Pilot study for WP4 - Testing

D10
4.3.13 Interoperability tools

French Hydrographic Service (Shom)

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Glossary

CEREMA	French Centre for Studies and Expertise on Risks, the Environment, Mobility and Urban Planning
EMODnet	European Marine Observation and Data Network
EN	English
EU	European Union
INSPIRE	Infrastructure for Spatial Information in Europe
HTML	HyperText Markup Language
OFB	French Biodiversity Agency
MarSur	Martime Surveillance project
MS	Member State
SAR	Search & Rescue
Shom	French Hydrographic Service
TSS	Traffic Separation Schemes
URL	Uniform Resource Locator
WFS	Web Feature Service
WMS	Web Map Service4

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1. Introduction

1.1. Context

Enhanced cooperation and smooth-flowing exchange of information between maritime surveillance authorities is today one of the main strategic objectives of the EU in the framework of the Integrated Maritime Policy and key component of the European strategy for maritime safety[1].

Since 2006, the European Commission has worked to improve cooperation across the maritime surveillance authorities of the Member States (MS) and to enhance the interoperability of their respective data systems, both at National and European level. The information exchange systems Europol (criminal and terrorist networks), MARSUR (maritime surveillance dialog) and SafeSeaNet (vessel traffic monitoring and information system) are good examples[2,3]of such collaboration work.

Today, the exchange of maritime information between various maritime authorities at National and European level is still complex and limited, mainly because of the "non-interoperability" of surveillance systems and the existence of legal barriers (EU directives, national policies, etc.). Maritime surveillance stakeholders continue to produce, collect and use geographical information very often separately, without initiating data sharing.

To overcome these limitations while meeting information needs, an interoperability tools geoportal dedicated maritime surveillance and environment data is implemented.

The Mediterranean governance for Strategic Maritime Surveillance and Safety issues project (MED OSMoSIS) strategic project aims to tackle this complexity through the development of tools/applications and the implementation of pilot studies that will enable the improvement of information exchange between different authorities and MS.

[1] Better situational awareness by enhanced cooperation across maritime surveillance authorities: next steps within the Common Information Sharing Environment for the EU maritime domain (2014). *Communication from the Commission to the European Parliament and the Council*, COM (2014) final, 1-8.

[2] https://www.europol.europa.eu/fr/about-europol

[3] Organismes et systèmes d'échange d'information multinationaux contribuant à la sûreté maritime (2015). *Etude prospective et stratégique de la DGRIS*, Ministère de la Défense, 1-47.

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1.2. The MED OSMoSIS project

MED OSMoSIS is a strategic project funded by the Interreg MED programme that consists of promoting the implementation of improved governance and data exchange among different actors of the Mediterranean Area towards the policy development of Integrated Maritime Surveillance in the European Union.

MED OSMoSIS brings together 10 partners from 8 coastal states of the Mediterranean: Greece – as the Lead Partner – Croatia, France, Italy, Montenegro, Portugal, Slovenia and Spain. It gathers public scientific institutions and national authorities in charge of navigation safety and maritime surveillance. The project focuses on the development of modules and applications regarding maritime surveillance activities – in terms of safety and security – to facilitate information exchanges that will support the further development of a regional/local smart plug-in capability.

The project explores the application of current guidelines and capabilities of the ongoing evolution of the interoperability tools. It carries out pilot activities and capitalization actions to test, disseminate and distribute the tools and protocols developed among partners either as potential users or as intermediaries to reach other participant entities.

Three pilot activities are foreseen in the project:

- **Greece and Spain** – Search and Rescue (SAR) Planning: Testing of tools, methodologies and algorithms for SAR operations;
- **Adriatic Sea** – Improvement of the cycle management of information necessary for the update of cartography to ensure safety to marine users;
- **France** – Development of an API (S-124) for the production and diffusion of Navigational Warnings by web services (FR/EN); Study on CISE to assess the process and needs for the integration of Shom's data into the French CISE network; **Development of interoperable tools and geoportal dedicated to maritime surveillance data**

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1.3. Purpose of the document

This pilot study corresponds to the deliverable D10 for the WP4 Testing and responds to the task 4.3.13 "Interoperability tools".

This report presents the significative improvements brought to the existing interoperability tool data.shom.fr platform, as well and the development of a thematic interactive map dedicated to maritime surveillance data. The report also describes further the steps undertaken to verify the functionalities of both tools.

2. Definition and goals for Interoperability Tools (French pilot study)

The missions carried out by Shom include the dissemination of information with regards to the characterization of the physical marine environment such as maritime boundaries, bathymetry, oceanographic forecast.

Within MED OSMoSIS project, Shom did commit to bring modifications to its platform in order to increase its interoperability, better accept the data flow coming from other EU platforms/webtools and deliver an integrated picture of the situation (*Deliverable D10 as per described in the Application Form, WP4 Testing, Task 4.3.13 Interoperability tools*).

In order to develop proper interoperability tools, Shom first carried out modifications to its existing data platform data.shom.fr. A second step was to create a demonstrator of lighter thematic portal that can be adapted according to a chosen range of data. The latest is likely to be integrated onto the National Portal of Maritime Limits website (https://maritimelimits.gouv.fr/). This lightweight portal can easily be integrated onto websites pages, and a version dedicated to maritime surveillance was successfully integrated as an example to MEDOSMoSIS website front page (https://med-osmosis.interreg-med.eu/).

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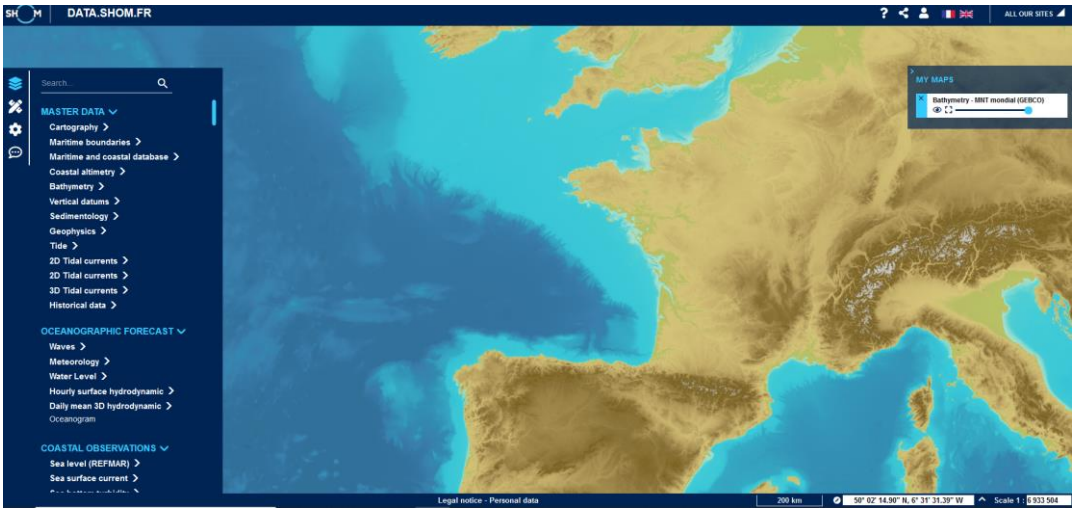
3. Technical developments of data.shom.fr

3.1. Background information and context

Created in 2013, the data.shom.fr portal makes data of public interest available and widely accessible for visualization. The platform is coordinated and administered by Shom's *Diffusion* department, working closely with the service contractor ensuring its maintenance and development. Data.shom.fr platform provides access to multiple services[4] :

- **Online visualization service of geographical information of public interest**
  Part of this geographic information is relevant to maritime surveillance. The interface gathers multiple data: reference data produced by Shom: bathymetry, maritime boundaries, oceanographic forecasts in partnership with Meteo France and Copernicus Marine Service (waves, meteorology) and coastal observations (water levels, surface currents).

Figure 1 : Overview of Datashom.fr portal



- **Access to data information and downloading option through a metadata catalog**
  Data produced by Shom is made available to the user in several formats: shape, Web Service (WMS, WFS) as per the Inspire Directive's recommendations. Some data is submitted to a restricted access and provided for visualization only, which implies that no downloading option is available.

