



Maritime Units Geodatabase Guide

Version 3.0

WP9 Data Management and Synthesis

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1. Introduction

CoCoNet is a European project that will produce guidelines to design, manage and monitor network of MPAs and Ocean Wind Farms. The Project covers a high number of Countries and involves researchers covering a vast array of subjects, developing a timely holistic approach and integrating the Mediterranean and Black Seas scientific communities through intense collective activities and a strong communication line with stakeholders and the public at large. Within this project we aim at providing a common framework for marine data management and final synthesis of the outcomes of different scientific topics from heterogeneous sources. An integrated Geodatabase and a WebGIS system will be the linking tool for all partners, regions and thematic research. It will involve the entire consortium at different levels in topics such as data provision and integration, GIS products, GIS interpretation, data archiving and data exchange. The work is organised around the following main objectives:

- assess the rules for data and metadata sharing between partners reviewing the existing common European protocols and standards (INSPIRE);
- design and implement data repositories (Marine Geodatabase) following the INSPIRE Directive, to store and retrieve the spatial data collected during the lifespan of the project for the Mediterranean and Black Sea areas and for the pilot study areas;
- develop the COCONET WebGIS to integrate the multi scale GIS layers derived from all regions going towards an integrated management of the marine resources;
- develop an analytical and evaluative framework for designing, managing and monitoring regional networks of MPAs, including wind farms, centred on science-based guidelines, criteria, concepts and models.

The CoCoNet project produced the architecture of ten Geodatabases storing data about the major themes starting from the INSPIRE Directive: Protected sites, Habitats and Biotopes, Threats, Geology, Biodiversity, Offshore Wind Farms, Elevation, Maritime Units, Oceanography, Socioeconomics.

The final goal will be to deliver digital maps of networks of marine protected areas and offshore wind farms as final synthesis of the outcome from all scientific topics. The integrated Geodatabase will be a fundamental tool to produce the guidelines to design, manage and monitor network of MPAs, and an enriched wind atlas for both the Mediterranean and the Black Seas. The Project will identify groups of putatively interconnected MPAs in the Mediterranean and the Black Seas, shifting from local (single MPA) to regional (Networks of MPAs) and basin (network of networks) scales. The identification of physical and biological connections will clear the processes that govern patterns of biodiversity distribution. This will enhance policies of effective environmental management, also to ascertain if the existing MPAs are sufficient for ecological networking and to suggest how to design further protection schemes based on effective exchanges between protected areas.

2. Geodatabase design

The INSPIRE data model is the conceptual model which the MaritimeUnits Geodatabase is inspired. The logic model is built in Microsoft Visio 2007 using ESRI classes. The physical model is a ESRI File Geodatabase, with

Feature Classes, Object Classes, Domains, Subtypes, Relationship Classes, Feature Dataset and RasterCatalogs.

Feature Class: a collection of geographic features with the same geometry type (such as point, line, or polygon), the same attributes, and the same spatial reference. Feature classes can be stored in geodatabases, shapefiles, coverages, or other data formats. Feature classes allow homogeneous features to be grouped into a single unit for data storage purposes. For example, highways, primary roads, and secondary roads can be grouped into a line feature class named "roads." In a geodatabase, feature classes can also store annotation and dimensions

Object Class: In a geodatabase, a collection of nonspatial data of the same type or class. While spatial objects (features) are stored in feature classes in a geodatabase, nonspatial objects are stored in object classes.

Relationship Class: An item in the geodatabase that stores information about a relationship. A relationship class is visible as an item in the ArcCatalog tree or contents view.

Domains: The range of valid values for a particular metadata element.

Code Value Domain: A type of attribute domain that defines a set of permissible values for an attribute in a geodatabase. A coded value domain consists of a code and its equivalent value. For example, for a road feature class, the numbers 1, 2, and 3 might correspond to three types of road surface: gravel, asphalt, and concrete. Codes are stored in a geodatabase, and corresponding values appear in an attribute table.

Subtype: In geodatabases, a subset of features in a feature class or objects in a table that share the same attributes. For example, the streets in a streets feature class could be categorized into three subtypes: local streets, collector streets, and arterial streets. Creating subtypes can be more efficient than creating many feature classes or tables in a geodatabase.

Feature Dataset: In ArcGIS, a collection of feature classes stored together that share the same spatial reference; that is, they share a coordinate system, and their features fall within a common geographic area. Feature classes with different geometry types may be stored in a feature dataset.

