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Growth and Innovation in the Ocean Economy: North Sea Checkpoint

Data Adequacy Report - Synopsis 2



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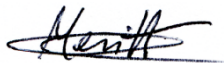
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Project manager	Olivia Merritt
Project director	Keiran Millard

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Executive Summary

This document provides a report on the progress of the challenges and a synopsis of the findings to date. The first four challenges have now completed their data gathering and undertaken an initial appraisal of the data they require, providing feedback from a user perspective which complements the lessons learnt from the literature review undertaken at the start of the project.

This report is deliverable 04 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).

Following discussions with DG Mare regarding the reporting structure for the NSCP project, this report provides a progress report and concise summary of key trends in data adequacy to date, with a view to producing one data adequacy report per challenge upon their completion. This is discussed further in this document.

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1. Introduction

This report is the fourth 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 summarises progress presents the findings to date for the first scheduled challenges. So far, all of the challenges underway, including the Wind farm challenge, Oil Spill challenge, Marine Protected Areas (MPA) challenge and Climate and Coastal Protection challenge have completed the first task of identifying the data needed to undertake the work, finding it, assessing it for its relevance, make an initial assessment of its usefulness and gaining access to the data.

The Wind farm Siting Challenge and oil spill challenge have also conducted a large proportion of their data analysis, allowing further conclusions to be drawn on data adequacy from applying the data to the challenges requirements. The Oil Spill Challenge has completed its first rehearsal and has therefore undertaken gathering of baseline data. It awaits the call for the final emergency response scenario.

The database developed to assess data quality for each of the challenges has evolved to meet the needs of the project and is in the process of being made available online.

2. Challenges

2.1. Introduction

The literature survey undertaken at the start of the project provided a first view of the potential gaps in data to be expected when undertaking the challenges. The literature survey was designed to have a symbiotic relationship with the data challenges, providing background information for the challenges while providing a basis on which the result from each of the challenges can build. The results of the challenges are therefore discussed in section 4 in the context of the literature survey.

2.2. Data Gathering

It is recognised that although each of the challenges require 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.

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 will be made available via the project website. The first publication of this database will coincide with the completion of the first challenge.

2.3. Wind Farm Challenge

The aim of the wind farm 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 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.

The majority of work for the wind farm challenge has now been completed. The data required for the challenge has been identified and gathered where possible. Data analysis is underway and nearly complete.

The core data required to map existing infrastructure, obstructions, human activities, license areas and protected areas has been identified and analysed. A sensitivity assessment has been applied to these datasets to identify potential areas for which analysis of environmental data would be of benefit (Figure 2.1). Some datasets have proved more difficult to find and are now in the process of being analysed.

Six areas have been identified across the two study areas specified in the project brief. These areas are now being reviewed to characterise the wind and wave climate within these smaller areas, the characteristics of the seabed geology and superficial deposits and gain an initial idea of potential ecological constraints.

For a 'real' wind farm siting exercise, it would be expected that analysis of environmental data would be undertaken to get an initial idea of environmental conditions but would be followed by a phase of focussed field work and sampling of seabed sediments and underlying geology, wave and wind regime and ecological studies to gain a more accurate picture of site characteristics.

The final output of the challenge and any additional lessons learnt will be outlined in detail in the challenge's Data Adequacy Report (DAR), expected to be delivered in March 2015.

