Recommendations
for transboundary MSP output data

Approved in 9th meeting of the BSR MSP Data Expert Subgroup
17-18 April Vilnius, Lithuania

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Subject and scope

This document sets out technical requirements (data specification) for the interoperability and harmonization of spatial data sets corresponding to the transboundary/cross-border maritime spatial planning output data (hereinafter - MSP output data) in order to ensure application of coherent maritime spatial plans across the Baltic Sea region and facilitate the transboundary consultations.

The main value of the MSP output data specification model is its simplicity, and flexible structure that allows data providers to publish their existing data in the most convenient way. It is expected that the effective use of the model will help in transboundary consultation processes, and will be used for maritime spatial plans which are coherent across borders.

In other words, this document prescribes how the GIS data, presenting MSP output data, could be structured to be comprehensible to stakeholders from other countries.

MSP output data refers to the maritime spatial plans, depicting the possible sea-use in the future. The spatial plans need to be in line with other spatial plans across the borders and beyond them.

Planned sea uses are regulated by spatial planning documents elaborated at various levels of administration, defined by responsible authorities. Sea use regulation over a geographical area is, in general, composed of three main elements:

- the overall *strategic orientation* that describes the development will of the competent administrative authority which is a textual document,
- the *textual regulation* that affects each zone and determines the planned sea use,
- the *cartographic representation* composed of elements regulated by spatial planning documents.

This document is focused on standards for spatial datasets used for c*artographic representation* of future sea use.

The MSP output data Specification is based on INSPIRE Land Use Data Specification, which is giving the exact spatial dimension of all the elements a spatial plan is composed of.

Glossary

Countries	- Baltic Sea region countries adjacent to the Baltic Sea, in particularly: Denmark, Estonia, Finland, Germany, Lithuania, Latvia, Poland, Russia and Sweden.
MSP	- maritime spatial planning
GIS	- geographic information system
OGC	- Open Geospatial Consortium (http://www.opengeospatial.org/)
WMS	- OGC Web Map Service
WFS	- OGC Web Feature Service
HELCOM	- Baltic Marine Environment Protection Commission - Helsinki Commission
VASAB	- “Vision and strategies around the Baltic Sea” - spatial planning cooperation

Spatial environment requirements

Coordinate reference systems

1. Coordinate reference system and map projections used for MSP must be clearly defined.
2. Coordinate reference system used for MSP must be valid for any kind of information/ resolution/ accuracy (the resolution and accuracy of MSP output data are out of scope of this document).
3. According to *INSPIRE Specification on Coordinate Reference Systems - Guidelines (D2.8.I.1)* The European Terrestrial Reference System 1989 (ETRS89) should be used as preferred coordinate reference system for MSP purposes. ETRS89 is related to the International Terrestrial Reference System (ITRS) and its realisations are designated by European Terrestrial Reference Frames (ETRFyy).
4. Map projections based on ETRS89 and corresponding to GRS80 ellipsoid are preferred for the MSP purposes.
5. World Geodetic System 1984 (WGS84) may be used for the MSP purposes. According to *INSPIRE Specification on Coordinate Reference Systems - Guidelines (D2.8.I.1) the most recent WGS84 realisations are in agreement with the ITRF at the level of a few centimetres. In consequence, the WGS84 products are considered as realisations of the ITRS*.
6. Map projections based on WGS84 and corresponding to WGS84 ellipsoid are allowed for the MSP purposes.

INSPIRE Annex II, Section 1.2
Datum for three-dimensional and two-dimensional coordinate reference systems

For the three-dimensional and two-dimensional coordinate reference systems and the horizontal component of compound coordinate reference systems used for making spatial data sets available, the datum shall be the datum of the European Terrestrial Reference System 1989 (ETRS89) in areas within its geographical scope, or the datum of the International Terrestrial Reference System (ITRS) or other geodetic coordinate reference systems compliant with ITRS in areas that are outside the geographical scope of ETRS89. Compliant with the ITRS means that the system definition is based on the definition of the ITRS and there is a well documented relationship between both systems, according to EN ISO 19111.

INSPIRE Annex II, Section 1.3
Coordinate Reference Systems

1.3.2. Two-dimensional Coordinate Reference Systems

- Two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in 1.2 and using the parameters of the GRS80 ellipsoid.
- Plane coordinates using the ETRS89 Lambert Azimuthal Equal Area coordinate reference system.
- Plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system.
- Plane coordinates using the ETRS89 Transverse Mercator coordinate reference system.

