# Bases para la planificación sostenible de áreas marinas en la Macaronesia

PLASMAR

## Activity 2.2.1.

TECHNICAL REPORT

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# 1 Introduction

The purpose of this report is to present the identification and availability of marine data that were carried out within the scope of the project.

The identification of data holders and potential data providers is related to activity *2.1.1. Finding the balance between the Sustainable Development of Blue Growth and the ecosystem approach*, which analyzes the implementation of environmental legislation (including the public exchange of environmental information). Data holders were identified through ongoing and completed marine environment projects.

Data infrastructures and data exchange initiatives relevant to maritime spatial planning in Macaronesia have been identified at all levels: international, European, national and regional.

The analysis of the available resources revealed the level of sharing, the type of quality network services and coverage of data and metadata.

In chapter 3, the results of this study will be presented.

# 2 Partners involved

The following partners were involved in this report:

- Direção Regional do Mar- Secretaria Regional de Mar e Pescas
- Agência Regional para o Desenvolvimento da Investigação, Tecnología e Inovação
- Universidad de Las Palmas de Gran Canaria
- Gestión del Medio Rural de Canarias
- Direção Regional dos Assuntos do Mar

# 3 Results

Geospatial data and information were identified at all levels (international, European, national and regional) including geodata and geoinformation relevant to maritime spatial planning for the area that encompasses the Macaronesian region.

As a result, it was established the existence of metadata associated with the filtered data sets and whether they would already be in accordance with any metadata standard (ISO 19115).

In a second phase, efforts were made to create harmonized metadata, according to the metadata profile established in the project based on the INSPIRE directive.

In a final phase, a significant number of metadata (series, data sets and services) were created and, to allow the implementation of discovery services, they were later loaded into a catalog of data and information that were developed through this action.

The catalog included the introduction of previously identified network services, as well as data uploaded to the map servers implemented in the project.

Data gaps were also identified in relation to the specifications of current legal instruments (international, European or national).

## 3.1 Data Identification

### 3.1.1 Characterization of the situation before the execution of the project

There are many themes related to the scope of maritime spatial planning, however, there are often weaknesses in the information sharing mechanisms similar to the scenario that generally occurs for all geographic information, even those arising from the intervention of public entities.

The questions about “what information is there and what is its quality”; “Where and how to access and use it” remain in the middle of the information technology era. The reuse of information is incipient, as well as the case-by-case and punctual way in which it is shared, with the integration of information systems aligned with the principles of spatial data infrastructures being almost non-existent in some regions. Otherwise, the data are disaggregated by several sites, making it necessary to carry out an exhaustive research on a given topic.

In view of this scenario, there is inefficiency and a little circulation of knowledge of the information existing within public entities, with aggravated repercussions for those who intend to carry out a maritime spatial planning process that needs a transversal and cross-border approach.

The magnitude of the exclusive economic zones of the Canary Islands, Madeira and Azores makes it even more relevant to identify all the dispersed maritime data related to them, and to engage in an data aggregation and centralization exercise in an MSP Macaronesian catalog developed within the scope of the project that will obey the premises of the INSPIRE directive.

The development of this work is of particular importance for the decision process in the scope of maritime spatial planning and for web application tools, such as INDIMAR, developed as a Decision Support System (DSS) that will use this data, to find best marine areas for setting up different activities according to values of a group of indicators.

### 3.1.2 Geographic data collection

In order to understand what data existed to assist the MSP process, a survey of the georeferenced data of the Macaronesian maritime space was carried out, covering the various themes of the INSPIRE Directive, and detailing its format.

The survey was conducted at the regional, national, european and international levels through online GIS platforms. Public institutions were also asked about whether they have geospatial of the maritime scope and about the possibility of sharing this information.

#### *3.1.2.1 Madeira*

The data collection carried out for the Autonomous Region of Madeira was made through the identification of data of interest available on national or regional platforms and spatial data infrastructures or by contacting with regional institutions. It should also be noted that this data collection coincided with the preparation of the regional maritime spatial plan, which facilitated the collection.

It was possible to collect 320 spatial datasets. About 89% of the geodata were collected through the SNIMar platform, about 10% were collected through the Madeira Maritime

Space Situation Plan (PSOEM) and 1% was gathered through other platforms or by contacting the entities.

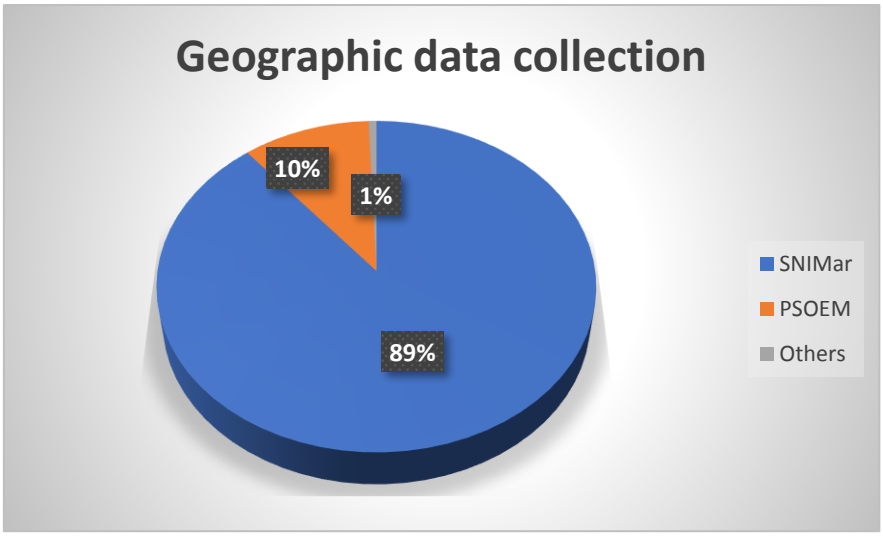


*Chart 1 – Collection of spatial datasets for Autonomous Region of Madeira.*

The information collected covered several areas, such as:

- Maritime zones under national jurisdiction and or sovereignty (territorial sea, exclusive economic zone and continental shelf);
- Species and habitats;
- Economic activities;
- Protected areas;
- Varied statistical information;
- Nautical activity areas;
- Plans or projects where it was possible to collect some type of information.

Approximately 97% of the collected data correspond to network services, of which 9% for Web Feature Services and 91% for Web Map Services, and 3% correspond to data collected without any type of format available or to other types of format, such as KML.