Raster Catalog: A collection of raster datasets defined in a table of any format, in which the records define the individual raster datasets that are included in the catalog. Raster catalogs can be used to display adjacent or overlapping raster datasets without having to mosaic them together into one large file (<http://support.esri.com/en/knowledgebase/GISDictionary/term/object%20class>).

The Habitats and Biotopes Geodatabase can store spatial data (vector, grid and raster) and nonspatial data (.dbf).

The Biodiversity Geodatabase is available as .xml file. To use it in ArcGIS, create an empty File Geodatabase and import the .xml file.

3. Geodatabase architecture

The MaritimeUnits Geodatabase consists of 4 Feature Classes: Baseline, BaselineSegment, MaritimeBoundary, MaritimeZone, and 2 tables: RelatedParty and SourceMethodType. The tables are

linked to the Feature Classes though Relationship Classes. Domains and Subtypes are present In the Feature Classes and in the Object Classes.

3.1. Feature Class: Baseline

The line from which the outer limits of the territorial sea and certain other outer limits are measured (INSPIRE Directive, r4618).

GeometryType: Polyline

Field	Type	Restriction	Description
BaselineID	String	None	Identification string of the baseline.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.2. Feature Class: BaselineSegment

Segment of the baseline from which the outer limits of the territorial sea and certain other outer limits are measured (INSPIRE Directive, r4618).

GeometryType: Polyline

Field	Type	Restriction	Description
BaselineIDfk	String	None	Identification string of the baseline. The field is used as foreign key (fk) in a relationship class.
SegmentID	String	None	Identification string of the segment.
SegmentType	String	Code Value Domain: SegmentTypeValue	The baseline type used for this segment. The type can be normal, straight or archipelagic (INSPIRE Directive, r4618).

3.3. Feature Class: MaritimeBoundary

A line depicting the separation of any type of maritime jurisdiction (INSPIRE Directive, r4618).

GeometryType: Polyline

Field	Type	Restriction	Description
BoundaryID	String	None	Identification string of the boundary.
Boundary	String	None	Name of the boundary.
Type	String	Code Value Domain: TypeBoundaryValue	Political situation. The boundary can be disputed, a median line or treaty.
Country1	String	Code Value Domain: CountryCode	The country that the maritime zone of this boundary belongs to (INSPIRE Directive, r4618).
Country2	String	Code Value Domain: CountryCode	The country that the maritime zone of this boundary belongs to (INSPIRE Directive, r4618).
LegalStatus	String	Code Value Domain:	Legal status of this boundary, it is considered in

		LegalStatusValue	terms of political agreement or disagreement of the marine boundary (INSPIRE Directive, r4618).
TechnicalStatus	String	Code Value Domain: TechnicalStatusValue	The technical status of the maritime boundary. It is considered in terms of its topological matching with the borders of maritime zones separated by this boundary. Edge-matched means that the same set of coordinates is used. (INSPIRE Directive, r4618).
TreatyDate	Date	None	The date of the treaty (if it exists).
LastChange	Date	None	The date of the last change in the political condition.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.4. Feature Class: MaritimeZone

A belt of sea defined by international treaties and conventions, where coastal State executes jurisdictional rights. The zone is established for e.g. cadastral, administrative, economic, security or safety purposes. It is not established for environmental management or regulation (INSPIRE Directive, r4618).

GeometryType: Polygon

Field	Type	Restriction	Description
ZoneID	String	None	Identification string of the zone.
ZoneType	String	Code Value Domain: ZoneTypeValue	Type of the maritime zone (INSPIRE Directive, r4618).
Name	String	None	Name of the maritime zone (INSPIRE Directive, r4618).
Country	String	Code Value Domain: CountryCode	The country that this maritime zone belongs to (INSPIRE Directive, r4618).
BaselineID	String	None	Identification string of the baseline.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.5. Object Classes

3.5.1. Object Class: RelatedParty

An organization or a person with a role related to a resource (INSPIRE Directive, r4618).