INSPIRE Annex II, Section 1.5
Coordinate Reference System Identifiers

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
2D 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

Encoding

Character encoding in Shapefiles

Different national languages have different (own) encodings because of, inter alia 'special' characters. For example, Windows-1250 is dedicated for Central European languages that use Latin script. Character encoding defines each character, its code point, and how the code point is represented in bits. Without knowing encoding, it is impossible to interpret a string of characters therefore the data based on this encoding are not displayed correctly in GIS systems.

Unicode contains code points for the majority of characters in all modern languages. There are three main Unicode character encoding schemes in use: UTF-8, UTF-16, and UTF-32 (UTF - Unicode Transformation Format). The numbers with UTF indicate the size, in bits, of units used for encoding, for example, UTF-8 uses 8-bit variable-width character encodings.

Tips for desktop GIS applications:

ArcGIS: At ArcGIS 10.2.1 code page UTF-8 is set by default in the shapefile (.DBF). For different versions of ArcGIS create a .cpg file (with the same name as the other Shapefiles), fill it with the name of the encoding (for example "UTF-8") and save it. If you then open the Shapefile in ArcGIS they will read the textual contents of the DBF in that charset.

QGIS: To change encoding for layer, choose Properties\General\Encoding. It can be changed also for exported files.

1. Encoding used in MSP output data must be clearly defined.
2. Unicode character set with UTF-8 encoding is preferred for MSP purposes.

MSP output data specification

These Recommendations focuses on two types of the MSP Output data:

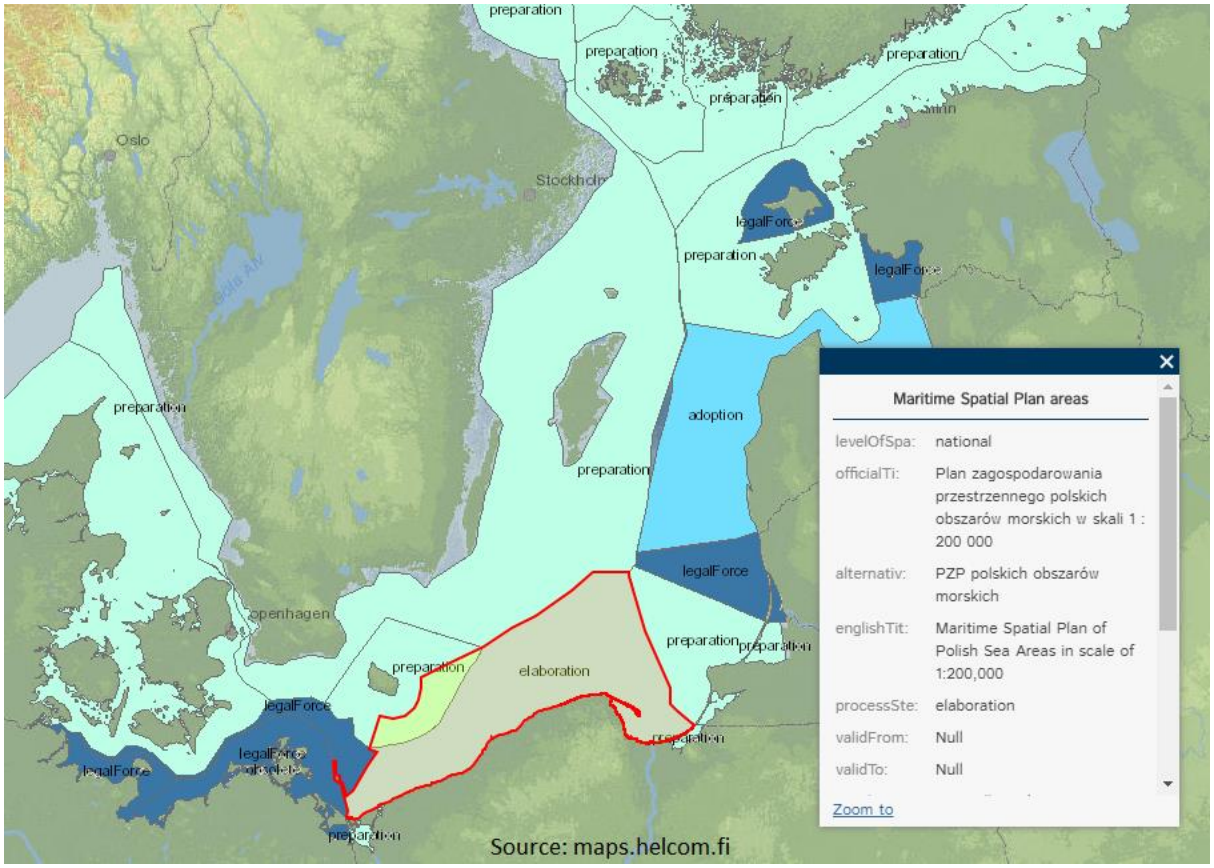
- maritime spatial plan area,
- planned sea uses.