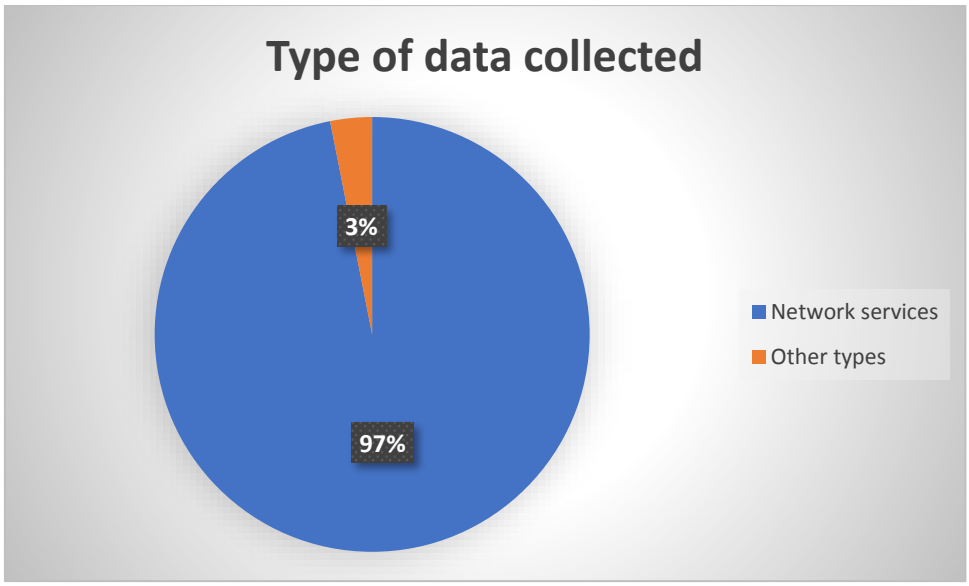


*Chart 2 - Type of data collected for Autonomous Region of Madeira.*

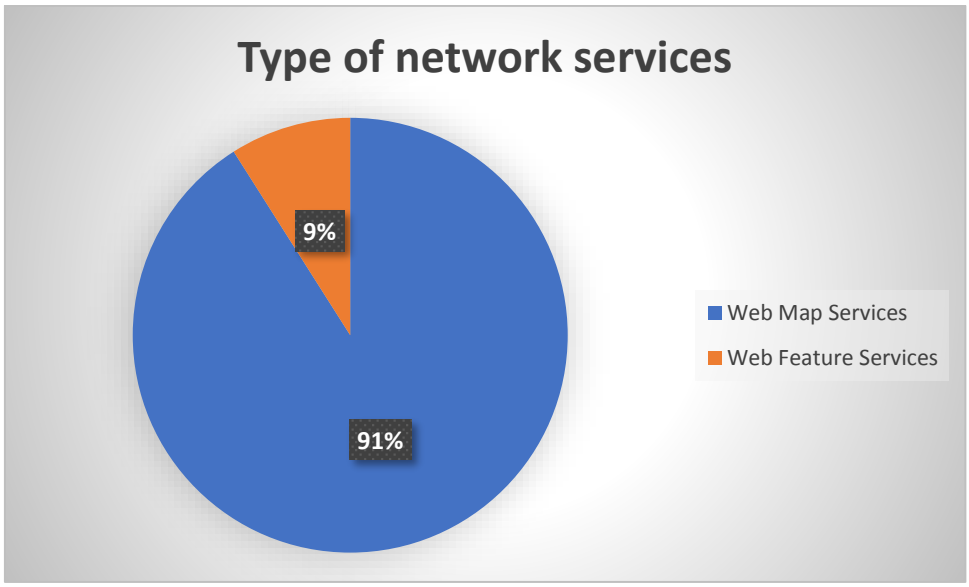


*Chart 3 - Type of network services identified in Madeira*

#### *3.1.2.2 Azores*

The Azores entity currently responsible for the collection of marine spatial data is the Regional Directorate of Sea Affairs (DRAM in Portuguese – Direção Regional dos Assuntos do Mar). For this purpose, DRAM has run a number of projects in order to accomplish this task: SNIMAR project (an EEA-GRANTS project); PEAMA project (PO2020 financial program, ERFD); MarSP (EMFF). As a result, DRAM gathered a comprehensive amount of maritime data and organized it into a regional maritime geoportal called SIGMAR.

In the beginning of the Plasmar project, DRAM GIS team had already identified 176 geographical datasets: 134 of which were collected by the University of the Azores (IMAR-UAç), through a contract signed with DRAM under the MarSP project and 42 geographical datasets were acquired directly from several entities of the regional government, including DRAM.

All of the 42 geographical datasets as acquired from the regional government entities as well as 43 out of the 134 datasets obtained from the IMAR-UAç would be made available to the public through the preliminary version of SIGMAR geoportal, still based on ESRI technology.

In order to avoid the usage of license based software (and following what is currently recommended by the regional government for the public administration of the Azores), DRAM readily started the development of an open source version of the SIGMAR geoportal, under MarSP project (using mapstore, PostgreSQL – Postgis and Geoserver). In order to start populating this upgraded solution, more 31 geographical datasets were obtained and integrated in it under PLASMAR.

The current available information in SIGMAR includes several themes, namely:

- Marine protected areas;
- Biodiversity;
- Oceanography;
- Bathymetry and geomorphological information;
- Economic and touristic activities;
- Regional, national and international regulations;
- Marine infrastructures;

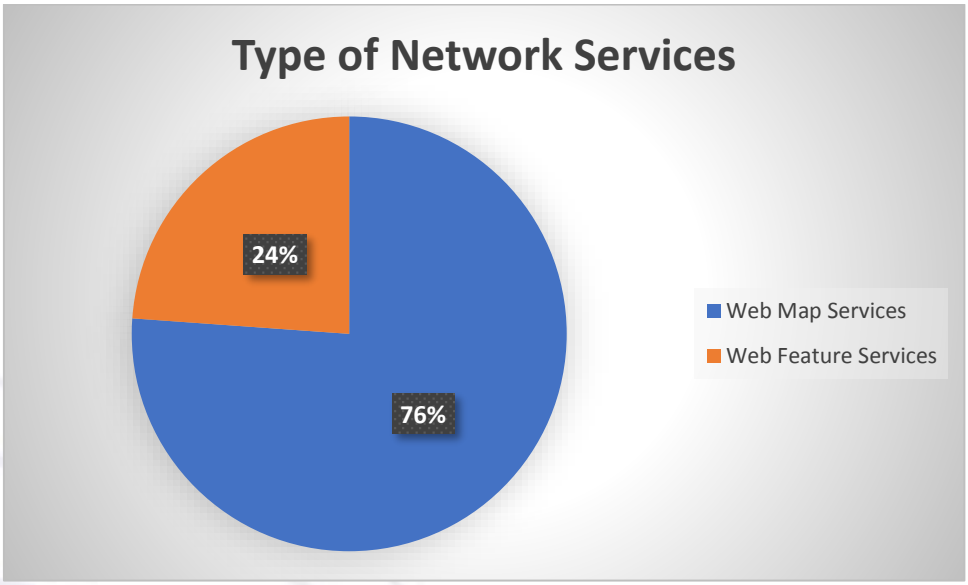


*Chart 4 - Type of network services identified in Azores*

All the 42 geographical datasets are accessible and can be downloaded through web feature Services (WFS), while the remaining layers are accessible through visualization as web map services (WMS).

#### 3.1.2.3 Canaries

With regard to the search for geographical information of interest in the process of marine spatial planning specific to the Canary Islands, numerous sources have been identified at all levels, from the European Environment Agency and other European agencies, national organisations and administration, and various regional and local government organisations and departments. The incorporation of data from the project partners themselves has also been important, such as those provided in relation to fisheries by GMR as well as those provided by IU-ECOAQUA itself as a result of the PLASMAR project itself or other projects in which it also participates or has participated.

Regarding the format of the data, numerous data sources have been found in which the availability was limited to visualization services or even PDF cartographic documents, so that the usefulness of the contents found to be used in possible analysis in geographic information systems during marine spatial planning processes is very limited. That is why, as far as the Canary Islands are concerned, special emphasis has been placed on finding data that can be directly downloaded, either directly or through download network services, such as Web Feature Service or through Atom services.

In many cases, during the collection of data, many of these have been obtained by direct transfer from producers or suppliers, so, as far as possible, they have been made available to the public, in order to facilitate the process of marine spatial planning, by means of web services for downloading and/or viewing in the marine data infrastructure created as an activity in the PLAMAR project.

With regard to the subject of the data, the search for them has been extended to data on any phenomenon located in the marine environment on the coasts, or where appropriate, that could affect them.

A total of 557 data sets have been collected so far, of which a summary by origin and format and subject is shown in the following table.

