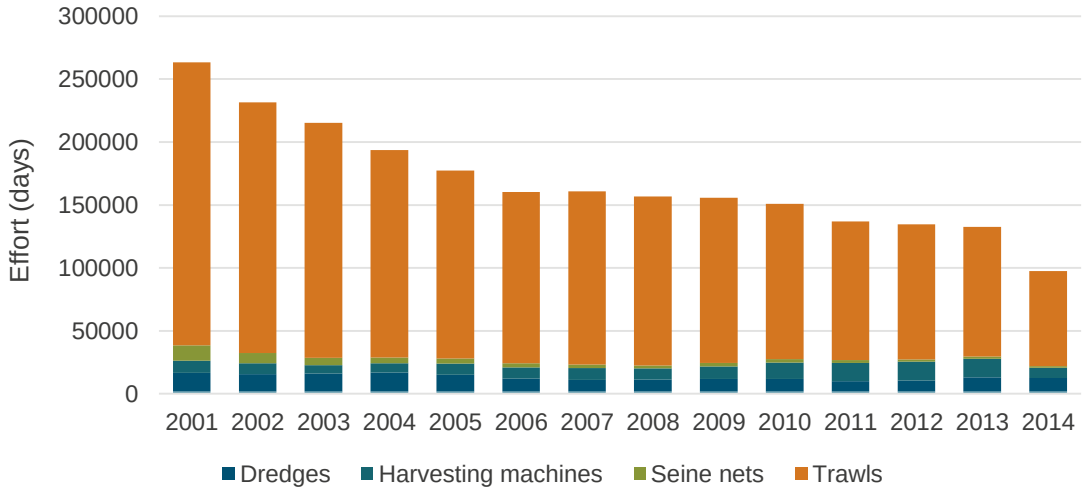


Figure 6.27: Proportion of fishing effort, in days, of Scottish vessels from 2001-2014, using different bottom-touching gears. Data: Marine Scotland

Ten years of VMS fishing effort data show the fishing activity of UK vessels in Scottish waters to have specific areas of high effort, in the centre of ICES Areas IVa and along the north coast of VIa and IVa (Figure 6.23). Foreign vessels in these waters also appear to exploit the same fishing grounds (Figure 6.25).

Trawls were and still are the largest gear group effort-wise, even though their use has decreased. The use of other gear groups is considerably smaller (Figure 6.27). The change in effort of dredges, specifically between 2000 and 2011 (Figure 6.24), has decreased generally in north eastern waters and increased in western waters (Figure 6.24).

6.1.5. Outcome

The outcome of this challenge was to gain:

> ‘…an understanding of whether data are available and sufficient to describe the extent of fisheries activities and their impact on the North Sea environment’

A significant amount of landings and fishing effort data have been collected and analysed to show:

- Major characteristics in the fleets utilising the area, including:
  - the most important species caught and discarded;
  - the most heavily used gears;
  - the most heavily used areas; and
  - the distribution of effort between different countries.
- Temporal changes in the fishing activity of these fleets over the whole area for at least a four year period and in some cases for a decade.

The datasets utilised in this study are not fully representative of fishing activity in the area (the landings datasets only include EU MS and the basin-wide fishing activity datasets only include 10 countries over 4 years of data) but they allow a good overall description and provide an example of the level of data available

to an end user. With more time, or with a focus on a specific country, detailed analyses of fishing activities and their impact could be conducted.

There is a lack of discard and bycatch data and therefore not enough information to describe the impact of fisheries on those species caught and discarded by fishing fleets. It is this aspect (the ecological species aspect) of the North Sea environment that cannot be determined from the data collected during this study.

Estimating the impact of fisheries on the North Sea environment:

Although maps of the fishing intensity reveal areas that are most heavily fished by bottom-contacting gears, they do not show how the areas are impacted. The impact of a trawl is a combination of:

- trawling intensity:
- the depth of penetration: and
- the sensitivity of the seabed habitat it is affecting.

The most useful datasets were the yearly statistics, however, the challenge was aiming for monthly data.

Further work would be required to clarify the sensitivity of various seabed habitats in the North Sea by overlaying data such as the intensity of towed gears with seabed habitat distribution. As part of the NSCP and generally under the EMODnet initiative, seabed habitat distribution data are readily available and could be easily combined with fishing activity data to conduct some basic analyses.

OSPAR have already suggested that such analyses are undertaken:

> In order to evaluate the extent to which seafloor integrity (Marine Strategy Framework Directive Descriptor 6 [16]) is being impacted by anthropogenic activity, a combination of habitat sensitivity assessments and cumulative pressures of human activity is required. The annual maps on spatial and temporal fishing activities are a first step in evaluating fishing intensity and impacts on benthic biodiversity, but are insufficient to address MSFD Descriptor 6. A number of data supply issues will need to be resolved to ensure that full coverage of all relevant fishing activity is achieved for the whole OSPAR area. Further work is required to improve the data on gear characteristics and towing speed by métier that are required to estimate fishing intensity. The next step should therefore be to establish a consistent classification of the sensitivity of seabed habitats and benthic ecosystems to fishing intensity. This needs to be mapped in the OSPAR area at a scale compatible with 0.05 × 0.05 degree grid cells. A combination of trawling intensity with seabed sensitivity could then be used to map impact. A further step will then be to derive an indicator or indicators of fisheries impact, against which management thresholds might be set. The setting of management thresholds will require understanding of the relationship between fishing pressure and state of the seabed. There are other pressures affecting seabed integrity (e.g. eutrophication, hazardous substances, dredging, gravel extraction, and coastal construction). Indicators and any management should ideally also take account of the impacts of these pressures.'[17]

[16] JNCC (2016). EU Marine Strategy Framework Directive Descriptors [Online]. Available: http://jncc.defra.gov.uk/page-5231#GES1 [Accessed 20.05.2016].

[17] ICES (2014). General advice: OSPAR request on mapping of bottom fishing intensity using VMS data. [Onine]. Available: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2014/Special%20Requests/OSPAR_mapping_bottom_fishing_intensity.pdf [Accessed 20.05.2016].

While more detailed evaluations are clearly needed to fully assess the impact of fisheries on the North Sea seabed environment, this challenge has shown that an end user can conduct some higher-level analyses and draw some broad conclusions.

6.2. Data Adequacy

This section reports on the data adequacy to deliver the challenge. Data adequacy is reported under the six value assessments used for screening the data: Contribution, Location, Commercial, Attributes, Delivery and Usability.

The main objective of the Fisheries Management Challenge is:

To gain

> ‘…an understanding of whether data are available and sufficient to describe the extent of fisheries activities and their impact on the North Sea environment’

To do this, specific outputs were decided upon (see Section 6.1.2. Analysis). Table 6.9 summarises the data needed for each output. Each dataset discovered was then assessed by the criteria in Table 6.9. This has been the basis for the analysis of data adequacy.

Table 6.9: Datasets considered suitable in the Fisheries Management Challenge

Output	Datasets required	Preferences
Basin-wide landings, discards and bycatch data	Mass and number of landings of fish by country, year, species, gear and ICES rectangle	• Cover all countries bordering the Project Area and all countries that land catches into ports into this area • Include the most recent data (up-to-date within a year) • Time series is as long as possible (before and after the introduction of the Data Collection Framework) • Readable in spreadsheets
Basin-wide seabed interaction data displayed in gridded data layers	Fishing activity (kW hours fishing) by country, year, gear type and ICES rectangle	• Cover all countries bordering the Project Area and all countries that land catches into ports into this area • Include the most recent data (up-to-date within a year) • Time series spans 10 years • Data provided in kW hours • Data convertible to GIS formats or already available in GIS formats

36 datasets have been assessed by the NSCP Fisheries Management Data Screen, 10 of which have been selected for use in the challenge. See **Appendix A** for the full list of datasets assessed.

6.2.1. Contribution – Do the data contain the right parameters?

As detailed in Table 6.7, datasets were considered for use where data were available or provided in the correct format (grouped by country, year, species, ICES rectangle) so that multiple datasets could be combined from countries to create basin-wide datasets.

Several datasets met these criteria but only datasets that were known not to overlap with others were selected for use. For example, due to the dynamic nature of fishing across several ICES rectangles, the catch and effort of fleets is reported and published by several countries at the same time. The team had to be cautious in the selection of datasets for final publication in order to avoid reporting the same information from different countries.

Landings, discards and bycatch data

The online dataset from the JRC was chosen for final publication. This online data tool displays landings and discards data from 2003-2014 and includes all EU countries bordering the project area (North Sea and English Channel).

During the data collection phase, countries were individually contacted and landings data were requested in a specific format required for the challenge. It was hoped that these datasets would supplement the JRC data. As Norway, Iceland and the Faroe Islands are not EU Member States, the JRC does not hold data for these countries and the challenge was reliant on their data provision.

Most countries did not respond until a very late stage in the data collection process and by the time datasets were being compiled for the challenge, countries only had a few weeks to submit full datasets. As such, only datasets with limited time series were provided free of charge.

Therefore the final landings, discards and bycatch dataset provided for the Fisheries Management Challenge was based entirely on that provided by the JRC. This dataset has good geographical coverage of the project area, an 11 year time series which is considered an adequate representation of temporal change in fisheries.

Seabed interaction and fishing effort data

Several datasets were chosen for final publication. Ideally (as defined in ‘Aims’ - Section 2) one set of gridded data layers of fishing effort for the entire project area would have been created but only Sweden provided data in the correct format for the challenge so searches were conducted looking for datasets with wider geographic coverage of the project area.

ICES provides a dataset that covers the entire OSPAR area, so is not restricted by EU designations. Although the time series only spans four years, six years less than the required time series, it was still possible to obtain a basin-wide picture of demersal fishing effort. Data were available to download as GIS data as well as in basic spreadsheet format so can be easily manipulated by users when creating their own maps. A possible deficiency of the WGSFD-datasets (ICES, 2014/2015) with respect to the aims of the challenge is that the data have been aggregated across countries, leaving the project with no possibilities to assess which countries are connected with the fisheries in a given area.

The UK (MMO and Marine Scotland) also provide VMS fishing effort data in kW hours for longer time series (MMO - 7 years, Marine Scotland - 5 years) which are downloadable in various formats ranging from spreadsheets, shapefiles and Geotiffs[18].

[18] A geotiff (often just referred to as a raster) is effectively just an image file with a spatial reference. Depending on the exact format, each pixel can have a wide range of values (often translated into greyscale, or a colour ramp) - e.g. each pixel could represent depth.

As the timeframe of the study did not allow for the complex task of combining the ICES, Swedish and UK datasets, separate maps from each dataset were produced to give an overall picture of demersal fishing effort in the project area.

6.2.2. Location – Do the data cover the correct timescale and area?

During the production of the final datasets, compromises were made at either spatial or temporal resolution to get basin-wide datasets.

Spatial resolution

To recap, for a dataset to be at the correct spatial resolution for the challenge, it needed to contain data grouped by ICES rectangle as this was the geographical and statistical designation chosen. The next aim was to collate these datasets for as many countries as possible in the project area to obtain basin-wide datasets.

Landings data

Datasets that were available by ICES rectangle were provided by the JRC, Sweden, Norway and the UK (MMO and Marine Scotland). Landings datasets provided by ICES were not grouped down to this level (only by ICES Area) and were not provided upon request.

Discards data

Data were provided by ICES rectangle by Sweden upon request. The only other discards data available were provided by the JRC, but were not initially grouped by ICES rectangle and the project team had to clip and combine tables to assign discards by ICES Area to discards by rectangle, using ratios.

Fishing activity and effort data

Data that were available by ICES rectangle were provided by the JRC, Sweden, the UK (MMO and Marine Scotland) and ICES. Whilst the JRC provided basin-wide effort data in hours fished per year, it was only available in spreadsheet format and not in a format that could be easily processed for GIS. However, basic graphical analyses using spreadsheet tools could be used to see general trends over time in fishing effort in the project area, as was the general aim of the challenge.

The UK (MMO) and ICES did provide effort data by ICES rectangle in GIS (shapefile) format, so general trends over a large geographical area could be successfully mapped. Sweden provided effort data upon request, by ICES rectangle and in kW hours. This provided a dataset that gave detailed insight into the year-on-year variation in fishing effort and potential seabed interaction for the Swedish fishing fleet. Sweden represents the ideal set of data provided by a country and, with more time, could be the level provided by all countries.

Temporal resolution

For a dataset to be at the correct temporal resolution for the challenge, the data were preferably as up-to-date as possible (to better represent the trends in fishing activity in the project area), for landings data the time series should as long as possible (to include before and after the EU's DCF came into place) and for effort data the time series should be at least ten years.

Landings data

There was great variation in the length of time series of landings datasets available. ICES provided data dating back to 1903 and up to 2014, which was the longest time series discovered (and incorporates data

before the DCF) but due to an incorrect spatial resolution, these data were not utilised. JRC landings and discards data spanned 11 years (2003-2014) and also substantially covered the project area. Sweden only provided data spanning five years (2010-2014).

Online landings datasets are usually provided for a maximum of ten years and often specific organisations have to be contacted in order to obtain longer time series. Long time series often require fisheries or data officers to manipulate national databases and as a result, requests for long time series can have cost and time implication. As such, many datasets provided in this challenge are relatively short. UK online landings datasets are 8-10 years long, Ireland five years, Denmark six years, Belgium and France ten years, Norway four years, and Netherlands and Germany nine years. Over half of these datasets are also only available online as part of reports in PDF form and cannot be extracted.

Fishing activity and effort data

The only effort data available in a ten year time series that could be mapped onto GIS maps was that provided by Sweden. However, year on year trends in effort data over 10 years can be analysed on a basin-wide level utilising the JRC data, just not on a geographic grid. ICES and the UK's MMO do provide fishing effort data in shapefile format, but these data only span five and eight years, respectively.

6.2.3. Commercial – Are the commercial terms acceptable?

Many datasets were freely available, such as those provided by the JRC and by ICES . However when data requests were sent to individual countries quotes were provided by several countries, to process and provide the data in the requested format. Denmark quoted €20,000 - €30,000, the Netherlands quoted €15,000 - 20,000 and Germany quoted €500. These quotes show that detailed extractions of data from national databases can be costly and is due to the number of processing hours (32-50 hours quoted by the Netherlands) it takes to extract several years of landings and effort data in specific formats.

6.2.4. Attributes – Do the data have the correct attributes?

During data collection the JRC (landings and discards) and ICES (effort) datasets were used as the primary datasets. Countries were slow to respond and as such, were only able to produce short time series. In several cases, years overlapped with those in JRC and ICES datasets so individual country data were not added to the main datasets to avoid double counting in landings and effort values.

The JRC and ICES collect data from countries and MS in a specific format and also present it in a specific format. During this process, overlaps will be accounted for, so selecting these datasets for use in the production of the final tables and maps was considered a sensible approach. Without access to these large datasets, the team would have relied on data provision from all the individual countries which, as explained above, would have inevitably had multiple data overlaps (many countries fish within one ICES rectangle), Moreover, access to many national datasets have significant costs.

Another example of overlap in data is between fishing activity datasets used in the challenge. The MMO provides spatial fishing effort data for all UK waters (including Scotland) and Marine Scotland provides spatial fishing effort data for Scottish waters. The ICES fishing activity datasets also provide data for these areas and the entire OSPAR region, so on three levels, overlaps occur. Due to lack of time in the study, one single set of gridded data layers could not be provided as datasets would have to be filtered and clipped to account for these data replications.

Generally there is a significant amount of fisheries landings and effort data provided on various national fisheries websites, but they are often in PDF format, embedded in reports, only for restricted time series, not grouped in the same way between countries and only viewable on interactive web maps.

With the datasets available for this challenge, only fine resolution mapping and analysis of fisheries data can be done on a national, but currently not basin-wide level.

6.2.5. Delivery – Can the data be provided to match the timeframe of the challenge?

In general delivery of data was not an issue as the datasets provided by the JRC and by ICES are available online for any user to download. However, if the challenge had had to rely on individual countries to create a basin-wide dataset, then the Fisheries Management Challenge would have presented very little data.

Several countries failed to respond at all to data requests by email, letter and phone call, including France, the Faroe Islands and Finland. The UK's MMO responded but did not provide data within the timeframe of the study. Ireland, Sweden, Germany and Norway responded too late in the process to provide complete datasets. Finally, Denmark and Belgium responded, albeit with quotes of over €15,000.

Although the JRC and ICES datasets allowed coarse level analysis to take place, the process by which to obtain longer time series or to obtain data in the correct format, is lengthy and complicated. According to Article 18 of Council Regulation (EC) No 199/2008, "end users must contact Member States directly to request data for scientific data for publication. These Member States may authorise the JRC to transfer the requested data which have already been made available to the JRC, or it may transfer data directly in no case should end users contact the Commission or the JRC to request data collected under the Data Collection Framework"[19]. Member States were subsequently contacted individually but none responded to the particular request of obtaining longer time series than those already displayed on the JRC data portals. ICES also reports issues with obtaining data from Member States for their own databases.

Longer time series were also requested from ICES regarding fishing effort data, and landings data were requested in a different format but ICES themselves are restricted by the request process to Member States[20] only. In this ICES advice process, there is first a formal data call sent out to all countries, then analysis of data by the ICES data centre and the Working Group on Spatial Fisheries Data (WGSFD) working group, then peer-review of the WGSFD report, followed by an advice drafting group, then an approval of advice, and release of advice with underlying data products. There are several conditions outlined in the ICES VMS data policy under which they receive data from countries and under which their experts are given permission to analyse the submitted VMS and log book data. Only after having signed the data policy at ICES are the working group WGSFD experts given permission to work with the data together with the ICES data centre – aggregating the data using 0.05º grids[20].

6.2.6. Usability – Is the data format and supporting information suitable?

Landings and discards

Most of the landings and discards datasets used for the Fisheries Management Challenge were downloadable in a spreadsheet format which were easily readable and editable in spreadsheet software.

[19] https://datacollection.jrc.ec.europa.eu/documents/10213/881778/2010-04 27_DCFDataAccessForEndUsers_D04789.pdf
[20] Personal communication with Neil Hintzen (Wageningen UR), Neil Holdsworth (ICES) and Sebastian Valanko (ICES).

Where data were not in a suitable format for use such as when data were embedded within PDFs, or just displayed on interactive web maps and not easily extracted or extractable at all.

The JRC landings and discards data were grouped specifically on the online portal by EC management regime (not by ICES rectangle) and discards and landings data were not presented on the same part of the portal. As such, data were extracted using specific instructions from the JRC and discards were assigned to ICES rectangle using discards information for the ICES Area and the ratio of landings by quarter and rectangle to landings by area as weight factor. These data did require a significant amount of processing but at all stages, it was in a usable format.

Fishing effort

Fishing effort data were spatial files (mostly ESRI shapefiles). In order to view these files, the user has to have access to GIS software to do this. The project team had this software (ArcGIS). Open access, free GIS programmes like QGIS are another option for users. Opening the files is not the main issue, however. Specialist knowledge will is required to correctly use and edit the GIS data to create the desired maps. Nevertheless, when the spatial datasets collected for this challenge were opened, they were generally in the correct projection for editing and the project team had the expertise to do this. Fishing effort datasets provided by Sweden for example, needed some editing to dispense data replicates and import the file into a geodatabase.

Some general issues with the usability of data came when (as described above) data are provided in different formats by each Member State, making overlaps in data likely and comparisons of datasets difficult.

A final issue is that many websites are not in English and as a result, it took time to navigate pages to obtain data and inevitably some important information will have been missed. However, Google Translate provides enough accuracy to do this and several languages are spoken in the project team so this is not a major issue.

6.3. Key Data Gaps

Through the JRC (landings and some discards) and ICES (fishing effort), UK (fishing effort) and Swedish (fishing effort) datasets, portals and spatial GIS files, basin-wide analyses of fisheries data can be conducted.

However, there are key gaps in the data.

Landings data time series

The final landings data tables only span 11 years (2003-2014) and do not include data prior to the implementation of the DCF. Requests to MS to expand these time series were unsuccessful, Datasets that were provided by countries were coincident with data received from JRC or ICES and so were not added to the final tables.

Landings data geographical scope

The final landings tables cover a significant geographical area but only include data from EU MS.

Fishing effort data time series and formats

Fishing effort data for the entire project area only spans five years (2009-2013) and relates to vessels of 15 m and over in length. Longer time series were provided by the UK and Sweden but due to submission of

fishing activity in different formats to the ICES datasets, they were not mapped together to form basin-wide gridded data layers.

Central data repository

Large international fisheries databases such as those managed by ICES and JRC do not publish the same types of data, making processing complex. A single central data repository for fisheries data in the North Sea Basin with data in a relatively unprocessed format would negate this issue.

VMS data

Fisheries activity data (originating from VMS data) would be useful to the end user, but are not readily available. This is due to data confidentiality. The fishing intensity values presented only represent the effort of fishing vessels of 15 m in length and above as these vessels are equipped with VMS. The smaller vessels tend to work in inshore areas so are unlikely to affect patterns further offshore.

Lack of discards and bycatch data

There is also a significant lack of discards, but particularly a lack of bycatch (non-target species) data and they appear to be collected sporadically (and not currently as an obligation) let alone by species, gear and ICES rectangle.

7. Discussion and Conclusions

The key objective of the Fisheries Management Challenge was to gain

> ‘…an understanding of whether data are available and sufficient to describe the extent of fisheries activities and their impact on the North Sea environment’

The datasets obtained and analysed give a high level view of fisheries activity in the North Sea Basin. Major characteristics of the fleets utilising the area can be identified, including the most important species caught and discarded, the most heavily used gears, the most heavily used areas, and the distribution of effort between different countries. The spatial data on fishing effort obtained also allow temporal changes in the activity of fleets to be studied.

However, these descriptions give an incomplete picture, as datasets are not representative of all fishing activity in the area. The landings datasets only include EU MS and the basin-wide fishing activity datasets only represent ten countries’ fishing over four years.

For this challenge, obtaining more data would have refined how representative the data were of the activities of the fishing fleets in the North Sea Basin. The provision of fisheries data from national fisheries authorities was generally poor. Some countries did not respond at all and some responded quoting fees upwards of €15,000 datasets due to the amount of processing time it would take. Processing times will be long as countries collect, process and submit data in different formats and in many cases the format requested for the challenge differed from these.

It appears that for landings data, at least, a significant amount of data is being collected but only becomes available free of charge to end users when it has been through international portals, such as the JRC Fisheries Dependent Information (FDI) databases. The JRC does make these available although there is usually a two year lag while data are collected from several MS.

The ICES Intercatch database has the potential to be the most useful source of fisheries landings and effort data for the North Sea, as data are collected from EU and non-EU Member States. Currently end users can only access the pre-processed products of this portal and direct access to 'raw' data can only be obtained with the written permission of individual countries.

Currently, there are no basin-wide databases for fisheries data that are fully accessible for end users.

There are also specific areas where data were scarce. Neither discards nor bycatch data from fisheries in the North Sea are collected on the same level as landings data so the true extent and ecological impact of fisheries on the stocks of these unmarketable species is unknown.

There are initiatives in localised areas collecting data, for example, the cetacean bycatch data in the English Channel. Also, EU MS are obligated to run on-board discard sampling programmes.

The VMS data are confidential and so cannot be made available. Data have been collected from vessels under 15m overall length for only a few years. This lack of spatial fishing effort data is partially addressed through the use of Automatic Information System (AIS) technology. The JRC are currently carrying out research activities on the mapping of fishing effort at high spatial-temporal resolution from AIS data and it should soon become publically available. However, analysis of fishing effort using AIS could be unsound as the fishers can turn the AIS off. This would mean that the data could be biased. VMS is an autonomous system that systematically registers position.

An important part of the NSCP is to identify priorities for data collection or assembly in order to improve the accuracy of results. Specifically, in relation to fishing impact on seabed habitats, further work is required to develop the data on gear characterisation and towing speed by gear type that are required to estimate fishing intensity. OSPAR has recommended that a next step should include establishing a consistent classification of the sensitivity of seabed habitats and benthic ecosystems to fishing intensity. This should be mapped in the OSPAR area (to include EU and non-EU countries) at a scale compatible with $0.05^{o} \times 0.05^{o}$ resolution grid cells and not just to the resolution of an ICES rectangle. A combination of trawling intensity with seabed sensitivity could then be used to map impact. Further steps could then be used to derive indicators of fisheries impact, against which management thresholds might be set.

The Marine Scotland data portal is a good example of how end users might access these data.

The collection of discard data, especially bycatch data would allow the analyses to be carried out. Databases such as the ICES Intercatch database could be made more generally available to end users so that fisheries data might be obtained without the lengthy, expensive and often unsuccessful request processes.

Changing end user access to data will also take a long time so as a more immediate solution, end users should try and influence data calls themselves. The next ICES data call is in 2017. The end user in this case could be members of EMODnet collaborating with ICES to address the issues described above. ICES suggested this approach when access to the Intercatch database was not possible.

Appendices

A. Data Screen and Assessment

NSC-005-Fish	Datasets Identified by the North Sea Checkpoint						
Full ID	**Project ID**	**Requireme**	**URI**	**Name**	**Inspire**	**Citation**	**MEP comments**
DT.Fish.NS001-European Commission Effort Data 1: 2000-2014	NS001		https://datacollection.jrc.ec.europa.eu/dd/effort/maps	European Commission Effort Data 1: 2000-2014	3.1 Statistical units	EC Joint Research Committee data. Effort data (hours fished) by rectangle and quarter (can sort by country, year, gear, vessel length and regulated area). Dataset can be displayed on the map tool, available on the same URL. Can download data as a text file. Years 2000-2014.	NOTE for EC data: a) Discard information is NOT by ICES rectangle, landings and effort data are. b) ALL data are aggregated byfishing management regimes (labelled as Annexes on URLs), so **data must not be summed across different annexes, otherwise double/multiple counting of the same effort or catch values will result**. Management regimes: Baltic Sea; Bay of Biscay; Cod Recovery Zone; Celtic Sea (whole area); Celtic Sea (partial area); Deep Sea; Fully Documented Fishery Baltic; Fully Documented Fishery Cod Recovery Zone; Sole Western Channel; Southern Hake and Nephrops; Western Waters. Cannot get EC data less aggregated than this. Data also not comparable to ICES datasets due to grouping by management regime.
DT.Fish.NS002-EC Landings Data 1: 2003-2014	NS002		https://datacollection.jrc.ec.europa.eu/dd/effort/maps	EC Landings Data 1: 2003-2014	3.1 Statistical units	EC Joint Research Committee data. Landings data (tonnes) by rectangle and quarter (can sort by species, gear, vessel length, country, year and regulated area). Dataset can be displayed on the map tool, available on the same URL. Can download data as a text file. Years 2003-2014.	As above.Useful for challenge when combined with NS-data-003.
DT.Fish.NS003-EC Effort Data 2: 2003-2014	NS003		https://datacollection.jrc.ec.europa.eu/dd/effort/tables	EC Effort Data 2: 2003-2014	3.1 Statistical units	EC Joint Research Committee data. Effort data by fisheries management regime (can select kW days) (can sort by gear, country, year and specon). Can download data as a text file. Years 2003-2014.	As above. Useful for challenge when combined with NS-data-002.
DT.Fish.NS004-EC Landings and Discards Data: 2003-2014	NS004		https://datacollection.jrc.ec.europa.eu/dd/effort/tables	EC Landings and Discards Data: 2003-2014	3.1 Statistical units	EC Joint Research Committee data. Landings and discards data (tonnes) by fisheries management regime (can sort by species, gear, country, year, vessel length). Can download data as a text file. Years 2003-2014.	As above
DT.Fish.NS005-Swedish Landings Data: 2003-2014	NS005		Data provided upon request to Swedish Agency Marine and Water Management (Havochvatten)	Swedish Landings Data: 2003-2014	3.1 Statistical units	Data provided by Sweden. Landings data (tonnes) by ICES area, ICES rectangle, vessel length, gear, species and year. 2003-2014.	Older data unavailable.
DT.Fish.NS006-Swedish Discards Data	NS006		Data provided upon request to Swedish Agency Marine and Water Management (Havochvatten)	Swedish Discards Data	3.1 Statistical units	Data provided by Sweden. Discards data (tonnes) by ICES area, ICES rectangle, vessel length, gear, species and year. 2003-2014, where available.	Older data unavailable. High costs associated with request for this.
DT.Fish.NS007-Swedish Fishing Activity Data	NS007		Data provided upon request to Swedish Agency Marine and Water Management (Havochvatten)	Swedish Fishing Activity Data	3.1 Statistical units	Data provided by Sweden. Fishing activity data (kWhours) by Country, Year, Month, Length, ID, Fishing hours, Fishing kW hours, Gear, ICES Area, ICES, Rec, DECLAT, DECLONG, MAF; Species, Quantity (kg). 2005-2015.	10 year time series.
DT.Fish.NS008-ICES Landings Data 1: 2006-2014	NS008		http://www.ices.dk/marine-data/dataset-collections/Pages/Fish-catch-and-stock-assessment.aspx	ICES Landings Data 1: 2006-2014	3.1 Statistical units	ICES data. Landings (labelled by ICES as catches) by country, year, ICES division, species, but not gear or ICES rectangle. Years 2006-2014. Can download Excel sheets.	NS data 008 and 009 will overlap in years. Data are not by ICES rectangle and there is no discards or bycatch data. Data not comparable to EC datasets due to EC data grouping by management regime. And NOT ICES division.
DT.Fish.NS009-ICES Landings Data 2: 1950-2010	NS009		http://www.ices.dk/marine-data/dataset-collections/Pages/Fish-catch-and-stock-assessment.aspx	ICES Landings Data 2: 1950-2010	3.1 Statistical units	ICES data. Landings (labelled by ICES as catches) by country, year, ICES division, species, but not gear or ICES rectangle. Years 1950-2010. Can download Excel sheets.	As above
DT.Fish.NS010-ICES Landings Data 3: 1903-1949	NS010		http://www.ices.dk/marine-data/dataset-collections/Pages/Fish-catch-and-stock-assessment.aspx	ICES Landings Data 3: 1903-1949	3.1 Statistical units	ICES data. Landings (labelled by ICES as catches) by country, year, ICES division, species, but not gear or ICES rectangle. Years 1903-1949. Can download Excel sheets.	As above
DT.Fish.NS011-OSPAR & ICES VMS Fishing Activity Data	NS011		http://ices.dk/publications/library/Pages/default.aspx#Default=%7B%22k%22%3A%22%2C%22r%22%3A%5B%7B%22n%22%3A%22owstaxIdPublicationType%22%2C%22t%22%3A%5B%22string(%5C%22%2303000983-a58-4e24-89b0-ac48fa0c82ad%5C%22)%5D%2C%22v%22%3A%22and%22%2C%22k%22%3Afalse%2C%22m%22%3Anull%7D%5D%7D	OSPAR & ICES VMS Fishing Activity Data	3.1 Statistical units	Shapefiles and jpeg maps of fishing effort and intensity based on data submitted by Belgium, Denmark, France, UK, Germany, Ireland, Netherlands, Norway, Portugal and Sweden. Maps show kW hours fished for the years 2009-2012 by year and by gear groups: beam trawls, demersal seines, dredges and otter trawls.	Time series not 10 years but it is the best data we have for fishing effort.
DT.Fish.NS012-EC (JRC) Landings and Effort Data: 2008-2014	NS012		http://stecf.jrc.ec.europa.eu/documents/43805/1034590/2015_STECF+15-07+-+EU+Fleet+Economic+data+tables.zip	EC (JRC) Landings and Effort Data: 2008-2014	3.1 Statistical units	EU STECF = Scientific, Technical and Economic Committe for Fisheries transversal data collected through the Fleet economic data call. Included in these Excel sheets are landings by year, weight, value (euros) species, country, up to 2014. Also included are landings and effort by FAO supra region, sub region, fishing technology and vessel length category, up to 2014.	2008-2014. May be useful for challenge but NS-data-002 and 003 may be more relevant.
DT.Fish.NS013-UK Geostore Fishing Activity Data: 2007-2014	NS013		http://www.geostore.com/environment-agency/WebStore?xml=environment-agency/xml/ogcDataDownload.xml	UK Geostore Fishing Activity Data: 2007-2014	1.2 Geographical grid systems	Summaries of fishing activity for UK commercial fishing vessels of 15m and over in length that are deemed to have been fishing within a specified calendar year. The data is referenced to a grid equal to a 0.05 degree sub-rectangle to provide a higher resolution. Years 2007-2014. Can download.	Longer time series unavailable.
DT.Fish.NS014-UK MMO Landings Data: 2008-2012	NS014		https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/335822/2008_to_2012_UK_fleet_landings_by_ICES_rectangle.xlsx	UK MMO Landings Data: 2008-2012	3.1 Statistical units	UK Marine Management Organisation (MMO) data. Data grouped by species, gear, year, country and ICES rectangle. Years 2008-2012. Downloadable.	In exactly the right format for study but time series is short. No discards or bycatch. Larger datasets were requested but contacts did not respond.
DT.Fish.NS015-Germany Landings Statistics: 2003-2014	NS015		http://www.ble.de/DE/02_Kontrolle/02_Fischerei/01_Fischwirtschaft/Fischwirtschaft_node.html	Germany Landings Statistics: 2003-2014	3.1 Statistical units	Landings statistics reports (PDF), 2003-2014	Pdf form, needs extracting. No effort data, discards or bycatch. Germany did not respond in time before data collection was drawn to a close. Fees for dataset were reasonable, at ~500 euros but data were not delivered in time.
DT.Fish.NS016-Irish Landings Data: 2011-2015	NS016		Data provided upon request to Sea Fisheries Protection Authority SFPA	Irish Landings Data: 2011-2015	3.1 Statistical units	Irish SFPA data. Landings data (number and kg) for Irish vessels by ICES area and Stratrect, year and species. Years 2011-2015	Data not provided by gear and time series is short. Responded too late in the process, so there was no time to provide fuller datasets that would match the required format of the Challenge.
DT.Fish.NS017-Netherlands Agrimatie Landings	NS017		http://www.agrimatie.nl/SectorDashboard.aspx?subpubID=2232&sec	Netherlands Agrimatie Landings dataset: 2003-2014	3.1 Statistical units	Landings of pelagic fish, Years 2003-2015.	Full data sets requested but fees of 20,000 Euros were quoted.
DT.Fish.NS018-Danish Agrifish Agency Landings dataset: 2007-2015	NS018		http://naturerhverv.dk/fiskeri/fiskeristatistik/landings-og-fangststatistik/#c8901	Danish Agrifish Agency Landings dataset: 2007-2015	3.1 Statistical units	Years 2007-2015	Full datasets were requested but process of approval would take too long for the study. They needed signed letters, security information and a guarantee that data would be deleted after the project. No effort data, discards or bycatch.
DT.Fish.NS019-Belgian Landings data and Fisheries Statistics: 2004-2014	NS019		http://lv.vlaanderen.be/nl/visserij/cijfers-marktoverzichten/publicaties	Belgian Landings data and Fisheries Statistics: 2004-2014	3.1 Statistical units	Landings statistics reports and fishing reports (PDF), Years 2004-2014. Overall fishing effort data (in kW hours) is also available in the annual fishing statistics reports, by gear, month and ICES area.	Time series is short. Full datasets were requested but not provided. No effort data, discards or bycatch. Data need to be extracted from pdf. Documents are in Flemish but can be translated by Google's translate document tool. Not useful format for Challenge - data are aggregated into tables where ICES regions, years and gear type data are aggregated separetly and cannot be related. Not useful for Challenge.
DT.Fish.NS020-French Ifremer ObsMer data 2003-2013	NS020		http://sih.ifremer.fr/Description-des-donnees/Les-donnees-collectees/Echantillonnage-des-captures-a-bord-des-navires-de-peche	French Ifremer ObsMer data 2003-2013	3.1 Statistical units	Years 2003-2013 Observations made on-board fishing vessels, allowing differentation between kept catch (landings), rejected catch (discards), accidental catch of mammals, birds, turtles (by-catch). Also has attention for studies on the efficiency of repulsive measures (pingers) on sea mammals).	Have requested. Full datasets were requested from France but no responses were received. Effort data not available.
DT.Fish.NS021-French Ifremer 2012 North Sea Fleet Data	NS021		http://sih.ifremer.fr/Publications/Syntheses/Facade-Atlantique/Synthese-des-flottilles-de-peche/2012/Synthese-des-Flottilles-de-peche-2012-Flotte-Mer-du-Nord-Manche-Atlantique-Mediterranee	French Ifremer 2012 North Sea Fleet Data	3.1 Statistical units	A compilation of economic and fisheries data from 2000 onwards, for several French fleet segments. Mer du Nord - Manche (North Sea and English Channel) is pertinent for the NSCP project.	Data need to be extracted from pdf. Full datasets were requested from France but no responses were received. Effort data not available.
DT.Fish.NS022-Norwegian Landings Data: 2010-2014	NS022		Data provided upon request by the Norwegian Directorate of Fisheries.	Norwegian Landings Data: 2010-2014	3.1 Statistical units	Number of landings divided by ICES areas, species, years and country (Norwegian and foreign). Years: 2010-2014.	NOTE: Double counting occurs. Longer time series not provided due to to time constraints. No effort data, discards or bycatch.
DT.Fish.NS023-FAO Global Capture Production: 1950-2014	NS023		http://www.fao.org/figis/servlet/TabSelector	FAO Global Capture Production: 1950-2014	3.1 Statistical units	Contains the volume of fish catches landed by country or territory of capture, by species or a higher taxonomic level, by FAO major fishing areas, and year for all commercial, industrial, recreational and subsistence purpose. 1950-2014.	Data aggregated by year and species and country only and cannot be split down to ICES areas or by gear. Data can be downloaded from the online query or by downloading FishStatJ spftware from the FAO website.
DT.Fish.NS024-EMODnet FAO Fish Catches GIS Layer (Human Activities Portal)	NS024		http://www.emodnet-humanactivities.eu/view-data.php	EMODnet FAO Fish Catches GIS Layer (Human Activities Portal)	3.1 Statistical units	FAO fish catches GIS layer. Same as NS-Data-024 but georeferenced. The geodatabase on fish catches in the EU was created in 2015 by Cogea for EMODnet. It is the result of the aggregation of EUROSTAT's fish catches datasets fish_ca_atl 27, fish_ca_atl 34, fish_ca_atl 37. EUROSTAT data have been related to FAO's georeferenced fishing statistical areas. Fish species have been grouped by EUMOFA's larger aggregations such as EUMOFA's Commodity Groups (CG) and Main Commercial Species (MCS). Tonnes live weight is provided for each fish species caught in EU fishing statistical area, by year of reference, fish species, CG, MCS and country. The dataset is updated yearly, as soon as new data from EUROSTAT is released. It covers a time series from 1950 to 2014. Compared with the previous version this new version includes data for 2013 and 2014, as well as the new Main Commercial Species identified by the EUMOFA in 2015.	Not useful for challenge.
DT.Fish.NS025-EMODnet Geology Portal	NS025		http://www.emodnet-geology.eu/emodnet/srv/eng/home	EMODnet Geology Portal	3.15 Oceanographic geographical features	Complex geological feature datasets, often specific to particular areas and processes (e.g. sediment accumulation rates) were deemed inappropriate for the MPA Challenge. Datasets are downloadable but interactive webmap not available yet.	Not useful for challenge.
DT.Fish.NS026-EMODnet Bathymetry Portal	NS026		http://portal.emodnet-bathymetry.eu/	EMODnet Bathymetry Portal	1.8 Hydrography	Depth contours, mean depths, marine topography datasets. May be useful as base mapping for GIS images. Can select on interactive map and dowload directly.	Could be used as base mapping for GIS images but Arc-GIS programme used to make maps for this challenge already had the appropriate base maps. May be useful for other GIS softwares without this built in layer function.
DT.Fish.NS027-EMODnet Seabed Habitats Portal	NS027		http://www.emodnet-seabedhabitats.eu/default.aspx?page=1974	EMODnet Seabed Habitats Portal	3.18 Habitats and biotopes	Maps of locations and habitat distribution available to download from interactive map	Not useful for challenge.
DT.Fish.NS028-EMODnet Chemistry Portal	NS028		http://www.emodnet-chemistry.eu/	EMODnet Chemistry Portal	3.21 Mineral resources	Datasets from CTDs, nutrient ratios etc available to download by clicking on coloured squares.	Not useful for challenge.
DT.Fish.NS029-EMODnet Biology Portal	NS029		http://www.emodnet-biology.eu/portal/index.php	EMODnet Biology Portal	3.19 Species distribution	Species distribution datasets downloadable from map service portal. Can select species groups and individual species from dop down menus to select specific datasets.	Not useful for challenge.
DT.Fish.NS030-EMODnet Physics Portal	NS030		http://www.emodnet-physics.eu/map/	EMODnet Physics Portal	3.14 Meteorological geographical features	Downloadable datasets such as sea water temperature, salinity, waves, winds and light attenuation from map portal	Not useful for challenge.
DT.Fish.NS031-Scotland Fisheries Statistics: 1922-2014	NS031		http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries	Scotland Fisheries Statistics: 1922-2014	3.1 Statistical units	Annually produced pdf summaries of landings, catch and effort of Scottish sea fisheries 1922-2014	Not useful for challenge as would need to extract and not grouped by ICES area or gear.
DT.Fish.NS032-Scotland Landings Data: 2009-2014	NS032		http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries	Scotland Landings Data: 2009-2014	3.1 Statistical units	Annually produced downloadable Excel documents of landings data, grouped by species, year and aggregated by destination of landings. Years 2009-2014.	Not useful for challenge as not able to split by ICES area or gear type.
DT.Fish.NS033-Scotland Effort and Landings Data by ICES rectangle: 2001-2014	NS033		http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/RectangleData	Scotland Effort and Landings Data by ICES rectangle: 2001-2014	3.1 Statistical units	Annually produced downloadable Excel documents of landings and effort data, grouped by species, year, ICES rectangle and gear.Years 2001-2014.	Potentially very useful for challenge as split by many of the desired data groupings and is a long time series.
DT.Fish.NS034-Scotland National Marine Plan Interactive: Geodataportal	NS034		https://marinescotland.atkinsgeospatial.com/nmpi/	Scotland National Marine Plan Interactive: Geodataportal	1.2 Geographical grid systems	Interactive web map where users can view layers of fishing activity, including, number of vessels, VMS intensity for certain gear types over a number of years, gridded effort by vessels using different gear types, changes in effort over years for different gear types, average effort (kW days), no. of days. Effort data are not directly downloadable but links to the sources are provided.	Yes - used for challenge to demonstrate a good example of data provision.
DT.Fish.NS035-Scotland VMS intensity layers by gear type: 2009-2013	NS035		http://www.gov.scot/Topics/marine/science/MSInteractive/Themes/fish-fisheries/vms09-13	Scotland VMS intensity layers by gear type: 2009-2013	1.2 Geographical grid systems	Geotiff files of VMS intensity layers for different gear types. Years 2009-2013. Files are downloadable.	Unknown if useful for challenge.
DT.Fish.NS036-Scotland effort distribution maps: 2010-2012	NS036		http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/Datasets/DistributionMaps	Scotland effort distribution maps: 2010-2012	1.2 Geographical grid systems	Gridded fishing effort distrubuton maps. Maps are also provided that show the degree of change year on year. Data are available as pdfs.	Useful to see change in effort over years, but just for Scotland and data are not actually downloadable.

