

TEG on Data for MSP workshop:
From conceptual development to application

MSP data Framework 2.0: from the concept to the implementation

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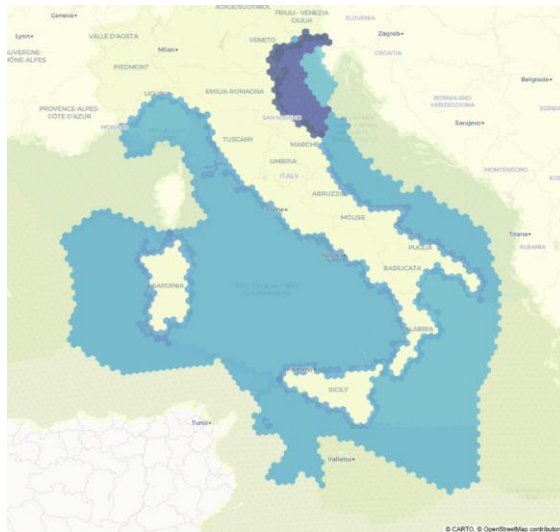


*Technical Expert
Group on Data
for MSP*

Why?

MSP4BIODIVERSITY main goal: to consolidate the Italian MSP, applying socio-ecological and **transdisciplinary** approaches to protect biodiversity and ensure sustainable use of the sea.

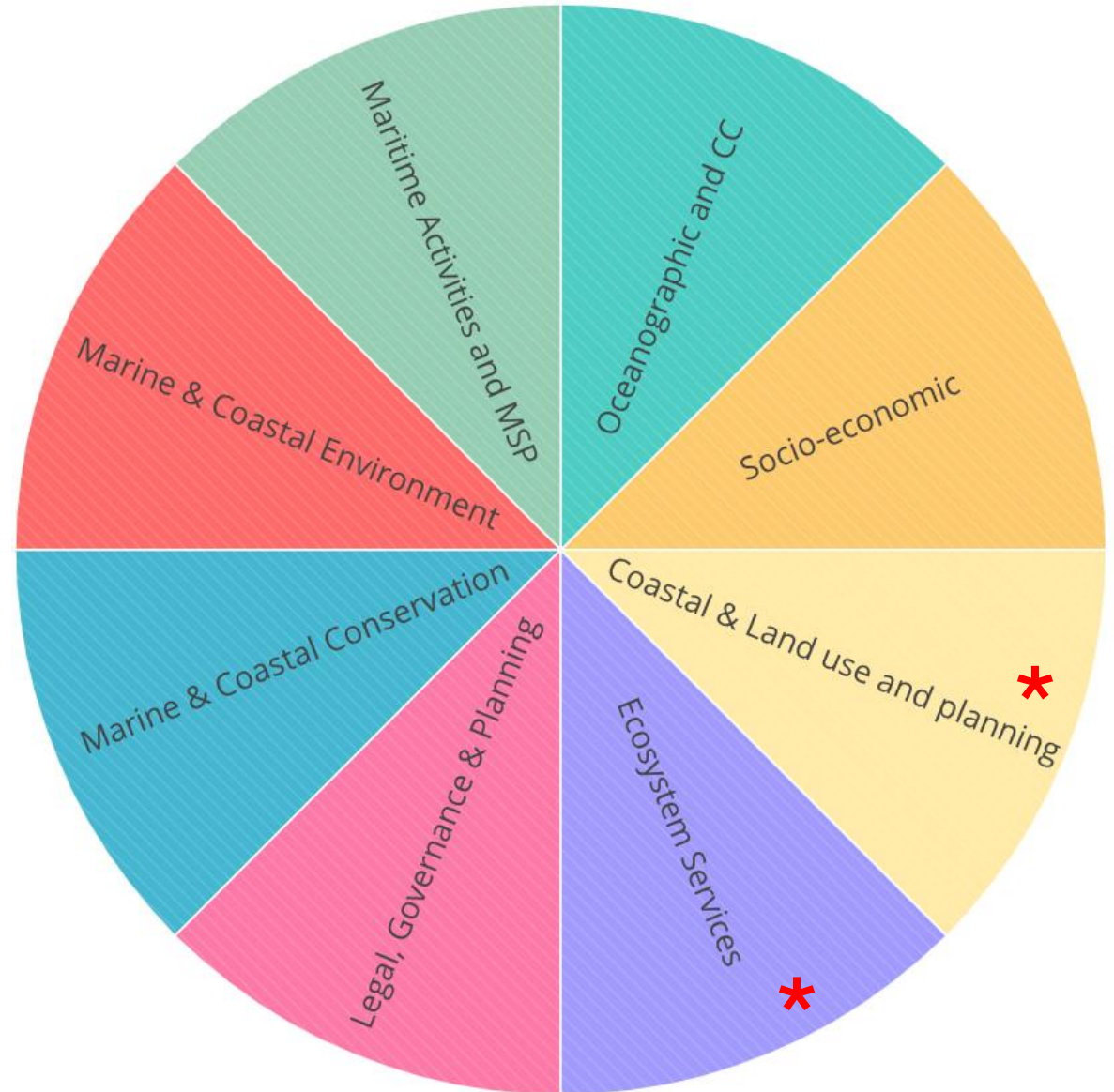
MSPdF as best candidate to organise large amount of knowledge and information, and communicate it with stakeholders.



MSPdF was **operationalised** to support the Italian plan consolidation also through the creation of a dedicated tool, maintaining the alignment with the TEG original idea of a **reusable** framework.

1. Clusters

= Broad, thematic groups to classify both spatial and non-spatial data relevant for the MSP process.



*under revision

ECOSYSTEM SERVICES

* under revision

- Ecosystem services are tangible and intangible benefits for human well-being provided by natural ecosystems
- Ecosystem services data in marine and coastal areas to understand ecological, cultural and provisioning benefits and functions
- Understanding and managing ecosystem services is crucial for sustainable resource use, conservation, and informed decision-making

Objects	Study area	Ecosystem services	Economic valuation method	Value	Reference
Coastal zone	Italy	Corp pollination	Market price	1,339 €/ha	Capriolo et al., 2020
		Outdoor recreation	Travel cost	275 €/ha	
		Flood control	Avoided cost	Residential areas 3,150,000 €/ha; Commercial areas 2,470,000 €/ha	

1. Clusters

2. Classification systems

= Hierarchical standardised categories used to organise data within a Cluster. When possible, they are based on already established international standards (e.g., NACE, eHILUCS, MSFD, CICES), otherwise they were custom-built.

