



Elevation Geodatabase Guide

Version 3.0

WP9 Data Management and Synthesis

Valentina Grande, Federica Foglini

CNR-ISMAR, Bologna, Italy

April 2015

Table of contents

1.	Introduction.....	1
2.	Geodatabase design	1
3.	Geodatabase architecture.....	2
3.1.	Feature Dataset– ElevationVectorElements.....	3
3.1.1.	Feature Class: BathymetricSurface.....	3
3.1.2.	Feature Class: BreakLine.....	4
3.1.3.	Feature Class: ContourLine.....	5
3.1.4.	Feature Class: IsolatedArea	5
3.1.5.	Feature Class: SpotElevation	6
3.1.6.	Feature Class. VoidArea.....	6
3.2.	Feature Dataset: ElevationGrigCoverage	7
3.3.	Raster Catalog: ElevationRasterCatalog	7
3.3.1.	Bathymetry	8
3.3.2.	Bathymetry_hillshade.....	8
3.3.3.	Elevation	8
3.4.	Object Classes	8
3.4.1.	Object Class: ChartDatum.....	8
3.4.2.	Object Class: SourceMethodType.....	9
3.4.3.	Object Class: RelatedParty.....	9
3.5.	Relationship Classes	10
4.	Metadata	16

ANNEX 1 – Acronyms and References

ANNEX 2 – Domains

ANNEX 3 – UML diagram

ANNEX 4 – Layer visualization

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 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 Elevation 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 Elevation Geodatabase can store spatial data (vector, grid and raster) and nonspatial data (.dbf).

The Elevation 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 Elevation Geodatabase consists of two Feature Dataset, the first one named ElevationVectorElements is used to store vector data (BathymetrySurface, BreakLine, ContourLine, IsolatedArea, SpotElevation, VoidArea), the second one named ElevationGridCoverage is used to store grid data (in this version of the Geodatabase the Feature Classes for this Feature Dataset have not been implemented). There is a Raster

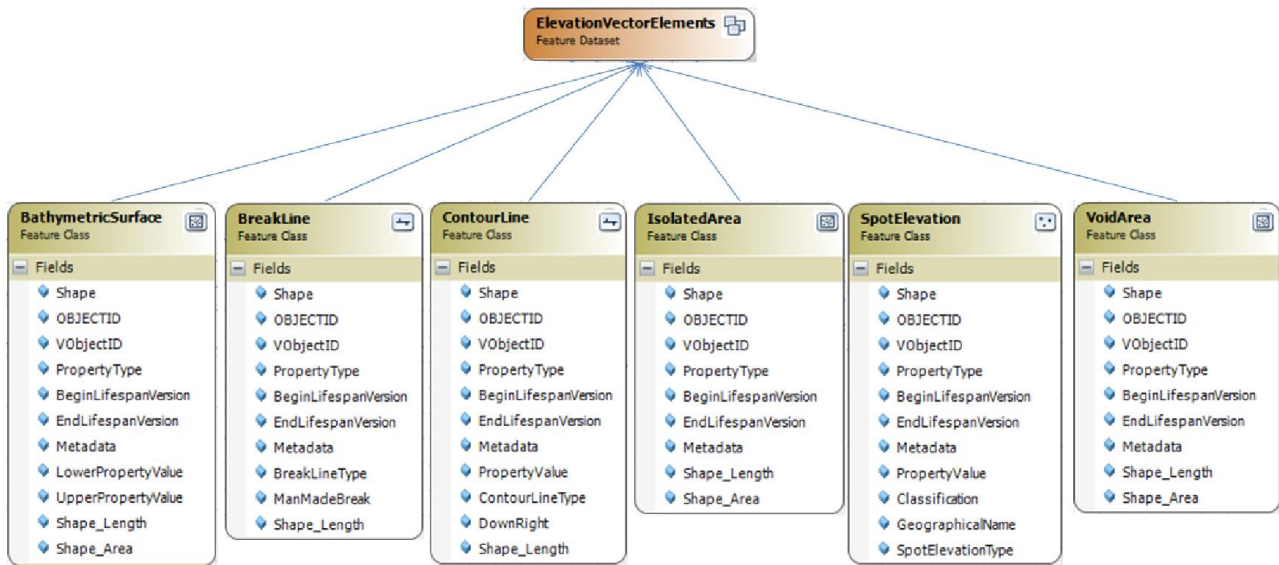
Catalog named ElevationRasterCatalog to store and describe raster data (Bathymetry, BathymetryHillshade and Elevation). Lastly, in the Geodatabase there are three tables: ChartDatum, RelatedParty and SourceMethodType. The tables are linked to the Feature Classes though Relationship Classes. Domains and Subtypes are present In the Feature Classes and in the Object Classes.

3.1. Feature Dataset- ElevationVectorElements

Elevation spatial object forming part of a vector data set, which participates in the description of the elevation property of a real world surface. It consists of an identity base for all vector objects which can be included as part of an elevation data set (D2.8.II.1_v3.0).The Feature Dataset consists of six Feature Classes:

- BathymetricSurface
- BreakLine
- ContourLine
- IsolatedArea
- SpotElevation
- VoidArea

GeometryType: None



3.1.1. Feature Class: BathymetricSurface

The Feature Class collects the zoning of the protected site. Several sites have a regulation plan that defines internal zones with different kind of protection. This areas are represented by polygons with a different color based on the protection degree.

GeometryType: Polygon

Field	Type	Restriction	Description
VObjectID	String	None	Identification string of the elevation object .
ElevationPropertyType	String	Code Value Domain	Attribute categorizing the elevation vector object as a land-elevation or a bathymetry spatial object. It determines the elevation property represented by the

			object (D2.8.II.1_v3.0).
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (D2.8.II.1_v3.0).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (D2.8.II.1_v3.0).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.
LowerPropertyValue	Integer	None	Lower value of the elevation property of the object referred to a specific vertical coordinate reference system.
UpperPropertyValue	Integer	None	Upper value of the elevation property of the object referred to a specific vertical coordinate reference system.

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

3.1.2. Feature Class: BreakLine

A line of a critical nature which describes the shape of an elevation surface and indicates a discontinuity in the slope of the surface (i.e. an abrupt change in gradient). Triangles included within a TIN model must never cross it (D2.8.II.1_v3.0).

GeometryType: Polyline

Field	Type	Restriction	Description
VObjectID	String	None	Identification string of the elevation object .
ElevationPropertyType	String	Domain	Attribute categorizing the elevation vector object as a land-elevation or a bathymetry spatial object. It determines the elevation property represented by the object (D2.8.II.1_v3.0).
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (D2.8.II.1_v3.0).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (D2.8.II.1_v3.0).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.
BreakLineType	String	Code Value Domain	The type of break line with regard the natural or man-made real world characteristic it represents, or the specific function it has in calculating a Digital Elevation Model (DEM) (D2.8.II.1_v3.0).
ManMadeBreak	String	Boolean Domain	Line which represents an elevation break due to an artificial or man-made construction present on the terrain (D2.8.II.1_v3.0).

3.1.3. Feature Class: ContourLine

Linear spatial object composed of a set of adjoining locations characterized by having the same elevation property value. It describes, together with other contour lines present in the area, the local morphology of the Earth's surface (D2.8.II.1_v3.0).

