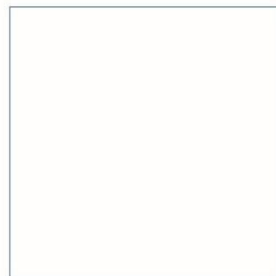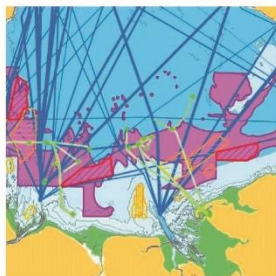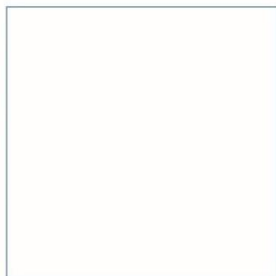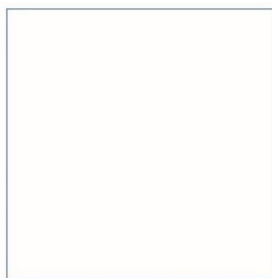# Welsh Government

Sustainable Management of Marine Natural Resources

Desktop Review of the Wales Marine Planning Portal

December 2018

Innovative Thinking - Sustainable Solutions

ABP mer

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1   Introduction

There is increasing recognition of the need to better manage marine activity both to ensure that marine environmental objectives are met but also to enable sustainable blue growth. Marine spatial planning is particularly being promoted as a process for addressing increased competition for space between marine activities and for seeking to ensure that the capacity of the marine environment is not exceeded.

Natural Resources Wales (NRW) has contracted ABPmer to support the development of the Welsh National Marine Plan through the Sustainable Management of Marine Natural Resources project. It is intended to increase understanding of the marine environment and to develop plans that provide sufficient local specificity and data against which benefits of marine planning can be understood and demonstrated. The project will do this by gathering new evidence and, collating, analysing and interpreting environmental (biological, chemical and physical) datasets addressing key knowledge gaps in marine planning.

The project is divided into two Work Packages (WPs):

- **Work Package 1 (WP1)** – Consolidating the marine environmental evidence base for Wales. This WP will identify areas for investigation; identify knowledge needs; gather, collate and process available data; and identify key knowledge gaps (ABPmer, 2018 and this report); and
- **Work Package 2 (WP2)** – Enhancing and applying marine evidence to support sustainable development. This WP will collect data; produce and disseminate guidance; and produce constraints and opportunity maps for sustainable development and activities within draft SRAs. Recommendations will also be provided on the refinement of Strategic Resource Area (SRA) boundaries where appropriate.

This report delivers the marine planning portal recommendations report within WP1.

1.1   Objectives

The main objective of the overarching project is to address the need for fit for purpose (synthesised, interpreted, quality assured and refined) data and knowledge to support marine environmental protection and sustainable use of tidal energy, wave energy and aquaculture resources. Stakeholder collaboration will be central to delivery thereby strengthening outputs and stakeholder buy-in to the project. This includes generating as much consensus as possible between all stakeholders (including developers and regulators) about the outputs so that there is a shared understanding of the constraints and opportunities relating to these areas.

To support the overarching objective, a review of the current Wales Marine Planning Portal (WMPP) has been undertaken, the results of which are documented herein. The key objectives of the review were to identify, document and develop recommendations against:

- Ease of use;
- Data accessibility;
- Overall functionality;
- Gaps (in the context of both the data requirements of this project and wider initiatives);
- Potential to include datasets collated as part of the wider Sustainable Management of Marine Natural Resources project (ABPmer, 2018); and
- Opportunities for development including supporting wider functions within Welsh waters.

1.2   Report Structure

The information within this report is structured according to the following key sections:

- Section 2: provides background context to inform consideration of how the WMPP fits within the principles of data sharing via such portals;
- Section 3: outlines the approach that has been used to review the WMPP;
- Section 4: contains the results of scenario testing conducted on the WMPP; and
- Section 5: presents general suggestions and comments derived from reviews of the WMPP and other portals and future trends in marine data management.

2   Background

2.1   Marine Spatial Planning

Marine spatial planning (MSP) aims to create a framework for decision making that is consistent, evidence-based and secures a sustainable future for the marine area. MSP therefore requires a wide range of data to produce a robust evidence base to support plan development and, as it is an explicitly spatial and temporal process, it requires data at appropriate spatial and temporal resolution.