Valuation of the data to solving a challenge (a sheet per challenge)

NSC-005-Fish

Data Set	Consideration	ValueCriteria	VCFlag	ValueCrireriaReason
DT.Fish.NS001-European Commission Effort Data 1: 2000-2014	Used	Contribution	True	Dataset parameters have been used in combination with NS-Data-002,003 and 004 to create basin-wide landings, discards and effort tables
NSC-005-Fish		Location	True	10 year time series is given. Data have been extracted that relate to countries surrounding the North Sea basin. All included apart from Norway.
		Price	True	Free to download
		Attributes	True	Data can be filtered and extracted to obtain the correct resolution which in this case is per country, species and by ICES rectangle.
		Delivery	True	Data immediately available to download from JRC website.
		Usability	True	Data can be extracted to the correct format
DT.Fish.NS002-EC Landings Data 1: 2003-2014	Used	Contribution	True	Dataset parameters have been used in combination with NS-Data-001,003 and 004 to create basin-wide landings, discards and effort tables
NSC-005-Fish		Location	True	10 year time series is given. Data have been extracted that relate to countries surrounding the North Sea basin. All included apart from Norway.
		Price	True	Free to download
		Attributes	True	Data can be filtered and extracted to obtain the correct resolution which in this case is per country, species and by ICES rectangle.
		Delivery	True	Data immediately available to download from JRC website.
		Usability	True	Data can be extracted to the correct format
DT.Fish.NS003-EC Effort Data 2: 2003-2014	Used	Contribution	True	Dataset parameters have been used in combination with NS-Data-001,002 and 004 to create basin-wide landings, discards and effort tables
NSC-005-Fish		Location	True	10 year time series is given. Data have been extracted that relate to countries surrounding the North Sea basin. All included apart from Norway.
		Price	True	Free to download
		Attributes	True	Data can be filtered and extracted to obtain the correct resolution which in this case is per country, species and by ICES rectangle.
		Delivery	True	Data immediately available to download from JRC website.
		Usability	True	Data can be extracted to the correct format
DT.Fish.NS004-EC Landings and Discards Data: 2003-2014	Used	Contribution	True	Dataset parameters have been used in combination with NS-Data-001,002 and 003 to create basin-wide landings, discards and effort tables
NSC-005-Fish		Location	True	10 year time series is given. Data have been extracted that relate to countries surrounding the North Sea basin. All included apart from Norway.
		Price	True	Free to download
		Attributes	True	Data can be filtered and extracted to obtain the correct resolution which in this case is per country, species and by ICES rectangle.
		Delivery	True	Data immediately available to download from JRC website.
		Usability	True	Data can be extracted to the correct format
DT.Fish.NS005-Swedish Landings Data: 2003-2014	Considered	Contribution	True	Data were provided in correct format from Sweden upon request
NSC-005-Fish		Location	Null	Data provided relate to Swedish catches but only over a 4 year time series.
		Price	True	Data provided at no cost
		Attributes	True	Data were provided in the format requested for the Challenge
		Delivery	True	Data were delivered in time.
		Usability	False	Data were not added to main tables as overlaps would have occurred with JRC EU data.
DT.Fish.NS006-Swedish Discards Data	Considered	Contribution	True	Data were provided in correct format from Sweden upon request
NSC-005-Fish		Location	Null	Data provided relate to Swedish catches but only over a 4 year time series.
		Price	True	Data provided at no cost
		Attributes	True	Data were provided in the format requested for the Challenge
		Delivery	True	Data were delivered in time.
		Usability	False	Data were not added to main tables as overlaps would have occurred with JRC EU data.
DT.Fish.NS007-Swedish Fishing Activity Data	Used	Contribution	True	Data were utlised to map fishing activity. Sweden have been used as an example country to show what information can be mapped when a country submits data upon request.
NSC-005-Fish		Location	True	Data were provided for Swedish waters and for the requested 10 year time period (2005-2015)
		Price	True	Data provided at no cost
		Attributes	True	Data were provided in the format requested for the Challenge
		Delivery	True	Data were delivered in time.
		Usability	True	Data were used to map fishing activity for the Challenge, tabular data was imported into a file geodatabase whereby geographical dimensions were applied using the ICES rectangle attribute

DT.Fish.NS008-ICES Landings Data 1: 2006-2014	NotConsidered	Contribution	False	Dataset was not in correct format for the Challenge.
NSC-005-Fish		Location	True	Data provided for all countries relevant to the challenge. Long time series when combined with other ICES catch and landings datasets.
		Price	True	Data free to download from ICES website
		Attributes	False	Data were not in the correct resolution for the Challenge (not aggregated by ICES rectangle)
		Delivery	True	Data available on ICES website
		Usability	False	Datasets overlap with other datasets from ICES, data not aggregated by ICES rectangle and no discards or bycatch information available to relate to landings data.
DT.Fish.NS009-ICES Landings Data 2: 1950-2010	NotConsidered	Contribution	False	Dataset was not in correct format for the Challenge.
NSC-005-Fish		Location	True	Data provided for all countries relevant to the challenge. Long time series when combined with other ICES catch and landings datasets.
		Price	True	Data free to download from ICES website
		Attributes	False	Data were not in the correct resolution for the Challenge (not aggregated by ICES rectangle)
		Delivery	True	Data available on ICES website
		Usability	False	Datasets overlap with other datasets from ICES, data not aggregated by ICES rectangle and no discards or bycatch information available to relate to landings data.
DT.Fish.NS010-ICES Landings Data 3: 1903-1949	NotConsidered	Contribution	False	Dataset was not in correct format for the Challenge.
NSC-005-Fish		Location	True	Data provided for all countries relevant to the challenge. Long time series when combined with other ICES catch and landings datasets.
		Price	True	Data free to download from ICES website
		Attributes	False	Data were not in the correct resolution for the Challenge (not aggregated by ICES rectangle)
		Delivery	True	Data available on ICES website
		Usability	False	Datasets overlap with other datasets from ICES, data not aggregated by ICES rectangle and no discards or bycatch information available to relate to landings data.
DT.Fish.NS011-OSPAR & ICES VMS Fishing Activity Data	Used	Contribution	True	Data used to map fishing activity in the North Sea basin. Data were in correct format.
NSC-005-Fish		Location	True	Only dataset found that covers whole North Sea basin. 6 year time series available (4 years less than hoped but best dataset there was).
		Price	True	Data free to downalod from ICES website
		Attributes	True	Data were in correct resolution for Challenge.
		Delivery	True	Data available from ICES website
		Usability	True	Data were used to map fishing activity for the Challenge,
DT.Fish.NS012-EC (JRC) Landings and Effort Data: 2008-2014	Considered	Contribution	False	Data were not in the correct resolution for the Challenge (not split by species)
NSC-005-Fish		Location	False	Short time series available and Norway is not included. Also some data are not split by species.
		Commercial	True	Data are free to download
		Attributes	False	Data were not in correct resolution for Challenge.
		Delivery	True	Data are immediately available
		Usability	Null	Data not used for challennge as JRC data above were more appropriate
DT.Fish.NS013-UK Geostore Fishing Activity Data: 2007-2014	Used	Contribution	True	Data were in correct format for Challenge
NSC-005-Fish		Location	True	Data available for UK waters, 7 year time series currently available.
		Commercial	True	Data are free to download
		Attributes	True	GIS data has correct attributes with which to map Kw hour fishing activity data
		Delivery	True	Data are immediately available
		Usability	True	Data can be mapped straight away from the available shapefile. Data were clipped to the project area. TAB and GML formats are also available.
DT.Fish.NS014-UK MMO Landings Data: 2008-2012	Considered	Contribution	True	Data are available in correct format
NSC-005-Fish		Location	Null	Data provided relate to Swedish catches but only over a 4 year time series.
		Price	True	Data provided at no cost
		Attributes	True	Data were provided in the format requested for the Challenge
		Delivery	True	Data were delivered in time.
		Usability	False	Data were not added to main tables as overlaps would have occurred with JRC EU data.

DT.Fish.NS015-Germany Landings Statistics: 2003-2014	NotConsidered	Contribution	False	Data not used for challenge as in incorrect format and data embedded within pdf
NSC-005-Fish		Location	Null	Data relevant to German waters but time series only goes back to 2003
		Commercial	True	Pdfs free to download
		Attributes	False	Data not in correct resolution for Challenge
		Delivery	True	Pdfs are available
		Usability	False	Pdf form, data needs extracting. No effort data, discards or bycatch.
DT.Fish.NS016-Irish Landings Data: 2011-2015	NotConsidered	Contribution	False	Datasets were not provided in the correct format so could not be disagregated to add onto JRC tables and as such. were not utilised,
NSC-005-Fish		Location	Null	Data for Irish waters but time series only 5 years long
		Commercial	True	No cost
		Attributes	False	Data were not split by gear type so were not in correct resolution
		Delivery	False	Full datasets could not be provided on time
		Usability	False	Data not in correct format
DT.Fish.NS017-Netherlands Agrimatie Landings dataset: 2003-2014	NotConsidered	Contribution	False	Data only available for pelagic fish landings so not utilised
NSC-005-Fish		Location	False	Data only available for pelagic fish landings
		Commercial	True	Free to download
		Attributes	False	Data do not cover NL fisheries
		Delivery	True	Data are immediately available
		Usability	False	Data are not in the correct format, nor do they cover NL fisheries. No discards or bycatch data.
DT.Fish.NS018-Danish Agrifish Agency Landings dataset: 2007-2015	NotConsidered	Contribution	True	Data not splittable by gear type so cannot be compared to JRC dataset which has been used a base dataset
NSC-005-Fish		Location	Null	Data for DK waters but time series is short
		Commercial	True	Free to download
		Attributes	False	Data not in correct format to add and compare to JRC tables
		Delivery	True	Data immediately available to download from agency website using filter tools
		Usability	False	Data are not in correct format so not used. No discards or bycatch data.
DT.Fish.NS019-Belgian Landings data and Fisheries Statistics: 2004-2014	NotConsidered	Contribution	False	Data not used for challenge as in incorrect format and data embedded within pdf
NSC-005-Fish		Location	Null	Data relevant to Belgian waters but time series only goes back to 2004
		Commercial	True	Pdfs free to download
		Attributes	False	Data not in correct resolution for Challenge
		Delivery	True	Pdfs are available
		Usability	False	Pdf form, data needs extracting. No effort data, discards or bycatch.
DT.Fish.NS020-French Ifremer ObsMer data 2003-2013	NotConsidered	Contribution	False	Data not used for challenge as in incorrect format and data embedded within web pages and reports for specific fleets. Data were not provided upon request.
NSC-005-Fish		Location	Null	Data not provided.
		Commercial	True	Free to request
		Attributes	Null	Data not provided.
		Delivery	False	Data were requested but not provided. No response received
		Usability	Null	Data were not provided
DT.Fish.NS021-French Ifremer 2012 North Sea Fleet Data	NotConsidered	Contribution	False	Data not used for challenge as in incorrect format and data embedded within pdf
NSC-005-Fish		Location	False	Data only relevant to 2012
		Commercial	True	Pdfs free to download
		Attributes	False	Data not in correct resolution for Challenge
		Delivery	True	Pdfs are available
		Usability	False	Pdf form, data needs extracting. No effort data, discards or bycatch.

DT.Fish.NS022-Norwegian Landings Data: 2010-2014	NotConsidered	Contribution	False	Data are too aggregated to be able to compare to main JRC table, they are not grouped by species or ICES rectangle
NSC-005-Fish		Location	Null	For Norwegian waters but time series is only 4 years long.
		Commercial	True	Data provided was free.
		Attributes	False	Data not in correct format, resolution is too coarse
		Delivery	Null	Data were provided upon request but were not in the correct format
		Usability	False	Data not in correct format to add and compare to JRC tables
DT.Fish.NS023-FAO Global Capture Production: 1950-2014	NotConsidered	Contribution	False	Data aggregated by year and species and country only and cannot be split down to ICES areas or by gear so were not used
NSC-005-Fish		Location	True	Covers all countries ant time series is long.
		Commercial	True	Free to download from FAO
		Attributes	False	Data are too aggregated as portal was not designed around ICES designations
		Delivery	True	Data immediately available
		Usability	Null	Data easily downloaded but not in correct format
DT.Fish.NS024-EMODnet FAO Fish Catches GIS Layer (Human Activities Portal)	NotConsidered	Contribution	False	Not relevant to challenge
NSC-005-Fish		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Fish.NS025-EMODnet Geology Portal	NotConsidered	Contribution	False	Not relevant to challenge
NSC-005-Fish		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Fish.NS026-EMODnet Bathymetry Portal	Suitable	Contribution	True	Could be used as base mapping for GIS images but Arc-GIS programme used to make maps for this challenge already had the appropriate base maps.
NSC-005-Fish		Location	True	Covers project area
		Commercial	True	Free to download from EMODnet
		Attributes	True	Correct attributes for base mapping
		Delivery	True	Immediately available from portal
		Usability	True	Shape files and other formats easily usable in GIS programmes
DT.Fish.NS027-EMODnet Seabed Habitats Portal	NotConsidered	Contribution	False	Not relevant to challenge
NSC-005-Fish		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Fish.NS028-EMODnet Chemistry Portal	NotConsidered	Contribution	False	Not relevant to challenge
NSC-005-Fish		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	

DT.Fish.NS029-EMODnet Biology Portal	NotConsidered	Contribution	False	Not relevant to challenge
NSC-005-Fish		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Fish.NS030-EMODnet Physics Portal	NotConsidered	Contribution	False	Not relevant to challenge
NSC-005-Fish		Location	Null	
		Commercial	Null	
		Attributes	Null	
		Delivery	Null	
		Usability	Null	
DT.Fish.NS031-Scotland Fisheries Statistics: 1922-2014	Considered	Contribution	False	Data not in correct format for challenge as were not split by ICES rectangle
NSC-005-Fish		Location	True	Covers scottish waters and provides long time series when combined with other datasets
		Commercial	True	Free to download
		Attributes	False	Not in the correct resolution for Challenge
		Delivery	True	Immediately downloadable
		Usability	Null	Excel format easy to use and download, not used for Challenge as not in correct format
DT.Fish.NS032-Scotland Landings Data: 2009-2014	Considered	Contribution	False	Data not in correct format for challenge as were not split by ICES rectangle
NSC-005-Fish		Location	True	Covers scottish waters and provides long time series when combined with other datasets
		Commercial	True	Free to download
		Attributes	False	Not in the correct resolution for Challenge
		Delivery	True	Immediately downloadable
		Usability	Null	Excel format easy to use and download, not used for Challenge as not in correct format
DT.Fish.NS033-Scotland Effort and Landings Data by ICES rectangle: 2001-2014	Considered	Contribution	False	Data not in correct format to compare to JRC data as not grouped by gear.
NSC-005-Fish		Location	True	Covers scottish waters and provides long time series when combined with other datasets
		Commercial	True	Free to download
		Attributes	False	Not in the correct resolution for Challenge
		Delivery	True	Immediately downloadable
		Usability	Null	Excel format easy to use and download, not used for Challenge as not in correct format
DT.Fish.NS034-Scotland National Marine Plan Interactive: Geodataportal	Used	Contribution	True	Data portal provides country level distribution of fishing effort in the correct format for the Challenge. Data have been used to show trends for Scotland in the form of maps and data analysis.
NSC-005-Fish		Location	True	Covers scottish waters for a long time series
		Commercial	True	Free to download
		Attributes	True	Attributes are adequate to show trends.
		Delivery	True	Immediately available
		Usability	True	Shape files and other formats easily usable in GIS programmes, excel data also eaisly used by end users
DT.Fish.NS035-Scotland VMS intensity layers by gear type: 2009-2013	Used	Contribution	True	Shows country level distribution of fishing effort in the correct format for the Challenge. Data have been used to show effort trends for Scotland
NSC-005-Fish		Location	True	Covers scottish waters for a long time series
		Commercial	True	Free to download
		Attributes	True	Attributes are adequate to show trends.
		Delivery	True	Immediately available
		Usability	True	Images useful for showing trends, excel data easy to download
DT.Fish.NS036-Scotland effort distribution maps: 2010-2012	Used	Contribution	True	Shows country level distribution of fishing effort in the correct format for the Challenge. Data have been used to show effort trends for Scotland
NSC-005-Fish		Location	True	Covers scottish waters for a long time series
		Commercial	True	Free to download
		Attributes	True	Attributes are adequate to show trends.
		Delivery	True	Immediately available
		Usability	True	Images useful for showing trends

B. Agency Contacts and Results

Country	Data requested	Date requested	Contact	Organisation	Email	Notes	Received?	Date received	Cost? (€)
UK	VMS, landings, by-catch and discards data for All ICES rectangles in ICES areas IVa, IVb, IVc, VIId, VIIe, IIIa, for all years except VMS, which was for 2005-2015	25/09/2015	Gemma Frazer	MMO	gemma.frazer@marine.management.org.uk	Garry Dando replied, do not have the resources to provide data in time directed team useful online MMO and EA archives for landings and effort data.	No - but directed team to useful resources		0
Sweden	"	24/09/2015	Anna Haslow	Havochvatten	anna.haslow@havochvatten.se	Have received VMS, landings and discards data for 2003-2014. Bycatch not available.	Yes, received but short time series	02/11/2015	0
Ireland	"	30/09/2015	Jim Shalloo	Sea Fisheries Protection Authority	Jim.Shalloo@sfpa.ie and Conor.OShea@sfpa.ie	Conor O Shea replied and provided some landings data	Yes -but only very basic data	09/02/2016	0
Faroe Islands	"	30/09/2015	Martin Kruse	Fisheries Management Centre Manager	martink@fve.fo	Waiting . Chased in December.	Did not respond		
Norway	"	30/09/2015	Anne Turi Baklien	Statistics Norway	anne.turi.baklien@ssb.no	Waiting	Did not respond		
Norway	"	30/09/2015	Trond Amund Steinset	"	trond.amund.steinset@ssb.no	Referred to contact below			
Norway		05/10/2015	Grethe Kuhnle	head of the unit of fishery statistics	grethe.kuhnle@fiskeridir.no	Yes, provided some landings data	Yes, but short time series and no effort data		
Russia	"	30/09/2015		Centre of Fishery Monitoring and Communications	stat15@mrcm.ru	Waiting	Did not respond		
Russia	"	30/09/2015		Centre of Fishery Monitoring and Communications	office@mrcm.ru	Replied saying Russian vessels do not fish in the stated ICES areas	Not relevant		
France	"	05/10/2015	Director for Sea, Fisheries and aquaculture	Ministère de l'Ecologie, du Développement Durable et de l'Energie	Sent formal request letter to > Ministère de l'Ecologie, du Développement Durable et de l'Energie > Direction des Pêches Maritimes et de l'Aquaculture > Mission des Affaires Scientifiques > Tour Séquoia / 92055 LA DÉFENSE Cedex	Waiting	Did not respond		
Finland	"	05/10/2015		Ministry of Agriculture and Forestry Natural Resources Department	kirjaamo.mmm@mmm.fi	Email saying request has been received by the Ministry of Agriculture and Forestry.	Did not respond		
Belgium	"	05/10/2015		MUMM marine data centre	info@mumm.ac.be	Request re-submitted to zeevisserij@lv.vlaanderen.be . Geert DEVOGEL (<geert.devogel@lv.vlaanderen.be) Replied saying VMS and fishing activity data were confidential. Data on landings were aggregated here: http://lv.vlaanderen.be/nl/visserij/cijfers-marktoverzichten/jaaroverzichten. Dave looking for data.	No - but were directed to useful fisheries links		
Denmark	"	05/10/2015	Jørgen Dalskov	DTU aqua	mynd@aqua.dtu.dk	Jørgen Dalskov (Senior fisheries advisor) responded saying the data call will cost €20,000-30,000.	Too expensive		20,000-30,000
Netherlands	"	03/11/2015	Cees Verbogt	Minez	c.j.m.verbogt@minez.nl	Niels Hintzen responded saying 32-40 hours work, will involve some cost. Have asked how much. 15-20,000.	Too expensive		15,000-20,000
Germany	"	05/10/2015	Svea Writschan	Thunen Institute of Sea Fisheries	sf@ti.bund.de	Svea Writschan (federal agency for agriculture and food) replied saying request is do-able but the cost is at least €500 .	Data were not processed in time		500
Netherlands	"	03/11/2015	Sieto Verver	Wageningen UR	sieto.verver@wur.nl	Niels responded saying 32-40 hours work, will involve large costs	Too expensive		15,000-20,000
France	"	10/11/2015	Eric Moussat	Ifremer	Eric.Moussat@ifremer.fr	He has emailed his colleagues to stimulate a response.	Did not respond		
ICES	"	26/11/2015	Neil Holdsworth and Sebastian Valanko	ICES	NeilH@ices.dk, sebastian.valanko@ices.dk	Referred to a small dataset of ICES fishing activity thatcan be used for Challenge. Longer time series for landings data are not available.	Yes - fishing activity data provided and directed to useful datasets.		0
JRC	"	26/11/2015	Stephen Holmes	JRC	steven.holmes@jrc.ec.europa.eu	Landings data provided for correct time series (with some discards data) band can be grouped by ICES Rectangle.	Yes - directed to landings and discards data used in Challenge.		0

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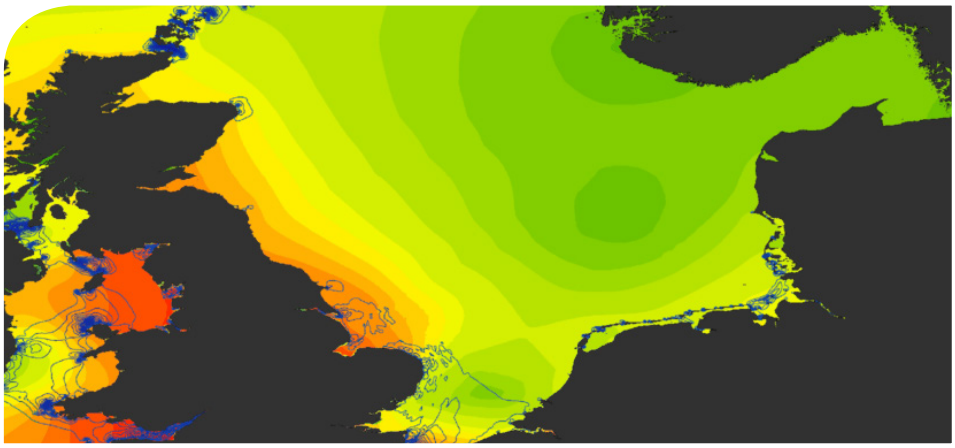

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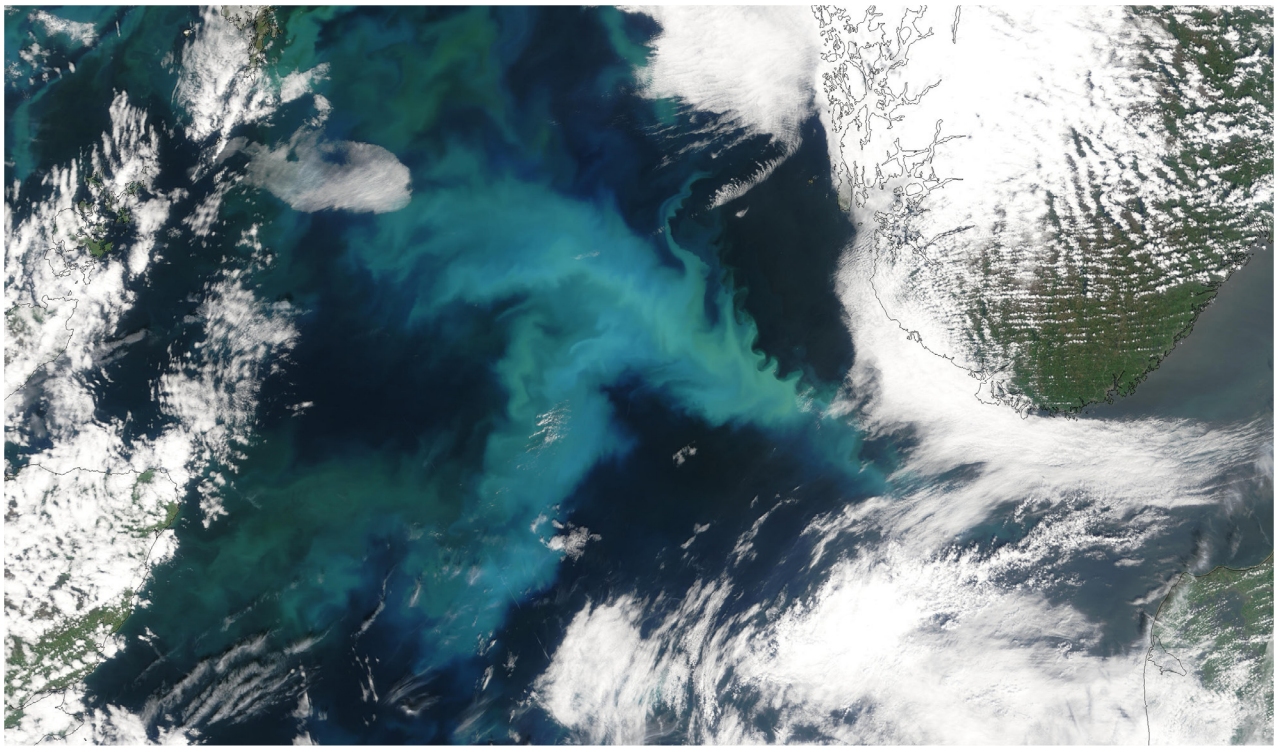
EMS 558310
OHS 595357

A.7. Marine Environment

HR Wallingford
Working with water

Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report - Marine Environment Challenge



DLS0342-RT013-R01-00 April 2016

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Project manager	David Middlemiss
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Date	Release	Prepared	Approved	Authorised	Notes
28 Apr 2016	01-00	EMN	VBA	QKH	

Document authorisation

Prepared	Approved	Authorised
EMN Hall	Valerie Houlden.	

Executive Summary

Headline highlights

- There is no pre-existing 'map of eutrophication' for the North Sea for any year.
- Marine eutrophication is an extremely complex process that is not yet fully understood. As a result, existing mechanisms for evaluating eutrophication stress the need to aggregate multiple parameters.
  - Any single parameter when used alone is not a suitable proxy for eutrophication, including remotely-sensed chlorophyll-*a*.
- The OSPAR convention method for eutrophication status has been used to evaluate data adequacy for analysing marine eutrophication at a North Sea basin scale:
  - The highest quality data are generally found for the chemical data, particularly for Category I parameters.
  - Even for the highest quality data, there are still issues with non-uniformity in the temporal and geographic resolution of the data (i.e. location adequacy issues).
  - Data of reasonable quality are available for Category II parameters. Data have some location and attribute adequacy issues e.g. variability in choice of taxa for phytoplankton across space, time and different surveys would introduce uncertainty into a basin-wide assessment.
  - Very few datasets are available on macrophytes, macroalgae, zoobenthos and fish kills.
  - Data availability for algal toxins is uncertain.

Most data are available for public use though open licensing, can readily be downloaded through internet portals within a reasonable time and are relatively easy to use.

Summary

Under the North Sea checkpoint project[1], HR Wallingford delivered an assessment of the data requirements for the challenge on the Marine Environment: marine eutrophication. The marine environment is important for a number of reasons, not least for tourism and fisheries. Eutrophication is a process driven by enrichment of water by nutrients that leads to increased growth, primary production and biomass of algae. This changes in the balance of organisms and causes water quality degradation. In turn, this can negatively impact each of tourism, fisheries and human health.

The search for data for this challenge was undertaken over a period of around five months, from December 2015 to April 2016. The data requirements for this challenge are driven by the parameters that Contracting Parties to the OSPAR convention are required to include in their assessments of eutrophication status. Data can be logically split into chemical and biological.

The highest quality data available was the chemical data, particularly for the key nutrients (nitrogen and phosphorus). With respect to the biological data, there are reasonable quality data on phytoplankton but very little available on fish and zoobenthos kills, zoobenthos biomass and community structure, and on macrophytes and macroalgae.

Even the highest quality data have some restrictions when considering their use at a basin-wide scale:

- Differences between the monitoring data held by different nations e.g. different sampling methods or choices of taxa.
- Non-uniformity in the temporal and geographic resolution:
  - Some areas are highly monitored whilst other areas are not.
  - Not every geographic sampling site is monitored more than once.
  - Not every sampling site is sampled at the same time.

  This makes pin-pointing particular 'snapshots' in time difficult to define with any certainty.

Furthermore, other common difficulties were:

1. Some detailed data were available but had to be downloaded one survey site at a time. Whilst this is suitable for 'case study' style analysis, it is excessively time consuming for large scale analyses.
2. Metadata is variable in quality and often difficult for a user to fully understand.

[1] The Marine Environment challenge was conducted as part of the North Sea Checkpoint project (NSCP): Growth and Innovation in the Ocean Economy – Gaps and Priorities in Sea Basin and Observation Data MARE/2012/11: North Sea, contract reference [SI2.658142]. The project was undertaken by HR Wallingford Ltd with input from the project members IMARES and McAllister-Elliot & Partners (MEP). The Data Adequacy Report (DAR) for this challenge details the findings of the work and represents the 13th deliverable of the project.

Contents

Figures

Tables

1. Introduction

This report is a deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The work for this report was undertaken by HR Wallingford Ltd. This document is a Data Adequacy Report (DAR) presenting the findings for the completed challenge on the marine environment.

This challenge addresses the stages of work required for a desk-based assessment of seasonal averages of eutrophication for the past ten years and change in eutrophication over the past ten years for the complete North Sea basin. The assessment was made using publically available data or data provided upon request from online data portals.

All datasets gathered have been recorded in the data adequacy assessment database, providing a searchable record of each of the datasets reviewed and the results of its evaluation where considered for one or more challenges. The database is in the process of being made available via the project website.

It is the process of gathering, appraising and using the data to meet the outcome which is most important in informing the overall objectives of the North Sea Checkpoint project, as each contributes to the results of the challenge undertaken.

In this context it should be noted that assessing data quality within a challenge is a continuous process through each stage of a challenge: data gathering, initial appraisal of the data, analysis, quality assurance of results, providing different insights into the accessibility and usefulness of a dataset at each stage.

Points for EMODnet

Data from EMODnet were interrogated for this challenge.

There was a considerable amount of data on water chemistry available through EMODnet on nitrates, phosphates, silicates and ammonium. The benefits of these datasets are:

- Temporal extent and resolution that should be suitable for the analysis.
- Geographic extent and resolution that should be suitable for the analysis.

The primary issue with these data is the way in which dates are formatted in the data. These are not in an immediately usable form (see Section 6.1.2 for more information) and the link to the metadata online returns a blank page. As a result of this, the datasets are not readily useable.

2. Aim

The aim of the challenge is to produce gridded data layers showing seasonal averages of eutrophication for the past ten years and change in eutrophication over the past ten years for the complete North Sea basin.

The North Sea basin is defined in the project documentation for the North Sea Check Point project (see Figure 2.1).

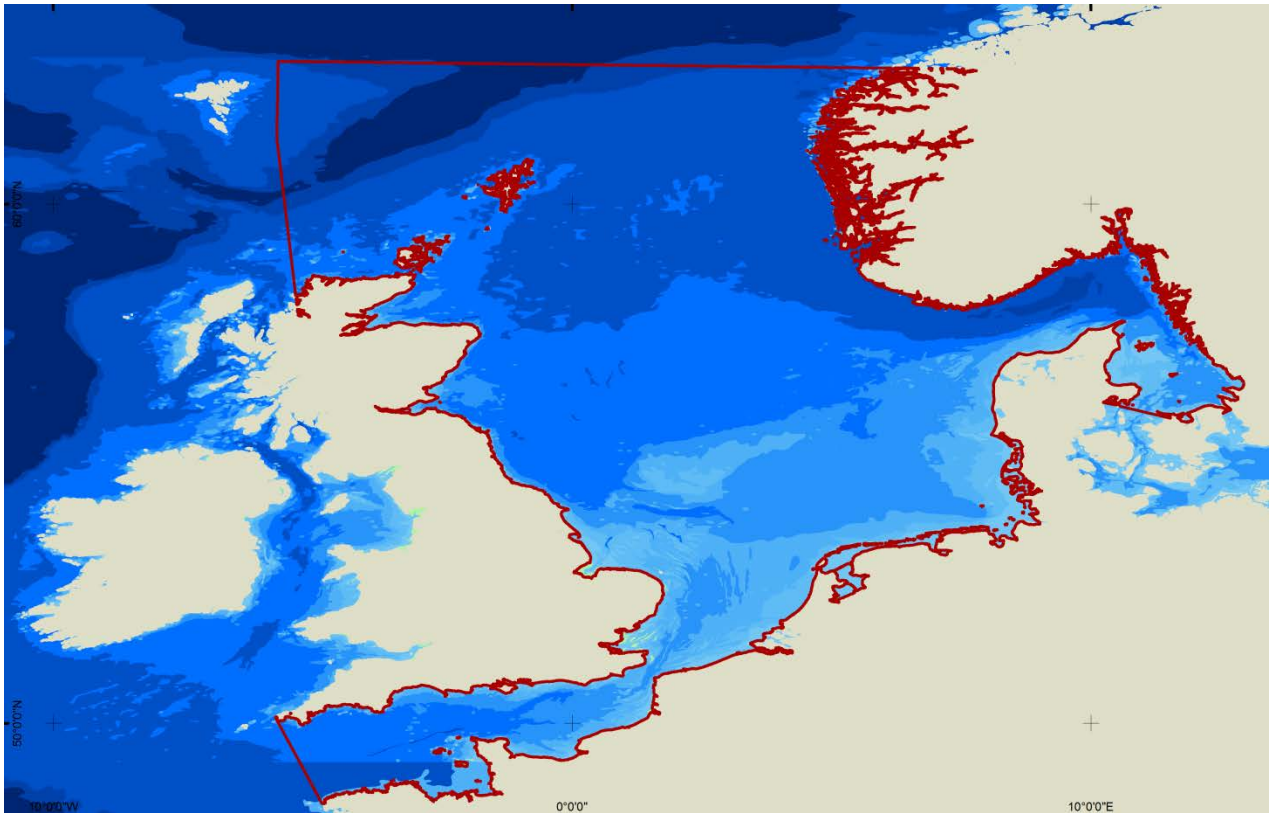

Figure 2.1: North Sea basin, contained within the red lines, as given in the project documentation.

3. Context

This section describes what eutrophication is, the policy context for evaluating eutrophication in the marine environment and the international monitoring programmes that may support eutrophication evaluation.

3.1. What is Eutrophication?

For the purposes of this study, eutrophication is defined as per Descriptor 5 of the Marine Strategy Framework Directive, which is:

> A process driven by enrichment of water by nutrients, especially compounds of nitrogen and phosphorus, leading to increased growth, primary production and biomass of algae; changes in the balance of organisms and water quality degradation.
>
> *Ferreira et al., 2010*

Nutrients naturally present in the sea include compounds of silicon (Si), nitrogen (N) and phosphorus (P). Nitrogen and phosphorus inputs from river inflows exaggerate the naturally seasonal cycle of nutrients, causing nutrient enrichment and greater primary production of organic material and an increase of algae. Management of eutrophication focuses on undesirable disturbance of the natural nutrient cycle as a result of anthropogenic influences, see Figure 3.1.

Eutrophication varies on a spatial and temporal scale. Spatial variations in eutrophication are driven by bathymetry and hydrodynamics, which influence the vertical and horizontal mixing of nutrients and growth and spread of algae. The extent of shallow areas, stratified river plumes, water residence times and upwelling all affect the vulnerability of waters to eutrophication. There are several established methods of eutrophication assessment. Due to the wide extent of eutrophic zones in some places, the use of remote sensing of surface chlorophyll-*a* (an indicator of phytoplankton biomass) content is an important source of data, to be complimented by ground-truth monitoring and modelling and the additional use of other biological and physico-chemical indicators. Temporal variations in eutrophication are influenced by season, with the exception of waters that are permanently stratified. Eutrophication occurs most commonly in late spring and in summer and any assessment of eutrophication must take into account this seasonality (Ferreira *et al.*, 2010).

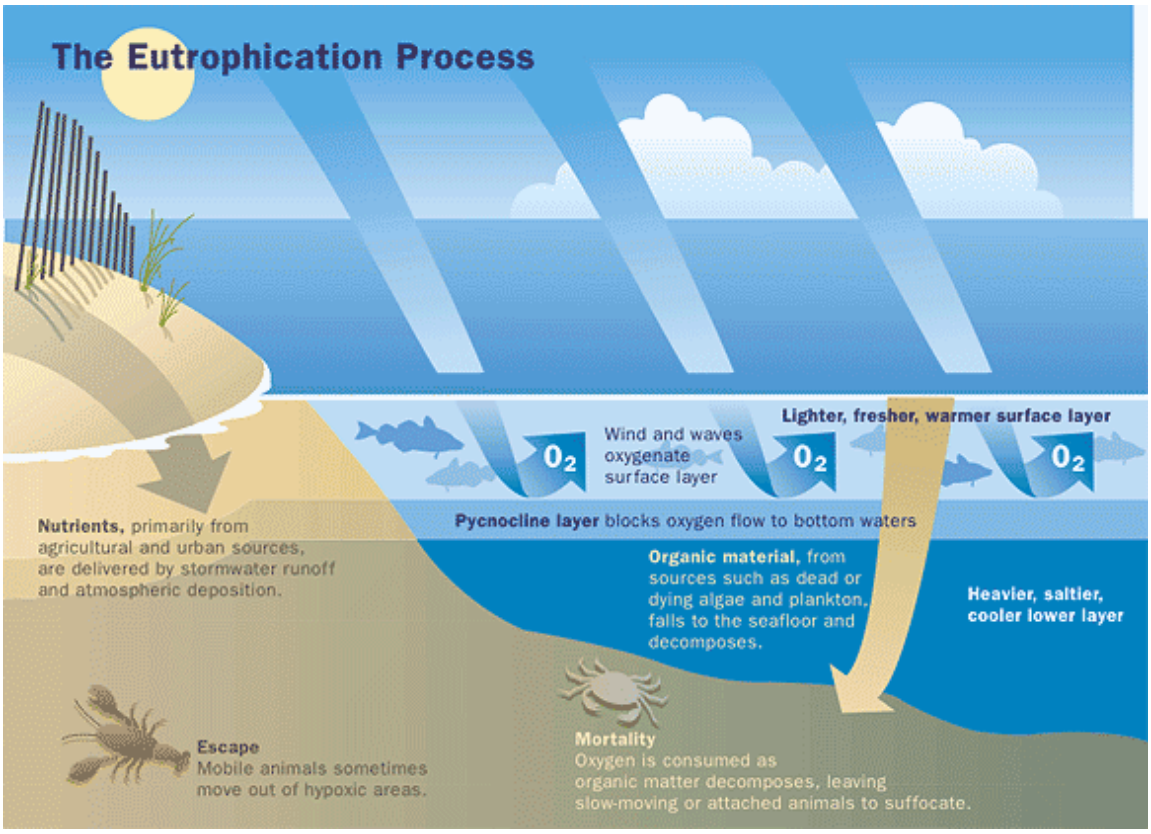

Figure 3.1: The Eutrophication Process.