GeometryType: Polyline

Field	Type	Restriction	Description
VObjectID	String	None	Identification string of the elevation object .
ElevationPropertyType	String	Code Value Domain	Attribute categorizing the elevation vector object as a land-elevation or a bathymetry spatial object. It determines the elevation property represented by the object (D2.8.II.1_v3.0).
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (D2.8.II.1_v3.0).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (D2.8.II.1_v3.0).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.
PropertyValue	Integer	None	Value of the elevation property of the object referred to a specific vertical coordinate reference system (D2.8.II.1_v3.0).
ContourLineType	String	Code Value Domain	The type of contour line with regard to the normal contour vertical interval (if any) (D2.8.II.1_v3.0).
DownRight	String	Boolean Domain	Property indicating that the contour line spatial object is digitized in a way that the height of the elevation surface is lower at the right side of the line. Note1 In the case of the contour lines, when the Downright attribute is "True" this indicates that the height of the surface is lower at the right side of the line (D2.8.II.1_v3.0).

3.1.4. Feature Class: IsolatedArea

Delimitation of an area of the Earth's surface where an isolated part of the elevation model exists. Its outside surroundings have no elevation information (D2.8.II.1_v3.0).

GeometryType: Polygon

Field	Type	Restriction	Description
VObjectID	String	None	Identification string of the elevation object.
ElevationPropertyType	String	Code Value Domain	Attribute categorizing the elevation vector object as a land-elevation or a bathymetry spatial object. It determines the elevation property represented by the object (D2.8.II.1_v3.0).
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set.
EndLifespanVersion	Date	None	Date at which this version of the spatial object was

			superseded or retired in the spatial data set.
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.1.5. Feature Class: SpotElevation

Point spatial object which describes the elevation of an Earth's surface at a specific location. It provides a single elevation property value. NOTE 1 It often represents a singular point in the morphology of a land or water body's floor surface (D2.8.II.1_v3.0).

GeometryType: Point

Field	Type	Restriction	Description
VObjectID	String	None	Identification string of the elevation object
ElevationPropertyType	String	Code Value Domain	Attribute categorizing the elevation vector object as a land-elevation or a bathymetry spatial object. It determines the elevation property represented by the object (D2.8.II.1_v3.0).
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (D2.8.II.1_v3.0).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (D2.8.II.1_v3.0).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.
PropertyValue	Integer	None	Value of the elevation property of the object referred to a specific vertical coordinate reference system (D2.8.II.1_v3.0).
Classification	String	Code Value Domain	Class of spot elevation according to the LAS specification of the American Society for Photogrammetry and Remote Sensing (ASPRS) (D2.8.II.1_v3.0).
GeographicalName	String	None	A geographical name that is used to identify a named land or water body's floor location in the real world, which is represented by the spot elevation spatial object (D2.8.II.1_v3.0).
SpotElevationType	String	Code Value Domain	The type of elevation spot (D2.8.II.1_v3.0).

3.1.6. Feature Class. VoidArea

Area of the Earth's surface where the elevation model is unknown because of missing input data. This area shall be excluded from a DEM (D2.8.II.1_v3.0).

GeometryType: Polygon

Field	Type	Restriction	Description
VObjectID	String	None	Identification string of the elevation object .
ElevationPropertyType	String	Code Value	Attribute categorizing the elevation vector object as a

		Domain	land-elevation or a bathymetry spatial object. It determines the elevation property represented by the object (D2.8.II.1_v3.0).
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (D2.8.II.1_v3.0).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (D2.8.II.1_v3.0).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.2. Feature Dataset: ElevationGridCoverage

The dataset collects the Feature Classes with a continuous coverage which uses a systematic tessellation based on a regular rectified quadrilateral grid to cover its domain, where the elevation property value is usually known for each of the grid points forming this domain (D2.8.II.1_v3.0). In this version the dataset is empty.

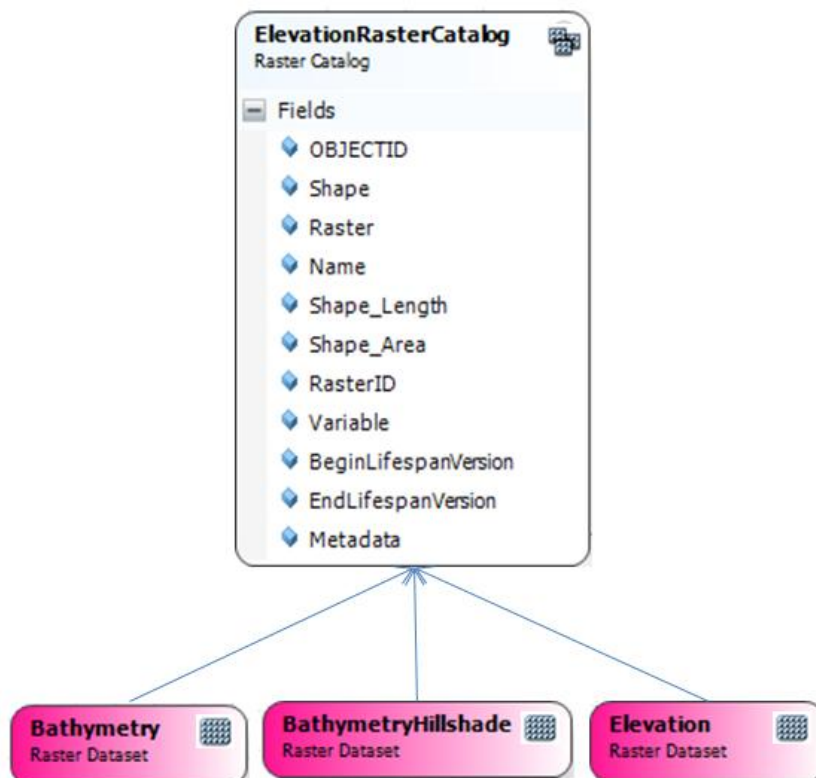
GeometryType: None



3.3. Raster Catalog: ElevationRasterCatalog

The Catalog accumulates elevation raster data information.

GeometryType: Polygon



Field	Type	Restriction	Description
Raster	Raster	None	The field contains the raster image as attachment.
Name	String	None	Name of the raster.
RasterID	String	None	Identification string of the raster.
Variable	String	None	Z variable of the raster.
BeginLifespanVersion	Date	None	Date at which this version of the raster was inserted or changed in the spatial data set (D2.8.II.1_v3.0).
EndLifespanVersion	Date	None	Date at which this version of the raster was superseded or retired in the spatial data set (D2.8.II.1_v3.0).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.3.1. Bathymetry

Digital Terrain Model coverage for Mediterranean Sea and Black Sea.

GeometryType: Raster

3.3.2. Bathymetry_hillshade

Hillshade of the Bathymetry DTM.

GeometryType: Raster

3.3.3. Elevation

Digital Elevation Model coverage for Mediterranean region and Black Sea region.

GeometryType: Raster

3.4. Object Classes

3.4.1. Object Class: ChartDatum

Local vertical coordinate reference system which is used to refer and portray depth measurements as property values. NOTE This data type is intended to describe the main characteristics of a vertical CRS for measurement of depths in cases where this information is rarely or not available through a CRS registry (e.g. like EPSG) (D2.8.II.1_v3.0).

Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the elevation object. The field is used as foreign key.
DatumWaterLevel	String	Code Value Domain	Water level determining the origin of the depth measurements for the chart datum (EXAMPLE high water, low water, etc.) (D2.8.II.1_v3.0).
Offset	Double	None	Relative difference between the height of each reference point and the height of the water level determining the chart datum (INSPIRE Directive, r4618).
Scope	String	None	Geographic scope in which the local depth datum is practically used (D2.8.II.1_v3.0).