Marine planning is also an iterative process in that the current status of marine activities are assessed at the start of the program, targets are set using management measures, and then these are monitored for progress. At specified intervals, these objectives will require re-visiting to assess progress and re-evaluate or create new targets. Figure 1 demonstrates the general marine planning process and indicates where data and decision support tools feed in to the planning process.
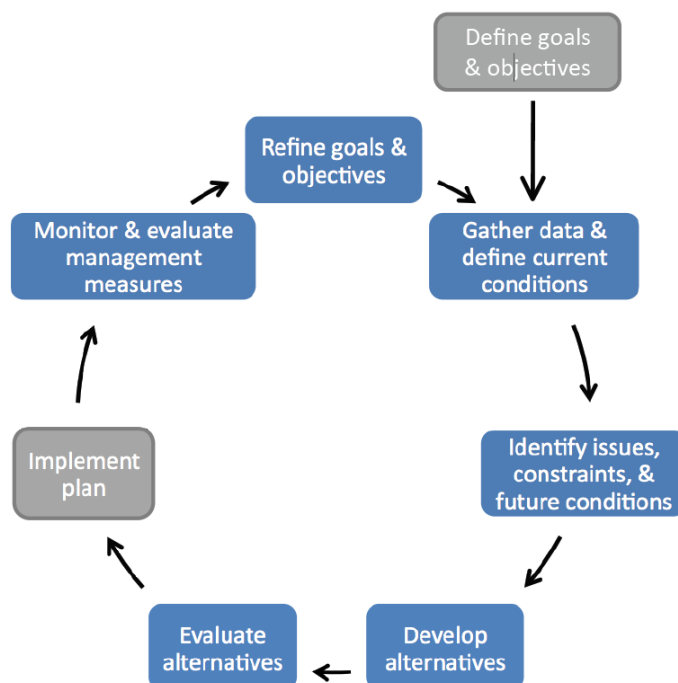
Source: PacMARA; Center for Ocean Solutions, 2011

Figure 1.   **Decision guide: Selecting decision support tools for marine spatial planning**

Integration of the data sources with tools to allow discovery, access, and the ability to view the data can influence marine spatial planning objectives, it is also important to the transparency of the process and can encourage stakeholder engagement.

2.2   MSP Data Considerations

MSP requires a wide range of evidence to support plan development and, as it is an explicitly spatial and temporal process, it requires data at an appropriate spatial and temporal resolution. MSP is also an integrative process and, therefore, also requires environmental, social and economic data including

data on all human activities occurring in the marine environment. Information is also required across the Land-Sea Interface, recognising that activities on or near the coast can influence or be influenced by the sea. The open nature of the marine environment also means that transboundary data may also be required.

There is no absolute list of information requirements for MSP but different national MSP processes generally use similar types of information (European Commission, 2016). Information requirements will also be dictated by the level of detail that MSP is seeking to achieve. For example, plans that are seeking to promote more prescriptive spatial policies are likely to require greater levels of evidence to underpin such policies and achieve stakeholder support (MSPP Consortium, 2006).

To deliver the maximum benefit and use of data, for the development of the Welsh marine spatial planning process, maintaining a spatial data platform (data products and metadata) along with an associated data portal is considered to be of greatest benefit. By maximising the availability and actively preserving the currency of data, the possible influence it has is also maximised, since more opinions and decisions are made using it (Defra, 2013). This can also empower others to deliver plan outcomes by making the right decisions.

2.3   Data Portals

Integration of the data sources with tools to allow discovery, access, and the ability to view the data that has influenced marine spatial planning policies, is important to the transparency of the process and encourages stakeholder engagement.

An MSP web portal allows the wider public to view the supporting information that helped inform the process and to justify decisions made. Another function of a web portal is to encourage stakeholders to actively provide data, offering the opportunity to upload datasets as long as certain data requirements, such as standardised metadata, are met (European Commission, 2016).

Following an evaluation of data and knowledge gaps to implement MSP, conducted on behalf of the Directorate-General for Maritime Affairs and Fisheries (DG MARE) in 2016 (European Commission, 2016), it was found that, although many European projects were short-lived (1 to 3 years), they did prove to be useful mechanisms for developing stakeholder ownership and channelling important policy issues through appropriate authorities. Some of the projects included the development of online mapping tools and those that continued beyond the lifetime of the project had a clear link to an underlying policy initiative or were managed by a public body with an interest in a longer-term MSP data strategy (European Commission, 2016).

Data portals allow the discovery, viewing of and access to the latest, most relevant datasets identified through the MSP process. A useful addition to data portals, with information from varying sources, is to include a clear, user friendly description of the dataset that is easily accessible. This can include information to summarise what the data is showing, who owns the data, how it was processed and possibly images to help convey information to the public in a user-friendly form. A good example of this being used in an MSP data viewer is the 'North East Ocean Planning Portal' for the North-East coast of the USA.

