MSP-OR
Advancing Maritime Spatial Planning in Outermost Regions

Data specification on monitoring module for MSP
MSP INSPIRE data model 2.0

August 2024

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ABSTRACT

The concept of the Maritime Spatial Planning (MSP) INSPIRE data model has evolved since 2014, incorporating the data management principles from the Infrastructure for Spatial Information of the Europe Directive 2007/2/EC (INSPIRE). This development began with the Marine Pilot project (EC Joint Research Centre 2014-2016) and continued through the PLASMAR project (INTERREG–V 2017-2020) and the MarSP project (EASME/EMFF/2016/1.2.1.6/03SI2.763106).

In the MarSP project, we encompass the conceptual development of the MSP data model and, more importantly, test it in real-world cases within the Macaronesia MSP processes. Initially, the INSPIRE data model for terrestrial planning (Planned Land Use) was evaluated to determine if it could be adapted for MSP. Testing revealed that while the terrestrial model is robust and capable of mapping MSPs, it tends to lose detail and specific information related to marine uses. Consequently, the Planned Land Use data model was adapted for maritime activities in marine environments.

Through the MSP-OR project we had the opportunity to update the product finalized in 2020 (Version 1.1), which was developed within the MarSP project. Version 2.0 of the model was released after the development of Proposal for making harmonized MSP plan data available across Europe (Technical Expert Group on Data for MSP, 2021- TEG), MSP Spain data and its application with the EMODnet MSP model for the development of the EU MSP data layer. Although Version 1.1 was used as basic tool for the development of the EMODnet MSP model (current applied standard), there were some missing components that was included from BASEMAPS, (the MSP data model applied for the Baltic Sea and developed by HELCOM), for the final EU MSP standard. All these resources are necessary to apply evaluation and assessment framework developed within TEG as well as the ReMAP project, that use MSP standard and EU MSP data layer as a base for MSP monitoring and evaluation development.

For the development of this version, we used the Data Specification on Land Use D2.8.III.4_v3.0 and the MarSP MSP INSPIRE data model report, which was updated with new features. Version 2.0 extended the conceptual model, templates, and Style Layer Descriptor, enhancing compatibility with the EMODnet MSP model and supporting the development of the EU MSP data layer. The data model and related products (GIS templates, SLD, registry, etc.) are available on the Canaries MSP platform[1] in the tools section.

[1] http://www.geoportal.ulpgc.es/marsp/

SUMMARY

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ABBREVIATIONS AND ACRONYMS

CEDEX	Centro de Estudios y Experimentación de Obras Públicas
ECOAQUA	Instituto Univ. en Acuicultura Sostenible y Ecosistemas Marinos de la ULPGC
EMODnet	European Marine Observation and Data Network
FRCT	Fundo Regional para a Ciência e Tecnologia
FBIO	Fundación Biodiversidad
HILUCS	Hierarchical INSPIRE Land Use Classification System
IEO (CSIC)	Instituto Español de Oceanografía – Agencia Estatal Consejo Superior de Investigaciones Científicas
INSPIRE	Infrastructure for Spatial Information in the European Community
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO
MSP	Marine Spatial Planning
MTERD-DGCM	Ministerio para la Transición y el Reto Demográfico
ReMAP	Reviewing and Evaluating the Monitoring and Assessment of Marine Spatial Planning
SRMP-DRAM	Secretaria Regional do Mar e das Pescas
TEG	MSP data Technical Expert Group
ULPGC	Universidad de Las Palmas de Gran Canaria
UNESCO	United Nations Educational, Scientific, and Cultural Organization

MARITIME SPATIAL PLANNING AND NEED FOR THE DATA MODEL

The data required for the Maritime Spatial Planning (MSP) process are inherently diverse, encompassing various domains, geographical regions, spatial and temporal scales, as well as differences in quality, completeness, availability, and reusability. Additionally, the availability of data varies across EU regions due to differences in data management practices, data infrastructures, documentation (specifications), and metadata catalogues. Many international pilot projects have highlighted issues and needs related to harmonized data and metadata, particularly within standardized data flows (Barbanti et al., 2015). The MSP process demands information that is applicable across borders. While cross-border data management is not a new challenge in Europe, many expected it to be addressed through the development of the Infrastructure for Spatial Information in the European Community (INSPIRE), a European binding data initiative (Directive 2007/2/EC). INSPIRE aims to resolve data heterogeneity issues, facilitate cross-border data and information integration, and promote the development of common European data flows by employing standards for data modelling and network services. In essence, INSPIRE seeks to improve access to, reuse, harmonization, and sharing of high-quality spatial data (including coastal, marine, and maritime data) held by the public sector to support the implementation of EU environmental policies, as well as other policies or activities that may impact the environment.

Directive 2014/89/EU mandates that Member States to create Maritime Spatial Plans that address the spatial and temporal distribution of relevant existing and future activities by 2021. While the MSP Directive does not regulate the format of digital plans, these plans clearly fall under the scope of INSPIRE and the related Commission Regulation No. 1089/2010 on the interoperability of spatial data sets. This regulation outlines specific requirements regarding digital plans, data interoperability, and the spatial planning data model.

Challenges in harmonizing the vision and frameworks of maritime spatial plans among countries sharing the same marine region or sub-region, were approached with TEG. This technical group provided a technical solution in 2021, a hybrid of the MSP INSPIRE data model and BASEMPAS, operative application in the Baltic Sea. The new model and solution described in the Proposal for making harmonized MSP plan data available across Europe (TEG), applied with EMODnet to share EU MSP data layer, require updating the MSP INSPIRE data model that can be 100% interoperable with new developments and standards. This interoperability allows application of the MSP monitoring and evaluation framework developed by ReMAP project.

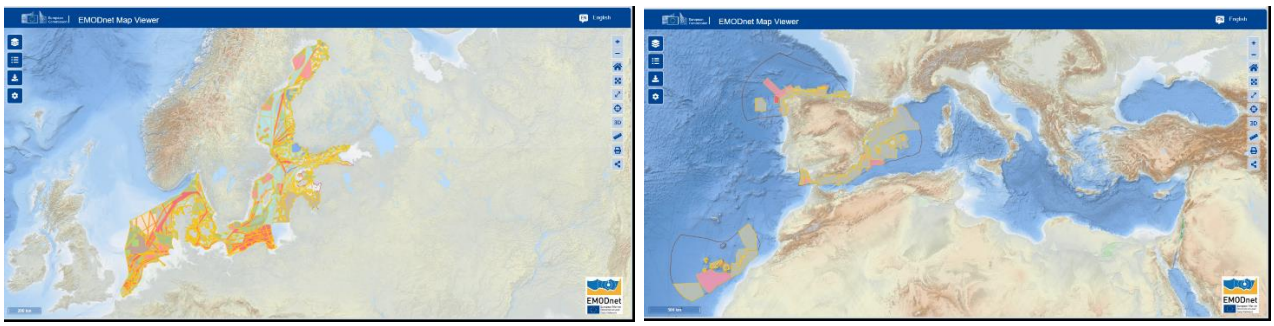

Figure 1. Development of the MSP data layer within teh EMODnet platform.

In the development of the INSPIRE Planned Land Use data model, as outlined in the Technical Guidelines document on "INSPIRE Data Specification on Land Use," the uses and planning of the Sea were considered, though not explored in great detail. Building on this INSPIRE Planned Land Use data model, the concept for an MSP (Maritime Spatial Planning) data model has been evolving since 2014. This development applies INSPIRE's data management principles to marine planning and data, beginning with the Marine Pilot project (EC Joint Research Centre 2014-2016) and continued through the PLASMAR project (INTERREG–V 2017-2020) and the MarSP project (EASME/EMFF/2016/1.2.1.6/03SI2.763106). Now, the MSP-OR follow up project provides an ideal opportunity to encompass the latest data model's development and test its application in a real-world case study focused on the Macaronesia Sub-basin of the North Atlantic Ocean.

INSPIRE THEMES, DATA MODELS, APPLICATION SCHEMAS FOR MSP

The INSPIRE website features the Interactive Data Specification, a digital application designed to identify relevant INSPIRE themes, data models, and associated application schemas suitable for mapping maritime spatial plans. By using the Interactive Data Specifications application, clear results were obtained regarding the appropriate application schema for MSP mapping (refer to Table 1). The spatial planning data model falls under the INSPIRE data theme of Land Use. Although the Planned Land Use data model was initially developed for terrestrial planning, considerations for sea uses and planning were also addressed during its development, as outlined in the Technical Guidelines document on "INSPIRE Data Specification on Land Use" (EC/JRC, 2013).

Table 1. Results of analysis with Interactive Data Specifications application.

Search Term	Results	Results related to MSP	Objects	Application Schemas	Themes
Maritime spatial planning	**Did not match any label, definition or description of selected INSPIRE object categories**	**0**	**0**		
Marine spatial planning	**Did not match any label, definition or description of selected INSPIRE object categories**	**0**	**0**		
Marine	**24**	**24**	**24**	**Water Transport Network, Sea Regions, Area Management Restriction & Regulation Zones, Geology, Mineral Resources, Bio-geographical Regions, Administrative & Social Governmental Services, Habitats & Biotopes, Soil, Species Distribution, Common Transport Elements Maritime Units, Production & industrial facilities, Water transport network**	**Sea Regions, Protected Sites, Agricultural & Aquaculture Facilities, Hydrography, Habitats & Biotopes, Meteorological geographical features**
Maritime	**5**	**5**	**5**	**Water Transport Network, Sea Regions, Area Management Restriction & Regulation Zones, Geology, Mineral Resources, Bio-geographical Regions, Administrative & Social Governmental Services, Habitats**	**Sea Regions, Protected Sites, Agricultural & Aquaculture Facilities, Hydrography, Habitats & Biotopes, Meteorological geographical features**

				and Biotopes, Soil, Species Distribution, Common Transport Elements Maritime Units, Production & industrial facilities, Water transport network	
Spatial planning	4	4	3	Planned Land Use, Protected Sites	Land Use Simple
Planning	4	4	3	Planned Land Use, Protected Sites	Land Use Simple
Marine spatial plan	Did not match any label, definition or description of selected INSPIRE object categories	0	0		
Maritime spatial plan	Did not match any label, definition or description of selected INSPIRE object categories	0	0		
Spatial plan	5	5	4	Planned Land Use, Protected Sites	Land Use Simple

LAND USE THEME & PLANED LAND USE CONCEPTUAL DATA MODEL

In INSPIRE, Land Use is defined as the characterization of territory based on its current and future planned functional dimension or socio-economic purpose (e.g., residential, industrial, commercial, agricultural, forestry, recreational). It describes land in terms of its socio-economic and ecological roles. Inland water bodies and coastal waters are included as part of the connected land, with the planning of sea use and seabed use also being considered.

Land Use is further divided into two distinct types:

1. Existing Land Use: This type objectively represents the actual use and functions of a territory as they have been and continue to be in reality.
2. Planned Land Use: This corresponds to spatial plans defined by spatial planning authorities, which outline the potential future utilization of land. Planned Land Use is governed by spatial planning documents prepared at various administrative levels. The INSPIRE Planned Land Use provides precise spatial dimensions for all the elements that make up a spatial plan. The application schema for Planned Land Use is available in the INSPIRE repository[2] for use with the related data model.