3.4.2. Object Class: SourceMethodType

Contains metadata about specific instances of elevation object. Refers to the methods on how observations have been made or recorded.

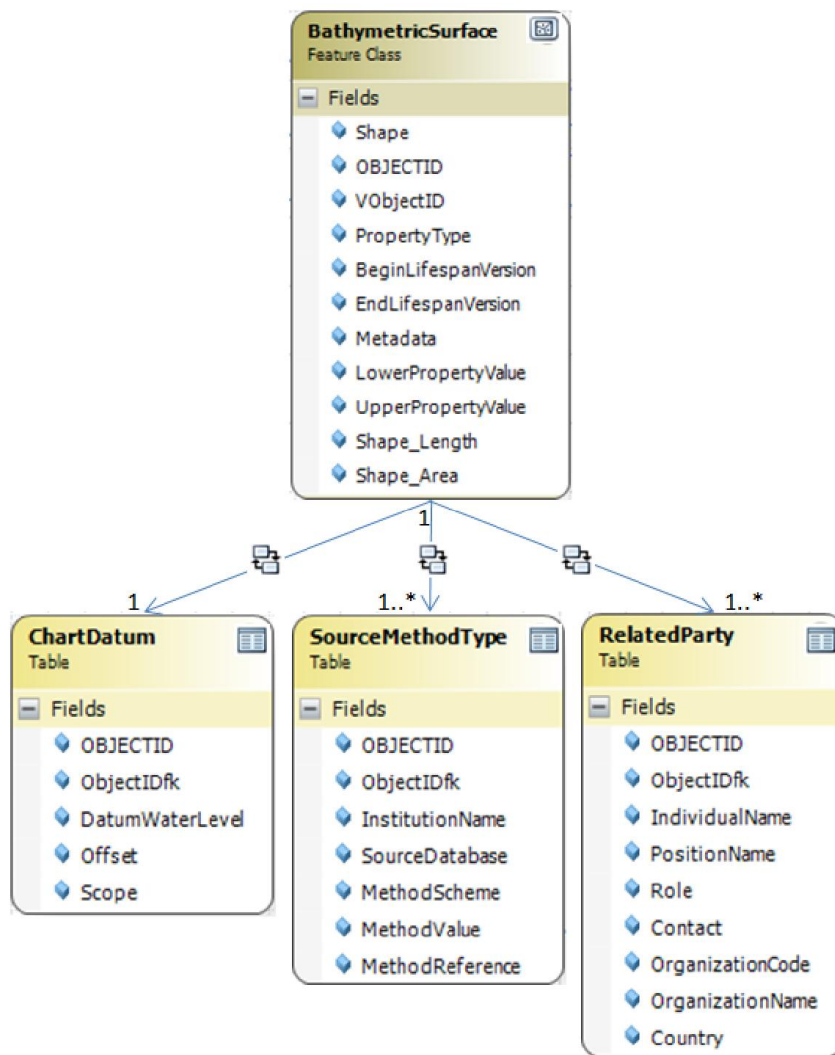
Campo	Tipo	Limitazioni	Definizione
ObjectIDfk	String	None	Identification string of the elevation object. The field is used as foreign key.
InstitutionName	String	None	Name of the owner or operator of the source database.
MethodScheme	String	None	Scheme used to compiling the Method Value field (Article17SourceMethodValue or GeneralSourceMethod).
MethodValue	String	None	Method by which the data on elevation object is collected.
MethodReference	String	None	A reference to a description of the method by which the data on elevation object is collected.
SourceDatabase	String	None	Name of the database where the elevation object data is retrieved from.

3.4.3. Object Class: RelatedParty

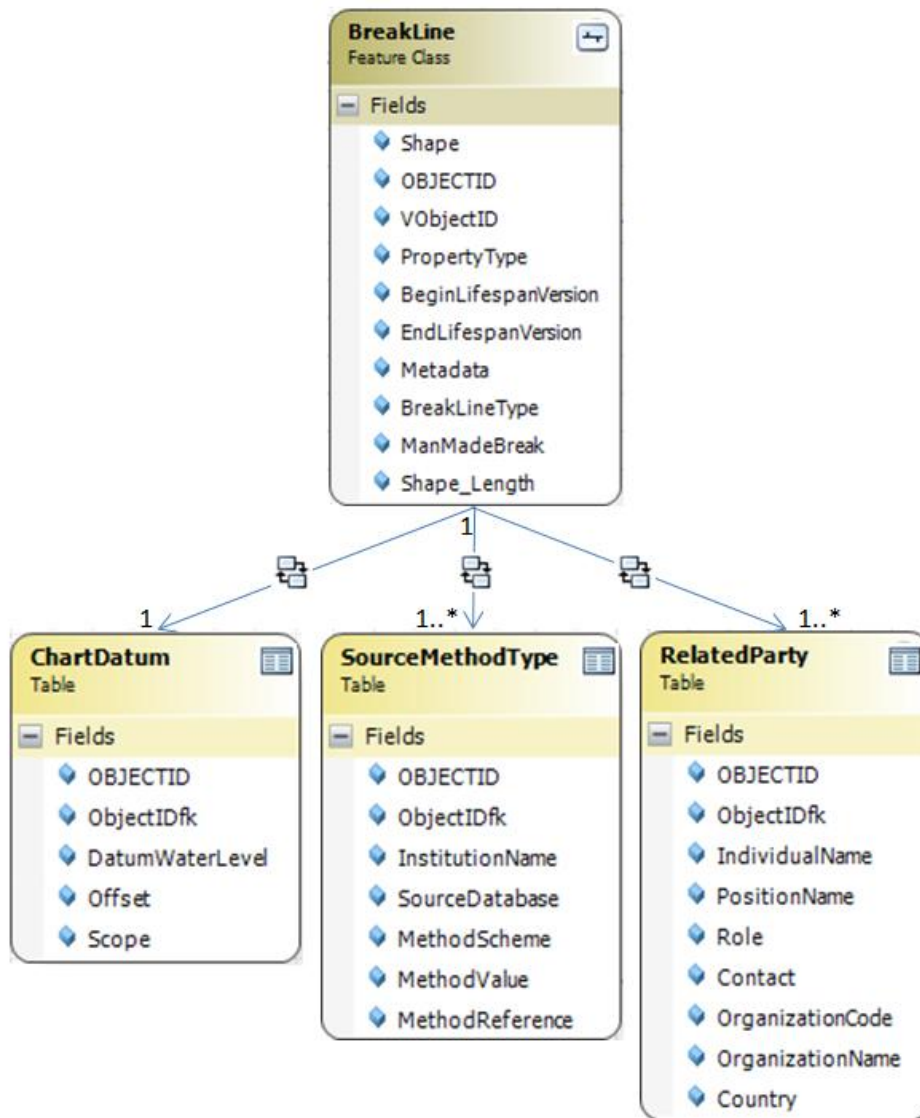
An organization or a person with a role related to a resource (INSPIRE Directive, r4618).

Campo	Tipo	Limitazioni	Definizione
ObjectIDfk	String	None	Identification string of the elevation object. The field is used as foreign key.
IndividualName	String	None	Name of the related party (D2.8.II.1_v3.0).
PositionName	String	None	Position of the party in relation to a resource, such as head of department (D2.8.II.1_v3.0).
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 (D2.8.II.1_v3.0).
OrganizationCode	String	None	Code of the related organization.
OrganizationName	String	None	Name of the related organization (D2.8.II.1_v3.0).
Country	String	Code Value Domain	Country of the related organization.