*Table i – Collected datasets in Canaries*

| Source of data set | Subject | N. of data sets |
|---|---|---|
| *Copernicus* Marine Environment Monitoring Service | Oceanography | 77 |
| Openstreetmap.com | Boundaries | 2 |
| PLOCAN | Infrastructure | 1 |
| I.U. ECOAQUA | Habitats | 6 |
| I.U. ECOAQUA - GMR | Fishering | 168 |
| I.U. ECOAQUA | Marine Traffic | 3 |
| I.U. ECOAQUA | Activities | 6 |

| | | |
|---|---|---|
| I.U. ECOAQUA | Infrastructure | 1 |
| European Environment Agency | Land use & MPA | 30+20 |
| EMIS | Oceanography | 2 |
| EMODNET | Fishering & activities | 17 |
| General Bathymetric Chart of the Oceans | Bathimetry | 1 |
| GMR | Boundaries | 4 |
| Gobierno de Canarias – Viceconsejería de Pesca | Fishering, aquaculture & activities | 169 |
| Atlantis – Biodiversidad Canarias | Species distribution | 1 |
| Cartográfica de Canarias | Boundaries | 2 |
| Instituto Español de Oceanografía | Fishering & activities | 6 |
| Ministerio para la Transición Ecológica (old MAPAMA) | Boundaries, infrastructure & activities | 53 |
| Ospar.org | Boundaries | 2 |
| EIONET | Boundaries | 5 |
| RedMIC | Boundaries | 1 |

#### *3.1.2.4 Macaronesia*

With regard to data collection for Macaronesia, it was carried out through prospecting and data collection on European and international platforms.

The analyzed platforms were the following:

- *MAES digital atlas;*
- *Maritime forum;*
- *Ocean biographic information system;*
- *JRC/Digital Observatory for Protected Areas;*
- *BlueBRIDGE's;*
- *ESA/Sentinels missions;*
- *EUROSTAT;*

- *Marine Strategy Framework Directive - Competence Centre;*
- *EMIS;*
- *JRC Data Catalogue;*
- *Water Information System for Europe;*
- *European Alien Species Information Network – EASIN;*
- *European Atlas of the Seas;*
- *CleanSeaNet;*
- *Blue hub;*
- *NOAA - National Oceanic and Atmospheric Administration;*
- *MISTIC SEAS Macaronesia;*
- *Espaço Aquicultura;*
- *Observatório Oceânico da Madeira;*
- *Marine Regions.Org.*

It was possible to collect more than 400 spatial datasets. About 38% of the GIS data was collected through the *i Marine* platform, around 25% was collected through the *EMODnet*, around 12% was collected through *Copernicus Marine Environment Monitoring Service*, about 11% over *Sea-data net*, around 10% through JRC/Environmental Marine Information System and 4% through other platforms.

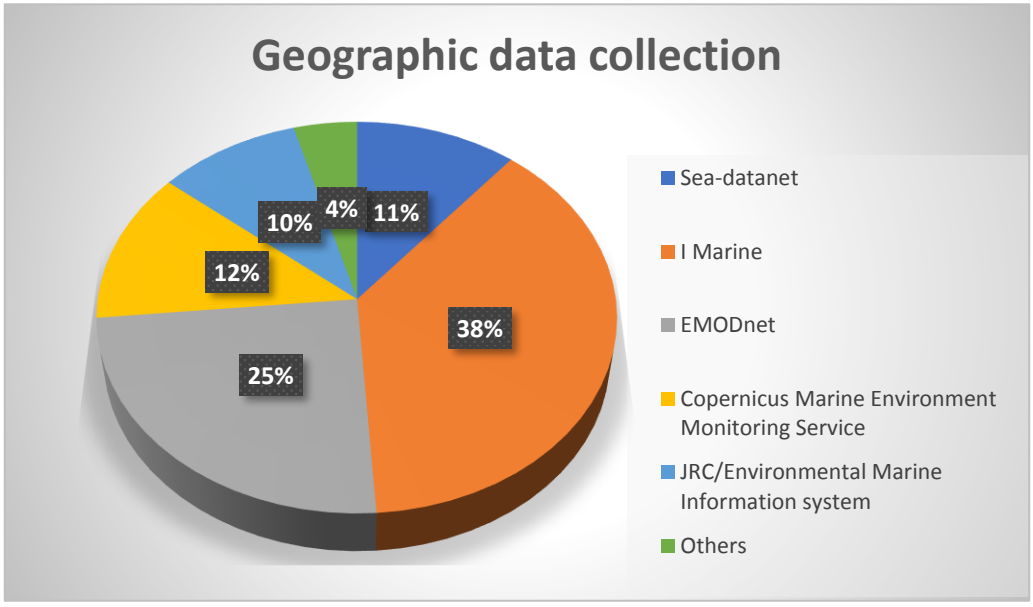


*Chart 5 – Collection of spatial datasets for Macaronesia Region.*

The information collected covered several areas, such as:

- Oceanographic parameters (temperature, salinity, chlorophyll, wind, seabed / geology)
- Maritime zones under national jurisdiction and sovereignty (territorial sea, exclusive economic zone and continental shelf);
- Species and habitats
- Economic activities

- Protected areas
- Varied statistical information
- Nautical charts
- Plans or projects where it was possible to collect some type of information

Approximately 95% of the collected data corresponded to network services, of which 36% to Web Feature Services and 64% to Web Map Services, and 4% correspond to data collected without any type of format available for consultation and about 1% correspond to other types of formats like KML.

