



# Oceanography

## Geodatabase

Version 3

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 organized 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, centered on science-based guidelines, criteria, concepts and models.

The CoCoNet project produced the architecture of thirteen 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, Biogeographical and Sea Regions, Oceanography, Socioeconomics, Connectivity, Habitat Mapping.

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 with 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 Protected Sites 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 Oceanography Geodatabase stores spatial data (vector, grid and raster) and nonspatial data.

The structure with data of the Geodatabase is available as .xml file, OGC services (WFS, WMS) and in the Google Earth file format (.kmz).

### 3. Geodatabase architecture

The Oceanography Geodatabase consists of one Feature Class named Ecoregion (used to store vector data) and one Raster Catalog named OceanographyRasterCatalog (used to store raster data). In the Geodatabase there are two tables: RelatedParty and SourceMethodType. The tables are linked to the Feature Classes through Relationship Classes. Domains and Subtypes are present in the Feature Classes and in the Object Classes.

#### 3.1. Feature Class- Ecoregion

The Feature Class collects a set of boundaries for the oceanic domain.

GeometryType: Polyline

Field	Type	Restriction	Description
RegionID	String	None	The identification string of the line
Metadata	String	None	The name of the metadata file available on the SeaDataNet repository
BeginLifespanVersion	Date	DD/MM/YYYY	Date at which this version of the spatial object was inserted or changed in the spatial data set
EndLifespanVersion	Date	DD/MM/YYYY	Date at which this version of the spatial object was superseded or retired in the spatial data set

Note 1: the ID fields have to be unique in the entire Geodatabase

#### 3.2. Raster catalog: OceanographyRasterCatalog

This Raster Catalog stores all the raster mosaics with an oceanographic interest, for example, physical and biogeochemical parameters and variables distribution.

GeometryType: polygon

Field	Type	Restriction	Description
Raster	Raster	None	Field that stores the raster mosaic
Name	String	None	Name of the raster mosaic
RasterID	String	None	The identification string of the raster mosaic
Variable	String	None	The variable represented, the Z component of the raster mosaic
Metadata	String	None	The name of the metadata file available on the SeaDataNet repository
BeginLifespanVersion	Date	DD/MM/YYYY	Date at which this version of the spatial object was inserted or changed in the spatial data set
EndLifespanVersion	Date	DD/MM/YYYY	Date at which this version of the spatial object was superseded or retired in the spatial data set

#### 3.3. Object Classes

##### 3.3.1. Object Class: RelatedParty

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

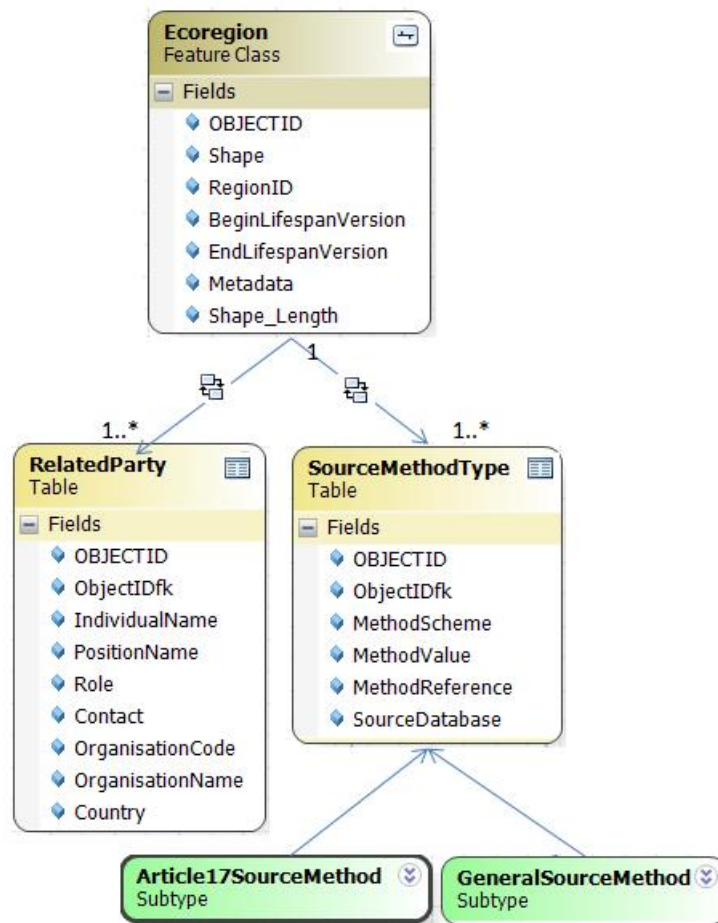
Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the oceanographic object. The field is used as foreign key.
IndividualName	String	None	Name of the related party (INSPIRE Directive, r4618).
PositionName	String	None	Position of the party in relation to a resource, such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