Maritime spatial plan area

Every maritime spatial planning document indicates a strategic direction for the **development of a given sea area.** Maritime spatial plan area can be presented as *SpatialPlan* feature type that corresponds to a spatial planning document and its area.

> Only the spatial planning documents that are or have to be legally adopted by an authority are considered within these Recommendations.

MSP output data of 'maritime spatial plan area' represents the extent of maritime spatial plan with additional attributes describing the type, level and status of the plan, scale, map of the plan, responsible institution, timeframe of the validity of the plan, as well as other maritime spatial plans in particular area, if there are such.



> *SpatialPlan* feature type has **polygon geometry** and **specific attributes that provide a general information about the MSP process** in BSR country.

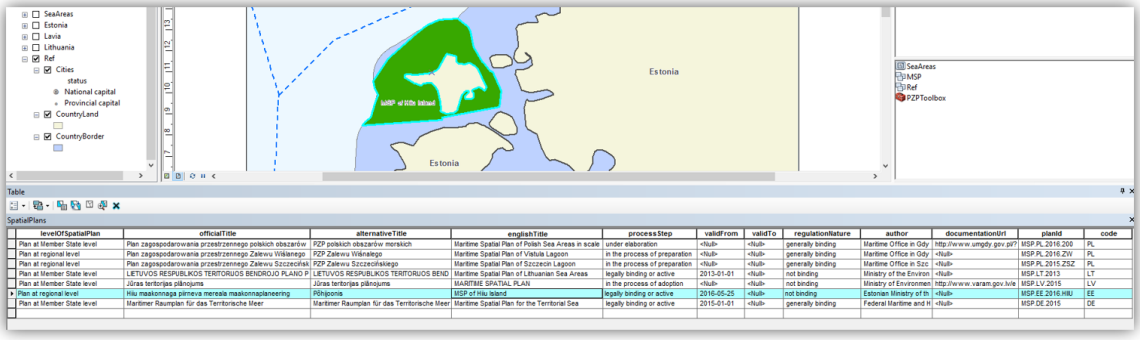
The first attempt to visualize *SpatialPlan,* as a general overview of maritime spatial plans around the Baltic Sea, is available on HELCOM Map and Data Service:

http://maps.helcom.fi/website/mapservice/?datasetID=aa96bca9-23f5-4e24-bc92-be24cf101d59

> *SpatialPlan* dataset could be provided by every BSR country.

Attributes for the maritime spatial plan area dataset:

Attribute name	Required	Data model	Comments
planId [CharacterString]	✓		Permanent identifier of spatial plan, unique at international level. It should be country code (eg. DE, FI, LT) followed by unique identifier at national level.
officialTitle [CharacterString]	✓	INSPIRE Land Use	Official title of the spatial plan exposed in national language.
alternativeTitle [CharacterString]		INSPIRE Land Use	Alternative (unofficial) title of the spatial plan exposed in national language.
englishTitle [CharacterString]	✓		Title used for transboundary consultations purposes.
planTypeName [CodeList]	✓	INSPIRE Land Use	Name of the type of plan that the responsible authority of the plan has given. Values for this attribute are managed at national level via a code list ('*Maritime Spatial Plan*')
levelOfSpatialPlan [CodeList]	✓	INSPIRE Land Use	Territorial hierarchy of plan
processStep [CodeList]	✓	INSPIRE Land Use	Derived from INSPIRE *ProcessStepGeneralValue*. General indication of the step of the planning process
spatialPlanMap [URI]			Identification of the maritime spatial plan map in raster format (link with eng version, if available)
scale [CharacterString]			Indication of the scale of the plan
backgroundMap [URI]		INSPIRE Land Use	Identification of the background map in raster format that has been used for constructing this Plan (link to eng version, if available)
responsibleAuthority [CharacterString]			Indication of the responsible authority for maritime spatial plan
validFrom [DateTime]	✓		First date at which the maritime spatial plan is valid in reality
validTo [DateTime]	✓		The time from which the maritime spatial plan is no longer valid
previousMspPlan [URI]			Identification of the previous maritime spatial plan, if such exists (with link to eng version, if available)



The raster version of the MSP map may be associated to the vector *SpatialPlan* feature type. The objective for the provision of a raster version of MSP map is twofold:

- only the paper based version of a spatial plan is the official in many countries,
- visualizes spatial plans in digital form where no vector data exists.