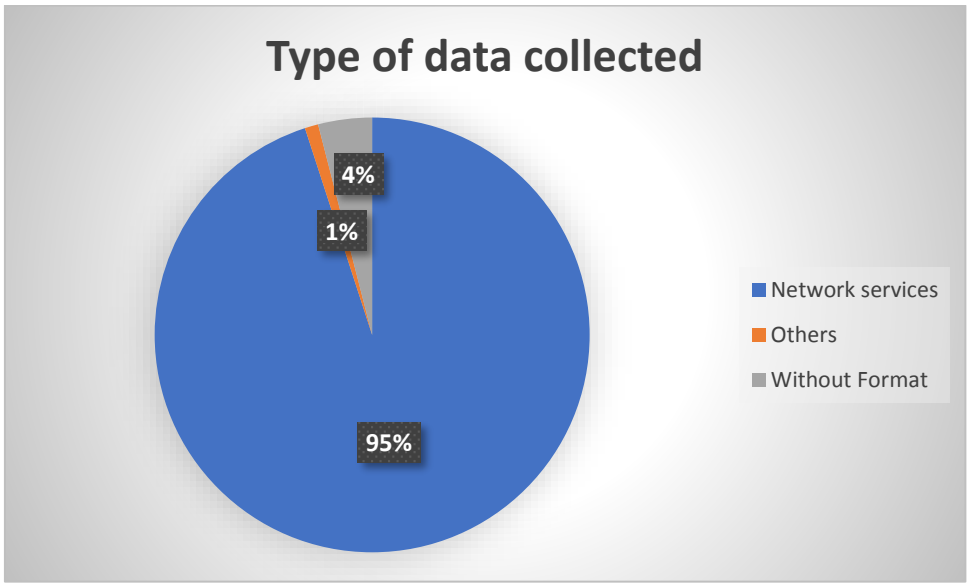


*Chart 6 - Type of data collected for the Macaronesia region*

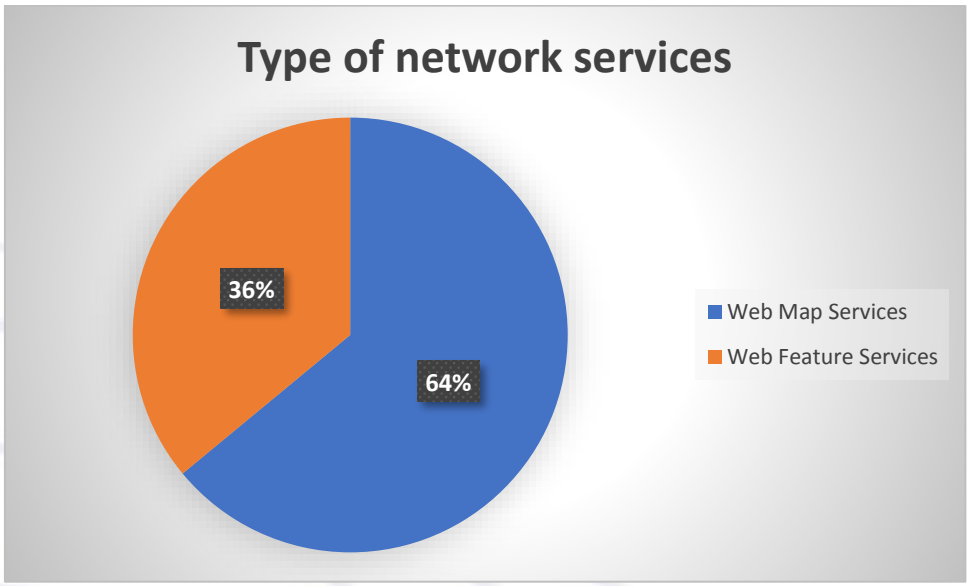


*Chart 7 - Type of network services identified for Macaronesia region*

### 3.1.3 Metadata

The INSPIRE Directive, Directive 2007/2 / EC of the European Parliament and of the Council, which entered into force on 15 May 2007, establishes the creation of the infrastructure for spatial information in Europe, which aims to promote the availability of information of a spatial nature, usable in the formulation, implementation and evaluation of European Union environmental policies.

The INSPIRE Directive focuses on spatial information under the responsibility of the public institutions of the Member States, referring to a set of themes spread over three annexes covering spatial data of a cross-sectoral nature and spatial data specific to the environmental sector.

To ensure that the spatial data infrastructures of the member states are compatible and usable in a community and transboundary context, the INSPIRE Directive required that additional legislation or common Implementing Rules (IR) are adopted for a number of specific areas (metadata, interoperability of spatial data sets and services, network services, data and service sharing and monitoring and reporting). These are published either as Commission Regulations or as Decisions.

The infrastructure for spatial information in Europe will allow the provision of integrated spatial information services to users, based on the existence of a distributed network of databases, linked based on common standards and protocols, ensuring their compatibility. These services should allow any user to identify and access geographic information from different sources, from the local to the global level, in an interoperable way and for a wide variety of uses.

In accordance with Article 5 of INSPIRE Directive 2007/2/EC, Member States shall ensure that metadata are created for the spatial data sets and services corresponding to the themes listed in Annexes I, II and III, and that these metadata are kept up to date.

The regulation regarding metadata (and subsequent amendments) and Technical guidelines set out the requirements for the creation and maintenance of such metadata.

#### *3.1.3.1 Madeira*

Decree-Law no. 180/2009, of 7 August, published in Diário da República no. 152, 1st Series, transposes Directive No. 2007/2 / EC, of the European Parliament and of the Council, of 14 March 2007 - that establish an Infrastructure for Spatial Information in the European Community (INSPIRE).

Following these diplomas, the Autonomous Region of Madeira did an intensive job to create and adapt metadata in accordance with regulatory standards. In about 90% of the data collected it was possible to collect metadata, even if they were not in accordance with what is required by INSPIRE. For the other 10%, there was no metadata because the geographic datasets had been created recently.

*Table ii – Existing and created metadata in Madeira*

| | **No.** |
|---|---|
| **Existing metadata** | 287 |
| **Created metadata** | 33 |

#### 3.1.3.2 Azores

The Regional Government of the Azores, transposed the Directive No. 2007/2/CE (INSPIRE) and the national Decree-Law no. 180/2009 into the Regional Legislative Decree no. 42/2012/A, which also creates the regional infrastructure of geographic datasets. In order to help the accomplishment of the objectives of this legal framework, the regional government created a Metadata Catalog Editor – GEMA, with a regional metadata profile.

Thus, there are 160 files of INSPIRE compliant metadata: 154 for datasets and 6 for services. These metadata is currently stored in the SNIMAR Catalog and in the SMA Catalog (Sistema de Metadados dos Açores).

#### 3.1.3.3 Canaries

In the Canary Islands, of the data sets found relating to the marine environment and which could be relevant to marine spatial planning processes, only a small percentage have been accompanied by the corresponding metadata. This has meant the creation of numerous metadata with the basic information in order to publish them in the catalogue created for the project and whose purpose is to create a system for locating the data found and facilitating their use by the parties involved. The following table shows a summary with the metadata placed in the catalogue.

*Table iii – Existing and created metadata in Canaries*

| | No. |
|---|---|
| **Existing metadata** | 17 |
| **Created metadata** | 895 |

#### 3.1.3.4 Macaronesia

Regarding geographic data for the Macaronesian region, about 96% of geodata collected on European or international platforms already had metadata and are in compliance with the INSPIRE directive.

### 3.1.4 Catalog

The catalog application to manage spatially referenced resources made it possible to make discovery services available, and to share the spatial data loaded on the map servers through network services.

With the spatial datasets and metadata collected and created, an effort was made to share all this information through the project catalog, to enable a more effective and accessible search to the public.

This catalog intends to provide a single location of information on all agreed services and to ensure that the spatial information is available to anyone. This catalog also aims to manage data and ensure accurate information on details, status and dependencies for all georeferenced data in operation or in preparation.

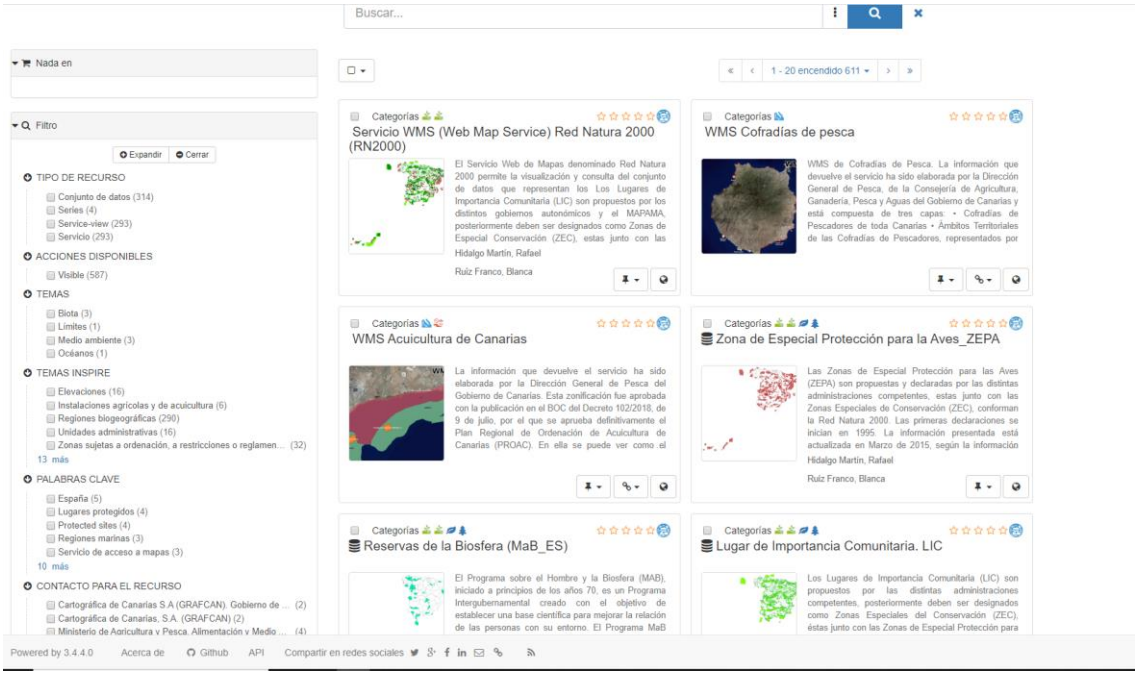


*Figure 1 – The catalog*

In this catalog, data and geographic information are organized through INSPIRE themes. Approximately 40% of the geographic information in this catalog is related to maritime regions theme, more than 12% corresponds to geographic meteorological characteristics, 6% to land cover and 5% are related to species distribution.