[4] More informations on https://www.shom.fr/fr/nos-activites/diffusion

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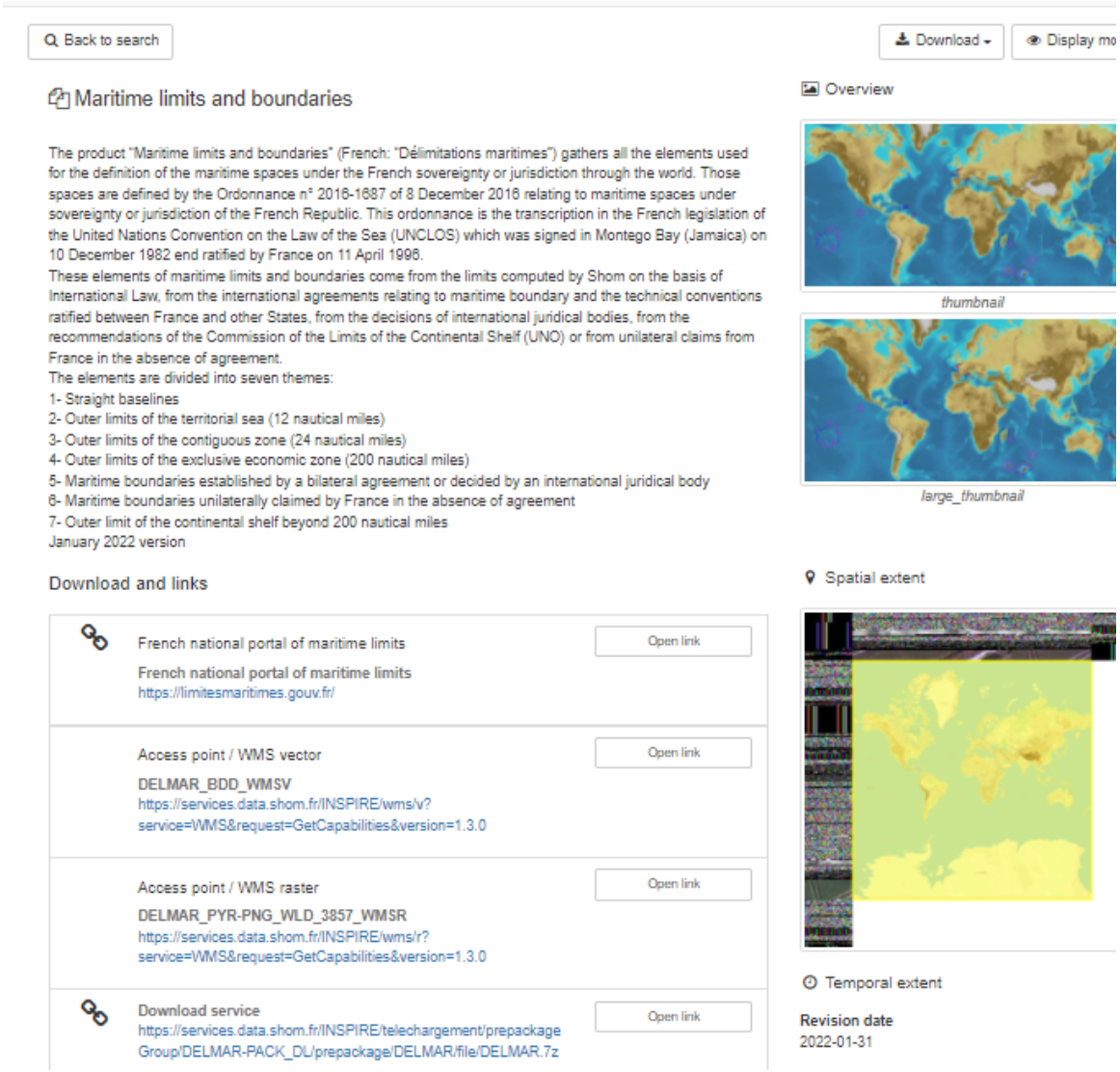
Figure 2 : Visualization of maritime limits and boundaries metadata (download and links)

https://services.data.shom.fr/geonetworks/srv/eng/catalog.search#/metadata/BDML_DELMAR.xml



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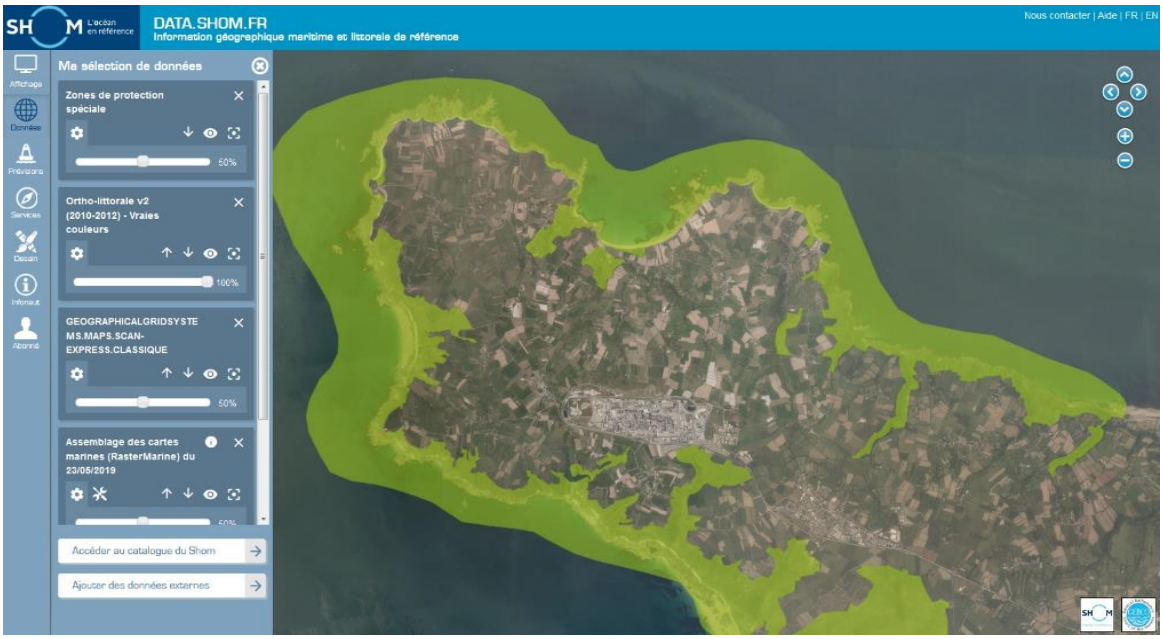
3.2. Developments carried out within the MED OSMoSIS project

In order to make the data shared by Data.shom.fr more interoperable and to evolve towards amore user-friendly interface also appropriate in a transboundary context such as the MEDOSMoSIS project, several developments were carried out.

3.2.1. Before development

Before the improvements performed under the MED OSMoSIS project, data from external partners could only to be visualized: the user did not have access to the relevant associated information regarding the legend, attribute table or metadata.

Figure 3 : Overview of DataShom.fr before development



3.2.2. After development

The following improvements carried out within the MEDOSMOSIS project (*Task 4.3.13 Interoperability Tools of the WP4 Testing)* enabled to develop the harvesting and tp get capabilities of the webservice (following OGC standard) from external producers.

Another objective of this study was to facilitate the use of data.shom.fr to non-French speakers with the full interface in English (portal architecture, data listing and tools).

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Figure 4 : Overview of Datashom.fr post development