Figure 2 shows the information pop-up for one dataset on 'North-East Ocean Planning Portal' and it clearly summarises the layer in question for the end-user with hyperlinks to the full metadata file for users requiring more technical information.
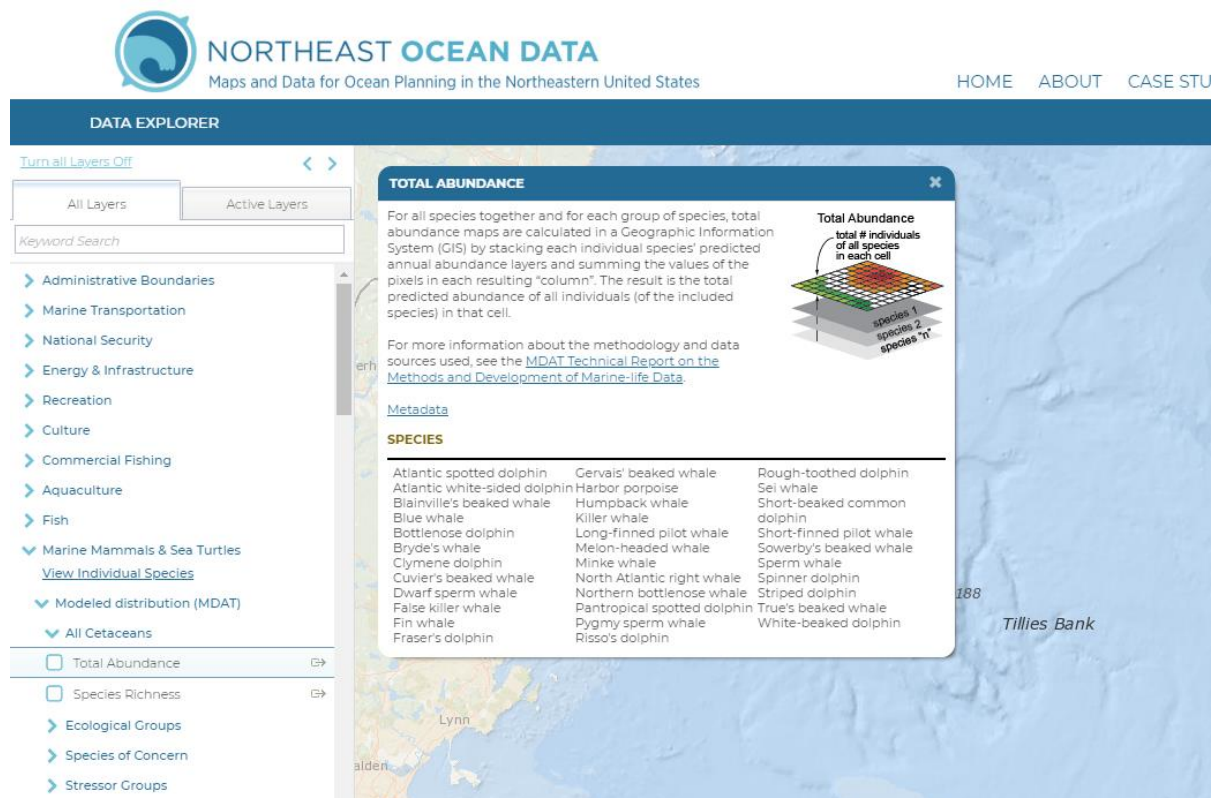
Figure 2.

Licensing of datasets should also be considered as a key component within the overall data management scope, and will ultimately determine whether a dataset can be used for MSP. The primary aim is to be open first, by establishing a 'Creative Commons' (CC) licence on datasets to be used for the MSP process to allow unrestricted usage and the ability to disseminate the information. Other licences may still allow this, however it is important to consider what restrictions they may have. By aiming for a CC licence, the need to review these restrictions and conditions on a case by case basis may not be necessary.

2.4   Data Reuse and Standards

Spatial data can be large in both its volume and complexity and have large numbers of disparate external data sources. Data governance is, therefore, very important for overseeing the integrity, use, availability and security of all data owned or controlled by an organisation. The full life-cycle of data management of spatial data includes collection from field and public domain sources, quality assessment and control, storage in standardized data models, distribution to viewer and/or analysis applications and capture in knowledge management and audit systems (WEC, 2010).

Data management standards are widely used within data collection and management with the aim of facilitating data maintenance, discovery and re-use. The availability of reliable data is key to any decision-making process; this can be achieved through standardisation and processes that define a set of common interfaces that aim to preserve an authoritative version of the data whilst enabling effective interoperability. These can include specifications that encompass data collection, the discovery and provision of web-based services to promote the sharing of and access to data.

Metadata should have sufficient information to allow users to have confidence in the data when deciding whether to use it to inform decisions. Requirements include defining ownership, accuracy

and precision of the data and including sufficient information on the lineage of the dataset to track how the data has been collected and subsequently manipulated to understand any limitations. A detailed description is also important so that the user has a thorough understanding of the information that the dataset is presenting before deciding whether it is appropriate for the intended use. There are metadata standards that have been designed to standardise metadata across industries, tailored to specific data types. Marine spatial planning can therefore benefit from adopting one of the common standards to ensure that data available for decision making is of a consistently high quality and easily accessible.

A possible improvement on metadata standards could be to develop extensions, such as controlled vocabularies for keyword tagging, to include information relating specifically to marine spatial planning. For example, MEDIN improved upon GEMINI and INSPIRE principles to make metadata requirements more specific to particular survey types in the marine environment. Some quality assurance steps, specifically in relation to how the dataset is of relevance in an MSP context, combined with a custom MSP controlled vocabulary could be included and appended to a metadata standard such as INSPIRE.

3   Approach

Usability is how easy something is to use. With regard to websites, usability considers how easy the average person can use the website to achieve a particular objective.

Usable websites lead to user satisfaction and depending on the user's goal repeat visitors. Usability testing uses scenarios where a person walks through a series of tasks that someone using a website for the first time is likely to perform.

3.1   Test Scenarios

A series of tasks representing what a user might undertake on the WMPP website (http://lle.gov.wales/apps/marineportal) was put together with the aim of assigning each of them a score from 0 (unachievable) to 5 (very easy).

The following scenario testing tasks were designed and agreed with Welsh Government.

- Select an area of interest and view all available data;
- Download all data applicable to an area of interest;
- View policies applicable to an area of interest;
- Download a list of all policies applicable to an area of interest and then download all policies;
- Create and print/download a JPEG image for area of interest with selected policy/evidence layers;
- Access the draft Welsh National Marine Plan;
- Provide feedback about a policy/ evidence for an area of interest; and
- Find contact for Welsh marine planning office.