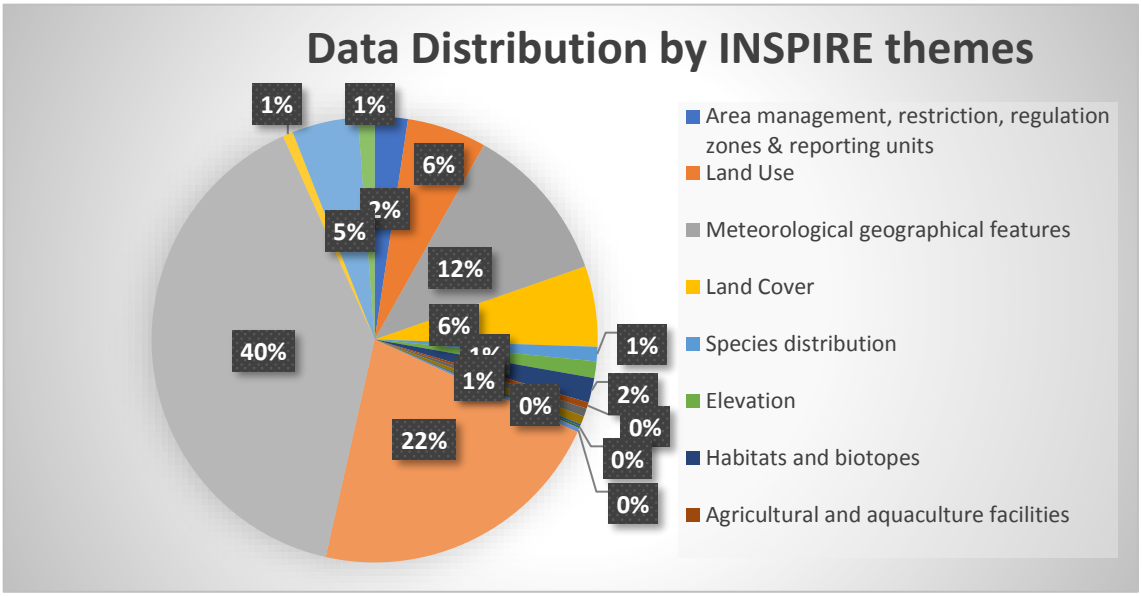


*Chart 8 – Data distribution by INSPIRE themes.*

When we analyse the geographical information by year, most of the data was produced between 2011 (30,7%) and 2012 (48,9%).

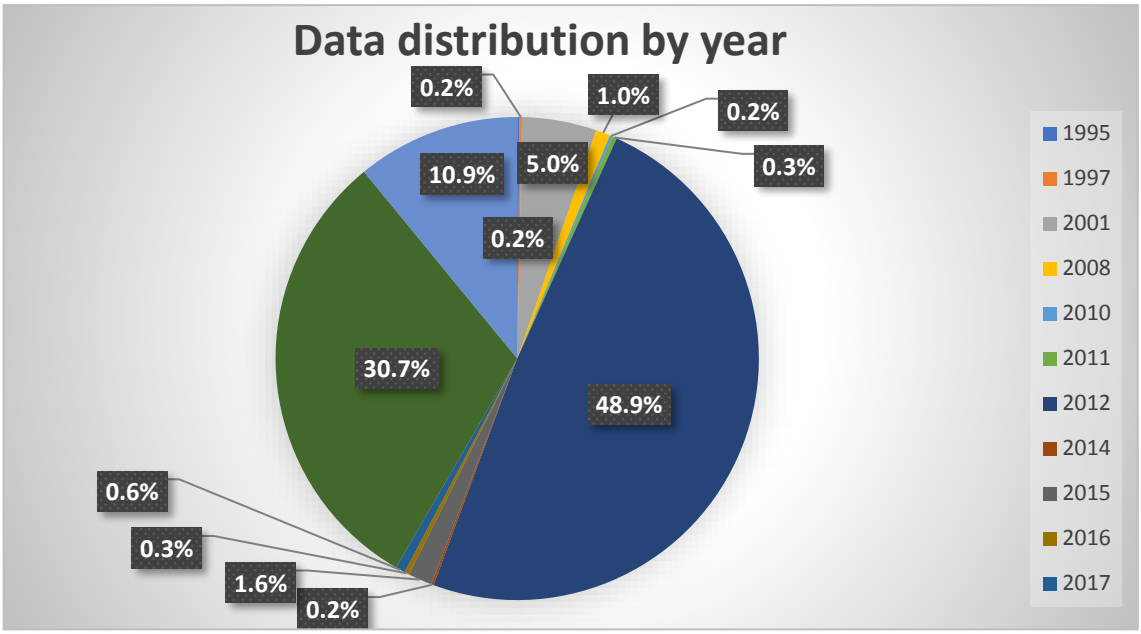


*Chart 9 – Data distribution by year.*

### 3.1.5 Indimar

The *Activity 2.2.2. Developed the MDDI* has the finality to developed a platform regarding the maritime spatial planning, called INDIMAR.

INDIMAR is a web-app tool developed as a decision support system (DSS). The objective is to find best marine areas for setting up different maritime activities according to values of a group of indicators that will be established during the project (task 2.1.1 b&c currently c and with action 2.1.2). Every indicator shall be weighted to determine its relative importance in the final values obtained.

All data collected in the scope of this action and uploaded to the project's spatial data infrastructure, in addition to being distributed to the public, feed the INDIMAR platform.

However, despite all the work of identifying and collecting data of interest to INDIMAR, some lack of data was detected. Below, of the determined data of interest to INDIMAR, are represented the data available or unavailable on the Indimar platform, for each region.

#### *3.1.5.1 Madeira*

In relation to the Autonomous Region of Madeira, it was possible to collect data on several topics. Some of them are applied only to the Region, such as maritime activities, but most of them are applied to the whole of Macaronesia, collected on European platforms.

For the Autonomous Region of Madeira, the following data are available:

### *Marine Strategy Framework Directive – Good Environmental Status*

*Table iv – List of available data*

| Name | Source |
|---|---|
| ***Descriptor 5.2 Eutrophication Med Chlorophyll a*** | COPERNICUS |
| ***Descriptor 5.3 Eutrophication Med Dissolved oxygen*** | COPERNICUS |
| ***Descriptor 5.5 Eutrophication Med Nitrate*** | COPERNICUS |
| ***Descriptor 5.6 Eutrophication Med Phosphate*** | COPERNICUS |
| ***Descriptor 5.7 Eutrophication Med Silicate*** | COPERNICUS |
| ***Descriptor 5.8 Eutrophication Med Iron*** | COPERNICUS |
| ***Descriptor 5.9 Eutrophication Med Primary production*** | COPERNICUS |
| ***Descriptor 1.1 Habitats*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Mammals*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Birds*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Turtles*** | Natura 2000 network forms |
| ***Descriptor 6. The sea floor integrity*** | Emodnet |

### *Marine protected areas*

*Table v - List of available data*

| Name | Source |
|---|---|
| ***CDDA by EEA*** | European inventory of nationally designated areas |
| ***Natura 2000 by directive*** | Nature 2K network ordered by directive |

### *Land use*

*Table vi - List of available data*

| Name | Source |
|---|---|
| ***CORINE: Urban Areas*** | Corine land cover |
| ***CORINE: Industrial Areas*** | Corine land cover |

| | |
|---|---|
| ***CORINE: Port Areas*** | Corine land cover |
| ***CORINE: Airport Areas*** | Corine land cover |
| ***CORINE: Agriculture*** | Corine land cover |
| ***CORINE: Forest*** | Corine land cover |
| ***CORINE: Beaches, dunes and sands*** | Corine land cover |
| ***Distance to the coast*** | - |