Source: http://www.ospar.org/work-areas/hasec/eutrophication

3.2. Policy context

The Convention for the Protection of the Marine Environment of the North-East Atlantic, more commonly known as the 'OSPAR Convention'[2], monitors eutrophication status in the north-east Atlantic. The OSPAR Convention was open for signature at the Ministerial Meeting of the Oslo and Paris Commissions in Paris on 22 September 1992. It was adopted together with a Final Declaration and an Action Plan. The OSPAR Convention entered into force on 25 March 1998. The OSPAR Convention covers the North-East Atlantic, broken up into 5 regions:

- Region I: Arctic Waters
- Region II: Greater North Sea (the area covered by this challenge)
- Region III: Celtic Seas
- Region IV: Bay of Biscay and Iberian Coast
- Region V: Wider Atlantic.

[2] http://www.ospar.org/convention

The geographical boundary of this challenge equates to Region II: The Greater North Sea, under the OSPAR agreement. The eight countries that border this region, known as the "Contracting Parties" of the OSPAR agreement, are:

1. France
2. Belgium
3. Denmark
4. Germany
5. the Netherlands
6. Norway
7. Sweden
8. England and Scotland in the UK.

The OSPAR Commission is guided by the ecosystem approach to the integrated management of human activities in the marine environment. This is supported by a general obligation of Contracting Parties to apply, the precautionary principle; the polluter pays principle; and to use best available techniques and environmental practice.

OSPAR's activities are split into six work areas; *Hazardous substances & eutrophication* is most applicable to this challenge. The OSPAR Eutrophication Strategy (OSPAR, 2003a) sets the objective to combat eutrophication in the OSPAR maritime area, in order to achieve and maintain a healthy marine environment where anthropogenic eutrophication does not occur. Contracting parties have long-standing commitments to achieve substantial reductions at source of inputs of phosphorous and nitrogen into areas where these inputs are likely to cause pollution.

The OSPAR Commission reports on the eutrophic state of the seas and has developed a common assessment framework to help Contracting Parties in identifying areas at risk in a consistent way and help to progress the objectives of the Eutrophication Strategy; known as the "Common Procedure". The Common Procedure is summarised in the box below and is described in detail in Section 4.

Common Procedure

The Common Procedure is the method developed for the identification of the eutrophication status of the OSPAR maritime area. It provides an assessment framework for the Contracting Parties to follow, in order to evaluate the eutrophication status of their maritime waters in a consistent manner, both between countries and with other related directives such as the Water Framework Directive and the Marine Strategy Framework Directive. The Common Procedure characterises areas as:

Non-problem areas: there are no grounds for concern that anthropogenic enrichment by nutrients has disturbed or may in the future disturb the marine ecosystem;

Potential problem areas: there are reasonable grounds for concern that the anthropogenic contribution of nutrients may be causing or may lead in time to an undesirable disturbance to the marine ecosystem due to elevated levels, trends and/or fluxes in such nutrients; and,

Problem areas: there is evidence of an undesirable disturbance to the marine ecosystem due to anthropogenic enrichment by nutrients.

The Common Procedure to establish eutrophication status is made up of two main parts:

- The Screening Procedure: A broad-brush process that uses information on demographic/hydrodynamic/physical characteristics of an area; optical observations made by ship, aircraft or satellite; and nutrient-related information to identify obvious non-problem areas.
- The Comprehensive Procedure: A more refined assessment undertaken on all areas that are not classified as 'non-problem areas'. This assessment evaluates a defined set of criteria that are linked to the cause-effect relationships associated with marine eutrophication. The criteria are evaluated against area specific baselines which are then scored and aggregated. The final step is for all of the results to be evaluated and presented in a transparent and verifiable manner by the Contracting Parties to enable OSPAR to undertake an overall assessment of the full maritime area and present this in its integrated report (last report in 2010).

Source: OSPAR (2013b)

3.3. Monitoring programmes

The Common Procedure is supported by monitoring under the Eutrophication Monitoring Programme as part of the OSPAR **Co-ordinated Environmental Monitoring Programme (CEMP)**. Waterborne and atmospheric inputs of nutrients into the OSPAR maritime area are also monitored under the **Riverine Inputs and Direct discharges (RID)** study (OSPAR, 2013a) and the **Comprehensive Atmospheric Monitoring Programme (CAMP)** monitoring programme (OSPAR, 2013b).

There are similarities between the Water Framework Directive and the Comprehensive Procedure that should enable the same datasets to be used for each approach. The similarities are described in the box below.

Similarities between the Water Framework Directive (WFD) and the Comprehensive Procedure

Pressures: Both the WFD and the Comprehensive Procedure seek to assess where human pressures are negatively influencing the environment and identify measures necessary to achieve good status (WFD) or non-problem area status (Comprehensive Procedure);

Geographical area: The WFD transitional and coastal water bodies assessment area is entirely included in the Comprehensive Procedure assessment area;

Parameters: Each covers phytoplankton, chlorophyll concentration, nutrients and dissolved oxygen as assessment parameters. The WFD seeks an assessment of the quality and functioning of the aquatic ecosystem and the Comprehensive Procedure evaluates eutrophication status. In the WFD parameters to assess change in the different biological quality elements (e.g. benthic invertebrates and macroalgae) have been further elaborated to assess the ecological quality of these elements; and

Classification: the boundary between good/moderate ecological status (WFD) should be comparable to the boundary between non problem/problem area status (Comprehensive Procedure).

3.3.1. Co-ordinated Eutrophication Monitoring Programme

Any monitoring programme for OSPAR should have clear objectives and comply with the guiding principles in the OSPAR Strategy for a Joint Assessment and Monitoring Programme. The objectives of the CEMP are to enable Contracting Parties:

1. To assess eutrophication status and trends, in particular through the application of the OSPAR Common Procedure; and
2. To evaluate the effectiveness of measures in relation to the objectives of the OSPAR Eutrophication strategy.

The CEMP specifies minimum requirements to the Contracting Parties on their national monitoring which, amongst other requirements, takes hydrographic characteristics and severity of perceived extent of eutrophication into account. Contracting Parties report on monitoring results for specific parameters, listed in Table 3.1 and Table 3.2, on an annual basis. The International Council for the Exploration of the Sea is the current data centre for OSPAR marine environmental monitoring data. Although OSPAR provides advice on the frequency and spatial extent of monitoring, such programmes are devised and carried out by the Contracting Parties individually. Furthermore, there are greater requirements for monitoring of problem and potential problem areas compared to non-problem areas. Therefore, the spatial and temporal extent and granularity of monitoring will vary across the Greater North Sea basin.

Table 3.1: Nutrient enrichment[1].

	Non-problem areas	Potential problem areas	Problem areas
NH_4-N (µmol l^{-1})[2,4]	+	+	+
NO_2-N (µmol l^{-1})[2,4]	+	+	+
NO_3-N (µmol l^{-1})[2,4]	+	+	+
PO_4-P (µmol l^{-1})[3,4]	+	+	+
SiO_4-Si (µmol l^{-1})[4]	-	+	+
Salinity	+	+	+
Temperature	+	+	+
Frequency[5]	About every three years during winter	Annually during winter when algal growth is at a minimum and during monitoring of direct and indirect effects	

Source: OSPAR (2013c)

+ Action required.
- Action discretionary.
1 All parameters should be monitored in conjunction with area-specific ecosystem features.
2 Winter dissolved inorganic nitrogen (DIN) is the sum of NH4-N, NO2-N and NO3-N.
3 Winter dissolved inorganic phosphate (DIP).
4 Monitoring of winter DIN, DIP and Si should be in conjunction with salinity measurements (see Common Procedure, sections 4.26 and 4.29).
5 Monitoring should include sufficient samples to confirm that the maximum winter nutrient concentration has been determined.

Table 3.2: Direct and indirect eutrophication effects[1].

	Non-problem areas	Potential problem areas	Problem areas
Phytoplankton chlorophyll-*a* (µg l^{-1})	-	+	+
Phytoplankton indicator species (cells l^{-1}; species composition)	-	+ species composition: (genera and nuisance/potentially toxic species)	+ species composition: (genera and nuisance/potentially toxic species) + TOC and POC[2]
Macrophytes, including macroalgae and angiosperms[3]	-	+ biomass	+ biomass + species composition, coverage, and reduced depth distribution
O_2 concentration (mg l^{-1}; including % O_2 saturation)	-	+	+
(zoo) Benthic communities	-	+ biomass and species composition (if time series already exist)	+ biomass, species composition and eutrophication indicator species
Frequency[4]	-	annually during the algal growing season	

Source: OSPAR (2013c)

+ Action required.
- Action discretionary.
1 All parameters should be monitored in conjunction with area-specific ecosystem features.
2 TOC: Total Organic Carbon; POC: Particulate Organic Carbon.
3 In shallow areas, primarily in estuaries and coastal waters.
4 With adequate frequency and area coverage.

Sampling in support of the Eutrophication Monitoring Programme is carried out using ships in winter (for nutrients) and summer (for eutrophication effect parameters) adopting various spatial designs. Other platforms such as Smartbuoys, gliders, towed devices and FerryBoxes may also be used to provide survey data and provide different temporal and spatial sampling capabilities to ships. Adequate quality assurance is critical for all sampling methods. In addition to these *in situ* sampling mechanisms, satellite and aerial remote sensing are also useful means of gathering data. These methods are especially useful where a wide spatial and more timely coverage is required, however, they benefit from being used in conjunction with direct sampling methods that can 'ground-truth' the remotely sensed information.

Smartbuoys

Smartbuoys are moored, automated, multi-parameter recording platforms used to collect marine environmental data. The Smartbuoys deployed by Cefas (the Centre for Environment, Fisheries and Aquaculture Science based in the UK) collect high-frequency time series of surface (1 metre) salinity, temperature, turbidity, oxygen saturation, chlorophyll fluorescence and nitrate concentration. Water samples are collected and preserved for later analysis of nutrients and phytoplankton species.

FerryBoxes

FerryBoxes are devices that are installed on ships to provide high-frequency surface biogeochemical measurements along selected transects on a regular basis. The results can be made available in real time for the primary parameters: temperature, salinity, particles and chlorophyll-*a* fluorescence. The systems are also equipped with a water sampling system that can be triggered remotely. This makes the system very operational for e.g. monitoring of harmful algal blooms. In addition, advanced measurement of water leaving reflectance can be measured and used for real-time validation of optical satellite data.

3.3.2. Riverine Inputs and Direct discharges (RID) study

The RID study aims to assess the input of selected contaminants to the OSPAR maritime area and its regions which are carried via rivers into tidal waters or are discharged directly into the sea. The RID Study currently focusses on mandatory monitoring and reporting of the concentrations and loads of several metals and the organic pollutant lindane. Additionally, the RID study also focusses on nitrogen and phosphorus species and suspended particulate matter. The latter three parameters are used to inform Challenge 7, on River Inputs, for the North Sea Checkpoint project.

OSPAR produces regular RID data reports using the annual RID study data. The most recent scientific assessment of long-term trends in riverine inputs and direct discharges of hazardous pollutants to the OSPAR maritime area is the 2005 RID data assessment. Updated data reports have been produced and evaluated qualitatively, but no statistical analysis has been undertaken to identify long-term trends.

The latest RID assessment (OSPAR, 2009a) indicated that riverine inputs of nitrogen and phosphorus in OSPAR region II, the Greater North Sea, had shown a significant decrease over the period 1990-2006. However, direct discharges still represented only a minor contribution to total waterborne inputs. Additionally, improvements in laboratory and analytical techniques over time were thought to lead to difficulties in detecting trends and quantifying reduction accurately. This further contributes to the uncertainties that result from the incompleteness of reporting and the monitoring coverage.

3.3.3. Comprehensive Atmospheric Monitoring Programme (CAMP)

The CAMP aims to assess the input of selected contaminants to the OSPAR maritime area and its regions via atmospheric deposition. Under the CAMP, the Contracting Parties monitor a range of metals, organic compounds and nutrients in precipitation and air. Some are monitored on a mandatory basis and some on a voluntary basis, see Table 3.3.

Region II, the Greater North Sea, is the most intensely observed region in this programme. Despite this, in the latest report, for most parties there are some elements missing, meaning that parties are not complying fully with the monitoring obligation defined by CAMP (OSPAR, 2015).

The evidence that is available indicates that the various pollutants in general show elevated levels closest to the main source areas although there is some variability in this. Over time, there are trends showing decreases in nitrogen, heavy metals and ɣ-HCH in accordance with the emission reductions in Europe in the last decades.

Table 3.3: Components to be measures under CAMP.

	Mandatory	Voluntary
Precipitation	As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, ɣ-HCH, NH^{4+}, NO^{3-}	PCB 28,52,101,118,138,153,180 PAHs: Phenanthrene, anthracene, flouranthene, pyrene, benzo(*a*)anthracene, chrysene, benzo(*a*)pyrene, benzo(*ghi*)perylene, indeno(*1,2,3-cd*)pyrene
Airborne	NO_2, HNO_3, NH_3, NH_4^{+a}, NO_3^{-a}	As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, ɣ-HCH, PCB 28,52,101,118,138,153,180, PAHs: Phenanthrene, anthracene, flouranthene, pyrene, benzo(*a*)anthracene, chrysene, benzo(*a*)pyrene, benzo(*ghi*)perylene, indeno(*1,2,3-cd*)pyrene, NO

Source: OSPAR, 2015

4. Method

This DAR has used the method that OSPAR Contracting Parties use to measure eutrophication in order to frame the evaluation and discussion of data that is available for a basin-wide eutrophication assessment. The latest assessments by the Contracting Parties have also been interrogated in order to evaluate the challenges and constraints of undertaking the assessment with respect to data availability and quality.

The box in Section 3.2 summarises the method that OSPAR Contracting Parties use to measure eutrophication. Known as "The Common Procedure", the method aims to provide a consistent framework to identify and classify the eutrophication status of the OSPAR maritime area.

The OSPAR approach does not undertake an assessment of eutrophication for the North Sea basin at the basin scale. Instead, the approach reduces the geographic scale of assessment and then aggregates the smaller scale evaluations to build a picture for the North Sea basin area as a whole. Methods that cover a wider extent and higher resolution, such as remotely-sensed data on chlorophyll-*a*, do exist and are extensively researched. However, the current limitations of such data mean that it is not yet good enough to be a reliable measure of eutrophication when used alone. Limitations include the fact that remote sensing of chlorophyll-*a* only detects the surface waters and not deeper water in which algal blooms also exist. Different spectra may be important for identifying blooms in the open ocean compared to in coastal areas; requiring different images and analytical techniques. Overall, remotely-sensed chlorophyll-*a* tends to overestimate algal blooms (Blondeau-Patissier *et al.* 2014; Cristina *et al.* 2015).

The Common Procedure is described in more detail in this section. The method is based upon the Conceptual Framework, Section 4.1. It then follows two steps, the Screening Procedure (Section 4.2) and the Comprehensive Procedure (Section 4.3).

4.1. Conceptual framework

Understanding eutrophication requires consideration of many variables as eutrophication is a complex and not fully understood phenomenon. The OSPAR commission base the Common Procedure (and importantly, the metrics for the Comprehensive Procedure) on a conceptual framework of the main cause-effect linkages for eutrophication, see Figure 4.1. Each aspect in the conceptual framework may be translated into assessment criteria/parameters (see Table 4.2) that are harmonised across the OSPAR area. The links described by Figure 4.1 of these harmonised criteria form a holistic assessment of eutrophication.

Category I parameters focus on nutrient enrichment. This part of the framework considers the existing nutrient loads, the nutrient inputs to the environment and the fluxes within and between geographic areas.

Category II parameters focus on the direct effects of nutrient enrichment on biological communities: phytobenthos, phytoplankton and macrophytes; and associated abiotic factors such as turbidity and light transparency.

Category III parameters focus on the indirect effects of nutrient enrichment. This includes changes to macroinvertebrate and fish communities, changes in habitat, amounts of organic matter and oxygen deficiency.

Category IV concerns algal toxins. Such toxins may have serious consequences, when present in high concentrations, on human health and well-being as well as the wider environment.

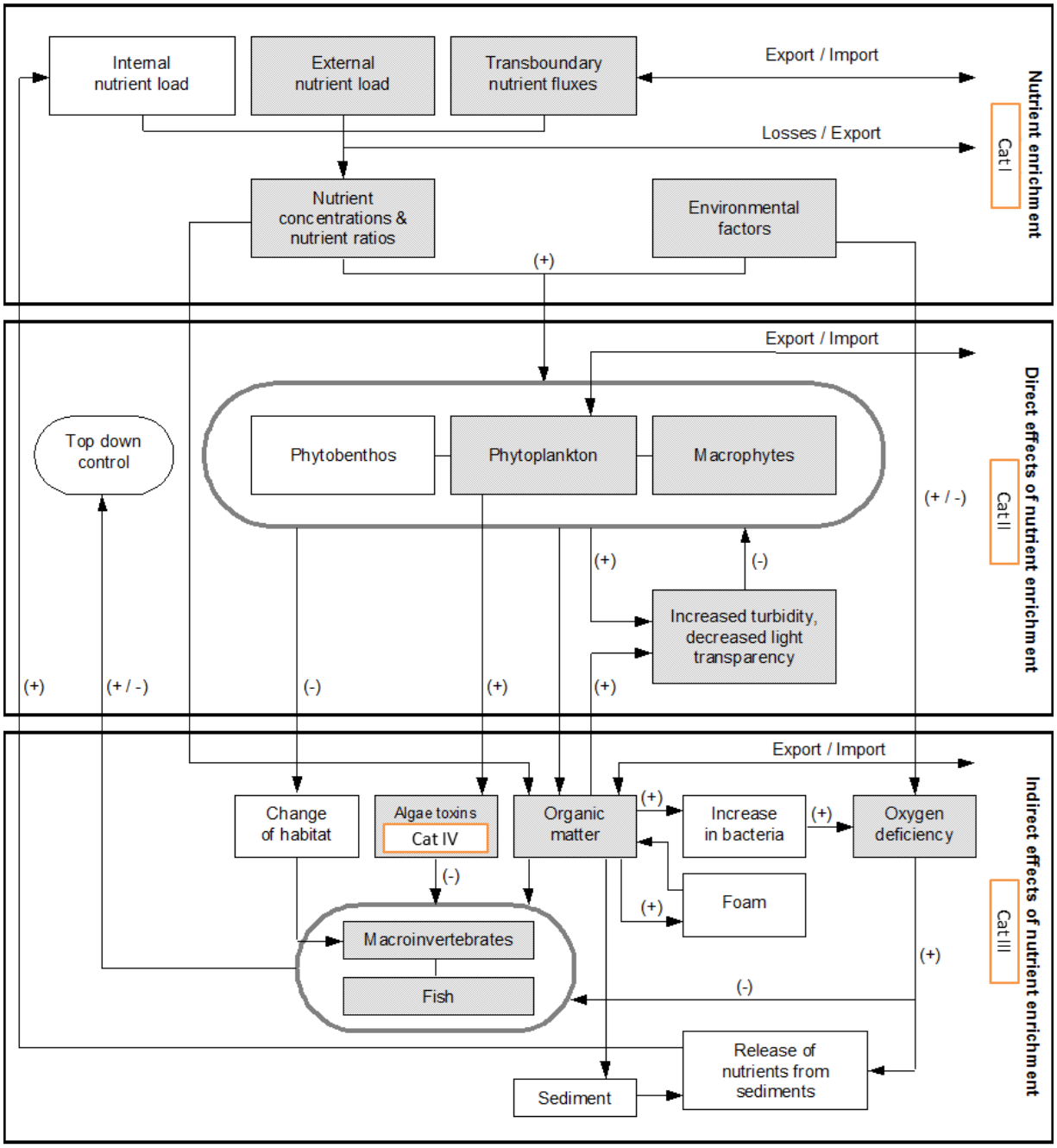

Figure 4.1: Generic conceptual framework to assess eutrophication in all categories of surface waters illustrating the main cause/effect linkages.

Source: OSPAR (2013c)

Shaded boxes indicate components relevant for the Comprehensive Procedure.
'+' indicate enhancement;
'-' indicate reduction;
Cat. I = Category I. Degree of nutrient enrichment (causative factors);
Cat. II = Category II. Direct effects of nutrient enrichment;
Cat. III = Category III. Indirect effects of nutrient enrichment;
Cat. IV = Category IV. Other possible effects of nutrient enrichment.

4.2. The Screening Procedure

The Common Procedure aims to characterise areas as:

- **Non-problem areas:** there are no grounds for concern that anthropogenic enrichment by nutrients has disturbed or may in the future disturb the marine ecosystem;
- **Potential problem areas:** there are reasonable grounds for concern that the anthropogenic contribution of nutrients may be causing or may lead in time to an undesirable disturbance to the marine ecosystem due to elevated levels, trends and/or fluxes in such nutrients; and,
- **Problem areas:** there is evidence of an undesirable disturbance to the marine ecosystem due to anthropogenic enrichment by nutrients.

The Screening Procedure was originally developed as a 'broad-brush' one-off process to identify areas that were obvious non-problem areas. However, following its implementation Contracting Parties consider that there is utility in using this part of the Common Procedure (or something very similar) on a more frequent basis.

The current Screening Procedure is a process of screening maritime waters to identify those that are either:

- Likely to be obvious non-problem areas with regard to eutrophication; or,
- Have been identified in successive previous assessments as non-problem areas and, the relevant pressures are known to be unlikely to increase.

It is up to the Contracting Parties to determine the geographic scale of the assessment. The scale will likely be influenced by the hydrodynamic characteristics of parties' marine waters and the proximity of nutrient sources.

The Screening Procedure recommends that Contracting Parties obtain readily available information on the following items in order to carry out an initial screening:

- Demographic/hydrodynamic/physical information:
  - Demographic data: population and waste water treatment;
  - Agriculture and industry;
  - Hydrodynamic/physical features (for example fronts, upwelling, turbidity, flushing rates, residence times, water transport and currents).
- Optical observations:
  - Observations made by ship, aircraft or satellite such as presence/absence of algal blooms or fish kills;
  - Information from in-situ mobile and fixed platforms such as FerryBoxes.
- Nutrient-related information:
  - Mandatory nutrient monitoring data;
  - Inputs data;
  - Nutrient budgets;
  - Information from monitoring from other EU directives (including the Water Framework Directive and the Marine Strategy Framework Directive).

It is left up to the Contracting Party to determine the precise parameters to use during the screening process. France, the UK and Norway were able to identify some non-problem areas in their maritime waters. For

example, when Norway undertook the Screening Procedure for the inshore waters of the Norwegian west coast, areas were classified as non-problem areas if:

- The anthropogenic nutrient load is low; and,
- The areas have a mainly high and unrestricted water exchange.

Areas that had any reported observations or reports of environmental disturbance that could be connected to nutrient enrichment were later subjected to the Comprehensive Procedure (NIVA, 2003).

For Belgium, Denmark, Germany, the Netherlands and Sweden it was obvious that their marine areas were sufficiently influenced that the Comprehensive Procedure should be applied everywhere (de Jong, 2007).

4.3. The Comprehensive Procedure

The Comprehensive Procedure is the second stage of the Common Procedure framework and should be carried out promptly after the Screening Procedure is complete. The Comprehensive Procedure should be carried out on:

- All areas that are not identified as non-problem areas;
- Local areas located within wider non-problem areas; and,
- Areas that were not covered under the Screening Procedure.

The Comprehensive Procedure may be repeated many times and, as such, may be useful to help identify trends in eutrophication status over time.

Similar to the Screening Procedure, the Contracting Parties are expected to determine the geographical scale of the assessment for the Comprehensive Procedure. The characterising of waters in this regard is important: too small and monitoring and evaluation of eutrophication will become inefficient; too large and local problems may be disguised. It is anticipated that the size of geographic assessment will increase, from smaller inshore waters to bigger offshore areas.

For the purpose of characterising eutrophication across the Contracting Parties, the method recommends that similar waters are grouped according to size, salinity ranges, residence time and effects, see Table 4.2.

Table 4.1: Geographic characterisation for group assessment.

Area type	Size	Salinity	Residence time
Estuaries	Small	0.5-18	Days
Inshore waters		<30	Days
Inner coastal waters	Medium	30-32	Weeks
Outer coastal waters		32-34.5	Weeks
Offshore waters	Large	>34.5 or 35	Months

Source: Adapted from OSPAR, 2013c

For waters such as coastal and transitional waters that also fall under the Water Framework Directive, it may be that the same divisions and typologies are used. However, waters that are further offshore will also need to be characterised. Other parameters such as depth, missing characteristics, sedimentation, residence time, substrate composition and temperature may be useful in further characterising these areas.

There are three main steps in the Comprehensive Procedure:

1. Assessment, Section 4.3.1;
2. Integration, Section 4.3.2;
3. Classification, Section 4.3.3.

4.3.1. Step 1: Assessment procedure

The aim of this step is to select and apply the parameters listed in Table 4.2 which are relevant for the area concerned because they reflect the cause/effect relationships of the eutrophication process. The parameters listed in Table 4.2 align with the general conceptual framework shown in Figure 4.1.

Whilst some parameters, such as those in Table 3.1 are compulsory, many other parameters may be used to support the assessment. These may be qualitative or quantitative and could include supporting environmental factors such as light availability, weather or hydrodynamic conditions. Alternatively, other biological parameters such as micro-phytobenthos may be used to support the assessment.

Process

- **A: Setting and selecting of area-specific assessment parameters**

At this stage in the process, areas have been differentiated according to their salinity (see Table 4.1). The Water Framework Directive typology or other differences between and within areas helps to guide the assessment parameters that are required.

The *"Necessary data characteristics / notes"* column of Table 6.1 provides a short summary of what the ideal data would provide for the assessment of an area and, therefore, it can be inferred where a particular parameter may be suitable. For example, Redfield N/P ratios may be unsuitable in coastal/transitional waters and therefore, it is inferred that this parameter is most useful for offshore areas.

Table 4.2: Harmonised assessment parameters for the Comprehensive Procedure and related elevated levels.

Assessment parameters		
Category I	**Degree of nutrient enrichment**	
	1	**Riverine inputs and direct discharges[3] (area-specific)**
		Elevated inputs and/or increased trends of total N and total P (compared with previous years)
	2	**Nutrient concentrations (area-specific)**
		Elevated level(s) of winter DIN and/or DIP
	3	**N/P ratio (area-specific)**
		Elevated winter N/P ratio (Redfield N/P = 16)
Category II	**Direct effects of nutrient enrichment (during growing season)**	
	1	**Chlorophyll-*a* concentration (area-specific)**
		Elevated maximum, mean and/or 90th percentile level
	2	**Phytoplankton indicator species (area-specific)**
		Elevated levels of nuisance/toxic phytoplankton indicator species (and increased duration of blooms)
	3	**Macrophytes including macroalgae (area-specific)**
		Shift from long-lived to short-lived nuisance species (e.g. Ulva). Elevated levels (biomass or area covered) especially of opportunistic green macroalgae)
Category III	**Indirect effects of nutrient enrichment (during growing season)**	
	1	**Oxygen deficiency**
		Decreased levels (< 2 mg/l: acute toxicity; 2 - 6 mg/l: deficiency) and lowered % oxygen saturation
	2	**Zoobenthos and fish**
		Kills (in relation to oxygen deficiency and/or toxic algae)
		Long-term area-specific changes in zoobenthos biomass and species composition
	3	**Organic carbon/organic matter (area-specific)**
		Elevated levels (in relation to III.1) (relevant in sedimentation areas)
Category IV	**Other possible effects of nutrient enrichment (during growing season)**	
	1	**Algal toxins**
		Incidence of DSP/PSP mussel infection events (related to II.2)

Source: OSPAR, 2013c. Parameters found at levels above the assessment level are considered as "elevated levels" and entail scoring of the relevant parameter category as (+) (cf. 'score' table at Annex 1). For concentrations, the "assessment level" is defined as a justified area-specific % deviation from background not exceeding 50%.

B: Defining and applying the area-specific assessment parameters and their assessment levels

The second part of the process concerns obtaining the assessment level(s) for the parameters that will be used in a given area to evaluate the eutrophication status. The assessment level may differ depending on the parameter. Additionally, for some parameters, both increased concentrations and trends may be

3 Principles of the Comprehensive Study on Riverine Inputs and Direct Discharges (RID) (reference number: 1998-5, as amended).

required for the assessment of eutrophication status. The concentration will be based upon a certain percentage above background nutrient levels which would normally be derived from historic data. In the first Comprehensive Procedure assessment in 2003 and, in order to allow for natural variability, the assessment level was defined as the concentration 50% above the salinity-related and/or area-specific background concentration. This was applied to winter DIN and DIP concentrations, winter N/P ratio and maximum and mean chlorophyll-*a* concentrations. OSPAR require that, as better information becomes available, assessment levels should be based upon justified areas-specific deviations from background (that do not exceed 50%). Parameters that are found to be above their assessment level are referred to as *"elevated levels"*.

- **C: Trends assessment**

Trend assessment is important because it helps improve understanding of the biological processes and the influence of anthropogenic effects and climatic changes. It is expected that trend assessment will be undertaken for river discharges, nutrient concentrations in receiving waters and phytoplankton biomass (chlorophyll-*a*), however the trends for other parameters may also be used to support the assessment. Together these parameters should provide a measure of the effectiveness of nutrient reduction measures.

The results of Step 1 are presented in a harmonised way for each area to aid comparison across Contracting Parties.

4.3.2. Step 2: Integration of categorised assessment parameters for initial area classification

The scores from step one are integrated to obtain an initial classification for the given area.

All of the results for the parameters from step 1 are recorded in the same manner for each area, in a common format that includes information on the parameter, a description of the results, the score (+, -, ?) and a confidence rating.

For a given area, the overall score of a category will be '+' where one or more of its assessment parameters is showing an increased trend, elevated level, shift or change. Where no parameter in a category shows an increased trend, elevated level, shift or change, then the overall score of the category will be '-'. Where data does not exist, or is unsuitable for the assessment, then the overall score for the category will be '?'. Category III and Category IV are merged for this process.

For each area, the three overall scores for the different parameter categories are then combined into an initial classification. The score combinations that are possible are shown in Table 4.3 together with the corresponding initial classification that they would achieve.

Table 4.3: Integration of cause-effect related categorised assessment parameters and the corresponding initial area classification.

Category I: Degree of nutrient enrichment	**Category II:** Direct effects	**Category III and IV:** Indirect effects / other possible effects	**Comments**	**Initial classification**
+	+	+	Elevated levels of nutrient enrichment and direct and/or indirect/other effects.	Problem area
+	+	-		
+	-	+		
-	+	+	Nutrient levels in area are ok, but direct and/or indirect/other effects are evident. Possible transboundary influences.	
-	+	-		
-	-	+		
+	-	-	No effects in area but elevated nutrient levels may contribute to problems elsewhere.	Non-problem area
+	?	?	Elevated levels of nutrient enrichment and not enough suitable data to ascertain whether there are direct and/or indirect/other effects.	Potential problem area
+	?	-		
+	-	?		
-	-	-	No nutrient enrichment or direct or indirect/other effects.	Non-problem area

Source: OSPAR, 2013c.

+ Increased trends, elevated levels, shifts or changes in the respective assessment parameters.

- Neither increased trends nor elevated levels nor shifts nor changes in the respective assessment parameters.

? Not enough data to perform an assessment or the data available is not fit for purpose.

4.3.3. Step 3: Overall area classification

The final step in the Comprehensive Procedure method is to undertake an appraisal of all of the relevant information for each given area. This appraisal should consider all the harmonised assessment criteria, their corresponding assessment levels and supporting environmental factors. These should be considered in relation to the definitions of the different area classifications (problem, potential problem and non-problem; note the definitions at the start of Section 0) and the scoring and integration process that has been undertaken. Contracting Parties are then expected to be able to provide the results for each assessment area as:

1. *"a statement that it does not see a need to assess additional local/regional supporting environmental factors and that the result of the application of steps 1 and 2 for an area, in accordance with the Comprehensive Procedure, is transparent and verifiable and reliable enough for giving a particular eutrophication status to that area"* (OSPAR, 2013c);
2. *"a transparent and verifiable assessment of all relevant information, including additional local/regional factors not addressed in the steps 1 and 2."* (OSPAR, 2013c)

It is also expected that OSPAR will review the results of the assessment and their comments will be taken into consideration by the Contracting Parties when finalising the eutrophication status of their maritime areas.

5. Data

Over a period of around five months, a search was undertaken for data for the harmonised parameters outlined in Table 4.2.

A broad range of data have been identified, downloaded where possible and reviewed for the challenge. The data were sourced through online resources including:

- OSPAR Convention;
- European Environment Agency (EEA);
- International Council for the Exploration of the Sea (ICES);
- European Environment Information and Observation Network (Eionet);
- Hamburg University (obtained from Johannes Pätsch: https://wiki.zmaw.de/ifm/ECOHAM/DATA_RIVER);
- Scottish Environment Protection Agency (SEPA);
- Centre for Environment Fisheries and Aquaculture Science (Cefas);
- Copernicus;
- European Marine Observation and Data Network (EMODnet);
- European Ocean Biogeographic Information System (EurOBIS);
- Norwegian Institute for Air Research (NILU).

Details of the datasets reviewed are provided in Appendix A.

6. Results

This section describes the adequacy of the data obtained to deliver the aim of this challenge: to produce gridded data layers showing seasonal averages of eutrophication for the past ten years and change in eutrophication over the past ten years for the complete North Sea basin.

Data adequacy is screened using six value assessments:

1. **Contribution:** An evaluation of whether the dataset parameters are useful to solving the challenge.
2. **Location:** An evaluation of whether the temporal and spatial locations of the data are relevant to solving the challenge.
3. **Commercial:** An evaluation of whether the commercial terms (e.g. prices, licences) are compatible for solving the challenge.
4. **Attributes:** An evaluation of whether the accuracy, precision and resolution etc. of the data are sufficient to solve the challenge. Note temporal and spatial coverage is dealt with in Location.
5. **Delivery:** A record of whether the data can be obtained in time to solve the challenge.
6. **Usability:** An evaluation of whether the data format and supporting information (i.e. the metadata) are suitable for solving the challenge.

Two scales of data are evaluated:

- Large scale: Data has been sourced for the North Sea basin as a whole in order to evaluate whether such an assessment would be possible given the data available. See Section 6.1.
- Small scale: As OSPAR requires eutrophication assessment to be undertaken at a smaller scale, the data used in the last application of the Comprehensive Procedure has been evaluated. See Section 6.2.

6.1. Large scale: OSPAR harmonised assessment data for the whole North Sea basin scale

Table 6.1 systematically lists all of the harmonised parameters for the Comprehensive Procedure (see Table 4.2) and then summarises some of the main characteristics of the ideal data and provides a summary of the best data found for a North Sea basin-wide assessment. The data evaluation, according to the six value assessments described in Section 6, is discussed.

Table 6.1: Data requirements to carry out OSPAR's harmonised assessment in the "Comprehensive Procedure" for assessing the eutrophication status of maritime waters and a high level summary of the data found for meeting those requirements.

Data category	**Data type**		**Ideal data characteristics / notes** (All data would ideally cover a 10-year extent as a minimum, in order to enable trend analysis. It would also take account of seasonal/geographic variations and provide reference conditions)	**High level summary of data found**
Category I: Degree of nutrient enrichment	Riverine inputs and direct discharges (area-specific)	Riverine inputs and direct discharges of total N and total P	The ideal data would consider annual river flows (wet and dry years) with respect to N and P inputs.	See Challenge 7 on River inputs.
		Transboundary nutrient transport (TBT) sources and effects	The ideal data would quantify nutrient budgets and fluxes across the seas.	TBT are calculated using modelling techniques (e.g. Blauw *et al*. 2006). Whilst these have been published, data could not be found.
		Atmospheric deposition of nitrogen	Measures of oxidised and reduced nitrogen in the marine environment is particularly important especially in coastal regions where river inputs are small.	Comprehensive Atmospheric Monitoring Programme (CAMP) data are the best available but the measurements are only land-based, not marine based. Furthermore, different sampling methods are used for the same parameter depending on location and date/time sampled and data must be downloaded for specific dates for each submission. Data for the whole basin is therefore time-consuming to get hold of, difficult to evaluate and potentially only relevant to coastal areas.
	Nutrient concentrations (area-specific)	Winter nutrient (DIN and/or DIP, and Si) concentrations	The ideal data would: • Sum dissolved inorganic nitrogen compounds i.e. NO_3, NO_2, and NH_4; • Provide ortho-P (PO_4^{3-}) and SiO_4; and, • Take account of salinity gradients.	NO_3, NO_2, and NH_4 point data provided by ICES for the full temporal extent, but not necessarily at the same regular intervals in all locations. PO_4^{3-} and SiO_4 point data are also provided by ICES. Seasonal (10-year moving average) water body nitrate, phosphate and silicate concentrations are also provided as a gridded product by EMODnet but how the geographical interpolation is undertaken is not known and therefore scientifically robust application of the gridded product by third parties is limited.

Data category	Data type		Ideal data characteristics / notes (All data would ideally cover a 10-year extent as a minimum, in order to enable trend analysis. It would also take account of seasonal/geographic variations and provide reference conditions)	High level summary of data found
		Total nitrogen and phosphorus	Although not currently included in the Eutrophication Monitoring Programme, TN and TP are useful assessment parameters because they cover all phases of the element N and P and hence can be used to explain long-term nutrient enrichment, such as that caused by TBT.	TN and TP point data provided by ICES for 2003 - 2014, but not necessarily at the same regular intervals in all locations.
	N/P ratio (area-specific)	Elevated winter N/P, N/Si and P/Si ratios (Redfield N/P = 16)	The ideal data would take account of salinity gradients. In coastal and transitional areas the use of the Redfield N/P ratio may not be appropriate because of naturally elevated N and P due to salinity levels. Ratios of N/Si and P/Si may be considered but Si is less influenced by anthropogenic activities.	TN, TP and SiO_4 point data provided by ICES for full temporal extent, but not necessarily at the same regular intervals in all locations. Therefore, ratios of nutrients should not be calculated.
Category II: Direct effects of nutrient enrichment (during growing season)	Chlorophyll-*a* concentration (area-specific)	Elevated maximum, mean and/or 90 percentile level	The ideal data would: • Account for salinity gradient; • Account for stratification (in general, higher in nutrient enriched coastal waters, at frontal systems, and in (offshore) stratified waters compared to un-stratified offshore waters); • Account for other limiting factors e.g. light availability, phytoplankton species composition and their physiological state (type of growth-limitation), and the grazing pressure; and, • Use 90th percentile values to eliminate outliers and better replicate the approach in the Water Framework Directive.	Chlorophyll-*a* point data provided by ICES for 1992 - 2015 but not necessarily at the same regular intervals in all locations. Copernicus provides remotely sensed chlorophyll-*a* products for different reflectance.
	Phytoplankton indicator species (area-specific)	Elevated levels (and increased duration) of nuisance phytoplankton	The ideal data would identify elevated levels of nuisance species such as: • *Phaeocystis spp.* (colony forming) - > 10^6 cells/l (and >30 days duration) and are associated with foam and oxygen deficiency; and,	*Phaeocystis, Chrysochromulina* (genus), *Chrysochromulina* (species), *Chrysochromulina polylepis, Noctiluca* (genus), *Noctiluca* (species), *Noctiluca scintillans, Gymnodinium* (genus), *Gymnodinium* (species), *Dinophysis* (genus) and *Alexandrium* (genus)

Data category	Data type		Ideal data characteristics / notes (All data would ideally cover a 10-year extent as a minimum, in order to enable trend analysis. It would also take account of seasonal/geographic variations and provide reference conditions)	High level summary of data found
		indicator species	• *Noctiluca scintillans* - > 10^4 cells/l (area coverage > 5 km^2) and is associated with oxygen deficiency.	point sample data are provided by ICES. ICES also provide phytoplankton community abundance data. North Sea Benthos survey data are provided by EurOBIS in kmz format.
		Elevated levels of toxic phytoplankton indicator species	The ideal data would identify elevated levels of toxic phytoplankton (e.g. dinoflagellates) such as: • *Chrysochromulina polylepis* - > 10^6 cells/l and is associated with fish and benthos kills; • *Prorocentrum spp.* - > 10^4 cells/l and are associated with DSP mussel infection; • *Dinophysis spp*. - > 10^2 cells/l and are associated with DSP mussel infection; • *Alexandrium spp.* - > 10^2 cells/l and are associated with PSP mussel infection; and, • *Gymnodinium mikimotoi* - > 10^5 cells/l and is associated with fish kills, PSP mussel infection.	
		Shifts in species composition	A shift from diatoms to flagellates (some of which are toxic) could indicate eutrophication. The composition of phytoplankton should be compared with area-specific reference conditions and could for example be expressed by the ratio of diatoms to flagellates.	See above for overview of the data on species of phytoplankton. Reference conditions for the required composition of species not found at the basin level; community composition is relevant to a more localised geographic scale.
	Macrophytes including macroalgae (area-specific)	Shift from long-lived to short-lived nuisance species (e.g. *Ulva*). Elevated levels (biomass or area covered) especially of opportunistic	The ideal data would: • Enable calculation of species populations / species biomass and/or community structure (e.g. ratio of one species or species type to another); • Consider variation in depth; and, • Consider variation in location e.g. estuaries, shallow waters and embayments.	ICES provide data on *Ulva spp*. and *Zoster marina* for 2012 only. These datasets are also restricted to the Skagerrak.