The attribute *spatialPlanMap* of the *SpatialPlan* feature type may be used to provide a raster version of a maritime spatial plan map either as image or geo-referenced image (eg. GEOTIFF).

"*PlanTypeName*" code list values

Attribute code	Description
maritimeSpatialPlan	Recommendations for transboundary MSP output data refers only to maritime spatial plans.

"*LevelOfSpatialPlan*" code list values

Attribute code	Description
national	Plan at BSR Country level. (This attribute should be considered also for regional and local plans if they are adopted by national authority)
supraRegional	A plan that overlaps several administrative regions.
regional	Plan at regional level (equivalent to NUTS2 or NUTS3 of EUROSTAT nomenclature of statistical units as established in Regulation (EC) No 1059/2003).
infraRegional	A plan that overlaps several infra-administrative units in one administrative region
supraLocal	A plan that overlaps several municipalities (entirely or partially).
local	Plan at municipal level, corresponding to the lower level of administration equivalent to LAU2 as laid down in Annex III to Regulation (EC) No 1059/2003 of the European Parliament and of the Council (OJ L 154, 21.6.2003, p. 1.)
other	Other level of spatial plan

"*ProcessStep*" code list values

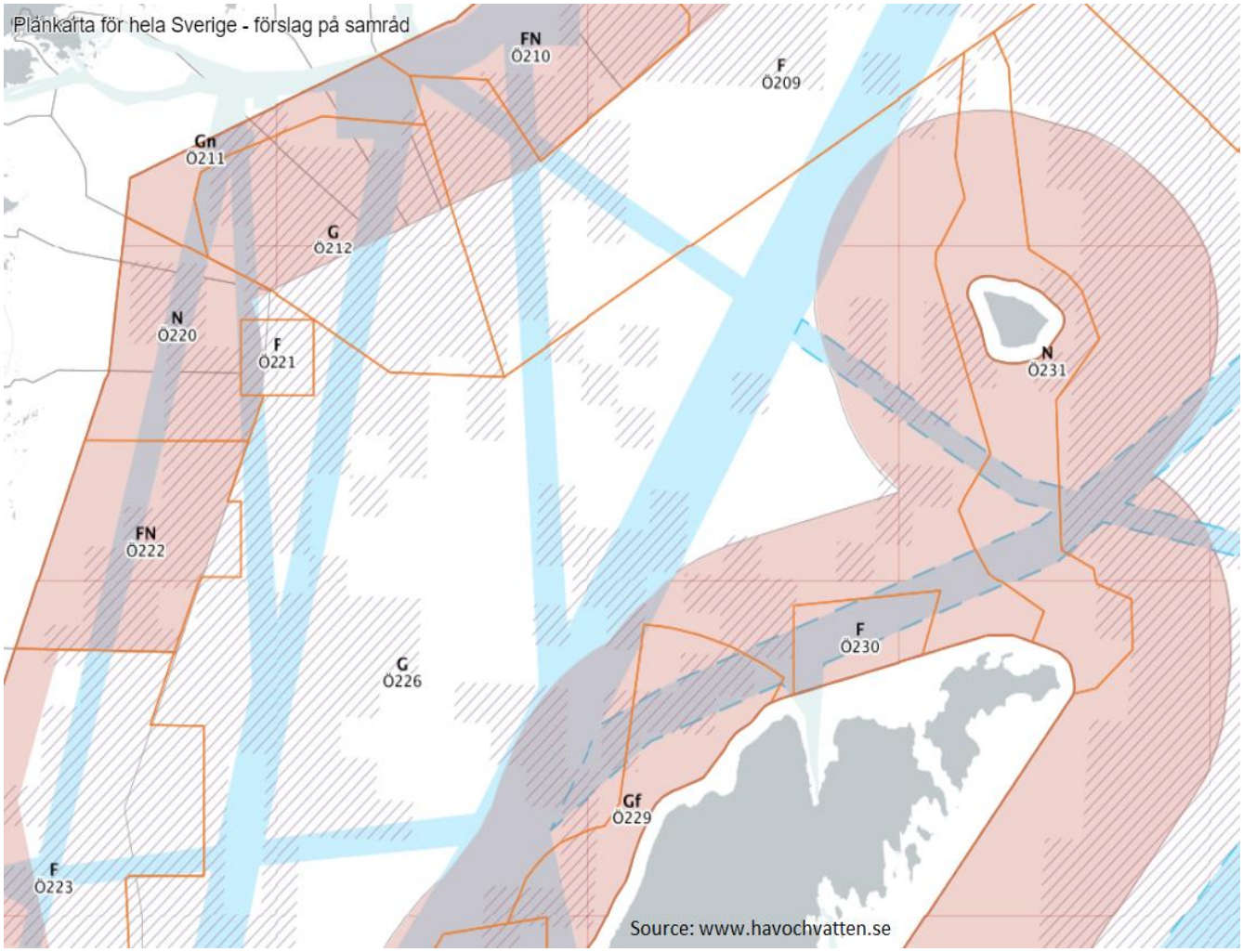
Attribute code	Description
preparation	Plan in the process of preparation - there is no official decision to elaborate the plan yet, but legislation is in the place and/or preparatory work for MSP has been launched (preparation of the Terms of Reference, context analysis etc.)
elaboration	Plan is under elaboration - decision of the starting the plan has been taken by responsible authority and officially announced
adoption	Plan is in the process of being legally adopted
legalForce	Plan is already adopted and legally binding or active
obsolete	Plan has been substituted by another plan, or is not any longer in force