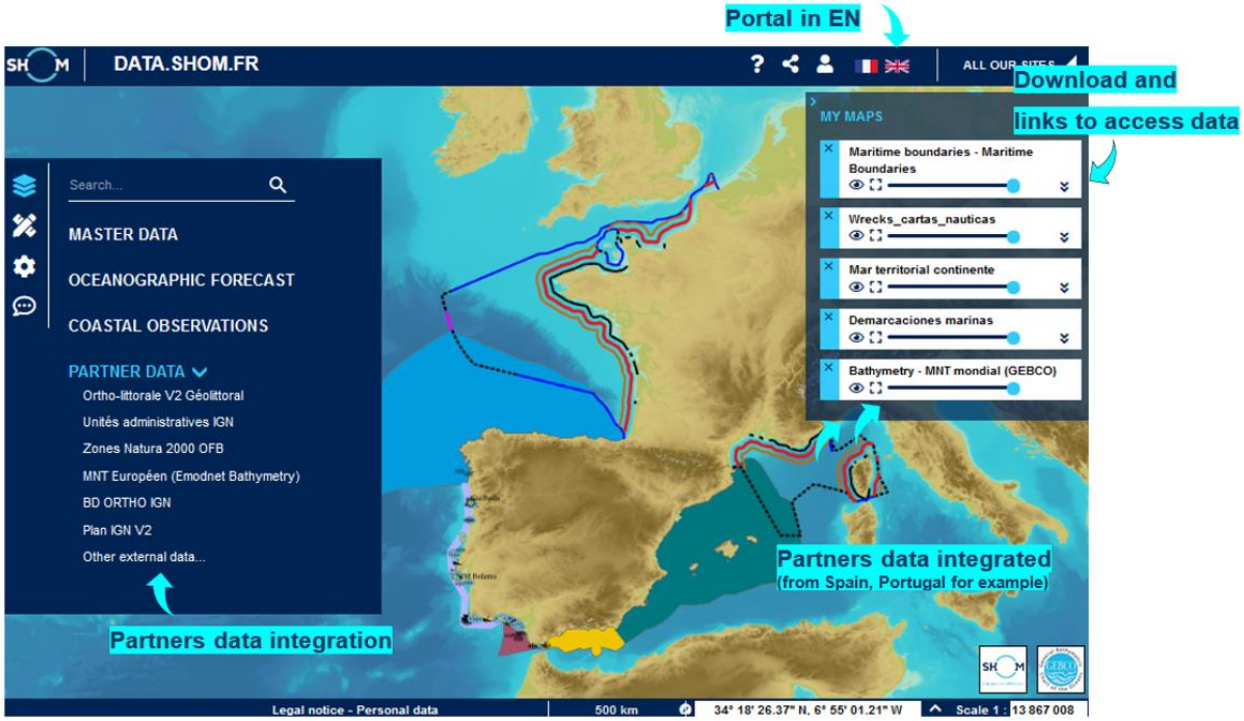
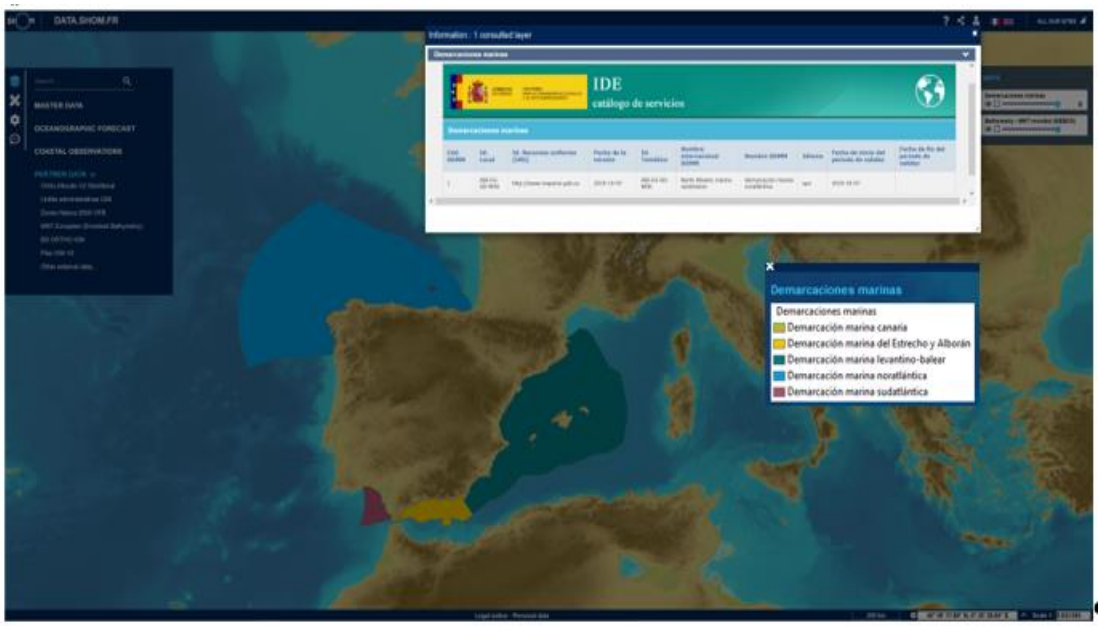


Figure 5 : Example of information available with integration of Partners data onto DataShom.fr



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3.2.3. English version of Datashom.fr

Various elements of the Data.shom.fr portal were translated into English:

- headers
- footers
- general interface information

Figure 6: Translation of the website skeleton

- data catalogue

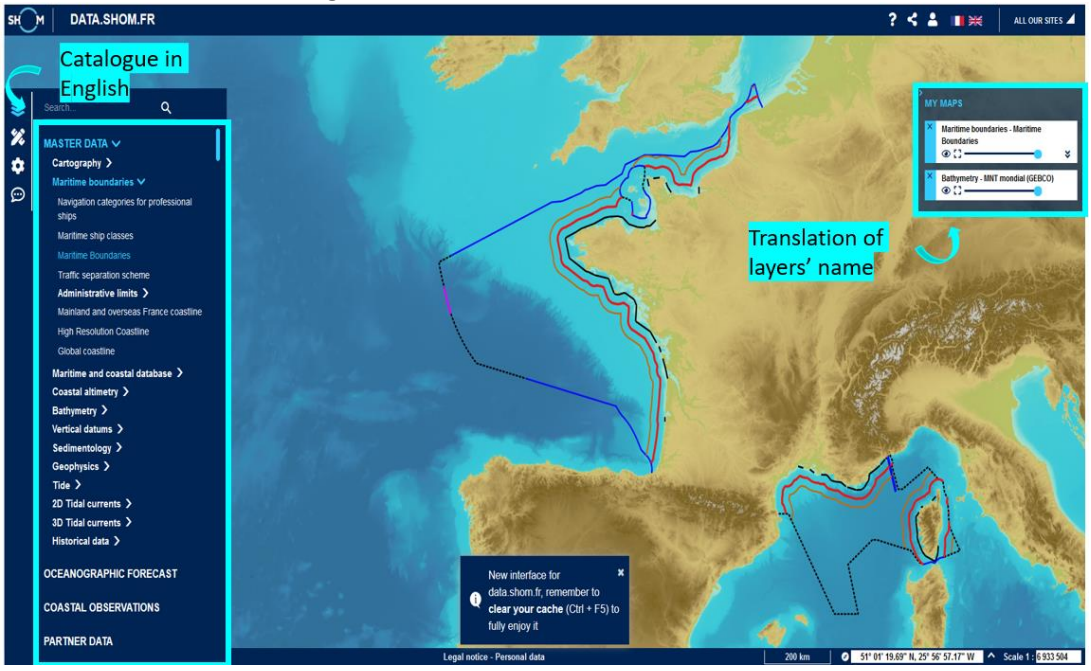

Figure 7: Translation of data catalogue

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- legend
- access to layer capabilities

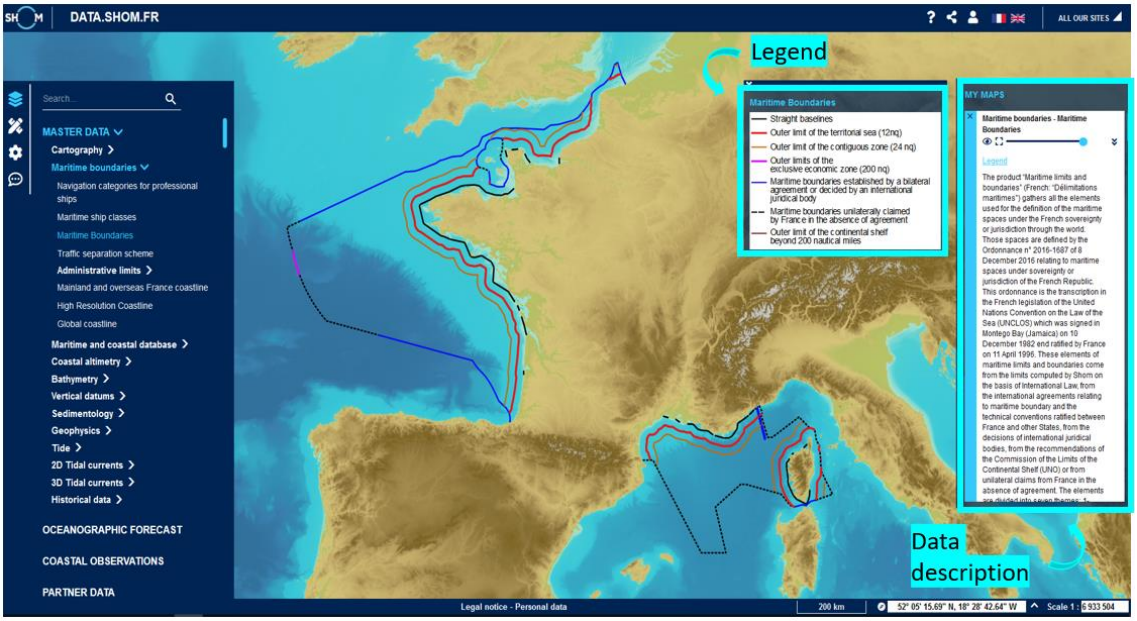

Figure 8: Translation of the data description and legend

The data description however remains in French. Where available, translation is accessible through a click on the EN header.

3.2.4. Importing partner data

Different types of webservices flows can be integrated (formats such as WMS, WFS, etc.) using URL addresses. Developments have been carried out to enable the integration of layers from partners and query access to:

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- the attribute tables,

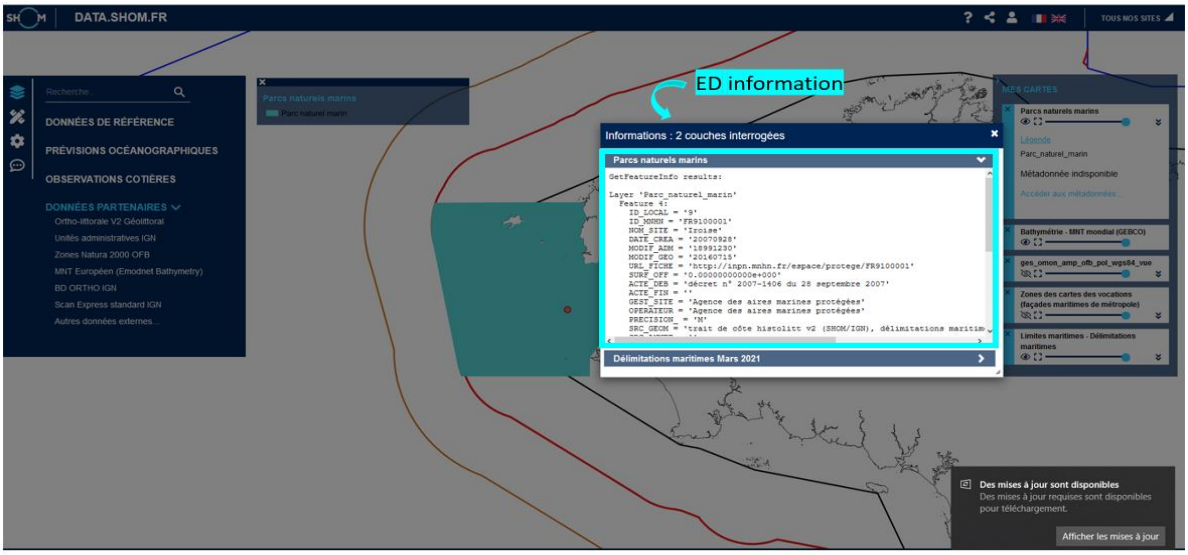

Figure 9: External data (ED) attribute information

- legends and related metadata.