Data category	Data type		Ideal data characteristics / notes (All data would ideally cover a 10-year extent as a minimum, in order to enable trend analysis. It would also take account of seasonal/geographic variations and provide reference conditions)	High level summary of data found
		green macroalgae)		
Category III: Indirect effects of nutrient enrichment (during growing season)	Oxygen deficiency	Decreased levels (< 2 mg/l: acute toxicity; 2 - 6 mg/l: deficiency) and lowered % oxygen saturation	The ideal data would: • Include both oxygen concentration and % saturation; • Undertaken on sufficient spatial scales i.e. along salinity gradients and depth; • Undertaken on sufficient temporal scales i.e. seasonally; and, • Include related information such as water temperature and salinity.	Dissolved oxygen point data provided by ICES for 1998 - 2015, but not necessarily at the same regular intervals in all locations. % saturation data not found.
	Zoobenthos and fish	Kills (in relation to oxygen deficiency and/or toxic algae)	A "yes-or-no" approach is undertaken for both fish and zoobenthos; therefore the ideal data simply needs information on the occurrence or not of such a phenomenon.	No data found on kills, this can only be supported by information on toxic phytoplankton and oxygen levels.
		Long-term area-specific changes in zoobenthos biomass and species composition	The ideal data would identify detailed species-specific information on community composition across a representative spatial scale.	Zoobenthos species composition data could not be found. OSPAR are yet to provide assessment guidance for this parameter.
	Organic carbon/organic matter (area-specific)	Elevated levels (in relation to III.1) (relevant in sedimentation areas)	Particulate organic carbon data would ideally: • Undertaken on sufficient spatial scales i.e. along salinity gradients and depth; • Undertaken on sufficient temporal scales i.e. seasonally; and, • Include related information such as chlorophyll-*a* levels and light regime.	Organic carbon point data provided by ICES for 1985 - 2014, but not necessarily at the same regular intervals in all locations. EMODnet provides data on the proportion of incoming light that reaches the seabed
Category IV:	Algal toxins	Incidence of DSP/PSP mussel	A "yes-or-no" approach is undertaken for this parameter. The information should be based upon the coherent	*Dinophysis* (genus), which are associated with DSP mussel infection, are provided by ICES as point sample

Data category	Data type		Ideal data characteristics / notes (All data would ideally cover a 10-year extent as a minimum, in order to enable trend analysis. It would also take account of seasonal/geographic variations and provide reference conditions)	High level summary of data found
Other possible effects of nutrient enrichment (during growing season)		infection events (related to II.2)	monitoring of phytoplankton eutrophication indicator species, as described above in Category II: Phytoplankton indicator species.	data. *Gymnodinium mikimotoi,* which is associated with PSP mussel infection, data could not be found. Nuisance and toxic phytoplankton discussed above may also contribute

6.1.1. Contribution

This aspect of the data screening related to whether or not the dataset was able to contribute to the challenge.

For the purpose of this discussion, the data for the parameters are split into two:

- Chemical:
  - All Category I parameters;
  - Chlorophyll-*a* (Category II);
  - Oxygen deficiency and organic carbon/organic matter (Category III).
- Biological:
  - Phytoplankton indicator species (area-specific);
  - Macrophytes including macroalgae (area-specific);
  - Zoobenthos and fish;
  - Algal toxic.

In addition to parameter specific data, OSPAR boundary and region shapefiles have the potential to be a useful contribution to an analysis at a basin wide scale in order to help manipulate other geographically more extensive datasets and for presentational purposes. In addition to this, EMODnet seabed habitats data on light attenuation and ICES salinity data provides information that is useful to defining boundaries between physical and biological zones and may therefore be useful in determining areas of similar physical and habitat conditions for the purpose of the eutrophication assessment. However, these data do not provide information that can be used to directly measure eutrophication and as such do not contain the right parameters support the main aim of this challenge.

Chemical

In order to assess eutrophication nutrient levels and the source of inputs needs to be understood. Therefore, data are required on river inputs and on the nutrient concentrations of the different assessment areas. Details of data for river inputs can be found in HR Wallingford (2016), Challenge 7 of this project. Whilst in principle, river inputs data exists, in reality, many years of data are missing from the datasets available. Furthermore, inconsistencies in the data presented and incomplete or absent metadata reduce confidence in the information provided. All relevant agencies were contacted to obtain better, more complete data, but not all responded. Compiling and harmonising data across different countries is a significant task in terms of the required resource.

Waterbase is the generic name given to the EEA databases that provide data on the status and quality of Europe's rivers, lakes, groundwater bodies and transitional, coastal and marine waters. The Waterbase dataset for transitional, coastal and marine waters should contain data from monitoring and flux stations, plus proxy pressures on the upstream catchment, basin and River Basin District that are associated with transitional and coastal waters. This should include chemical quality data on nutrients in seawater and hazardous substances in biota, sediment and seawater. Data in Waterbase are only sub-samples of national data, assembled for the purpose of providing comparable indicators of pressures, state and impact on waters at a Europe-wide scale. The datasets are not intended for assessing compliance with any European Directive or any other legal instrument. The data have useful attributes and the delivery and commercial viability is suitable. However, the datasets are not properly geo-referenced. This means that it

is difficult to use the data to support this challenge. More information on these difficulties is provided in the rest of this section.

There was a considerable amount of data available through EMODnet on nitrates, phosphates, silicates and ammonium. Whilst on face value, these datasets appeared to be useful to the challenge, on closer inspection it became apparent that they were not. The dates provided are illogical numbers that bear no resemblance to established date formats. Coupled with the lack of explanation of this in the data information and a broken link to the metadata, see Section 6.1.2, this rendered the datasets unsuitable for this challenge.

The Copernicus programme holds a number of datasets that have been reviewed for use in this challenge. There are a number of forecasting and hindcasting models which estimate parameters such as nitrate, phosphate, oxygen, chlorophyll-*a*, phytoplankton biomass, primary production, and light attenuation across the North Sea. There are also hydrodynamic-ecosystem models that can be used to forecast and hindcast biogeochemistry. Forecasts and hindcast models are not suitable for identifying actual past eutrophication, although may be helpful in understanding the complex processes that exist.

The Copernicus programme also holds observational datasets for the North West Shelf that are based upon either sampling and/or satellite data. Such data include chlorophyll-*a* concentrations, salinity and oxygen and therefore would be useful to help inform an assessment of eutrophication alongside the other parameters listed in Table 4.2.

CAMP monitoring is highlighted as an important input to the assessment of eutrophication in the North Sea basin, as atmospheric nutrient deposition may form an important source of nutrients in many areas. However, based upon the data that could be found, it is unclear how the CAMP monitoring data could be used with confidence. The measurements appear to be from terrestrial-based monitoring. As a result of this, the data cannot contribute to this challenge.

Biological

This concerns biological data help to inform the direct, indirect and other effects of nutrient enrichment.

ICES DOME is where Contracting Parties store eutrophication data, therefore these data have the most potential for use in addressing this challenge. The data portal allows the user to search on dataset type (the name of a particular survey for example), parameter (e.g. total nitrogen), species, matrix (e.g. sea water sample before filtration), year and area. Numerous data are stored here, including - but not limited to - total nitrogen and phosphorus; silicate; salinity; organic carbon; dissolved oxygen; chlorophyll-*a*; and, phytoplankton, macrophyte and macroalgae species. There are millions of survey records in total; collating both historic data and modern surveys from the 1800s to the present day. Many of these surveys are useful to informing this challenge for both chemical and biological parameters but they all have limitations which are discussed in sections 6.1.2 to 6.1.6.

No data were found that were considered suitable to address this challenge with respect to fish kills. Similarly, Eurobis research data on North Sea benthos surveys could not be used due to location, attribute and usability adequacy issues that are discussed further in sections 6.1.2 to 6.1.6.

6.1.2. Location

This aspect of the data screening related to whether or not the dataset covers the correct time and spatial extent and resolution.

The data requirement for this challenge is that the full extent of the North Sea Basin is needed, for a ten year period, preferably the last 10 years. In terms of resolution, eutrophication can be highly localised, so the geographic resolution needs to be at least high enough to evaluate all of the different areas identified by the Contracting Parties. With respect to temporal resolution, many parameters are affected by seasonal differences, so seasonal resolution at least would be ideal.

The Waterbase data are not properly georeferenced and the metadata does not contain this information. Based upon the longitude and latitude information for the Eionet stations in the Waterbase TCM dataset, stations for the UK, Denmark and Germany are missing. Flux stations are only available for Belgium and Sweden. Convention stations are available for all Contracting Parties, although it is unclear what the definition of this is. In order to use these data in a time series assessment multiple years would have to be analysed separately. Data are available for the years 2004 to 2015, so the temporal extent of these data is suitable for this challenge.

A key challenge with respect to the locations specified in the ICES data is that the resolution is variable. The latitude and longitude information for survey points is given in decimal degrees that may have any number of decimal places, including zero. This variable accuracy in location is a key restriction for a spatial assessment of eutrophication. Furthermore, many datasets cover a wide temporal extent, but not necessarily at regular intervals and for some datasets, many years are missing. In addition, whilst many years may have been surveyed for the basin as a whole, a particular location may have only one or two survey points, making time series analysis difficult. Also, the data available for the Kattegat area of the Greater North Sea basin is frequently different i.e. data that are available for the Kattegat are not available for the rest of the North Sea and vice versa. These data are the best available and should reflect the data used by Contracting Parties in their assessments. However, the geographic and temporal resolution quality of these data means that they are not suitable for the production of gridded time-series of eutrophication.

ICES data relevant to this challenge include:

- Data that might support Category I parameters:
  - Total N and Total P: A number of different survey datasets are available that measure Total N. The dataset that specifies that it is related to eutrophication effects (Contaminants + nutrients + biological and eutrophication effects in water data) does not include survey data in the Kattegat. However, samples in the Kattegat (plus the rest of the North Sea basin) are available in other data. There is coverage from 2003 to 2014 in the “Contaminants + nutrients + biological and eutrophication effects in water data” survey data.
  - DIP:
    - Phosphate: Similar to Total N and Total P, there are a number of different survey datasets available that measure phosphate and the “Contaminants + nutrients + biological and eutrophication effects in water data” survey data does not include the Kattegat and includes data points from 1992-2015. When other survey types are included, the temporal extent increases to 1929 to 2015 and the geographical extent includes the Kattegat.
  - DIN:
    - Nitrate as N: As per other parameters, there are a number of different survey datasets available

that measure nitrates. The "Contaminants + nutrients + biological and eutrophication effects in water data" survey data does not include the Kattegat and includes data points from 1992-2015. When other survey types are included, the temporal extent increases to 1930 to 2015 and the geographical extent includes the Kattegat.

  - Ammonium: As per other parameters, there are a number of different survey datasets available that measure ammonium. The "Contaminants + nutrients + biological and eutrophication effects in water data" survey data does not include the Kattegat and includes data points from 1992-2015. When other survey types are included, the temporal extent increases to 1930 to 2015 and the geographical extent includes the Kattegat.
  - Nitrite as N: As per other parameters, there are a number of different survey datasets available that measure nitrites. The "Contaminants + nutrients + biological and eutrophication effects in water data" survey data does not include the Kattegat and includes data points from 1992-2015. When other survey types are included, the temporal extent increases to 1930 to 2015 and the geographical extent includes the Kattegat.
  - Nitrate as N plus Nitrite as N: None of the data sets provided under ICES include the Kattegat. Data are provided from 1995 to 2015, but not for all years.
- Silicate: The survey dataset for silicate is the same as for phosphate for the "Contaminants + nutrients + biological and eutrophication effects in water data" survey data. When other surveys are included, the temporal range is 1930-2015 for the whole geographical area, including the Kattegat.
- Salinity: The survey dataset for salinity is the same as for phosphate and silicate for the "Contaminants + nutrients + biological and eutrophication effects in water data" survey data. When other surveys are included, the temporal range is 1891-2015 for the whole geographical area, including the Kattegat.

- Data that might support Category II parameters:
  - Chlorophyll-*a*: As per other parameters, there are a number of different survey datasets available that measure chlorophyll-*a*. The "Contaminants + nutrients + biological and eutrophication effects in water data" survey data does not include the Kattegat and includes data points from 1992-2015. When other survey types are included, the temporal extent increases to 1960 to 2015 and the geographical extent includes the Kattegat.
  - Phytoplankton:
    - *Phaeocystis:* there are three (out of six) species of Phaeocystis that are known to be bloom species, *P. pouchetii, P. antarctica, P. globose* (Schoemanna *et al.* 2005). Data are available through ICES on *P. globosa* (assumed to be the same as *P. globose*) for 1902 – 1912 and restricted to the southern part of the North Sea basin; *P. pouchetii f*or 1913 – 2013 and restricted to the northern part of the North Sea basin; *Phaeocystis* (species) for 1989 – 2014 and restricted to the southern part of the North Sea basin plus the Kattegat; and, Phaeocystales (the Order that the *Phaeosystis* genus belongs to) for 1902 – 2014 for the whole of the basin but the species or genus for each sample is not specified.
    - *Chrysochromulina* (separate genus and species datasets): The species and genus datasets are limited to the Kattegat over the period 1985-2014.
    - *Chrysochromulina polylepis:* The species and genus datasets are limited to the Kattegat over the period 1988-1989.
    - *Noctiluca* (separate genus and species datasets): The species dataset is limited to the Kattegat for 2009 and 2012 and the genus dataset is restricted to the southern part of the North Sea basin

over the period 1902-2014.

  - *Noctiluca scintillans:* The species dataset is limited to the Kattegat and the genus dataset is restricted to the southern part of the North Sea basin over the period 1902-2014.
  - *Gymnodinium* (separate genus and species datasets): The species dataset and the genus dataset do not include The Channel and are over the period 1907-2012.
  - *Alexandrium* (genus) The data are restricted in geographic extent to the Kattegat and the northern part of the North Sea basin. The temporal extent stretches from 1907-2014.
- Macrophytes and macro algae:
  - *Ulva:* data for the genus *Ulva* is only available for the Swedish shore in the Kattegat in 2012. No data are available for specific species or species belonging to a higher taxonomic group, such as in the Family, Ulvaceae.
  - *Zostera marina:* data for *Zostera marina* is only available for the Swedish shore in the Kattegat in 2012.

- Data that might support Category III parameters:
  - Dissolved oxygen: As per other parameters, there are a number of different survey datasets available that measure dissolved oxygen. The "Contaminants + nutrients + biological and eutrophication effects in water data" survey data does not include the Kattegat and includes data points from 1992-2015. When other survey types are included, the temporal extent increases to 1902 to 2015 (but not for all years) and the geographical extent includes the Kattegat.
  - Organic carbon: As per other parameters, there are a number of different survey datasets available that measure organic carbon. The "Contaminants + nutrients + biological and eutrophication effects in water data" survey data only includes data survey points along the coast of Belgium and the Netherlands for the period 1994 to 2014. When other survey types are included, the temporal extent increases to 1985 to 2014 and the geographical extent includes the Kattegat and the rest of the North Sea basin.
- Data that might support Category IV parameters:
  - Diarrhetic Shellfish Poisoning (DSP):
    - *Dinophysis*: The genus, *Dinophysis* contains more than 200 species. Only some species are associated with DSP. At least 12 different species are available on ICES. Under the "Dinophysis (genus)" dataset available on ICES, *D. acuminata, D. actua, D. dens, D. norvegica, D. odiosa, D. rotundata* and *Dinophysis sp.* only identified to genus level are included for the period 1902 to 2014.
  - Paralytic shellfish poisoning (PSP):
    - *Gymnodinium mikimotoi* (former name *Gyrodinium aureolum*): No data on ICES for *Gymnodinium mikimotoi* and samples of *Gyrodinium aureolum* are restricted to the Kattegat between 1989 and 2009 (not all years covered).

EMODnet data on nitrates, phosphates, silicates and ammonium has a geographic extent and resolution that is suitable for the challenge. The data information on the website specifies that the temporal extent and resolution should also be suitable for the challenge (a 10-year running average). However, the date formats within the data appear illogical, they are strings of four or five numbers and, bear no resemblance to established date formats. An explanation of the date format is not apparent in the data information note on the website and the metadata link returns a blank page. As a result, the data is not readily useable.

EurOBIS research data on North Sea benthos surveys covers the correct geographical extent, but the temporal resolution is also unclear due to the lack of metadata.

The Copernicus programme observational datasets for the North West Shelf (for chlorophyll-*a* concentrations, salinity and oxygen) appear to have a very high geographic resolution. European data centres regularly gather and feed in the latest monitoring information from fixed point and mobile sampling platforms as well as from satellite observations. Whilst it is anticipated that the Copernicus data does indeed represent an aggregation of the best data available, the geographic resolution of these observational sampled data does not match the sampled data that has been found from other sources during the research in this challenge. This suggests that even where the data is 'observational' that post-processing of the data (modelling or interpolation) may have been carried out. The specific methods used and accuracy of these isn't fully understood; the metadata doesn't include this information in plain English. This introduces an element of uncertainty over the suitability of this sampled data for this challenge. Additionally, the temporal resolution does not cover a full 10 years, except for where previous data records have been re-processed.

6.1.3. Commercial

This aspect of the data screening related to whether or not the commercial terms e.g. licence terms and cost, or the data itself were acceptable for the challenge.

There were no significant commercial issues with the data that were found. All datasets were either available to be downloaded directly, for free with open licenses or they were available on request, in reasonable timeframes also for free and with open licences.

The most significant issue is actually that the quality of data that can be obtained for the North Sea Basin as a whole is either not particularly good, or it is extremely detailed and variable which, would require significant resources to process. The resource requirement for a basin-wide assessment is therefore very large.

6.1.4. Attributes

This aspect of the data screening related to whether or not the accuracy, precision and resolution of the data were acceptable for the challenge, accepting that geographical and temporal extent and resolution are dealt with separately.

The Waterbase and ICES chemical data have acceptable attributes for information on nutrients. However, the phytoplankton, macrophyte and macro algae data from ICES are more difficult to interpret. There are datasets available for specific species, genus, orders, families and classes. It is not clear whether the genus datasets contain all of the information for the different species datasets, or whether they are simply separate surveys. The taxonomic level used is important as, for example, in the genus *Phaeocystis*, only three of the six species are known to bloom. The risk is that a count at the genus level may therefore over-estimate the direct effect of nutrient enrichment.

The most challenging parameter to source data on, on a basin wide scale, was fish kills. During the search for data on fish kills, the following datasets were found. Whilst providing interesting contextual information, they are not able to contribute to this challenge directly, because fish kills information is absent:

- CEFAS fish spawning and nursey grounds: Whilst this shapefile data provides interesting information on populations of 14 commercially important species, the data cannot contribute to the challenge because of the absence of information on fish kills.

- EMODnet:
  - Detailed habitat distribution map for the Atlantic and the Baltic. This data does not contain information on fish kills.
  - MESH Atlantic project outputs: Broad and biozone maps. Does not include information on fish kills.
  - EUNIS habitat map layers: Broad to fine scale habitat maps that do not include information on fish kills.
  - OSPAR habitats: habitat polygon data for the northeast Atlantic submitted by OSPAR contracting parties that do not contain information on fish kills.

EurOBIS research data on North Sea benthos surveys contains species counts of multiple different species. Unfortunately, the recording effort is difficult to determine, therefore utility of the data is limited because the actual populations of each species cannot be estimated.

CAMP data provides no atmospheric measurements taken over the sea. All samples appear to be from terrestrial monitoring systems. Furthermore, different methods of measurement are used for the same parameter depending on location and time sampled. For example, the instrument types differ depending on location for nitrogen dioxide and similarly, the “matrix” (the medium to which the measurement values refer) are also different. Additional information on instrument types is found in the numerous data reports for the individual datasets, rather than being aggregated and held centrally. Therefore it is unclear, to any expert without specialist knowledge of atmospheric chemistry, whether these results should be used in conjunction with one another as part of the same analysis, or whether aggregating such data would be inappropriate.

The Copernicus programme data fall into two main categories that are of interest: 1) modelled hindcast/forecast data; and, 2) observational data. The challenge aims to provide information on the *actual* instance of eutrophication over the last 10 years. Modelled data would be better considered to be an estimate of the conditions under which it may be inferred that eutrophication might have been possible and as such is inappropriate for use in this challenge. The observational data is apparently more suitable for use in this challenge, although there are issues with this data also, discussed in Section 6.1.2.

6.1.5. Delivery

This aspect of the data screening related to whether or not the data could be delivered in time for its use in the challenge.

All data found were either available for immediate download or, requests for the data had to be made using an online form. In all cases, data could be obtained readily and this was not a restriction to the challenge. As mentioned in Section 6.1.3, the data quality is sometimes poor. It may be possible to obtain better data directly from the respective Government agencies of the Contracting Parties. Delivery of data direct from such agencies has been found to take considerable time (as was the case for Challenge 7 on River Inputs) and would be a restriction on undertaking the Challenge.

6.1.6. Usability

This aspect of the data screening related to whether or not the data format and associated supporting information is suitable to support the challenge.

Most data are provided in a format that is readily usable, requiring mapping software and little expertise in data manipulation. The exception to this is data from EurOBIS. EurOBIS research data on North Sea

benthos surveys are supplied in kmz format with multiple survey results. This format is more challenging to use because it needs to first be converted into a file format suitable for carrying out the analysis of eutrophication. This isn't a significant barrier to use to assess eutrophication, but there are other file formats that would be quicker to use, such as SHP.

The lack of or poor quality of metadata and the breadth of expertise necessary to understand eutrophication processes means that the analysis and interpretation of the data available is very difficult for a single individual to perform. For example, Waterbase metadata is not descriptive enough to support analysis and whilst the ICES data policy describes the existence of metadata, this has not been found. The ICES data are relatively well laid out but the lack of metadata still makes interpreting the data challenging in some respects. For instance, there is no obvious explanation for the separation of the survey datasets, or information on whether one survey dataset contains samples from another. Another example is the EMODnet datasets on chemistry. The link to the metadata contained within the data information tab in the web portal returns a blank page. The date formats in this data are not in an immediately usable form and since the metadata cannot be viewed it has not been possible to use this data in this challenge.

6.2. Small scale: second application of the Comprehensive Procedure

In 2009, OSPAR published a summary of the second Comprehensive Procedure to be undertaken by Contracting Parties (OSPAR, 2009b). This covered the whole of the OSPAR region, not just the Greater North Sea however; the summary provided here only considers the results for Region II: the Greater North Sea.

The summary was based upon the second application of the Comprehensive Procedure by Contracting Parties which covers the years 2001-2005. Contracting Parties discuss the availability and quality of data available to them in order to undertake their assessments. The information contained within the summary document (OSPAR, 2009b) and the relevant Contracting Parties' assessment reports has been appraised and provided in Table 6.2 and Table 6.3.

Some Contracting Parties provide much more detail on the quality of their data than others. Therefore, the absence of detail on data quality does not necessarily mean that the data available to a party is perfect. It has also been necessary to interpret the information in the reports in the context of the different terminology for data quality assessment used by this project.

Table 6.2 and Table 6.3 show that the most common data adequacy issue(s) facing Contracting Parties are location based i.e. data are either not geographically or temporally representative for the purpose of the assessment of eutrophication. In some cases, for example for Norway, national datasets were heavily supported by local assessments. This means that for some areas, the availability of data is very good, but for others it is poor or even absent. This lack of uniformity in temporal or geographical scales and extents of survey information appears to be common across all Contracting Parties for at least some of the parameters considered.

In a few cases, attribute, delivery or usability adequacy issues were inferred in the reports evaluated. These are described in more detail in Table 6.2 and Table 6.3 and in the rest of the text in this section. It was not possible to identify any specific contribution or commercial adequacy issues.

The best available data for the agreed harmonised assessment parameters are for Category I data i.e. RID, winter DIN and DIP concentrations and N/P ratios. Data quality decreases, through Category II, III and IV in order, from the datasets that appear to be most comprehensive, to the least.

Category I assessment parameters

All Contracting Parties used RID in their assessments and three, Germany, Norway and the UK, highlighted location adequacy issues because some isolated areas have poor or no data.

France consider that winter DIN and DIP or N/P ratios cannot be used at this time to aid the assessment of eutrophication due to the complexity of the relationships between nutrients and eutrophication. This has been considered to be a data attribute issue. All other Contracting Parties have used these parameters in their assessments. Germany, Norway and the UK highlighted location adequacy issues as per the RID inputs information.

Category II assessment parameters

With respect to the Category II harmonised assessment parameters, chlorophyll-*a* was applied by all Contracting Parties. Only Denmark and Germany raised some data location adequacy issues.

The phytoplankton parameter was also used by all Contracting Parties, but five of them, Belgium, Denmark, Germany, Norway and the UK, reported some location adequacy issues.

Belgium does not consider that macrophytes are an applicable parameter for their waters. The Netherlands also did not use this parameter in their assessment, citing non-relevance to some waters and location adequacy issues. France similarly chose not to use this parameter. Other Contracting Parties used this parameter but Denmark, Germany and the UK reported some location adequacy issues.

Category III assessment parameters

Category III harmonised assessment parameters are oxygen deficiency, kills in fish and zoobenthos, long-term changes in zoobenthos biomass and species composition and organic carbon. Oxygen deficiency was included as an assessment parameter by all Contracting Parties, but Denmark, Germany, the Netherlands and Norway reported some location adequacy issues.

Zoobenthos and fish kills were used by every Contracting Party except for France. It is unclear if this was because no data were available or because there had been no zoobenthos or fish kills. Belgium, Germany, the Netherlands and Norway reported location adequacy issues.

France and the Netherlands did not use zoobenthos biomass and species composition in their assessments. France cites location adequacy issues as the reason for the non-inclusion. The Netherlands cites time and capacity constraints which may be interpreted as delivery or usability adequacy issues. All other Contracting Parties included this parameter in their assessments. Belgium, Denmark, Germany, Norway and the UK reported location adequacy issues. The information provided by the UK also suggested that attribute issues may also be a concern.

Only Germany, the Netherlands, Norway and Sweden used organic carbon as an assessment parameter and all four Contracting Parties reported location adequacy issues. Belgium cited location and attribute adequacy as the reason for not including the data for this parameter in their assessment. France also had location adequacy issues that have since been rectified by the development of a new monitoring programme. Denmark specified that no data were available and the UK did not deem this parameter relevant to UK waters.

Category IV assessment parameter

Sweden has used algal toxins as an assessment parameter and reported no data adequacy issues.

Belgium, Denmark, the Netherlands and the UK have not included algal toxins in their assessments. Belgium report location adequacy issues, a new monitoring programme seeks to measure this parameter, but data were not available for the second assessment. Denmark stated that whilst data were thought to be available, it wasn't possible to obtain these in time for the assessment, thus there are delivery adequacy issues with this data. The Netherlands reported that algal toxins are not routinely monitored, therefore location adequacy issues are assumed. The UK reports that sufficient data are available but data have still not been used in many of the area assessments. Norway do have monitoring data for toxic algae, however, these data tend to be associated with the presence of aquaculture and as such are not suitable for a larger geographic scale overall classification. Therefore, there are attribute and location adequacy issues associated with this data.

Table 6.2: Summary of data availability and quality for the second application of the Comprehensive Procedure for the Greater North Sea (2001-2005) for Belgium, Denmark, France and Germany. Agreed harmonised parameters are shaded and additional voluntary parameters (*) are not.

Assessment parameters	Belgium		Denmark		France		Germany	
Category I: Degree of nutrient enrichment								
Riverine inputs and direct discharges	Y	Used as assessment parameters; are consistently monitored during the assessment period 2001-2005. No data adequacy issues reported.	Y	Used as assessment parameters. No data adequacy issues reported.	Y	Used as assessment parameters. No data adequacy issues reported.	Y	**Location adequacy issues** in some areas. Data are sufficient in estuaries, moderate in coastal waters and insufficient in Offshore and Central North Sea areas.
Winter DIN and/or DIP	Y	Used as an assessment parameter; are consistently monitored during the assessment period 2001-2005. No data adequacy issues reported.	Y	Used as an assessment parameter. No data adequacy issues reported.	N	France considered that the relationship between nutrient concentration and eutrophication is too complex to define a criterion based on nutrient concentrations or nutrient ratios. The **attributes of this data** are therefore unsuitable for the assessment in French waters.	Y	**Location adequacy issues** in some areas. Whilst data are available for all areas, the highest density of data are highest in the coastal waters and the Wadden Sea. Data are sufficient in estuaries and the Wadden Sea, moderate in coastal waters and the Central North Sea and insufficient in Offshore areas.
N/P ratio: Elevated winter N/P ratio (Redfield N/P = 16)	Y	Used as an assessment parameter; are consistently monitored during the assessment period 2001-2005	N	There are no particular data issues for this parameter, the N/P ratio could have been used in all areas where TN and TP have been used. However, this was not used in the assessment.	N	France considered that the relationship between nutrient concentration and eutrophication is too complex to define a criterion based on nutrient concentrations or nutrient ratios. The **attributes of this data** are therefore unsuitable for the assessment in French waters.	Y	Minor **location adequacy issues** in some areas. TN/TP ratios and DIN/DIP ratios calculated. Data are moderate in most areas.
*Elevated inputs and/or increased trends of total N and total P (compared with	N	Total nitrogen and phosphorus are routinely monitored in Belgian waters but are not at	Y	Used as an assessment parameter. No data	N	A voluntary parameter that was not used in the assessment.	Y	**Location adequacy issues** in some areas. Data are sufficient in estuaries, moderate in

Assessment parameters	Belgium		Denmark		France		Germany	
previous years)		present considered as eutrophication assessment parameters. The further monitoring of these parameters should support further threshold setting for nutrients and examination of relationships between nutrients and phytoplankton biomass.		adequacy issues reported.				coastal waters and insufficient in Offshore and Central North Sea areas. Data are very sparse in open waters.
*Transboundary nutrient transport	Y	Extensive measurement of transboundary nutrient fluxes is not feasible with present instrumentation and resources. Estimate of TNT is made using information on tidal activity, salinity and mixing information plus an evaluation of the spatial variability of the concentrations of nutrients measured in the monitoring network.	Y	Used as an assessment parameter. No data adequacy issues reported.	N	A voluntary parameter that was not used in the assessment.	Y	Measured as a voluntary parameter using nutrient budget calculations
*Atmospheric nitrogen deposition	N	A voluntary parameter that was not used in the assessment.	N	A voluntary parameter that was not used in the assessment.	N	A voluntary parameter that was not used in the assessment.	Y	Measured as a voluntary parameter. No data adequacy issues reported.
*Silicate (and Si ratios)	N	Monitored but not used in the assessment it is not a significant causative factor for eutrophication in this region.	N	A voluntary parameter that was not used in the assessment.	N	A voluntary parameter that was not used in the assessment.	Y	**Location adequacy issues** in some areas. Data are very sparse in open waters.
Category II: Direct effects of nutrient enrichment (during growing season)								
Chlorophyll-*a* concentration: Elevated	Y	Used as an assessment parameter; are consistently	Y	Used as an assessment	Y	Used as an assessment parameter. No data adequacy	Y	**Location adequacy issues** in some areas. Very little

Assessment parameters	Belgium		Denmark		France		Germany	
maximum, mean and/or 90 percentile level		monitored during the assessment period 2001-2005. No data adequacy issues reported.		parameter. Some location specific **location adequacy issues**.		issues reported.		sampling available in estuaries, open coastal waters and offshore areas. Data was obtained mainly from Dutch and Danish measurements. Remotely sensed information, particularly for the Coastal, Offshore and Central North Sea areas is sufficient.
Phytoplankton indicator species: Elevated levels of nuisance/toxic phytoplankton indicator species (and increased duration of blooms)	Y	Not routinely monitored therefore a lack of data (i.e. not the correct **'location' adequacy**) for quantitative assessment. Consideration of their presence is made in a qualitative manner for the coastal assessment.	Y	Used as an assessment parameter. **Location adequacy issues** are assumed as data were only use "where available".	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	**Location adequacy issues** in some areas. Frequency of sampling is variable depending on location. As a result, data are insufficient in most areas. It is moderate in the Wadden Sea.
Macrophytes including macroalgae: Shift from long-lived to short-lived nuisance species (e.g. Ulva). Elevated levels (biomass or area covered) especially of opportunistic green macroalgae)	N	Not relevant to Belgian waters and therefore not assessed.	Y	Used as an assessment parameter. Some location specific **location adequacy issues**.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	**Location adequacy issues** in some areas. Collated from multiple reports, publications, local analyses and airplane surveillance. Sampling performed during the growing season. Data are moderate in the Wadden Sea and insufficient in Estuaries.
Category III: Indirect effects of nutrient enrichment (during growing season)								
Oxygen deficiency: Decreased levels (< 2 mg/l: acute toxicity; 2 - 6 mg/l: deficiency) and lowered % oxygen saturation	Y	Used as an assessment parameter; are consistently monitored during the assessment period 2001-2005 although are not considered very relevant to Belgian	Y	Used as an assessment parameter. Some location specific **location adequacy issues**.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	**Location adequacy issues** and issues with data attributes. Oxygen is sampled at the surface, not at the bottom as requested by the Comprehensive Procedure. The data that are available are

Assessment parameters	Belgium		Denmark		France		Germany	
		waters.						not representative in either time or space. Data are sufficient in estuaries and insufficient in coastal, offshore and central north sea areas.
Zoobenthos and fish: Kills (in relation to oxygen deficiency and/or toxic algae)	Y	Consideration of their presence is made in a qualitative manner for the coastal assessment. **Location adequacy issues** assumed due to the information reported for long-term zoobenthos and fish changes.	Y	Discrepancy between the DK report and the OSPAR summary report. Used as assessment parameter. No data adequacy issues reported.	N	There are no events of kills in fish on the French coast since 1982. It is unclear whether this is a data issue concerning **location adequacy issues**, or whether this parameter simply hasn't happened in French waters.	Y	**Location adequacy issues** in some areas. Biomass, abundance and species composition is considered, but the majority of data are insufficient.
Zoobenthos and fish: Long-term area-specific changes in zoobenthos biomass and species composition	Y	Not routinely monitored therefore a lack of data for quantitative assessment with the require **location adequacy**. High sampling density over long-term period is required. In the future, additional monitoring for other EU policies (WFD) will increase data availability.	Y	Used as assessment parameter. **Location adequacy issues** as fauna are not monitored in all areas.	N	**Location adequacy issues**. The national benthic monitoring programme started in 2003. For the time being, no data series on changes in zoobenthos are available for the assessment period 2001-2005.	Y	**Location adequacy issues** in some areas. Macrozoobenthos monitored in some locations; biomass, abundance and species composition considered. Data supplemented with scientific literature for the assessment. Data are moderate in coastal waters but are insufficient everywhere else.
Organic carbon/organic matter: Elevated levels (in relation to III.1) (relevant in sedimentation areas)	N	Available data were not fit for purpose for an overall assessment due to issues with **location and attribute adequacy issues**; the parameter is less relevant to larger spatial extent on the sandbanks with strong hydrodynamics.	N	No data are available but specific data adequacy issues are not reported.	N	The national monitoring programme started in 2003. For the time being, no data series on organic carbon are available for the assessment period 2001-2005 (i.e. **location adequacy issues**).	Y	**Location adequacy issues** in some areas. Dissolved Organic Carbon and Particulate Organic Carbon measured in Wadden Sea and estuaries. There are a few data points for offshore and coastal waters and none for the central north sea. Data for the Wadden sea is missing in 2005.

Assessment parameters	Belgium		Denmark		France		Germany	
								Data are sufficient in estuaries and insufficient everywhere else.
*Secchi depth	N	A voluntary parameter that is not measured	N	A voluntary parameter that was not used in the assessment.	N	A voluntary parameter that was not used in the assessment.	Y	**Location adequacy issues** in some areas. Seasonal sampling distribution homogenous. Sampling only in a few locations and as a result, data are insufficient in most locations.
Category IV: Other possible effects of nutrient enrichment (during growing season)								
Algal toxins: Incidence of DSP/PSP mussel infection events (related to II.2)	N	**Location adequacy issues**. Monitoring began in 2006 following the development of mussel aquaculture in the Belgian marine waters. Therefore, data are not available for the assessment period 2001-2005.	N	Whilst some data were thought to be available, it wasn't possible to obtain these in time for the assessment. Therefore the **delivery** of this data was the primary challenge for this aspect of the assessment.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Specifies that algal toxins have been estimated but data quality isn't reported in detail. No data adequacy issues reported.

Source: Table adapted from OSPAR, 2009b with contributions from Andersen and Kaas (2008), OSPAR (2007, 2008a and 2008b)

** A voluntary assessment parameter.*

'Y' parameter is included in the assessment. A description of any data adequacy issue is described.

'N' parameter is not included in the assessment. A description of any data adequacy issue is described.

Table 6.3: Summary of data availability and quality for the second application of the Comprehensive Procedure for the Greater North Sea (2001-2005) for the Netherlands, Norway, Sweden and the UK. Agreed harmonised parameters are shaded and additional voluntary parameters (*) are not.

Assessment parameters	Netherlands		Norway		Sweden		UK	
Category I: Degree of nutrient enrichment								
Riverine inputs and direct discharges	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Some isolated **location adequacy issues**, almost all areas have sufficient data	Y	Used as assessment parameters. No data adequacy issues reported.	Y	**Location adequacy issues** as there is no information for 18 of 33 estuaries.
Winter DIN and/or DIP	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	**Location adequacy issues** for many areas, particularly in the Skagerrak coastal assessment	Y	Used as an assessment parameter. In offshore Kattegat and Skagerrak, the median and mean DIN:DIP ratios very seldom exceed the assessment level.	Y	**Location adequacy issues** as there is no information for 18 of 33 estuaries.
N/P ratio: Elevated winter N/P ratio (Redfield N/P = 16)	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	**Location adequacy issues** for many areas, particularly in the Skagerrak coastal assessment	Y	Winter N/P ratios have been assessed for offshore areas only. Elevated nitrogen levels inshore make the use of standard Redfield ratios inappropriate.	Y	**Location adequacy issues** as there is no information for 18 of 33 estuaries.
*Elevated inputs and/or increased trends of total N and total P (compared with previous years)	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Some isolated **location issues**, almost all areas have sufficient data	Y	Used as an assessment parameter. No data adequacy issues reported.	N	**Location adequacy issues** as there is no information for 18 of 33 estuaries.
*Transboundary nutrient transport	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Only considered important for the Norwegian West coast as it is situated downstream areas with eutrophication problems and is therefore a recipient of water and	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Discrepancy between the UK report and the OSPAR summary report. Transboundary nutrient transport not discussed in UK report.

Assessment parameters	Netherlands		Norway		Sweden		UK	
				properties associated with these areas.				
*Atmospheric nitrogen deposition	Y	Estimated input from the EMEP Programme. No data adequacy issues reported.	Y	Not considered. No data adequacy issues reported.	Y	Used as an assessment parameter. No data adequacy issues reported.	N	A voluntary parameter that was not used in the assessment.
*Silicate (and Si ratios)	N	Data are available but are not used in the assessment. No data adequacy issues reported.	N	Not considered. No data adequacy issues reported.	Y	Used as an assessment parameter. No data adequacy issues reported.	N	A voluntary parameter that was not used in the assessment.
Category II: Direct effects of nutrient enrichment (during growing season)								
Chlorophyll-*a* concentration: Elevated maximum, mean and/or 90 percentile level	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Data for many areas relies on local scientific studies. Therefore, for the country as a whole, there are location adequacy issues because not all sites are covered.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Used as an assessment parameter. No data adequacy issues reported.
Phytoplankton indicator species: Elevated levels of nuisance/toxic phytoplankton indicator species (and increased duration of blooms)	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Data for many areas relies on local scientific studies. Therefore, for the country as a whole, there are **location adequacy issues** because not all sites are covered.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Some location specific **location adequacy issues**. Data insufficient for some locations and sufficient for others. A phytoplankton index has been used.
Macrophytes including macroalgae: Shift from long-lived to short-lived nuisance species (e.g. Ulva). Elevated levels	N	Some **location adequacy issues**. Sufficient monitoring in the Wadden Sea but for estuarine and other marine waters but this is not relevant.	Y	Data for many areas relies on local scientific studies. Therefore, for the country as a whole,	N	**Location adequacy issues**. Macrophytes are presently monitored at only one location along the Swedish west coast and the results might not be	Y	Some location specific **location adequacy issues**. Data insufficient for some locations and sufficient for others.