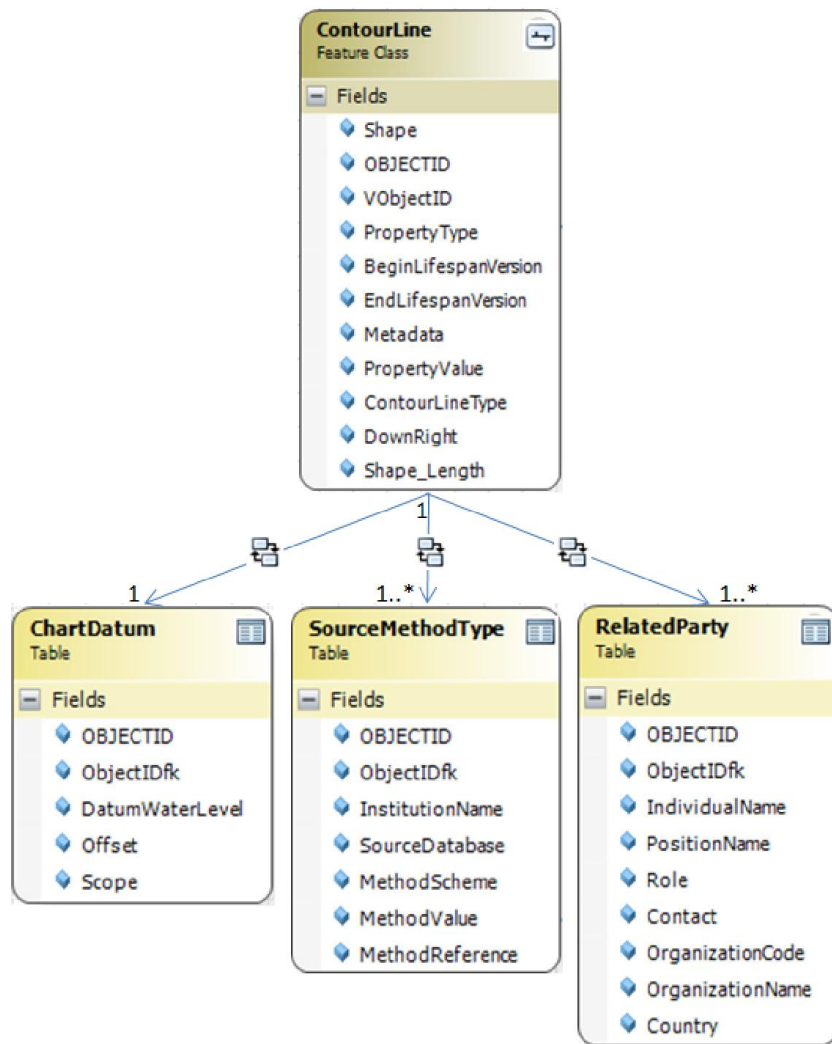
3.5. Relationship Classes



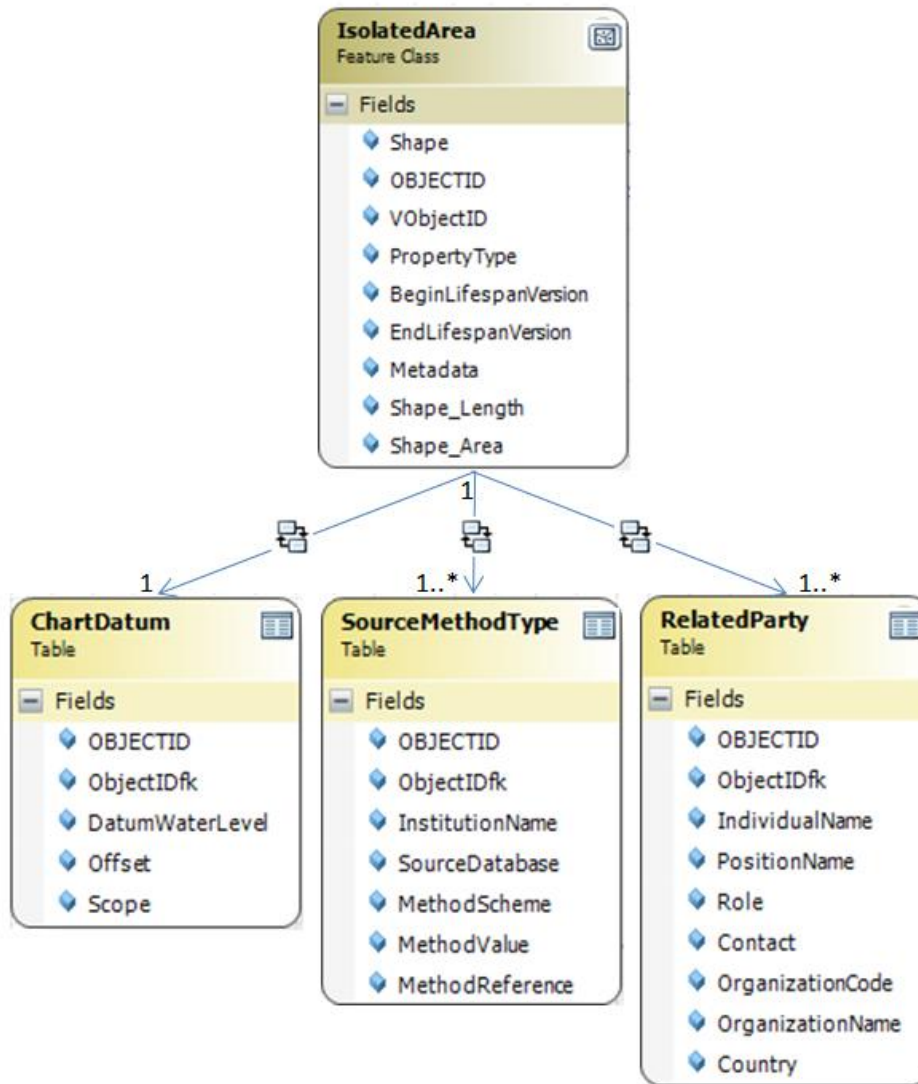
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
BathymetrySurfaceHas ChartDatum	1→1	BathymetrySurface	ChartDatum	VObjectID	ObjectdIDfk
BathymetrySurfaceHas SourceMethdoType	1→1..*	BathymetrySurface	SourceMethodType	VObjectID	ObjectdIDfk
BathymetrySurfaceHas RelatedParty	1→1..*	BathymetrySurface	RelatedParty	VObjectID	ObjectdIDfk