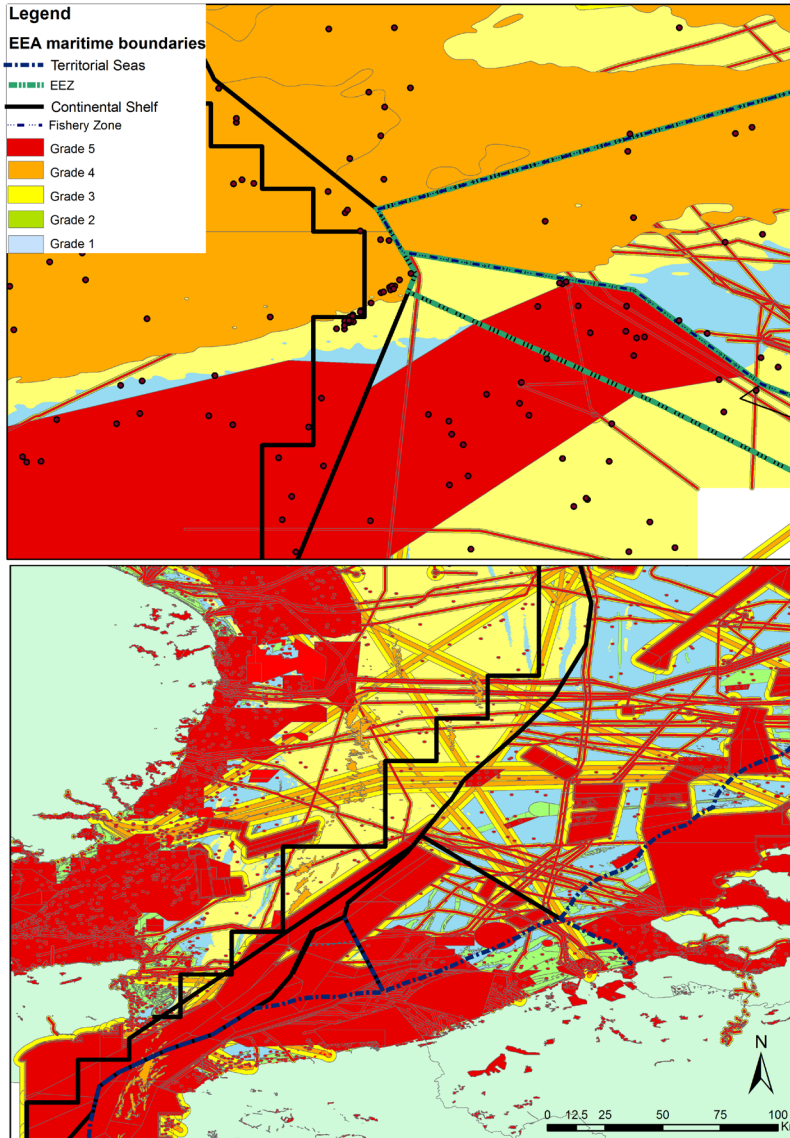


Figure 2.1: Interim results of data analysis for the wind farm challenge showing the data sensitivity grading system being used

2.4. Oil Spill Challenge

IMARES are awaiting the final oil spill challenge exercise. The challenge rehearsal has been performed and after incorporating feedback, from project partners and DG-MARE, IMARES are now ready and prepared for the real challenge.

An initial assessment of data required to model the response has been made and suitable datasets have been identified as being fit for the purpose. The data is available from different publically available sources.

Automated R scripts have been prepared for pre-processing the data for the use in the model, including stitching together hindcast winds to forecast winds. Output data from the spill model was further analysed in

a GIS environment. Automated download script (Python) has been coded when (near) real-time/forecast data is required.

A complete evaluation of data adequacy has not yet been performed because at this stage we have only rehearsed the challenge. The timeframe for completion of the challenge and delivery of the Oil Spill Challenge Data Adequacy Report will be dependent on when the final oil spill exercise is conducted. A full DAR will be part of the main report of the real challenge.