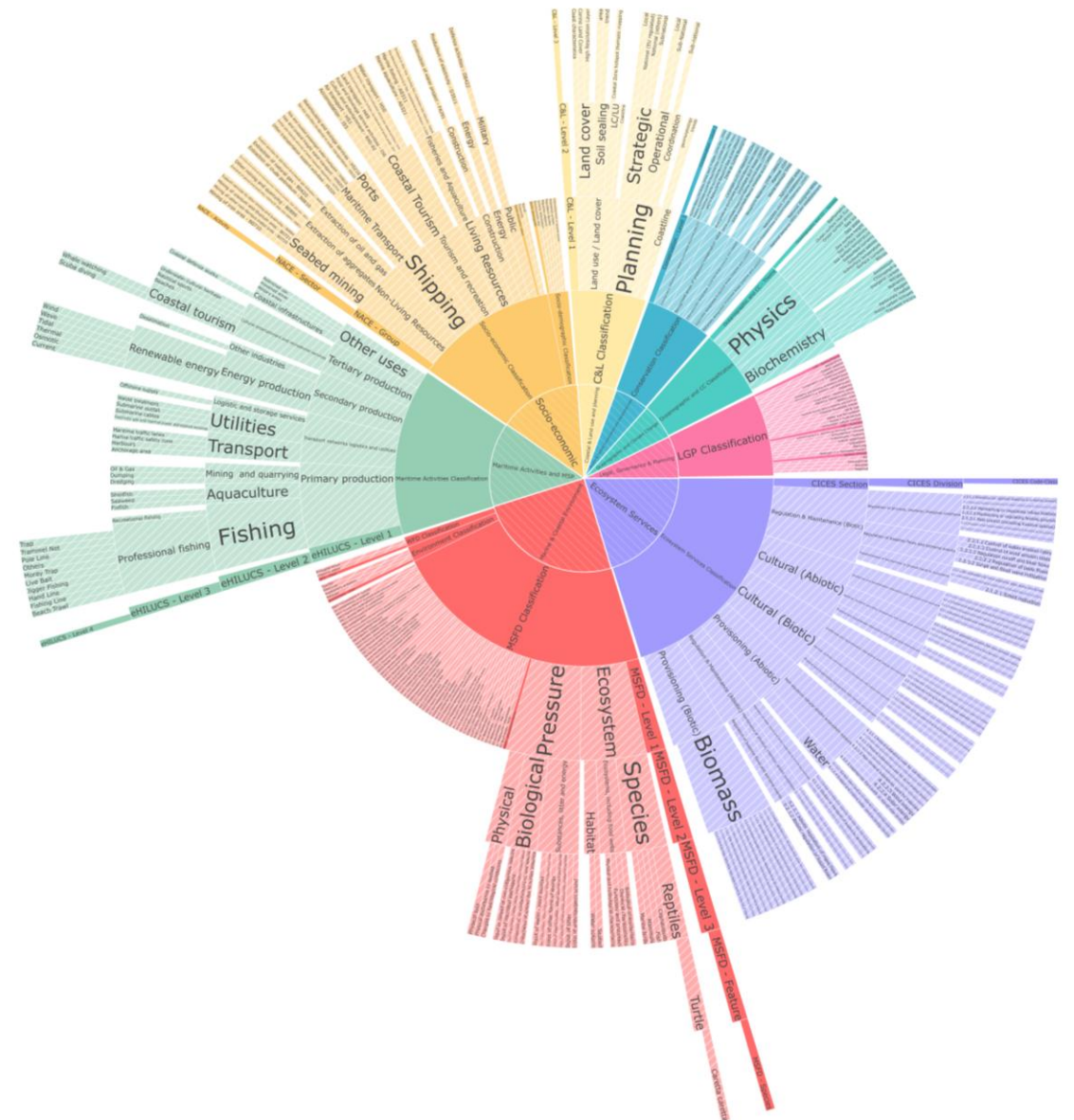
LEGAL, GOVERNANCE & PLANNING	LPG Classification	LPG - Function				
		LPG - Sector/Theme				
		Spatial interest				
OCEANOGRAPHIC AND CLIMATE CHANGE	Oceanographic and CC Classification	Oceanographic and CC - Theme	Oceanographic and CC - Variable			
MARITIME ACTIVITIES AND MSP	Maritime Activities Classification	eHILUCS - Level 1	eHILUCS - Level 2	eHILUCS - Level 3	eHILUCS - Level 4	
MARINE & COASTAL CONSERVATION DESIGNATED SITES	Conservation Classification	Conservation - Level 1	Conservation - Level 2			
ECOSYSTEM SERVICES	Ecosystem Services Classification	CICES Section	CICES Division	CICES Code-Class		
COASTAL & LAND USE AND PLANNING	C&L Classification	C&L - Level 1	C&L - Level 2	C&L - Level 3		
MARINE & COASTAL ENVIRONMENT	MSFD Classification	MSFD - Level 1	MSFD - Level 2	MSFD - Level 3	MSFD - Features	MSFD - Species
		MSFD - Descriptor/Criterion				
	Environment Classification	Environment - Class				
	WFD Classification	WFD - Class				
SOCIO-ECONOMIC	Socio-economic Classification	NACE - Group	NACE - Sector	NACE - Activity		
	Socio-demographic Classification	Socio-economic Value				
		Socio-demographic				

- 1. Clusters
- 2. Classification systems

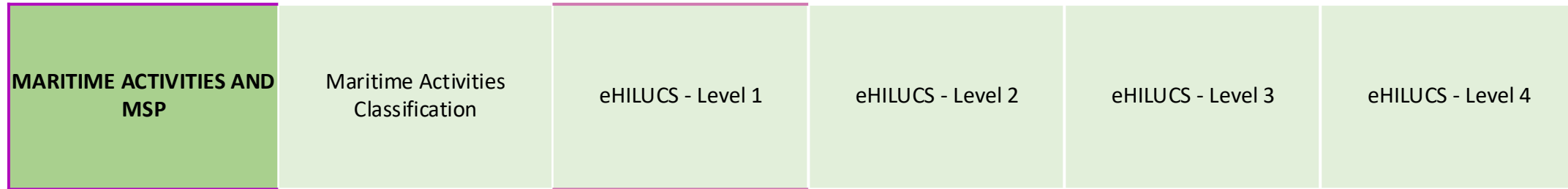
3. Elements

= Controlled vocabularies or thesauri (broader term/narrower term) used to classify data within each classification system.