### 3.3.2. Object Class: SourceMethodType

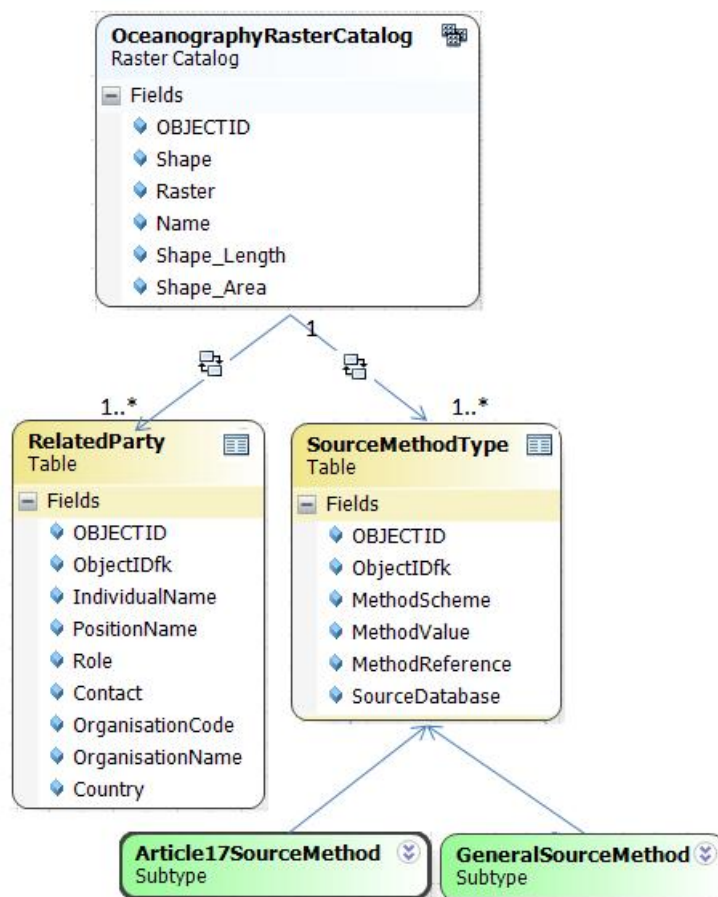
Contains metadata about specific instances of the object. Refers to the methods on how observations have been made or recorded (INSPIRE Directive, r4618).

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

### 3.4. Relationship Classes



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
EcologyHasSourceMethodType	1→1..*	Ecoregion	SourceMethodType	RegionID	ObjectdIDfk
EcologyHasRelatedParty	1→1..*	Ecoregion	RelatedParty	RegionD	ObjectdIDfk



Name	Multipli city	Origin class	Destination class	Primar y key	Foreign key
OceanographyRasterCatalogHas SourceMethodType	1→1..*	Oceanography RasterCatalog	SourceMethodType	Region ID	ObjectdID fk
OceanographyRasterCatalogHas RelatedParty	1→1..*	Oceanography RasterCatalog	RelatedParty	Region D	ObjectdID fk

#### 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](http://seadatanet.maris2.nl/v_cdi_v3/search.asp)

The user of the WebGIS platform can find the name of the metadata file, which the object refers, in the field named "Metadata" in the attribute table.