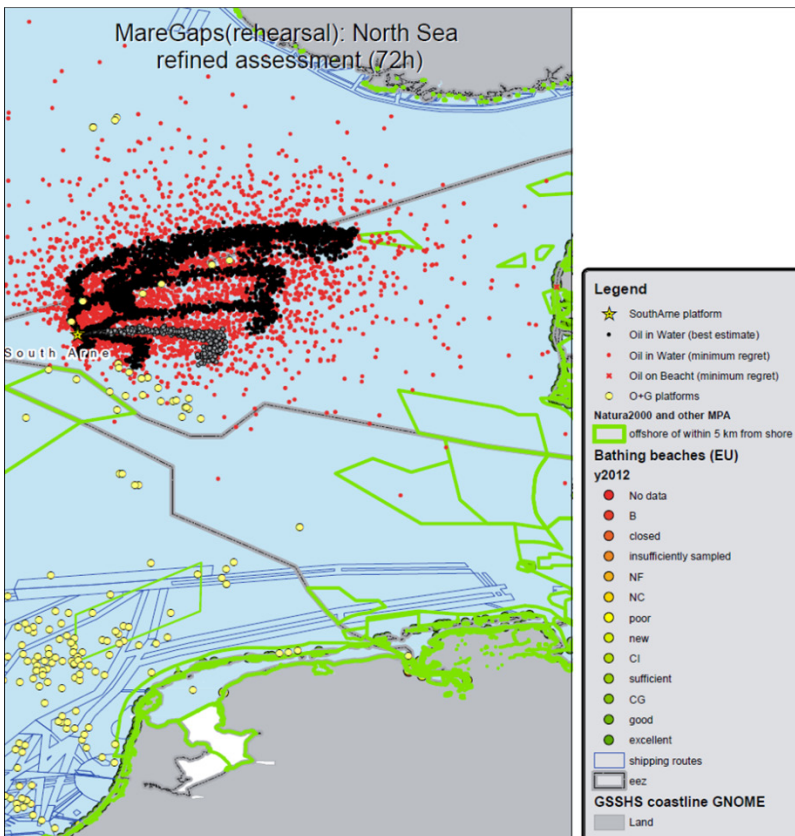


Figure 2.2: Results of rehearsal oil spill model after 72 hours, showing position with respect to bathing beaches, NATURA sites and oil platforms (left) and bathing beaches, NATURA sites and shipping density (right)

Source: IMARES

2.5. MPAs Challenge

The MPA Challenge is due to be completed by the end of May 2015. As specified in the MPA section of the project proposal (WP3: Challenge 2: Marine Protected Areas), the expected output of this challenge is 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’.

The challenge is assessing the availability and quality of data from the perspective of a basic marine user wishing to obtain information on the North Sea MPA network.

During the data gathering process it has become increasingly apparent that to fully assess ecologically coherency using the 5 OSPAR criteria (see project proposal), much more time and resources would be required as a significant amount of technical modelling, mapping and complex analysis would be involved.

Ecological coherency has been previously assessed in such a way but to provide a basic analysis in the timeframe of this project would be inaccurate and too coarse-a-scale. Therefore it is already possible to say that the data collected within the timeframe and resources of this project (specifically for the MPA Challenge) will not be sufficient to predict the ecological coherence of the North Sea MPA network.

Table 4.1 below summarises the data needed for each output. Each dataset discovered was then assessed for its usefulness in meeting the requirements of the challenge. This has been the basis for the analysis of data adequacy.

Table 2.1: Data requirements for MPA challenge

Output	Datasets Required	Preferences
Interactive webmap	MPA boundaries from all 8 countries	Must include all types of MPA designations (MCZ, SSSI etc) Preferably the most recent designations Must be comment spatial data format Metadata available
	Species and habitat data for each MPA	Must be common spatial data format
	Management data for each MPA	Preferably the most recent management plans
Test statistics (OSPAR Criteria)	'Features & Representivity': species and habitat data	Species and habitats information must be OSPAR or EU defined
	'Resilience' (replication, MPA size diversity): species, habitat and MPA size data	Species and habitats information must be OSPAR or EU defined Units of size data preferably given
	'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
Literature review	Previous assessments of ecological coherency assessments	Assessments preferably relevant to North Sea MPAs

Source: MEP

Data gathering has now been completed for:

- MPA locations;
- Spatial features of MPAs.

Data gathering is ongoing for:

- Annex I & II habitats and species (and non-EU classified protected species and habitats – for Norway) present in MPAs;
- Larval dispersal data for recognised species in MPAs;
- Physical data that will assist in determining MPA connectivity (e.g. current/surface wind data);
- Management measures relevant to each MPA.

It was decided that data should be initially collected at the international level (e.g. the OSPAR MPA list), and then at the national level. This would help account for country-specific MPA plans and designations. The 8 countries of focus include the UK, France, the Netherlands, Denmark, Belgium, Sweden, Germany and Norway.