For each level of the classification systems, one or more elements specifying the category are present.

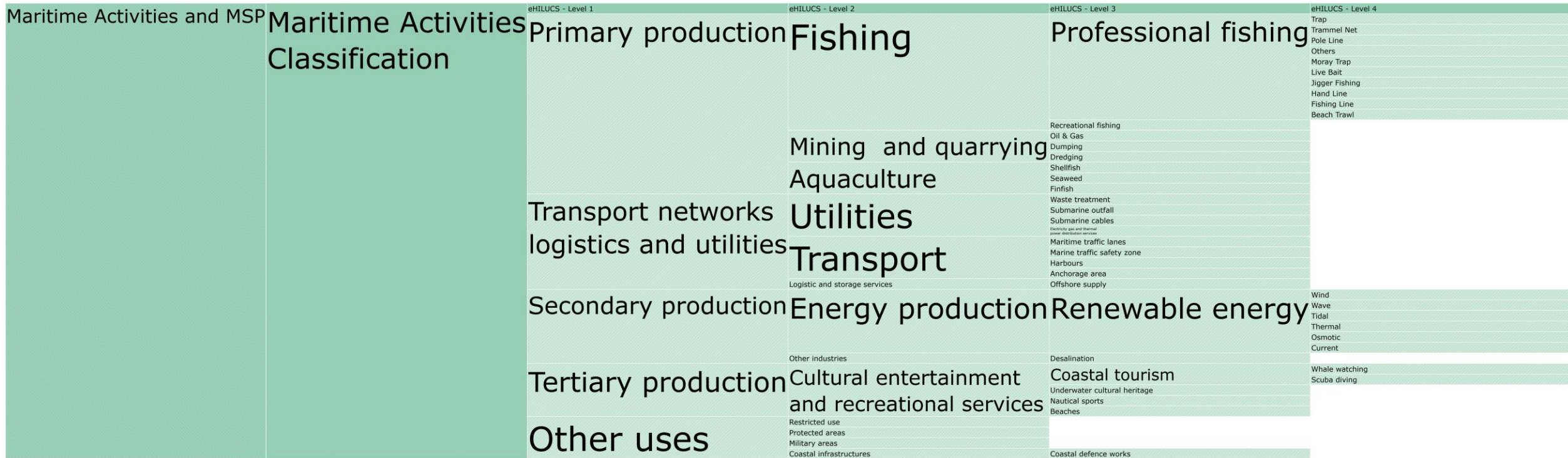


eHILUCS Classification system & categories



- Extended version of the INSPIRE HILUCS classification, adapted to cover specific classes for maritime uses (ULPGC, ECOAQUA)
- 4 levels:
 - Level 1: Primary production, Secondary production, Tertiary production, Transport networks logistics and utilities, Other uses
 - Level 2: Sea uses, e.g., Aquaculture, Fishing, Mining and Quarrying, Energy production, Transport
 - Level 3: More detailed level of sea uses, e.g., types of aquaculture
 - Level 4: Even more detailed, e.g., gear type

Elements from eHILUCS Classification



Conservation Classification system & categories



2 levels:

- Level 1: defines the responsible authority (international, regional, national), and if conservation designated sites are standard or non-standard (e.g., OECM)
- Level 2: defines the type of protected area, e.g., Ramsar sites, Natura 2000, Fishery Restricted Areas

Elements from Conservation Classification

Marine & Coastal Conservation and Designated sites	Conservation Classification	Conservation - Level 1	Conservation - Level 2
		Recognised areas of protection/conservation value	IUCN Important Marine Mammal Areas (IMMA) IUCN candidate Important Marine Mammal Areas (cIMMA) Important Bird Areas (IBAs) Ecologically or Biologically Significant Marine Areas (EBSA) Cetacean Critical Habitats (CCHs)
		Potential Other Effective area-based Conservation Measures (OECMs)	IMO's Particularly Sensitive Sea Areas (PSSAs) Fishery Restricted Areas for Vulnerable Marine Ecosystem (VME - FRAs) Fishery Restricted Areas for Essential Fish Habitat (EFH - FRAs) Fishery Restricted Areas below 1000 m depth (deep sea - FRAs)
		Regionally designated Protected Areas (marine and coastal)	Biological Conservation Areas Specially Protected Areas of Mediterranean Importance (SPAMI) Natura2000 sites under establishment
		Internationally designated Protected Areas (marine and coastal)	Natura2000 sites World Heritage Sites Ramsar sites
		Nationally designated Protected Areas (marine and coastal)	Biosphere Reserves (MAB - UNESCO) National designed MPAs under establishment National designed MPAs