Assessment parameters	Netherlands		Norway		Sweden		UK	
(biomass or area covered) especially of opportunistic green macroalgae)				there are **location adequacy issues** because not all sites are covered.		extrapolated to a large coastal area. Data time series are also too short for the assessment		
Category III: Indirect effects of nutrient enrichment (during growing season)								
Oxygen deficiency: Decreased levels (< 2 mg/l: acute toxicity; 2 - 6 mg/l: deficiency) and lowered % oxygen saturation	Y	**Location adequacy issues**. Sufficient monitoring only in offshore areas	Y	Data for many areas relies on local scientific studies. Therefore, for the country as a whole, there are **location adequacy issues** because not all sites are covered.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Used as an assessment parameter. No data adequacy issues reported.
Zoobenthos and fish: Kills (in relation to oxygen deficiency and/or toxic algae)	Y	**Location adequacy issues**. Not monitored routinely and therefore only included in the assessment where incidental monitoring has occurred.	Y	Data for many areas relies on local scientific studies. Therefore, for the country as a whole, there are **location adequacy issues** because not all sites are covered.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Used as an assessment parameter. No data adequacy issues reported.
Zoobenthos and fish: Long-term area-specific changes in zoobenthos biomass and species composition	N	Parameter of long-term changes in zoobenthos has not been used due to **time and capacity constraints (possibly delivery or usability adequacy issues)** for undertaking the assessment.	Y	Data for many areas relies on local scientific studies. Therefore, for the country as a whole, there are **location adequacy issues** because not all sites are covered.	Y	Used as an assessment parameter. No data adequacy issues reported.	Y	Used as an assessment parameter. However, **attribute and location adequacy** may exist because data was taken from another assessment (not for eutrophication). Data and methods are being developed for the WFD, so data should be expected to improve over time.
Organic carbon/organic	Y	**Location adequacy issues**.	Y	Data for many areas	Y	Data insufficient, **location**	N	Not relevant Organic carbon

Assessment parameters	Netherlands		Norway		Sweden		UK	
matter: Elevated levels (in relation to III.1) (relevant in sedimentation areas)		Sufficient monitoring in sedimentation areas.		relies on local scientific studies. Therefore, for the country as a whole, there are **location adequacy issues** because not all sites are covered.		**adequacy issues**, no new information compared to the OSPAR assessment 2002		has not been measured because this is considered to be only relevant in sedimentation areas and there are no such areas in the waters assessed by the UK.
*Secchi depth	N	A voluntary parameter that was not used in the assessment.	Y	Considered as part of the Norwegian classification criteria alongside nutrients, chlorophyll-*a* and oxygen for surface waters in summer and winter.	Y	Used in the Swedish monitoring system	N	A voluntary parameter that was not used in the assessment.
Category IV: Other possible effects of nutrient enrichment (during growing season)								
Algal toxins: Incidence of DSP/PSP mussel infection events (related to II.2)	N	Discrepancy between the NL report and the OSPAR summary report. Not routinely monitored and therefore not included in the assessment (**location adequacy issues**).	Y	Monitoring of toxic algae and mussel toxins occurs at fairly regular intervals around the coast of Norway. However, these data tend to be associated with the presence of aquaculture and as such are not suitable for a larger geographic scale overall classification. Therefore, there are **attribute and location adequacy**	Y	Used as an assessment parameter. No data adequacy issues reported.	N	Discrepancy between the UK report and the OSPAR summary report. Sufficient data available. Algal toxins have been measured but measurements have not been used in the assessment. No data adequacy issues reported.

Assessment parameters	Netherlands	Norway	Sweden	UK
		issues associated with this data		

Source: Table adapted from OSPAR, 2009b with contributions from OSPAR, 2008c, Molvær et al. 2007a and 2007b, SMHI, 2007 and Anon, 2007.

** A voluntary assessment parameter.*

'Y' parameter is included in the assessment. A description of any data adequacy issue is described.

'N' parameter is not included in the assessment. A description of any data adequacy issue is described.

6.3. OSPAR's overall eutrophication status assessment

The information reported by Contracting Parties is used by OSPAR to produce an overall assessment of the eutrophication status of all part of the OSPAR maritime area. An example of the final results produced by OSPAR for the first and second application of the Comprehensive Procedure is shown in Figure 6.1, Figure 6.2, Figure 6.3 and Figure 6.4.

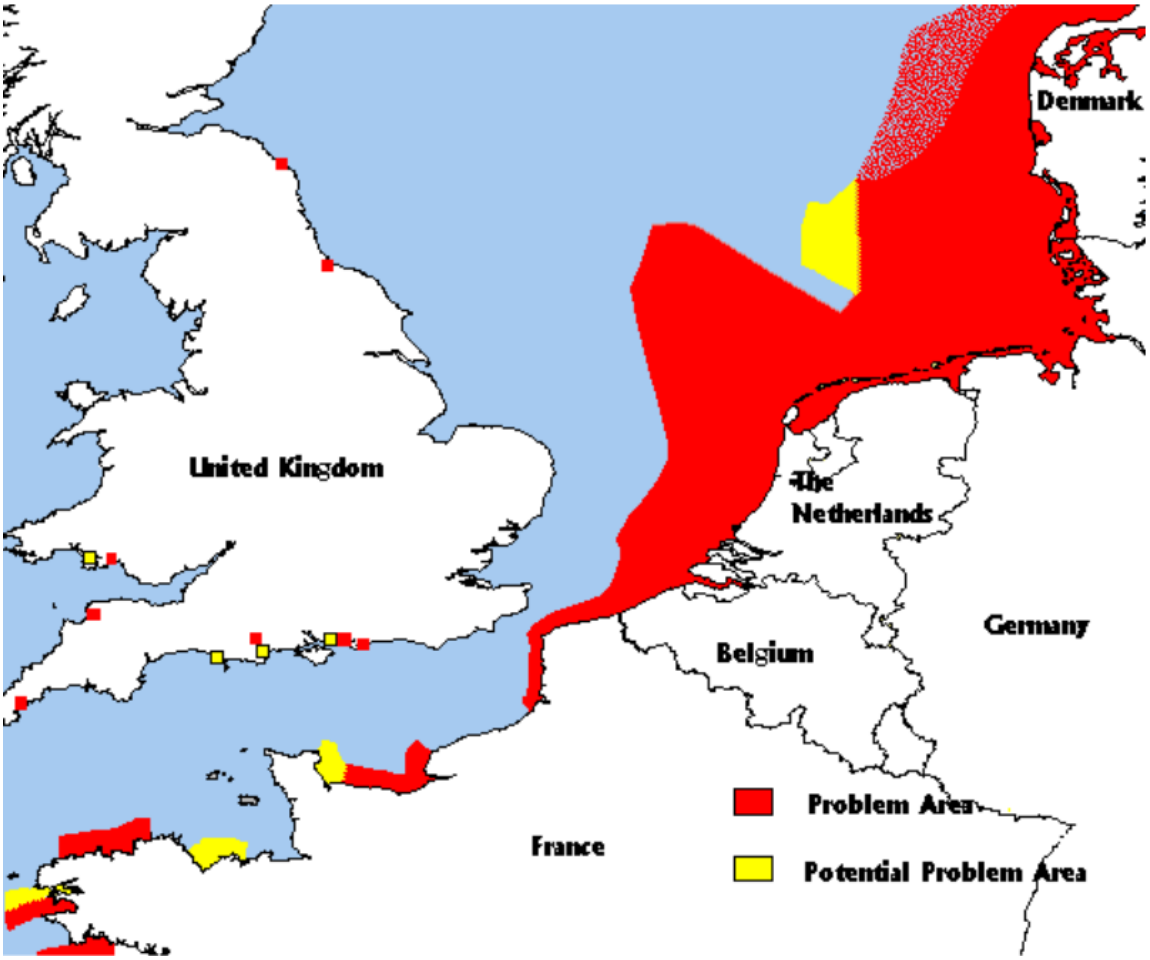

Figure 6.1: Eutrophication status of the OSPAR maritime area in 2003 following the first application of the Comprehensive Procedure by Contracting Parties.

Source: OSPAR, 2003

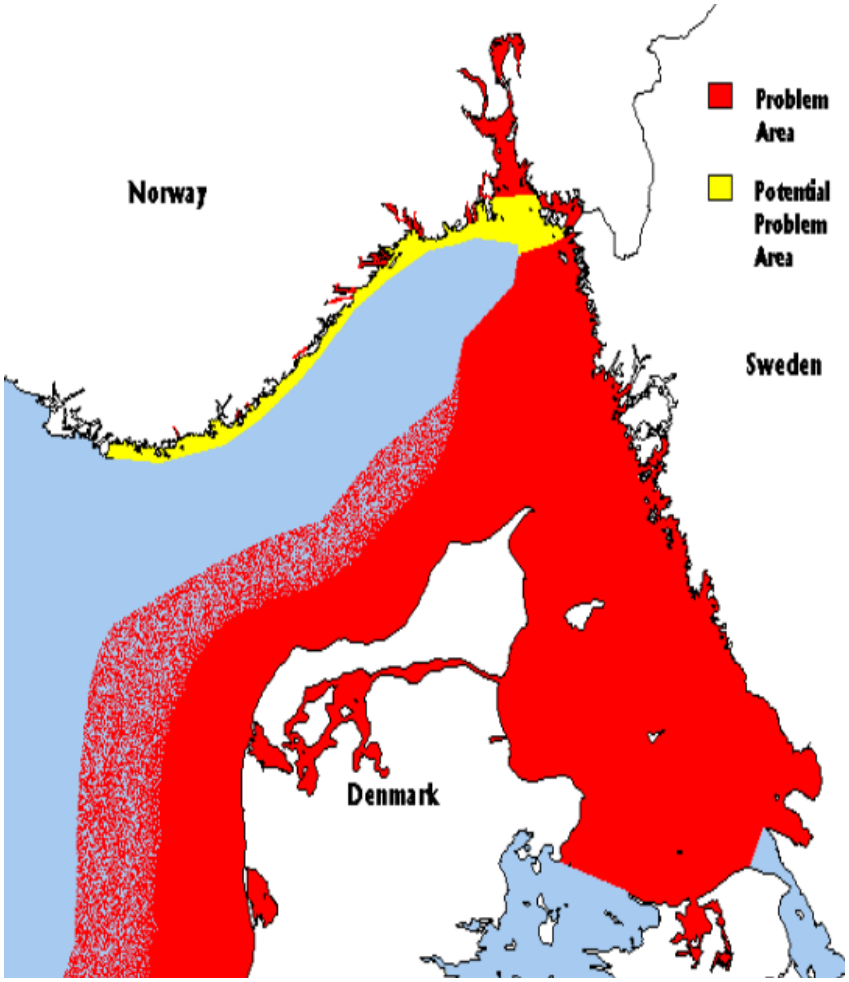

Figure 6.2: Eutrophication status of the OSPAR maritime area in 2003 following the first application of the Comprehensive Procedure by Contracting Parties: Kattegat.

Source: OSPAR, 2003

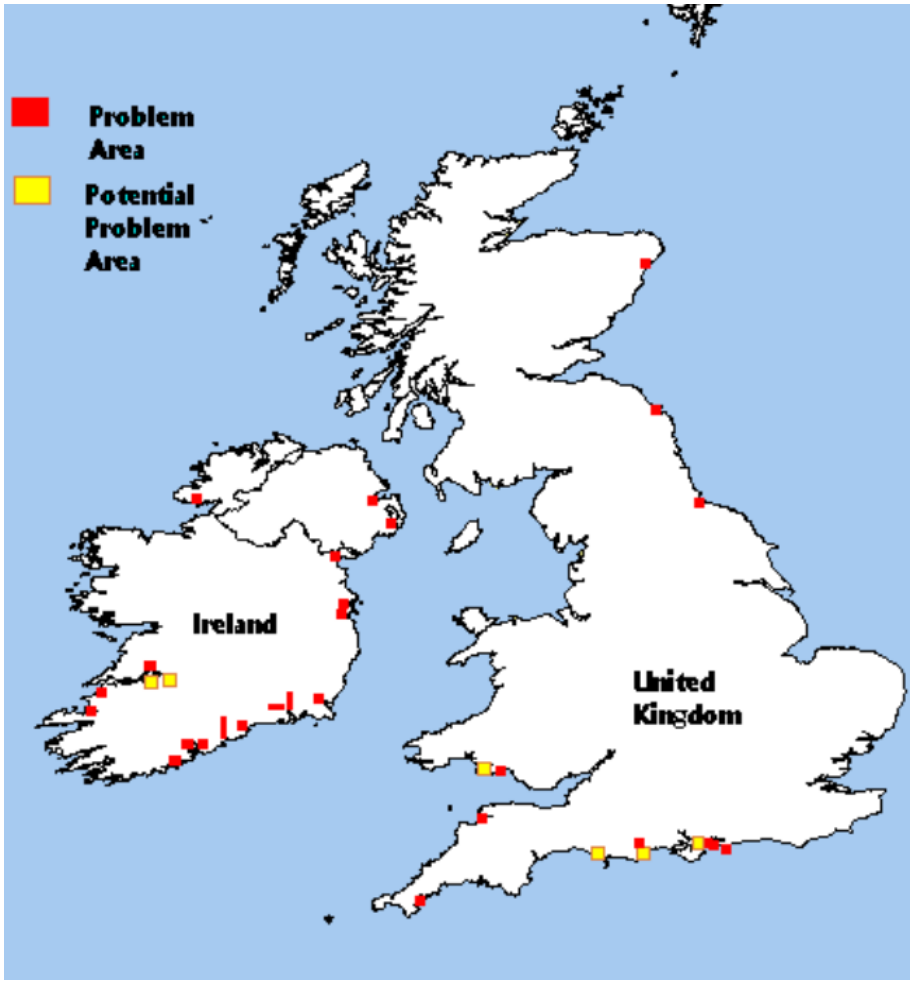

Figure 6.3: Eutrophication status of the OSPAR maritime area in 2003 following the first application of the Comprehensive Procedure by Contracting Parties: UK only.

Source: OSPAR, 2003

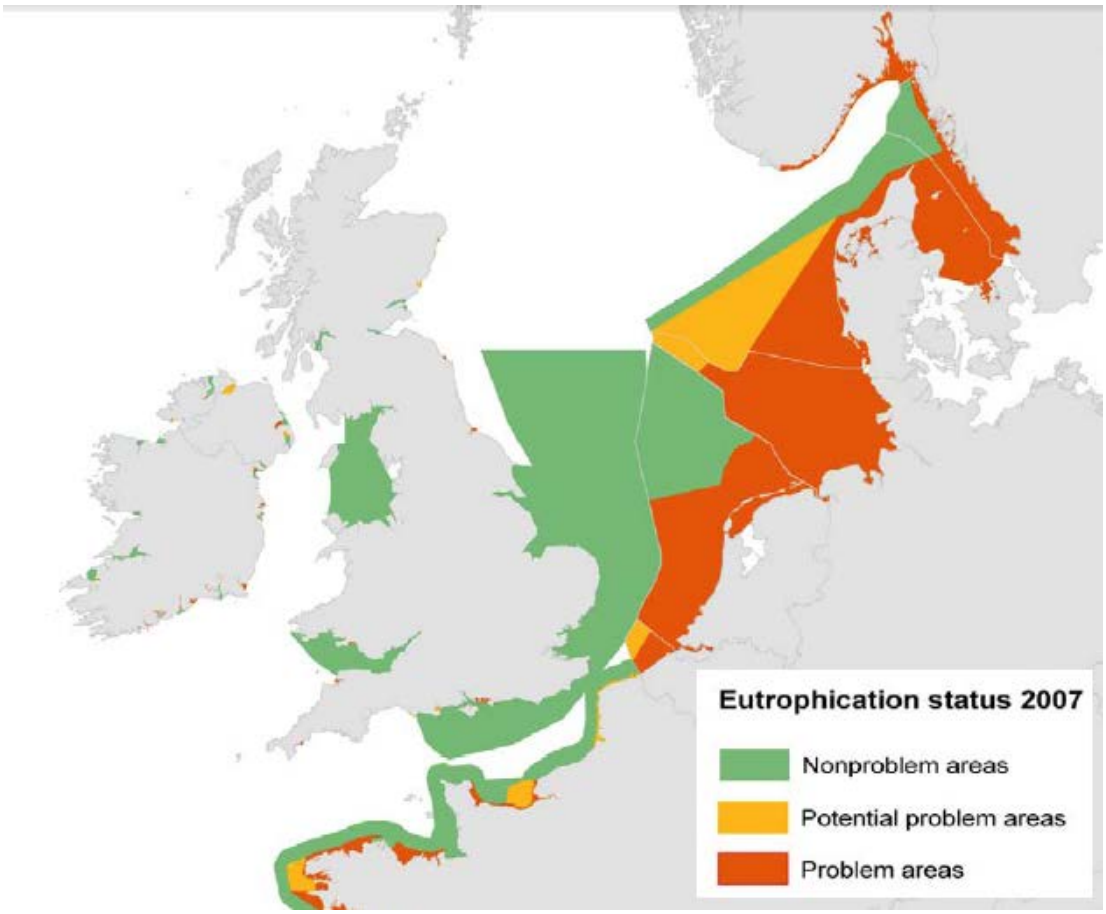

Figure 6.4: Eutrophication status of the OSPAR maritime area in 2007 following the second application of the Comprehensive Procedure by Contracting Parties.

Source: OSPAR, 2009b

In the latest Quality Status Report in 2010, OSPAR summarised the findings of latest eutrophication status assessment, stating that Region II, The Greater North Sea was the most widely affected area and that the status in the second assessment period had not significantly changed since the first assessment period. They list a number of detrimental impacts from eutrophication on ecosystems and society in northern European countries, despite a reduction in overall nutrient inputs since 1990. OSPAR highlights the importance of transboundary transport of nutrients in this region. It also states that the existing monitoring programmes are limited in terms of temporal and spatial coverage. Although new technologies, including ferry boxes, smart buoys and remote sensing, can provide better temporal and spatial data to support the assessment of eutrophication, OSPAR is of the opinion that *'they do not offer the same quality-assured biogeochemical observations as is achieved by monitoring water quality using scientific research vessels'*.

6.4. Key data issues and gaps

The key data issues and gaps relating to the assessment of eutrophication at both the large scale and small scale are summarised below:

- **Geographic scale and resolution:** the geographic scale and resolution of data are highly variable.
  - Some datasets were highly restricted to particular areas within the North Sea basin.

  - Estuaries and coastal areas in general are subject to more detailed monitoring than offshore marine areas.
  - Areas with potential for eutrophication impacts, such as those around aquaculture industry, also tend to be more heavily monitored than those areas in a more natural state.
- **Temporal scale and resolution:** the temporal scale and resolution of data are highly variable and often restricted.
  - Some data, such as certain phytoplankton datasets, are only available for a restricted set of years.
  - Other data, such as for phosphates and nitrates, are available for a significant time period extent overall, but the regularity of samples in particular locations is not uniform.
  - Whilst the temporal extent may be wide enough to support the challenge, in reality many years may be absent of data.
- **Lack of consistency in choice of taxonomy** for species leads to confusion in choosing the data required for assessment.
- **Zoobenthos, macrophyte and macro-algae and fish kills data** was very limited or absent.

7. Discussion and Conclusions

The aim of this challenge was to *"produce gridded data layers showing seasonal averages of eutrophication for the past ten years and change in eutrophication over the past ten years for the complete North Sea basin"*.

Marine eutrophication is an extremely complex process that is not yet fully understood. The Marine Strategy Framework Directive uses a definition of marine eutrophication that includes consideration of the enrichment of water by nutrients; the effects of that enrichment on growth, primary production and algal biomass; and, the subsequent changes in the balance of organisms and water quality degradation.

There is no 'map of eutrophication' for the North Sea for any year; instead Contracting Parties to the OSPAR agreement evaluate the eutrophication status of their waters, using a common methodology and then OSPAR aggregates the information to provide an overview of the entire region. The common methodology collates and evaluates numerous pieces of information together to form a picture of eutrophication status classification either: a problem, potential problem or non- problem area. This is because any individual parameter does not give a full picture of eutrophication.

This DAR has applied a consistent approach to evaluating the data available for a basin-wide eutrophication assessment. Although Contracting Parties are requested to identify where there are issues with data availability or quality, a consistent method of data evaluation is not a requirement. In principle, the particular difficulties with presenting such aggregated information at a basin-wide scale are:

- Differences between the monitoring data held by different nations e.g. different sampling methods or choices of taxa.
- Non-uniformity in the temporal and geographic resolution:
  - Some areas are highly monitored whilst other areas are not.
  - Not every geographic sampling site is monitored more than once.
  - Not every sampling site is sampled at the same time.

  This makes pin-pointing particular 'snapshots' in time difficult to define with any certainty.

Furthermore, other common difficulties were[4]:

- Some detailed data were available but had to be downloaded one survey site at a time. Whilst this is suitable for 'case study' style analysis, it is excessively time consuming for large scale analyses.
- Metadata is variable in quality and often difficult for a user to fully understand.

Remotely sensed chlorophyll-*a* concentrations are a commonly used proxy for algal blooms and eutrophication. This information is likely to be the only source that is suitable on a basin-wide, ten year, scale. However, there are considerable limitations to using only remotely sensed chlorophyll-*a* data to identify eutrophication and such data are not yet good enough to be a reliable measure of eutrophication across a whole sea basin (in particular coastal and open sea areas) when used alone (Blondeau-Patissier *et al.* 2014, Cristina *et al.* 2015).

[4] Fortunately, most data are available for public use though open licensing, can readily be downloaded through internet portals within a reasonable time and is relatively easy to use.

It is therefore not possible to present a meaningful time series of seasonal averages of eutrophication in the North Sea over a ten year period. Instead, the data required for the OSPAR convention assessment of eutrophication have been evaluated and are summarised below:

- The four categories of parameters evaluate the level of nutrient enrichment (Category I); direct effects (Category II); indirect effects (Category III); and, other effects (Category IV).
- The highest quality data are generally found for the Category I parameters, particularly for phosphorus and nitrogen. The temporal and geographic extent and resolution is greatest for nutrients. Despite this fact, some Contracting Parties still report location adequacy issues with respect to these data. Primarily, the issue appears to be that there is not complete uniformity in monitoring, either over space or time. Monitoring programmes run for a defined length of time and then stop, or are undertaken on an opportunity basis. Further to this, areas with known problems, or developments that may cause eutrophication problems may be subject to great monitoring effort. This has the potential to add bias to the assessments made.
- Category II parameters are focused on direct effects of nutrient enrichment: chlorophyll-*a* concentration, instance and elevated levels of nuisance/toxic phytoplankton indicator species, and elevated levels and shifts in macrophytes and macroalgae from long-lived to short-lived nuisance species. Chlorophyll-*a* concentrations are either measured directly in water samples or estimated from satellite imagery. Chlorophyll-*a* has also been monitored for a significant amount of time (since the 1960s). The data quality is on a par with the Category I data. All Contracting Parties used chlorophyll-*a* in their assessments and only two reported any data adequacy issues.

  Phytoplankton communities are also sampled and used by all Contracting Parties in their assessments. However, whilst some species or genera have been sampled since the beginning of the twentieth century, the consistency of sampling over time isn't as good as for nutrients and the geographic extents for some organisms are also very restricted. Five Contracting Parties reported data adequacy issues, related to location, for this parameter. For a basin-wide assessment, these issues are further compounded by the fact that there is not consistency across the different surveys in the choice of taxonomic level at which to sample the organisms. This has the potential to reduce the accuracy of any analysis at such a large geographic scale.

  For macrophytes and macroalgae, there are very few datasets available at the basin-wide scale. Survey samples are restricted to the Kattegat. This was a parameter used by many Contracting Parties, although location adequacy issues were reported. The lack of data for this parameter must surely reduce the effectiveness of using this parameter in the assessment.
- Category III and IV parameters include measures of indirect and other effects of nutrient enrichment, namely: oxygen deficiency, zoobenthos and fish kills and biomass, organic carbon/organic matter and algal toxins. All Contracting Parties used oxygen deficiency in their assessment and data similar in quality terms to other nutrients, are available through ICES. Similarly, all Contracting Parties except France, used fish kills in their assessments, however no such data have been found at a basin scale. Zoobenthos biomass/species composition was a parameter used by all Contracting Parties except from France and the Netherlands, but similar to fish kills, no data could be found on this on a basin-wide scale. Conversely, only four contracting parties used the organic carbon parameter in their assessments and yet data are available at the basin scale since 1985, albeit with considerable non-uniformity in the temporal/geographic resolution of samples.

  Only Sweden has been able to use algal toxins as an assessment parameter without reporting any data adequacy issues. The UK reported that data were available, but chose not to use this parameter. All other Contracting Parties reported data adequacy issues that prevented them from including this

parameter in their second assessments. This is apparently in contrast to the advice given by OSPAR, which is to employ a "yes-or-no" approach using data on specific phytoplankton eutrophication indicator species. Indicators such as *Dinophysis* and *Gymnodinium* species that are associated with DSP and PSP mussel infections are available at a basin scale through ICES, albeit with the same restrictions as described for the phytoplankton indicators above.

The outcome of this challenge to produce gridded data layers showing seasonal averages of eutrophication for the past ten years and change in eutrophication over the past ten years for the complete North Sea basin has found that the specific remit of the challenge is not possible from the data and methods that exist today.

The OSPAR Comprehensive Procedure could, in theory, be applied to highlight eutrophication status on a seasonal or annual basis for the last ten years, however not all of the data to support this has been collated by the Contracting Parties and is therefore not readily available for others. As summarised in the points above, not all of the Category I to IV parameters can be provided as seasonal averages over the last ten years, mainly due to lack of adequate data. Where data are available, location adequacy (i.e. spatial and temporal extent and resolution) issues are common. In order to provide seasonal averages of eutrophication on an annual basis, more frequent and consistent monitoring of the Category I to IV parameters would be needed across all the Contracting Parties.

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Glossary

Attributes adequacy

An evaluation of whether the accuracy, precision and resolution etc. of the data are sufficient to solve the challenge. Note temporal and spatial coverage is dealt with in Location.

Commercial adequacy

An evaluation of whether the commercial terms (e.g. prices, licences) are compatible for solving the challenge.

Contribution adequacy

An evaluation of whether the dataset parameters are useful to solving the challenge.

Common Procedure

The Common Procedure is the method developed for the identification of the eutrophication status of the OSPAR maritime area. It provides an assessment framework for the Contracting Parties to follow, in order to evaluate the eutrophication status of their maritime waters in a consistent manner, both between countries and with other related directives such as the Water Framework Directive and the Marine Strategy Framework Directive.

- **The Screening Procedure:** A broad-brush process that uses information on demographic/hydrodynamic/physical characteristics of an area; optical observations made by ship, aircraft or satellite; and, nutrient-related information to identify obvious non-problem areas.
- **The Comprehensive Procedure:** A more refined assessment undertaken on all areas that are not classified as 'non-problem areas'. This assessment evaluates a defined set of criteria that are linked to the cause-effect relationships associated with marine eutrophication. The criteria are evaluated against area specific baselines which are then scored and aggregated. The final step is for all of the results to be evaluated and presented in a transparent and verifiable manner by the Contracting Parties to enable OSPAR to undertake an overall assessment of the full maritime area and present this in its integrated report (last report in 2010).

Delivery adequacy

A record of whether the data can be obtained in time to solve the challenge.

Eutrophication

A process driven by enrichment of water by nutrients, especially compounds of nitrogen and phosphorus, leading to increased growth, primary production and biomass of algae; changes in the balance of organisms and water quality degradation.

Location adequacy

An evaluation of whether the temporal and spatial locations of the data are relevant to solving the challenge.

Usability adequacy

An evaluation of whether the data format and supporting information (i.e. the metadata) are suitable for solving the challenge.

Appendix

A. Data assessment

Valuation of the data for the literature review

NSC-006-Mari

Data Set / Source	Consideration	ValueCriteria	VCFlag	ValueCriteriaReason
DT-NS601-OSPAR-Boundary-shapefile	Considered	Contribution	False	This would be useful for presentational purposes only. Not for any analysis.
		Location	True	The location is relevant - showing the OSPAR boundaries of the North Sea basin
		Commercial	True	Data freely available for public use
		Attributes	False	Data would need to be used alongside a map of Europe and/or the OSPAR Regions shapefile.
		Delivery	True	Data downloaded
		Usability	True	Data is in shapefile format and readily useable.
DT-NS602-OSPAR-Regions-Shapefile	Considered	Contribution	False	This would be useful for presentational purposes and for assisting in analysis.
		Location	True	The location is relevant - showing the OSPAR regions, including the North Sea basin
		Commercial	True	Data freely available for public use
		Attributes	True	Resolution is fit for purpose
		Delivery	True	Data downloaded
		Usability	True	Data is in shapefile format and readily useable.
DT-NS603-EEA-Waterbase-TCM-v12	Considered	Contribution	False	The location of the data isn't useable.
		Location	False	All north sea basin countries are included in principle i.e. Belgium, Germany, Denmark, France, United Kingdom, Netherlands, Norway and Sweden. However, some countries are not actually represented in some of the data. Annual inputs provided over time. The time periods covered are different, depending upon the type of input meaured. Multiple versions of this data would have to be obtained to analyse time series (2004-2015 are available currently)
		Commercial	True	Data freely available for public use
		Attributes	True	Attributes acceptable
		Delivery	True	Downloaded as mdb files.
		Usability	False	Projection used for the location of the gauging stations is unknown and is not provided in the associated metadata (Geographic Coordinate System: GCS_WGS_1984; Datum: D_WGS_1984; Prime Meridian: Greenwich; Angular Unit: Degree using the maximum lat and long co-ordinates might be correct)
DT-NS604-ICES-GreaterNorthSea-AllData-Chlorophyll-a	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1960-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS605-ICES-GreaterNorthSea-AllData-DissolvedOxygen	Considered	Contribution	False	Has potential for use to solve the challenge (a Category III parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1902-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS606-ICES-GreaterNorthSea-AllData-Total-N	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1965-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS607-ICES-GreaterNorthSea-AllData-Total-P	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1965-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS608-EEA-EIONET_Annual-RiverineInputs-and-OSPARDirectDischarges	Considered	Contribution	True	Can contribute to the challenge, but data is partial
		Location	False	The north sea basin countries included are Germany, Denmark, France, The Netherlands, United Kingdom, Norway and Sweden. The Belgium is not included. Different countries have provided different amounts of information for different years. Total phosphorus and total nitrogen are provided for OSPAR Convention monitoring. Ten years is only available online for Norway and Sweden. All other countries only provide either two or three years' worth of data
		Commercial	True	Data freely available online
		Attributes	True	Attributes acceptable
		Delivery	True	Downloaded xlsx files
		Usability	True	Not all years are provided.
DT-NS609-Radach-and-Patsch-Hamburg-Uni-Continental-river-inputs	Considered	Contribution	True	Can contribute to the challenge, but data is partial
		Location	False	This dataset includes Germany and the Netherlands. The temporal resolution of the data is suitable. Data for eight rivers is provided, but the location of the gauging sites is unknown.
		Commercial	True	The location of this data was obtained freely upon request from Hamburg University. The data was downloaded from the recommended site.
		Attributes	True	Attributes acceptable
		Delivery	True	Downloaded as ASCII files
		Usability	True	This data is logically laid out and suitable for use in this challenge.
DT-NS610-Scottish-North-Sea-River-Discharge-Data-2002-2014	Considered	Contribution	True	Can contribute to the challenge, but data is partial
		Location	True	This dataset is for Scotland only. The temporal extent is suitable.
		Commercial	True	Data free and available on request from SEPA
		Attributes	True	Data provides annual means and totals. Maximum and minimum values are not provided
		Delivery	True	Provided by email following data request
		Usability	True	This data is logically laid out and suitable for use in this challenge.
DT-NS611-Data-from-Norweigen-Water-Resources-and-Energy-Directorate	Considered	Contribution	False	Data unsuitable for challenge
		Location	False	This dataset is for Norway. The data is provided for coastal areas and not the main rivers provided to OSPAR. It is unclear how these relate to one another.
		Commercial	True	This data was requested from the Norweigen Water Resources and Energy Directorate, who freely supplied the data.
		Attributes	True	Data is provided for mean, max and min values of runoff from coastal areas. Raw data is not provided.
		Delivery	True	Provided by email following data request
		Usability	False	The data requires a little manipulation before use and it is supplied as a text file that is not logically laid out. It is unclear whether the areas are just main rivers or estimates of the catchment run-off.
DT-NS612-ICES-GreaterNorthSea-AllData-Silicate-SiO4-Si	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1930-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS613-ICES-GreaterNorthSea-AllData-Nitrate-as-N	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1930-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS614-ICES-GreaterNorthSea-AllData-Nitrite-as-N	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1930-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS615-ICES-GreaterNorthSea-AllData-Nitrate-plus-Nitrite-as-N	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location incorrect - the Kattegat is excluded from the dataset. Furthermore, accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1930-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.

Value Criteria	
Contribution	TRUE If the data set parameters are useful to solving then callenge, otherwise FALSE
Location	TRUE if the temporal and spatial location of the datasets are relevant to solving the challenge, otherwise FALSE
Commercial	TRUE if the commercial terms (prices, licences) are compatible for solving the challenge, otherwise FALSE. A data does not need to be free to be used, but price proportionate to the challenge
Attributes	TRUE if accuracy, precision and resolution etc. of the data are sufficient to solve the challenge, otherwise FALSE. Note temporal and spatial coverage is dealt with in Location
Delivery	TRUE is the data can be delivered in time to solve the challenge. Otherwise FALSE. Includes continuation of supply
Usability	TRUE if the data can be readily used in systems to solve the challenge. FALSE otherwise. Note condition is normally false when the data is in an obscure or legacy encoding or has a non-intuitive or incorrect data structure.

Note:
If any criteria is unknown then it must be FALSE

DT-NS616-ICES-GreaterNorthSea-AllData-Phosphate	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1929-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS617-ICES-GreaterNorthSea-AllData-Salinity	Considered	Contribution	False	Potentially useful to solving the challenge (as part of the OSPAR Comprehensive Procedure areas are categorised, in part, due to their salinity). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1891-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS618-ICES-GreaterNorthSea-AllData-Phaeocystis	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, actually data coverage is variable. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type and the taxa chosen.
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS619-ICES-GreaterNorthSea-AllData-Chrysochromulina(genus)	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, actually data coverage is limited to the Kattegat. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type.
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS620-ICES-GreaterNorthSea-AllData-Chrysochromulina(species)	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, actually data coverage is limited to the Kattegat. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type.
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS621-ICES-GreaterNorthSea-AllData-Chrysochromulina-polylepis	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, actually data coverage is limited to the Kattegat. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type.
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS622-ICES-GreaterNorthSea-AllData-Noctiluca(species)	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, actually data coverage is limited to the Kattegat and for only two years (2009 and 2014)
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS623-ICES-GreaterNorthSea-AllData-Noctiluca(genus)	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, actually data coverage is limited to the southern part of the North Sea basin. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full temporal extent: 1902-2014).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS624-ICES-GreaterNorthSea-AllData-Noctiluca-scintillans	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, actually data coverage is limited to the southern part of the North Sea basin. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full temporal extent: 1902-2014).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS625-ICES-GreaterNorthSea-AllData-Gymnodinium(genus)	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full temporal extent: 1907-2012).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS626-ICES-GreaterNorthSea-AllData-Gymnodinium(species)	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full temporal extent: 1907-2012).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS627-ICES-GreaterNorthSea-AllData-Alexandrium(genus)	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea - however, the extent of the actual data is restricted to the Kattegat and the northern part of the North Sea basin. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full temporal extent: 1907-2014).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	The required taxa choice in order to view the data used by OSPAR Contracting Parties is unclear. For Phytoplankton, there are datasets available for specific species, genus, orders, families and classes. How or if these datasets overlap is not known.
		Delivery	True	Data can be downloaded.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS628-ICES-GreaterNorthSea-AllData-OrganicCarbon	Considered	Contribution	False	Has potential for use to solve the challenge (a Category III parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal and geographic extent and resolution varies depending on the dataset type (full extent 1985-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS629-CEFAS_FishDAC_Spawning-and-Nursery-Grounds	NotConsidered	Contribution	False	Abundance data for the seas is provided but fish kills is not.
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea. Resolution is fit for purpose
		Commercial	True	Data freely available for download
		Attributes	False	Fish kill data not included.
		Delivery	True	Data downloaded
		Usability	True	Data is in shapefile format and readily useable.
DT-NS630-ARCTIC_ANALYSIS_FORECAST_BIO_002_004	NotConsidered	Contribution	False	Provides a forecast rather than a repository of historic data and therefore cannot contribute to the challenge

		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The model provides a forecast. Data available from Dec 2011 onwards.
		Commercial	True	Data freely available for download following registration to the website.
		Attributes	False	Historic data not provided
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS631-INSITU_NWS_NRT_OBSERVATIONS_013_036	Considered	Contribution	True	Potentially useful to solving the challenge, in order to complement other data on nutrients (Chlorophll-a, salinity and moles of oxygen are provided by this data). The full temporal extent required is not provided.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic extent is fit for purpose. The latest month of data is available online. Data further back in time (to Dec-2009) is also held in individual files but the regularity of data over time is unknown. Ten years of data not provided.
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable and updatable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS632-NORTHWESTSHELF_ANALYSIS_FORECAST_BIO_004_002_b	NotConsidered	Contribution	False	A highly complex lower-trophic marine ecosystem model. It is a forecast. Helpful to provide additional context and understanding of the marine system, but not directly useful to understanding past eutrophication.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The model provides a forecast. Data available from April 2011 onwards.
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	False	Historic data not provided
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS633-NORTHWESTSHELF_REANALYSIS_BIO_004_007	NotConsidered	Contribution	False	Provides a modelled hindcast dataset rather than an actual observed dataset. Therefore, not suitable for informing the challenge
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. Data available from 1967-2004
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	False	A coupled hydrodynamic-ecosystem model that provides monthly means hindcast products. Whilst useful to understanding relevant processes, this is a model, not a measure of eutrophication
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS634-NORTHWESTSHELF_REANALYSIS_BIO_004_008	NotConsidered	Contribution	False	Provides a modelled hindcast dataset rather than an actual observed dataset. Therefore, not suitable for informing the challenge
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. Data available from 1985-2009
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	False	A coupled, 3D physical, chemical and biological model provides monthly mean hindcast of ocean biogeochemistry. It is designed to help study primary production and dispersion on particles such as fish larvae and pollution. Whilst useful to understanding relevant processes, this is a model, not a measure of eutrophication
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS635-NORTHWESTSHELF_REANALYSIS_BIO_004_011	NotConsidered	Contribution	False	Uses a forecast rather than a repository of historic data and therefore cannot contribute to the challenge
		Location	True	Location correct - Includes the OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. Data available from 1985-2012
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	False	Based on a forecasting model, not observed data
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS636-NORTHWESTSHELF_REANALYSIS_PHYS_004_006	NotConsidered	Contribution	False	Provides a modelled hindcast dataset rather than an actual observed dataset. Therefore, not suitable for informing the challenge
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. Data available from 1985-2009
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	False	A coupled, 3D physical, chemical and biological model provides monthly mean hindcast of ocean biogeochemistry. It is designed to help study primary production and dispersion on particles such as fish larvae and pollution. Whilst useful to understanding relevant processes, this is a model, not a measure of eutrophication
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS637-OCEANCOLOUR_ATL_CHL_L3_NRT_OBSERVATIONS_009_036	Considered	Contribution	True	Potentially useful to solving the challenge, to support other data. However, the full temporal extent is not provided
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. Data available from March - 2013
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	True	Estimate chlorophyll from satellite observations.
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS638-OCEANCOLOUR_ATL_CHL_L4_NRT_OBSERVATIONS_009_037	Considered	Contribution	False	Potentially useful to solving the challenge, to support other data. However, the full temporal extent is not provided
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. Data available from 042013 - 03-2014
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	False	Provides an interpolation of the OCEANCOLOUR_ATL_CHL_L3_NRT_OBSERVATIONS_009_036 data
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS639-OCEANCOLOUR_ATL_CHL_L3_REP_OBSERVATIONS_009_067	Considered	Contribution	False	Potentially useful to solving the challenge, to support other data. However, the accuracy of the geographic resolution is unclear.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose; however, it is unclear what interpolation may be used between sample sites and the accuracy of this information. Data available from 09/1997 - 07/2012
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	True	Provides a historic daily average of chlorophyll that can be used alongside the SeaWiFS sensor, therefore creating a longer timeseries.
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS640-OCEANCOLOUR_EUR_CHL_L3_NRT_OBSERVATIONS_009_050	NotConsidered	Contribution	False	Not applicable for this challenge. The data is more suitable for global analyses.
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. Data available from 01-2015 - ongoing
		Commercial	True	Data freely available for download following registration to the website according to a worldwide, non exclusive, royalty free and perpetual licence.
		Attributes	False	Global sea surface chlorophyll concentrations that accounts for the optical differences between different seas. Not particularly applicable to the requirements of this challenge.
		Delivery	True	Data available online
		Usability	True	Data is in netCDF format and is therefore widely useable. However, NetCDF format requires a higher level of expertise for use than other formats such as csv.
DT-NS641-201208_EUSeaMap_Atlantic_Habitats_Userguide	NotConsidered	Contribution	False	Potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS642-20110204_EUSeaMap_baltic_Habitats	NotConsidered	Contribution	False	Potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	True	Location correct - Includes the Kattegat
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS643-20120724_EUSeaMap_Atlantic_Light	Suitable	Contribution	True	Potentially useful as additional information to inform aspects of the challenge.
		Location	True	Location correct - Includes the Kattegat
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS644-20131206_MESHAtlanticBroadScaleMap	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	False	Location is restricted to Atlantic waters of Portugal, Spain, Ireland and France
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS645-20140930_EUSeaMap_Atlantic_BioZones	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	False	Location is restricted to Atlantic waters of Portugal, Spain, Ireland and France
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS646-EMODnetSBH_BroadScale_SurveyMaps_EUNIS_v20150827	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	False	Location includes some, but not all North Sea basin countries. Data includes some Atlantic or Celtic Sea only countries.
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.