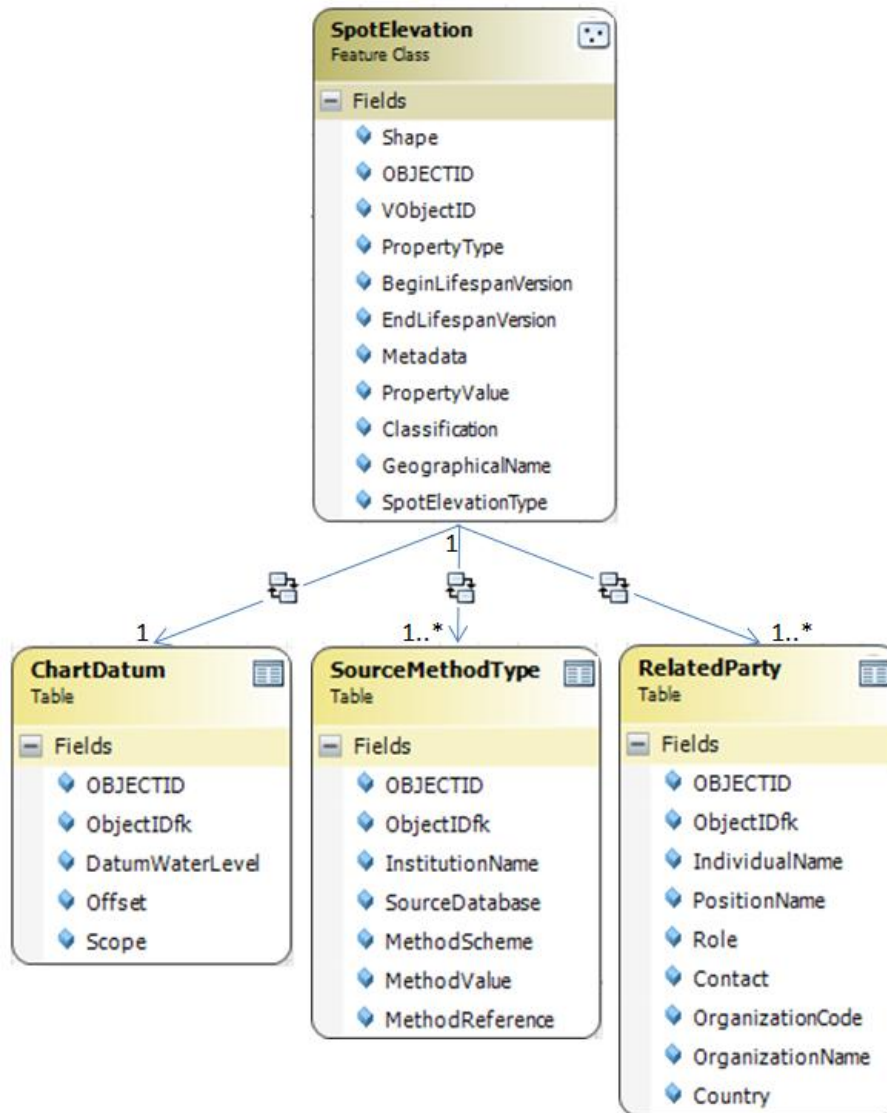
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
BreckLineHas ChartDatum	1→1	BreckLine	ChartDatum	VObjectID	ObjectdIDfk
BreckLineHas SourceMethdoType	1→1..*	BreckLine	SourceMethodType	VObjectID	ObjectdIDfk
BreckLineHas RelatedParty	1→1..*	BreckLine	RelatedParty	VObjectID	ObjectdIDfk



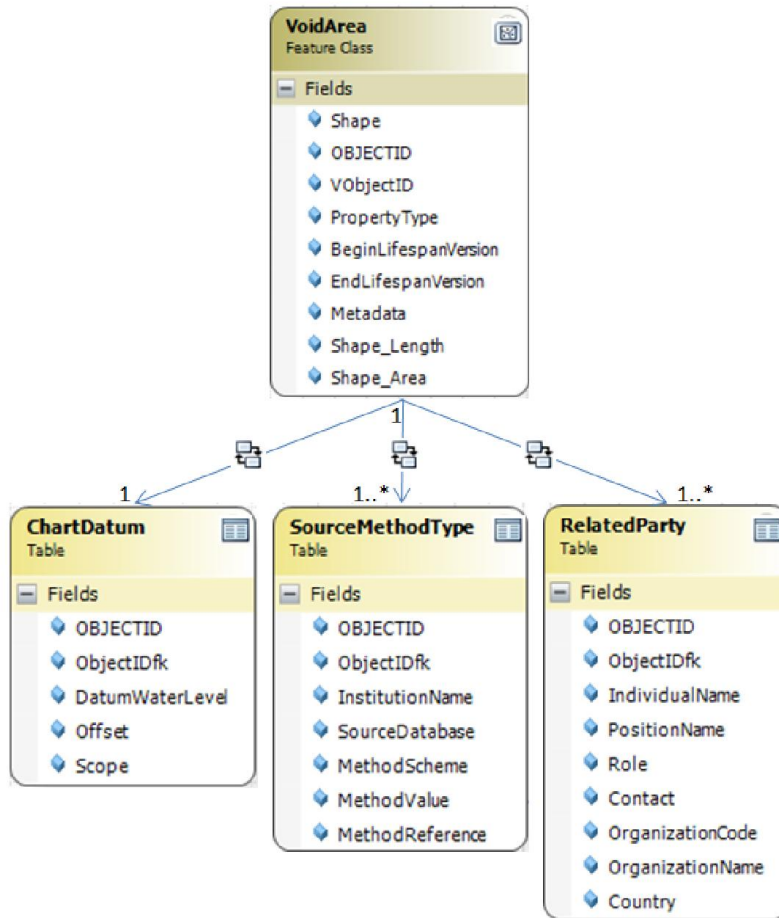
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
ContourLineHas ChartDatum	1→1	ContourLine	ChartDatum	VObjectID	ObjectdIDfk
ContourLineHas SourceMethdoType	1→1..*	ContourLine	SourceMethodType	VObjectID	ObjectdIDfk
ContourLineHas RelatedParty	1→1..*	ContourLine	RelatedParty	VObjectID	ObjectdIDfk



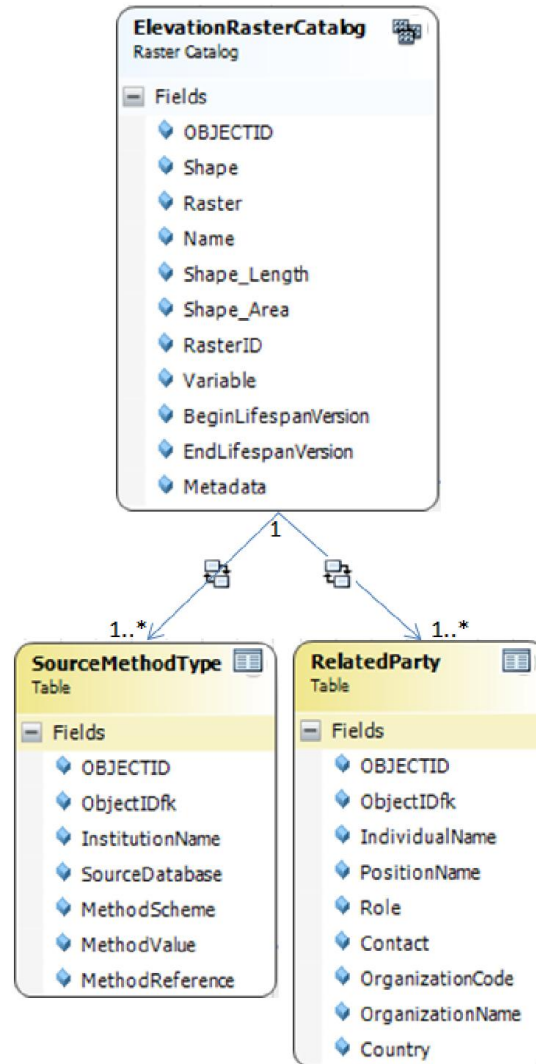
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
IsolatedAreaHas ChartDatum	1→1	IsolatedArea	ChartDatum	VObjectID	ObjectdIDfk
IsolatedAreaHas SourceMethdoType	1→1..*	IsolatedArea	SourceMethodType	VObjectID	ObjectdIDfk
IsolatedAreaHas RelatedParty	1→1..*	IsolatedArea	RelatedParty	VObjectID	ObjectdIDfk