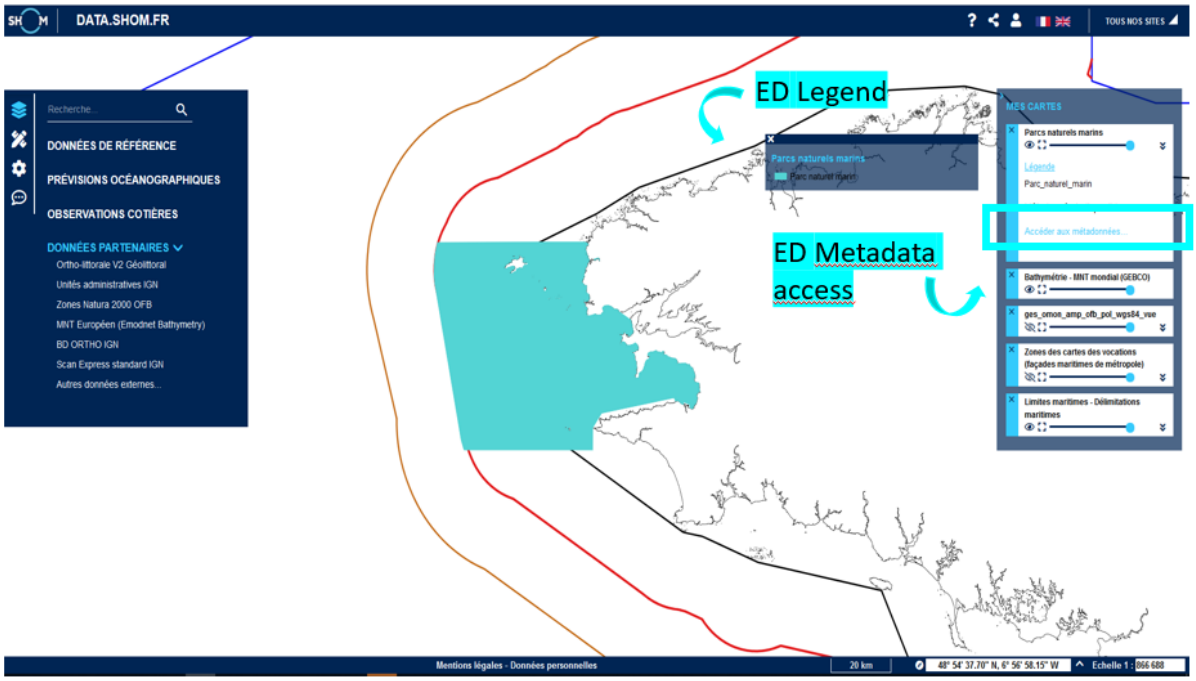

Figure 10: External data (ED) legend and metadata access

Nevertheless, this functionality depends mainly on the upstream parameters of the webservice configurated by the data producer. The role of stakeholders is therefore highlighted with regards to

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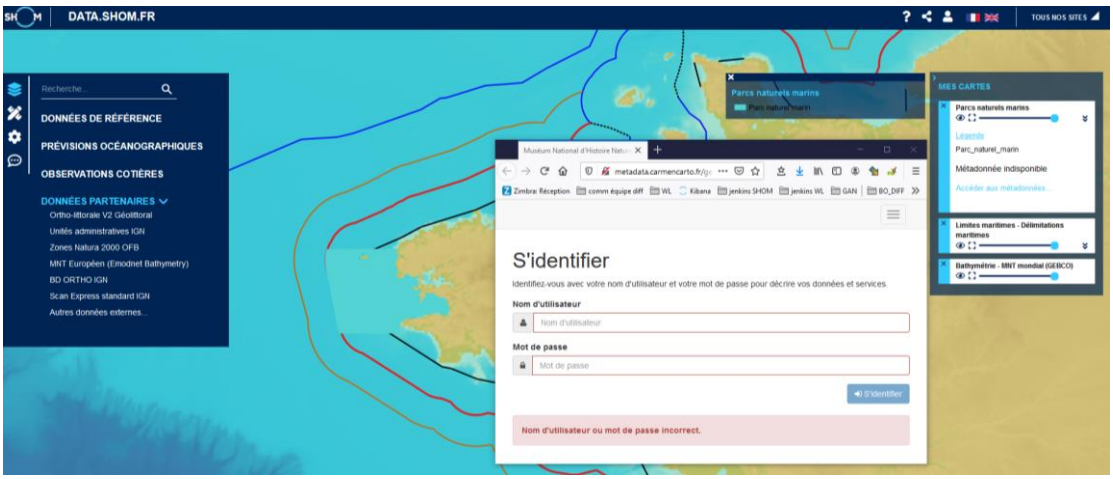
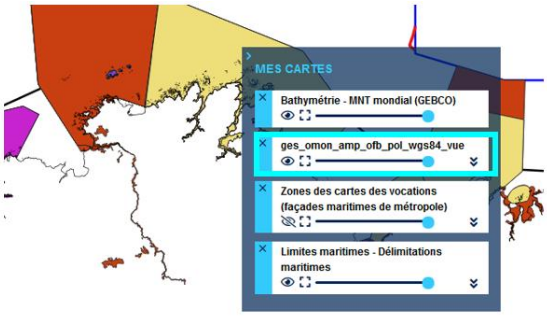
the dissemination of the data. The data.shom.fr interface displays only external data. It remains the responsibility of the data producer to ensure the integrity, quality and reliability of the data displayed.

Examples of issues that may arise from external data integration:

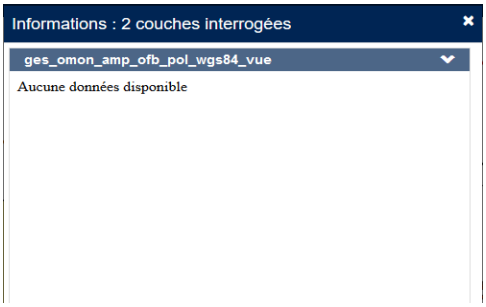
- Access/Login to metadata



- Non-explicit layer names



- Lack of data attribute



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Instruction for the use of this tool is available in **Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.** if additional guidance is needed.

3.3. Creation of a thematic portal

The data.shom.fr platform provides a very exhaustive set of data and associated information. In addition to the modifications brought to increase the platform's interoperability, it was decided to develop a lighter portal targeting specific data and information to illustrate some sectors.

3.3.1. Background information and context

Several portals dedicated to environment, maritime surveillance and MSP managed by Shom were identified as relevant for the maritime surveillance theme. Data.shom.fr was used in third application but all data catalogues and drawing capacities were copied which was not very user-friendly for non-expert users and sometimes not very ergonomic.

- **The national maritime boundaries portal (PNLM)**

The French national portal of maritime limits (PNLM: Portail national des limites maritimes - https://limitesmaritimes.gouv.fr) was initiated in 2017 to publish the limits of French sovereignty and jurisdiction. The portal has been upgraded regularly since 2018 in order to increase visibility and facilitate access to the main regulatory limits at sea. In this case the full data.shom.fr portal was not very user friendly and a lighter portal would be more appropriate.

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Figure 11 : Overview of the French national portal of maritime limits

- **Shom's portal dedicated to European maritime surveillance and MSP projects: https://services.mspdata.eu**

This portal (https://services.mspdata.eu/home/en/med_osmosis) gives an overview of the various projects Shom's MSP Department has been working since 2015: SIMcelt, SIMNORAT, SEANSE SIMWESTMED, SIMATLANTIC, MSPMED, MED OSMoSIS, MSP-OR and eMSP NBSR projects. For each project, the portal provides information on the objectives, participants and related information such as a detailed description of the deliverables and access to portal viewers when available. The portal integrates the interoperability web tool developed as part of the project, a light thematic portal that enables an overall visualization of some identified specific layers useful to surveillance.