3.2   Consideration of Other Portals

A brief desktop review of various data portals, primarily within Europe, has been undertaken to identify trends or strengths of other existing portals, with a focus on data portals containing web map applications. The portals were made up of a mix of existing MSP specific portals and portals serving other objectives, but at a national or international/regional level. The portals reviewed included:

- Compendium for Coast and Sea (Marine Institute, Flanders);
- EPA Maps (Environmental Protection Agency, Ireland);
- GeoHive (Ordnance Survey Ireland);
- HELCOM (Baltic Sea Region);
- Heritage Maps (The Heritage Council, Ireland);
- INFOMAR;
- IPAS (Integrated Petroleum Affairs System);
- Ireland's Digital Ocean;
- Ireland's Marine Atlas (https://atlas.marine.ie);
- MAP-MEP (Interactive energy map of the North Sea);
- MMO (Marine Management Organisation, UK);
- Marine Plan (Spain);
- NMPi (Marine Scotland);
- National Maps and Wildlife Services (Ireland);
- Northeast Ocean Data; and
- Wadden Sea Region Planning Tool.

In addition, a review of the Lle Geo-Portal for Wales was undertaken to assess the inter-relationships between the Lle Geo-portal and the WMPP. This was undertaken with the objective of identifying areas in which the two applications could be better integrated or signposted to support the marine planning process.

4   Scenario Results

The results of the scenarios have been used to review the usability of the WMPP and propose improvements to the WMPP, as summarised in Table 1.

The WMPP has a nice clean user interface and clear primary purpose related to marine planning in Wales. Overall whilst the portal currently provides a satisfactory user experience, it could be further enhanced with inclusion of a "getting started" pop up guide, additional spatial filtering and export/sharing functionality, as well as the provision of links through to related policies.

The interactive map is efficient in loading data layers and running queries. The user experience is let down by its lack of accessibility to underlying data, reports and policy information alongside the unintuitive nature of some of the tools and issues correctly displaying or exporting target or area coordinates.

There was also a functionality issue experienced when using the portal with Google Chrome (broken *measure areas/spatial search* function).

Table 1.   **Scenario Testing Results Table**

Task	Score	Comments	Suggested Improvement
Select an area of interest and view all available data	3	• Easy to search using the search/measure tool. • Easy to view data layers but not obvious has a 50-layer limit. • Longitude and Latitude coordinate target finder displaying incorrect coordinates. • Functionality combined with measure tool and link hidden in measurement pop-up.	• Add a short "getting started" pop up guide when portal is opened. • Add a counter to the search result pop up so it is clear how many layers have been selected. • Fix Longitude and Latitude target finder and move from bottom right corner to top left below the post search box. • Policies search should be separated out from the measure tool.
Download all data applicable to an area of interest	0	Unachievable	• Provide downloadable GIS data layers for area of interest, including standardised meta data. • Include area of interest coordinates in download.
View policies applicable to an area of interest	2	• Policies are listed in the *Area Layer Search* results box however not possible to click through to view the policy. • The metadata pop-up provides limited detail but no link to view the policy/ more detail on evidence (Figure 3).	• Include more detail about the policies. • Include links directly to policy documents. • Include links through to reports for evidence layers.

Download a list of all policies applicable to an area of interest and then download all policies	0	Unachievable	• Provide a downloadable CSV/PDF file containing summaries of all policies/ evidence for the selected area of interest. • Include selected area of interest coordinates in download.
Create and print/download a jpeg image for area of interest with selected policy/evidence layers	4	• Clear and easy to follow instructions to print a map with selected layers. • No inclusion of selected area of interest coordinates in print out. • No options on position of legend when printing.	• Provide option to create a PDF with links to policies and a JPEG/PNG/PDF of the selected area. • Include selected area of interest coordinates in print out/ download.
Access the draft Welsh National Marine Plan	3	• Easy to find Marine Planning section along top ribbon. • Incorrect link to the draft Welsh National Marine Plan. Currently links to consultation homepage.	• Update link to correct document: https://gov.wales/draft-welsh-national-marine-plan
Provide feedback about a policy/ evidence for an area of interest	5	• Easy to find feedback button on top ribbon. • Current map view saved with message and copy sent to email address. • Marketing opt-in tick box pre-ticked – not GDPR compliant.	• To be GDPR compliant, re-word the opt-in so that a positive opt-in is required: • "If you want to receive further information via e-mail from time to time on the development of the Wales National Marine Plan, tick this box:"
Find contact for Welsh Marine Planning Office	1	• No marine planning contact information available on the marine planning section of the portal (Note the marine planning page link is out of date). • Link in the Contact Us section of the home page does not provide text version of contact info (email). • Contact info only available from main Contact Us section of www.gov.wales	• Provide a contact link to relevant marine planning office in marine planning tab. • Update link to marine planning page. • Create a contact tab in the main ribbon of the portal – provide phone number/enquiry email.
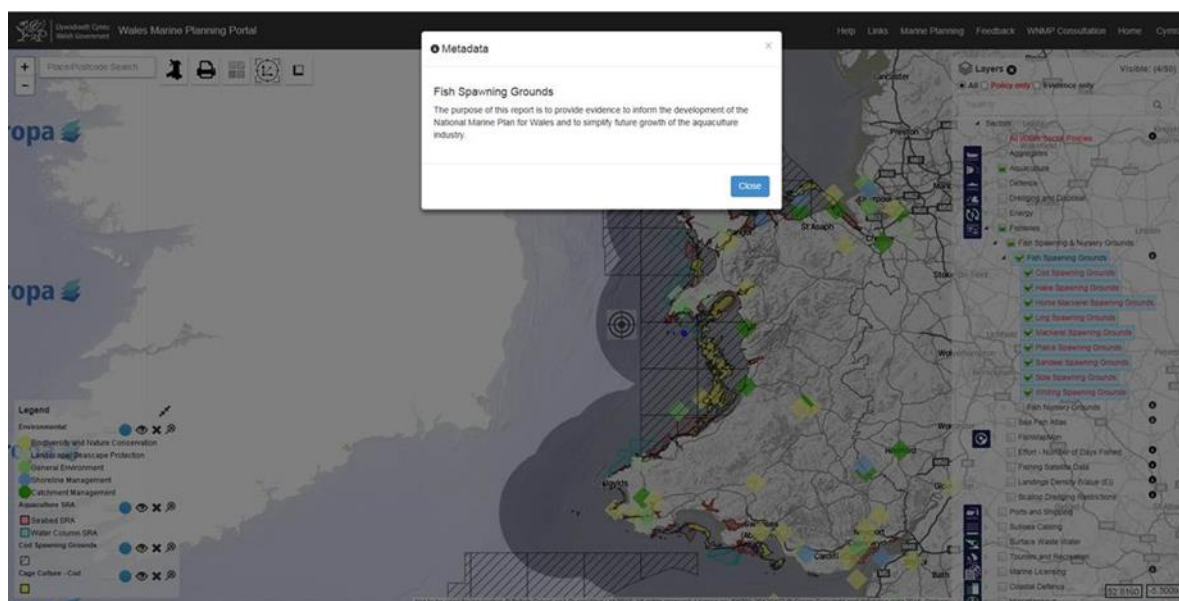
Figure 3. Example of limited detail provided in the metadata description – no link through to Fish Spawning Grounds report