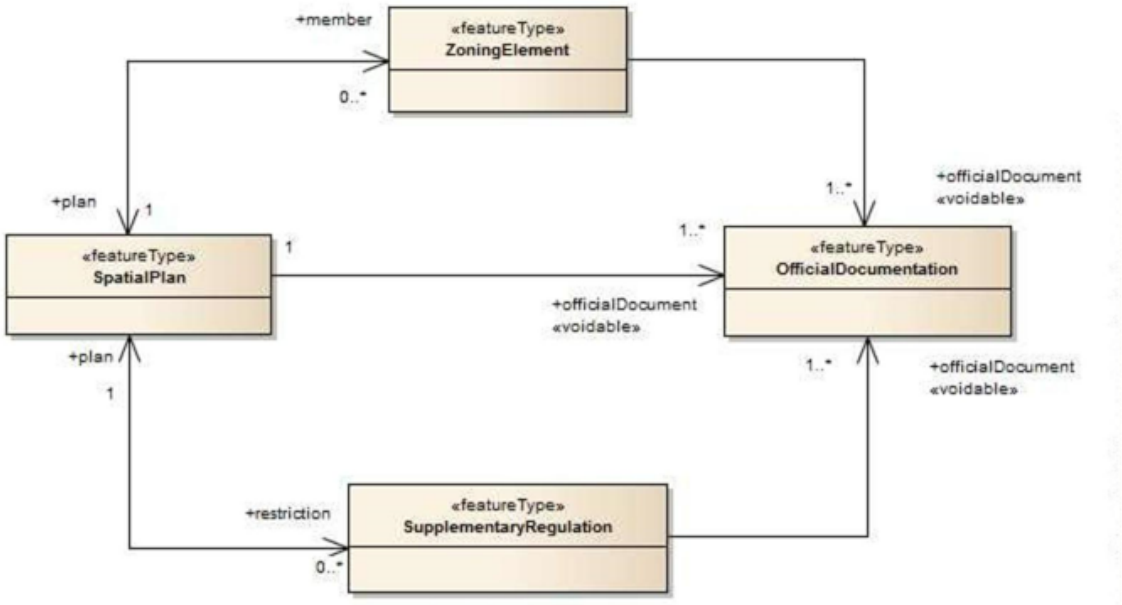

Figure 2. Planned Land Use overview. Figure extracted from https://inspire.ec.europa.eu

The Planned Land Use conceptual data model is composed of four key feature types (see Figure 2):

1. **The Spatial Plan** – This is the primary spatial object that encompasses a collection of features, outlining the strategic direction for the development of a specific geographic area. It articulates policies, priorities, programs, and land allocations designed to implement this strategic vision, thereby influencing the distribution of people and activities across various spatial scales.
2. **Zoning Elements** – These are the spatial features incorporated within the Spatial Plan that support the zoning concept of planning. They represent regulated allocations for specific uses and activities. Each Zoning Element includes a mandatory attribute for describing and classifying the zoning activity, utilizing the **Hierarchical INSPIRE Land Use Classification System (HILUCS)**[3], which provides a multi-level classification of 98 use categories.

[2] https://inspire.ec.europa.eu/schemas/
[3] http://inspire.ec.europa.eu/codelist/HILUCSValue

HILUCS has three hierarchic levels, starting with six values at the primary level, continuing with the secondary and third levels:
1_Primary Production (e.g. 1_1_ Agriculture; 1_1_2_Farming Infrastructure);
2_Secondary Production (e.g. 2_4_Energy Production; 2_4_1_Nuclear Based Energy Production);
3_Tertiary Production (e.g. commercial or community services);
4_Transport Networks Logistics and Utilities (e.g. Railway Transport);
5_Residential Use;
6_Other Use (e.g. Abandoned areas).

3. **Supplementary Regulation** – This is an optional spatial feature that offers additional information or imposes limitations on land use. It is essential for spatial planning and for formalizing external rules defined by legal texts. Examples include restrictions related to local flood management regulations, protected areas, or other international, European, or national legal instruments that could influence planning.
4. **Official Documentation** – This is a required non-spatial feature or set of features that includes the relevant legislation, regulations, and descriptive elements of the spatial plan. Additionally, it may reference Zoning Elements and/or Supplementary Regulation features.

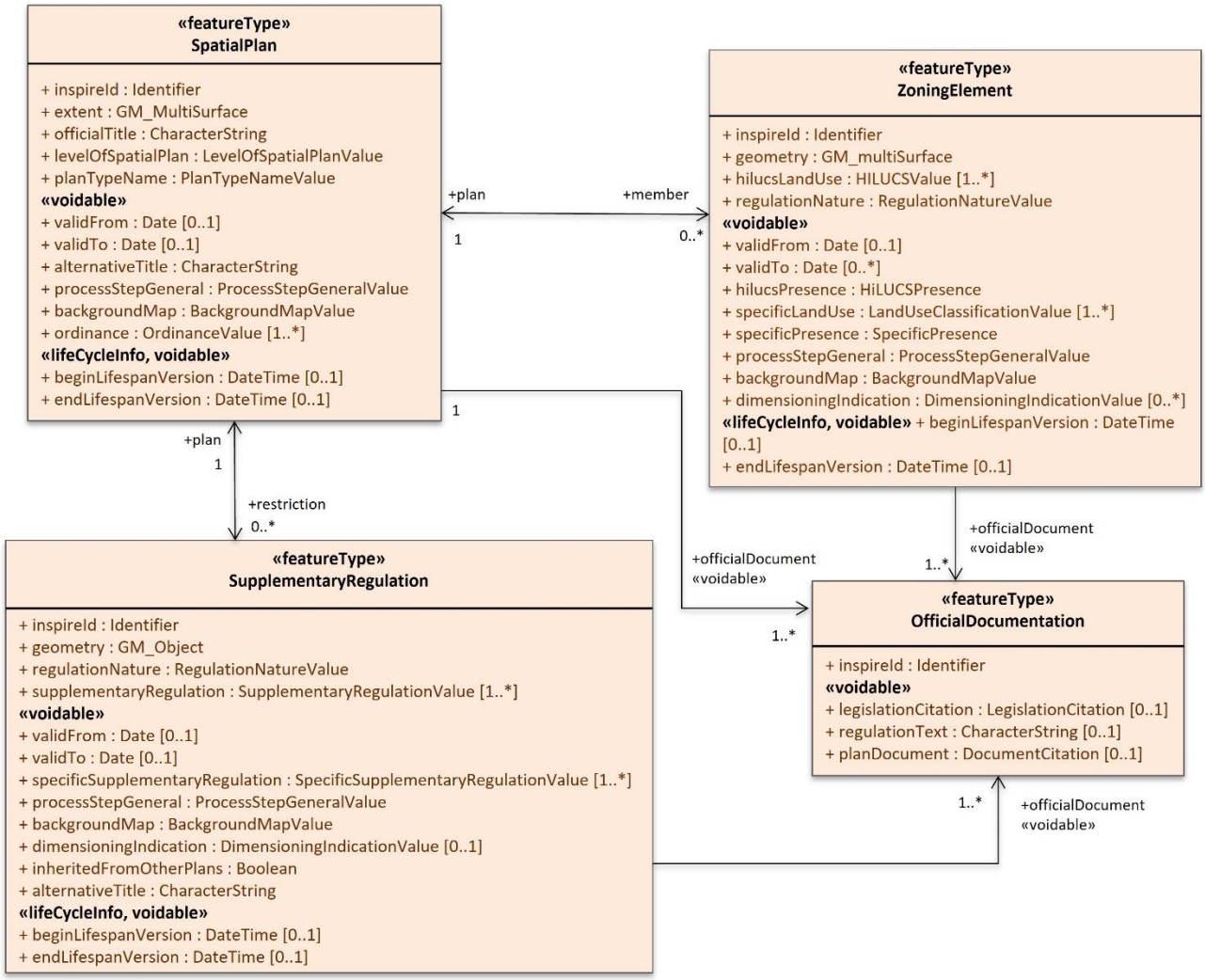

Figure 3. Planned Land Use conceptual model. Figure extracted from https://inspire.ec.europa.eu

PLANNED LAND USE APPLIED TO MSP

The Planned Land Use data model was evaluated and tested using published spatial plans available on the UNESCO/IOC Marine Spatial Planning Initiative webpage. Examples include the Draft of the Spatial Plan for the German Exclusive Economic Zone – North Sea, the Master Plan for the Sustainable Use of the Belgian Part of the North Sea, and the Trilateral Wadden Sea Plan. The mapping of these maritime spatial plans yielded positive results, showing no incompatibilities with planned marine uses (Abramic et al., 2018). The Planned Land Use data model proved robust enough to encode actual maritime spatial plans. However, the zoning classification system used—Hierarchical INSPIRE Land Use Classification System (HILUCS)—provides general, non-specific information that does not adequately capture all possible maritime uses (see Table 2). Although the HILUCS classification is a closed INSPIRE code list (non-extendable) and is somewhat broad, it facilitates the comparison of different data sets developed and provided by various sources and data providers (Abramic et al., 2018).

Table 2. Examples of MSP common spatial objects mapped into HILUCS. Modified from Abramic et al., 2018.

Spatial object	HILUCS
Reservation Area Shipping	**4_1_4_WaterTransport**
Priority Area Shipping	**4_1_4_WaterTransport**
Traffic Separation Scheme	**4_1_4_WaterTransport**
Offshore wind energy	**2_4_4_RenewableEnergyProduction**
Offshore wave energy	**2_4_4_RenewableEnergyProduction**
Offshore tidal energy	**2_4_4_RenewableEnergyProduction**
High Voltage Cable (in use)	**4_3_1_ElectricityGasAndThermalPowerDistributionServices**
Reservation Area for Pipelines	**4_3_1_ElectricityGasAndThermalPowerDistributionServices**
Priority Area for Pipelines	**4_3_1_ElectricityGasAndThermalPowerDistributionServices**
Natural Gas pipeline	**4_3_1_ElectricityGasAndThermalPowerDistributionServices**

To provide more detailed information on marine/maritime uses, the "Zoning Element" feature, Figure 4 includes an additional non-mandatory attribute called *specificLandUse*. This attribute allows spatial data providers to define custom values (e.g., shallow sea offshore wave energy versus the broader HILUCS 2_4_4_RenewableEnergyProduction category), thereby eliminating any ambiguity regarding marine use.

Additionally, traditional land planning primarily focuses on the two-dimensional allocation of human uses, mainly on the Earth's surface. However, this approach may present challenges in Maritime Spatial Planning (MSP) because marine uses are distributed not only on the surface of the sea but also within the water column, on the seabed, and in the marine subsoil. This potential issue can be addressed by extending the **Planned Land Use** data model to include information on the vertical distribution of human uses within the marine area, specifying whether these uses apply to the marine surface, water column, seabed, subsoil, or a combination thereof.

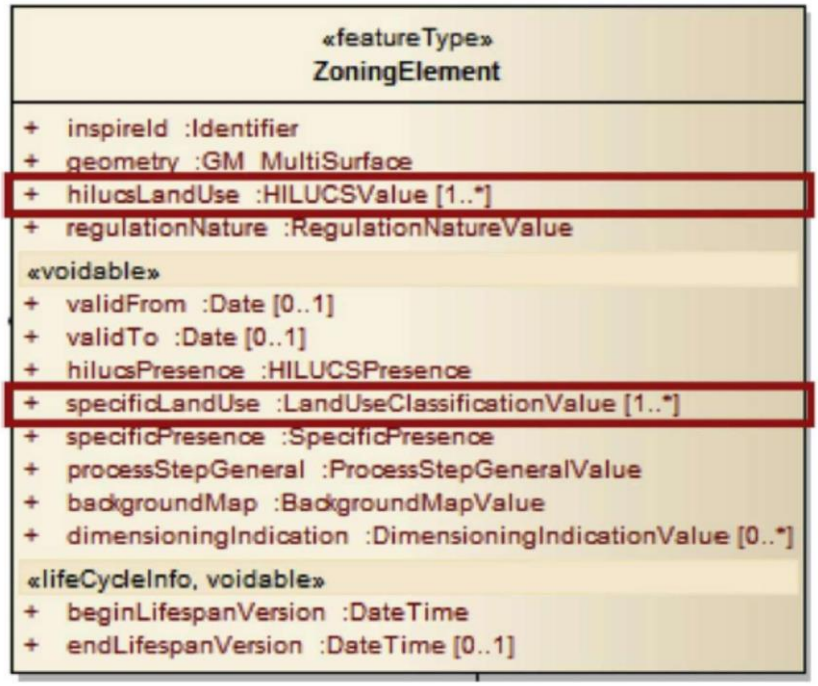

Figure 4. Zoning Element feature, with obligatory (hilucsLandUse: HILUCSValue) and nonobligatory (specificLandUse: LandUseClassificationValue) attributes. Source: Abramic et al., 2018, and INSPIRE UML data model repository publicly available in HTML format at http://inspire.ec.europa.eu/

MSP DATA MODEL, CONCEPTUAL MODELLING

MARINE USE CLASSIFICATION – EXTENDED HILUCS

During the development of the INSPIRE Planned Land Use data model, as outlined in the "*Technical Guidelines document on "INSPIRE Data Specification on Land Use*", considerations were made for the uses and planning of the sea, though they were not elaborated in detail. Upon mapping and testing the Planned Land Use data model with detailed maritime spatial plans, it was concluded that the model is sufficiently robust to map maritime activities, but it requires adaptations in the following areas:

- **Development of a Classification System:** There is a need to develop a classification system that can accurately map and specify maritime activities/marine use, ideally one that is compatible or comparable with HILUCS.
- **Inclusion of Vertical Distribution Information:** The model should incorporate information about the vertical distribution of maritime activities, specifying whether they occur on the marine surface, within the water column, on the seabed, or in the subsoil.
- **Specification of Function Types in Zoning Elements:** The model should include attributes that define the nature of the use classification within zoning elements, such as whether the area is designated as a priority, reserved, forbidden, potential, etc.