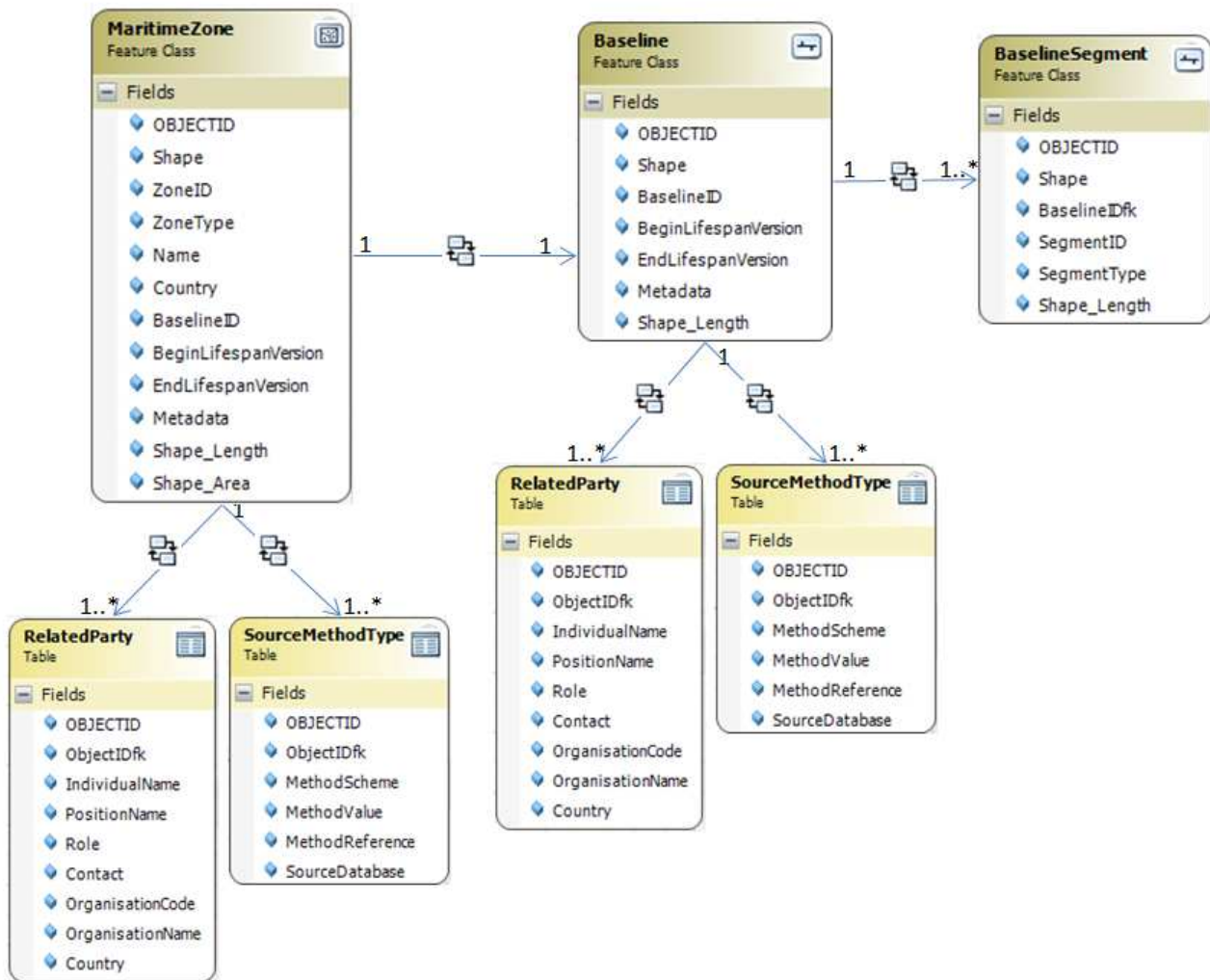
Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the object. The field is used as foreign key.
IndividualName	String	None	Name of the related party (INSPIRE Directive, r4618).
PositionName	String	None	Position of the party in relation to a resource, such as head of department (INSPIRE Directive, r4618).
Role	String	Code Value Domain: PartyRoleValue	Role(s) of the party in relation to a resource, such as owner (INSPIRE Directive, r4618).
Contact	String	None	Contact information for the related party (INSPIRE Directive, r4618).
OrganizationCode	String	None	Code of the related organization (INSPIRE Directive, r4618).
OrganizationName	String	None	Name of the related organization (INSPIRE Directive, r4618).
Country	String	Code Value Domain: CountryCode	Country of the related organization (INSPIRE Directive, r4618).

3.5.2. Object Class: SourceMethodType

Contains metadata about specific instances of elevation object. Refers to the methods on how observations have been made or recorded (INSPIRE Directive, r4618).