DT-NS647-EMODnetSBH_FineScale_SurveyMaps_EUNIS_v20150827	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	False	Location includes some, but not all North Sea basin countries. Data includes some Atlantic or Celtic Sea only countries.
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS648-EMODnetSBH_FineScale_SurveyMaps_OtherClassifications_v20150827	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	False	Location includes some, but not all North Sea basin countries. Data includes some Atlantic or Celtic Sea only countries.
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS649-EMODnetSBH_MediumScale_SurveyMaps_EUNIS_v20150827	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	False	Location includes some, but not all North Sea basin countries. Data includes some Atlantic or Celtic Sea only countries.
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS650-EMODnetSBH_MediumScale_SurveyMaps_OtherClassifications_v20150827	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	False	Location includes some, but not all North Sea basin countries. Data includes some Atlantic or Celtic Sea only countries.
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS651-OSPAR Habitats	NotConsidered	Contribution	False	Parameters are potentially useful as additional information to inform aspects of the challenge, however not directly useful to identifying eutrophication.
		Location	True	Location correct - Includes OSPAR Region II, Greater North Sea.
		Commercial	True	Data freely available for download.
		Attributes	False	Fish kill data not included.
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS652-Chemistry-Autumn-Nitrate	Considered	Contribution	False	Nitrate concentration, should be directly useful to inform the challenge but due to the temporal scale, it isn't.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS653-Chemistry-Autumn-Phosphate	Considered	Contribution	False	Phosphate concentration, should be directly useful to inform the challenge but due to the temporal scale, it isn't.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS654-Chemistry-Autumn-Silicate	Considered	Contribution	False	Silicate concentration, should be directly useful to inform the challenge but due to the temporal scale, it isn't.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS655-Chemistry-Autumn-Ammonium	Considered	Contribution	False	Ammonium concentration, should be directly useful to inform the challenge but due to the temporal scale, it isn't.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS656-Chemistry-Spring-Nitrate	Considered	Contribution	False	Nitrate concentration, should be directly useful to inform the challenge although the time of year is not ideal
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS657-Chemistry-Spring-Ammonium	Considered	Contribution	False	Ammonium concentration, should be directly useful to inform the challenge although the time of year is not ideal
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS658-Chemistry-Winter-Nitrate	Considered	Contribution	False	Nitrate concentration, should be directly useful to inform the challenge but due to the temporal scale, it isn't.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS659-Chemistry-Winter-Phosphate	Considered	Contribution	False	Nitrate concentration, should be directly useful to inform the challenge but due to the temporal scale, it isn't.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. Geographic resolution is fit for purpose. The temporal resolution is unclear. Whilst the metadata specifies a 1960 - 2014 range, for Autumn, of 10-year running averages, it is not possible to see how the actual data relating to 'time' relates to this.
		Commercial	True	Data freely available for download.
		Attributes	True	Attributes acceptable
		Delivery	True	Data available online
		Usability	True	Data is shapefile format and is readily useable.
DT-NS660-NorthSeaBenthosSurvey	Considered	Contribution	False	Useful to provide presence/absence and contextual information, but not to contribute directly to the understanding of benthos populations.
		Location	False	Location correct - Includes OSPAR Region II, Greater North Sea. The temporal resolution is unclear as there is no metadata.
		Commercial	True	Data freely available for download.
		Attributes	False	Species counts of multiple different species. Recording effort is difficult to determine, therefore utility of the data is unclear.
		Delivery	True	Data available online
		Usability	True	Data is kmz format which needs to be converted to another suitable file format for use in analysis.
DT-NS661-CAMP-Data-International-Database_EBAS-NILU	Considered	Contribution	False	Terrestrial-based atmospheric measurements of various CEMP compounds.
		Location	False	All on land. Data available for different temporal extents.
		Commercial	True	Data freely available for download.
		Attributes	False	No atmospheric measurements are available for the ocean. Different methods of measurement are used for the same parameter depending on location and time sampled. OSPAR indicate that CAMP data is used to inform the eutrophication assessment - it is unclear on what method is used to do this.
		Delivery	False	Data available online. Dates for data have to be specified for each individual submission. Hence it would be difficult and time consuming to download for the whole of the North Sea basin.
		Usability	True	Delivered in NAS format.
DT-NS662-ICES-GreaterNorthSea-AllData-Ammonium-NH4-N	Considered	Contribution	False	Has potential for use to solve the challenge (a Category I parameter under the OSPAR Comprehensive Procedure). But location and usability adequacy is restrictive.
		Location	False	Location correct - OSPAR Region II, Greater North Sea. Accuracy of survey location may be restrictive for a spatial assessment of eutrophication. Temporal extent and resolution varies depending on the dataset type (full extent 1930-2015).
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	True	Attributes acceptable
		Delivery	True	Data downloaded where the number of records is below 10,000. When over 10,000 records, the data must be requested from the online portal.
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS663-ICES-GreaterNorthSea-AllData-Ulva	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct but restricted. Ulva is only available for the Swedish shore in the Kattegat in 2012. No data is available for specific species or species belonging to a higher taxonomic group, such as in the Family, Ulvaceae.
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	Number of records is too small to be of use
		Delivery	True	Data available for download
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.
DT-NS664-ICES-GreaterNorthSea-AllData-Zostera-marina	Considered	Contribution	False	Has potential for use to solve the challenge (a Category II parameter under the OSPAR Comprehensive Procedure). But location, attributes and usability adequacy is restrictive.
		Location	False	Location correct but restricted. Zostera marina is only available for the Swedish shore in the Kattegat in 2012.
		Commercial	True	ICES data is freely available for public use as long as the data used are properly cited and referenced
		Attributes	False	Number of records is too small to be of use
		Delivery	True	Data available for download
		Usability	False	Data is in shapefile format and well laid out, however an absence of detailed metadata makes this information difficult to use.

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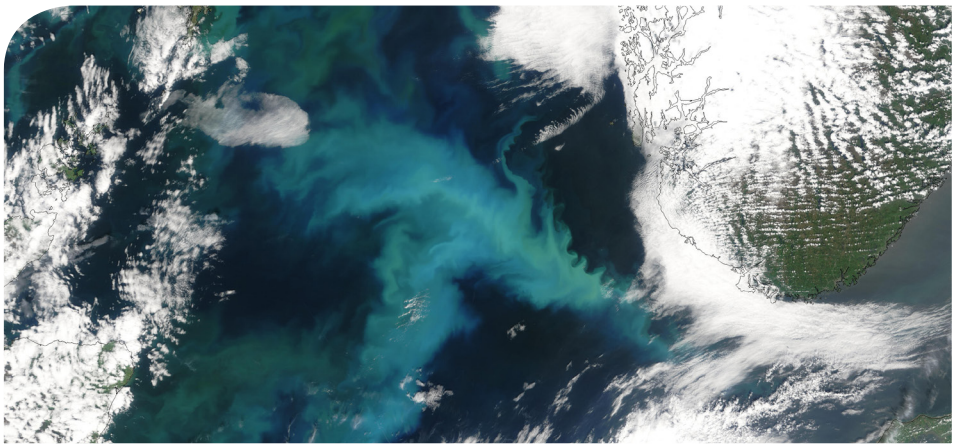

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A.8. River inputs

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Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Growth and Innovation in the Ocean Economy: North Sea Checkpoint

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Executive Summary

Headline highlights

- Monitoring inputs from rivers is a critical aspect of the OSPAR convention to help evaluate the condition of the North Sea environment
- Salmon are economically important and migrate between rivers and the sea; the quality of both habitats is important for their survival
- Belgium, Denmark, France, Germany, Netherlands, Norway, Sweden and UK monitor nutrients & flows for OSPAR - getting this data is challenging!
- We need nutrient & flow data seasonally, over many years, for detailed analysis. But mostly only annual figures and 3 years were obtained
- Data on fish was difficult to find – we need more than just the presence or absence of a species
- Metadata quality is often poor and difficult to understand. This renders datasets unusable
- Most data providers cannot deliver the right data in a reasonable time – data needs to be available online if it is to be used

Summary

Under the North Sea checkpoint project[1], HR Wallingford delivered an assessment of the data requirements for the challenge on river inputs. Rivers take freshwater, sediment and nutrients to sea. Evaluating these inputs helps us to understand the pressures on the marine environment. The marine environment is important for a number of reasons, including for tourism and fisheries. A number of economically and environmentally important fish species migrate between freshwater and the sea at different stages of their lives. Therefore the quality of both these habitats is important for their survival.

The search for data for this challenge was undertaken over a period of around 10 months. The data requirements for this challenge can be split into two main elements:

- Biological inputs i.e. fish populations
- Physico-chemical inputs i.e. volume of water, sediment, nitrates and phosphates

Obtaining data on the biological inputs was very difficult. Species specific data was only found for England, despite the conservation and economic importance of Atlantic salmon. In order to estimate the population of a species from sampling data it is necessary to be able to estimate the sampling effort, relative to the geographical and temporal extent. Such information was not available.

Obtaining data on the physico-chemical inputs that would be suitable for the challenge analyses was also difficult. However, mean data are often available, implying that data does exist but that it is simply difficult to obtain.

Common difficulties in gaining access to the required data were:

1. The data was only available as a calculated annual figure, not as raw data, which reduces its utility when trying to undertake more detailed analyses on the inputs into the North Sea.
2. Detailed data was available but had to be downloaded one survey site at a time. Whilst this is suitable for 'case study' style analysis, it is excessively time consuming for large scale analyses.
3. Not enough historic data was available to define trends over time with confidence.
4. Metadata is variable in quality and often difficult for a user to fully understand.

As a result of these common difficulties, the data sources met many of the adequacy requirements to present the data for this report, however, they would be otherwise unsuitable for detailed analyses of river inputs.

[1] The River Inputs challenge was conducted as part of the North Sea Checkpoint project (NSCP): Growth and Innovation in the Ocean Economy – Gaps and Priorities in Sea Basin and Observation Data MARE/2012/11: North Sea, contract reference [SI2.658142]. The project was undertaken by HR Wallingford Ltd with input from the project members IMARES and McAllister-Elliot & Partners (MEP). The Data Adequacy Report (DAR) for this challenge details the findings of the work and represents the 11th deliverable of the project.

Contents

Tables

1. Introduction

This report is a deliverable to DG Mare under the North Sea Check Point project (Growth and Innovation in the Ocean Economy – Gaps and Priorities in sea basin and observation data MARE/2012/11: North Sea) contract reference SI2.658142. The project comprises seven challenges:

1. Windfarm siting
2. Marine protected areas
3. Oil platform leak
4. Climate change coastal protection
5. Fisheries management
6. Marine environment
7. River inputs

This challenge, number 7, addresses the stages of work required for a desk-based assessment of the inputs from rivers flowing into the North Sea basin. The assessment was made using publically available data or data provided upon request from national and international organisations.

The work for this report was undertaken by HR Wallingford Ltd. This document is a Data Adequacy Report (DAR) presenting the findings for the completed challenge.

All data gathered has been recorded in the data adequacy assessment database, providing a searchable record of each of the datasets reviewed and the results of its evaluation where considered for one or more challenges. The database is in the process of being made available via the project website.

Although each of the challenges requires a result to be produced from the exercise being undertaken, it is the process of gathering, appraising and using the data to meet that outcome which is most important in informing the overall objectives of the North Sea Checkpoint project.

In this context it should be noted that assessing data quality within a challenge is a continuous process through each stage: data gathering, initial appraisal of the data, analysis and quality assurance of results, each provide different insights into the accessibility and usefulness of a dataset.

Points for EMODnet

River inputs are of importance to the evaluation of the environment in the North Sea. Rivers convey freshwater, sediment and nutrients to sea. A number of economically and environmentally important species migrate between freshwater and the sea at different stages of their lives; meaning that the quality of both the marine and the freshwater environment is important to their survival.

Data from the EMODnet portals are generally unsuitable for this challenge. This is because EMODnet collates marine data and not river data.

2. Aim

The aim of the challenge is to assess the inputs from rivers flowing into the North Sea basin (see Figure 2.1). For each river inflow, this aim will require a time series (for the past ten years) for the following parameters to be obtained:

- Water
- Sediment
- Total nitrogen
- Phosphates
- Salmon
- Eel.

Time series data would allow annual inputs and monthly averages, maxima and minima for the past ten years to be calculated.

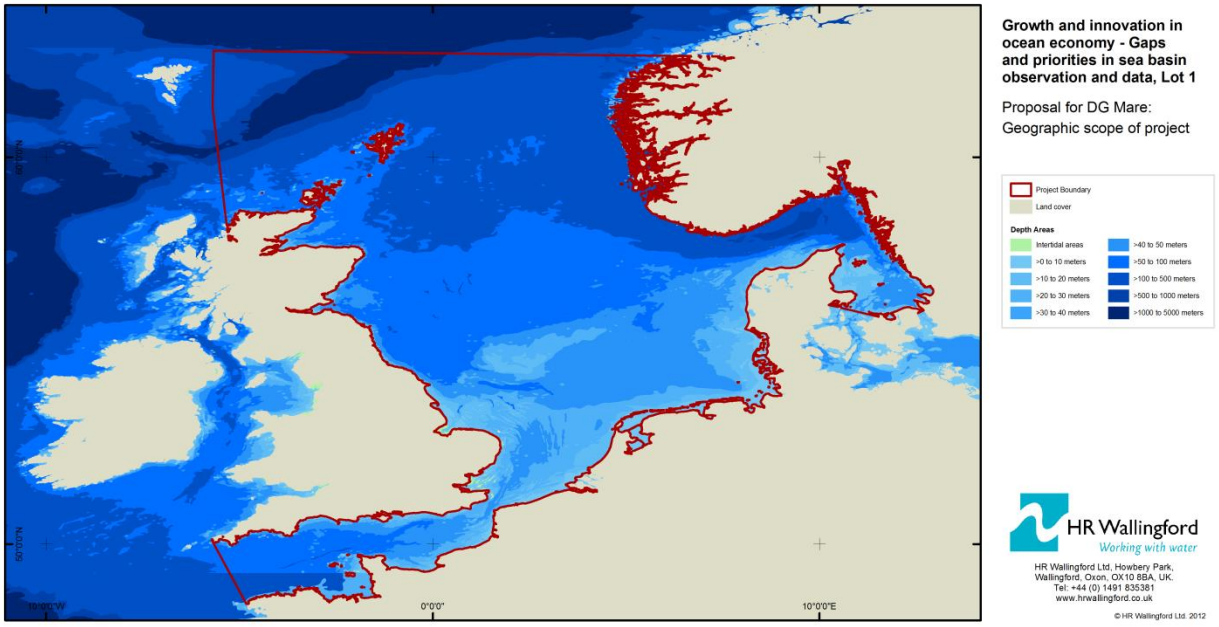

Figure 2.1: North Sea basin, contained within the red lines

Source: n/a

3. Context

Major rivers that flow into the North Sea include the Seine, Thames, Scheldt, Rhine, Ems, Weser, Elbe, Forth, Humber, Meuse, Spey, Tay and Tyne. Information on the inputs from these rivers and smaller rivers is important for sustainable environmental management of the North Sea. River input data are needed, for example, for biophysical models that assess the impact on the North Sea of changes in inputs.

Water

Information on water inflows identifies how much freshwater is discharging into the North Sea basin. The seasonal and annual variation of discharges to the basin influences the mixing of saline water with freshwater as well as the volume of sediment and nutrient inputs to the basin.

Sediment

Information on sediment identifies the concentration and quantity of bed material load and wash load that is transported to the sea.

Nutrients

The parameters nitrogen and phosphorus are the main nutrients that discharge to the sea. These are of significance to the environment as changes to the nutrient balance of the sea can lead to imbalances in the ecosystem and problems such as eutrophication.

Fish – Atlantic salmon (*Salmo salar*) and European eel (*Anguilla anguilla*)

Salmon numbers entering the sea from rivers provide an indication of the health of the fish populations. The salmon life cycle includes phases in the sea and in rivers and changes in either of these environments may impact fish populations. European eels similarly have a lifecycle that includes phases in both the sea and in rivers and therefore the numbers of these helps to create a fuller picture of the health of these environments.

4. Method

The work for this challenge will build on previous data reviews and provide an updated consideration of what data are available. Skogen and Søiland (2002) reviewed the availability of data on river discharges and river nutrient loads to the North Sea and provided an overview of data owners in all North Sea countries. The EEA (2004) researched the source apportionment of loads of nutrients to the North Sea and found that OSPAR[2] data and HELCOM[3] data represented the best data sets in terms of completeness and comparability at that time.

Both national and international data sources and providers have been used to meet this challenge. The work has been carried out by completing a literature review of studies that have reviewed river input data or that have used this type of data in order to determine the range of data sources that are available. Where relevant, the data providers identified from the literature review have been contacted to obtain the relevant data from them. In parallel with this activity, national agencies that are responsible for river management have been contacted to obtain data that they can make available. Further to this, internet-based data portals and the websites of major environmental management organisations in northern Europe have been scrutinised in order to obtain data. Metadata have been stored in the data register (Appendix A).

Quality checks have been carried out to determine, as far as possible, the accuracy and consistency of the data. Suitable data have been used to compile time series of annual inputs and monthly averages, maxima and minima for the past ten years wherever possible. This has been carried out in order to assess whether the availability, consistency and resolution of the data are sufficient for the task. Any gaps identified are reported in Section 6.3.

5. Data

A range of data has been identified, downloaded where possible and reviewed for the challenge. The data were sourced primarily through online resources including:

[2] OSPAR is so named because of the original Oslo and Paris Conventions ("OS" for Oslo and "PAR" for Paris).

[3] Baltic Marine Environment Protection Commission - Helsinki Commission

- EU funded websites (primarily EEA)
- HELCOM
- OSPAR.

All data identified have been recorded in the data register (Appendix A).

Following an initial assessment of data accessibility and fitness for purpose, a small number of datasets have been used in the analysis for the challenge. The data considered suitable for use in the challenge are listed in Table 5.1. Details of the datasets reviewed and either excluded or considered but not used are provided in Appendix A.

Table 5.1: Data suitable in meeting the river inputs challenge

Data	Inspire theme	Suitable sources
Nutrient and flow inputs	1.8 Hydrography	DT-NS718-EEA-EIONET_Annual-RiverineInputs-and-OSPARDirectDischarges DT-NS721-Radach-and-Patsch-Hamburg-Uni-Continental-river-inputs DT-NS724-Scottish-North-Sea-River-Discharge-Data-2002-2014
Salmon and eel species abundance for England	3.19 Species distribution	DT-NS723-EA-Requests-TraC-Abundance-Fish-Catches

The majority of the data obtained have been downloaded from the internet directly or obtained from Hamburg University (via authors of a relevant paper; Radach and Pätsch, 2007) through an online portal.

Between June and December 2015, the following organisations were contacted by email or through online forms in order to obtain missing data or to find out whether higher resolution data existed and were available:

- Belgium - Vlaamse Milieumaatschappij (contacted via email, no response received);
- Denmark - Miljoeportal (contacted via email, response received);
- France - Observation et statistiques for the Ministère de l'Écologie, du Développement Durable et de l'Énergie (contacted via an online form, no response received);
- Germany - The German Federal Institute of Hydrology (BfG) (contacted via email, no response received)
- Netherlands - Rijkswaterstaat (contacted via an online form, no response received);
- Norway - Norwegian Water Resources and Energy Directorate (NVE) (contacted via email, response received);
- Sweden – Swedish Meteorological and Hydrological Institute (SMHI) (contacted via email, response received);
- UK:
  - England: Environment Agency (contacted via email, response received);
  - Scotland: Scottish Environment Protection Agency (SEPA) (contacted via an online form, response received).

6. Results

6.1. Challenge output

6.1.1. Introduction

A literature review of data on river inputs to the North Sea was the first task to be carried out. This resulted in the discovery that researchers Günther Radach and Johannes Pätsch have been instrumental in collating such information over the past 35 years for Germany and the Netherlands. Johannes Pätsch provided a link to an online portal[4] containing all of the data collated for Germany and the Netherlands (Pätsch and Lenhart, 2004; Radach and Pätsch, 2007).

The majority of the rest of the data required for this challenge were readily available through data collated for the OSPAR convention. OSPAR Region II is the Greater North Sea and includes the coastlines of Belgium (North Sea), Denmark (Skagerrak, Kattegat and North Sea), France (Channel), Germany (North Sea), Netherlands (North Sea), Norway (Skagerrak and North Sea), Sweden (Kattegat and Skagerrak) and UK (North Sea and Channel). Under the OSPAR convention, nitrogen, phosphates, suspended particulate matter, flow rate and long term average flows are all recorded. In a report published in 2013 (OSPAR Commission, 2013) a time series of relevant data between 1990 and 2011 was published, see Figure 6.1. Reporting coverage for these particular variables varies considerably, between three and seven countries per year. A maximum of eight countries should contribute to this data set, but this has not occurred between 1990 and 2011 for the variables presented. There appears to be very little difference between the upper and lower values of each variable which is not intuitive given that nutrient loads tend to vary considerably throughout a year due to factors such as seasonal changes in run-off.

Fish abundance data has not been found for any country other than England.

[4] https://wiki.zmaw.de/ifm/ECOHAM/DATA_RIVER

Figure 6.1: Results of time series analysis for riverine inputs and direct discharges into the Greater North Sea.

Source: OSPAR Commission, 2013

6.1.2. Analysis

The data found to be suitable for this challenge are presented in this section.

Water

There are many ways of measuring or estimating the volume (flow) of water in a river. All methods were considered and both volumetric flow rate (also known as discharge) and total volumes are presented to illustrate the available data.

Firstly, the data obtained on discharge is considered. Figure 6.2 shows the volumetric flow rate of rivers into the North Sea. Either mean or median data are provided - it is not always possible to determine which have been provided. As a result, all data are aggregated. This provides only approximate information on the discharge inputs. The Riverine Inputs and Direct Discharges (RID) data were obtained from EIONET[5]'s Reporting Obligations Database (ROD), a repository for environmental reporting obligations that countries have towards international organisations, such as OSPAR. The RID data are one element of the monitoring programme of OSPAR.

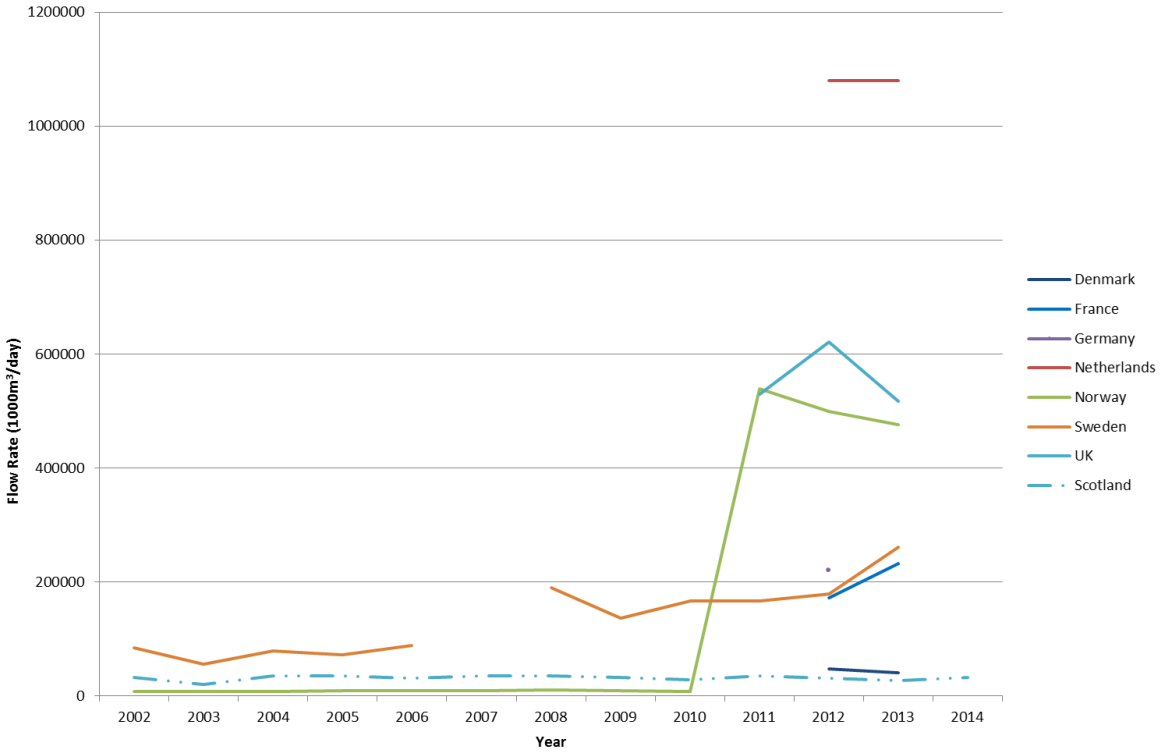

Figure 6.2: Mean flow rate of rivers into the North Sea

Source: http://rod.eionet.europa.eu/ and https://wiki.zmaw.de/ifm/ECOHAM/DATA_RIVER. Contains SEPA data © Scottish Environment Protection Agency and database right 2015. All rights reserved

The difference in flow across the different countries is large, flow from Scotland is markedly different from that of the Netherlands. This is to be expected as the size of rivers varies significantly across northern Europe. The reason for the increase in flow in the data from Norway between 2010 and 2011 is not known.

[5] European Environment Information and Observation Network

As can be seen in the figure, there is a lot of missing data. No data are available for Belgium. There is only one year provided for Germany. Only two years are available for Denmark, the Netherlands and France. Discontinuous data are available for Sweden. EIONET provides three years of data for the UK however, such data in the UK is collected by two separate agencies: the Environment Agency for England and the SEPA for Scotland. Some data were provided by the Environment Agency for England, but this only represented those rivers in the North East and Anglian regions of the country, not the southern regions and therefore this data has not been included. Additional data were provided by the Environment Agency at a later date, however, this was after the analysis had been completed and so this data was not included. Data extent is best represented for Scotland (2002-2014) and Norway (2002-2013). However, the large difference in flow from the 2002-2010 period and the 2011-2013 period raises concern regarding the quality of the data provided.

This project has presented this data but did not calculate the statistics. It is presumed that the values are calculated by the data owners.

The Norwegian Water Resources and Energy Directorate (NVE) provided discharge data on request. This is presented in Figure 6.3. Data are provided on a monthly basis from 1970 to 2014. The data appears to be for all of the fjords that run along the coastline of Norway, however no metadata was provided with the data. Total average, minimum and maximum values were calculated from the data received. The project also received average, minimum and maximum values calculated by NVE for each of the locations. Information within the calculations provided indicates that more data (on at least a daily basis) exists, but was not provided to the project.

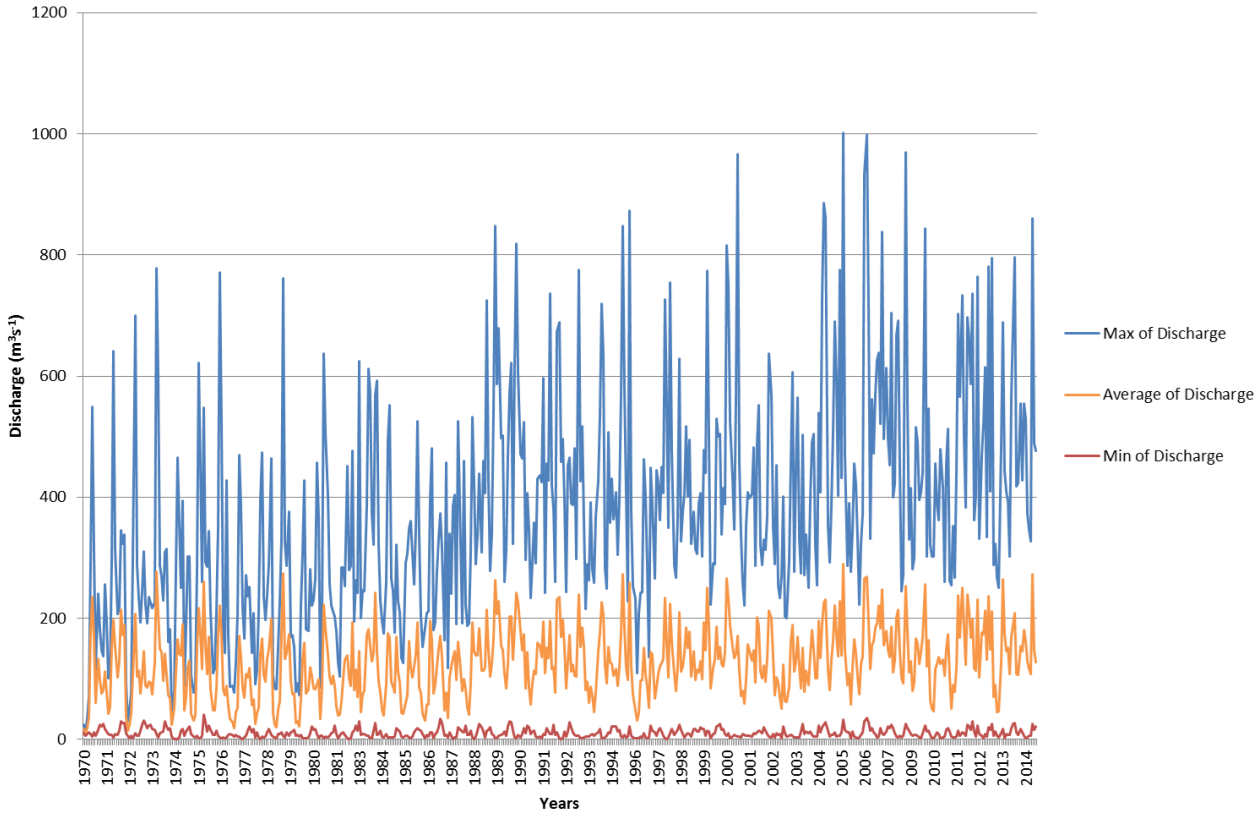

Figure 6.3: Norwegian coastline discharge time series data

Source: Norwegian Water Resources and Energy Directorate

It is important to note that Figure 6.3 does not show the large jump in discharge that is presented in Figure 6.2 for Norway. The reason for this is unclear and this reduces the confidence that can be held in the data held by EIONET for Norway.

Secondly, we consider data on total volume. Figure 6.4 presents some of the most comprehensive data that were available on flow into the North Sea: the maximum, mean and minimum monthly volume from rivers in Germany and the Netherlands to the North Sea, 1977-2012. The data in Figure 6.4 was compiled by Radach and Pätsch (2007) for rivers in Germany and the Netherlands only. The data are freely available to download and compiles all the available, daily discharge data for major rivers, from 1977 onwards. In addition to the daily data, the authors also calculate monthly and annual volume data. Whilst there are a few gaps in the data, most years are available. The daily data are provided in cubic metres per second, however, the monthly data quotes the units to be "m^3/a". It isn't possible for this data to be a 'per annum' figure as values for each month per year are provided, it is assumed that it is actually a monthly sum of volume instead, but this is not confirmed in the metadata.

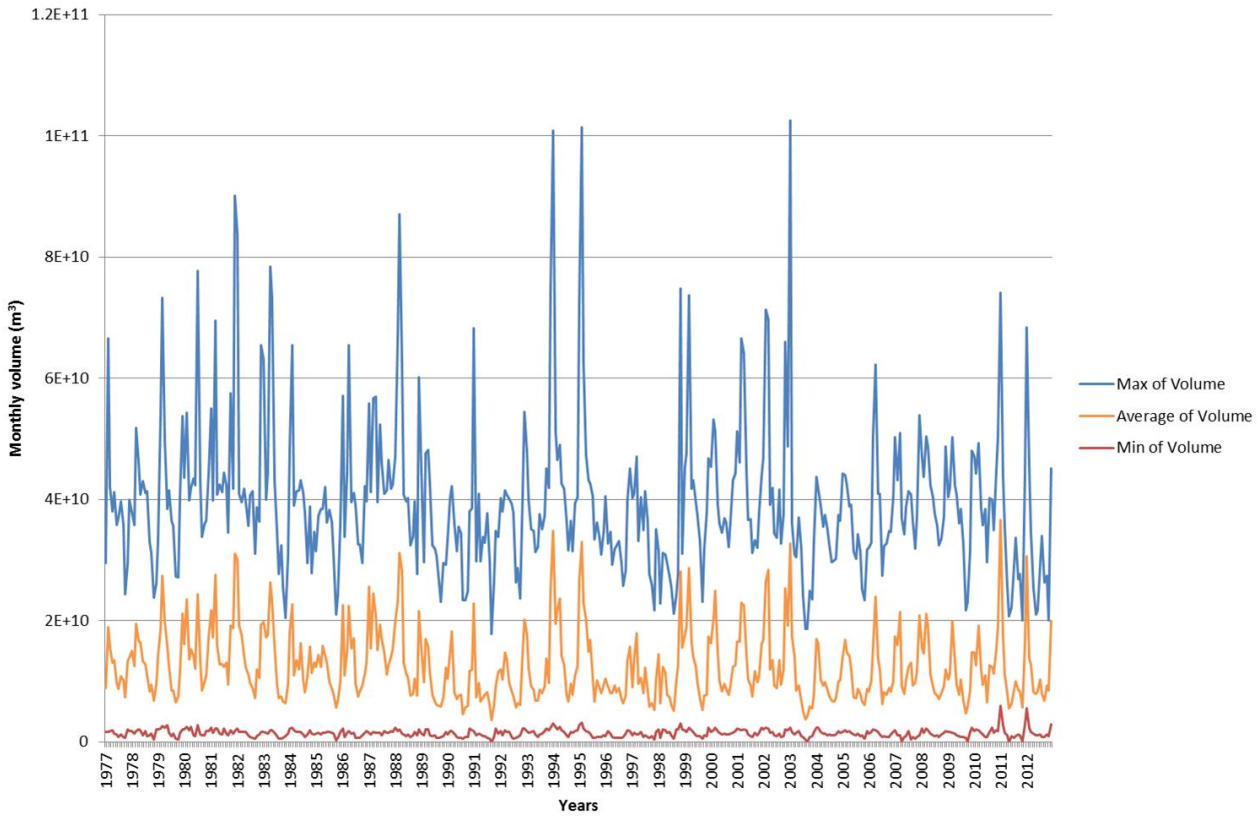

Figure 6.4: Average, maximum and minimum monthly volume for rivers from Germany and the Netherlands into the North Sea, 1977-2012.

Source: Obtained from Radach and Pätsch: https://wiki.zmaw.de/ifm/ECOHAM/DATA_RIVER

Although Figure 6.4 presents the monthly volume figures calculated by Radach and Pätsch (2007), the data provided by this team does include daily discharge data. The higher resolution, daily discharge data maybe more suitable for certain types of analysis that need to consider the range and variability of flows.

Sediment

Figure 6.5 shows the upper, mean and lower values of Suspended Particulate Matter (SPM) loads of rivers into the North Sea. The data were also obtained from EIONET's ROD.

Figure 6.5: Suspended Particulate Matter (SPM), as reported to OSPAR, of rivers into the North Sea

Source: *http://rod.eionet.europa.eu/*

As can be seen in the figure, there are a lot of missing data. No data are available for Belgium. Only two years are available for Denmark, Germany and the Netherlands. There are three years of data for France and the UK. The longest dataset is for Norway (2002-2013). For Norway and France, there is almost no difference between the upper and the lower values. In the case of Norway, both the upper and lower values are practically equal to the mean.

This project has presented this data but did not calculate the statistics. It is presumed that the values are calculated by the data owners.

Total nitrogen

Figure 6.6 shows the upper, mean and lower values of total Nitrogen (kt/a) loads of rivers into the North Sea. The data were also obtained from EIONET's ROD.

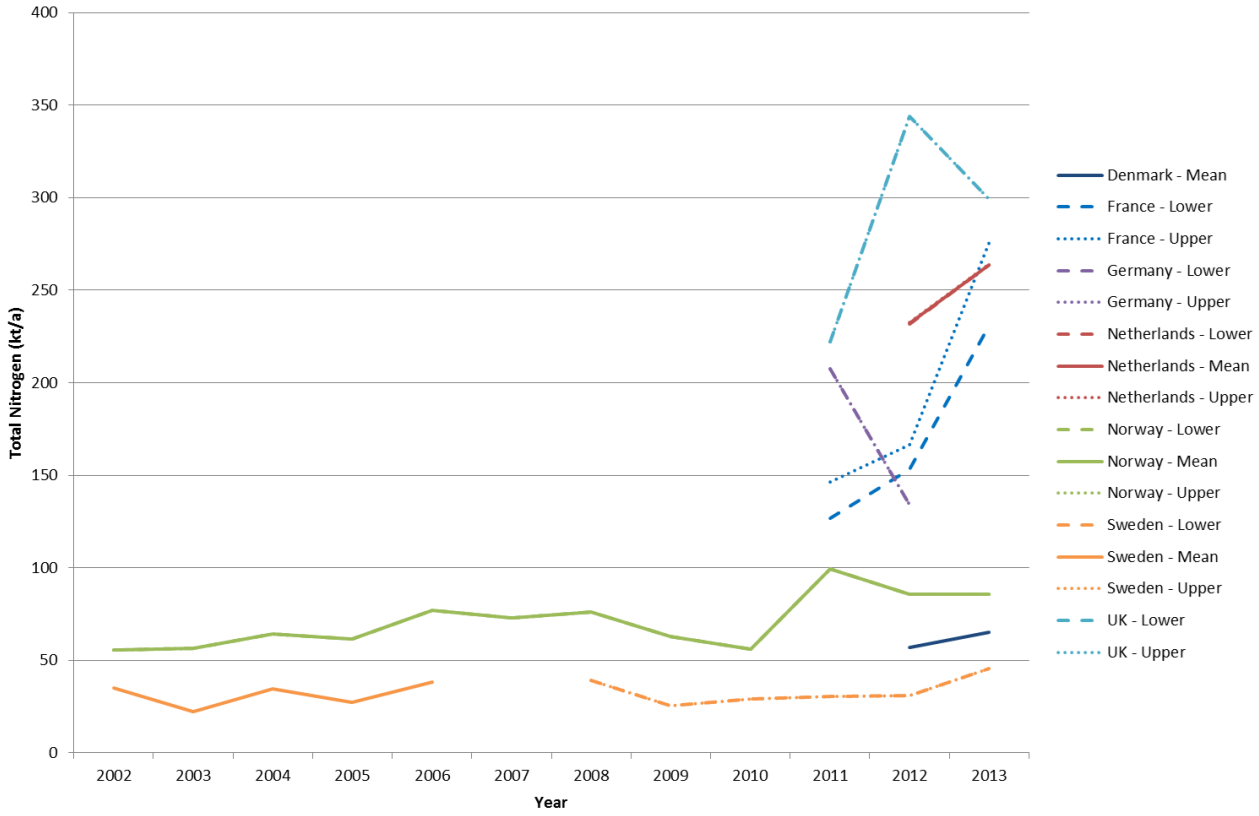

Figure 6.6: Total Nitrogen (kt/a), as reported to OSPAR, of rivers into the North Sea

Source: *http://rod.eionet.europa.eu/*

As can be seen in the figure, there are a lot of missing data. No data are available for Belgium. Only two years are available for Denmark, Germany and the Netherlands. There are three years of data for France and the UK. Discontinuous data are available for Sweden between 2002 and 2013. The longest dataset is for Norway (2002-2013). For Germany, the UK, Sweden and Norway there is almost no difference between the upper and the lower values. In the case of Norway, both the upper and lower values are practically equal to the mean.

This project has presented this data but did not calculate the statistics. It is presumed that the values are calculated by the data owners.

Figure 6.7 presents some of the most comprehensive data that were available on Total Nitrogen loads into the North Sea; the maximum, mean and minimum monthly Total Nitrogen in rivers in Germany and the Netherlands to the North Sea, 1977-2012. The data in Figure 6.7 were compiled by Radach and Pätsch (2007) for rivers in Germany and the Netherlands only. The data are freely available to download and compiles all the available, daily data for major rivers, from 1977 onwards. In addition to the daily data, the authors also calculate monthly and annual data. Whilst there are a few gaps in the data, most years are available.