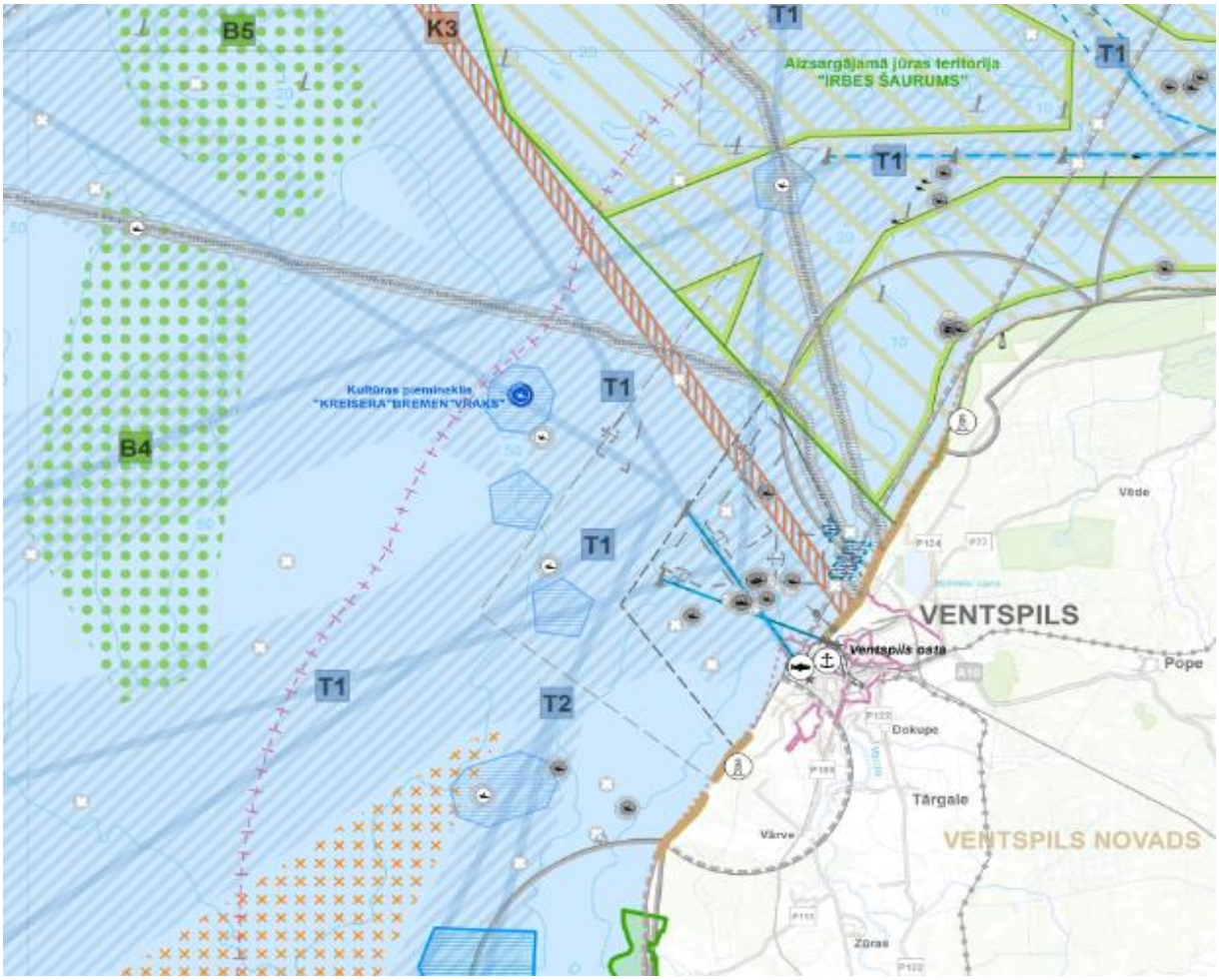
Planned sea use

Countries have own views of MSP and therefore also specific MSP output data. Countries are also at various stages of MSP implementation and therefore on different stages of MSP data management systems. To ensure that maritime spatial plans are coherent across the Baltic Sea, little modification of national data structures may be needed. According to the suggestions below, every country should consider extending their MSP data structures by adding several attributes to existing national datasets. It will illustrate thematically spatial designations in the maritime spatial plan in coherent way. This can be achieved by extending existing thematic datasets by following rules:

- Identification of relevant Sea use *(SeaUse)*;
- Defining Sea use type *(SeaUseType)* for particular thematic designation / dataset *(SeaUse)*;
- If possible, other sea-uses that are indicated in the plan as allowed, restricted or forbidden in particular designation;
- If needed, adding Sea use description outlining specific conditions or restrictions (*useDsc*).

The above sets a minimum amount of information needed to have a general overview of particular maritime spatial plan and to allow different plans to be mutually compatible. However, for more comprehensive information and specific conditions transnational/cross-border consultations, as well as strong collaboration between planners and GIS specialists should be facilitated.





Source: Latvian Ministry of Environmental Protection and Regional Development

Sea uses

Sea use *(SeaUse)* within these Recommendations can be considered as spatial implication of the existing or planned activities or areas in the sea. The code list values for the sea uses are listed below and also available online at VASAB webpage. It should be noted that the list is not fixed and is open for update if any new sea-use occurs.

"*SeaUse*" code list values

Attribute code	Sea use description
aquaculture	aquaculture
aquaculture-fish	fish
aquaculture-mussel	mussel
aquaculture-plant	plant
coast	coast protection
coast-deposit	reserved areas for coast protection (sand deposit area)
extraction	raw material extraction areas