The final output of the challenge and any additional lessons learnt will outlined in detail in the MPA challenge's Data Adequacy Report to be delivered in advance of the panel meeting in May 2015.

2.6. Climate Change Challenge

All the data considered for the challenge has been downloaded apart from the tidal gauge data from REFMAR, still currently awaited and the data from EMODnet Physics portal, for which the zip file downloaded won't open. No suitable freely available sediment data has been found which meets the requirements of the challenge.

The data quality assessment has been completed for sea level data and analysis of seethe data is now underway. Two kind of data are being used for this parameter: tide gauge data and model results. The tide gauge data is being analysed using python scripts and Excel.

From Permanent Service Mean Sea Level monthly mean sea level data, the different steps of the method are the followings:

1. Calculate the yearly mean for each location.
2. Linear regression of the yearly mean data for each location in order to identify a trend which will represent the average sea level rise at the same location. See Figure 2.2 below where the average sea level rise is 1.16 millimetre per year.
3. Calculate the spatial average sea level rise at the coast and for each NUTS3.

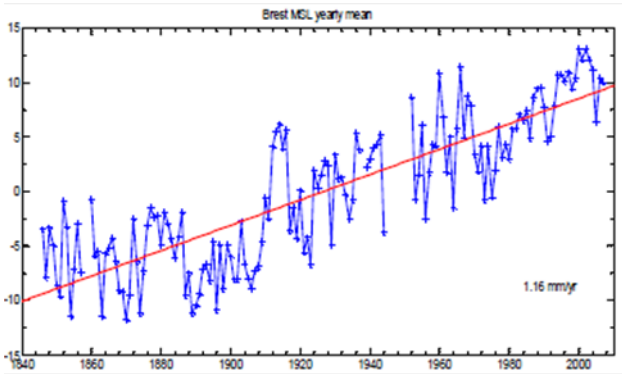


Figure 2.3: Brest Mean Sea Level Rise

3. Synopsis of Results

3.1. Introduction

Each stage of work including data gathering, data quality review, analysis and mapping provides a different perspective on the data as the problems arising from sourcing data may differ from those which become apparent when using the data.

Quality assessment of data has been 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 vary a great deal between datasets. While the current challenges are at different stages of completion, there are some re-occurring trends present across them which will be fully reported in their respective DARs and discussed in detail in advance of the panel meeting to be held in May 2015.

3.2. Data Discovery

Accessibility

Most data sourced for the challenges has been downloaded from web resources including EU funded resources such as EMODnet portals, MyOcean, SeaDataNet, the EEA website and European Map of the Sea. Additional data has been sourced from National repositories and commercial data providers.

There have been instances of data access being restricted. In some cases, the links to data downloads were broken. In other cases, data downloaded could not be extracted from their compressed files. This was a problem which occurred on several of the EMODnet portals.

Where registration was required to access data, there were cases of delays being experienced in accessing data (REFMAR). This was not a problem in most cases but could affect other data users with short deadlines.

Data Costs

Data costs have had to be considered for several of the challenges. As the main aim of NSCP is to appraise the data for its availability and usefulness in fulfilling the requirements of each challenge, therefore data has only been bought where absolutely necessary. Where possible, data which is publicly and freely available has been used, while chargeable data has been included in the data quality assessment process. The cost

of data would have been considered differently if we were conducting a real wind farm siting exercise or oil spill response. For the purpose of the NSCP, data costs have been considered where they are expected to be cost-effective. The benefits of individual data costs have been considered in the assessment of each dataset as part of the Data Adequacy Reports.

Instances where data costs were chargeable for the data include the following:

- Access to data model for the oil spill challenge. A lower resolution freely available model was used.
- Offshore sediment data for the North Sea. The freely available .kml on EMODnet One geology was used for reference.
- Commercial shipping and fishing data (ANATEC data, VMS data). Only English VMS data was used for the wind farm challenge.
- S57 chart data and enhanced chart data products. The SeaZone Hydrospatial Base product contains S57 vector chart data for the full North Sea study area. The data was made accessible to all project challenges, to enable its consideration as part of the data assessment and to provide baseline mapping for the challenge outputs.