5 General usability and data overview

5.1 General observations and suggestions

As well as testing the scenarios on the WMPP, other functional aspects of the site were looked at in more detail in parallel to the desktop review of other data portals. The review of other data portals highlighted a variety of good features, summarised in Table 2 below, from which observations and suggestions for the potential development of the WMPP have been developed (Table 2).

Table 2   Observations and suggestions developed from general review of marine portals in parallel to review of WMPP

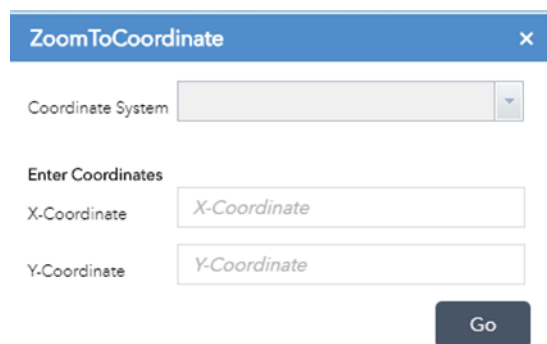| Broad Group	Good Practice derived from review of other portals	Observation / suggestion for the development of the WMPP	Benefit of implementation
Ease of Use	- User-friendly; - Large map area; - Clean and simple layout; - Clarity of purpose; - Clear scale and zoom/pan features; - Fast loading and data refreshing performance; - Responsive site design; and - Comprehensive user guide.	Offer pop-up user help on interactive map starting with a question "Do you know how to use this portal?" or similar	Having a site that is customer focused at its core using an effective and user-centric design will retain higher footfall and encourage wider adoption by users. Users have become familiar with interface elements acting in a certain way, so being consistent and predictable in layout and tool functionality will help users successfully complete their objectives on the site. Being purposeful in page layout can help draw user attention to the most important pieces of information. Making sure that the user is clearly informed as they interact with the site and provide easily accessible guidance will improve the user experience.
		Offer help link at the point where a specific tool or functionality (widget) is displayed – could jump to relevant section bookmark on help page	
		Add hover tooltips on widget buttons within mapping area	
		In layers list - category policy and evidence categories – alphabetical	
		In layers list – make clear how many layers are available in total/selected	
		Add a zoom to coordinate function (Figure 4)	
		Use of mobile friendly (hamburger) menu to declutter mobile experience	
Data Accessibility	- Rich data attributes and appropriate use of symbology; - Appropriately themed datasets; - Dataset information 'pop-ups', including images/reports; - One-look licensing flag, for example the red/green light system (used in MEDIN's data portal);	Querying layers experience not working with onscreen policy search polygon	Integration of the data layers, sources with tools to allow discovery, access, and the ability to view the data helps deliver marine spatial planning objectives, and is important to the transparency of the process and encourages stakeholder engagement. A useful addition to data portals, with
		In layers list – standardise the description, metadata and source link for all layers (Figure 5)	
		Include more detail about the policies and where to get additional info on the related policy	
		Provide links to policy documents in results	