To provide more detailed classification of maritime activities, it is possible to utilize the non-compulsory attribute *specificLandUse* (as shown in Figure 4), which can include values from well-documented vocabularies and libraries, such as those available through the ***SeaDataNet* European initiative**[4]:

1. **M12 JNCC** categories of human activity in the marine environment (11 classes).
2. **M13 JNCC** standard list of human activities in the marine environment (39 classes).
3. **HA2 EMODnet** human activity categories (56 classes).

While the current Planned Land Use data model does not require classification beyond HILUCS, such classification is crucial for maritime spatial planning to avoid ambiguity regarding marine uses. To address this, the model adapted for MSP should include a new compulsory attribute that provides specific information on maritime uses. **The Zoning Element spatial feature has been extended with a new compulsory attribute,** *hilucsMSP* (as illustrated in Figure 5). The feature has been renamed to **MSP Zoning Element** to reflect this extension.

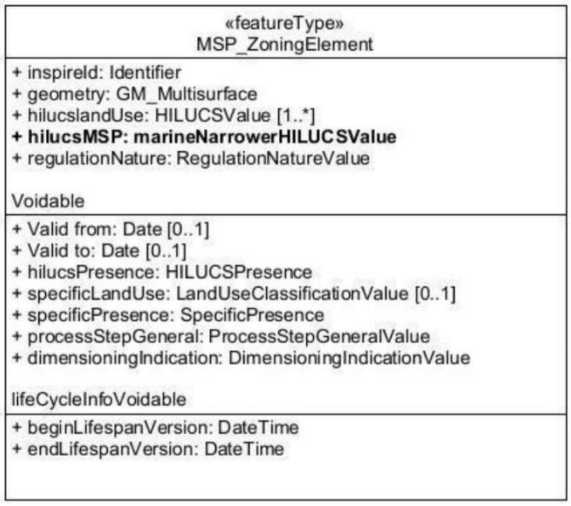

Figure 5. MSP_Zoning Element, Zoning Element extended with hilucsMSP attribute.

[4] http://seadatanet.maris2.nl/v_bodc_vocab_v2/welcome.asp

HILUCS is an INSPIRE closed code list regulated by COMMISSION REGULATION (EU) No 1089/2010[5] and managed within the INSPIRE code list register as a non-extendible list. When using the HILUCS three-level structure to specify marine uses, it becomes necessary to extend the list to a 4th or even 5th level to adequately detail marine activities. **The rationale for extending a non-extendible code list is to apply a consistent classification structure across both land and sea uses, thereby enhancing interoperability across various domains, including land use data sets,** marine use data sets, spatial information on land planning, and Maritime Spatial Planning (MSP).

To adapt HILUCS for MSP, the **HILUCS Extended register**[6] has been developed (as shown in Figure 6 and 7). This extended register includes all the "basic" HILUCS values, along with additional, extended 3rd, 4th, and 5th level values that specifically address marine uses, such as different types of marine renewable energy production, maritime services, and types of underwater cultural heritage. This maritime use code list is open to suggestions from data providers and can be further extended as needed. To propose a new term for the extended HILUCS, one must send an email to the address specified within the register.

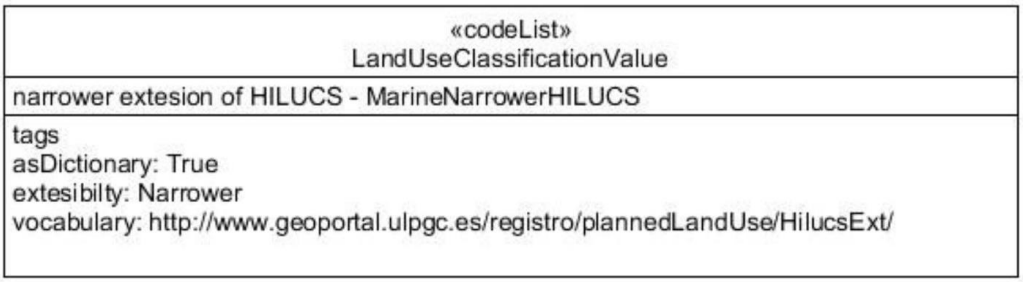

Figure 6. Narrower extension of HILUCS with marine uses.

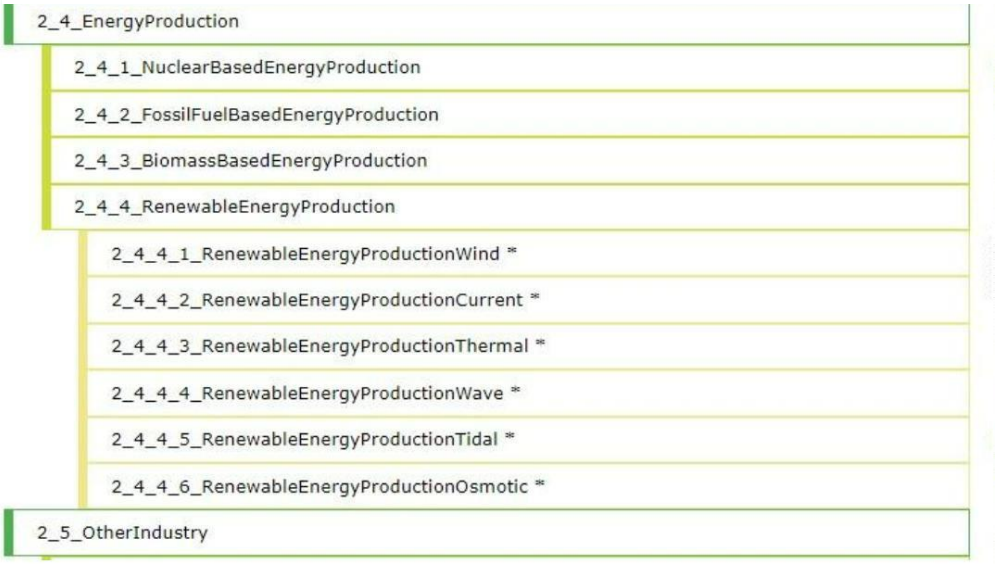

Figure 7. Example of the HILUCS Extended register - extended values on level 4, maritime Renewable energy production types (2_4_4_x).

The original INSPIRE model accounts for multi-use and co-use cases by allowing the *hilucsLandUse* attribute to have a cardinality ranging from one to many (as shown in Figure 5). However, to streamline the implementation of the MSP data model, the newly introduced *hilucsMSP* attribute has been assigned a cardinality of one, making its fulfilment mandatory. In situations involving multi-use or co-use cases, multiple instances of the original polygon will be created as needed. For each of these instances, the value of the *hilucsPresence* attribute must be incremented accordingly.

[5] https://eur-lex.europa.eu/eli/reg/2010/1089/2013-12-30
[6] http://www.geoportal.ulpgc.es/registro/plannedLandUse/HilucsExt/

MARINE USE VERTICAL DISTRIBUTION

Strategic terrestrial spatial planning primarily operates as a two-dimensional exercise, focusing on describing human activities on the Earth's surface. However, this approach is inadequate for representing marine uses due to the vertical nature of certain maritime activities. As demonstrated in previous tests (see Table 2; Abramic et al., 2018), using a two-dimensional model to present land use fails to accurately depict the complexities of marine environments. In a two-dimensional representation, human activities and marine uses often appear to overlap, even when there is no actual interaction between them (e.g., maritime transport and submarine cables, as illustrated in Figure 8).

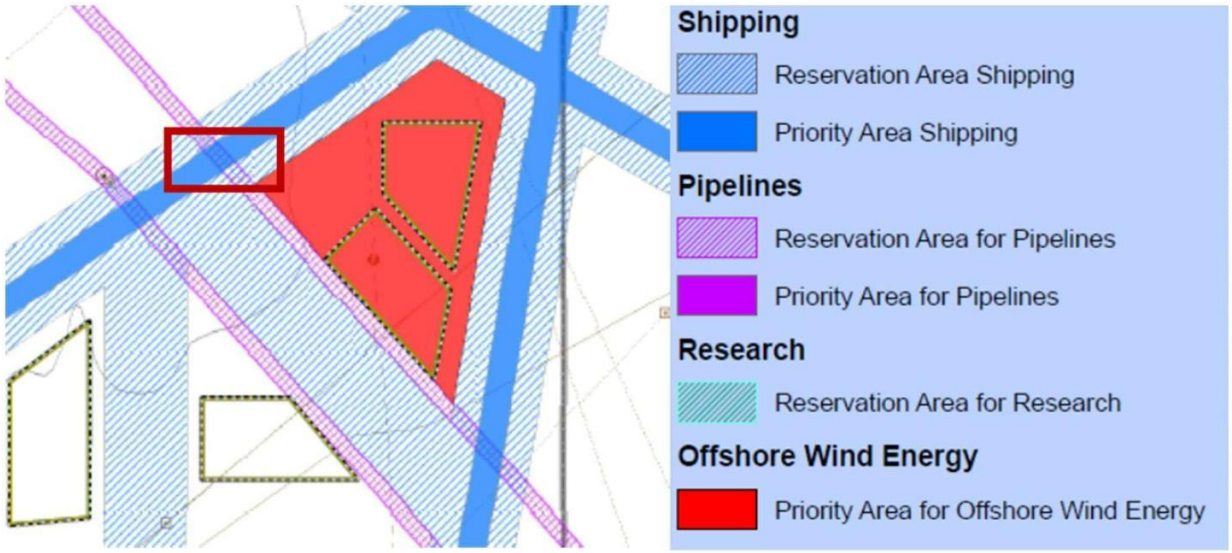

Figure 8. Detail of German EEZ; maritime transport and pipelines.

Certain marine uses are confined solely to the sea surface, others are limited to the seabed, while some activities extend vertically from the water surface, through the water column, and down to the subsoil (e.g., offshore wind turbines). To accurately represent these uses, the data model must be adapted to account for the distribution of activities across different "dimensions" within the marine environment, including the sea surface, water column, and areas above and below the seabed. To accommodate this requirement, **the MSP_Zoning Element has been extended with an additional compulsory attribute called *verticalDistributionValue*** (as shown in Figure 9), which provides information on the specific zones where an activity takes place: surface, water column, seabed, and/or subsoil.

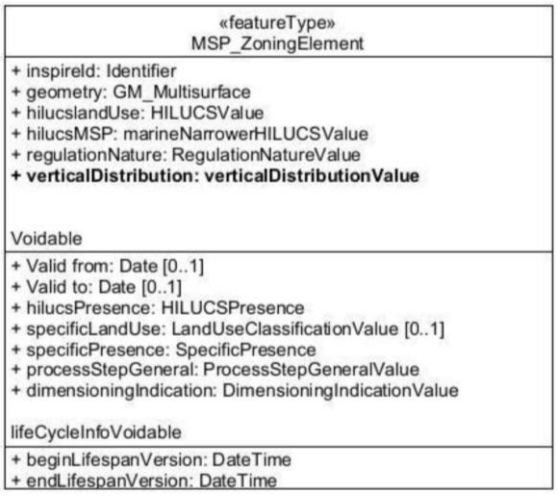

Figure 9. MSP_ZoningElement extension Vertical Distribution.

Within the ECOAQUA registry (ULPGC Geoportal), we provide **a code list called *verticalDistributionValue***[7], which includes four basic values as shown in Figure 10 along with all possible combinations as depicted in Figure 11. The **Vertical Distribution** attribute has a cardinality of 1 in relation to the *hilucsMSP* attribute. If more than one HILUCS value is used to describe multi-use scenarios, the same rule should be applied as explained in the previous chapter. This ensures that each instance of multi-use is accurately represented with the appropriate vertical distribution information.

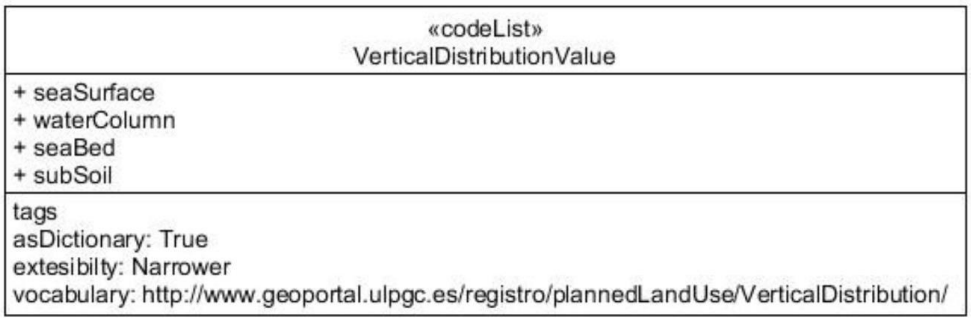

Figure 10. Vertical distribution code list, only basic values.