### *Oceanography*

*Table vii - List of available data*

| Name | Source |
|---|---|
| ***Temperature Mean*** | COPERNICUS |
| ***Currents Vel Med*** | COPERNICUS |
| ***Wave height Med*** | COPERNICUS |
| ***Depth/bathymetry*** | COPERNICUS |
| ***Wind Vel Med*** | COPERNICUS |
| ***Salinity Med*** | COPERNICUS |
| ***Mixed layer thickness Med*** | COPERNICUS |
| ***Bottom temperature Mean*** | COPERNICUS |

### *Maritime activities*

*Table viii - List of available data*

| Name | Source |
|---|---|
| ***Maritime traffic lanes*** | Situation Plan |
| ***Aquaculture areas*** | Situation Plan |
| ***Artificial reefs*** | Situation Plan |
| ***Maritime tourism*** | Situation Plan |
| ***Military areas*** | Situation Plan |
| ***Research Areas*** | Situation Plan |
| ***Seaweed cultivation*** | Situation Plan |

#### 3.1.5.2 Canaries

Regarding the Autonomous Region of Canaries, it was possible to collect data about several subjects. Some of them, applied only to the Region, like the maritime activities but, most of them are applied to whole Macaronesia, collected on European platforms.

For the Autonomous Region of Canaries, the following data are available:

***Marine Strategy Framework Directive – Good Environmental Status***

*Table ix – List of available data*

| Name | Source |
|---|---|
| ***Descriptor 3.1. The population of commercial fish species. Benthic Cephalopods*** | - |
| ***Descriptor 3.1. The population of commercial fish species. Benthic Cephalopods*** | - |
| ***Descriptor 3.3. The population of commercial fish species. Coastal pelagics*** | - |
| ***Descriptor 3.4. The population of commercial fish species. Demersal fishes*** | - |
| ***Descriptor 3.5 The population of commercial fish species. DSL*** | - |
| ***Descriptor 3.6. The population of commercial fish species. Mesodemersal fish*** | - |
| ***Descriptor 3.7. The population of commercial fish species. Molluscs*** | - |
| ***Descriptor 3.8. The population of commercial fish species. Moray eels*** | - |
| ***Descriptor 3.9. The population of commercial fish species. Oceanic pelagics*** | - |
| ***Descriptor 3.10. The population of commercial fish species. Oceanic sharks*** | - |
| ***Descriptor 3.11. The population of commercial fish species. Pelagic cephalopods*** | - |
| ***Descriptor 3.12. The population of commercial fish species. Shrimps.*** | - |
| ***Descriptor 3.13. The population of commercial fish species. Skipjack tuna*** | - |

| | |
|---|---|
| ***Descriptor 3.14. The population of commercial fish species. Tunas*** | - |
| ***Descriptor 4.1. Elements of foof webs. Benthic Cephalopods*** | - |
| ***Descriptor 4.2. Elements of foof webs. Benthic sharks and rays*** | - |
| ***Descriptor 4.3. Elements of foof webs. Coastal pelagics*** | - |
| ***Descriptor 4.4. Elements of foof webs. Demersal fishes*** | - |
| ***Descriptor 4.5. Elements of foof webs. Dolphins and beaked whales*** | - |
| ***Descriptor 4.6. Elements of foof webs. DSL*** | - |
| ***Descriptor 4.7. Elements of foof webs.Jellyfishes*** | - |
| ***Descriptor 4.8. Elements of foof webs. Mesodemersal fish*** | - |
| ***Descriptor 4.9. Elements of foof webs. Molluscs*** | - |
| ***Descriptor 4.10. Elements of foof webs. Moray eels*** | - |
| ***Descriptor 4.11. Elements of foof webs. Oceanic pelagics*** | - |
| ***Descriptor 4.12. Elements of foof webs. Oceanic sharks*** | - |
| ***Descriptor 4.13. Elements of foof webs. Other benthic invertebrates*** | - |
| ***Descriptor 4.14. Elements of foof webs. Pelagic cephalopods*** | - |
| ***Descriptor 4.15. Elements of foof webs. Phytoplankton*** | - |
| ***Descriptor 4.16. Elements of foof webs. Seabirds*** | - |
| ***Descriptor 4.17. Elements of foof webs. Seagrass/Seaweed.*** | - |
| ***Descriptor 4.18. Elements of foof webs. Shrimps.*** | - |
| ***Descriptor 4.19. Elements of foof webs. Skipjack tuna*** | - |

| | |
|---|---|
| ***Descriptor 4.20. Elements of foof webs. Toothed whales*** | - |
| ***Descriptor 4.21. Elements of foof webs. Tunas*** | - |
| ***Descriptor 4.22. Elements of foof webs. Turtles*** | - |
| ***Descriptor 4.23. Elements of foof webs. Urchins*** | - |
| ***Descriptor 4.24. Elements of foof webs. Zooplankton*** | - |
| ***Descriptor 5.2 Eutrophication Med Chlorophyll a*** | COPERNICUS |
| ***Descriptor 5.3 Eutrophication Med Dissolved oxygen*** | COPERNICUS |
| ***Descriptor 5.5 Eutrophication Med Nitrate*** | COPERNICUS |
| ***Descriptor 5.6 Eutrophication Med Phosphate*** | COPERNICUS |
| ***Descriptor 5.7 Eutrophication Med Silicate*** | COPERNICUS |
| ***Descriptor 5.8 Eutrophication Med Iron*** | COPERNICUS |
| ***Descriptor 5.9 Eutrophication Med Primary production*** | COPERNICUS |
| ***Descriptor 9. Contaminants in seafood (incomplete)*** | MAGRAMA |
| ***Descriptor 10. Marine litter*** | - |
| ***Descriptor 1.1 Habitats*** | Natura 2000 network forms |
| ***Descriptor 1.2 Coastal habitats*** | IEHEM - Ecocartográficos |
| ***Descriptor 1.3 Sensitive species: Mammals*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Birds*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Turtles*** | Natura 2000 network forms |
| ***Descriptor 2. Non-indigenous species (incomplete)*** | MAGRAMA |
| ***Descriptor 5.4 Eutrophication Dissolved nutrients*** | MAGRAMA |
| ***Descriptor 6. The sea floor integrity*** | Emodnet |

| | |
|---|---|
| ***Descriptor 11. Energy, including underwater noise data*** | MAGRAMA |

### *Marine protected areas*

*Table x - List of available data*

| Name | Source |
|---|---|
| ***CDDA by EEA*** | European inventory of nationally designated areas |
| ***Natura 2000 by directive*** | Nature 2K network ordered by directive |

### *Land use*

*Table xi - List of available data*

| Name | Source |
|---|---|
| ***CORINE: Urban Areas*** | Corine land cover |
| ***CORINE: Industrial Areas*** | Corine land cover |
| ***CORINE: Port Areas*** | Corine land cover |
| ***CORINE: Airport Areas*** | Corine land cover |
| ***CORINE: Agriculture*** | Corine land cover |
| ***CORINE: Forest*** | Corine land cover |
| ***CORINE: Beaches, dunes and sands*** | Corine land cover |
| ***Distance to the coast*** | - |

### *Oceanography*

*Table xii - List of available data*

| Name | Source |
|---|---|
| ***Temperature Mean*** | COPERNICUS |
| ***Currents Vel Med*** | COPERNICUS |
| ***Wave height Med*** | COPERNICUS |
| ***Depth/bathymetry*** | COPERNICUS |
| ***Wind Vel Med*** | COPERNICUS |

| | |
|---|---|
| ***Salinity Med*** | COPERNICUS |
| ***Mixed layer thickness Med*** | COPERNICUS |
| ***Bottom temperature Mean*** | COPERNICUS |