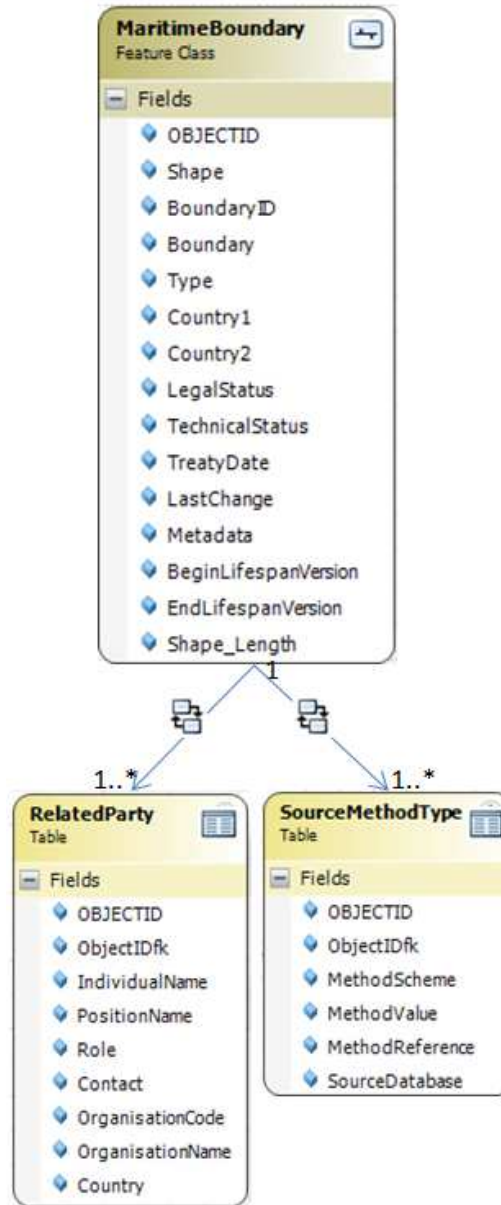
Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the object. The field is used as foreign key.
MethodScheme	Integer	Subtype	Classification scheme used to compiling the MethodValue field (Article17SourceMethod or GeneralSourceMethod).
MethodValue	String	Code Value Domain: GeneralSourceMethodValue/ Article17SourceMethodValue	Method by which the data is collected (INSPIRE Directive, r4618).
MethodReference	String	None	A reference to a description of the method by which the data is collected (INSPIRE Directive, r4618).
SourceDatabase	String	None	Name of the database where the data is retrieved from (INSPIRE Directive, r4618).

3.6. Relationship Classes



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
MaritimeZoneHasBaseline	1→1	MaritimeZone	Baseline	BaselineID	BaselineID
MaritimeZoneHas RelatedParty	1→1..*	MaritimeZone	RelatedParty	ZoneID	ObjectIDfk
MaritimeZoneHas SourceMethodType	1→1..*	MaritimeZone	SourceMethodType	ZoneID	ObjectIDfk

Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
BaselineHas BaselineSegment	1→1..*	Baseline	BaselineSegment	BaselineID	BaselineIDfk
BaselineHas RelatedParty	1→1..*	Baseline	RelatedParty	BaselineID	ObjectIDfk
BaselineHas SourceMethodType	1→1..*	Baseline	SourceMethodType	BaselineID	ObjectIDfk



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
MaritimeBoundaryHas SourceMethdoType	1→1..*	MaritimeBoundary	SourceMethodType	BoundaryID	ObjectIDfk
MaritimeBoundaryHas RelatedParty	1→1..*	MaritimeBoundary	RelatedParty	BoundaryID	ObjectIDfk

4. Metadata

In the framework of the CoCoNet project, metadata are produced by Mikado software. Each Feature Class and raster layer has a CDI (Common Data Index) accessible through the SeaDataNet portal (http://seadatanet.maris2.nl/v_cdi_v3/search.asp). The CDIs are also available on the webpage <http://coconetgis.ismar.cnr.it/> as .xml files, grouped by Geodatabase. Lastly, the metadata file is linked to the feature or to the raster file through a field in the attribute table.

ANNEX 1

Acronyms

CDI – Common Data Index

FC – Feature Class

FD – Feature Dataset

OC - Object Class

fk – foreign key

References

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

D2.8.I.2 Data Specification on Administrative Units – Technical Guidelines (D2.8.I.4_v3.1)

<http://inspire.ec.europa.eu/data-model/approved/r4618/html/> (INSPIRE Directive, r4618)

<http://coconetgis.ismar.cnr.it/>

http://seadatanet.maris2.nl/v_cdi_v3/search.asp

ANNEX 2 – Domains

Article17SourceMethodValue_v3

Type: Code Value Domain

Description: The methods that have been used in the sources for compiling the information about the occurrences of the habitats within an aggregation unit for article 17 purposes. Describes how the information about the occurrences of the habitats within a a unit has been compiled (INSPIRE Directive, r4618-ir)