1. Clusters 2. Classification systems 3. Elements

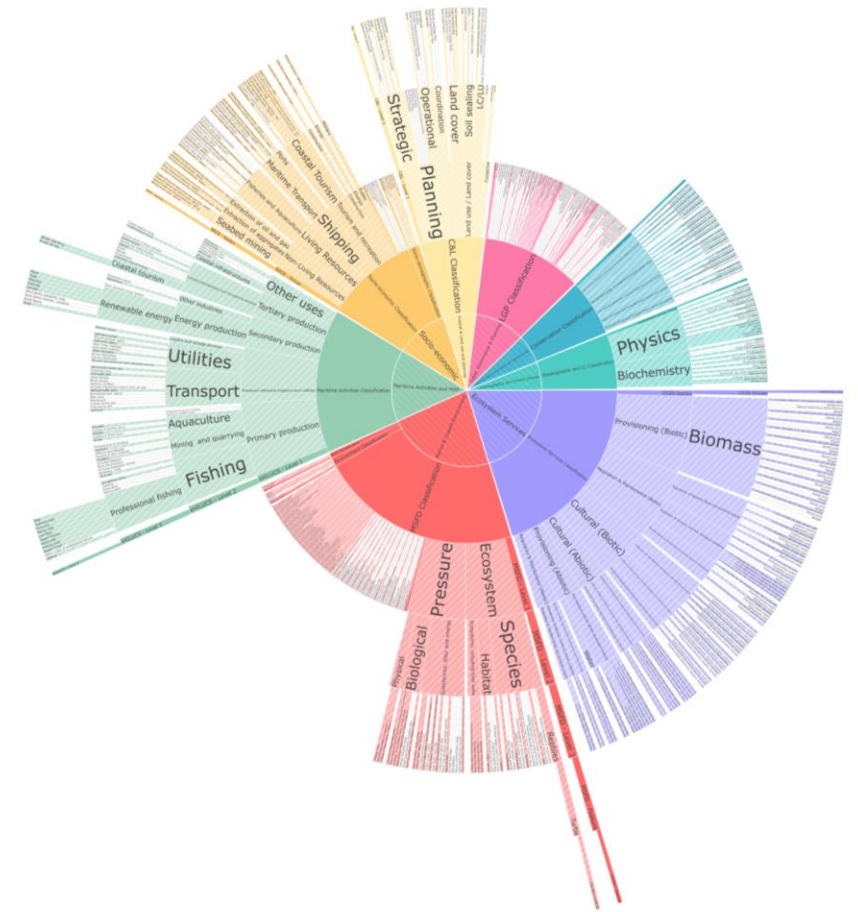
4. Dataset types

= Consolidated ways to represent a specific type of information within a classification system or cluster. Rather than the representation itself, a dataset type is a way of representation.

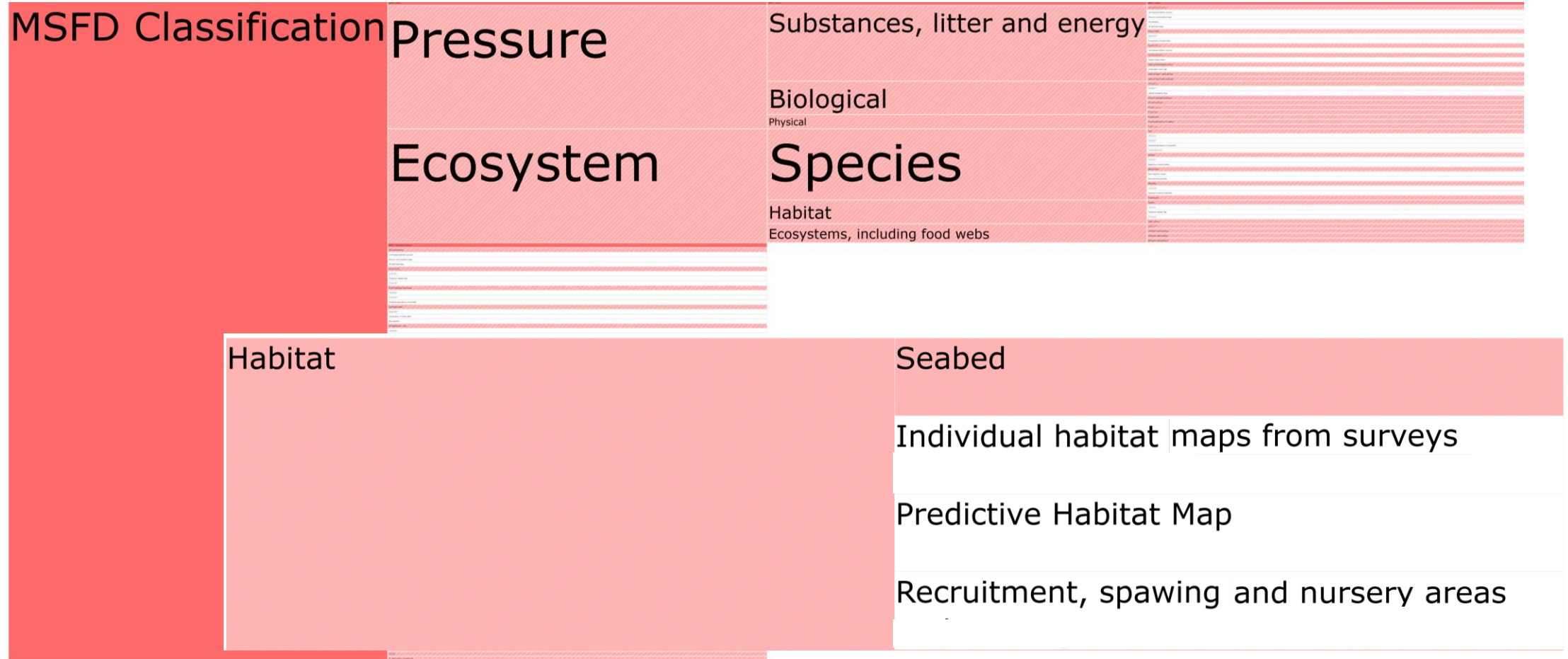
For example, a species distribution model (presence/absence, biomass per km², or probability of presence) is a way of representing ecological information, regardless of the species.

The introduction of this concept makes the MSPdF more effective in supporting reuse of data within tools and DTO.

- For each element, there is at least a respective Dataset type
- A Dataset type might be shared among different clusters