Broad Group	Good Practice derived from review of other portals	Observation / suggestion for the development of the WMPP	Benefit of implementation
	▪ Link to dataset download (functionality often hosted on data catalogue sites); ▪ Keyword search on layers; ▪ Ability to view layer attribute tables; ▪ Link to standards compliant metadata, with full data description and lineage information; and ▪ Promoting the adoption of Creative Commons (CC) data licencing.	Extend number of evidence datasets, including evidence layer equivalents of policy layers (e.g. fish spawning and nursery grounds)	information from varying sources, is to include a clear, user friendly description of the dataset that is easily accessible. Wide adoption of open licencing on datasets to be used for the MSP process will allow unrestricted usage and the wider use of data in broader initiatives. Ensuring data is searchable, accessible, interoperable and re-usable by users ensures the longevity of data throughout the MSP process.
		Inclusion of more data attributes (e.g. Include all qualifying features in Natura 2000 data layers)	
		Better use of symbology to visually categorise data (e.g. active and expired marine licences)	
		Ability to download a JPEG/PNG/PDF of selected map/ area (see Figure 6)	
		Ability to download a CSV/PDF file containing summaries of all policies/evidence	
		Ability to export search results including links to policies/webpages	
Functionality	▪ Ability to dynamically change layer symbology; ▪ Apply a spatial search query to data layers via user drawn polygon; ▪ Option to re-order loaded layers; ▪ Control of layer transparency; ▪ Ability to move/minimise legend; ▪ Facility for stakeholders to provide data to the portal; ▪ Provision of multiple base maps; and ▪ Social media sharing capability.	Link to data downloads	Adding well-structured functionality can enhance the user experience on the website. Functionality can help achieve specific MSP objectives (e.g. network planning, general consultation exercises). Providing extra functionality empowers users to interrogate the data further to answer their questions.
		Link to full metadata records	
		Dedicated top level spatial search widget	
		Consolidate function of add line/polygon widget to deliver spatial search functionality	
		Add options to spatial search widget e.g. rectangle, line, point, radius (Figure 7) and user uploads	
		Add social media sharing functionality to the map (Figure 8)	
		Extend spatial search to optionally return both policy and evidence layers	
Understanding users	▪ N/A	Use of advanced tracking codes – reversing IPs would identify organisations using website	Understanding user behaviour helps to improve the experiences your users have

Broad Group	Good Practice derived from review of other portals	Observation / suggestion for the development of the WMPP	Benefit of implementation
		In page analytics could provide insight on how users are accessing the interactive map	on your website and can help shape future development plans for the site
		Tracking data downloads	
General observations	▪ N/A	Loading and refreshing speed needs to be as fast as possible	Encourages stakeholders, including those with poorer broadband access, to continue to engage with the process.
		Review of themes and layers data gaps and inclusion of new data layers	
		Improvements to the source metadata to ensure they are not only INSPIRE compliant, but also provide useful descriptions and lineage information about each dataset	
		One-look licensing or openness rating flag, as seen in MEDIN, would be useful to highlight which datasets can be downloaded free of charge and which ones need a data licence agreement with the data owner	

Figure 4.   Example of zoom to coordinate function (Northern Ireland Marine Mapviewer)
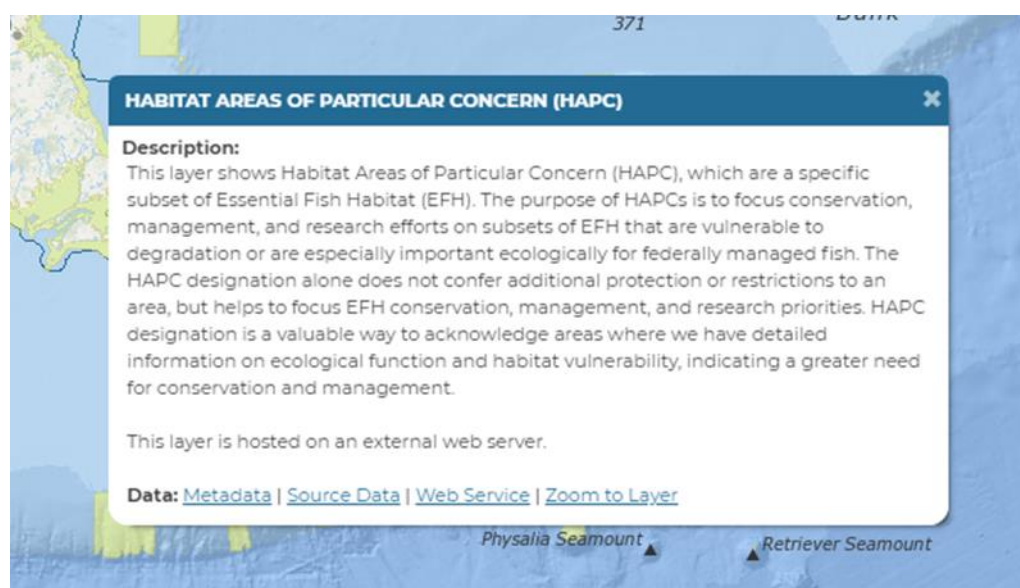
Figure 5.   Example of standardised description, metadata and source description (North East Ocean Data - https://www.northeastoceandata.org/data-explorer/)
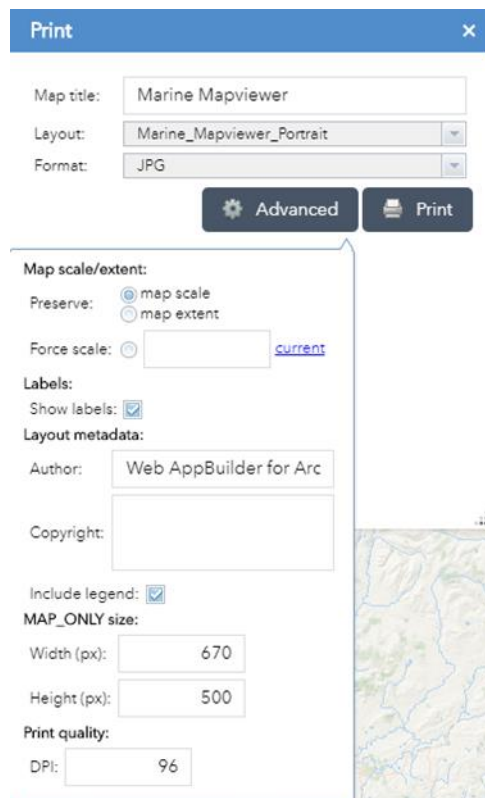
Figure 6.   **Example of advanced print/ download function (Northern Ireland Marine Mapviewer)**
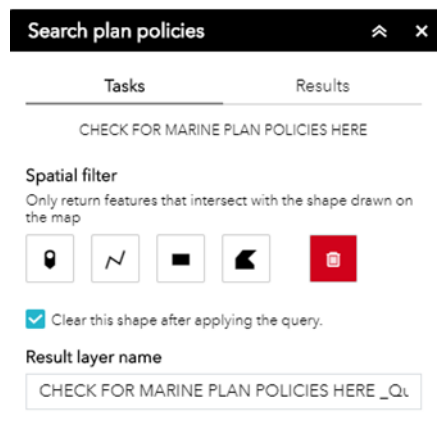