Value	Code	Definition
Absent data	absentData	Absent data (INSPIRE Directive, r4618-ir)
Complete survey	completeSurvey	Complete survey (INSPIRE Directive, r4618-ir)
Estimate expert	estimateExpert	Estimate based in expert opinion with no or minimal sampling (INSPIRE Directive, r4618-ir)
Estimate partial	estimatePartial	Estimate based on partial data with some extrapolation and/or modeling (INSPIRE Directive, r4618-ir)

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: SourceMethodType (OC)

Extensibility: none

Note 1: The values of the list are found here:

[http://circa.europa.eu/Public/irc/env/monnat/library?l=/habitats_reporting/reporting_2007-2012/reporting_guidelines/reporting-formats_1/_EN_1.0_&a=d \(D2.8.II.1_v3.0\)](http://circa.europa.eu/Public/irc/env/monnat/library?l=/habitats_reporting/reporting_2007-2012/reporting_guidelines/reporting-formats_1/_EN_1.0_&a=d (D2.8.II.1_v3.0))

BaselineSegmentValue_v3

Type: Code Value Domain

Description: The types of baselines used to measure the breadth of the territorial sea (INSPIRE Directive, r4618).

Value	Code	Definition
Archipelagic	archipelagic	The baseline for measuring the breadth of the territorial sea is straight baseline joining the outermost points of the outermost islands and drying reefs of the archipelago (INSPIRE Directive, r4618).
Normal	normal	The normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on large-scale charts officially recognized by the coast State (INSPIRE Directive, r4618).
Straight	straight	The baseline for measuring the breadth of the territorial sea is the straight baseline established by joining the appropriate points (INSPIRE Directive, r4618).

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: BaselineSegment (FC)

Extensibility: none

Note 1: none

CountryCode_v3

Type: Code Value Domain

Description: Country code as defined in the Interinstitutional style guide published by the Publications Office of the European Union (INSPIRE Directive, r4618).

Value	Code
Albania	AL
Algeria	DZ
Bosnia and Herzegovina	BA
Bulgaria	BG
Cyprus	CY
Croatia	HR
Egypt	EG
France	FR
Gaza Trip	PS
Georgia	GE
Gibraltar	GI
Greece	EL
Israel	IL
Italy	IT
Lebanon	LB
Libya	LY
Malta	MT
Monaco	MC
Morocco	MA
Montenegro	ME
Romania	RO
Russia	RU
Slovenia	SI
Spain	ES
Syria	SY
Tunisia	TN
Turkey	TR
Ukraine	UA
United Kingdom	UK

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: MaritimeBoundary (FC), MaritimeZone (FC), RelatedParty (OC).

Extensibility: none

Note 1: none

GeneralSourceMethodValue_v3

Type: Code Value Domain

Description: What are the methods that have been used in the sources for compiling the information about the elevation objects

Value	Code	Definition
Collection examination	collectionExamination	Data collected from examinations of collections (INSPIRE Directive, r4618-ir)
Grid mapping	gridMapping	Data observations collected by systematic surveys in

		grid cells (INSPIRE Directive, r4618-ir)
Line sampling	lineSampling	Data collected by systematic surveys along linear transects (INSPIRE Directive, r4618-ir)
Literature examination	literatureExamination	Data collected from literature examinations like printed maps, tables (INSPIRE Directive, r4618-ir)
Prediction modeling	predictionModeling	Data from prediction modeling
Random observation	ramdomObservation	Data collected by randomly distributed (INSPIRE Directive, r4618-ir)collection/observation sites randomly outside a systematic survey (INSPIRE Directive, r4618-ir)
Remote sensing observation	remoteSensingObservation	Data collected by the Remote Sensing Observation method
Statistical sampling	statisticalSampling	Data collected on locations selected by statistical sampling methods (INSPIRE Directive, r4618-ir)

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: SourceMethodType (OC)

Extensibility: yes

Note 1: none

LegalStatusValue_v3

Type: Code Value Domain

Description: A Description of the legal status of administrative boundaries (INSPIRE Directive, r4618).

Value	Code	Definition
Agreed	agreed	The edge-mached boundary has been agreed between neighbouring administrative units and is stable now (INSPIRE Directive, r4618).
Not agreed	notAgreed	The edge-mached boundary has not yet been agreed between neighbouring administrative units and could be changed (INSPIRE Directive, r4618).