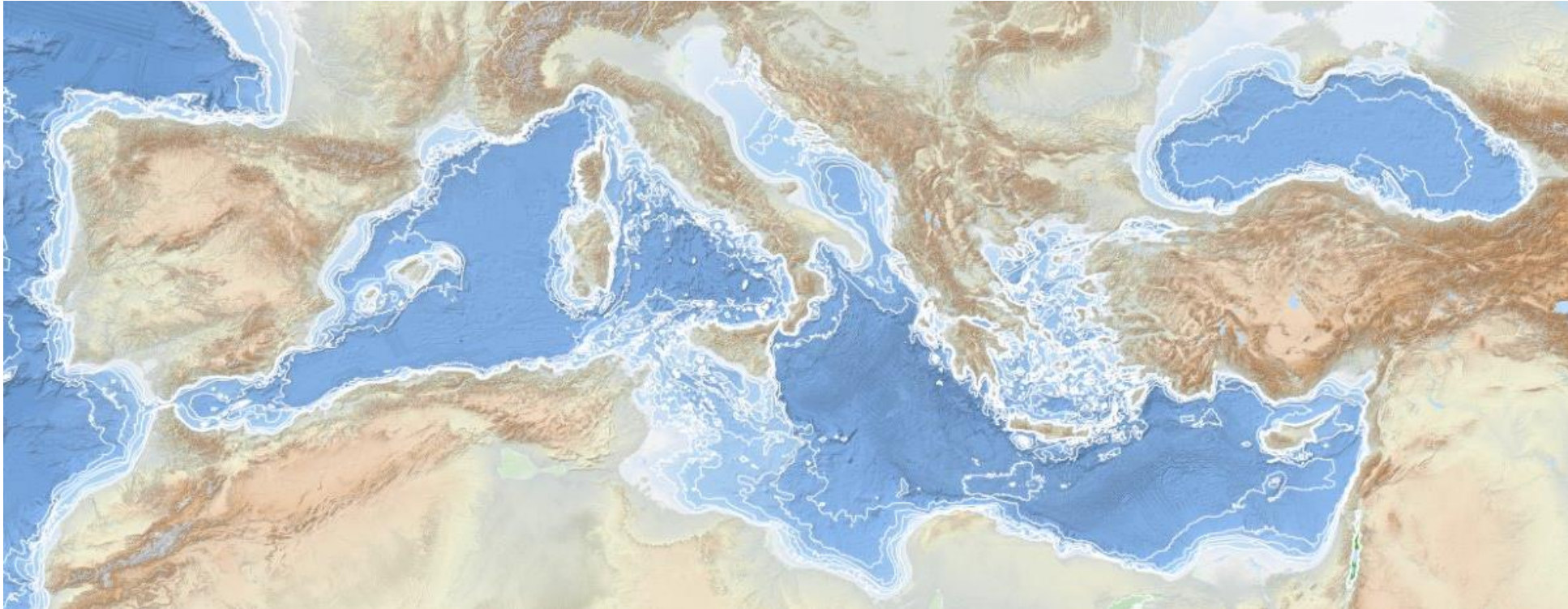


Dataset types for MSFD Classification



Dataset examples

Bathymetric contours - EMODnet



How to classify: Oceanographic and CC → Essential variables → Physics → Bathymetry

Dataset examples

Predicted abundance of bottlenose dolphins in the Mediterranean Sea (2018-2019) - ACCOBAMS



How to classify:

- Environment → MSFD Classification → Ecosystem → Species → Mammals
- Environment → MSFD Descriptor/Criteria → D1 Biodiversity - mammals

Online tool: MSPdF Explorer



Applications

- MSP4Bio - Catalogue I
- MSP4Bio - MSPdF Explorer
- PROMETEO - Coastal I
- PROMETEO - Oceanog
- ReMAP - MSP & MSFD
- ReMAP - MSP out

Administration

admin

Logout



MSP4Bio - MSPdF Explorer

Explorer Analytics

Edit mode

Explore the hierarchy visually: click on any slice to drill down into Clusters, Categories, Elements and Dataset types.

Clusters Categories Elements Datasets

Type to search...

Filter nodes without datasets

Include subtree

Chart layout

Sort

Max depth

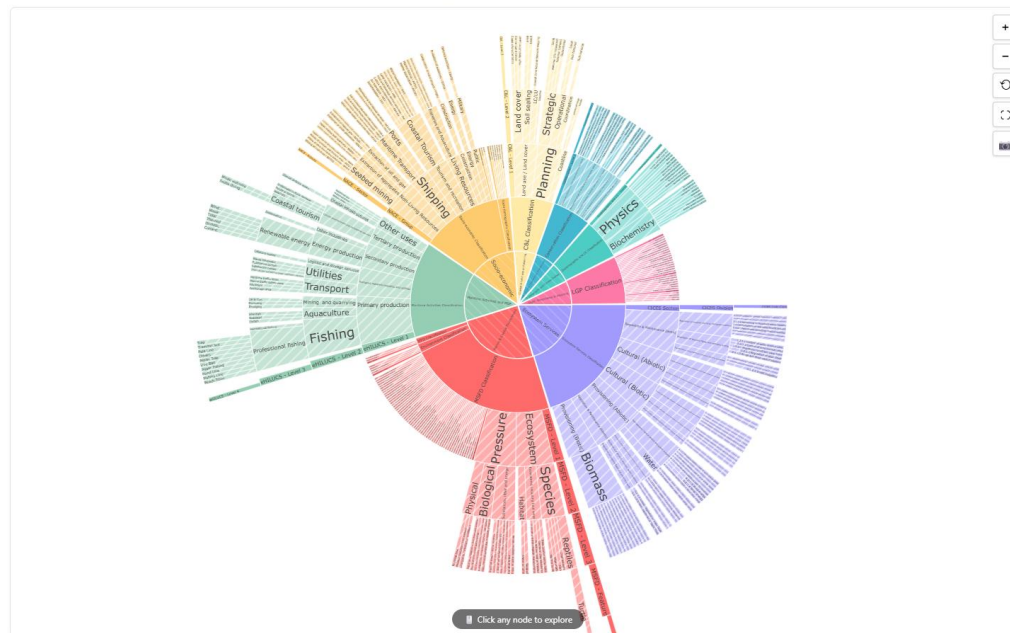
Sunburst Icicle

By size A + Z

7

Show elements

Show dataset types



Cluster Category Element Dataset type

Coastal & Land use and planning Ecosystem Services Legal, Governance & Planning Marine & Coastal Conservation and Designated sites Marine & Coastal Environment Maritime Activities and MSP Oceanographic and Climate Change Socio-economic



MSP4Bio - MSPdF Explorer

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By size A + Z

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Live Demo

LIVE DEMO

Tools4MSP GeoApps

- Applications
 - MSP4Bio - Catalogue Explorer
 - MSP4Bio - MSPDF Explorer
 - PROMETEO - Coastal Monitori
 - PROMETEO - Oceanographic D
 - ReMAP - MSP & MSFD
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Search apps by name, description or project...

A-Z

Applications

MSP4Bio - Catalogue Explorer

Browse classified datasets from the production layer with hierarchy filters, maps and analytics.

CKAN datasets maps

Open app →

MSP4Bio - MSPDF Explorer

Explore Maritime Spatial Planning Data Framework hierarchies with interactive visualizations.

MSPDF hierarchy

Open app →

PROMETEO - Coastal Monitoring

Coastal structures analysis with time series data and early warning system.

coastal monitoring

Open app →

PROMETEO - Oceanographic Data

WAVEWATCH3-SHYFEM ocean model data - forecast & hindcast maps and time series.

oceanographic WMS

Open app →

ReMAP - MSP & MSFD

Marine Spatial Planning and Marine Strategy Framework Directive integration tools.