Figure 7.   **Example of spatial filter function (MMO MIS viewer)**
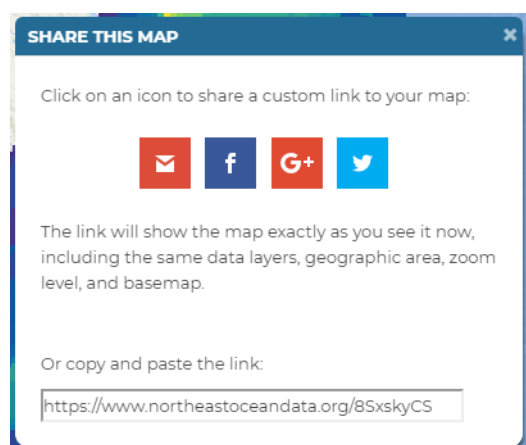
Figure 8.   Example of social sharing function (North East Ocean Data portal)

5.2   WMPP Marine Data Review

As part of the data assessment process the structure and contents of the WMPP has been reviewed to evaluate:
- Data gaps (in the context of both the data requirements of this project and wider initiatives); and
- Potential to include datasets collated as part of the wider Sustainable Management of Marine Natural Resources project (ABPmer, 2018).

A wide range of data suitable for marine planning is available on the WMPP, however, a number of data gaps have been highlighted, many of which are addressed in the geodatabase provided as part of the wider project (ABPmer, 2018).

One of the biggest gaps is biological data within the environmental section. There is limited data on species distributions on the planning portal including; marine mammals, fish, sharks, non-native species and seabirds. This will be required for any aspect of a project lifecycle from initial marine planning to consenting and is therefore fundamental to MSP. Some examples of data currently unavailable on the WMPP include:

- No data could be found which showed the distribution of Section 7 habitats and species. This data would be required to provide better confidence in site selection and assessment of activities. This links closely to the lack of data on shark distribution, and to basking shark in particular, a Section 7 species. Limited marine mammal data for both cetaceans and seals are included on the portal. Only one data layer regarding seal haul out could be found.
- Physical and chemical data are quite sparse. The only layer relating to WFD monitoring found on the portal was WFD River Basin Districts. Addition of all WFD monitoring data from Cycle 1 and 2 could be included within the portal to address this gap.
- Although a range of seabird data are available on the portal, much of this data is from 2011 and more recent data would be needed to accurately inform consenting activities. Similarly, no data on wading birds was available on the portal.
- Data on fish distribution was not on the portal and this has been highlighted as major issue for informing the consenting process. In addition, data on the distribution of migratory species also poses a large data gap, and this would be especially important where activities may occupy constrained geographical areas e.g. tidal streams within sounds. Although data on spawning and nursery habitats is on the WMPP, it is under a policy context as opposed to providing underlying environmental data.

Where environmental layers are available they often appear to be outdated and/or related to policy as opposed to presenting the underlying data. In this context there is the opportunity for greater integration between the WMPP and the Lle Geo-portal (which furthermore could be updated with the data collated throughout the wider Sustainable Management of Marine Natural Resources project, as discussed in Section 5.3 below).

5.3   Relationship to Lle Geo-portal

The Lle Geo-portal was developed to serve as a hub for data and information covering a wide spectrum of topics, primarily around the environment. There are therefore a wide range of data held within the Lle Geo-portal which have relevance to the WMPP but there is currently no direct linkage between the two.