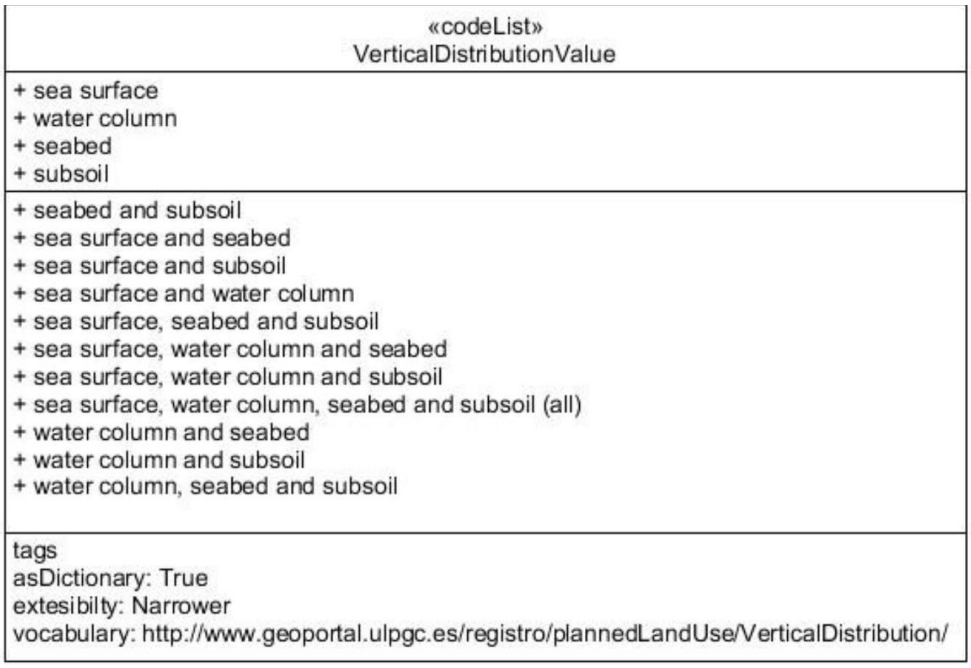

Figure 11. Final Vertical distribution code list.

[7] http://www.geoportal.ulpgc.es/registro/plannedLandUse/VerticalDistribution/

SEA USE FUNCTION – MAIN UPDATE

The planned use of a given marine area can be defined not only by what activities are permitted but also by what activities are prohibited, including functions that fall in between. To facilitate the clear definition of the function represented by each zoning element, **a compulsory attribute called *SeaUseFct* has been included** to describe this function (as shown in Figure 12). This attribute is derived from MSP data models delivered within the BASEMAPS and EMODnet MSP model, which are applied at the Human Activities EMODnet geoportal. This approach enhances the compatibility of the MSP INSPIRE data model with the BASEMAPS and EMODnet MSP models, thereby supporting the development of the EU MSP data layer as proposed by the Technical Expert Group on MSP data[8,9].

Within the ECOAQUA registry, **a code list called *seaUseFunction* is provided,** which includes seven basic values (as depicted in Figure 13). The *SeaUseFct* attribute has a cardinality of 1 in relation to the *hilucsMSP* attribute. If multiple HILUCS values are used to describe multi-use scenarios, the corresponding *SeaUseFct* values must be included to accurately represent each function.

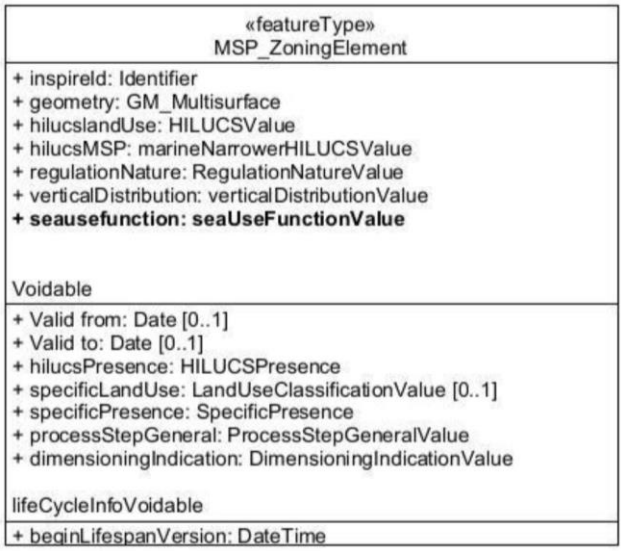

Figure 12. MSP Zoning Element extension Sea Use Function.

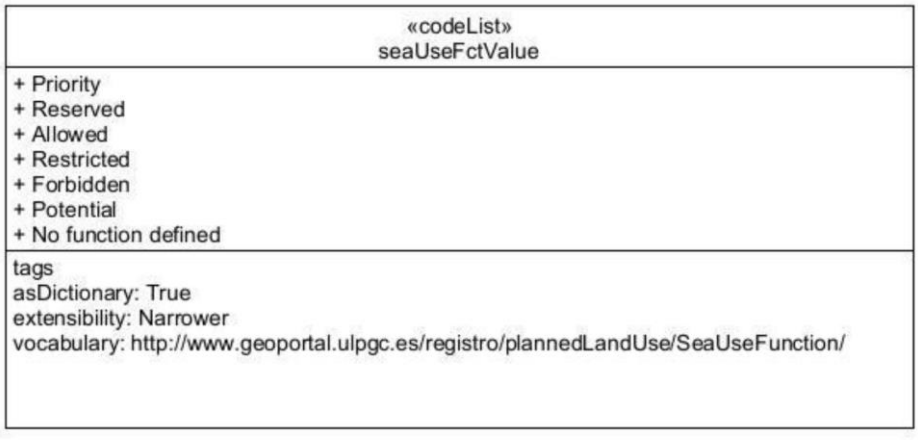

Figure 13. Sea Use Function code list.

[8] https://maritime-spatial-planning.ec.europa.eu/msp-resources/technical-expert-group-teg-data-msp
[9] https://maritime-spatial-planning.ec.europa.eu/sites/default/files/hz0121216enn.en_.pdf

DATA SPECIFICATION – FEATURE CATALOGUE

This section provides a detailed definition of each attribute within the Planned Land Use conceptual model (Figure 3), including those newly added as part of the data model extension for applicability to Marine Spatial Planning (MSP) (as shown by the bold and underlined attributes in the "*MSP ZoningElement*" feature in Figure 14). These new attributes ensure that the model can effectively accommodate the unique requirements of MSP, addressing the vertical distribution of activities, specific marine uses, and other critical aspects necessary for comprehensive maritime planning.

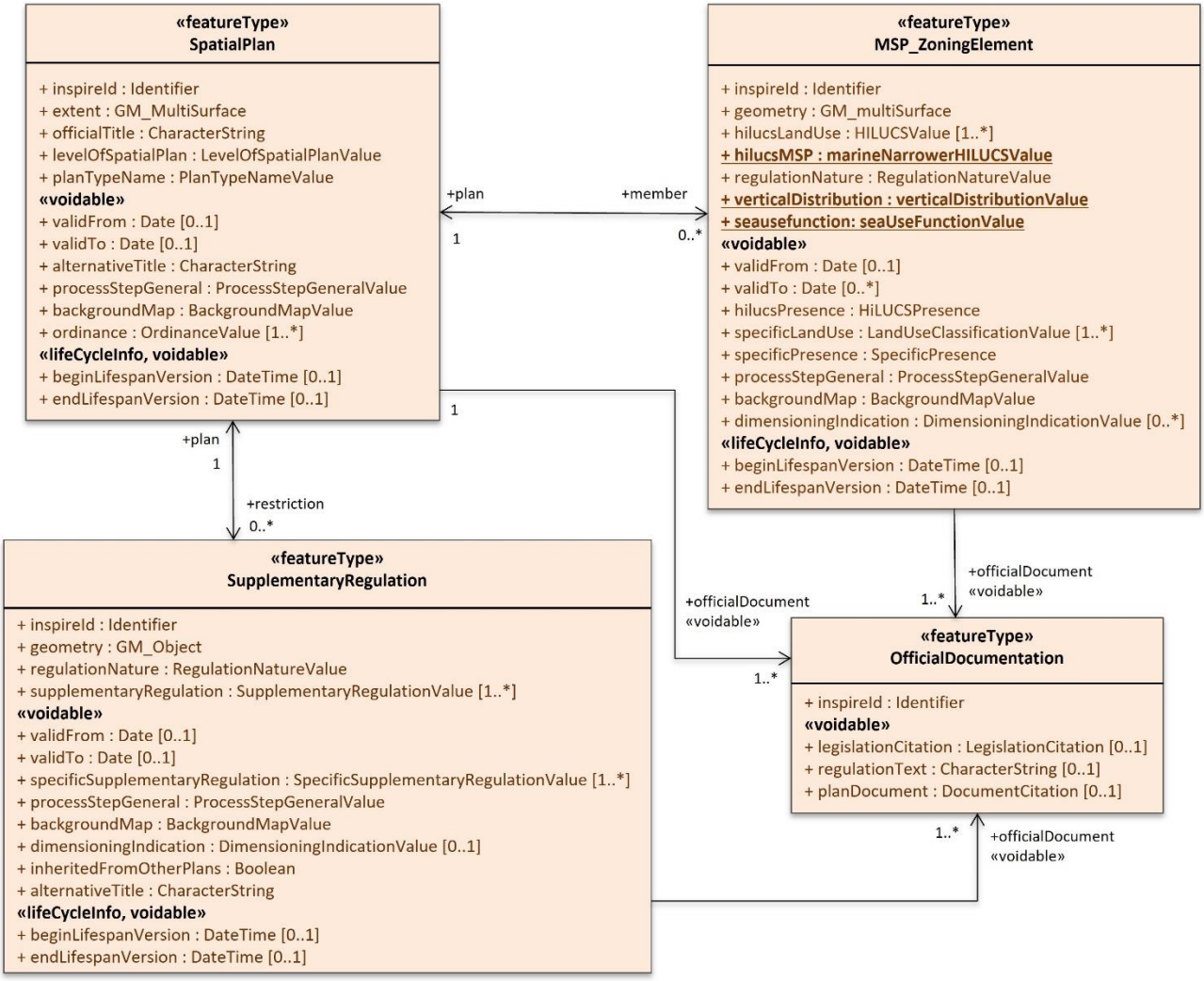

Figure 14. Planned Land Use conceptual data model extended to be applied to MSP.

Feature type: MSP Spatial Plan

Compulsory Attributes:

1. **INSPIRE ID**: A complex attribute type divided into three other attributes:
   - *LocalID* (characterString): A local identifier assigned by the data provider. It is unique within its namespace, ensuring that no other spatial object carries the same identifier.
   - *Namespace* (URL): A Uniform Resource Locator (URL) that uniquely identifies the data source of the spatial object, essentially serving as a web address.
   - *VersionID* (characterString): An optional attribute that specifies the version of the ID.

2. **extent** (GM_MultiSurface): This attribute can represent the geometrical union of all instances of the spatial objects ZoningElement and SupplementaryRegulation. Within the MSP context, it refers to the marine administrative unit, such as Territorial Waters or the Exclusive Economic Zone.

3. ***officialTitle*** (CharacterString): The official title of the spatial plan.

4. ***levelOfSpatialPlan*** (codeListValue): Indicates the level of the administrative units covered by the plan. Use the URL value from the INSPIRE non-extensible list: http://inspire.ec.europa.eu/codelist/LevelOfSpatialPlanValue.

5. ***planTypeName*** (*codeListValue*): The name of the type of plan as designated by the Member State. This can use any URL, code list, or value defined by the data provider.

Voidable Attributes (Non-compulsory Attributes):

1. ***processStepGeneral*** (codeListValue): A general indication of the step in the planning process that the plan is currently undergoing. Use the URL value from the INSPIRE non-extensible list: http://inspire.ec.europa.eu/codelist/ProcessStepGeneralValue

2. ***backgroundMap*** (URL): Identifies the background map used to construct the plan. This attribute should reference an internet service or provide a direct link to the map.

3. ***ordinance*** (URL): A multi-valued attribute that can reference multiple ordinances related to different steps the planning process has undergone (e.g., ordinance for plan preparation, adoption, approval, etc.), regardless of the plan's current legal status.

4. ***validFrom*** (DateTime): The date and time when the spatial plan first becomes valid.

5. ***validTo*** (DateTime): The date and time when the spatial plan ceases to exist in the real world.