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
SpotElevationHas ChartDatum	1→1	SpotElevation	ChartDatum	VObjectID	ObjectdIDfk
SpotElevationHas SourceMethdoType	1→1..*	SpotElevation	SourceMethodType	VObjectID	ObjectdIDfk
SpotElevationHas RelatedParty	1→1..*	SpotElevation	RelatedParty	VObjectID	ObjectdIDfk



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
VoidAreaHas ChartDatum	1→1	VoidArea	ChartDatum	VObjectID	ObjectdIDfk
SVoidAreaHas SourceMethdoType	1→1..*	VoidArea	SourceMethodType	VObjectID	ObjectdIDfk
VoidAreaHas RelatedParty	1→1..*	VoidArea	RelatedParty	VObjectID	ObjectdIDfk



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
ElevationRasterCatalogHas SourceMethodType	1→1..*	ElevationRaster Catalog	SourceMethod Type	RasterID	ObjectdIDfk
ElevationRasterCatalogHas RelatedParty	1→1..*	ElevationRaster Catalog	RelatedParty	RasterID	ObjectdIDfk

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.II.1 INSPIRE Data Specification on Elevation – Technical Guidelines, 2013 (D2.8.II.1_v3.0)

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

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

<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 (D2.8.II.1_v3.0).

Value	Code	Definition
Absent data	absentData	Absent data
Complete survey	completeSurvey	Complete survey
Estimate expert	estimateExpert	Estimate based in expert opinion with no or minimal sampling
Estimate partial	estimatePartial	Estimate based on partial data with some extrapolation and/or modeling

Created: 08/04/2015

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).

Boolean_v3

Type: Code Value Domain

Definition: Most valuable in the predicate calculus, where items are either True or False, unless they are ill formed (D2.8.II.1_v3.0).

Value	Code
TRUE	true
FALSE	false

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: BreakLine (FC), ContourLine (FC)

Extensibility: none

Note 1: none

BreakLineTypeValue_v3

Type: Code Value Domain

Description: List of possible type values for break lines based on the physical characteristics of the break line [in the elevation surface] (D2.8.II.1_v3.0).

Value	Code
Bottom of slope	bottomOfSlope
Change in slope	changeInSlope
Flat area boundary	flatAreaBoundary
Form line	formLine
Top of slope	topOfSlope

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR
State: approved
Used in: BreakLine (FC)
Extensibility: none
Note 1: narrower

ContourLineTypeValue_v3

Type: Code Value Domain

Description: List of possible categories of contour lines based on the equidistance parameter of the data set (D2.8.II.1_v3.0).

Value	Code	Definition
Auxillary	auxillary	A supplementary contour – not corresponding to the normal contour vertical interval – estimated or interpolated from surrounding contours, used in areas where there is insufficient height information for elevation mapping purposes or to control the creation of a digital elevation model
Master	master	Contour at a vertical distance which is multiple to the equidistance parameter (corresponding to a certain multiple of the normal contour vertical interval) associated with the nominal scale
Ordinary	ordinary	Contour at the equidistance parameter (corresponding to the normal contour vertical interval) associated with the nominal scale, and which is not a master contour

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: ContourLine (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 (D2.8.II.1_v3.0).

Value	Code
Albania	AL
Algeria	ZD
Bosnia and Herzegovina	BA
Bulgaria	BG
Cyprus	CY
Croatia	HR
Egypt	EG
France	FR
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: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: RelatedParty (OC)

Extensibility: none

Note 1: none

ElevationPropertyTypeValue_v3

Type: Code Value Domain

Description: Enumeration type which determines the elevation property which has been measured or calculated (D2.8.II.1_v3.0).

Value	Code	Definition
Depth	depth	Elevation property measured along a plumb line in a direction coincident to Earth's gravity field (downwards)
Height	height	Elevation property measured along a plumb line in a direction opposite to Earth's gravity field (upwards)

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: BathymetrySurface (FC), BreakLine (FC), ContourLine (FC), IsolatedArea (FC), SpotElevation (FC), VoidArea (FC), ElevationGridCoverage (FD)

Extensibility: narrower

Note 1 An elevation property is a vertically-constrained dimensional property of an element consisting of an absolute measure referenced to a well-defined surface which is commonly taken as origin (geoid, water level, etc.) (D2.8.II.1_v3.0).

Note 2 It does not include relative elevations of the element referenced to other spatial objects (D2.8.II.1_v3.0).

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
Grid mapping	gridMapping	Data observations collected by systematic surveys

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

Created: 08/04/2015

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 (D2.8.II.1_v3.0).

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

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: RelatedParty (OC)

Extensibility: yes

Note 1: none

SpotElevationClassValue_v3

Type: Code Value Domain

Description: Possible classification values for spot elevations based on the LAS specification maintained by the American Society for Photogrammetry and Remote Sensing (ASPRS) (D2.8.II.1_v3.0).

Value	Code
Building	building
Created, never classified	created, never classified
Ground	ground
High vegetation	high vegetation
Low point (noise)	low point (noise)
Low vegetation	low vegetation
Medium vegetation	medium vegetation
Model key point	model key point
Overlap points	overlap points
Unclassified	unclassified
Water	water

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: SpotElevation (FC)

Extensibility: yes

Note 1: These classes are proposed regardless of the acquisition method of the spot elevation. They correspond to the ASPRS Standard LIDAR Point Classes (D2.8.II.1_v3.0).

SpotElevationTypeValue_v3

Type: Code Value Domain

Description: Possible values for spot elevation points that describe a singularity of the surface (D2.8.II.1_v3.0).

Value	Code
Depression	depression
Form spot	Form spot
Generic	generic
Pass	pass
Summit	summit

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: SpotElevation (FC)

Extensibility: narrower

Note 1: none

SurfaceTypeValue_v3

Type: Code Value Domain

Description: Enumeration type which determines the elevation surface with regard to its relative adherence to the Earth's bare surface (D2.8.II.1_v3.0).

Value	Code	Definition
Digital Elevation Model	DEM	Digital elevation model (DEM). A digital model or 3D representation of a terrain's surface created from terrain elevation data.
Digital Terrain Model	DTM	Digital terrain model. Example: buildings, bridges or vegetation do not form part of a DTM

Digital Surface Model	DSM	Digital surface model. Example 1: Vegetation, buildings and bridges are examples of static features. Example 2: Cars, trucks and other dynamic feature are examples of temporary phenomena
-----------------------	-----	--

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

Used in: ElevationGridCoverage (FD)

Extensibility: yes

Note 1: none

WaterLevelValue_v3

Type: Code Value Domain

Description: The tidal datum / waterlevel to which depths and heights are referenced. SOURCE

[Codelist values based on DFDD] (D2.8.II.1_v3.0).