It is therefore recommended that MSP datasets required for the WNMP are stored within the Lle Geo-Portal: (http://lle.gov.wales/, 2018), but accessible for visualisation and query via the WMPP, thus ensuring datasets that are potentially useful for MSP are discoverable and accessible by all stakeholders. Where stakeholders initially interact with the Lle Geo-Portal it is recommended that signposting is provided to the WMPP, to allow users to visualise and query the data for MSP purposes where appropriate.

To facilitate the user experience, the search functionality in the Lle Geo-Portal would benefit from a review to include a 'Marine' theme with subcategories and consider themes/activities relevant to MSP and used in the WMPP, including subcategories that are currently missing, such as recreational and socio-economic activities.

By ensuring the Lle Geo-Portal is used as the primary data catalogue for MSP related evidence datasets enables the creation of linkages from the WMPP evidence data layers back to underlying metadata records and dataset downloads.

5.4   Future Considerations

Further to the developments identified as part of the functionality review of the WMPP against other current portals (Section 5.1), consideration has been made as to how the WMPP could potentially develop over time into a more comprehensive marine spatial planning tool.

As the internet and the way people interact with it evolve at a rapid rate, functionality is already evolving in design to be mobile first, and subsequently could see a wider adoption of native mobile apps for engaging with stakeholders. An obvious application would be around collecting related citizen data to generate new activity layers to feed into the MSP process. Another could be as a communication tool to alert users of upcoming events and provide news updates during the MSP process. To that end it is noted that any web products moving forward should also be responsive in design.

To discover what MSP data and tools exist, users will need to be guided and this experience could vary between internal and external stakeholder groups. External users will need to easily find the online MSP space and be provided contextual narrative and signposting to relevant tools supporting their involvement along the MSP journey. The narratives could also be delivered as interactive web applications such as ESRI's story maps aiming to bring the ability to tell a story whilst allowing stakeholders to interact with the data. In time, other supporting MSP information such as case studies could be incorporated into the user experience.

Internal (Welsh Government / Natural Resources Wales (NRW)) stakeholders may have access to a separate Geographic Information System (GIS) platform that is integrated with a core data repository. The platform could span multiple departments where users have access to either web or desktop based GIS tools, depending on their function, and data access also profiled by function. For example, planners may not have access to data related to ongoing licensing applications. This approach would ensure that duplicate and outdated datasets would be replaced by a single central authoritative version of the data for all GIS desktop or web users. Another possibility could be to explore options to expand the existing web platform to handle both internal and external users. This route could require significant restructuring of the architecture both in scalability and implementation of extra authentication measures. Other considerations would include the day to day environment and tools that functions such as planning or licensing could be using. For example, NRW is bolting its marine licensing function onto a central SharePoint environment, this could be complemented by integrating mapping into task specific workflows, potentially with outputs captured against the relevant job.

To ensure that MSP datasets are discoverable and re-usable by stakeholders, it will be beneficial to ensure INSPIRE compliant metadata is provided with a full data description and informative lineage. It may also be useful to consider building upon a metadata standard such as INSPIRE, using controlled vocabularies to meet Welsh needs and include MSP keywords/tags to aid the discoverability and rating of datasets under relevant themes. The themes for MSP should also include subcategories to help stakeholders locate datasets of interest in line with the WNMP. It is worth considering the option to investigate the use of a similar controlled vocabulary and potentially establish a new schema related to marine and MSP datasets under Schema.org.

The user experience for stakeholders when using a MSP portal needs to be as intuitive as possible. To achieve an intuitive user experience consideration should be given to concepts such as using pre-bundled maps or themes of data. The data could potentially be grouped by activity, receptor or user which, if tied in with a simple layer search interface presented as a single layer management tool fronting the portal, could make it easy for the user to bulk load key layers and find other layers relevant to their project as required.

Providing a workflow for stakeholders to find and then download datasets, with the option to allow users to add multiple datasets to a shopping basket, providing bundled data downloads, could be beneficial. Additional functionality could allow the download bundles to be grouped by different parameters, such as the data licence type which would allow tracking of user acceptance of any data licensing agreements as required.

Offering users the ability to create optional user accounts facilitates the addition of other portal functionality including: retention of layer selections; users roles; data and functionality security controls; and communications channel for portal and data updates.

Looking forwards, it is possible to conceive an opportunity to allow stakeholders, such as developers, the ability to upload related datasets via a web interface as a form of contribution into the overall evidence base. This could include datasets submitted from processes associated with consenting or marine licence applications which, if integrated and catalogued appropriately, could contribute to improving the overall scientific understanding of the marine environment and impact evaluation.

These concepts are not exhaustive and the adoption of technologies moves at such a pace that requires a watching brief to flag other technical or functional opportunities that would benefit the MSP process in Wales going forward.

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7   Abbreviations/Acronyms

CC	Creative Commons Attribution
CSV	Comma Separated Values
DG MARE	Directorate-General for Maritime Affairs and Fisheries
GDPR	General Data Protection Regulations
GIS	Geographic Information System
HELCOM	Helsinki Commission
HM	Her Majesty
IPAS	Integrated Petroleum Affairs System
MIS	Marine Information System
MMO	Marine Management Organisation
MSP	Marine Spatial Planning
MSPP	Marine Spatial Planning Portal
NRW	Natural Resources Wales
SRA	Strategic Resource Area
WFD	Water Framework Directive
WMPP	Wales Marine Planning Portal
WNMP	Welsh National Marine Plan
WP	Work Package

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.