extraction-co2	CO_2
extraction-gas	gas
extraction-oil	oil
extraction-sand	sand and gravel
fishing	fishing
fishing-industrial	industrial fishing
fishing-recreational	recreational fishing

fishing-small-boat	small boat fishing
general	future reservation for undefined activities or general use
heritage	underwater cultural heritage
heritage-landscape	landscape protection
heritage-wreck	wreck
installations	installations and infrastructures
installations-owf	offshore wind farm
installations-platform	platform
installations-wave	wave energy
line	submarine cable and pipeline routes
line-electricity	electricity cable
line-pipeline	pipeline
line-telecom	telecommunication cable
military	military areas
military-training	military training areas
military-radar	military radar area
nature	nature and species conservation
nature-biodiversity	biodiversity
nature-infrastructure	green infrastructure (connectivity, green corridors etc.)
nature-mpa	marine protected areas (HELCOM Baltic Sea Action Plan, Directive 2008/56/EC (Marine Strategy Framework Directive)
nature-spa	special protection areas (Directive 2009/147/EC on the conservation of wild birds)
nature-sac	special areas of conservation (Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora)
nature-scs	species conservation sites (e.g., fish spawning areas etc.)
nature-spawning	spawning area
other	other
other-bridge	bridge
other-dredging	dredging
other-dumping	dumping
other-islands	artificial islands
other-multiuse	multifunctional economic development
other-port	port
other-radar	buffer zones of radars, where building is forbidden
other-tunnel	tunnel
research	scientific research
research-monitoring	monitoring station
tourism	tourism
tourism-bathing	bathing place
tourism-birdwatching	birdwatching areas
tourism-boating	leisure boating
tourism-diving	diving areas
tourism-recreation	recreation areas
tourism-seascape	seascape (sea-land landscape)
transport	maritime transport routes and traffic flows
transport-anchorage	anchorage
transport-deep	deep water route

transport-flow	traffic flow
transport-infrastructure	infrastructure providing access to the port
transport-recommended	recommended route
transport-safety	safety zone