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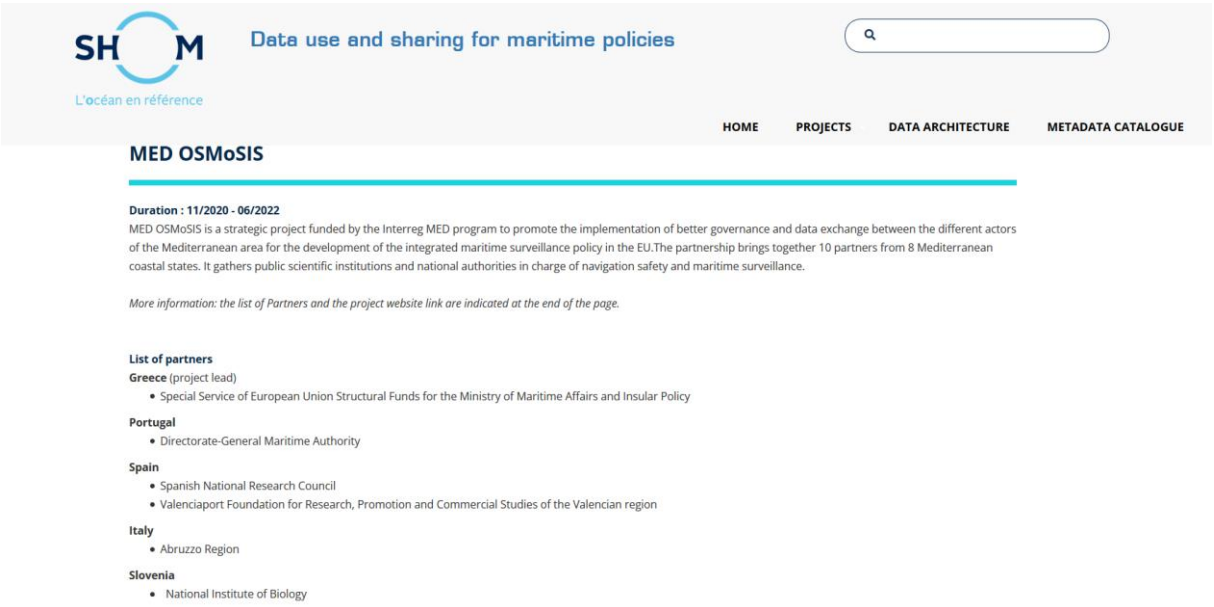
Figure 12: Shom European maritime surveillance and MSP editorial site https://services.mspdata.eu



3.3.1. Developments carried out within the MED OSMoSIS project

As previously mentioned, Shom was expected within the MED OSMoSIS project to develop interoperability tools in order to increase data interoperability and provide an integrated picture of the situation.

- Technical **Web tool description**

For a lighter and more targeted interface specifically dedicated to the needs of maritime surveillance actors, an adaptation of Data.shom.fr was necessary. Due to the exhaustive information of Data.shom.fr, the search for specific and targeted data or information indeed could result not optimal in some cases. Shom therefore developed with the support of its service contractor a new interoperable web tool in order to improve the use and visibility of data in the Mediterranean area, and to enable a cross-analysis between information related to European maritime surveillance, planning and environment.

- **Source identification and main information**

The integrated data comes with access to description, legend, metadata allowing 1) identification of the data producer and 2) data download link when possible. The data related to MSP (French vocation areas, Spanish demarcation maritime) was particularly handled with care since, in addition to the main

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information that can be interrogated, access is given to prescriptions and recommendations for each vocation area.

- **Easy access to data and partners data**

The portal can be adapted according to specifically identified topics. In this study, data is related to maritime surveillance (e.g.: Search and Rescue Areas).

Data is sourced either internally from Shom's database, or externally - with the required- and integrated onto the portal.

In a European context and in the interest of the portal's interoperability, external data sources are essential. They will also make the portal more attractive.

The formats expected from external sources for the import of data are web service formats such as WFS, WMS, WMTS. Harvesting webservices ensure Using these formats enable a direct access to the best available data and continuously updated from the data producers. The data is also updated when.

- **Use of resources hosted on web platform**

New data can easily be added to the thematic maps provided that the defined data format is correct and inserted in the web page by a code line. As an example, in the study, it was considered that the portal would appear on the project website: https://med-osmosis.interreg-med.eu/ and Shom's MSP editorial website (https://services.mspdata.eu).

To deliver this tool, Shom capitalized on the tools and functionalities developed for the improvement of platformShom.data.fr aiming to provide a better user experience. The new interface comes with a lighter infrastructure and an improved visual, and is accessible in both English and French languages.

The different functionalities of the portal were tested and several improvements were carried out by Shom to reach better data interoperability. Exchanges took place from June 2021to December 2021 between Shom and the service contractor in order to refine the portal.

This led for example to the improved display of data from web services, integration of ocean forecast data (WMS format), grouping of data per category, access to data producer information (logo, legend, metadata) or layer query.

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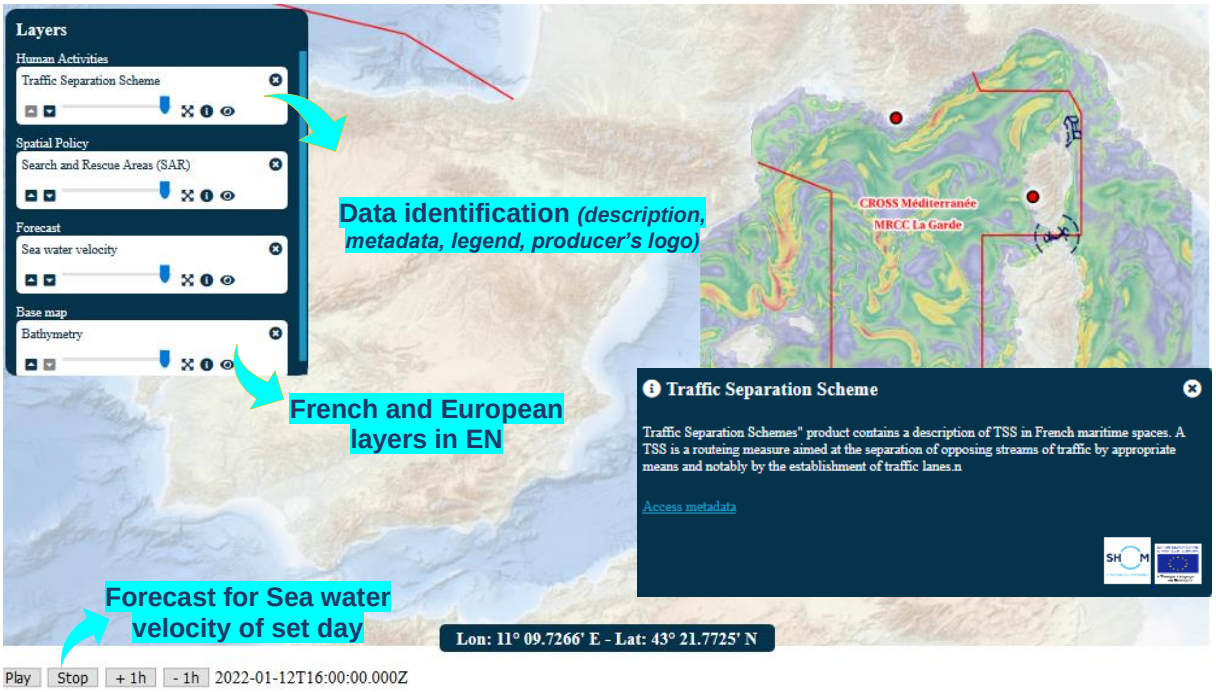
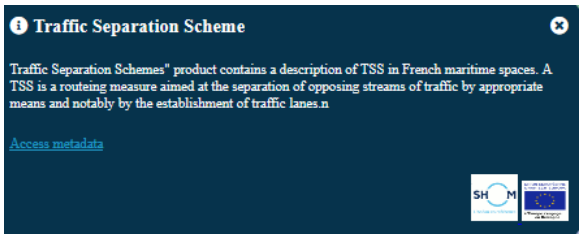
Figure 13 : Portal overview





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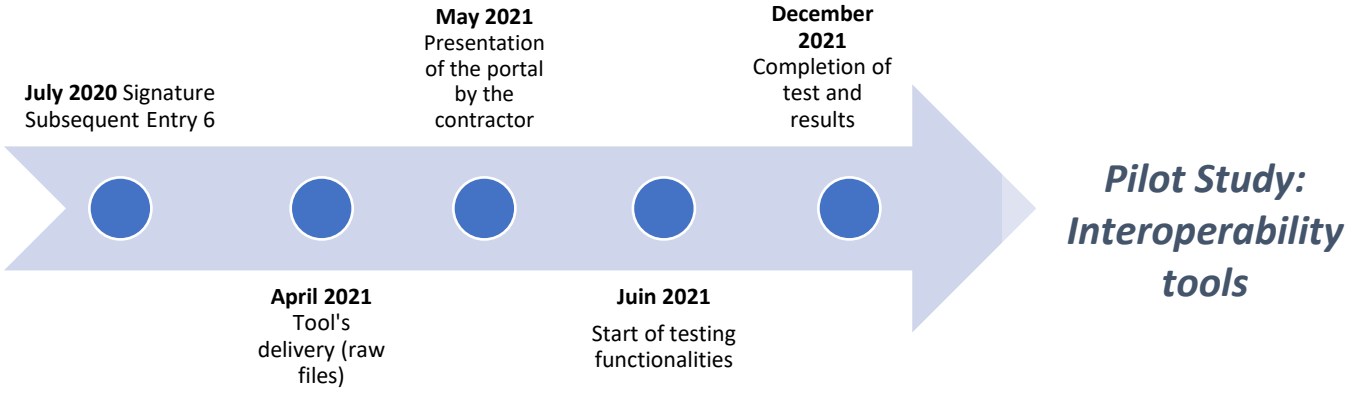
4. Results

4.1. Presentation of the tool delivered by the contractor

The new portal was delivered as per defined and agreed contractually (Subsequent Entry 6 Technical Memory part 2.2.3 p32) in March 2021. In order for its interoperability to be tested and in order to be able to integrate this portal onto web pages, Shom proceeded to the testing of its functionalities and modalities.