6. ***alternativeTitle*** (CharacterString): An alternative (unofficial) title for the spatial plan.

7. ***beginLifespanVersion*** (DateTime): The date and time when this version of the spatial object was first inserted or modified in the spatial data set.

8. ***endLifespanVersion*** (DateTime): The date and time when this version of the spatial object was superseded or retired in the spatial data set.

Association Attributes:

1. **officialDocument** (URL): This attribute serves as the association role, providing a link to the OfficialDocumentation feature that corresponds to this spatial plan.

Geographic Coordinate System Attributes:

1. ***srsname*** (URL): The name of the coordinate reference system used for the feature. It is recommended to use URLs provided by the Open Geospatial Consortium as coordinate system identifiers based on the EPSG Geodetic Parameter Registry. Table 3 includes values for the default coordinate reference system. The EPSG registry can be accessed at http://www.epsg-registry.org.

Table 3. List of URL's reference system values.

Coordinate reference system	Short name	http URI identifier
3D Cartesian in ETRS89	ETRS89-XYZ	http://www.opengis.net/def/crs/EPSG/0/4936
3D geodetic in ETRS89 on GRS80	ETRS89-GRS80h	http://www.opengis.net/def/crs/EPSG/0/4937
3D geodetic in ETRS89 on GRS80	ETRS89-GRS80	http://www.opengis.net/def/crs/EPSG/0/4258
2D LAEA projection in ETRS89 on GRS80	ETRS89-LAEA	http://www.opengis.net/def/crs/EPSG/0/3035
2D LCC projection in ETRS89 on GRS80	ETRS89-LCC	http://www.opengis.net/def/crs/EPSG/0/3034
2D TM projection in ETRS89 on GRS80, zone 26N (30Â°W to 24Â°W)	ETRS89-TM26N	http://www.opengis.net/def/crs/EPSG/0/3036
2D TM projection in ETRS89 on GRS80, zone 27N (24Â°W to 18Â°W)	ETRS89-TM27N	http://www.opengis.net/def/crs/EPSG/0/3039
2D TM projection in ETRS89 on GRS80, zone 28N (18Â°W to 12Â°W)	ETRS89-TM28N	http://www.opengis.net/def/crs/EPSG/0/3040
2D TM projection in ETRS89 on GRS80, zone 29N (12Â°W to 6Â°W)	ETRS89-TM29N	http://www.opengis.net/def/crs/EPSG/0/3041
2D TM projection in ETRS89 on GRS80, zone 30N (6Â°W to 0Â°)	ETRS89-TM30N	http://www.opengis.net/def/crs/EPSG/0/3042
2D TM projection in ETRS89 on GRS80, zone 31N (0Â° to 6Â°E)	ETRS89-TM31N	http://www.opengis.net/def/crs/EPSG/0/3043
2D TM projection in ETRS89 on GRS80, zone 32N (6Â°E to 12Â°E)	ETRS89-TM32N	http://www.opengis.net/def/crs/EPSG/0/3044
2D TM projection in ETRS89 on GRS80, zone 33N (12Â°E to 18Â°E)	ETRS89-TM33N	http://www.opengis.net/def/crs/EPSG/0/3045
2D TM projection in ETRS89 on GRS80, zone 34N (18Â°E to 24Â°E)	ETRS89-TM34N	http://www.opengis.net/def/crs/EPSG/0/3046
2D TM projection in ETRS89 on GRS80, zone 35N (24Â°E to 30Â°E)	ETRS89-TM35N	http://www.opengis.net/def/crs/EPSG/0/3047
2D TM projection in ETRS89 on GRS80, zone 36N (30Â°E to 36Â°E)	ETRS89-TM36N	http://www.opengis.net/def/crs/EPSG/0/3048
2D TM projection in ETRS89 on GRS80, zone 37N (36Â°E to 42Â°E)	ETRS89-TM37N	http://www.opengis.net/def/crs/EPSG/0/3049
2D TM projection in ETRS89 on GRS80, zone 38N (42Â°E to 48Â°E)	ETRS89-TM38N	http://www.opengis.net/def/crs/EPSG/0/3050
2D TM projection in ETRS89 on GRS80, zone 39N (48Â°E to 54Â°E)	ETRS89-TM39N	http://www.opengis.net/def/crs/EPSG/0/3051
Height in EVRS	EVRS	http://www.opengis.net/def/crs/EPSG/0/3907
3D compound: 2D geodetic in ETRS89 on GRS80, and EVRS height	ETRS89-GRS80-EVRS	http://www.opengis.net/def/crs/EPSG/0/7409

Feature type: MSP Zoning Element

Compulsory Attributes:

1. **INSPIRE ID**: A complex attribute type consisting of three other attributes:
   - *LocalID* (characterString): A local identifier assigned by the data provider, unique within its namespace, ensuring no other spatial object shares the same identifier.
   - *Namespace* (URL): A Uniform Resource Locator (URL) that uniquely identifies the data source of the spatial object.
   - *VersionID* (characterString): An optional attribute indicating the version of the ID.

2. **Geometry** (GM_MultiSurface): Represents the geometry of the zoning element.

3. ***hilucsLandUse*** (codeListValue): Classification of land use values included in the INSPIRE register as a non-extendible INSPIRE code list. Available at: http://inspire.ec.europa.eu/codelist/HILUCSValue.

4. ***hilucsMSP*** (codeListValue): A specific MSP data model attribute representing an extended HILUCS code list to address and specify marine uses needed for MSP. This attribute should use narrower extended HILUCS values for marine space usage. Available at the HILUCS Extended register developed by the ECOAQUA Institute: http://www.geoportal.ulpgc.es/registro/plannedLandUse/HilucsExt/.

5. ***regulationNature*** (codeListValue): Defines the legal nature of the land/marine use indication, based on a non-extendible INSPIRE code list. Available at: http://inspire.ec.europa.eu/codelist/RegulationNatureValue.

6. ***verticalDistribution*** (codeListValue): A specific MSP data model attribute describing where activities occur along the vertical axis of marine space, including the sea surface, water column, seabed, and subsoil. This code list is part of the Marine Spatial Planning data model developed by the ECOAQUA Institute and available at: http://www.geoportal.ulpgc.es/registro/plannedLandUse/VerticalDistribution/.

7. ***seaUseFct*** (codeListValue): Another specific MSP data model attribute that defines the function within the zoning element. This attribute follows the rules and recommendations for developing the EU MSP data layer. The code list register is developed by the IU ECOAQUA and available at: http://www.geoportal.ulpgc.es/registro/plannedLandUse/SeaUseFunction/.

Voidable Attributes (Non-compulsory Attributes):

1. ***ProcessStepGeneralValue*** (codeListValue): Indicates the general step of the planning process that the zoning element is undergoing. Values should be selected from the INSPIRE register: http://inspire.ec.europa.eu/codelist/ProcessStepGeneralValue/adoption.

2. ***hilucsPresence*** (number): Represents the actual presence of a land use HILUCS category within the object. This attribute should be used when there is more than one hilucsMSP value (multi-use), with the presence values provided in the same order as the uses.

3. ***specificLandUse*** (codeListValue or characterString): A land use category according to the nomenclature specific to the data set. The data provider should choose the classification of land/marine use. Vocabularies are available from SeaDataNet: http://seadatanet.maris2.nl/v_bodc_vocab_v2/welcome.asp.

4. ***specificPresence*** (value): Indicates the presence of one or more land use classification values in an area, either as a percentage covered for each value or as values listed in their order of importance, according to the code list provided by the data provider (e.g., SeaDataNet).

5. ***backgroundMap*** (URL): Identifies the background map used for constructing this zoning element. Use this attribute only as a reference to an internet service or direct map link, especially if it differs significantly from the reference map included in the plan.

6. ***beginLifespanVersion*** (DateTime): The date and time when this version of the spatial object was inserted or modified in the spatial data set.

7. ***endLifespanVersion*** (DateTime): The date and time when this version of the spatial object was superseded or retired in the spatial data set.

8. ***validFrom*** (DateTime): The date when this spatial plan becomes valid in reality.

9. ***validTo*** (DateTime): The date when the spatial plan ceases to exist in reality.

10. ***DimensioningIndicationValue*** (value): Provides specifications about the dimensions of maritime developments. These can be indicated as dimension character values, measure values, real values, or integer values.

Association Attributes:

1. ***spatialPlanID*** (URL): A link to the spatial plan that includes the zoning element. The links are composed of the union of the namespace and LocalID as described in the SpatialPlan feature attributes.

Association Voidable Attributes:

1. ***officialDocument*** (URL): Provides the association role (link) to the OfficialDocumentation feature corresponding to this zoning element(s).

Geographic Coordinate System Attributes:

1. ***srsname*** (URL): The name of the coordinate reference system used in the feature. It is recommended to use URIs provided by the Open Geospatial Consortium as coordinate system identifiers based on the EPSG Geodetic Parameter Registry. Default coordinate reference system values can be found in Table 3 at: http://www.epsg-registry.org.

Feature type: Supplementary Regulation

Compulsory Attributes:

1. **INSPIRE ID**: A complex attribute type that consists of three other attributes:
   - *LocalID* (characterString): A local identifier assigned by the data provider. This identifier is unique within the namespace, ensuring no other spatial object shares the same identifier.
   - *Namespace* (URL): A namespace that uniquely identifies the data source of the spatial object. It should be a Uniform Resource Locator (URL), essentially a web address.
   - *VersionID* (characterString): An optional attribute that indicates the version of the ID.

2. **Geometry** (GM_MultiSurface): Represents the geometry of this zoning element.

3. ***regulationNature***: Indicates the legal nature of the land use regulation, specifying whether the regulation is legally binding. Use the INSPIRE code list for values: http://inspire.ec.europa.eu/codelist/RegulationNatureValue/definedInLegislation.

4. ***supplementaryRegulation***: Refers to the code of the supplementary regulation. This can be a hierarchical supplementary regulation code available on the INSPIRE registry[10], or any other value using the registry of EU (EuroLex[11]) or national legislation. In the case of the MSP data model, the INSPIRE code list has been extended to include specific values, available at the ECOAQUA MSP data model extension [12].

Voidable Attributes (Non-compulsory Attributes):

1. ***ProcessStepGeneralValue*** (codeListValue): Indicates the general step of the planning process that the zoning element is undergoing. Values should be selected from the INSPIRE register: [INSPIRE ProcessStepGeneralValue](http://inspire.ec.europa.eu/codelist/ProcessStepGeneralValue/adoption).

2. ***specificSupplementaryRegulation*** (codeListValue or characterString): Refers to a category of supplementary regulation provided in a specific nomenclature by the data provider. This attribute does not require inclusion as a code list.

3. ***specificRegulationNature*** (CharacterString): Describes the legal nature of the use regulation from a national perspective.

4. ***backgroundMap*** (URL): Identifies the background map used to construct the zoning element.

5. ***inheritedFromOtherPlans*** (Boolean): Indicates whether the supplementary regulation is inherited from another spatial plan.

6. beginLifespanVersion (DateTime): The date and time when this version of the spatial object was inserted or modified in the spatial data set.

7. ***endLifespanVersion*** (DateTime): The date and time when this version of the spatial object was superseded or retired in the spatial data set.

8. ***validFrom*** (DateTime): The date when this spatial plan becomes valid in reality.

9. ***validTo*** (DateTime): The date when the spatial plan ceases to exist in reality.

10. ***DimensioningIndicationValue*** (value): Provides specifications about the dimensions of maritime developments. These can be expressed as character values, measure values, real values, or integer values.

[10] http://inspire.ec.europa.eu/codelist/SupplementaryRegulationValue/
[11] https://eur-lex.europa.eu/homepage.html
[12] http://www.geoportal.ulpgc.es/registro/plannedLandUse/SupplementaryRegulation/

Association Attributes:

1. ***spatialPlanID*** (URL): A link to the spatial plan that includes supplementary regulation element(s). Links are composed of the union of the namespace and LocalID as described in the SpatialPlan feature attributes.

Association Voidable Attributes:

1. ***officialDocument*** (URL): Provides the association role (link) to the OfficialDocumentation feature corresponding to this Supplementary Regulation element(s).

Geographic Coordinate System Attributes:

1. ***srsname*** (URL): The name of the coordinate reference system used in the feature. It is recommended to use URIs provided by the Open Geospatial Consortium as coordinate system identifiers based on the EPSG Geodetic Parameter Registry. Default coordinate reference system values are listed in Table 3 at: http://www.epsg-registry.org.