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: MaritimeBoundary (FC)

Extensibility: yes

Note 1: none

MaritimeZoneTypeValue_v3

Type: Code Value Domain

Description: Type of maritime zone (INSPIRE Directive, r4618).

Value	Code	Definition
Contiguous zone	contiguousZone	A zone contiguous to a territorial sea of a coastal State, which may not extend beyond 24 nautical miles from the baseline from which the breadth of the territorial sea is measured (INSPIRE Directive, r4618).
Continental shelf	continentalShelf	A maritime zone beyond and adjacent to the territorial sea of a coastal State whose outer boundary is determined in

		accordance with Article 76 of the United Nations Convention on the Law of the Sea (INSPIRE Directive, r4618).
Exclusive Economic Zone	exclusiveEconomicZone	An area beyond and adjacent to the territorial sea of a coastal State, subject to the specific legal regime under which the rights and the jurisdiction of the coastal State and rights and freedoms of other States are governed by the relevant provisions of the United Nations Convention on the Law of the Sea (INSPIRE Directive, r4618).
Internal water	internalWater	The water on the landward side of the baseline of the territorial sea of the coastal State (INSPIRE Directive, r4618).
Territorial sea	territorialSea	A belt sea of a defined breadth not exceeding 12 nautical miles measured from the baseline determined in accordance to the United Nations Convention on the Law of the Sea (INSPIRE Directive, r4618).

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: MaritimeZone (FC)

Extensibility: yes

Note 1: none

PartyRoleValue_v3

Type: Code Value Domain

Description: Roles of parties related to or responsible for a resource (INSPIRE Directive, r4618).

Value	Code	Definition
Author	author	Author of the data (INSPIRE Directive, r4618-ir)
Custodian	custodian	Guardian or keeper responsible for maintaining data (INSPIRE Directive, r4618-ir)
Distributor	distributor	Person or organisation who distributes the data (INSPIRE Directive, r4618-ir)
Originator	originator	Responsible party who created the dataset or metadata (INSPIRE Directive, r4618-ir)
Owner	owner	Person who owns the data (INSPIRE Directive, r4618-ir)
Point of contact	pointOfContact	Responsible party who can be contacted for acquiring knowledge about or acquisition of the data (INSPIRE Directive, r4618-ir)
Principal investigator	principallInvestigator	Key person responsible for gathering information and conducting research (INSPIRE Directive, r4618-ir)
Processor	processor	Responsible party who has processed the data in a manner in which data has been modified (INSPIRE Directive, r4618-ir)
Publisher	publisher	Responsible party who published the data (INSPIRE Directive, r4618-ir)
Resource provider	resourceProvider	Party that supplies the data (INSPIRE Directive, r4618-ir)
User	user	Person who uses the data (INSPIRE Directive, r4618-ir)

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR
State: approved
Used in: RelatedParty (OC)
Extensibility: yes
Note 1: none

TechnicalStatusValue_v3

Type: Code Value Domain

Description: Description of the technical status of administrative boundaries (INSPIRE Directive, r4618).

Value	Code	Definition
Edge matched	edgeMatched	The boundaries of neighbouring administrative units have the same set of coordinates (INSPIRE Directive, r4618).
Not edge matched	notEdgeMatched	The boundaries of neighbouring administrative units do not have the same set of coordinates (INSPIRE Directive, r4618).

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: MaritimeBoundary (FC)

Extensibility: none

Note 1: none

TypeBoundaryValue_v3

Type: Code Value Domain

Description: type of boundary's political situation.