### *Maritime activities*

*Table xiii - List of available data*

| Name | Source |
|---|---|
| ***Coastal point pressures*** | - |
| ***Esfuerzo Pesquero. Demersales*** | - |
| ***Esfuerzo Pesquero. Pelágicos*** | - |
| ***Esfuerzo Pesquero. Crustáceos*** | - |
| ***Esfuerzo Pesquero excepto atún*** | - |
| ***Esfuerzo Pesquero. Atún (Toda la flota)*** | - |
| ***Esfuerzo Pesquero. Atún <15m.*** | - |
| ***Esfuerzo Pesquero Atún >15m.*** | - |
| ***Maritime traffic lanes*** | - |
| ***Aquaculture areas*** | - |
| ***Artificial reefs*** | - |
| ***Offshore Cables*** | - |
| ***Fishing areas*** | - |
| ***Fossil fuel extraction (incomplete)*** | - |
| ***Maritime tourism*** | - |
| ***Military areas*** | - |
| ***Research areas*** | - |
| ***Seaweed cultivation*** | - |
| ***Nautical sports*** | - |
| ***Wrecks*** | - |

#### 3.1.5.3 Azores

Concerning the Autonomous Region of Azores, it was possible to collect data about several thematises. Some of them, applied only to the Region, like the maritime activities but, most of them are applied to all Macaronesia, collected on European platforms.

For the Autonomous Region of Azores, the following data are available:

### *Marine Strategy Framework Directive – Good Environmental Status*

*Table xiv – List of available data*

| Name | Source |
|---|---|
| ***Descriptor 5.2 Eutrophication Med Chlorophyll a*** | COPERNICUS |
| ***Descriptor 5.3 Eutrophication Med Dissolved oxygen*** | COPERNICUS |
| ***Descriptor 5.5 Eutrophication Med Nitrate*** | COPERNICUS |
| ***Descriptor 5.6 Eutrophication Med Phosphate*** | COPERNICUS |
| ***Descriptor 5.7 Eutrophication Med Silicate*** | COPERNICUS |
| ***Descriptor 5.8 Eutrophication Med Iron*** | COPERNICUS |
| ***Descriptor 5.9 Eutrophication Med Primary production*** | COPERNICUS |
| ***Descriptor 1.1 Habitats*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Mammals*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Birds*** | Natura 2000 network forms |
| ***Descriptor 1.3 Sensitive species: Turtles*** | Natura 2000 network forms |
| ***Descriptor 6. The sea floor integrity*** | Emodnet |

### *Marine protected areas*

*Table xv - List of available data*

| Name | Source |
|---|---|
| ***CDDA by EEA*** | European inventory of nationally designated areas |
| ***Natura 2000 by directive*** | Nature 2K network ordered by directive |

### *Land use*

*Table xvi - List of available data*

| Name | Source |
|---|---|
| ***CORINE: Urban Areas*** | Corine land cover |
| ***CORINE: Industrial Areas*** | Corine land cover |
| ***CORINE: Port Areas*** | Corine land cover |
| ***CORINE: Airport Areas*** | Corine land cover |
| ***CORINE: Agriculture*** | Corine land cover |
| ***CORINE: Forest*** | Corine land cover |
| ***CORINE: Beaches, dunes and sands*** | Corine land cover |
| ***Distance to the coast*** | - |

### *Oceanography*

*Table xvii - List of available data*

| Name | Source |
|---|---|
| ***Temperature Mean*** | COPERNICUS |
| ***Currents Vel Med*** | COPERNICUS |
| ***Wave height Med*** | COPERNICUS |
| ***Depth/bathymetry*** | COPERNICUS |
| ***Wind Vel Med*** | COPERNICUS |
| ***Salinity Med*** | COPERNICUS |
| ***Mixed layer thickness Med*** | COPERNICUS |
| ***Bottom temperature Mean*** | COPERNICUS |

### *Maritime activities*

*Table xviii - List of available data*

| Name | Source |
|---|---|
| ***Maritime traffic lanes*** | - |
| ***Aquaculture potential areas*** | - |
| ***Aquaculture areas*** | - |

| | |
|---|---|
| ***Offshore cables*** | - |
| ***Deep sea mining*** | - |
| ***Dredging / Sand extraction*** | - |
| ***Research Areas*** | - |
| ***Seaweed cultivation*** | - |
| ***Nautical sports*** | - |

### 3.1.6 Missing data

#### *3.1.6.1 Madeira*

In the Autonomous Region of Madeira, most of the missing data is related to the indicators of the Marine Strategy Framework Directive. The main reason is that the data has not been compiled or is not in GIS format or has never been studied.

For the Autonomous Region of Madeira, the following data are not available:

***Marine Strategy Framework Directive – Good Environmental Status***

*Table xix – List of unavailable data*

| Name |
|---|
| ***Descriptor 1.2 Coastal habitats*** |
| ***Descriptor 1.3 Sensitive species: Cephalopd*** |
| ***Descriptor 2. Non-indigenous species*** |
| ***Descriptor 3. The population of commercial fish species*** |
| ***Descriptor 3.1. The population of commercial fish*** |
| ***Descriptor 3.2. The population of commercial fish*** |
| ***Descriptor 3.3. The population of commercial fish species*** |
| ***Descriptor 3.4. The population of commercial fish species*** |
| ***Descriptor 3.5 The population of commercial fish species*** |
| ***Descriptor 3.6. The population of commercial fish species*** |
| ***Descriptor 3.7. The population of commercial fish species*** |
| ***Descriptor 3.8. The population of commercial fish species*** |
| ***Descriptor 3.9. The population of commercial fish species*** |

| |
|---|
| ***Descriptor 3.10. The population of commercial fish species*** |
| ***Descriptor 3.11. The population of commercial fish species*** |
| ***Descriptor 3.12. The population of commercial fish species.*** |
| ***Descriptor 3.13. The population of commercial fish species*** |
| ***Descriptor 3.14. The population of commercial fish species*** |
| ***Descriptor 4.1. Elements of food webs. Benthic Cephalopods*** |
| ***Descriptor 4.2. Elements of food webs. Benthic sharks and rays*** |
| ***Descriptor 4.3. Elements of food webs. Coastal pelagics*** |
| ***Descriptor 4.4. Elements of food webs. Demersal fishes*** |
| ***Descriptor 4.5. Elements of food webs. Dolphins and beaked whales*** |
| ***Descriptor 4.6. Elements of food webs. DSL*** |
| ***Descriptor 4.7. Elements of food webs. Jellyfishes*** |
| ***Descriptor 4.8. Elements of food webs. Mesodemersal fish*** |
| ***Descriptor 4.9. Elements of food webs. Molluscs*** |
| ***Descriptor 4.10. Elements of food webs. Moray eels*** |
| ***Descriptor 4.11. Elements of food webs. Oceanic pelagics*** |
| ***Descriptor 4.12. Elements of food webs. Oceanic sharks*** |
| ***Descriptor 4.13. Elements of food webs. Other benthic*** |
| ***Descriptor 4.14. Elements of food webs. Pelagic*** |
| ***Descriptor 4.15. Elements of food webs. Phytoplankton*** |
| ***Descriptor 4.16. Elements of food webs. Seabirds*** |
| ***Descriptor 4.17. Elements of food webs.*** |
| ***Descriptor 4.18. Elements of food webs. Shrimps.*** |
| ***Descriptor 4.19. Elements of food webs. Skipjack tuna*** |
| ***Descriptor 4.20. Elements of food webs. Toothed whales*** |
| ***Descriptor 4.21. Elements of food webs. Tunas*** |
| ***Descriptor 4.22. Elements of food webs. Turtles*** |
| ***Descriptor 4.23. Elements of food webs. Urchins*** |

| |
|---|
| ***Descriptor 4.24. Elements of food webs. Zooplankton*** |
| ***Descriptor 7. Permanent alteration of hydrographical*** |
| ***Descriptor 8. Concentrations of contaminants  heavy*** |
| ***Descriptor 9. Contaminants in seafood*** |
| ***Descriptor 10. Marine litter*** |
| ***Descriptor 11. Energy, including underwater noise data*** |

### *Maritime activities*

*Table xx - List of unavailable data*

| Name |
|---|
| ***Offshore Cables*** |
| ***Coastal point pressures*** |
| ***Fishing areas*** |
| ***Fossil fuel extraction*** |
| ***Nautical sports*** |
| ***Wrecks*** |

#### *3.1.6.2 Canaries*

For the three regions, the Canaries present the most complete data. Only a few MSFD indicators are not available, because either the data is not available in GIS format or because the data does not exist.