Feature type: Official Documentation

Compulsory Attributes:

1. **INSPIRE ID**: A complex attribute type consisting of three other attributes:

- LocalID (characterString): A local identifier assigned by the data provider. This identifier is unique within its namespace, ensuring that no other spatial object carries the same identifier.
- Namespace (URL): A namespace that uniquely identifies the data source of the spatial object. It should be a Uniform Resource Locator (URL), essentially a web address.
- VersionID (characterString): An optional attribute that indicates the version of the ID.

Voidable Attributes (Non-compulsory Attributes):

1. ***legislationCitation*** (URL): A reference to the document that contains the text of the regulation.

2. ***regulationText*** (CharacterString): The actual text of the regulation.

3. ***planDocument*** (CharacterString): A citation of scanned plans and structural drawings, which may or may not be geo-referenced.

TEMPLATES

To facilitate the use of the MSP INSPIRE data model, three types of templates have been developed:

1. MSP_INSPIRE_Data_Model.xsd: Geography Markup Language (GML) application schemas.
2. MSP_INSPIRE_Data_Model.gpkg: GeoPackage template (recommended).
3. MSP_INSPIRE_Data_Model.zip: A zip file that includes ESRI Shapefiles, which follow the INSPIRE conceptual model (structure). However, due to format limitations, attribute names do not exceed 10 characters:
    a. MSP_Spatial_Plan.
    b. MSP_Zoning_Elements.
    c. Supplementary Regulation.
    d. Official Documentation (not a spatial object, only a DBF file):

Templates for version 1.1 can be downloaded from the Tools section of the MSP platform Canaries: http://www.geoportal.ulpgc.es/atom/download/MSP_INSPIRE_Data_Model1.zip

Templates for version 2.0 can be downloaded from the Tools section of the MSP platform Canaries: http://www.geoportal.ulpgc.es/atom/download/MSP_INSPIRE_Data_Model2.zip

Figure 15. MSP platform Canaries, available templates and data specification of MSP INSPIRE data model.

SLD PORTRAYAL

As previously mentioned, Maritime Spatial Planning (MSP) processes require information to be shared across borders. However, there are currently challenges in harmonizing the visions and frameworks of maritime spatial plans among countries that share the same marine region or sub-region, even in the most advanced European examples (Figure 1). This difficulty is partly due to the lack of harmonized data models, standard rules for layers, and consistent styles for portraying the spatial object types within these plans. Applying INSPIRE standards to data sets, layers, and the portrayal of marine spatial plans could address these issues.

In this context, the MSP-OR project provided an excellent opportunity not only to revise the data model development for MSP but also to continue the good practices learnt in previous projects to promote the establishment of common styles for portraying spatial objects within spatial plans, and to apply these developments to real-world use cases in Macaronesia.

To standardize the symbolization of all spatial objects that might be mapped in an MSP process, the Spanish Institute of Oceanography (IEO) developed a Styled Layer Descriptor (SLD) based on a set of symbols also created by IEO. These symbols correspond to all spatial objects previously considered in the extended HILUCS developed by ECOAQUA. The SLD is a profile of the Web Map Service (WMS) Encoding Standard, both of which are OpenGIS® standards. An SLD defines an encoding that allows users to define the symbolization and colouring of geographic features and coverage data. To ensure that users and software can control the visual portrayal of data, a styling language that both client and server can understand is necessary.

The OpenGIS® Symbology Encoding Standard (SE) (http://www.opengeospatial.org/standards/symbol) provides this language, and the SLD profile allows the application of symbology to WMS layers while defining an operation for standardized access to legend symbols (http://www.opengeospatial.org/standards/wms).

Initially, existing symbology standards for marine cartography were reviewed, including the symbols from the International Hydrographic Organization (IHO). However, these symbols were found to be unsuitable due to their reliance on specific figures or icons in images, poor visibility when layers overlapped, and limitations in handling map updates or spatial scale changes.

Subsequently, various map display services (Web Map Services - WMS) for MSP were analysed to determine whether any homogeneous or analogous representations for the same spatial uses existed. No consistent symbology was found across the different WMS services.

As a result, a general portrayal structure for the MSP data model was designed. This structure is based on the Hierarchical INSPIRE Land Use Classification System (HILUCS) and its six main land use categories:

1. Primary Production
2. Secondary Production
3. Tertiary Production
4. Transport, Networks, Logistics, and Utilities
5. Residential Use
6. Other Uses

The elements in the HILUCS list should apply to both existing and planned land use. Most elements are represented as areas, even if they include linear elements. Therefore, it was decided that these elements would be depicted as polygons with an outer perimeter line of equal width, a hollow interior, and a pattern of lines or points.

A general colour or tone was assigned to each of the six main classes within the MSP data model (Figure 16). To maintain consistency, all symbols within these categories were designed to have a similar tone.

Category	Colour
1_Primary Production	
2_Secondary Production	
3_Tertiary Production	
4_Transport, Networks, Logistics And Utilities	
5_Residential Use	
6_Other Uses	

Figure 16. Shows the six main land use categories of HILUCS and their corresponding colour.

Different patterns or geometric frame styles were then assigned to the next level within the hierarchical structure of the model (Figure 17). As the level of detail increases for elements in the HILUCS list, the complexity of the corresponding symbols or patterns also increases, reflecting a clearly structured hierarchy (Figure 18).

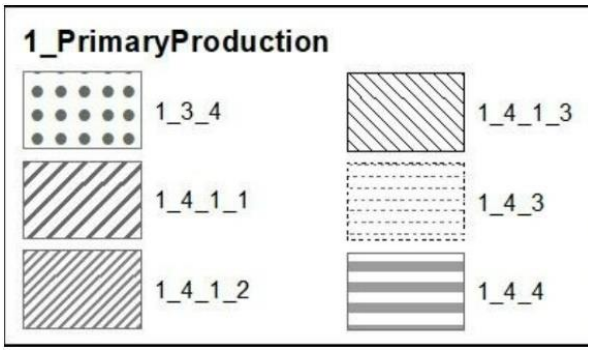

Figure 17. Examples of geometrical frame styles that are assigned across the hierarchical structure of the HILUCS land use categories.

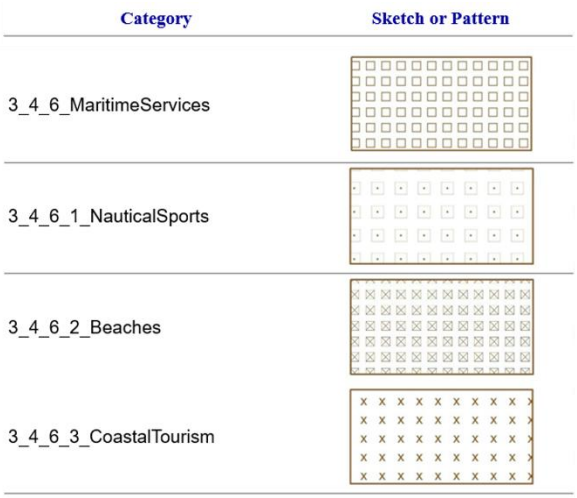

Figure 18. Examples of the gradual increase of complexity of the geometrical frame styles across the hierarchical structure of the HILUCS land use categories.

For each successive level of detail, different geometric frames were established within the style of the upper level, incorporating variations in angle, offset, separation, layers, etc (Figure 19). This approach was necessary to create a coherent and structured symbology for MSP. Additionally, for certain elements, line chart symbology was developed to better represent their characteristics.

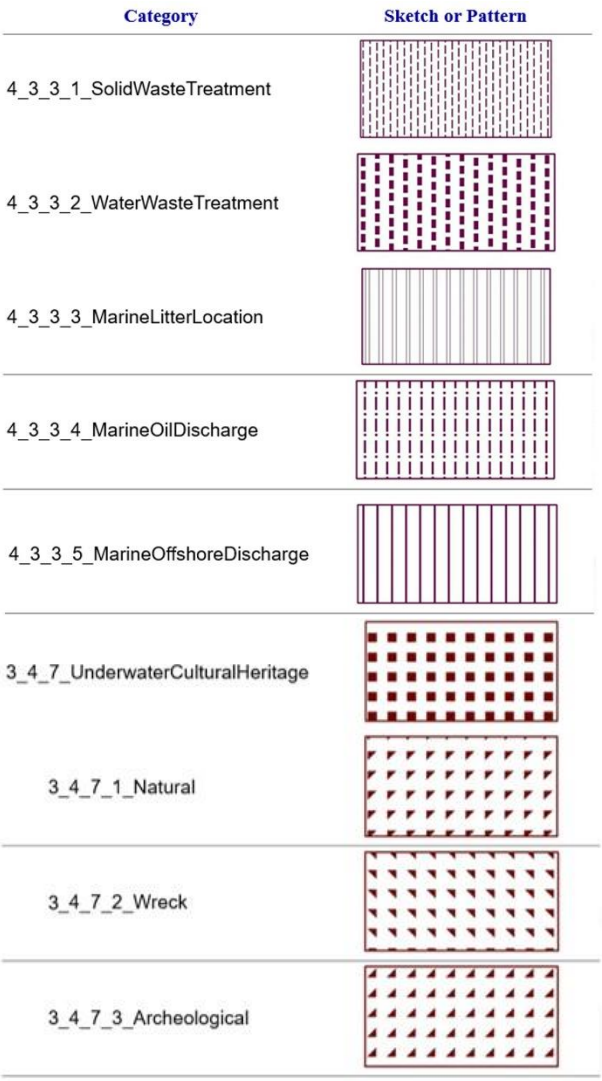

Figure 19. Examples of geometrical frames that are established within the style of the upper level.

This symbology structure is sequenced across successive categories and levels of detail, with different frames assigned to each element of the HILUCS list within the MSP model. Alongside these rules applied to the **hilucsMSP** attribute, it is important to note that for each zoning element, seven possible functionality values have been defined using the **seaUseFct** attribute. Since this attribute represents a key characteristic of the zoning element, it was necessary to differentiate

this quality visually. Therefore, a second outer perimeter line of a specific colour was added according to the list of functionality values (Figure 20).

Sea Use Function	Colour
Priority	
Reserved	
Allowed	
Restricted	
Forbidden	
Potential	
No Function Defined	

Figure 20. Shows the leyend of colours applied to each of the defined sea functions in the MSP data model.

As a result, for each category in the *hilucsMSP* attribute, seven new symbologies were generated by combining the possible values of the seaUseFct attribute. Figure 21 shows an example of this combination for the category 3_4_6_MaritimeServices.

Depending on the complexity of each MSP process, zoning elements can be represented either together or separately based on their *seaUseFct* attribute. An example of this can be seen in the national MSPs currently available for download on the EMODnet Human Activities site.

The symbology developed for the MSP data model is available for download via the following links, which provide the SLD files for MSP INSPIRE data model versions 1.1 and 2.0 (zoning elements both combined and not combined with the *seaUseFct* attribute):

- Version 1.1: http://www.geoportal.ulpgc.es/atom/download/msp_sld_styles1.zip
- Version 2.0: http://www.geoportal.ulpgc.es/atom/download/msp_sld_styles2.zip

The symbology can be created or modified using various desktop software applications, with QGIS and ArcGIS being the most commonly used. These tools allow for the export of symbology to XML format. After developing or modifying the symbology using these applications, it is necessary to export the XML format to the standard SLD format. QGIS provides an export tool for this

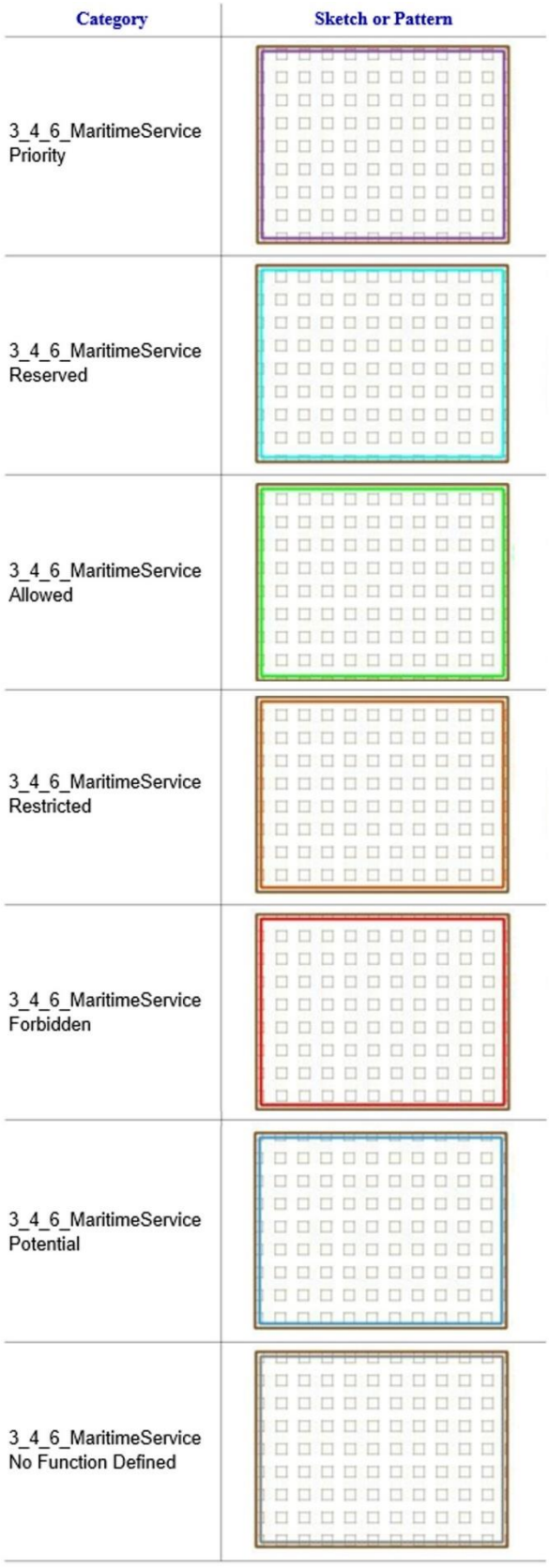

Figure 21. Shows an example of the possible combination of both the hilucsMSP and the seaUseFct attributes.