Value	Code	Definition
Disputed	disputed	
Median line	medianLine	
Treaty	treaty	

Created: 25/08/2015

Modified: none

Author: CNR-ISMAR

State: approved

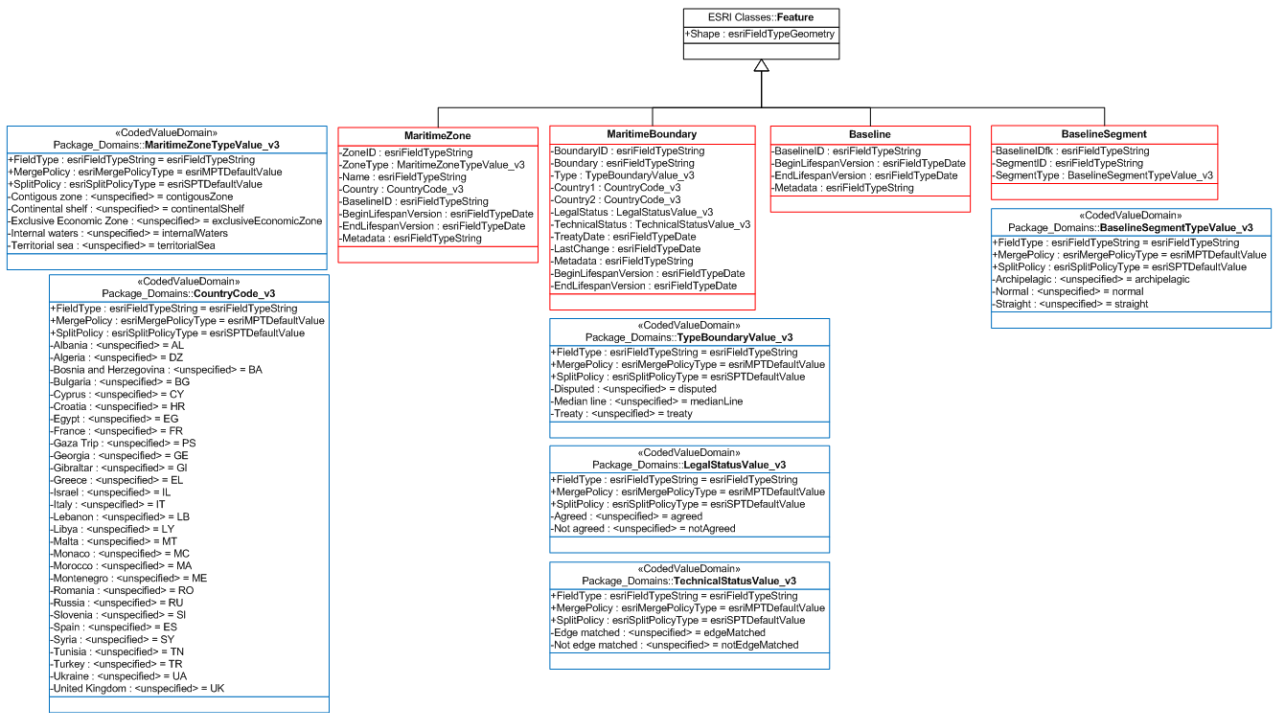
Used in: MaritimeBoundary (FC)