In most cases, an alternative lower resolution could be found for the purpose of the challenges while the chargeable data's fitness for purpose has been assessed in the context of a real time scenario.

Data delivery format

Delivery formats are mostly well considered by data suppliers. They tend to cater for most likely users.

In most cases, data was provided in a format which enabled a broad range of users to make use of the data.

Some datasets are specifically aimed at expert users and primarily provide raw data (EMODnet physics and chemistry, MyOcean, SeaDataNet).

Other resources focus more on management use and provide interpreted data which can be used for reference by a broader range of users using basic software packages.

There were cases of data being over-derived to increase ease of access, which led to the data becoming less useful. This was the case with some EMODnet human activity data where datasets have been compiled from a range of providers. Data such as licence areas, originally produced as vector polygons are provided as part of an EMODnet point data layer. In the case of the wind farm challenge, the data could not be used as existing licence areas extents need to be accurately known.

Metadata was in many cases well documented. There are some instances of metadata not being provided which have been recorded in the project database.

Some data was delivered in format which enabled users to view the data either as an image (e.g. .pdf or .jpg) or georeferenced image (e.g. Google Earth .kml) but restricting its use alongside other data (ENTSO-E, EMODnet seabed sediments from BGS).

3.3. Spatial Coverage

Overlaps

During the identification of possible data sources, it was found that there were also considerable overlaps between websites in the data they offered, 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. The data provided via the EMODnet human activities portal, by the Atlas of the Seas website and the EEA website often provide different versions of similar data.

Significant overlaps between datasets were also found to exist when sourcing map data for MPA sites, species and habitat data, and Seabed infrastructure data.

Where 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.

Data Gaps

Where EMODnet portals had received data from some National data providers and not others, the data downloaded covered only part of the project study area (Wind farm license areas, 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). Some of the data downloaded from the portals only covered parts of Europe.

3.4. Usability

Data Updates

Users expect data downloaded from online resources to be definitive and up-to-date. There were cases across several challenges where data was either not updated regularly enough for the purpose of the challenge or was found to be out of date.

For the MPA challenge, the OSPAR MPA data was last updated in 2013 and is due to be updated towards the middle of 2015.

Data provided by MyOcean and Global Marine Net are updated every 24 hours, at around 11:00a.m.. The time at which the oil platform leak is set will therefore affect how up to date the data model is.

In many cases, data providers sourced their data from different locations, leading to inconsistencies and uncertainty over the definitive versions of data. 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.

Data accuracy

Data was compared in instances where multiple versions are available from different sources. The accuracy of data sometimes varied between sources. For example, 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).

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.

4. Conclusions

4.1. Challenge Issues

No issues with data sourcing have been identified which would result in a challenge not being completed at some level. There have been multiple instances where compromises have to be made to manage short comings in the data such as a lack of resolution in data or the presence of information gaps.

Considerable time also needs to be spent in identifying definitive data, comparing multiple version of similar data to identify the most up-to-date, useful datasets. This is an issue which would in part be resolved by better provision of metadata before the data is downloaded.

4.2. EMODnet

The ease of use of EMODnet portals was found to vary with the nature of data and access requirements. The different portals know their target audiences and the data provided tends to be in a format which is aimed at its likely use. For instance, data from the physics , bathymetry and chemistry portals primarily provide raw data for modelling, while data from the human activities portal is aimed at users such as planners who require data to be easily queried in excel or viewed alongside other data in GIS.