The metadata for this Geodatabase are also in the CoCoNet Geoportal for metadata:

<http://gp.sea.gov.ua:8082/geoportal/>



## **ANNEX 1**

### **Acronyms**

CDI – Common Data Index

FC – Feature Class

FD – Feature Dataset

OC - Object Class

fk – foreign key

xml – eXtensible Markup Language

kmz - Keyhole Markup Language

### **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)

D2.5: Generic Conceptual Model, Version 3.4 (D2.5\_v3.4)

<http://inspire.ec.europa.eu/data-model/approved/r4618-ir/html/>

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

[http://seadatanet.maris2.nl/v\\_cdi\\_v3/search.asp](http://seadatanet.maris2.nl/v_cdi_v3/search.asp)

<http://gp.sea.gov.ua:8082/geoportal/>

## ANNEX 2 – Domains

### Article17SourceMethodValue\_v3

Type: Code Value Domain

Description: The methods that have been used in the sources for compiling the information for article 17 purposes. Describes how the information 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: 20/05/2015

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))

### 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-ir)

Value	Code
Albania	AL
Algeria	ZD
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: 20/05/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: 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 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: 20/05/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: SourceMethodType (OC)

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-ir)

<b>Value</b>	<b>Code</b>	<b>Definition</b>
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: 20/05/2015

Modified: none

Author: CNR-ISMAR

State: approved

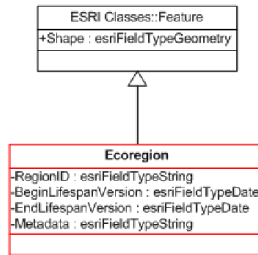
Used in: RelatedParty (OC)

Extensibility: yes

Note 1: none

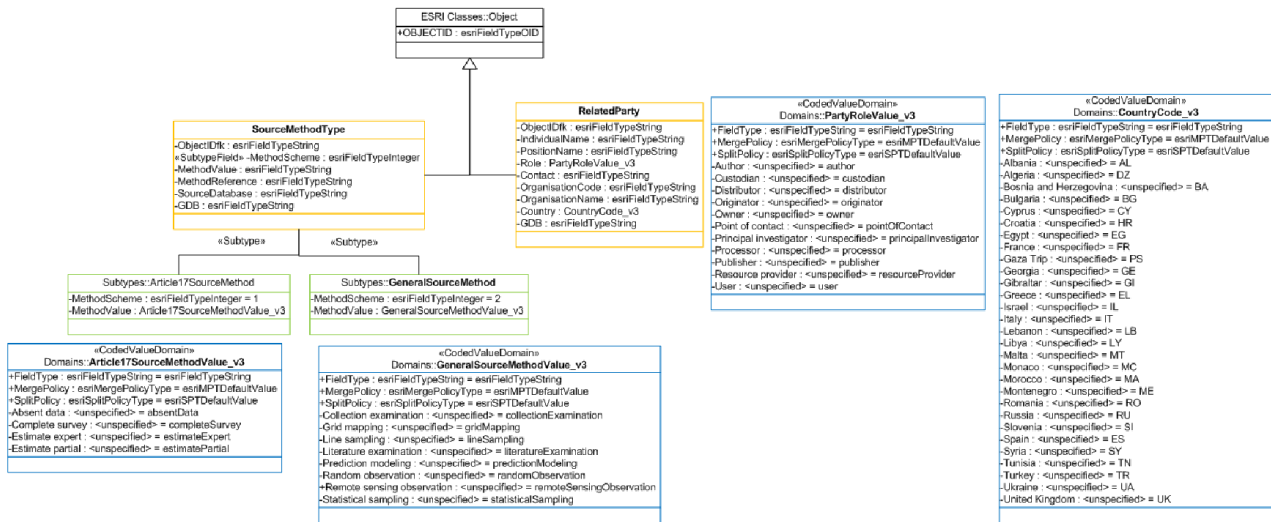
# Annex 3 –UML diagram

## Feature classes



Feature Class: red

## Object classes

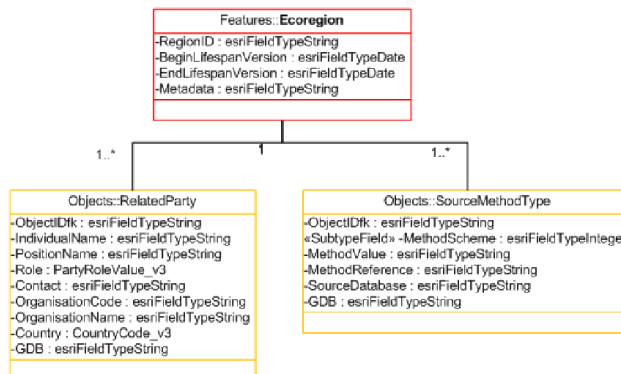


Object Class: orange

Subtype: green

Domain: blue

## Relationship classes



Feature Class: red

Object Class: orange

**Annex 4 – Layer visualization**