Sea use types

Different objects described by the same sea use may have different meaning. For example, in one area *fishing* may be allowed, while in other area the same use is restricted or even forbidden. Going forward, in some area *fishing-recreational* may be allowed, but in the same area *fishing-industrial* may be forbidden.

In order to specify the principles of using particular sea use with known geometry, additional value should be given - priority function (mspPriorityUse), reserved use (mspReservedUse) allowed use (mspAllowedUse), restricted (mspRestrictedUse) or forbidden (mspForbiddenUse). Additionally, comprehensive and concise description should be added to indicate specific conditions of given sea use in particular area.

"*SeaUseType*" attributes

Attribute Suggested names	Definition
mspPriorityUse (Priority Use)	Indicating planned sea use which **has a priority** in given sea area in country maritime spatial plan.
mspReservedUse (Reserved Use)	Indicating planned sea use which is to be **given specific weight** in relation to other spatially relevant activities.
mspAllowedUse (Allowed Use)	Indicating planned sea use which **is allowed** in given sea area in country maritime spatial plan.
mspRestrictedUse (Restricted Use)	Indicating planned sea use for which some **kind of restriction is imposed** in given sea area in country maritime spatial plan.
mspForbiddenUse (Forbidden Use)	Indicating planned sea use which **is forbidden** in given area in country maritime spatial plan.

Sea use description

Sea use description *(UseDsc)* is an attribute with text information (free text) about important specific conditions for given sea area.

Adding attributes (*mspPriorityUse, mspReservedUse, mspAllowedUse, mspRestrictedUse, mspForbiddenUse* and *useDsc*) to existing or new datasets is optional when preparing maritime spatial plan.

The six attributes mentioned above, should be read together to have full overview of maritime spatial plan designations and principles. The definition of suggested attributes provides generalized overview, however national definition of sea-use types should be taken into account when interpreting the MSP output data.

Extending existing MSP output data

Schematically, extension of the MSP data structures can be described as follows:

Identified geometry in MSP data structure	Priority Use [SeaUse CodeList] [multiple options possible - 0…*]	Reserved Use [SeaUse CodeList] [multiple options possible - 0…*]	Allowed Use [SeaUse CodeList] [multiple options possible - 0…*]	Restricted Use [SeaUse CodeList] [multiple options possible - 0…*]	Forbidden Use [SeaUse CodeList] [multiple options possible - 0…*]	Use Dsc [CharacterString]
xxx	Selection from *seaUse* code list		Selection from *seaUse* code list	Selection from seaUse code list	Selection from seaUse code list	Requirements & restrictions within sea use area
	Examples:					
	installations-owf		Aquaculture - mussel		shipping, fishing	*Areas suitable for OWP development*
			fishing-bottom trawling		cables	*Areas important for sea bottom trawling*
					shipping	*Areas prohibited for navigations*

This simple effort gives standardised data format and transborder comparability. It is suited to any geometry type: polygon, line, point without any change for current MSP Data workflow. When structuring the output data, strong team work between planners and GIS experts should be promoted in order to ensure comprehensivity and to link the background information with planning designations - visualization itself is not always self-exploratory or all-encompassing.

This approach allows for developing MSP output data structures in the way BSR countries are doing already.

Towards common Baltic MSP web-map

The goal of setting minimum requirements for transboundary MSP output data is to facilitate data exchange and cooperation under MSP consultations. With the help of a Baltic MSP web-map, countries should be able to exchange vector data needed for any kind of analysis in order to have maritime spatial plans coherent across borders.

In order to support regional efforts towards a common Baltic MSP web-map, the BSR countries should be encouraged to implement the web-services (WFS) that can ensure data availability through a decentralized approach. The Baltic MSP web-map will be based on national Marine Spatial Data Infrastructures (MSDI) in order to access the data from the original sources and no central database storage is involved. Hence, the system allows users to have access to the most updated datasets. Taking into account that not all countries have web-map user interfaces in place, the provided solution will be a hybrid data exchange system by combining centralized and decentralized data approaches.