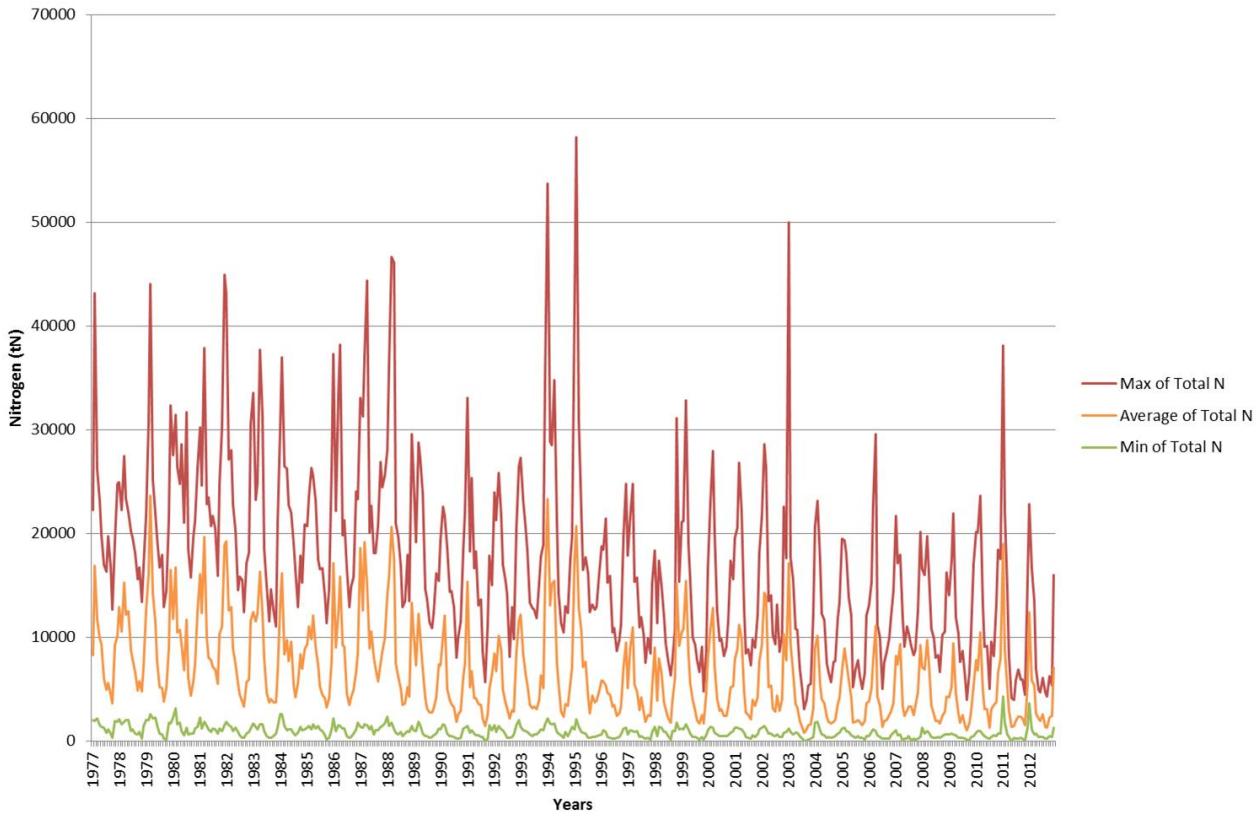

Figure 6.7: Average, maximum and minimum monthly Total Nitrogen loads for rivers from Germany and the Netherlands into the North Sea, 1977-2012

Source: Obtained from Radach and Pätsch: https://wiki.zmaw.de/ifm/ECOHAM/DATA_RIVER

Radach and Pätsch (2007) also compiled a similar dataset for nitrates, shown in Figure 6.8.

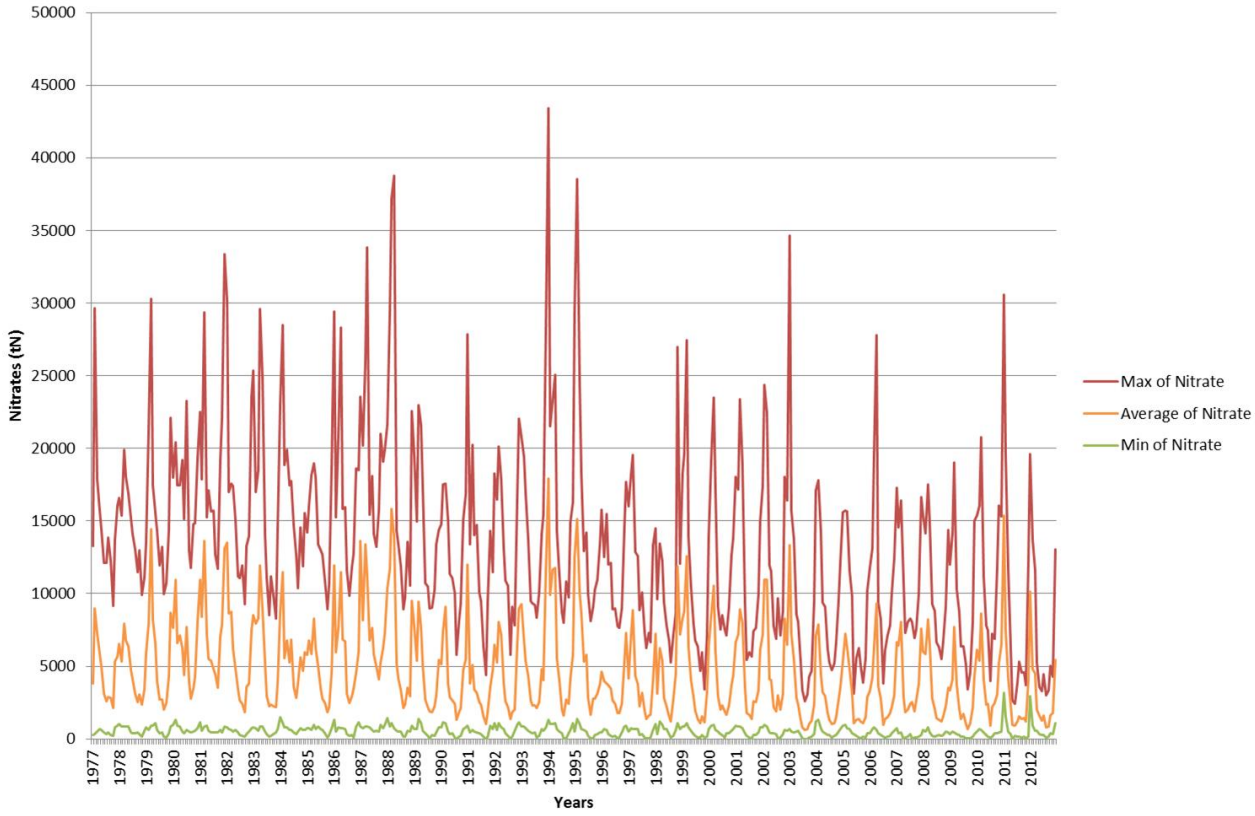

Figure 6.8: Average, maximum and minimum monthly Nitrate loads for rivers from Germany and the Netherlands into the North Sea, 1977-2012

Source: Obtained from Radach and Pätsch: https://wiki.zmaw.de/ifm/ECOHAM/DATA_RIVER

As per the discharge data from Radach and Pätsch, for presentational purposes, the monthly values are presented here. However, the daily data are available for download. Daily data would likely be a much more useful input to any analysis on the environmental impact of such nutrients into the North Sea.

Phosphates

Figure 6.9 shows the upper, mean and lower values of Phosphate (PO4-P) (kt/a) loads of rivers into the North Sea. The data were also obtained from EIONET's ROD.

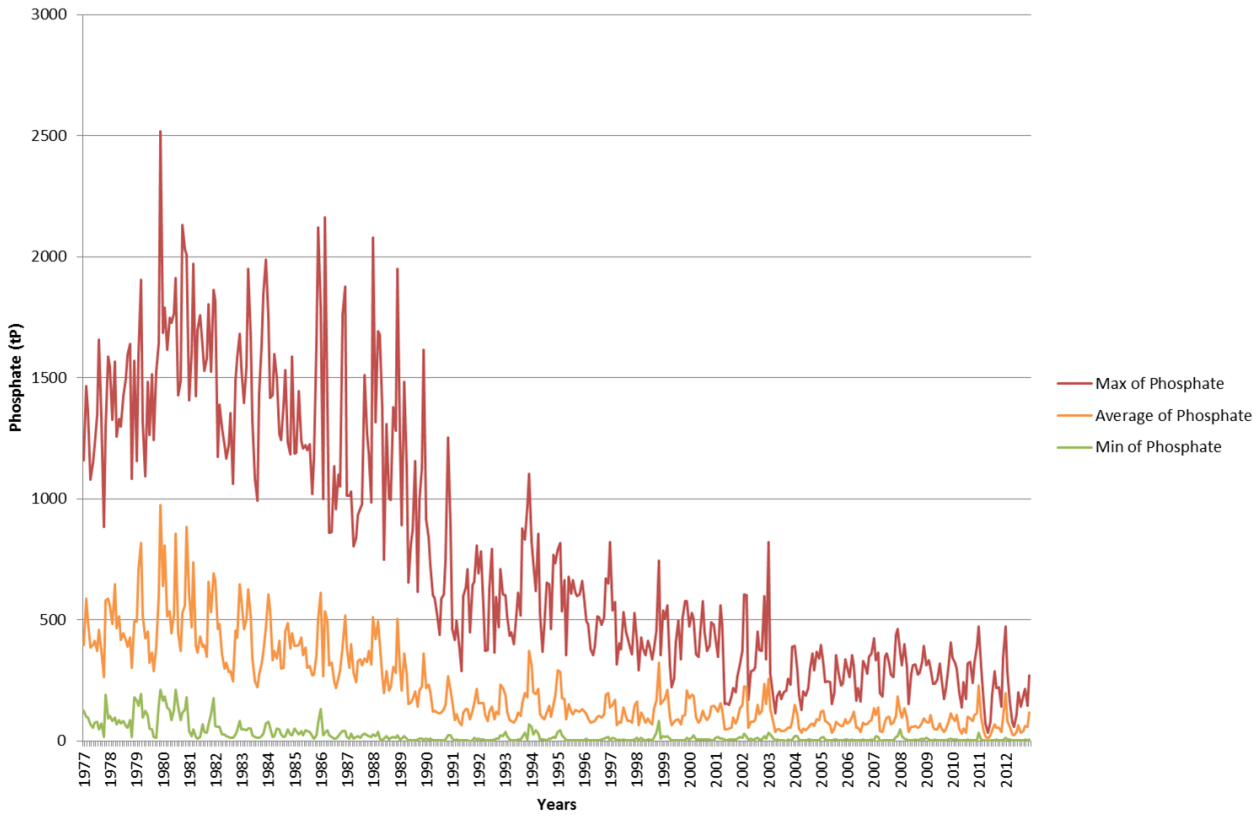

Figure 6.9: Phosphate (PO4-P), as reported to OSPAR, of rivers into the North Sea

Source: *http://rod.eionet.europa.eu/*

As can be seen in the figure, there are a lot of missing data. No data are available for Belgium. Only two years are available for Denmark, Germany and the Netherlands. There are three years of data for France and the UK. Discontinuous data are available for Sweden. The longest dataset is for Norway (2002-2013). For Germany, the UK, Sweden and Norway there are almost no differences between the upper and the lower values. In the case of Norway, both the upper and lower values are practically equal to the mean.

Figure 6.10 shows the upper, mean and lower values of Total Phosphorus (kt/a) loads of rivers into the North Sea. The data was also obtained from EIONET's ROD.

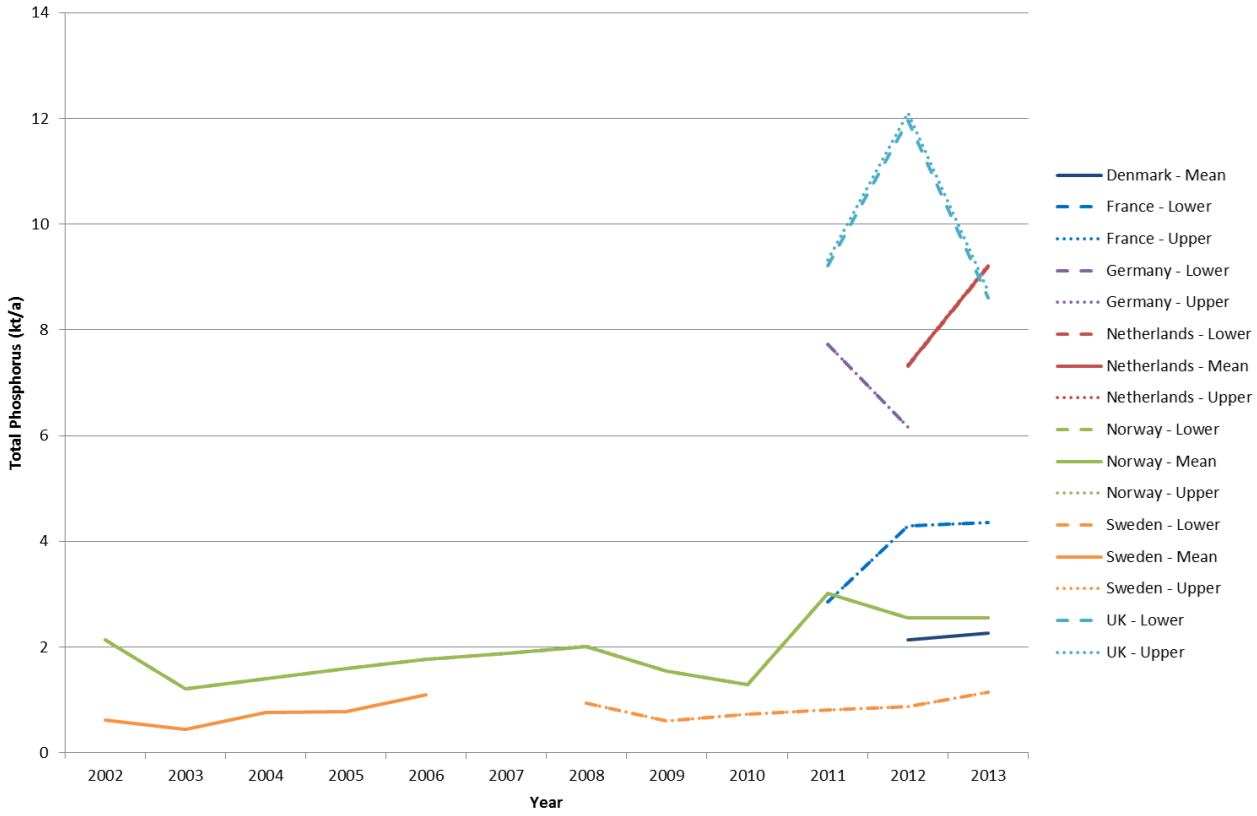

Figure 6.10: Total Phosphorus (kt/a), as reported to OSPAR, of rivers into the North Sea

Source: *http://rod.eionet.europa.eu/*

Similar to all of the other parameters, there are a lot of missing data. No data are available for Belgium. Only two years are available for Denmark, Germany and the Netherlands. There are three years of data for France and the UK. Discontinuous data are available for Sweden. The longest dataset is for Norway (2002-2013). For all countries, except Denmark, there are almost no differences between the upper and the lower values. In the case of Norway and the Netherlands, both the upper and lower values are practically equal to the mean.

As per previous parameters, this project has presented this data but did not calculate the statistics. It is presumed that the values are calculated by the data owners.

Figure 6.11 presents some of the most comprehensive data that was available on Phosphate loads into the North Sea; the maximum, mean and minimum monthly Phosphate amounts in Germany and the Netherlands to the North Sea, 1977-2012. The data in Figure 6.11 were compiled by Radach and Pätsch (2007) for rivers in Germany and the Netherlands only. The data are freely available to download and compiles all the available, daily data for major rivers, from 1977 onwards. In addition to the daily data, the authors also calculate monthly and annual data. Whilst there are a few gaps in the data, most years are available. As per previous parameters, the higher resolution of this time series provides more potential for use in assessing the impact of the parameters on the North Sea.

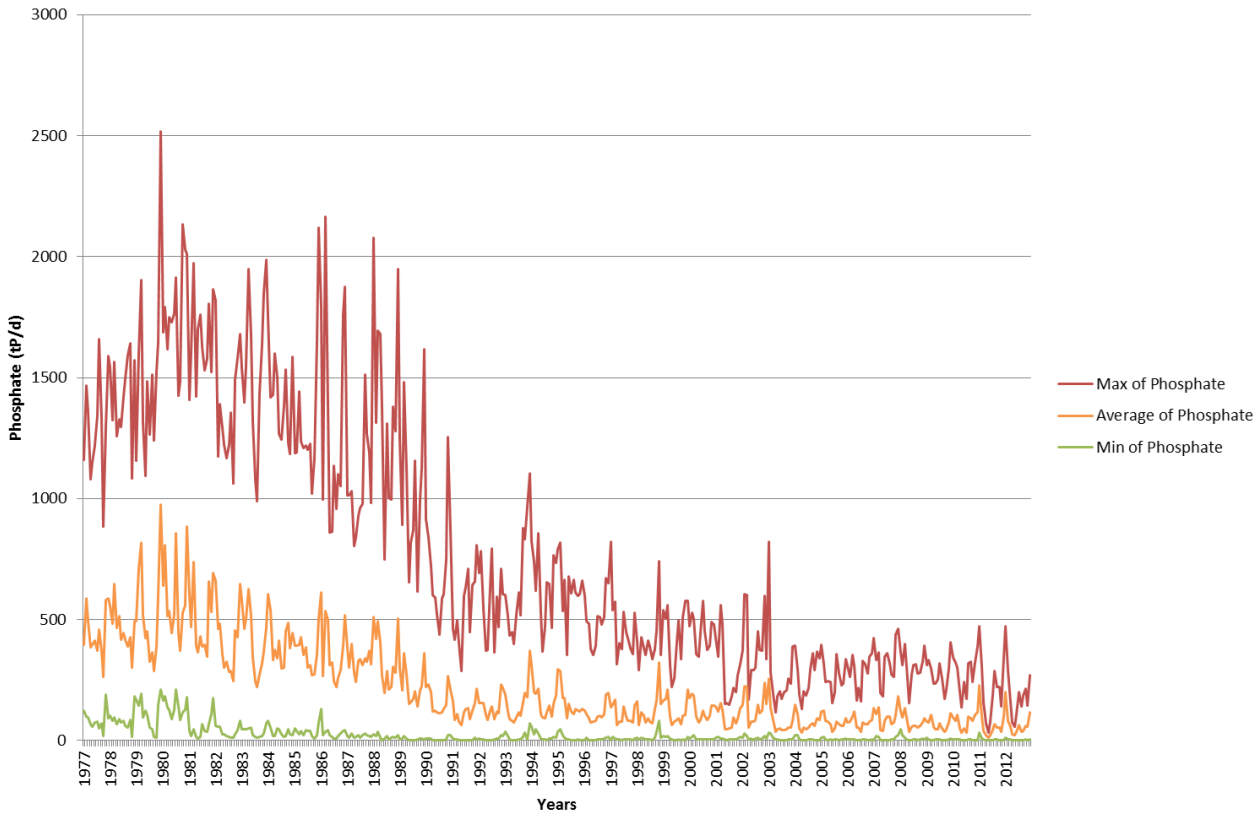

Figure 6.11: Average, maximum and minimum monthly Phosphate loads for rivers from Germany and the Netherlands into the North Sea, 1977-2012

Source: Obtained from Radach and Pätsch: https://wiki.zmaw.de/ifm/ECOHAM/DATA_RIVER

Fish

Figure 6.12 shows all the raw salmon and eel count data that have been obtained for transitional waters that enter the North Sea. Data were only accessed for England, from the Environment Agency.

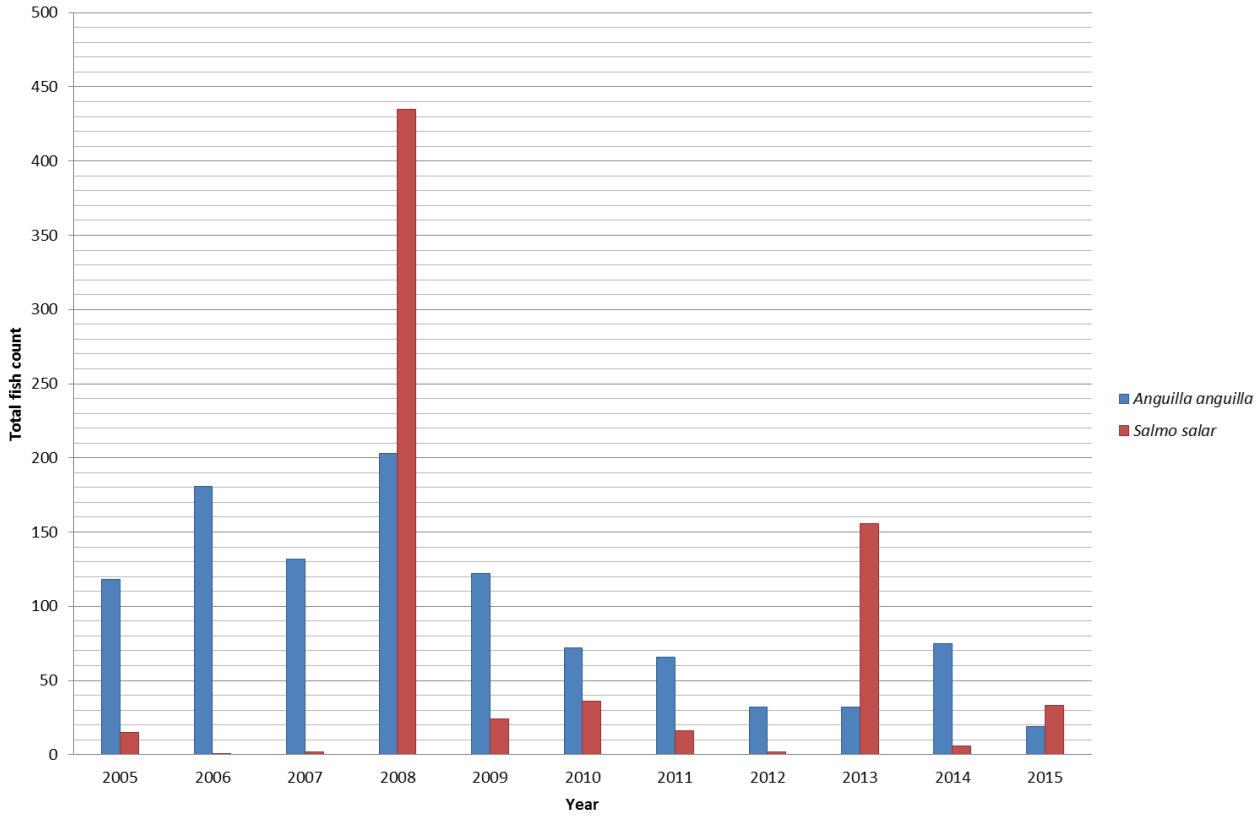

Figure 6.12: Salmon and Eel count data for transitional waters in England.

Source: Contains Environment Agency information © Environment Agency and database right

Counts are made up to twice a year from 35 waterbodies (and 126 locations) in England. The range of years surveyed is from 2005 to 2015, but not every site is surveyed every year. There are 392 data points provided but there is no information on the areas sampled or the number of samples undertaken for any single site. Therefore it is not possible to make estimates of fish per area or catch per unit effort. Furthermore, there are 126 survey sites sampled over 35 waterbodies and 10 year period. To detect changes over time, it is necessary for the same sites to be sampled multiple times. As a result this dataset is not sufficient to make estimates of adult salmon numbers entering the rivers, or of smolt output to the sea; similarly it would not be possible to accurately estimate eel escapement to the North Sea with the eel data collected from these surveys.

6.1.3. Outcome

The method used to assess the inputs from rivers flowing into the North Sea basin is relatively simple in concept. The method relies upon the measurement of a selection of parameters over time and uses such measurements to build a time series of inputs. Such information could then be used as input information to further assess the influence of such parameters on the marine environment.

Unfortunately, with the exception of inputs from Germany, the Netherlands and Norway, it has not been possible to present detailed minimum, mean and maximum values for the variables included in this

assessment. For reasons that will be discussed in Section 6.2, there is low confidence in the data that has been obtained.

6.2. Data Adequacy

This section describes the adequacy of the data obtained to deliver the challenge. Data adequacy is reported under the six value assessments used for screening the data:

1. **Contribution:** An evaluation of whether the dataset parameters are useful for solving the challenge.
2. **Location:** An evaluation of whether the temporal and spatial location of the datasets are relevant to solving the challenge.
3. **Commercial:** An evaluation of whether the commercial terms (e.g. prices, licences) are compatible for solving the challenge.
4. **Attributes:** An evaluation of whether the accuracy, precision and resolution etc. of the data are sufficient to solve the challenge. Note temporal and spatial coverage is dealt with in Location.
5. **Delivery:** A record of whether the data can be obtained in time to solve the challenge.
6. **Usability:** An evaluation of whether the data format and supporting information (i.e. the metadata) are suitable for solving the challenge.

For information, the data requirements for this challenge can be split into two main elements:

- Biological inputs i.e. fish population;
- Physico-chemical inputs i.e. discharge, sediment, nitrates, phosphates.

The data requirements are split this way based upon the potential sources of the data. The biological inputs are generally measured by and/or the records are held by different organisations compared to the physico-chemical inputs. As a result, the two types of data are discussed separately.

6.2.1. Contribution – Does the data contain the right parameters?

Biological inputs

In order to contribute to this challenge, biological input data needs to contain parameters that record the species of fish and the number of individuals in the sample. Atlantic salmon (*Salmo salar*) and European eel (*Anguilla anguilla*) were the species of interest for this challenge.

This challenge aims to understand the inputs from rivers. In terms of fish, this would mean the exchange of fish between the river and the sea. Both salmon and eel have complex lifecycles in which different life stages occur in freshwaters versus marine waters. The smolt (young) salmon and silver (adult) eel leave the rivers to the sea and the adult salmon and glass (very young) eels return.

Historical fish observation information was found for the Netherlands and Russia through EMODnet. However, the data does not contain specifies abundance information or data for the time period required.

HELCOM provide data online for both salmon and eel, either in terms of presence/absence data or in terms of a relative score for a river (red, yellow and green) based upon its potential production capacity. Neither type of data are suitable for this challenge. The parameters contained within the data do not allow populations of a particular species at a point in time to be measured. Furthermore, a measure of any fluctuations in populations over time cannot be made.

The NBN gateway in the UK holds similar presence/absence data for both salmon and eels, for the last couple of centuries in UK rivers, but unfortunately abundance data are not available through this platform. Therefore, these data suffer from the same draw-back as the HELCOM data.

The International Council for the Exploration of the Sea (ICES) hold abundance data for the Order, Anguilliformes in the North Sea itself, but data are not available for salmon or the European eel specifically.

The Environment Agency for England does hold abundance data for fish caught in coastal and transitional waters. Salmon and European eels are included in this dataset along with information on the location of the catch and the waterbodies that the catches may be applied to. However, there is no information on the areas or time that sampling took place, making catch per unit effort and therefore the population numbers impossible to estimate accurately.

Physico-chemical inputs

For the countries of Northern Europe, that boarder the North Sea basin, management of rivers is generally high on the environmental agenda. It is presumed therefore that the data required for this challenge do exist and it is simply a question of finding them. There are a number of datasets that are seemingly useful to address this challenge. However, on closer inspection, the datasets that are publicly available for download, via various portals and government websites, do not necessarily provide the information necessary to compile detailed time series data. For example:

- Waterbase, the generic name given to the EEA databases on the status and quality of Europe's rivers, lakes, groundwater bodies and transitional, coastal and marine waters, should provide data on direct discharges and riverine input loads. The Waterbase dataset for rivers contains data on nutrients, organic matter, hazardous substances and other chemical determinands in water, proxy pressure data on the upstream catchments, physical characteristics of the WISE-SoE river monitoring stations and biological quality elements (BQEs) phytobenthos and macroinvertebrates from WISE-SoE river monitoring stations. Data in Waterbase are only sub-samples of national data, assembled for the purpose of providing comparable indicators of pressures, state and impact on waters at a Europe-wide scale. The datasets are not intended for assessing compliance with any European Directive or any other legal instrument. The data does not, therefore, contain the information useful to addressing this challenge, however, its existence suggests that such data should be available from national agencies at least.
- Inspection of the Waterbase water quantity data shows that it contains information on flow and would therefore be useful in addressing this challenge with respect to water inputs. However, the location and usability characteristics of this dataset meant that it could not be used, (see Section 6.2.2 and 6.2.6 for more information).
- The description of the EEA's Sediment Discharges data suggests that the data would be very suitable for use in this challenge: Total Suspended Solid (TSS) delivery downstream within the sea. However, the link online to the metadata for this dataset did not work properly and therefore, it was not possible to ascertain whether the data were useful for the challenge or not because detailed metadata were not available.
- The European Catchments and Rivers Network System (ECRINS) data, is the hydrographical system currently in use at the European Environment Agency (EEA) as well as widely serving as the reference system for the Water Information System for Europe (WISE). Input information is not provided as part of this dataset but this information could potentially be useful to help solve this challenge to improve the location quality of another, compatible, dataset on river inputs.

The data used to address the challenge has been compiled primarily from data submitted to the OSPAR convention. Whilst in principle, this should provide the input information required, in reality, many years of data are missing from the datasets available for download. Furthermore, inconsistencies in the data presented reduces confidence in the outputs, for example, upper and lower annual values are often the same, or very similar. This suggests that these values are actually a mean, but there is little metadata provided, so this cannot be confirmed. Whilst this data is broadly suitable for presenting a time series, the lack of raw data means that any additional analysis, to help determine potential environmental impact on the North Sea, could not be calculated from this information.

More detailed data were obtained for Germany and the Netherlands, compiled by researchers from Hamburg University, Radach and Pätsch. Radach and Pätsch provide daily, monthly and annual data, including means, maximum and minimum values of discharge, total nitrogen, nitrates and total phosphorus among other variables. Data are provided for major rivers only but covers the years 1977 to 2012. There is some inconsistency in the units provided between the metadata and the data itself, which makes the information difficult to interpret. However, this is by far the most detailed information that has been found.

Additionally, monthly data from 1977-2014 was provided for Norway by NVE. NVE also provided some calculations of average, maximum and minimum discharge. Unfortunately, the values did not match values calculated from the data provided. Based upon the number of data points provided, it is assumed that NVE hold more data on discharge than was provided to the project and that therefore this was the cause of the mismatch in the calculated values.

6.2.2. Location – Does the data cover the correct time / space location?

Biological inputs

In order to evaluate river inputs of fish, the fish need to be monitored in the right locations (and preferably during the migration of each species), to enable an estimate of the number moving from river to sea to be estimated. The fish data held by HELCOM applies to rivers, but are not specific in terms of location near the mouth of the river, nor in terms of multiple samples over time. Additionally, HELCOM only covers nations around the Baltic Sea.

Data held by the NBN Gateway or the Environment Agency for England are restricted to English rivers only. The overall length of time covered by each data set are suitable for the challenge. However, the replicates for each site within the Environment Agency data are too few and the area sampled is not known which means that estimating total population is not possible.

Historical fish observation information found for the Netherlands and Russia through EMODnet. The data for the Netherlands were from 1888 and 1897. The data from Russia were from 1615-1937. As a result, both datasets are not useable for the challenge. Atlantic salmon tagging data is also available through EMODnet. However, it was only available for County Mayo in Ireland, outside the study area.

Physico-chemical inputs

Similar to fish data, the location of river inputs sampling is critical. The parameters must provide information on the inputs directly from rivers, excluding any other input sources in the sea. Therefore, the data must be obtained from river gauges rather than those in the sea. As a result, the data held by EMODnet is unsuitable to support this challenge as the data are with respect to sea measurements rather than in rivers.

The various Waterbase data are available for download and should be georeferenced. However, metadata information on the projection used in geo-referencing the information is absent. Despite trialling a number of

commonly used coordinate systems, it was not possible to correctly present the information and therefore, it was not possible to isolate those data that input to the North Sea only. Furthermore, a time series per location is not available. These two factors render this data unusable for this challenge.

Fortunately, a fully georeferenced spatial presentation of data was not imperative for this challenge. Data was available on discharge, total nitrogen, total phosphorus and sediment inputs for every country that has rivers that feed into the North Sea, except for Belgium. Therefore, whilst the specific location of the data points is unknown, the data obtained and used for the challenge are suitable in terms of being relevant to the correct geographic area.

Obtaining a time series of the data in question was significantly more challenging. Data from the early 2000s is available for Norway and to an extent, for Sweden, from the EIONET datasets for the OSPAR convention. Unfortunately, the quality of these datasets is questionable, see Section 6.1.2 for more information. Data for Scotland is available directly from SEPA from 2002-2014. Data extending back to 1970 is available for the Netherlands and for Germany from Radach and Pätsch's research; and, for Norway from NVE. For other countries, there are mostly less than three years of data available. There may be significant variability in the discharge of major rivers in Northern Europe. Having data only from a very short period of time means that it is very difficult to accurately identify any trends in any of the parameters measured.

6.2.3. Commercial – Are the commercial terms acceptable?

Biological inputs

The commercial terms for all of the data found were acceptable. The data found for England were available via the Environment Agency of England, for free and under a non-commercial licence. For other countries however, the source of data has not been found in a reasonable period of time (~10 months).

Physico-chemical inputs

The commercial terms for addressing the challenge were acceptable in so far as the majority of data were free and available for download online or via requests to the relevant data provider. However, the data obtained and used are unlikely to be useful for detailed analysis of river inputs to the North Sea because the resolution of the data is too coarse (see Section 6.2.4).

In a couple of instances, data required payment for handling (e.g. the Centre for Ecology and Hydrology National River Flow Archive). One dataset had a complex data request process: river discharge time series for gauging stations across the world can be requested from an archive currently managed by the Global Runoff Data Centre (GRDC). Large data requests, such as for a whole sea basin, may require agreement for collaboration and results sharing, determined on a case-by-case basis. A handling charge for data extraction may also be applied and other conditions related to storage and security may also apply. Commercial use of the data and redistribution are also not permitted.

Contacting multiple agencies across multiple countries to obtain raw data has proven to be time consuming and ineffective; some national agencies did not respond to our requests for data; others responded slowly or did not fully complete the request in the time available (~10 months). The time and resources that would be required to ascertain the existence of raw data at a suitably fine resolution is considerable and the commercial terms of this raw data are unknown.

6.2.4. Attributes – Does the data have the correct attributes?

Biological inputs

With the exception of data for England, no data has been found for fish abundance. Most data available, such as through HELCOM or the NBN Gateway, only provide presence/absence data. Whilst some HELCOM datasets apparently provide population data, the values appear too small to be of actual fish communities. In terms of calculating the inputs of fish, of either species, into the North Sea, presence/absence data is not sufficient to estimate the inputs.

The areas surveyed are also unknown in any of the datasets. The area survey or the length of time of a transect during a survey is needed in order to help calculate catch per unit effort information and aid extrapolation to estimate population numbers.

Physico-chemical inputs

With the exception of data from NVE and from Radach and Pätsch, most data were too coarse for detailed analysis. Whilst it is possible to present annual data in a time series to address this challenge, the data would be of little use for further analysis into the inputs to the North Sea.

Furthermore, accuracy of the data obtained were difficult to ascertain. Inconsistencies in units used between the data and the metadata; similarities in the upper and lower values in a dataset; and extreme and unexplained changes in data from one time period to another all reduce the confidence in the datasets presented.

6.2.5. Delivery - Can the data be provided to match the timeframe of the challenge?

Biological inputs

Obtaining data on salmon and eel was particularly challenging. The only datasets available online provide information on the presence/absence of the species, but no detail on the population numbers from any date. On request, the Environment Agency of England was able to provide a dataset including population numbers.

Despite the importance of the Salmon industry in a number of Northern European countries, no data have been found or provided. For example, Norway is the world's leading producer of Atlantic salmon and the second largest seafood exporter in the world (Fisheries.no, 2014). Similarly, aquaculture is also an important industry in Scotland, particularly of Atlantic salmon. Scotland and Norway agreed a Memorandum of Understanding on co-operation and best practice in Aquaculture in 2009 (Scottish Government, 2016) because of the key importance of this industry to these countries. Despite this, the organisations contacted did not appear to be clear on which organisation would maintain information on salmon and eel.

Physico-chemical inputs

The fact that some mean data has been provided for the OSPAR convention by the majority of the countries that have rivers that input into the North Sea basin implies that more detailed data is held by the Government Agencies of those nations. As a result of this, this project attempted to identify and contact the likely data owners in each nation. The project used the contact methods advised on each organisation's website. However, only five out of the nine countries (for the UK, English and Scottish agencies were contacted separately) responded to the data request at all. The response from some of the agencies was very slow and in some cases it was difficult to ensure that the respondents understood the request being made,

including where the potential language barrier could not have been an issue. Another agency responded initially, asking for clarification which was provided but has since not returned any communication. Access to data was provided by a few agencies, however, it was not always possible to understand or access data *en-masse* when provided via an online portal, such as data from SMHI. Often it was necessary to download data per catchment or per gauging station (e.g. Centre for Ecology and Hydrology National River Flow Archive) which, is a very time-consuming task when compiling all data for the North Sea Basin.

Contacting multiple agencies across multiple countries to obtain raw data has proven to be time consuming and ineffective; some national agencies did not respond to our requests for data; others responded slowly or did not fully complete the request in the time available (~10 months). The time and resources that would be required to ascertain the existence of raw data at a suitably fine resolution is considerable. This difficulty in obtaining data would place undue time pressure on a research team and draw, often scant, time away from the analysis they were attempting to implement.

6.2.6. Usability – Is the data format and supporting information suitable?

Biological inputs

The format of the data supplied by the Environment Agency on salmon and European eel is logically laid out and easy to use. However, for the reasons described in the previous sections, it is still not possible to calculate fish inputs from the information provided.

Physico-chemical inputs

The majority of data was available as csv, ASCII or xlsx files. The data collected were mostly provided in a suitable and logical layout for use. The following usability issues were identified in some datasets and have been discussed in the previous sections:

- Unknown co-ordinate systems mean that spatial data cannot be used (e.g. Waterbase data);
- Broken links to the metadata of some data meant that the information was difficult to understand (e.g. EEA's Sediment Discharges data);
- Inconsistent use of location information between datasets meant that it was not possible to work out whether two datasets from the same country were duplicated or not (e.g. OSPAR data and NVE data for Norway); and,
- Links to online portals containing data allowed individual gauged data to be downloaded, but did not allow data to be downloaded *en-masse* (e.g. Centre for Ecology and Hydrology National River Flow Archive).

6.3. Key data gaps

The key data gaps are listed below:

- **Fish population data:** It was not possible to obtain any data on fish populations other than from England. Data that has been obtained would be of limited use to estimating populations numbers as the density or catch per unit effort cannot be calculated from the data provided.
- **Daily data:** The majority of the data obtained was only available as an annual amount. Whilst this is reasonable for presentational purposes, it would not be sufficient for undertaking further analysis on the riverine inputs to the North Sea where information on extremes and variability in flows, nutrient and

sediment loads, and fish is more useful for understand ecosystem dynamics and the potential impacts of such changes on the environment.

- **Temporal coverage:** Few countries made data available prior to 2010. It is to be expected that riverine inputs would fluctuate over time. A minimum of 10 years would be required for analysis, preferably longer.

With the exception of the Netherlands and Germany, it is anticipated that data should exist, held by relevant government agencies for some, if not all, nations in finer temporal detail and over a longer time period than has been obtained for this challenge. This assumption is based upon the knowledge and experience of the author; having either worked with or seen presentations of similar works given by representative researchers of some of the countries in question. Thus, the gap is generally considered to be in obtaining the data from the sources, rather than a requirement to measure such information in the first place.

The position with respect to the fish population data is less clear. It is not known if there is abundance data available in all the relevant countries, although it is expected in at least some countries, salmon would be monitored due to the importance of the aquaculture industry, although not necessarily by Government Agencies and therefore potentially not available under satisfactory terms.

7. Discussion and Conclusions

The data requirements for this challenge can be split into two main elements:

- Biological inputs i.e. fish population;
- Physico-chemical inputs i.e. discharge, sediment, nitrates, phosphates.

The data requirements were split this way based upon the potential sources of the data. The biological inputs are generally measured by and/or the records are held by different organisations compared to the physico-chemical inputs.

7.1. Biological river inputs

Obtaining data on the biological inputs has been very difficult. Only the Environment Agency in England was able to offer any data on fish populations. There are geo-referenced data on presence/absence of certain fish species available at a European scale. However, it is not possible to convert this into information on the abundance of a species. Even where abundance data is available, multiple replicates at the same location and information on the area surveyed or survey time is required in order to convert the samples into population estimates.

As a result, it has not been possible to make an estimate of biological inputs into the North Sea basin under this challenge.

7.2. Physico-chemical inputs

Obtaining data on the physico-chemical inputs that would be suitable for the challenge analyses was also difficult. However, it is known, by the authors of this report, that many, if not all, of the northern European countries in question do hold some detailed survey information on the largest rivers in their countries. In particular, flow records for major rivers into the North Sea are expected to exist for all countries. Common difficulties in gaining access to the required data were:

1. **The data was only available as a calculated annual figure, not as raw data.** Whilst this can be used to present summary information, it would be of little utility when trying to undertake more detailed analyses on the inputs into the North Sea.
2. **Detailed data was available but had to be downloaded one survey site at a time.** Whilst this is suitable for 'case study' style analysis, it is excessively time consuming for large scale analyses.
3. **Not enough historic data was available.** A good historic record is required in order to analyse trends. Both hydrological, chemical and biological data can fluctuate greatly on an annual basis. Much of the data found was only available for three years or so, which is not enough to define a trend with any confidence.
4. **Metadata is variable in quality and often difficult for a user to fully understand:** Few datasets are presented with detailed, user-friendly and accurate metadata information. Metadata is crucial for understanding how the data should and should not be used. For example, units must be accurate, projection information is required for spatial data and population estimates cannot be made from species counts alone.