Extensibility: none

Note 1: none

Annex 3 –UML diagram

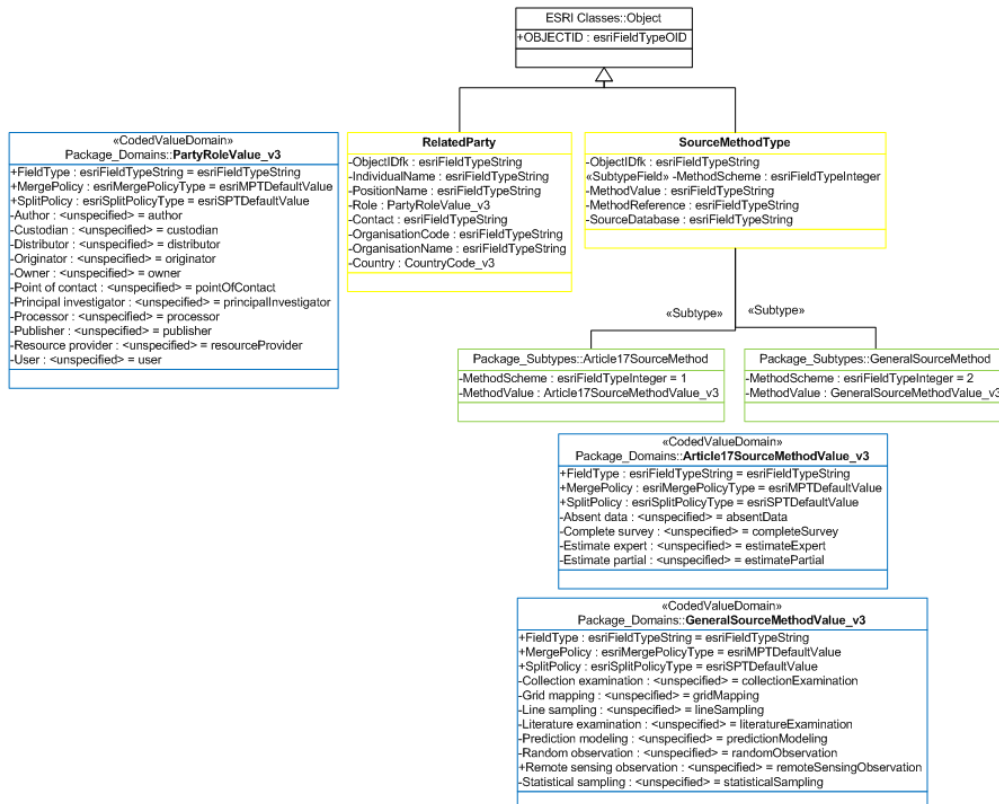
Feature classes



Feature Class: red

Domain: blue

Object classes

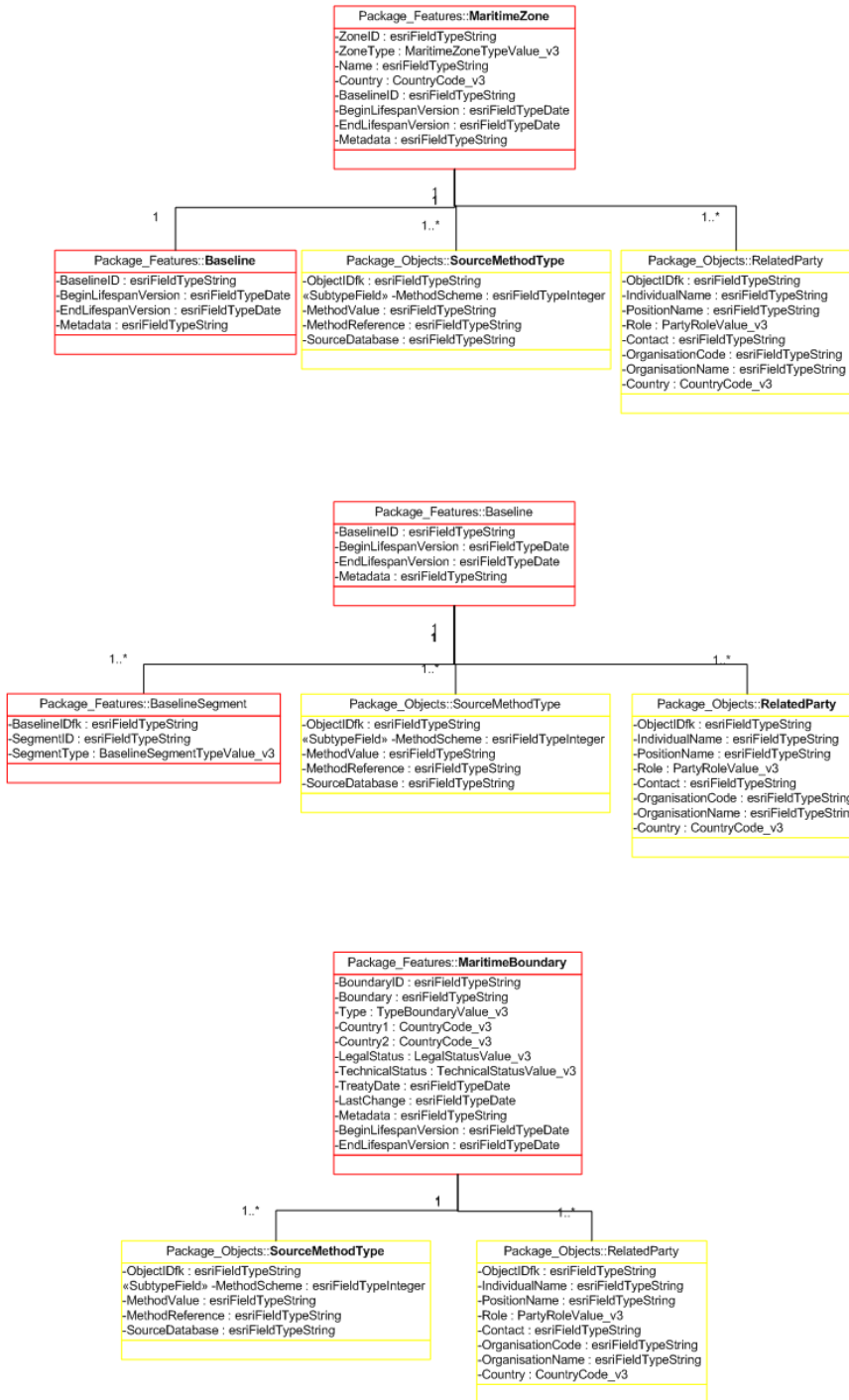


Object Class: yellow

Subtype: green

Domain: blue

Relationship classes



Feature Class: red

Object Class: yellow

Annex 4 – Layer visualization