Shom was provided with several coding files and interfaces allowing access to the portal. Carrying out the testing implied the integration and modification of the delivered files. The portal's delivering process is detailed in the graph shown in figure 7.

The portal, created and hosted by the contractor in the framework of the MED OSMoSIS and managed by Shom, will be administered by the manager of the web page into which it will be integrated.

In this study, the portal could be inserted, for example, on the MED OSMoSIS project page of the Shom's editorial site dedicated to MSP (see 2.2.4. *Shom's portal dedicated to MSP*) but also onto the MED OSMoSIS web page (https://med-osmosis.interreg-med.eu/).

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The integration of the portal is an easy process, consisting in calling the portal located in the common production library common to the provider and to Shom through an URL. The format of the portal can also be redefined during this integration so that it fits in the web page.

The full URL will be provided to partners willing to integrate the portal onto a web page. Support may be offered by Shom within the remaining duration of the project.

Figure 14 : Visualization of integration of the portal onto MED OSMoSIS web page

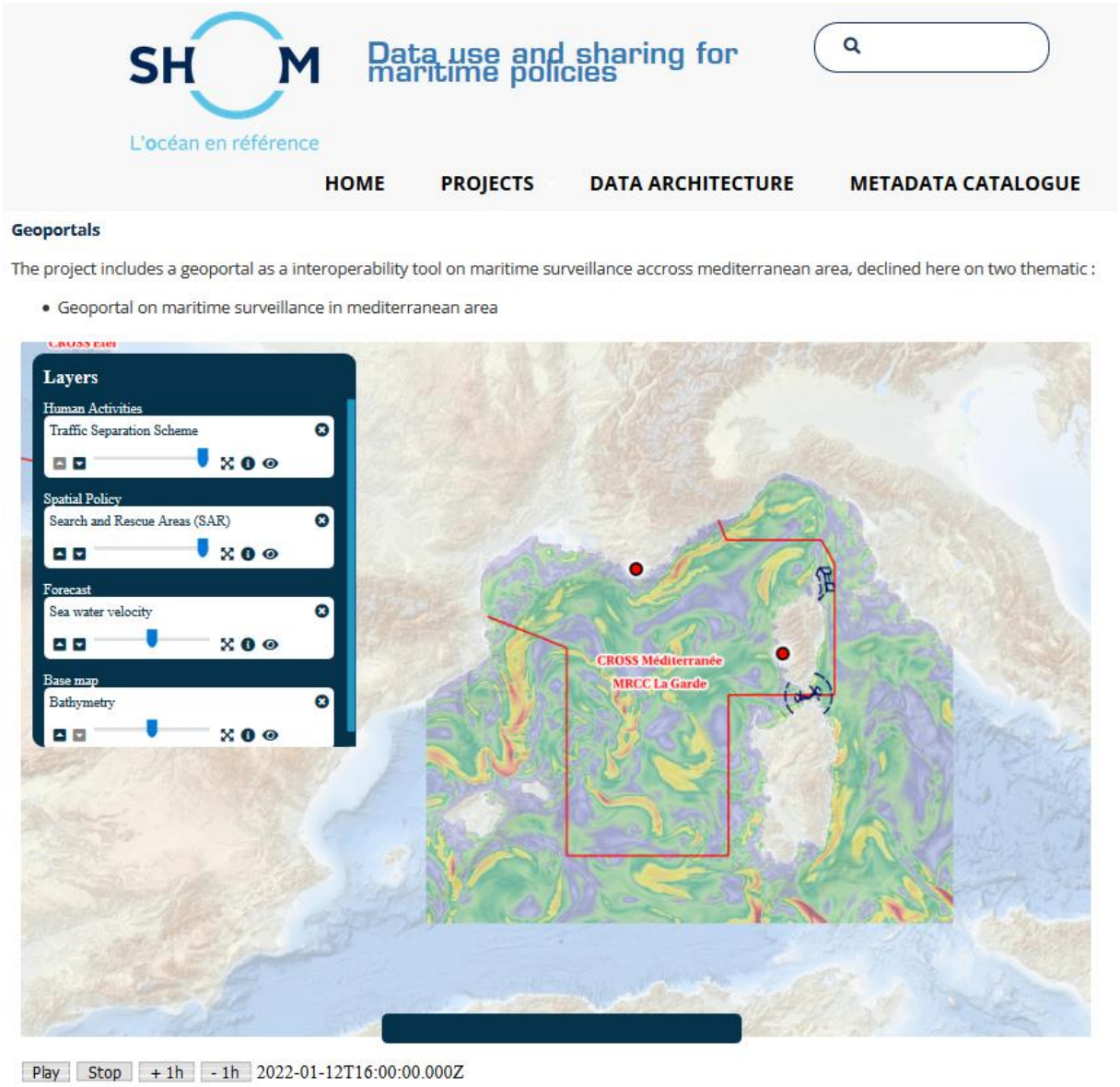

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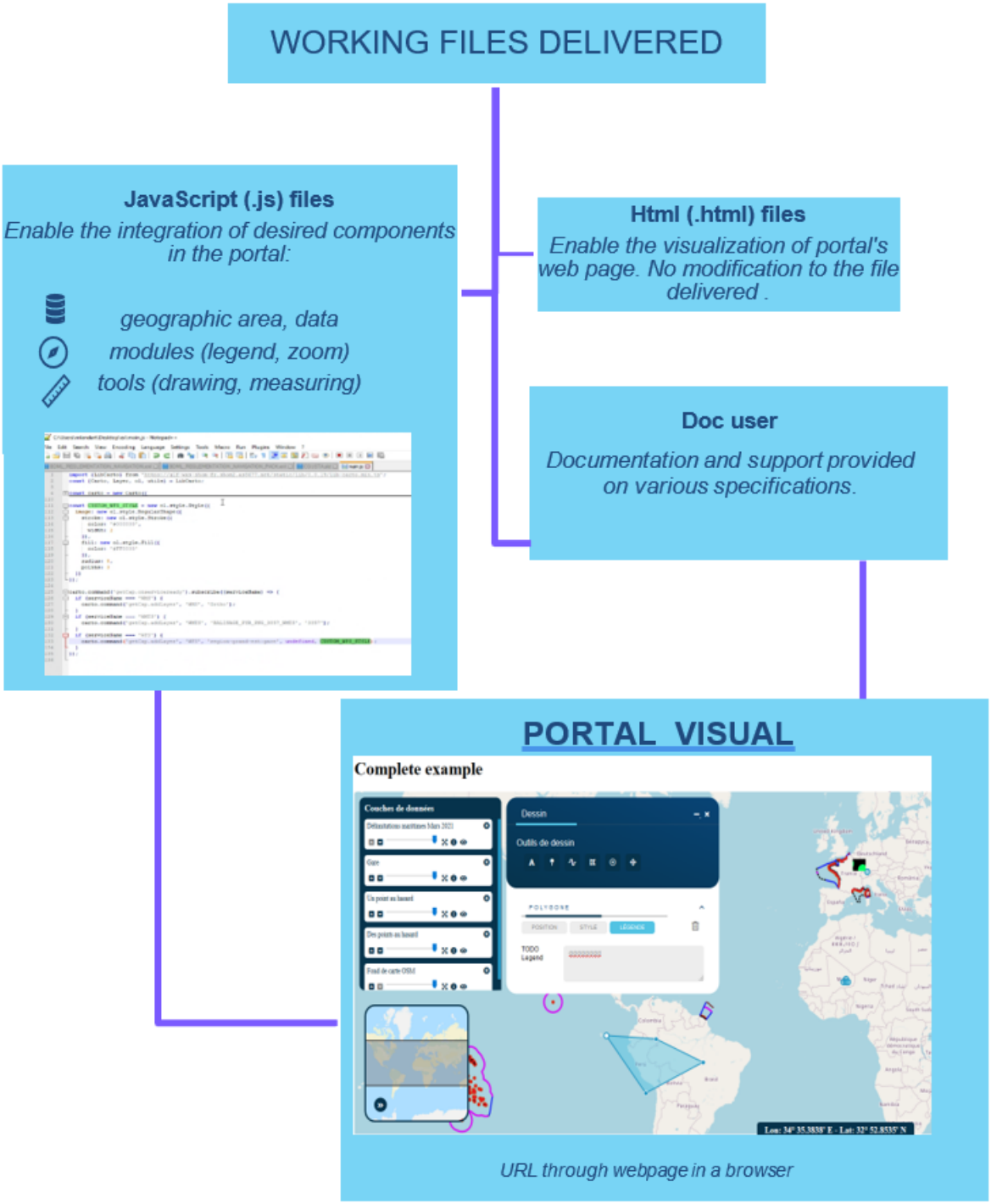
Figure 15 : Web tool contents graph



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4.2. Testing phase and results

4.2.1. Appropriate documentation and working files

In order for the portal to be delivered, it was necessary to install a software to allow the secure copying of files between a local and a remote computer, a common workspace between the contractor and Shom.