MSP MSFD monitoring

Open app →

ReMAP - MSP out

Marine Spatial Planning outputs and reporting tools with full member access.

MSP planning

Open app →

Administration

Management tools - visible to admins only.

Classifier

Unified classifier app for experiments, production runs, configs, and review.

classifier experiments production configs

Open app →

Log Viewer

Browse and search application log files with level filtering and live tail.

logs monitoring

Open app →

MSPDF Admin

Manage MSPDF elements tree: backups, restore, CSV import, and element CRUD.

MSPDF backup

Open app →

System Services

Monitor background daemons, database, domain area updates, external APIs and app registry.

daemons monitoring

Open app →

Task Monitor

Track, resume, and manage background tasks: experiments, classifications, syncs.

tasks monitoring scheduler

Open app →

Users & Sessions

Manage users, active sessions, roles, and access settings.

users sessions

Open app →



MSP4Bio - MSPDF Explorer

Explorer Analytics

Edit mode

Explore the hierarchy visually: click on any slice to drill down into Clusters, Categories, Elements and Dataset types.

Clusters Categories Elements Datasets

Type to search... Reset

Filter nodes without datasets

Include subtree

Chart layout

Sort

Max depth 7

Show elements

Show dataset types

Flatten

Reverse

Sunburst Icicle

By size A → Z

Administration

admin

Logout



Node Detail

Click a node on the chart or select from the focus bar below.

Legend: Cluster, Category, Element, Dataset type. Color key for: Coastal & Land use and planning, Ecosystem Services, Legal, Governance & Planning, Marine & Coastal Conservation and Designated sites, Marine & Coastal Environment, Maritime Activities and MSP, Oceanographic and Climate Change, Socio-economic.

How to read this chart



MSP4Bio - MSPDF Explorer

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Node Detail

Click a node on the chart or select from the focus bar below.

- Applications
- MSP4Bio - Catalogue Explorer
- MSP4Bio - MSPDF Explorer
- PROMETEO - Coastal Monitori
- PROMETEO - Oceanographic D
- ReMAP - MSP & MSFD
- ReMAP - MSP out

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- admin
- Logout

Edit mode - click on any slice to select a node for editing.

- Type to search...
- ◆ Coastal & Land use and planning
- ◆ Ecosystem Services
- ◆ Legal, Governance & Planning
- ◆ Marine & Coastal Conservation and Designated sites
- ◆ Marine & Coastal Environment
- ◆ Maritime Activities and MSP



Click any node to explore

Edit Move New child Delete

Label

No pending changes.

- Cluster
 - Category
 - Element
 - Dataset type
- Coastal & Land use and planning Ecosystem Services Legal, Governance & Planning Marine & Coastal Conservation and Designated sites Marine & Coastal Environment Maritime Activities and MSP Oceanographic and Climate Change Socio-economic



MSP4Bio - MSPDF Explorer

Explorer Analytics

Edit mode

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Clusters Categories Elements Datasets

MSFD Classification Reset

Filter nodes without datasets

Include subtree

Chart layout

Sort

Max depth 7

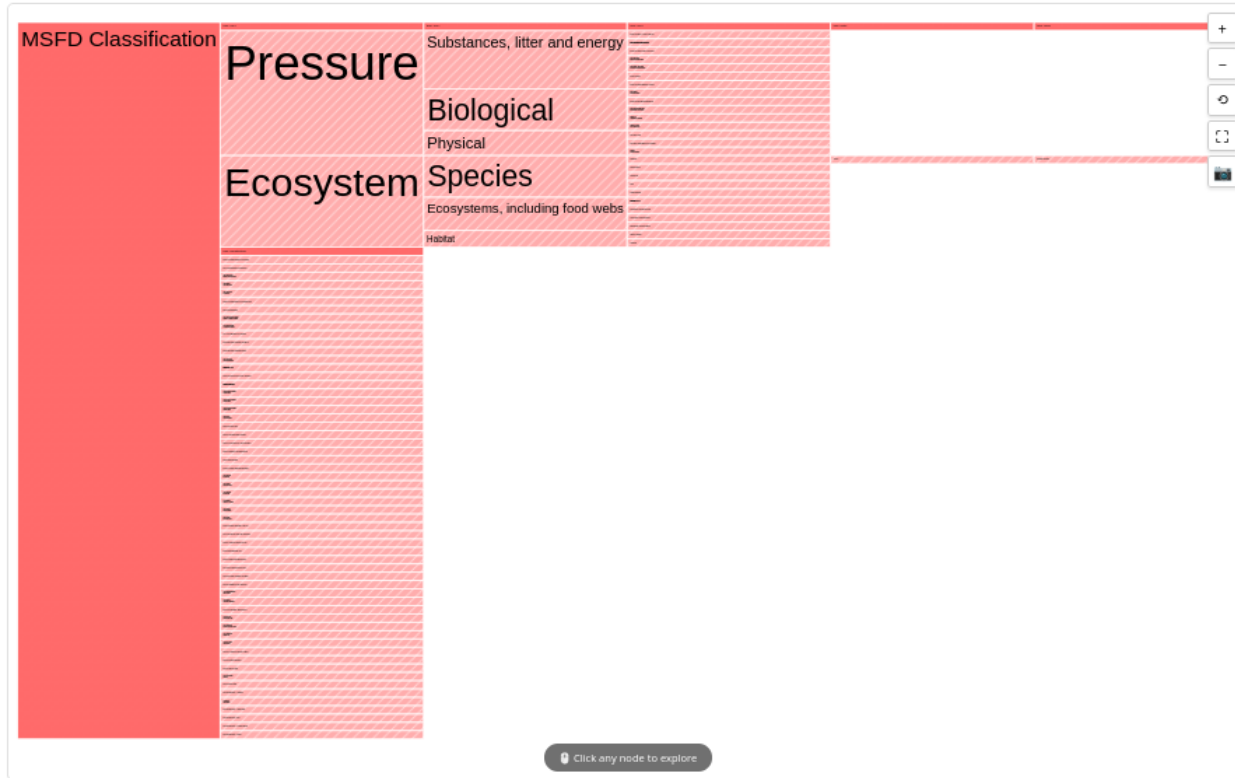
Show elements

Show dataset types

Flatten

Sunburst Icicle

By size A → Z



Click any node to explore

Node Detail

Relevance Filters

MSFD Classification

Clear

Cluster: Marine & Coastal Environment

MSFD Classification

Sub-categories: 2/6 - Elements: 0/94 - Dataset types: 0/23 (direct / subtree)

Elements (94) Dataset types (53)

Filter

Type to filter rows...