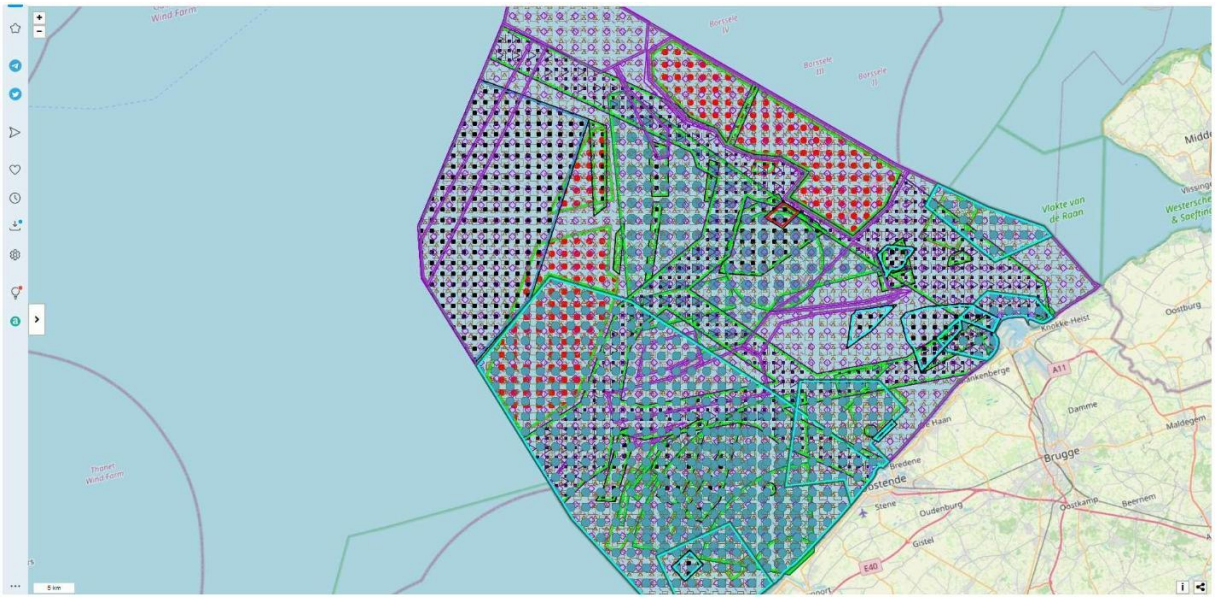

Figure 22. Application of the SLD 2.0 for the MSP of Belgium, and available EU MSP data layer December 2022: http://www.geoportal.ulpgc.es/visor2/?json=emodnetMSP.json#

purpose. Since SLD is an open standard, any modifications can also be made using a text editor. For more details, refer to the GeoServer SLD Cookbook: https://docs.geoserver.org/latest/en/user/styling/sld/cookbook/index.html

Finally, to apply the style to a map service, a Web Server such as GeoServer or ArcGIS Server must be used. The SLD file is imported via the "style manager" and then becomes available for use. Geospatial Web Servers like GeoServer use the SLD standard as the primary language to define styles. More information can be found in the GeoServer SLD Reference: https://docs.geoserver.org/latest/en/user/styling/sld/reference/index.html

In the case of Madeira, the non-combined symbology is applied to layers published through the Web Map Service. For this setup, the dataset MSP_ZoningElement must include the field "*hilucsMSP.1.href*" because this data will be symbolized through it using a filter rule defined by the standard SLD:

```
<ogc:Filter>
   <ogc:PropertyIsEqualTo>
      <ogc:PropertyName>hilucsMSP.1.href</ogc:PropertyName>
      <ogc:Literal>"code value"</ogc:Literal>
   </ogc:PropertyIsEqualTo>
</ogc:Filter>
```

Figure 23 demonstrates an example of the SLD developed by the Spanish Institute of Oceanography (IEO) for the MSP data model, which has been applied to a map service within the Madeira archipelago MSP data model.

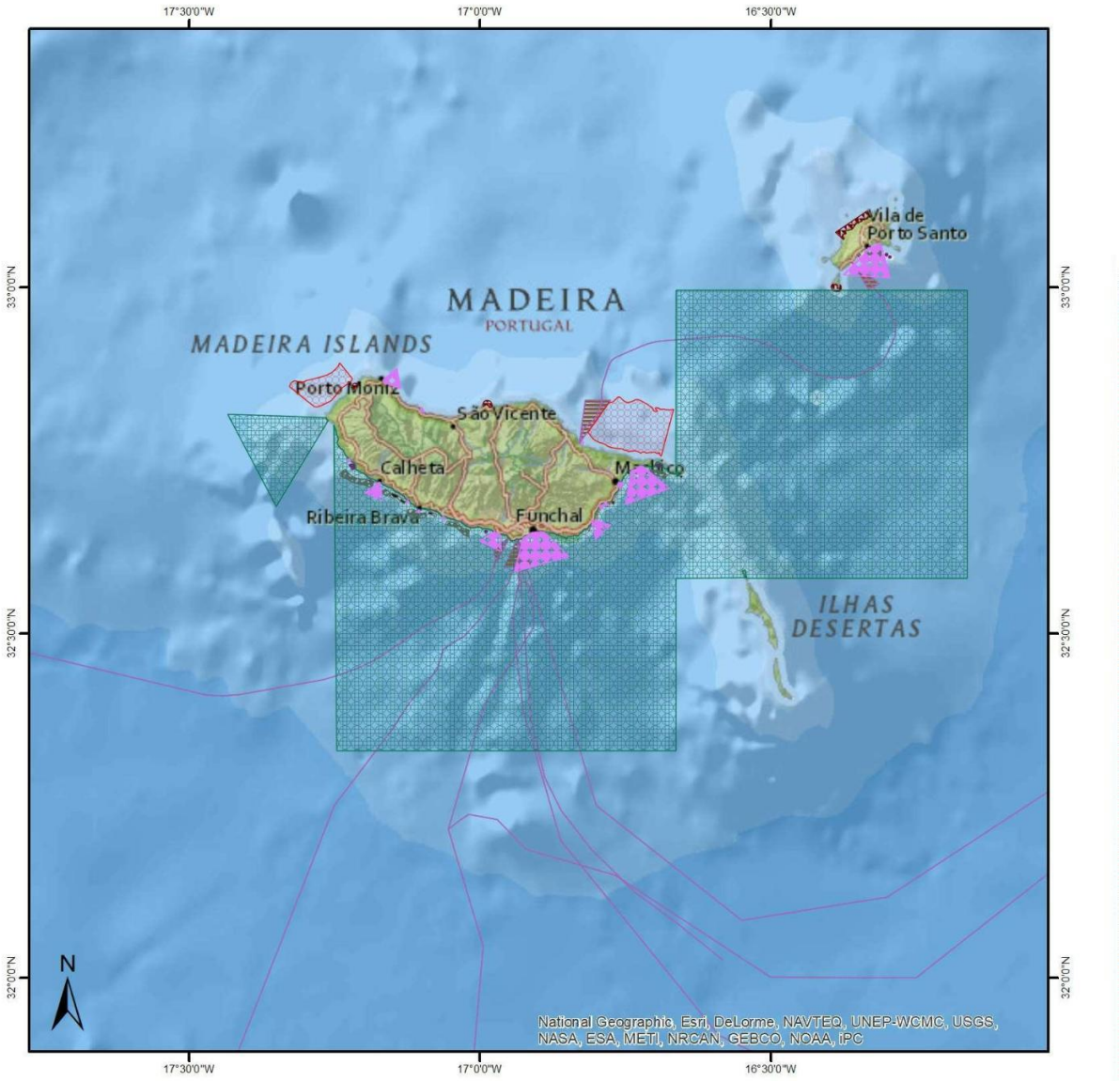

Figure 23. SLD applied on the Madeira MSP draft shared at: http://www.geoportal.ulpgc.es/visor2/?json=mspmadeira.json#

The SLD files can also be downloaded from the Canaries MSP platform, under the MSP Tools section (refer to the chapter on Templates), within the MSP INSPIRE model resources.

MAPPING INSPIRE ATTRIBUTES IN *.SHP ATTRIBUTES

Shapefile (.shp) files, a widely used geospatial vector format developed in the early 1990s, remain the most used GIS data format globally despite several limitations. One significant limitation is the maximum number of characters (10) allowed for attribute names. This constraint makes shapefiles incompatible with INSPIRE rules, as most attributes within the INSPIRE conceptual model have names that exceed 10 characters.

To address this issue in the **shapefile INSPIRE-like data model** presented here, a mapping between the shapefile attribute names and the INSPIRE-compliant names is included. This mapping ensures that the shapefile format can be used in a way that aligns with INSPIRE standards, even with the character limitation.

Table 4. Coding examples of the different attributes across INSPIRE and the MSP Land Planning data model.

Spatial Plan attributes	
Shapflie attribute name	**INSPIRE conceptual model**
LocalID	LocalID
namespace	Namespace
versionID	VersionID
	extent (Geometry)
officTitle	officialTitle
LevelSpPla	levelOfSpatialPlan
PlanTyNam	planTypeName
proStepGen	processStepGeneral
bcgMap	backgroundMap
ordinance	ordinance
validFrom	validFrom
validTo	validTo
altTitle	alternativeTitle
begLifeV	beginLifespanVersion
endLifeV	endLifespanVersion
officDocum	officialDocument
srsName	srsname

MSP Zoning Elements	
Shapefile attribute name	**INSPIRE conceptual model**
LocalID	LocalID
nameSpace	Namespace
versionID	VersionID
	Geometry
HilucsV1	hilucsLandUse
HilucsMSP1	hilucsMSP
regulNatur	regulationNature
vertDistr	verticalDirstribution
seaUseFct	*seaUseFct*
proStepGen	ProcessStepGeneralValue
hilucsPres	hilucsPresence
SpecifLU1	specificLandUse
specPresen	specificPresence
bcgMap	backgroundMap
begLifeV	beginLifespanVersion
endLifeV	endLifespanVersion
validFrom	validFrom
validTo	validTo
DimIndVal	DimensioningIndicationValue
spatPlanID	spatialPlanID
officDocum	officialDocument
srsName	srsname

Supplementary Regulation	
Shapflie attribute name	**INSPIRE conceptual model**
LocalID	LocalID
nameSpace	Namespace
versionID	VersionID
	Geometry
regulNatur	regulationNature
suppRegula	supplementaryRegulation
proStepGen	ProcessStepGeneralValue
spcSupReg	specificSupplementaryRegulation
spcRegNat	specificRegulationNature
bcgMap	backgroundMap
inherited	inheritedFromOtherPlans
begLifeV	beginLifespanVersion
endLifeV	endLifespanVersion
validFrom	validFrom
validTo	validTo
DimIndVal	DimensioningIndicationValue
spatPlanID	spatialPlanID
officDocum	officialDocument
srsName	srsname

7 STEPS TO MAKE MARITIME SPATIAL PLAN INSPIRE COMPLIANT

Step 1: Download MSP data model templates

- Download MSP data model templates at the Tools section of the MSP platform Canaries.

Step 2: Choose the template:

- MSPdataModel_ESRI_shp.
- MSPdataModel_GeoPackage.