Value	Code	Definition
Equinoctial spring low water	equinoctialSpringLowWater	The level of low water springs near the time of an equinox
Higher high water	higherHighWater	The highest of the high waters (or single high water) of any specific tidal day due to the declination A1 effects of the moon and sun
Higher high water large tide	higherHighWaterLargeTide	The average of the highest high waters, one from each of 19 years of observations
Highest astronomical tide	highestAstronomicalTide	The highest tidal level, which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions
Highest high water	highestHighWater	The highest water level observed at a location
High water	highWater	The highest level reached at a location by the water surface in one tidal cycle
High water springs	highWaterSprings	An arbitrary level, approximating that of mean high water springs
Indian spring high water	indianSpringHighWater	A tidal surface datum approximating the level of the mean of the higher high water at spring tides
Indian spring low water	indianSpringLowWater	A tidal surface datum approximating the level of the mean of the lower low water at spring tides
Local datum	localDatum	An arbitrary datum defined by an authority of a local harbour, from which levels and tidal heights are measured by that authority
Lower low water	lowerLowWater	The lowest of the low waters (or single low water) of any specified tidal day due to the declination A1 effects of the moon and sun
Lower low water large tide	lowerLowWaterLargeTide	The average of the lowest low waters, one from each of 19 years of observations
Lowest astronomical tide	lowestAstronomicalTide	The lowest tide level that can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions
Lowest low water	lowestLowWater	An arbitrary level conforming to the lowest tide observed at a location, or somewhat lower

Lowest low water springs	lowestLowWaterSprings	An arbitrary level conforming to the lowest water level observed at a location at spring tides during a period shorter than 19 years
Low water	lowWater	An approximation of mean low water adopted as the reference level for a limited region, espective of better determinations later
Low water datum	lowWaterDatum	An approximation of mean low water that has been adopted as a standard reference for a limited area
Low water springs	lowWaterSprings	A level approximating that of mean low water springs
Mean higher high water	meanHigherHighWater	The average height of higher high waters at a location over a 19-year period
Mean higher high water springs	meanHigherHighWaterSprings	The average height of higher high water at spring tides at a location
Mean higher low water	meanHigherLowWater	The average of the higher low water height of each tidal day observed over a National Tidal Datum Epoch
Mean high water	meanHighWater	The average height of all high waters at a location over a 19-year period
Mean high water neaps	meanHighWaterNeaps	The average height of the high waters of the neap tide
Mean high water springs	meanHighWaterSprings	The average height of the high waters of spring tides
Mean lower high water	meanLowerHighWater	The average of the lower high water height of each tidal day observed over a National Tidal Datum Epoch
Mean lower low water	meanLowerLowWater	The average height of the lower low waters at a location over a 19-year period
Mean lower low water spring	meanLowerLowWaterSprings	The average height of lower low water at spring tides at a location
Mean low water	meanLowWater	The average height of all low waters at a location over a 19-year period
Mean low water neaps	meanLowWaterNeaps	The average height of the low waters of the neap tide
Mean low water springs	meanLowWaterSprings	The average height of the low waters of spring tides
Mean sea level	meanSeaLevel	The average height of the sea at a tide station measured from a fixed predetermined reference level
Mean tide level	meanTideLevel	The arithmetic mean of mean high water and mean low water
Mean water level	meanWaterLevel	The average of all hourly water levels over the available period of record
Nearly highest high water	nearlyHighestHighWater	An arbitrary level approximating the highest water level observed at a location, usually equivalent to the high water springs
Nearly lowest low water	nearlyLowestLowWater	A level approximating the lowest water level observed at a location, usually equivalent to Indian spring low water.

Tropic higher high water	tropicHigherHighWater	The highest of the high waters (or single high water) of the tides occurring semimonthly when the effect of the Moon's maximum declination is greatest
Tropic lower low water	tropicLowerLowWater	The lowest of the low waters (or single low water) of the tides occurring semimonthly when the effect of the Moon's maximum declination is greatest

Created: 08/04/2015

Modified: none

Author: CNR-ISMAR

State: approved

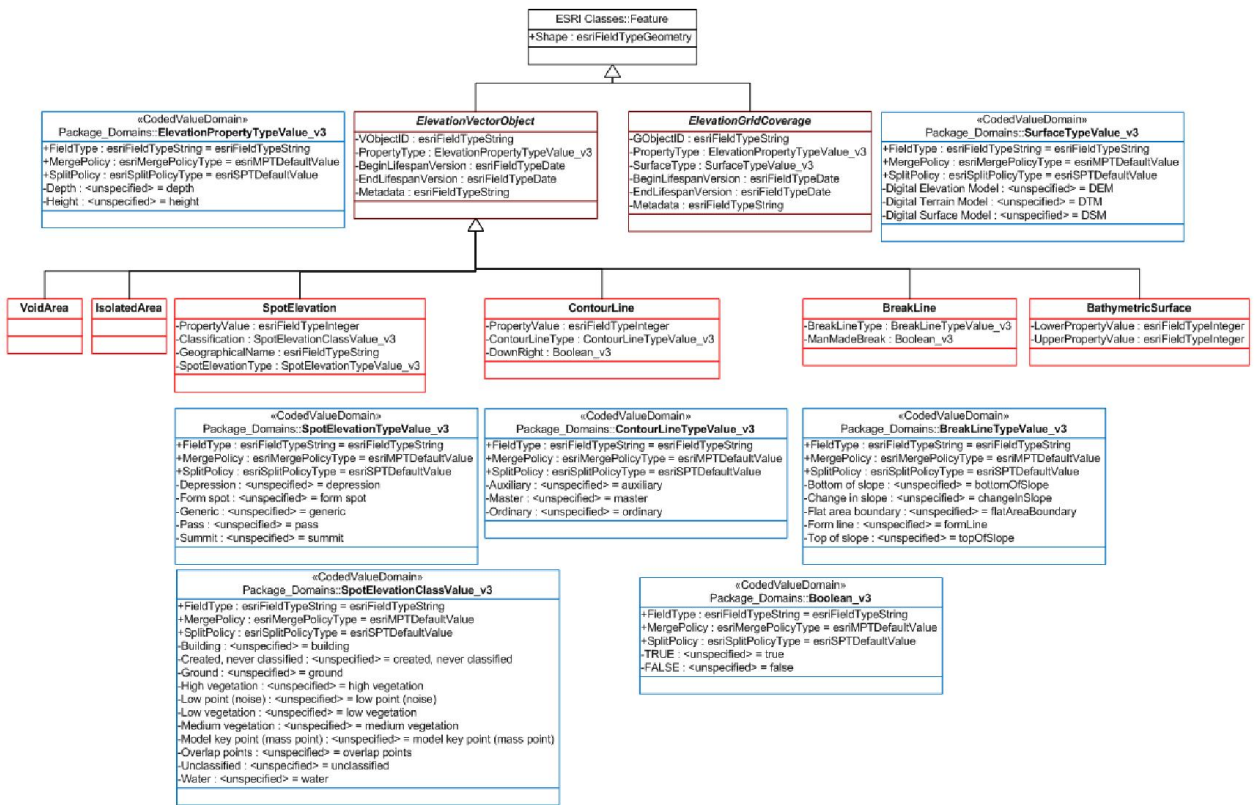
Used in: ChartDatum (OC)