The study to date has identified some points for discussion with regard to the EMODnet portals. These are summarised as follows:

- There have been difficulties in opening some data downloaded from EMODnet portals. The tidal gauge data downloaded from the EMODnet Physics portal for the climate change challenge was delivered as a zip file which would not open.
- The resolution and accuracy of some data has been reduced to integrate it into single larger datasets. A better quality of data would be maintained by delivery of data by source rather than as derived layers.
 - EMODnet Human Activities:
 - Aggregate extraction – points referring to licence areas, but are not centroids;
 - Dredging – provided as point data;
 - Waste disposal, Dredged spoil dumping - data provided as points. Available as polygons in S57 charts;
 - Hydrocarbon extraction – provided as point data.
- There is an assumption that data provided through the portals will contain full coverage of EU waters. Providing data by source would give the user a better understanding of the likely spatial coverage of the data before downloading it. This would also make the data updates easier to handle.
 - EMODnet Human Activities:
 - Waste disposal, Dumped munitions areas – no data in Wind farm study area. Sources differ from SeaZone Hydrospatial Base;
 - Wind farms – No data for North Sea or UK.

- Some of the data provided through the EMODnet portals were provided in a format which is less user-friendly than in other online locations. For example, the protected areas in EMODnet Human Activities is provided as a .csv, while the same data can be downloaded as a shapefile from the EEA website.

4.3. Knowledge Gaps

Across the current challenges, some gaps in available data have been identified:

- Freely available sediment data is only available through EMODnet One Geology as a downloadable .kml file, enabling the data to be viewed in Google Earth. The data covers the whole of the North Sea Basin, however, it is unclear how the full dataset can be accessed via the BGS. SeaZone Hydrospatial only provides the data for UK waters.
- Offshore tidal gauge data. All of the tidal gauge stations are located along the coast. The temporal coverage varies a great deal between tidal gauge stations and also remains very limited (Figure 4.1).
- Management data relating to the development of MPAs is difficult to find. Data providers needed to be contacted directly for access to reports.
- There are large gaps in the availability of larval data. This is probably due to the limited number of larval modelling studies and as a result, there are a limited number of species for which dispersal and duration data have been published.

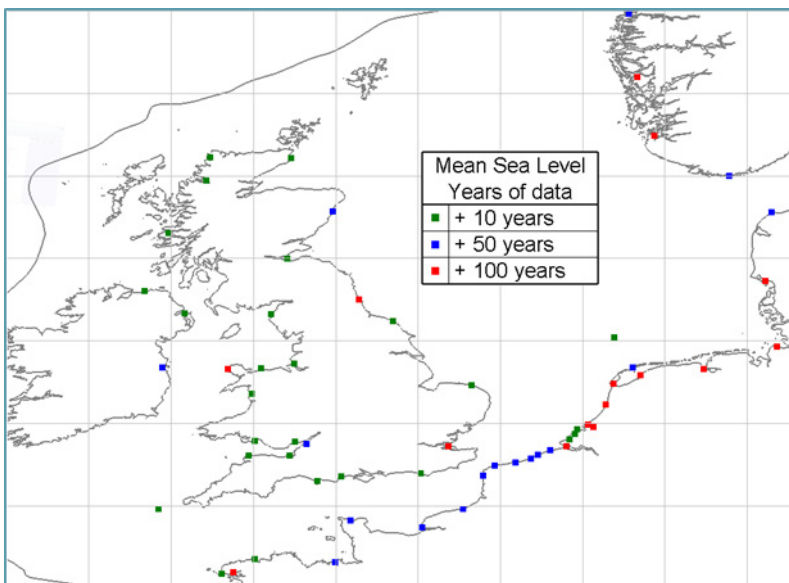


Figure 4.1: PSMSL Tide gauge data spatial and temporal coverage

Source: PSMSL

The issues identified during the sourcing of data across the current challenges have been grouped as follows:

- Finding data and accessing data
 - Some data difficult to source
 - Difficulties in accessing data from online resources
 - Broken links / source pathways
 - Some data too expensive for use in a scenario
 - Data conflicts
 - Metadata not always available
- Data gaps
 - Datasets not containing data for the search area
 - Conflicting information between data suppliers
 - Duplication between data sources
- Applicability to challenge
 - Resolution not suited to needs of challenge
 - CRS data missing
 - Data formats

5. Reporting

Following discussions between HR Wallingford and DG Mare, it has been agreed that a change to the reporting strategy for the project would reduce repetition of results between reports and enable reports to be integrated with the structures of the project website and database.