Taking into account the current development of MSP data management in the BSR, the initial information about spatial plan area, status etc. is harvested and maintained temporarily by a centralized approach and displayed via HELCOM Map and Data Service as a support for the joint HELCOM-VASAB MSP Working Group. BSR national MSP data focal points ensure the data accuracy by providing the HELCOM Secretariat with most updated information and data, when necessary. The information and data provided by the responsible authority should be considered as the official one.

What concerns MSP output data in BSR, the aim is to facilitate the development of pan-Baltic MSDI and build a web-map interface based on those principles to the data available. The web-map will be developed using the BASEMAPS platform, developed in Interreg BSR Programme`s project "Coherent Linear Infrastructures in Baltic Maritime Spatial Plans" (Baltic LINes), which will be further developed to meet this purpose. The BASEMAPS will display the available MSP output data from national MSDIs using distributed spatial data as far as possible and following INSPIRE principles of hosting data at source and harmonization of data.

As the countries are on different stages of elaboration of national MSP and MSP plan data can be stored in different national formats, several options on adding MSP output data to the BASEMAPS need to be developed, including adding shapefiles to the system. The BASEMAPS should also contain a conversion tool for transferring national MSP output data into common data model defined in this document, which a is prerequisite for building a Baltic MSP web-map presentation which can be queried by sectoral use or by sea use type. BSR national MSP data focal points play an important role here — the BASEMAPS could be designed in a way that country data administration rights are given to the countries' MSP data focal point to add and update services.

To better understand the MSP output data and designations of maritime spatial plans, additional information on the priorities and conditions of the designations should be provided. It will be ensured partly through *UseDsc* attribute, but it is not always enough. Therefore, an option to complement the HELCOM-VASAB Country fiches with relevant information on data structure could be further elaborated.

Thus, MSP Data focal points play an important role before the maritime spatial plan is adopted, as the web-map will display only plans that are in legal force. Until then MSP Data focal points are the main distributors of national MSP output data for transboundary consultations.

Who and how will use the common Baltic MSP web-map?

Three main target groups of the common Baltic MSP map can be highlighted and each of them have specific needs and requirements for convenient and reasonable use of online map viewer and content of common Baltic MSP web-map.

The first target group is maritime spatial planners in the BSR and also other sea basins. It is crucial to develop a user-friendly online map viewer, which will allow planners to access the MSP designations of neighboring countries without having a specific GIS software. Therefore the main interest for planners would be to see the priorities set in MSPs of neighboring countries, as well as limitations (restricted and forbidden uses) in order to not plan a contradictory zone on the other side of the border. It is also important to see the sectoral designations of neighboring countries, e.g. all territories for offshore installations—where those are prioritized and where are "*no go*" zones.

The second target group is MSP data experts, who should be able to download the vector data of neighboring countries to use it for data analysis on their own computers.

The third target group is potential maritime business developers, who should be able to see all the possible places for their business ideas in the BSR, including those territories that are prioritized and those that have some restrictions.

Taking into consideration all possible combinations of given functions (sea use types - priority, reserved, allowed, restricted, forbidden) in MSP, and different MSP systems in each BSR countries, there is no possibility to deliver a solution to present all MSP output data and meet the needs of all target groups in one map. This means that the MSP output data in the common Baltic MSP web-map needs to be displayed at least in these manners:

1) Priority and/or Reserved uses of the maritime spatial plans;
2) Restrictions of the sea use (*restricted or forbidden use*)
3) All uses by sectors (*aquaculture*, *coast*, *extraction*, *fishing*, *et al*)

When the first draft of the web-map will be prepared, it should be further discussed and agreed which data to present first and which can be turned on/off upon the need of the user.

References

1. Preparatory Work for Establishing an Expert Subgroup to the HELCOM/VASAB MSP WG on MSP Data, Spatial Data Infrastructure and an MSP Data Network in the Baltic Sea Region, Kira Gee and Stephen Jay, Liverpool, November 2014, repository.liv.ac.uk/1778557
2. Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services
3. Commission Regulation (EU) No 1312/2014 of 10 December 2014 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data services
4. D2.8.I.1 INSPIRE Specification on Coordinate Reference Systems – Guidelines
5. D2.8.III.4 Data Specification on Land Use – Technical Guidelines