As a result, data available for download from online sources met many of the adequacy requirements to present the data for this report, however, the data would be otherwise unsuitable for detailed analyses of river inputs.

8. References

EEA (2004) Indicator fact sheet: (WEU7) Source apportionment and loads (riverine and direct) of nutrients to coastal waters. Authors: Gunni Ærtebjerg (NERI) and Steve Nixon (WRc).

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Pätsch, J. and Lenhart, H.-J. 2004. Daily Loads of Nutrients, Total Alkalinity, Dissolved Inorganic Carbon and Dissolved Organic Carbon of the European Continental Rivers for the Years 1977-2002. Hamburg, Institut für Meereskunde. Report number: 48.

Radach and Pätsch (2007) Variability of Continental Riverine Freshwater and Nutrient Inputs into the North Sea for the Years 1977–2000 and its Consequences for the Assessment of Eutrophication. *Estuaries and Coasts*. Vol. 30, No. 1, p.66-81.

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Skogen, M.D. and Søiland, H. (2002) Availability of river discharges and river nutrient loads to the North Sea. *Institute of Marine Research, Norway*. Online: http://www.imr.no/nb-no [Accessed: 20/04/2015].

Appendices

A. Data register

A copy of the data register is provided below:

NSC-007-Rive				
Data Set / Source	**Consideration**	**ValueCriteria**	**VCFlag**	**ValueCriteriaReason**
DT-NS701-Waterbase-TransitionalCoastalandMarineWaters-Version9	Considered	Contribution	False	More up-to-date data should be available.
NSC-007-Rive		Location	True	All north sea basin countries are included i.e. Belgium, Germany, Denmark, France, United Kingdom, Netherlands, Norway and Sweden.
		Commercial	True	Data freely available online
		Attributes	True	Annual inputs provided over time. The time periods covered are different, depending upon the type of input meaured. This is not the latest version of this dataset.
		Delivery	True	Downloaded as csv files
		Usability	False	Projection used for the location of the gauging stations is unknown and is not provided in the associated metadata (Geographic Coordinate System: GCS_WGS_1984; Datum: D_WGS_1984; Prime Meridian: Greenwich; Angular Unit: Degree using the maximum lat and long co-ordinates might be correct)
DT-NS702-Waterbase-TransitionalCoastalandMarineWaters-Version11	Considered	Contribution	False	The location of the data isn't useable.
NSC-007-Rive		Location	True	All north sea basin countries are included i.e. Belgium, Germany, Denmark, France, United Kingdom, Netherlands, Norway and Sweden.
		Commercial	True	Data freely available online
		Attributes	True	Annual inputs provided over time. The time periods covered are different, depending upon the typoe of input meaured.
		Delivery	True	Downloaded as csv files
		Usability	False	Projection used for the location of the gauging stations is unknown and is not provided in the associated metadata (Geographic Coordinate System: GCS_WGS_1984; Datum: D_WGS_1984; Prime Meridian: Greenwich; Angular Unit: Degree using the maximum lat and long co-ordinates might be correct)
DT-NS703-Waterbase- Rivers-Version14	Considered	Contribution	False	The location of the data isn't useable.
NSC-007-Rive		Location	True	All north sea basin countries are included i.e. Belgium, Germany, Denmark, France, United Kingdom, Netherlands, Norway and Sweden.
		Commercial	True	Data freely available online
		Attributes	True	Annual inputs provided over time. The time periods covered are different, depending upon the typoe of input meaured.
		Delivery	True	Downloaded as csv files
		Usability	False	Projection used for the location of the gauging stations is unknown and is not provided in the associated metadata (Geographic Coordinate System: GCS_WGS_1984; Datum: D_WGS_1984; Prime Meridian: Greenwich; Angular Unit: Degree using the maximum lat and long co-ordinates might be correct)
DT-NS704-EEA-EuropeanCatchmentsandRiversNetworkSystem-Ecrins	Considered	Contribution	True	Whilst the location information provided by ECRINS may be useful to solving the challenge, input information is not provided by this dataset, so it would only serve to improve the location quality of another dataset.
NSC-007-Rive		Location	True	All north sea basin countries are included i.e. Belgium, Germany, Denmark, France, United Kingdom, Netherlands, Norway and Sweden.
		Commercial	True	Data freely available online
		Attributes	False	The European Catchments and Rivers Network System (ECRINS) is the hydrographical system currently in use at the European Environment Agency (EEA) as well as widely serving as the reference system for the Water Information System for Europe (WISE). Input information from rivers to the sea are not provided as part of this dataset
		Delivery	True	Downloaded as mdb files
		Usability	True	Data readily useable in ArcGIS
DT-NS705-EEA-SedimentDischarges	Considered	Contribution	False	The metadata for this dataset doesn't work properly and therefore it is difficult to tell what the data is and whether it is useful.
NSC-007-Rive		Location	True	All north sea basin countries are included i.e. Belgium, Germany, Denmark, France, United Kingdom, Netherlands, Norway and Sweden.
		Commercial	True	Data freely available online
		Attributes	False	Based upon the name of the dataset, this should be useful however, given the comment in 'Contribution' above, it's utility is unknown.
		Delivery	True	Downloaded zip file containing shape files.
		Usability	False	False because of the issue described above with the metadata

DT-NS706-Waterbase-WaterQuantity	nsidered	Contribution	True	Flow is included in the data
NSC-007-Rive		Location	False	The stream flow stations only have data for France, Belgium, the Netherlands and Denmark.
		Commercial	True	Data freely available online
		Attributes	False	Single data points are provided. Different years of data are available but a time series per location isn't available.
		Delivery	True	Downloaded csv files
		Usability	False	Projection used for the location of the stream flow and rain gauge stations is unknown and not in the associated metadata (Geographic Coordinate System: GCS_WGS_1984; Datum: D_WGS_1984; Prime Meridian: Greenwich; Angular Unit: Degree)
DT-NS707-HELCOM-Anguilla_anguilla-PresenceAbsenceData	Considered	Contribution	False	Abundance data not provided
NSC-007-Rive		Location	False	Only for area between Denmark and Sweden
		Commercial	True	Data freely available online
		Attributes	False	Only presence/absence info, not abundance.
		Delivery	True	Downloaded shp files
		Usability	True	Useable format but restricted geographical coverage.
DT-NS708-HELCOM-RedListRivers	Considered	Contribution	False	Abundance data not provided
NSC-007-Rive		Location	False	Only for Denmark, Norway and Sweden
		Commercial	True	Data freely available online
		Attributes	False	No actual data, only categories of a particular smolt production capacity. The red listed rivers presents the rivers with original salmon populations in their native rivers that have salmon smolt production of less than 50% of the potential smolt production capacity.
		Delivery	True	Downloaded shp files
		Usability	True	Suitable format but unsuitable data detail. Inputs / abundance of fish is unknown.
DT-NS709-HELCOM-YellowListRivers	Considered	Contribution	False	Abundance data not provided
NSC-007-Rive		Location	False	Only for Denmark, Norway and Sweden
		Commercial	True	Data freely available online
		Attributes	False	No actual data, only categories of a particular smolt production capacity. The Yellow list consists salmon rivers with smolt production of 50% - 80% of the potential smolt production capacity.
		Delivery	True	Downloaded shp files
		Usability	True	Suitable format but unsuitable data detail. Inputs / abundance of fish is unknown.
DT-NS710-HELCOM-GreenListRivers	Considered	Contribution	False	Abundance data not provided
NSC-007-Rive		Location	False	Only for Denmark, Norway and Sweden
		Commercial	True	Data freely available online
		Attributes	False	No actual data, only categories of a particular smolt production capacity. The Green list rivers have a salmon smolt production of > 80% of the potential smolt production capacity.
		Delivery	True	Downloaded shp files
		Usability	True	Suitable format but unsuitable data detail. Inputs / abundance of fish is unknown.
DT-NS711-HELCOM-Salmo_salar-PresenceAbsenceData	Considered	Contribution	False	Abundance data not provided
NSC-007-Rive		Location	False	Only for area between Denmark and Sweden
		Commercial	True	Data freely available online
		Attributes	False	Only presence/absence info, not abundance.
		Delivery	True	Downloaded shp files
		Usability	True	Suitable format but unsuitable data detail. Inputs / abundance of fish is unknown.
DT-NS712-HELCOM-SalmonRivers	Considered	Contribution	False	Dataset is unclear and difficult to use for this challenge.
NSC-007-Rive		Location	False	Only for Sweden and Denmark
		Commercial	True	Data freely available online
		Attributes	False	Population data is apparently included but the magnitude of population figures is too small to be actual numbers of fish. It is unclear what unit the population data represents.
		Delivery	True	Downloaded shp files
		Usability	False	Metadata infers usefulness in the data but in fact many data points are missing.

DT-NS713-EnvironmentAgenyc-OSPAR-controlled-substances_01092014	Considered	Contribution	True	DT-NS718-EEA-EIONET_Annual-RiverineInputs-and-OSPARDirectDischarges dataset is in an easier to use format and is therefore favoured for use in this challenge.
NSC-007-Rive		Location	True	England only.
		Commercial	True	most datasets that were available,
		Attributes	False	Lots of missing data. Limited time series information. Mostly single years only.
		Delivery	True	Downloaded mdb file
		Usability	True	Small amount of data manipulation in order to ascertain the location of input data is required
DT-NS714-OSPAR_ControlledSubstances_2012	Considered	Contribution	False	This dataset is not readily useable.
NSC-007-Rive		Location	True	Only Netherlands, Belgium, Germany and Denmark for sediment data; Biota data points available for all countries.
		Commercial	True	Data freely available online
		Attributes	True	Majority of points are a single data point. Not possible to obtain a time-series using this information although multiple years are available
		Delivery	True	Downloaded shp and csv files
		Usability	False	It is not obvious how a time-series could be obtained from this information.
DT-NS715-CEH-NationalRiverFlowArchive	Considered	Contribution	True	A disproportionate amount of effort is required to obtain all data using the online portal.
NSC-007-Rive		Location	True	UK only
		Commercial	True	Data freely available online if downloading one gauge at a time. For multiple gauges a request must be submitted to CEH. CEH will charge a handling fee.
		Attributes	True	Suitable for flow inputs only
		Delivery	True	Downloaded csv files
		Usability	False	Each flow gauge must be downloaded individually.
DT-NS717-EURO-FRIEND-Water-Project_RiverFlowArchive	Considered	Contribution	False	The data has not been requested
		Location	True	All north sea basin countries are included i.e. Belgium, Germany, Denmark, France, United Kingdom, Netherlands, Norway and Sweden.
		Commercial	True	Data needs to be requested and authorised by the project coordinator
		Attributes	True	River discharge time series. Time scale of data varies between gauges (up to 200 years for some gauges)
		Delivery	False	The data has not been requested
		Usability	False	The data has not been requested
DT-NS718-EEA-EIONET_Annual-RiverineInputs-and-OSPARDirectDischarges	Used	Contribution	True	Total phospohorus and total nitrogen are provided for OSPAR Convention monitoring
		Location	True	The north sea basin countries included are Germany, Denmark, France, The Netherlands, United Kingdom, Norway and Sweden. The Belgium is not included. Different countries have provided different amounts of information for different years.
		Commercial	True	Data freely available online
		Attributes	True	Total phospohorus and total nitrogen are provided for OSPAR Convention monitoring. Ten years is only available online for Norway and Sweden. All other countries only provide either two or three years' worth of data
		Delivery	True	Downloaded xlsx files
		Usability	True	However, not all years are provided
DT-NS719-NBN-Salmo-salar-PresenceAbsenceData	Considered	Contribution	False	Data unsuitable for challenge because only presence/absence data is available
		Location	False	UK only
		Commercial	True	Data freely available online
		Attributes	False	Only presence/absence, not abundance
		Delivery	True	Downloaded csv files
		Usability	False	Not all relevant countries are included and only presence/absence data
DT-NS720-NBN-Anguilla-anguilla-PresenceAbsenceData	Considered	Contribution	True	Data unsuitable for challenge because only presence/absence data is available
		Location	False	UK only
		Commercial	True	Data freely available online
		Attributes	False	Only presence/absence, not abundance
		Delivery	True	Downloaded csv files
		Usability	False	Not all relevant countries are included and only presence/absence data
DT-NS721-Radach-and-Patsch-Hamburg-Uni-Continental-river-inputs	Used	Contribution	True	Data parameters are suitable for the challenge
		Location	False	This dataset includes Germany and the Netherlands.
		Commercial	True	The location of this data was obtained freely upon request from Hamburg University. The data was downloaded from the recommended site.
		Attributes	True	The temporal resolution of the data is suitable. Data for eight rivers is provided, but the location of the gauging sites is unknown.
		Delivery	True	Downloaded as ASCII files
		Usability	True	This data is logically laid out and suitable for use in this challenge.

DT-NS722-Data-from-Norweigen-Water-Resources-and-Energy-Directorate	Considered	Contribution	True	Data parameters are suitable for the challenge
		Location	False	This dataset is for Norway. The data is provided for coastal areas and not the main rivers provided to OSPAR. It is unclear how these relate to one another.
		Commercial	True	This data was requested from the Norweigen Water Resources and Energy Directorate, who freely supplied the data.
		Attributes	True	Data is provided for mean, max and min values of runoff from coastal areas. Raw data is not provided.
		Delivery	True	Provided by email following data request
		Usability	False	The data requires a little manipulation before use and it is supplied as a text file that is not logically laid out. It is unclear whether the areas are just main rivers or estimates of the catchment run-off.
DT-NS723-EA-Requests-TraC-Abundance-Fish-Catches	Used	Contribution	True	Data parameters are suitable for the challenge
		Location	True	This dataset is for England only.
		Commercial	True	The Environment Agency of England freely supplied this data on request.
		Attributes	True	The raw data has been provided, allowing summary statistics to be calculated.
		Delivery	True	Provided by email following data request
		Usability	True	This data is logically laid out and suitable for use in this challenge.
DT-NS724-Scottish-North-Sea-River-Discharge-Data-2002-2014	Used	Contribution	True	Data parameters are suitable for the challenge
		Location	True	This dataset is for Scotland only. The temporal extent is suitable.
		Commercial	True	Data free and available on request from SEPA
		Attributes	True	Data provides annual means and totals. Maximum and minimum values are not provided
		Delivery	True	Provided by email following data request
		Usability	True	This data is logically laid out and suitable for use in this challenge.
DT-NS725-EMODNET_RAVON(NL)-FishObservationsExtracted-Hoek(1888)andHoek(1897)	NotConsidered	Contribution	False	The data measures sighting of different species. The abundance of each species does not appear to have been recorded.
		Location	False	Latitude and longitude are provided but the observations are only from the Netherlands and assumed to be observations at sea. Other countries are not included. The data is from 1888 and 1897 and therefore is not appropriate to be included.
		Commercial	True	Freely available
		Attributes	False	Location precision is to 100 metres. The number of indidivudals is not included and therefore it is not possible to ascertain abundance
		Delivery	True	Data can be downloaded in a Tab or Excel file.
		Usability	False	The data format would be usable if the other criteria were suitable.
DT-NS726-EMODNET_HMAPDataset09:NorthRussianSalmonCatchData,1615-1937	NotConsidered	Contribution	False	The abundance of each species does not appear to have been recorded.
		Location	False	The location does not include rivers that input to the North Sea
		Commercial	True	Freely available
		Attributes	False	Location precision is unknown. The number of indidivudals is not included and therefore it is not possible to ascertain abundance
		Delivery	True	Data can be downloaded in a Tab or Excel file.
		Usability	False	The data format would be usable if the other criteria were suitable.
DT-NS727-EMODNET_AtlanticSalmonTagging	NotConsidered	Contribution	False	The metadata does not describe the data that is held. Therefore, the potential contribution is unknown
		Location	False	The location does not include rivers that input to the North Sea
		Commercial	False	The availability is restricted.
		Attributes	False	Other attributes are unknown
		Delivery	True	The delivery was not requested because the location is not usable.
		Usability	False	It is not possible to tell if the data format would be usable, the retriction on location means that it could not be used.
DT-NS728-Norwegian-coastline-total-runoff-data	Used	Contribution	True	There is no metadata, but flow is provided simply in m3/s
		Location	True	This discharge data is for Norway, but the location of the different sites is unclear as there is no metadata. It is assumed that all the information provided drains into the North Sea, since this is what was requested and this matches the file naming conventions of the data used.
		Commercial	True	Freely available
		Attributes	True	The data provided appears to be accurate. There is evidence in what has been supplied that more detailed, daily data would be available.
		Delivery	True	Data is provided as multiple DAT files
		Usability	True	This data is logically laid out and suitable for use in this challenge.
DT-NS729-SMHI-Hydrological-Predictions-for-the-Environment-model	Considered	Contribution	False	Unsure if the data is suitable for the challenge, the majority of the data is in Swedish
		Location	False	The geographic scale appears to be suitable. The temporal scale is unknown.
		Commercial	True	Open data licence
		Attributes	False	The precision and accuracy are unknown. The information that can be translated suggests that most catchments are unguaged, and therefore, the flows would be modelled estimates.
		Delivery	False	The model is available online but the data cannot be easily accessed en-masse
		Usability	Null	Data has not been downloaded

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B. Statistics

In total, 380 datasets were evaluated across all challenges. The assessments were recorded in the project 'Data Advisor' system by the data users themselves as they attempted each of the challenges. The statistics given in this appendix have been generated from these evaluations.

B.1. Number of datasets evaluated grouped by challenge

Of the 385 datasets recorded, a very small percentage of the datasets were not evaluated for use at all. This seemed to be mainly due to the fact that, although the data source was readily identified, it was not easy to access the data in order to perform the evaluation.

A large number of the datasets were considered, but were not deemed to be suitable for use in the challenges. The main reasons for this seemed to be due to the location not matching up, commercial licence or cost implications, or inconsistent formats and download issues.

118 datasets were considered suitable, however only 67 of those were finally used in the challenges.

Table B.1: Dataset Evaluation

Challenge	Null	Not Considered	Considered	Suitable	Used	Total
Windfarm Siting	2	39	24	10	16	**91**
Marine Protected Areas	3	21	26	36	35	**121**
Climate and Coastal Protection	0	26	15	3	1	**45**
Fisheries Management	0	18	7	1	10	**36**
Marine Environment	0	18	45	1	0	**64**
River Inputs	0	3	20	0	5	**28**
Total	**5**	**125**	**137**	**51**	**67**	**385**

Source: North Sea Checkpoint Data Advisor system

The Marine Protected Areas Challenge identified and used the highest number of datasets – 118 were evaluated, with a final 35 being used (41%). The Marine Environment Challenge records no datasets used. This was the only challenge that the scientists felt was not met and so this is reflected in this 'use' statistic. As such, this does not mean that all of the considered datasets were absolutely useless, rather that they could not directly meet the challenge set.

Overall the final percentage of datasets actually used from those identified is fairly low: less than 20%.

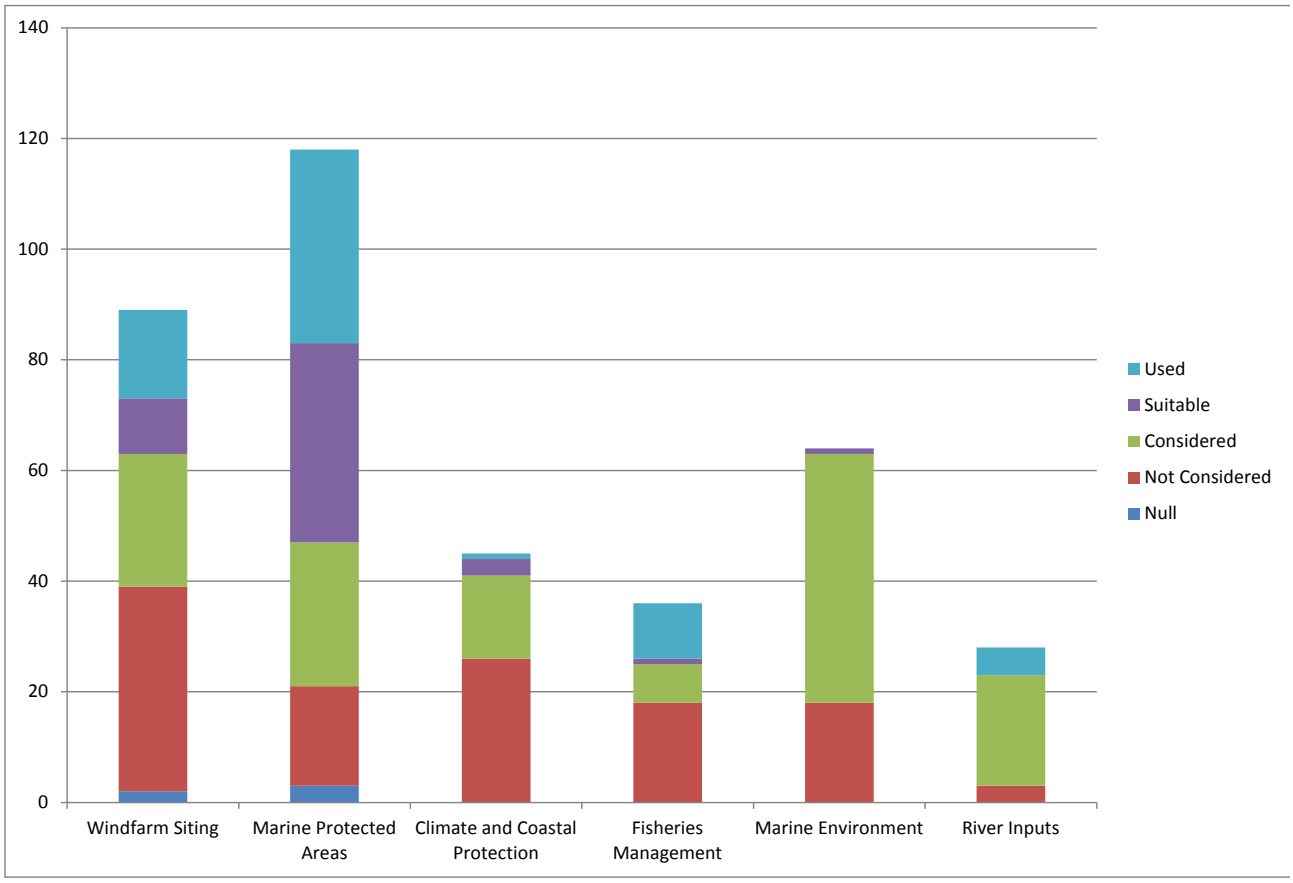

Figure B.2: Number of datasets evaluated grouped by challenge

Source: North Sea Checkpoint Data Advisor system

B.2. Datasets grouped by Criterion Assessment

Of the 380 datasets that were identified and evaluated:

- 231 were identified as potentially useful in solving the challenges;
- 202 had a temporal and spatial location that was relevant to solving the challenge;
- 322 had commercial terms (prices, licences) that were compatible to solving the challenge (data did not need to be free to be used but the price had to be proportionate to the challenge);
- 234 were sufficient in terms of accuracy, precision and resolution in order to solve the challenge (Note: temporal and spatial coverage is dealt with in Location);
- 310 had data delivered in time to solve the challenge (this includes continuation of supply); and
- 236 could be readily used in systems in order to solve the challenges.

The figures given in B.1 state that only 67 datasets were actually used in completing the challenges, out of the 236 deemed feasible here.

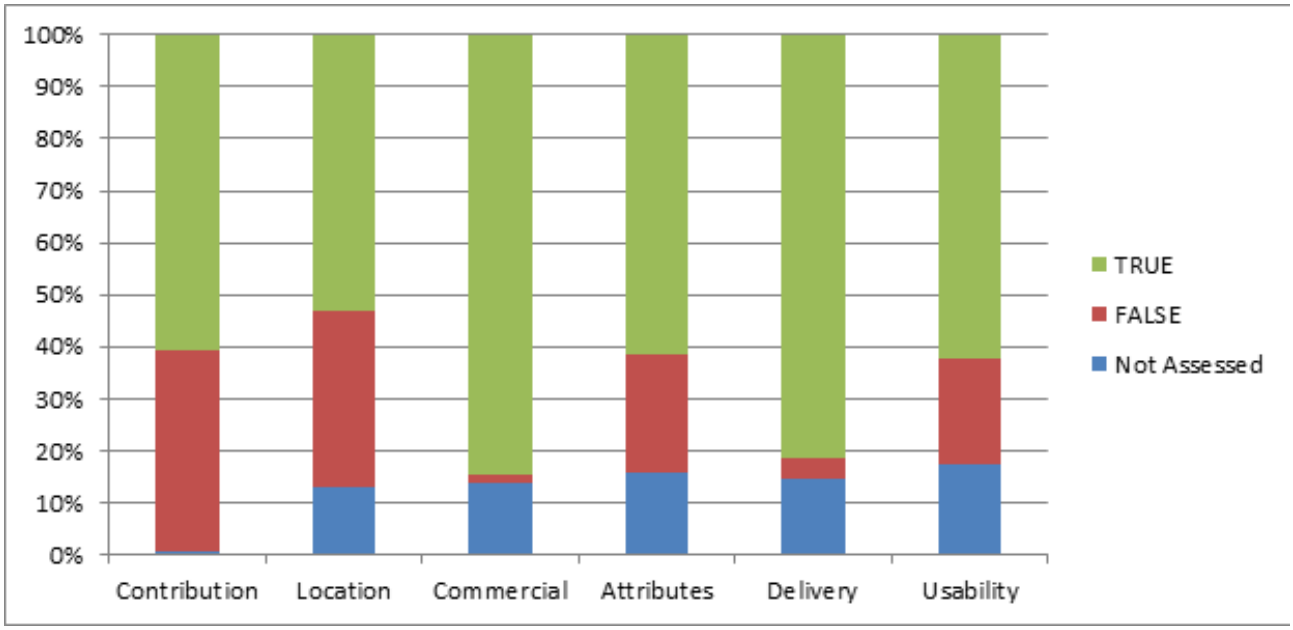

Figure B.3: Datasets grouped by Criterion Assessment

Source: North Sea Checkpoint Data Advisor system

B.3. Evaluations per Challenge

This breaks down the figures above into the individual challenges. In summary:

- The Windfarm Siting Challenge found usability their biggest issue.
- The Marine Protected Areas Challenge seemed quite successful in identifying relevant datasets.
- The Climate and Coastal Protection Challenge also provided positive feedback about their datasets.
- The Fisheries Management Challenge found that Contribution (relevance), usability and attributes were the main obstacles.
- The Marine Environment Challenge had very mixed evaluation results – contribution and location scored extremely low – but they scored positively for commercial and delivery.
- The River Inputs Challenge - scored positively for commercial and delivery with the other criteria being mixed.

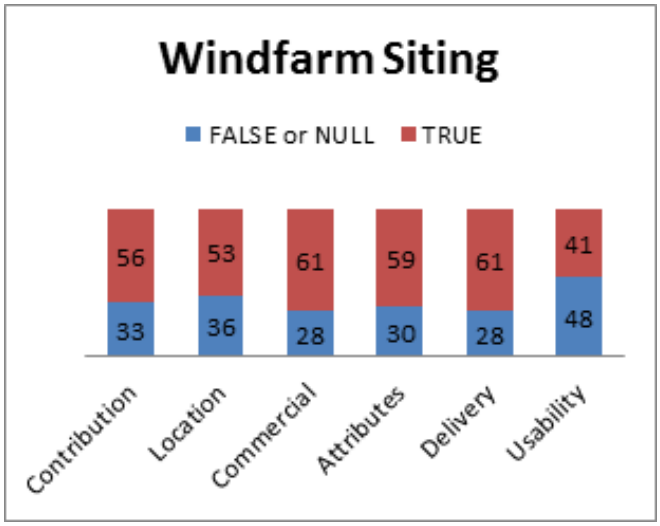

Figure B.4: Windfarm Siting Challenge Dataset Evaluation

Source: North Sea Checkpoint Data Advisor system

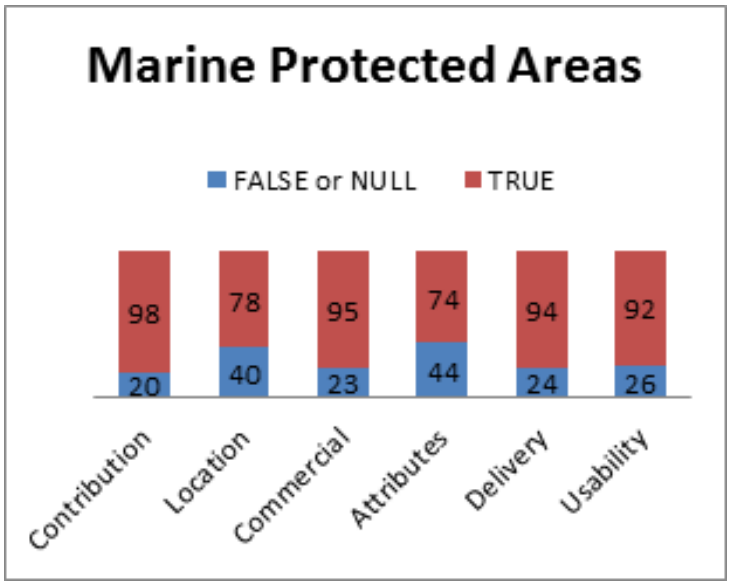

Figure B.5: Marine Protected Areas Challenge Dataset Evaluation

Source: North Sea Checkpoint Data Advisor system

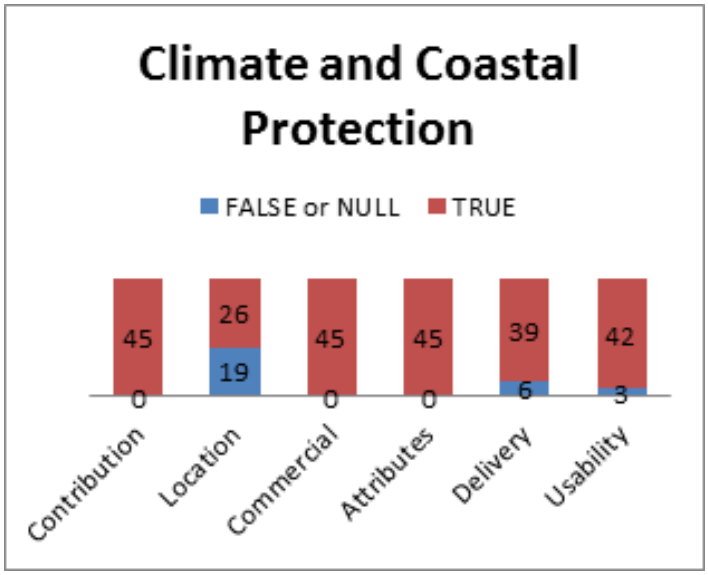

Figure B.6: Climate and Coastal Protection Challenge Dataset Evaluation

Source: North Sea Checkpoint Data Advisor system

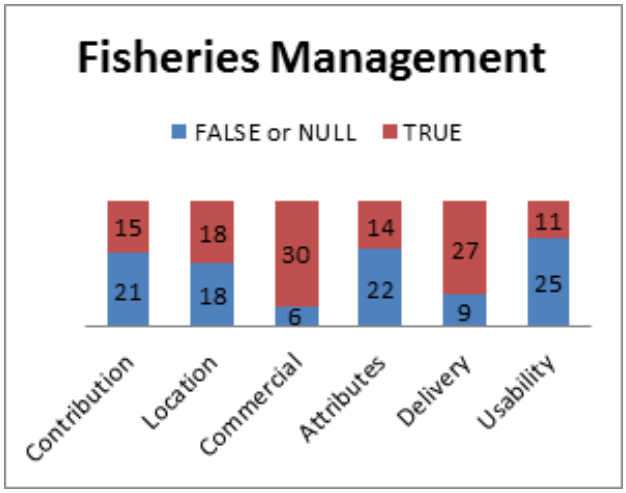

Figure B.7: Fisheries Management Challenge Dataset Evaluation

Source: North Sea Checkpoint Data Advisor system

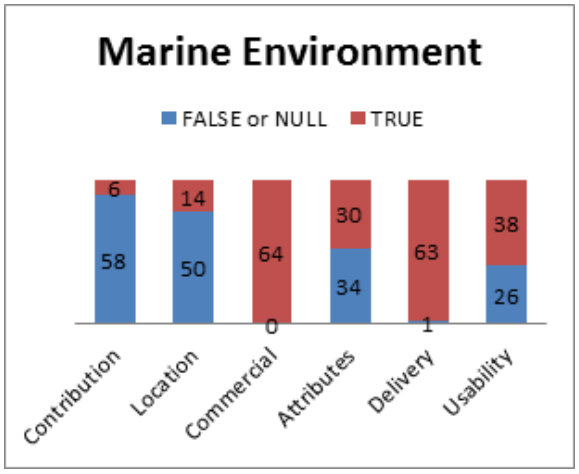

Figure B.8: Marine Environment Challenge Dataset Evaluation

Source: North Sea Checkpoint Data Advisor system

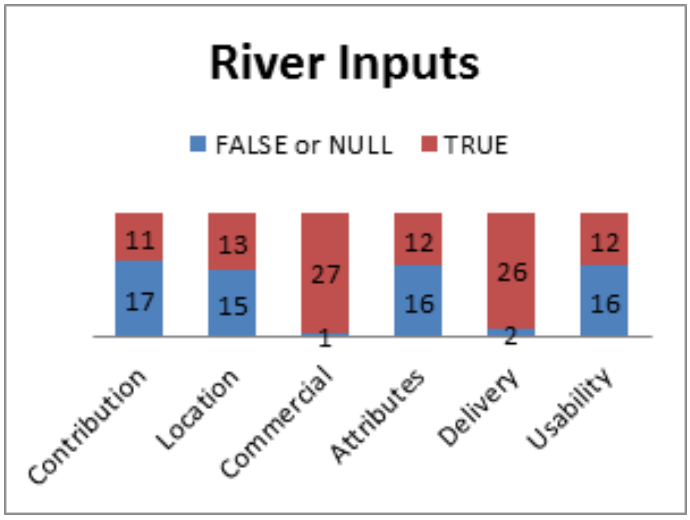

Figure B.9: River Inputs Challenge Dataset Evaluation

Source: North Sea Checkpoint Data Advisor system

B.4. Inspire Themes per Challenge

The table below indicates the intersection between each challenge and the associated INSPIRE themes, with the numeric values indicating the number of datasets.

Table B.10: Challenges and INSPIRE Themes

INSPIRE Theme	Climate and Coastal Protection	Fisheries Management	Marine Environment	Marine Protected Areas	Oil Platform Leaks	River Inputs	Windfarm Siting
1.1 Coordinate reference systems				1			
1.2 Geographical grid systems		4		1			
1.3 Geographical names							
1.4 Administrative units			2				1
1.5 Addresses				1			
1.6 Cadastral parcels							
1.7 Transport networks					2		7
1.8 Hydrography	1	1	36		9	18	5
1.9 Protected sites				80			8
2.1 Elevation		2		1	2		2
2.2 Land cover							
2.3 Orthoimagery							
2.4 Geology	4	1		1			4
3.1 Statistical units		31		4	2		1
3.2 Buildings		1		1			1
3.3 Soil	1						1
3.4 Land use					4		5
3.5 Human health and safety					1		1
3.6 Utility and Government services							1
3.7 Environmental monitoring facilities				1			3
3.8 Production and industrial facilities							
3.9 Agricultural and aquaculture facilities							2
3.10 Population distribution – demography							
3.11 Area management / restriction / regulation zones & reporting units				8	7		2
3.12 Natural risk zones							
3.13 Atmospheric conditions	1		1		10		10
3.14 Meteorological geographical features	4						3
3.15 Oceanographic geographical features	36	2		2	2		5
3.16 Sea regions					1		2

INSPIRE Theme	Climate and Coastal Protection	Fisheries Management	Marine Environment	Marine Protected Areas	Oil Platform Leaks	River Inputs	Windfarm Siting
3.17 Bio-geographical regions				2			
3.18 Habitats and biotopes	1	1	11	12	1		4
3.19 Species distribution		1	14	7	2	10	12
3.20 Energy resources							11
3.21 Mineral resources							2

Overall, the Windfarm Siting challenge spanned the most INSPIRE themes (23), with River Inputs the least (2). Marine Protected Areas had the highest intersection of relevant datasets for an individual INSPIRE theme, with 80 covering theme 1.9 Protected Sites.

B.5. Number of datasets evaluated grouped by INSPIRE theme

27 out of a possible 34 INSPIRE themes were identified. The highest count, by far, was for Protected Sites ("Area designated or managed within a framework of international, Community and Member States' legislation to achieve specific conservation objectives"[10]), followed by Hydrography, Oceanographic Geographical Features and Species Distribution. This information is slightly skewed, however, due to the large number of datasets identified by the Marine Protected Areas Challenge.

[10] INSPIRE Themes : http://inspire.ec.europa.eu/Themes/Data-Specifications/2892 (accessed 24th October 2016)

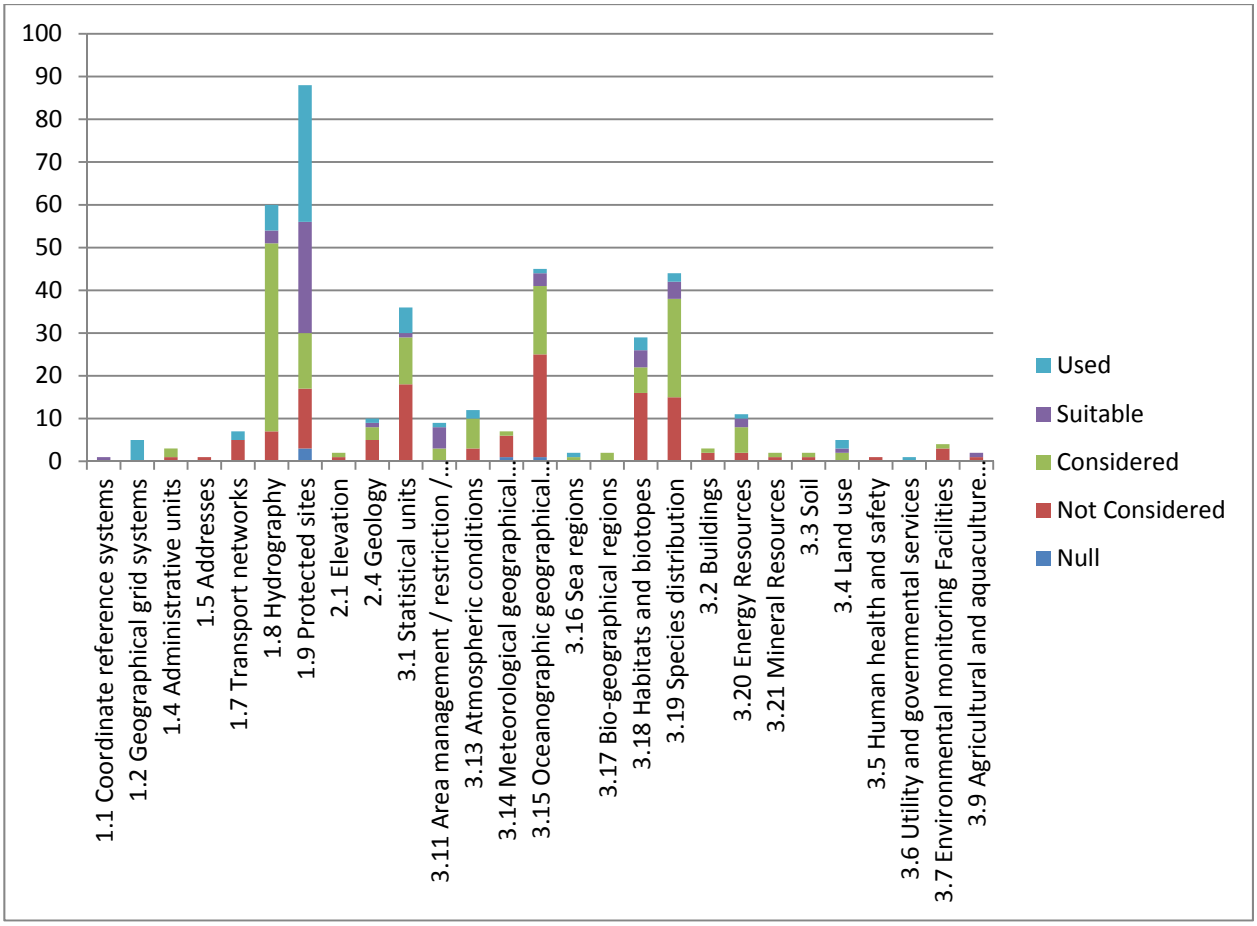

Figure B.11 Number of datasets evaluated grouped by INSPIRE theme

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