Element	Category	Cluster	Dataset types	Best relevance
Pressure	MSFD - Level 1	Marine & Coastal Environment	0	-
Ecosystem	MSFD - Level 1	Marine & Coastal Environment	0	-
Substances, litter and energy	MSFD - Level 2	Marine & Coastal Environment	0	-
Physical	MSFD - Level 2	Marine & Coastal Environment	0	-
Biological	MSFD - Level 2	Marine & Coastal Environment	0	-
Species	MSFD - Level 2	Marine & Coastal Environment	0	-
Habitat	MSFD - Level 2	Marine & Coastal Environment	0	-
Ecosystems, including food webs	MSFD - Level 2	Marine & Coastal Environment	0	-
Input of water - point sources	MSFD - Level 3	Marine & Coastal Environment	0	-
Input of other substances - diffuse source	MSFD - Level 3	Marine & Coastal Environment	4	high

Download CSV



MSP4Bio - MSPDF Explorer

Explorer Analytics

Edit mode

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Type to search... Reset

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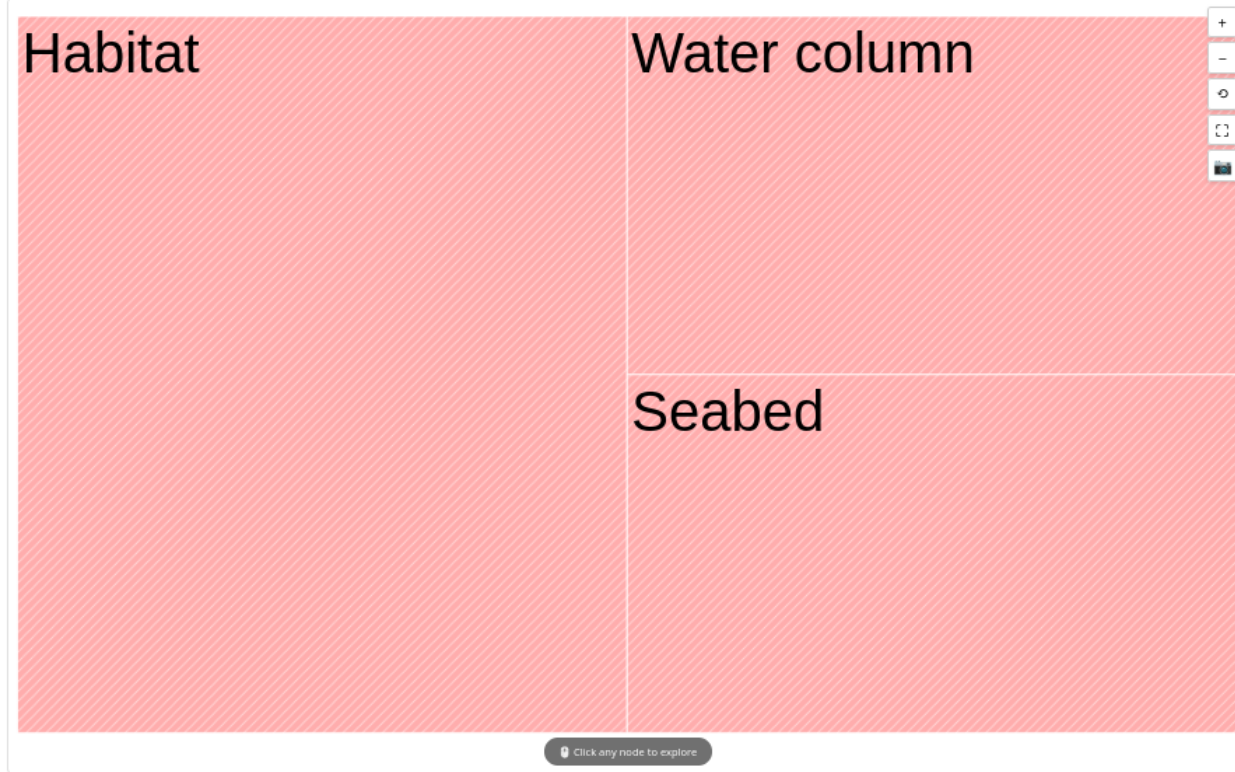
Show elements

Show dataset types

Flatten

Sunburst Icicle

By size A → Z



Node Detail

Relevance Filters

Habitat

Clear

Cluster: Marine & Coastal Environment - Category: MSFD - Level 2

Habitat

Sub-elements: 2/2 - Dataset types: 0/3 (direct / subtree)

Dataset types (3)

Filter

Type to filter rows...

Dataset type	Element	Category	Cluster	Relevance	Contexts
Individual habitat maps from surveys	Seabed	MSFD - Level 3	Marine & Coastal Environment	High	International/Present: Medium, Internatic
Predictive Habitat Map	Seabed	MSFD - Level 3	Marine & Coastal Environment	High	International/Present: High, International
Recruitment, spawning and nursery areas	Seabed	MSFD - Level 3	Marine & Coastal Environment	High	International/Present: High, International

Download CSV

Click any node to explore

Cluster Category Element Dataset type



MSP4Bio - MSPDF Explorer

Explorer Analytics

Relevance UpSet Plot Overlap Data Quality

Shows how dataset types are shared across clusters. Each column is a unique combination of clusters; dots indicate membership. Bars are stacked by relevance level (High / Medium / Low).