Rather than delivering two Data Adequacy Reports (DAR) at set times during the project, it has been proposed that a separate DAR be produced on completion of each of the project challenges, with DAR synopsis reports (DARS) providing progress updates at regular intervals during the project. All project results will be discussed and summarised in the final project DARS. The advantage of this report is that specific aspects and detail of how data was used to solve the challenge, as well as the challenge outputs are self-contained. This can also include specific comments on individual datasets. The DARS can then focus of the conclusions from the challenge-DAR as well as identifying trends and generic issues related to data and data policy.

The number of project deliverables will remain the same and will be delivered at similar intervals as follows:

Table 5.1: Revised Deliverables Schedule

Deliverable	Date Due	Description	Note
1	30/04/2014	Progress Report 1	Delivered
2	31/07/2014	Data Adequacy Report 1 (incl. Literature review)	Delivered
3	31/10/2014	Progress Report 2	Delivered
4	28/02/2015	Data Adequacy Report Synopsis -2	Delivered

Deliverable	Date Due	Description	Note
5	10/04/2015	Data Adequacy Report Synopsis -3	Replace Data Adequacy Report 2
6	10/04/2015	Data Adequacy Reports: <ul style="list-style-type: none"> • Wind Farm Challenge • MPA Challenge • Oil Platform Leak Challenge • Climate Change Challenge 	Detailed DAR and data deliverables for each challenge. All to be completed before 31/05/2015. Windfarm challenge due to be completed by mid-March.
	w/c 20/04/2015	Panel Meeting 1	Date and location tba
7	30/04/2015	Panel Report 1	Summary of panel meeting outcomes
8	31/10/2015	Data Adequacy Report Synopsis - 4	Replace Interim Report
9	31/03/2016	Data Adequacy Report Synopsis - 5	Replace Sea Basin Checkpoint Report
10	31/07/2016	Data Adequacy Reports: <ul style="list-style-type: none"> • Fisheries Management Challenge • River Inputs Challenge • Marine Environment Challenge 	Due upon completion of challenge, all to be completed before 31/05/2016
11	31/07/2016	Data Adequacy Report Synopsis - 6	
12	23/09/2016	Final Report Draft	Final Report. Includes content and conclusions to date from DARS-6 as well as input from each of the Challenge DAR.
	w/c 10/10/2016	Panel Meeting 2	Date and location tba
13	14/10/2016	Panel Report 2	Summary of panel meeting outcomes
14	31/10/2016	Final Report	Includes summary and discussion of all project results and input from panel

6. Database

A prototype of the website which includes a front end to the data quality assessment/signposting database, which will allow the user to filter the quality assessments made for the project's challenges was presented at the EMODNET SC Meeting on 9/10th December 2014.

A full production version has now been realised and needs to be integrated into the NSCP website. Following discussions between the Secretariat and HR Wallingford, a method has also been established for developing the static part of the website via the EMODNET content management system. This has been seeded with initial content. The next main step is the first release of the 'data advisor'. This will be done following completion of the wind farm challenge. Once a challenge has been completed the data screening spreadsheets are frozen and the content transferred to the website for the on-line version. This process is repeated for subsequent challenges.

7. Next Steps

Mapping, analysis of data and update of the data registers are now underway for the marine protected areas, climate and coastal protection and wind farm challenges. The River Inputs challenge is also in the early stages of data gathering.

The Wind Farm Challenge will submit the First Challenge DAR in March 2015. Once reviewed by DG Mare, this will provide a template for the other challenge DARs to follow. The data register from the Wind Farm Challenge will be the first to populate the quality assessment database which will be accessible via the NSCP website.

The marine protected areas, climate and coastal protection and wind farm challenges will all seek to be fully reported on in time for the first Panel Meeting, scheduled for May 2015, Full reporting of the oil spill challenge will depend on the timing of the next and final call for an emergency response.



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FS 516431
EMS 558310
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HR Wallingford, Howbery Park, Wallingford, Oxfordshire OX10 8BA, United Kingdom
tel +44 (0)1491 835381 fax +44 (0)1491 832233 email info@hrwallingford.com
www.hrwallingford.com