The files constituting the portal came in two formats and were delivered in JavaScript (.js) and Html (see diagram above). Integration of layers, modules and tools were carried out in a JavaScript document. This required the use of the JavaScript language and its codes.

4.2.2. Selection of data and metadata

An inventory work was necessary to find out which data needed to be integrated to the portal depending on the chosen theme. The data identified needed to match the expected format for the portal and metadata. The data producer's website and logo needed to be associated. Over 20 layers of interest were selected and are shown in the table below.

Table 1 : Identified dataset of interest for surveillance and MSP

Layers	Producer	Display on portal (as of 17/12/21)
Maritime boundaries	Shom	No
Search and rescue (SAR) zones	Shom	Yes
Beaconing listed by Shom and DAM	Shom	No
Submarine pipes and cables listed by Shom	Shom	No
Wrecks and obstructions listed by the Shom	Shom	No
LITTO3D® Maritime part Provence- Alpes-Côte d'Azur 2014	Shom	No
LITTO3D® Maritime part Languedoc Roussillon 2014-2015	Shom	No

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LITTO3D® Maritime part - Corsica 2017-2018	Shom	No
LITTO3D® PACA 2015	Shom	No
LITTO3D® Languedoc Roussillon 2009	Shom	No
Bathymetric DTM of the Gulf of Lion - Côte d'Azur coastline (Homonim project)	Shom	No
Bathymetric DTM of the Corsican coastline (Homonim project)	Shom	No
500,000 scale background data	Shom	No
50 000 scale background data	Shom	No
Global sediment map	Shom	No
Numerical sea state model	Shom	No
Numerical weather forecasting model	Shom	No
2D hydrodynamic model of water levels and surges	Shom	Yes
3D hydrodynamic model of ocean evolution	Shom	No
Traffic separation schemes	Shom	Yes
Regulation - Navigation	Shom	No
Zones Natura 2000 OFB	OFB (French Biodiversity Agency)	No
National Plan	CEREMA	Yes
Vessel density of the year 2020	EMODnet	No
Marine demarcation SP	MAPAMA (SPAIN)	Yes
Mean_atlas_land EU	EMODnet	Yes

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Natura2000areas EU	EMODnet	Yes
Italian MSP process (available soon)	To be advised	To be added once available
Spain traffic separation schemes	To be advised	To be added once available
Italian traffic separation schemes	To be advised	To be added once available
Spain SAR	To be advised	To be added once available
Italian SAR	To be advised	To be added once available

The choice was made to not use the whole of the data identified for display on the portal. The user would otherwise get lost in a too exhaustive amount of information and the portal would then become a substitute for the already existing portal data.shom.fr.

For this reason, use cases were created.

4.2.3. Use cases

Use case n°1: Description of restricted traffic areas and search and rescue (SAR) areas

Description: Awareness of traffic separation schemes (TSS) and search and rescue (SAR) zones in order to prevent and anticipate possible incidents in poor weather conditions.

- Information exchanged:
    - Weather forecasts: surface currents in the Mediterranean
    - French maritime traffic separation schemes
    - Spain maritime traffic separation schemes (available soon)
    - Italian vessel traffic separation schemes (available soon)
    - French search and rescue (SAR) zones
    - Spain search and rescue (SAR) zones (available soon)
    - Italian search and rescue (SAR) zones (available soon)
    - EMODnet Bathymetry: base map

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Use case n°2: Description of protected ecosystem zones for MSP

To highlight the interaction between MSP and maritime surveillance and to showcase interoperability among the data from different member states, two use cases were chosen:

- Description
- A knowledge of protected ecosystem areas is essential for planning activities at sea in order to respect boundaries, avoid constraint on ecosystems and to ensure their protection.
- Information exchanged:
    - French MSP process
    - Spain MSP process
    - Italian MSP process (soon)
    - EMODnet Natura 2000 area
    - EMODnet Bathymetry: base map
    -

The figure 11 illustrates both use cases examples.

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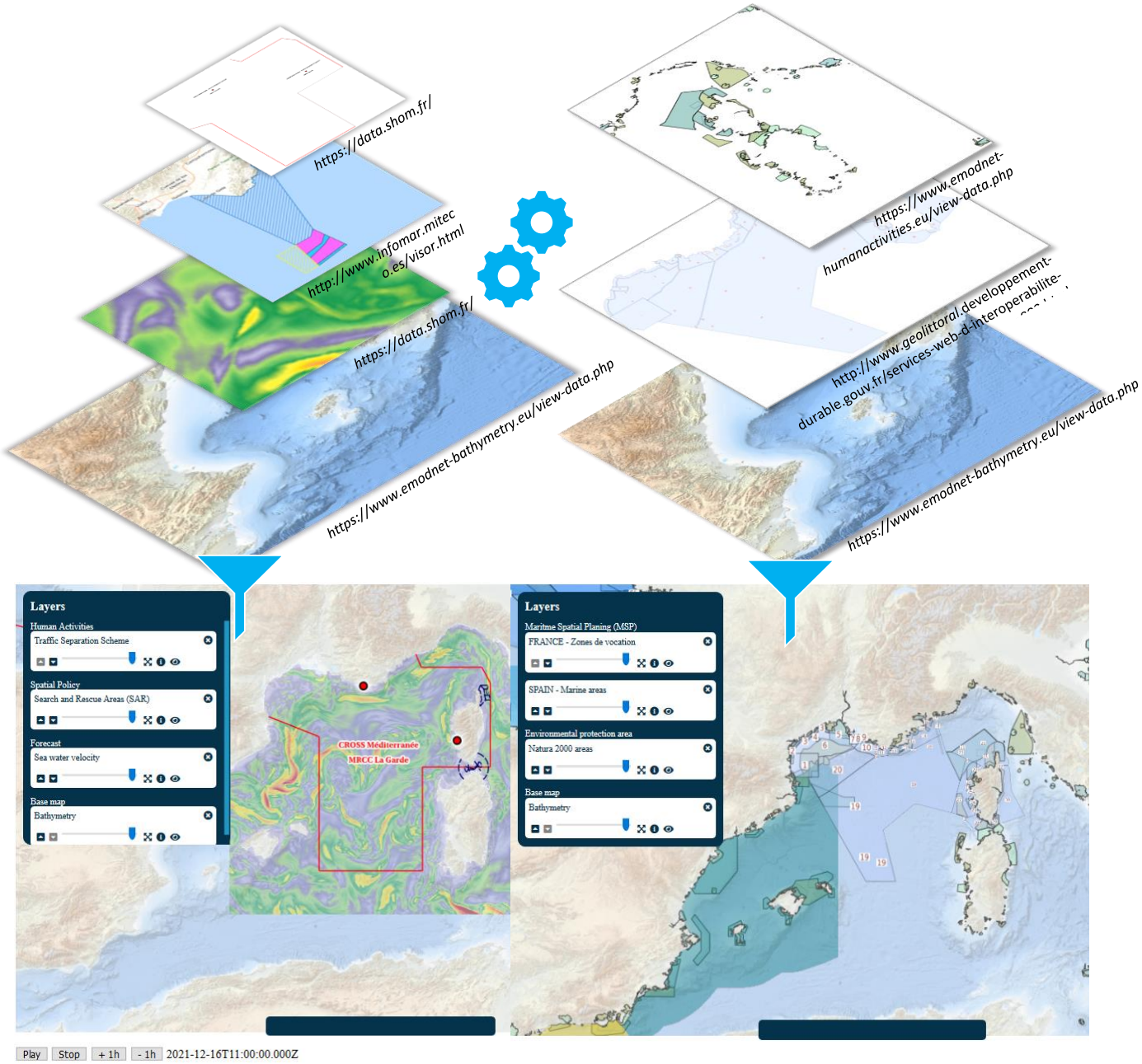
Figure 16 : Examples of compilation of data layers of interest: Use Case n°1 (left) and n°2 (right)



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4.2.4. Functionalities testing and developments

The different functionalities of the portal were tested and several developments were carried out to meet expectations in an effort to improve data interoperability. Exchanges took place from June 2021 to December 2021 between Shom and the service contractor in order to refine the portal.