For the Autonomous Region of the Canary Islands, the following data are not available:

### *Marine Strategy Framework Directive – Good Environmental Status*

*Table xxi - List of unavailable data*

| Name |
|---|
| ***Descriptor 1.3 Sensitive species: Cephalopd*** |
| ***Descriptor 3. The population of commercial fish species*** |
| ***Descriptor 4. Elements of food webs*** |

| |
|---|
| ***Descriptor 7. Permanent alteration of hydrographical*** |
| ***Descriptor 8. Concentrations of contaminants heavy*** |

### *Maritime activities*

*Table xxii - List of unavailable data*

| Name |
|---|
| ***Fossil fuel extraction*** |

#### *3.1.6.3 Azores*

In Autonomous Region of Azores, most of the missing data are related with the Marine Strategy Framework Directive indicators. The main reason is because the data weren't compiled or aren't in geographic information format or never been studied.

For the Autonomous Region of Azores, the following data are not available:

### *Marine Strategy Framework Directive – Good Environmental Status*

*Table xxiii – List of unavailable data*

| Name |
|---|
| ***Descriptor 1.2 Coastal habitats*** |
| ***Descriptor 1.3 Sensitive species: Cephalopd*** |
| ***Descriptor 2. Non-indigenous species*** |
| ***Descriptor 3. The population of commercial fish species*** |
| ***Descriptor 3.1. The population of commercial fish*** |
| ***Descriptor 3.2. The population of commercial fish*** |
| ***Descriptor 3.3. The population of commercial fish species*** |
| ***Descriptor 3.4. The population of commercial fish species*** |
| ***Descriptor 3.5 The population of commercial fish species*** |
| ***Descriptor 3.6. The population of commercial fish species*** |
| ***Descriptor 3.7. The population of commercial fish species*** |
| ***Descriptor 3.8. The population of commercial fish species*** |
| ***Descriptor 3.9. The population of commercial fish species*** |

| |
|---|
| ***Descriptor 3.10. The population of commercial fish species*** |
| ***Descriptor 3.11. The population of commercial fish species*** |
| ***Descriptor 3.12. The population of commercial fish species.*** |
| ***Descriptor 3.13. The population of commercial fish species*** |
| ***Descriptor 3.14. The population of commercial fish species*** |
| ***Descriptor 4. Elements of food webs*** |
| ***Descriptor 4.1. Elements of food webs. Benthic Cephalopods*** |
| ***Descriptor 4.2. Elements of food webs. Benthic sharks and rays*** |
| ***Descriptor 4.3. Elements of food webs. Coastal pelagics*** |
| ***Descriptor 4.4. Elements of food webs. Demersal fishes*** |
| ***Descriptor 4.5. Elements of food webs. Dolphins and beaked whales*** |
| ***Descriptor 4.6. Elements of food webs. DSL*** |
| ***Descriptor 4.7. Elements of food webs. Jellyfishes*** |
| ***Descriptor 4.8. Elements of food webs. Mesodemersal fish*** |
| ***Descriptor 4.9. Elements of food webs. Molluscs*** |
| ***Descriptor 4.10. Elements of food webs. Moray eels*** |
| ***Descriptor 4.11. Elements of food webs. Oceanic pelagics*** |
| ***Descriptor 4.12. Elements of food webs. Oceanic sharks*** |
| ***Descriptor 4.13. Elements of food webs. Other benthic*** |
| ***Descriptor 4.14. Elements of food webs. Pelagic*** |
| ***Descriptor 4.15. Elements of food webs. Phytoplankton*** |
| ***Descriptor 4.16. Elements of food webs. Seabirds*** |
| ***Descriptor 4.17. Elements of food webs.*** |
| ***Descriptor 4.18. Elements of food webs. Shrimps.*** |
| ***Descriptor 4.19. Elements of food webs. Skipjack tuna*** |
| ***Descriptor 4.20. Elements of food webs. Toothed whales*** |
| ***Descriptor 4.21. Elements of food webs. Tunas*** |
| ***Descriptor 4.22. Elements of food webs. Turtles*** |

| |
|---|
| ***Descriptor 4.23. Elements of food webs. Urchins*** |
| ***Descriptor 4.24. Elements of food webs. Zooplankton*** |
| ***Descriptor 7. Permanent alteration of hydrographical*** |
| ***Descriptor 8. Concentrations of contaminants  heavy*** |
| ***Descriptor 9. Contaminants in seafood*** |
| ***Descriptor 10. Marine litter*** |
| ***Descriptor 11. Energy, including underwater noise data*** |

### *Maritime activities*

*Table xxiv - List of unavailable data*

| Name |
|---|
| ***Artificial reefs*** |
| ***Coastal point pressures*** |
| ***Fishing areas*** |
| ***Fossil fuel extraction*** |
| ***Military areas*** |

# 4 Added value

The European Union spatial data infrastructure allows the provision of integrated spatial information services to users, based on the existence of a distributed network of databases, linked on the basis of common standards and protocols, ensuring their compatibility. These services allow any user to identify and access geographic information from different sources, from the local to the global level, view different levels of information, superimpose information from different sources, and perform spatial and temporal analysis of that information, among others, in an interoperable way and for a wide variety of uses.

These services are available through a catalog, which represents useful toolbox, which, through discovery services, will make it easier through discovery services for policy makers, stakeholders or potential stakeholders, in one place, to access all available and useful information and data.

The strategic interest of the PLASMAR project and the articulation with the sea policy motivate a great interest in the continuous collection of geographic data and, at the same time, support the centralization of Macaronesian marine data in its marine data distributed infrastructure, which will be permanently updated, through the local nodes present in the Azores, Madeira and the Canaries.

The strategy for the Sea in the Macaronesian space makes it increasingly necessary to have a concrete knowledge of this phenomenon of greatness and unique variability: the Sea. Knowledge will have to result in information, and we believe that the most value of it arises from its characterization and availability through network services.

The educational field and the promotion of the sea in the academic and school community are another reason that will certainly make PLASMAR a persistent project over time.

# 5 Bibliography

SNIMAR - Sistema Nacional de Informação do Mar, available on the following website: http://geoportal.snimar.pt/

SIGMAR – Sistema de Informação Geográfica Marinho dos Açores, available on the following website: https://sigmar.azores.gov.pt/

JRC/ENVIRONMENTAL MARINE INFORMATION SYSTEM, available on the following website: http://mcc.jrc.ec.europa.eu/emis/

COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE, available on the following website: http://marine.copernicus.eu/services-portfolio/access-to-products/

I-MARINE, available on the following website: http://www.i-marine.eu/Content/OurServices.aspx?id=599ee2b9-de2e-4ab2-80ee-808a9a973b13&li=0

Plano de Situação do Ordenamento do Espaço Marítimo (PSOEM), available on the following website: www.psoem.pt

EMODnet, available on the following website: http://www.emodnet-humanactivities.eu/download-data.php

SNIG - SISTEMA NACIONAL DE INFORMAÇÃO GEOGRÁFICA, available on the following website: http://snig.dgterritorio.pt/portal/index.php?option=com_wrapper&view=wrapper&Itemid=239&lang=pt

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