Step 3: Mapping the MSP into the data model

- Mapping the MSP Spatial Plan.

- Mapping the MSP framework into the MSP Spatial Plan layer, including at least all compulsory attributes defined for feature type MSP Spatial Plan, including Id, Name, Title, Extension and territorial hierarchy of plan.
    - Extension is a polygon that presents an Exclusive Economic Zone or overall area included in the planning process.
    - MSP Spatial Plan will include attributes with association links with Official documentation (e.g., as URL).

Step 4: Mapping the MSP into the data model

- Mapping the MSP-Zoning Elements

- Mapping planned activities in the MSP-Zoning Elements layer.
- Each maritime activity included in the plan will be a separate feature with its own geometry and at least the following compulsory attributes: Id, Classification of zoning activities with HILUCS & extended HILUCS, Regulation nature, Vertical distribution value, and Sea use function value.

Step 5: Mapping the MSP into the data model

- Mapping the Supplementary Regulation

- Mapping Supplementary regulation elements within the Supplementary regulation layer.
- Each regulation included in the planned area will be a separate feature with its own geometry and at least the following compulsory attributes: Id, Regulation classification, and Nature of the regulation.
- Each Supplementary regulation feature will include an association link with the MSP spatial plan and optionally with Official documentation.

Step 6: Mapping the MSP into the data model

- Mapping the Official Documentation

- Mapping Official documentation.
- This feature can be included only in Spatial Plan as a URL or as a separate table with all Id and related attributes.

Step 7 - INSPIRE compliancy

- If you used the GeoPackage template, your mapped data set is already INSPIRE compliant.
- If you used the ESRI_shp template, your data set is INSPIRE-like, but not fully compliant with the INSPIRE data model. To obtain compliance:
    - Upload the ESRI_shp file as a source data set into Humboldt Alignment Editor (HALE).
    - Upload the XSD file as a target template.
    - Execute transformation file () into INSPIRE compliant gml file.

ANNEX – MADEIRA USE-CASE, EXAMPLE

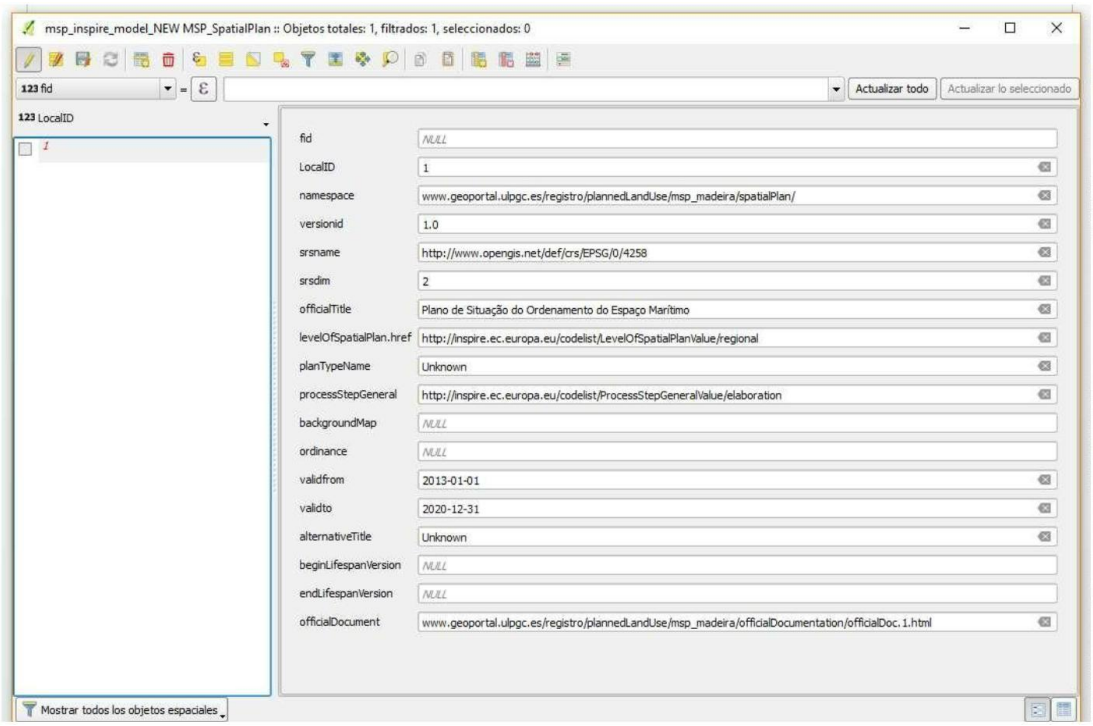

Figure 24. Attributes example (Madeira MSP draft) MSP Spatial Plan feature.

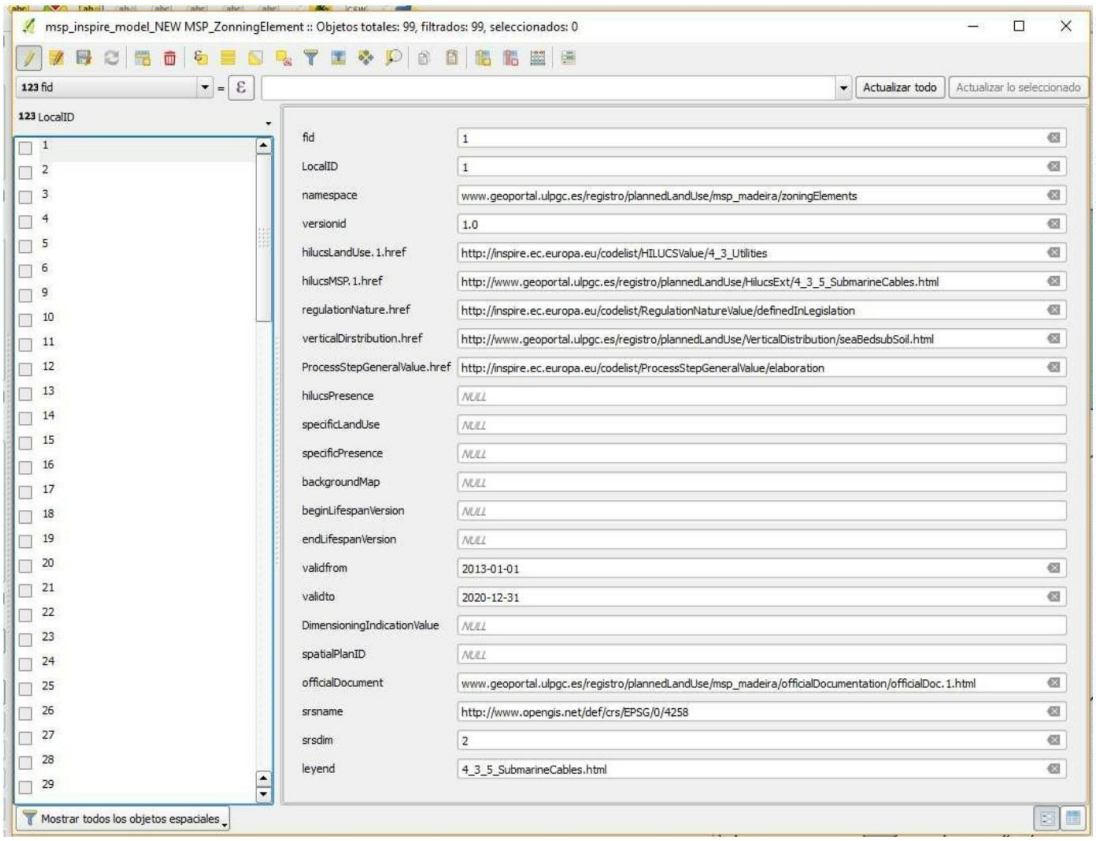

Figure 25. Attributes example (Madeira MSP draft) MSP Zoning Element feature.

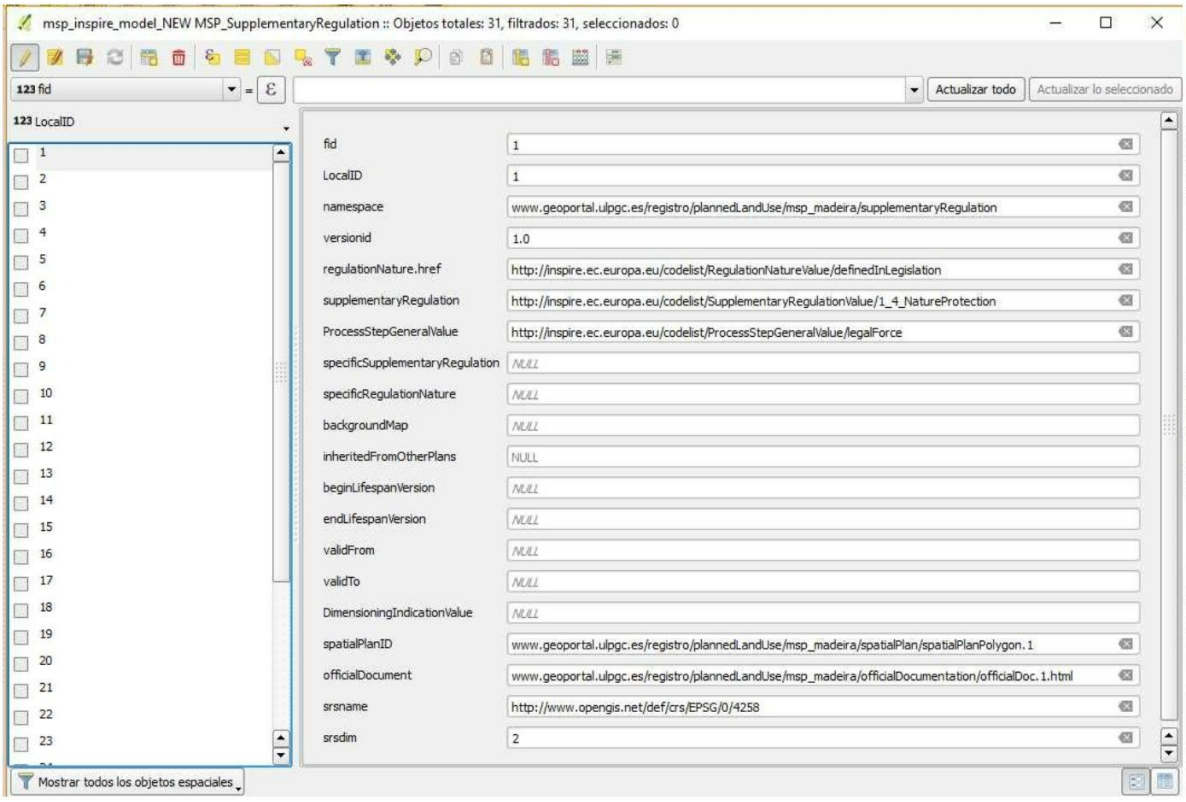

Figure 26. Attributes example (Madeira MSP draft) Supplementary regulation feature.

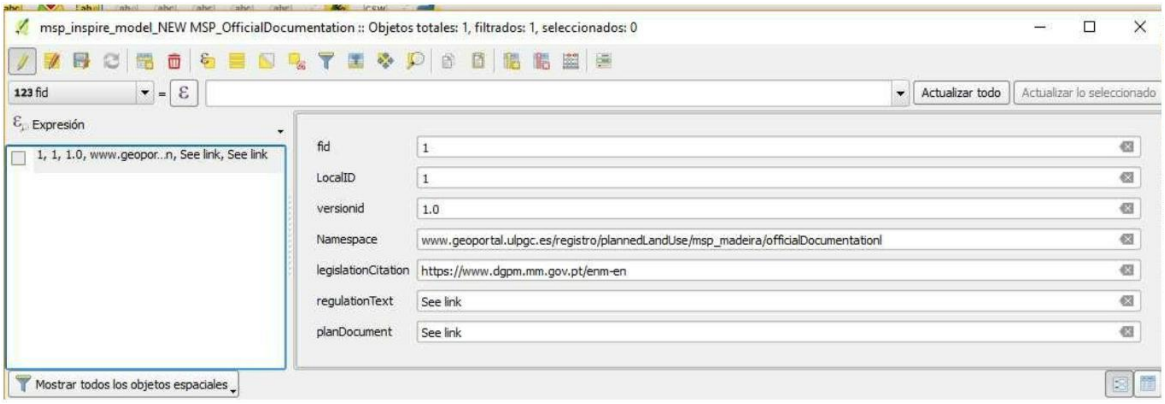

Figure 27. Official documentation feature.

MSP-OR
Advancing Maritime
Spatial Planning
in Outermost Regions

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