Table 2 : Functionalities and required developments

Functionalities	Validation	Comments
Light architecture derived from data.shom.fr	Yes	/
Creation of *an* independent map viewers	Yes	/
English platform	Yes	Development requested post delivery
Data display in web services	Yes	/
Integration of ocean forecast data (ncWMS format)	Yes	Development requested post delivery
Option for data classification	Yes	/
Grouping of data per category	Yes	Development requested post delivery
Layer query (GeFeatureInfo)	Yes	Development requested post delivery
Access to data producer information (logo, legend, metadata)		Development requested post delivery
Alert in case of unreliable/unavailable flow	tba	Development will be realized in second phase
Support service after production startup	tba	Development will be realized in second phase

Instructions for the use of this tool are available in Appendix 2.

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5. Conclusion

Within the MED OSMoSIS project, several limitations to interoperability were identified. Language, data format, availability are common obstacles that were highlighted in other studies, including the field survey conducted among the maritime surveillance stakeholders and associated survey report (WP3 Studying, Task 3.2.1) or the data collection (WP3, Task 3.3).

Under this task, studies and developments by Shom of interoperable web tools showed how data from surveillance maritime fit with an interoperability and dissemination process. The developments data.shom.fr carried out within this task made possible to strongly highlight a cross-border vision through an English version, since it is the language most commonly used in Europe, and multidisciplinary integration of EU partners data.

The lighter thematic web tool enables an easy visualization of layers while still providing direct access to the information issued directly by the data producers. This portal makes a cross-analysis with any type of information easier and clearer thanks to the selection of a limited number of specific data layers. The tool therefore enables a transboundary vision on specific topics, stakes or issues, and underlines the interest of a crossborder perspective. The development of this light portal also shows the cooperation effort carried out to gather and share data of common interest.

The issue of data interoperability goes well beyond the challenges specifically met in maritime surveillance. A better use of data at a transnational level is mandatory to meet the targets carried out by both the Maritime Strategy Framework Directive (MSFD) and the Green Deal In order to adapt maritime policies in Europe, and anticipate future natural and human disasters linked for example to Climate change.

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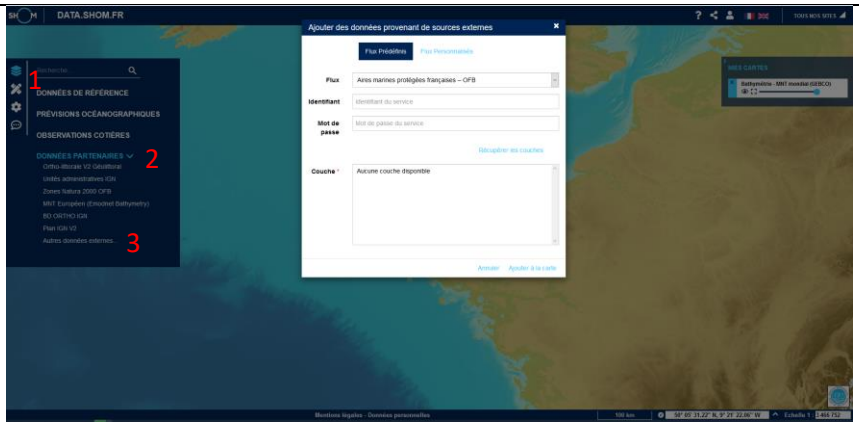
Appendices

Appendix 1 : Guidance document data partners integration

Data catalog (1) > Partner data (2) > Other external data (3)	
2 possibilities: -The feeds are already configured in data.shom.fr. > defined feeds (1) -Or the user has a custom flow to display > custom flow (2)	
1 Predefined feed Choice of the feed (1) Retrieve layers (2) Choose layers (3) Add to map (4)	

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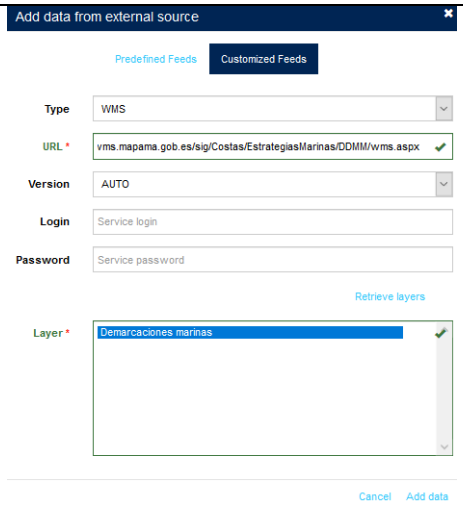
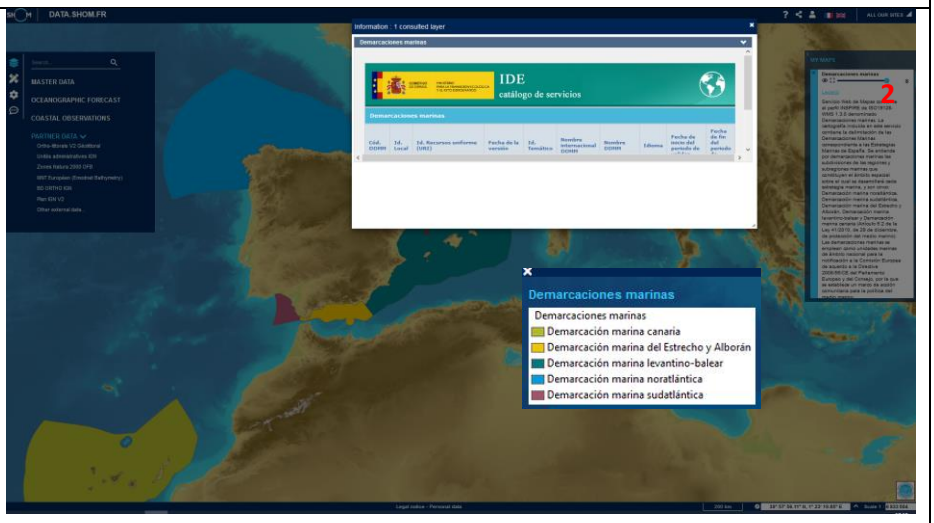
<table>
<tr>
<td>2: Customized feeds
Choice of feed (1)
Stream URL (2)
Retrieve layers (3)
Add to map (4)</td>
<td> 
</td>
</tr>
<tr>
<td colspan="2">Example of recovered information
Customized external layer: https://wms.mapama.gob.es/sig/Costas/EstrategiasMarinas/DDMM/wms.aspx (producer: Mapama, Spain)</td>
</tr>
<tr>
<td>Attribute information with one single click (1)
Access to legend, data information and metadata (2)</td>
<td> 
</td>
</tr>
</table>

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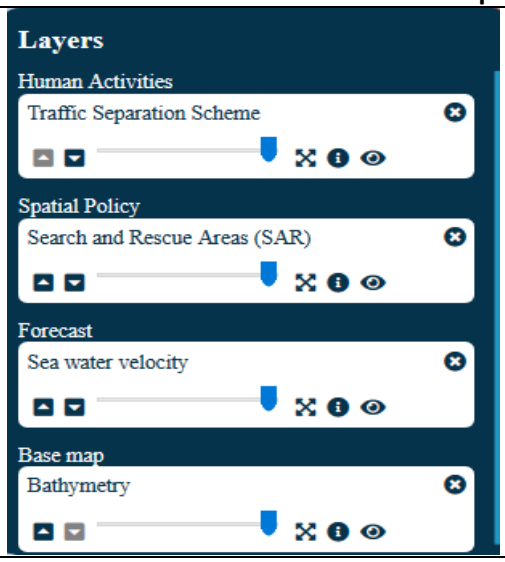
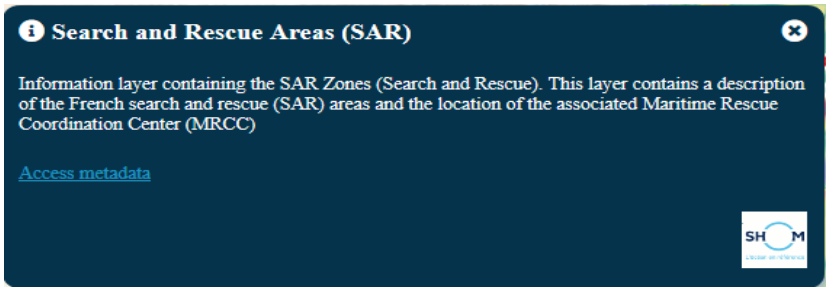
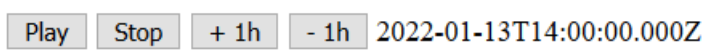
Appendix 2 : Instructions for using the portal

Tools	View of tool on portal
Datasets available	
Move the data upfront or backwards	
Data opacity	
Zoom on data opacity	
Data Information (description, access metadata, legend, producers)	 
Data display	
Geographic coordinates	
Forecast for Sea water velocity of set day	 Navigation available +/-1h of the day.

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