Extensibility: yes

Note 1: none

Annex 3 –UML diagram

Feature classes

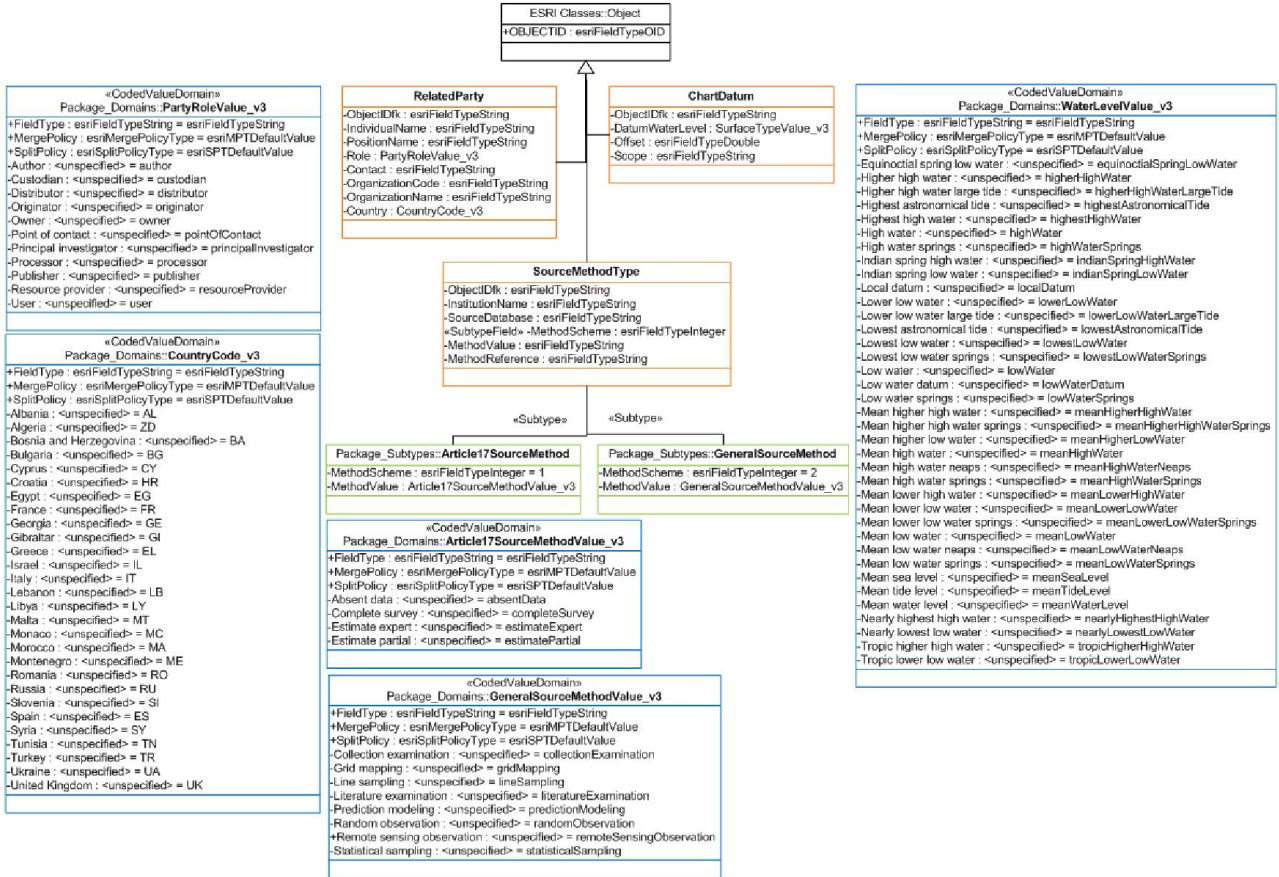


Feature Class (abstract): brown

Feature Class: red

Domain: blue

Object classes

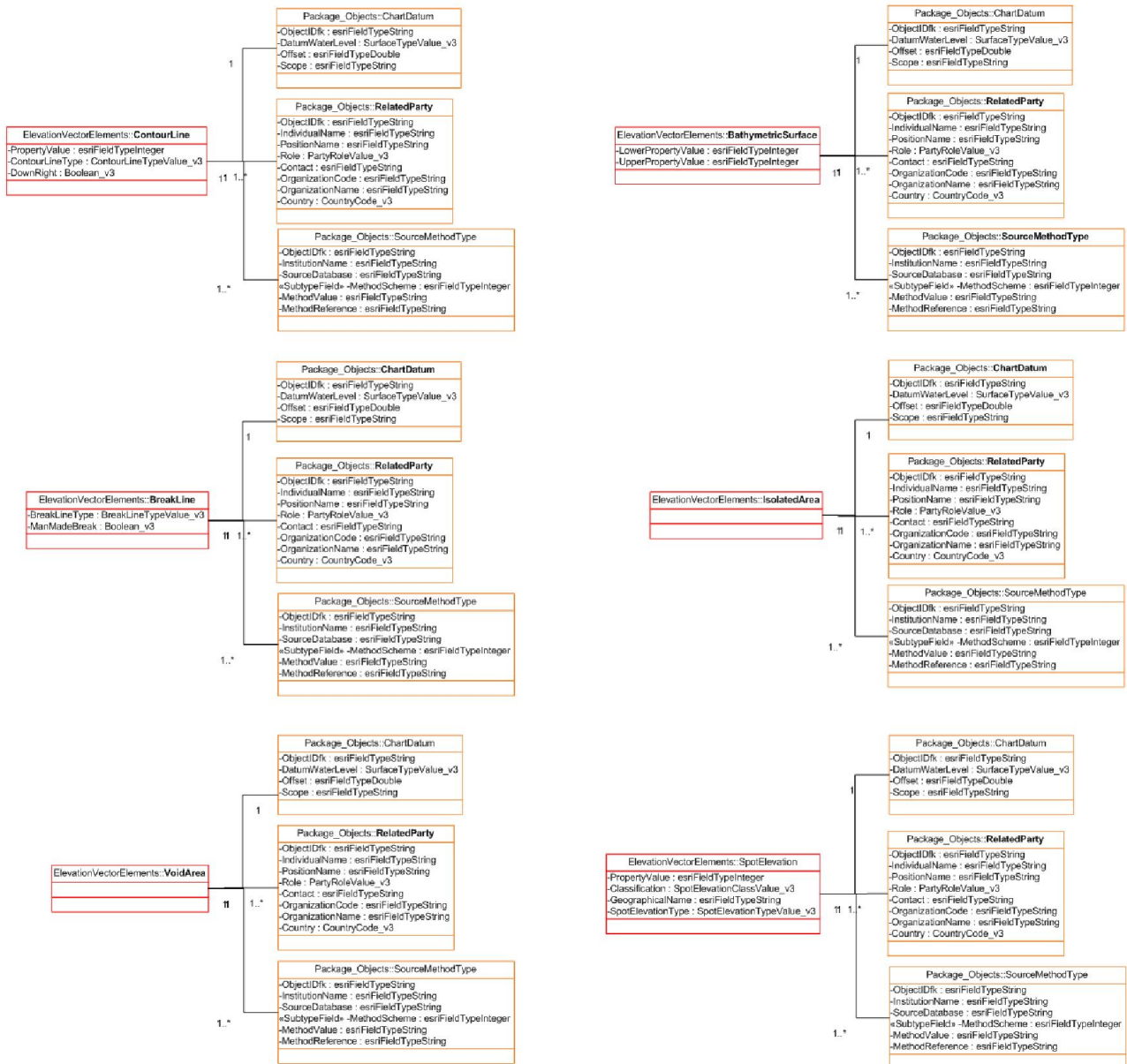


Object Class: orange

Subtype: green

Domain: blue

Relationship classes



Feature Class: red
Object Class: orange

Annex 4 – Layer visualization