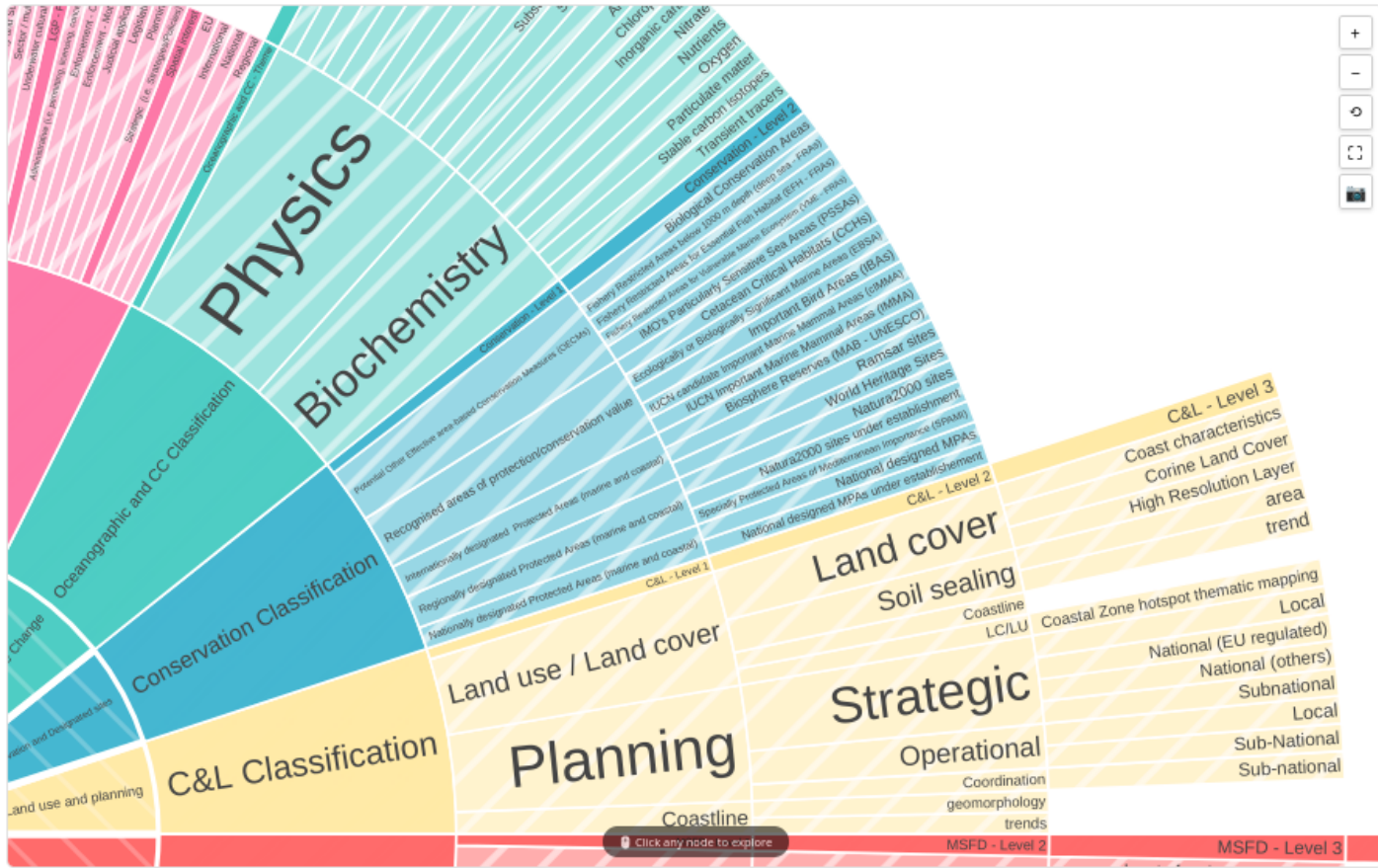


Intersection details

Set	Clusters	High	Medium	Low	Unrated	Total	Dataset types
Set 2	Marine & Coastal Environment		12	3	2	7	24 Beach litter abundance aggregated statistics, Bird migration routes, Bird wintering grounds, Broad-Scale Pred
Set 3	Oceanographic and Climate Change		11	1	1	2	15 Ammonium (NH4), Bathymetry map, Bottom temperature, Chlorophyll-a aggregated statistics, Hypoxic condi
Set 4	Coastal & Land use and planning		4	0	1	10	15 CORINE Land Cover (CLC), CORINE Land Cover Change (CHA), Coastal Land Cover/Land Use (LC/LU) change la
Set 5	Legal, Governance & Planning		0	0	0	12	12 Aquaculture Concession Areas, Bilateral agreements, Biodiversity Strategy, EU Fisheries regulation, EU Ocean
Set 6	Ecosystem Services		0	0	0	7	7 Costline evolution, Extension/Landed weight, Market price, Production function, Replacement costs, Stated/r
Set 7	Coastal & Land use and planning + Legal, Governance & Planning		0	0	0	5	5 Aquaculture Strategy, EU Aquaculture Policy, EU Fisheries policy, Fisheries strategy, Ship Pollution Preventio
Set 8	Socio-economic		0	0	0	5	5 Economic value added, Goods loaded and unloaded, Municipal resident population, Occupancy in collective
Set 9	Marine & Coastal Conservation and Designated sites		0	0	0	2	2 Established protected areas, Under establishment protected areas
Set 10	Maritime Activities and MSP + Socio-economic		0	0	0	1	1 Employment in Full time equivalent
Set 11	Ecosystem Services + Legal, Governance & Planning		0	0	0	1	1 Regional Aquaculture Spatial Planning

- Applications
 - MSP4Bio - Catalogue Explorer
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Edit mode - click on any slice to select a node for editing.

+
-
↺
↻
🖼️

Edit Node

✖ Deselect

Element: Biological Conservation Areas (id=877)

Marine & Coastal Conservation and Designated sites → Conservation Classification → Conservation - Level 1 → Conservation - Level 2 | Parent: Potential Other Effective area-based Conservation Measures (OECMs)

[Edit](#) [Move](#) [New child](#) [Delete](#)

Label

No pending changes.

Take home messages

- The structure is flexible and modular, and can easily be extended or changed, by e.g., adding new levels, classification systems, clusters.
- Interdisciplinary & Collaborative approach
- The flexibility of the structure allows this framework to be applied to multiple MSP contexts, but also to other processes (e.g., Adaptive Management).
- The MSPdF Explorer allows collaborative management/refinement of the structure and interactive visualization of the Cluster-Classification system-Elements-Dataset types framework

Next steps

- Finalise the cluster revision with stakeholders and experts
- Complete the Dataset types
- Improve formal semantic of the concepts Cluster-Classification system-Element-Dataset types framework (semantic web)
- Consolidate and improve MSPdF Explorer interface
- Test the MSPdF 2.0 and the online tool MSPdF Explorer in other MSP contexts
- Integrate MSPdF Explorer with an AI-enhanced classification system

MSPdF Explorer:

<https://geoapps.tools4msp.eu/>