[F1 ANNEX III

REQUIREMENTS FOR SPATIAL DATA THEMES LISTED IN ANNEX II TO DIRECTIVE 2007/2/EC

Textual Amendments

F1 Inserted by Commission Regulation (EU) No 1253/2013 of 21 October 2013 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC as regards interoperability of spatial data sets and services.

1. ELEVATION

1.1. Definitions

In addition to the definitions set out in Article 2, the following definitions shall apply:

(1) ‘digital elevation model’ (DEM) means Digital Surface Model (DSM) or Digital Terrain Model (DTM).

(2) ‘digital surface model’ (DSM) means a surface describing the three dimensional shape of the Earth's surface, including all static features placed on it. Temporary phenomena do not form part of the surface, but due to the technical difficulties in removing them some of these features may also be present in the surface.

(3) ‘digital terrain model’ (DTM) means a surface describing the three dimensional shape of the Earth's bare surface, excluding as possible any other features placed on it.

(4) ‘elevation’ means a vertically-constrained dimensional property of an spatial object consisting of an absolute measure referenced to a well-defined surface which is commonly taken as origin.

(5) ‘height’ means an elevation property measured along a plumb line in a direction opposite to Earth's gravity field (upwards).

(6) ‘depth’ means an elevation property measured along a plumb line in a direction coincident to Earth's gravity field (downwards).

1.2. Structure of the Spatial Data Theme Elevation

The types specified for the spatial data theme Elevation are structured in the following packages:

— Elevation – Base Types
— Elevation – Grid Coverage
— Elevation – Vector Elements
— Elevation – TIN

Spatial data sets describing the morphology of land elevation shall be made available at least using the spatial object types included in the package Elevation – Grid Coverage.

Spatial data sets describing the morphology of bathymetry shall be made available at least using the spatial object types included in either the package Elevation – Grid Coverage or the package Elevation – Vector Elements.

1.3. Elevation – Base Types

1.3.1. *Enumerations*

1.3.1.1. Elevation Property Type (ElevationPropertyTypeValue)

Enumeration type which determines the elevation property which has been measured or calculated.
Values for the enumeration ElevationPropertyTypeValue

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

1.3.1.2. Surface Type (SurfaceTypeValue)

Enumeration type which determines the elevation surface with regard to its relative adherence to the Earth's bare surface.
Values for the enumeration SurfaceTypeValue

Value	Definition
DTM	Digital terrain model.
DSM	Digital surface model.

1.4. **Elevation – Grid Coverage.**

1.4.1. *Spatial object types*

The package Elevation – Grid Coverage contains the spatial object type Elevation Grid Coverage.

1.4.1.1. Elevation Grid Coverage (ElevationGridCoverage)

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.

This type is a sub-type of RectifiedGridCoverage.
Attributes of the spatial object type ElevationGridCoverage

Attribute	Definition	Type	Voidability
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
domainExtent	Extent of the spatiotemporal domain of the coverage.	EX_Extent	

endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable
inspireId	External object identifier of the spatial object.	Identifier	
propertyType	Attribute determining the elevation property represented by the elevation grid coverage.	ElevationPropertyTypeValue	
surfaceType	Attribute indicating the type of elevation surface that the coverage describes in relation to the Earth's bare surface.	SurfaceTypeValue	

Association roles of the spatial object type ElevationGridCoverage

Association role	Definition	Type	Voidability
contributingElevationGridCoverage	Reference to the elevation grid coverages that compose an aggregated elevation grid coverage. The association has additional properties as defined in the association class ElevationGridCoverageAggregation.	ElevationGridCoverage	

Constraints of the spatial object type ElevationGridCoverage

The grid dimension shall always be 2 for an elevation grid coverage.

The domainExtent shall be at least populated with a subtype of EX_GeographicExtent.

The coordinate reference system used to reference the grid shall be provided.

All the ElevationGridCoverage instances, to which an aggregated ElevationGridCoverage instance refers, shall share the same orientation of grid axes and the same grid spacing in each direction.

The origin of the grid shall be described in two dimensions.

The values in the range set shall be described by the Float type.

1.4.2. *Data types*

1.4.2.1. Elevation Grid Coverage Aggregation (ElevationGridCoverageAggregation)

Geometrical characteristics of the elevation grid coverage aggregation.

This type is an association class.
Attributes of the data type ElevationGridCoverageAggregation

Attribute	Definition	Type	Voidability
contributingFootprint	Geometric representation delineating the geographic area of the elevation grid coverage that contributes to the aggregated elevation grid coverage.	GM_MultiSurface	

1.5. Elevation - Vector Elements

1.5.1. *Spatial object types*

The package Elevation – Vector Elements contains the following spatial object types:
— Elevation Vector Object
— Spot Elevation
— Contour Line
— Breakline
— Void Area
— Isolated Area

1.5.1.1. Elevation Vector Object (ElevationVectorObject)

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.

This type is abstract.
Attributes of the spatial object type ElevationVectorObject

Attribute	Definition	Type	Voidability
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable

localDepthDatum	Identification of a local vertical coordinate reference system not included in a registry, which is used to refer depth measurements.	ChartDatum	
propertyType	Attribute categorizing the elevation vector object as a land-elevation or a bathymetry spatial object. It determines the elevation property represented by the object.	ElevationPropertyType	Value

1.5.1.2. Spot Elevation (SpotElevation)

Point spatial object which describes the elevation of an Earth's surface at a specific location. It provides a single elevation property value.

This type is a sub-type of ElevationVectorObject.
Attributes of the spatial object type SpotElevation

Attribute	Definition	Type	Voidability
classification	Class of spot elevation according to the LAS specification of the American Society for Photogrammetry and Remote Sensing (ASPRS).	SpotElevationClassValue	voidable
geographicalName	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.	GeographicalName	voidable
geometry	Represents the geometric properties of the spatial object.	GM_Point	
propertyValue	Value of the elevation property of the spatial object referred to a specific vertical	DirectPosition	

	coordinate reference system.		
spotElevationType	The type of elevation spot.	SpotElevationTypeValue	voidable

Constraints of the spatial object type SpotElevation

The dimension of the property value coordinate shall be 1

The property value shall be expressed referring to a vertical coordinate reference system

1.5.1.3. Contour Line (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.

This type is a sub-type of ElevationVectorObject.
Attributes of the spatial object type ContourLine

Attribute	Definition	Type	Voidability
contourLineType	The type of contour line with regard to the normal contour vertical interval (if any).	ContourLineTypeValue	voidable
downRight	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.	Boolean	voidable
geometry	Represents the geometric properties of the spatial object.	GM_Curve	
propertyValue	Value of the elevation property of the spatial object referred to a specific vertical coordinate reference system.	DirectPosition	

Constraints of the spatial object type ContourLine

The dimension of the property value coordinate shall be 1.

The property value shall be expressed referring to a vertical coordinate reference system.

1.5.1.4. Breakline (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.

This type is a sub-type of ElevationVectorObject.
Attributes of the spatial object type BreakLine

Attribute	Definition	Type	Voidability
breakLineType	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).	BreakLineTypeValue	
geometry	Represents the geometric properties of the spatial object.	GM_Curve	
manMadeBreak	Line which represents an elevation break due to a man-made construction present on the terrain.	Boolean	voidable

1.5.1.5. Void Area (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.

This type is a sub-type of ElevationVectorObject.
Attributes of the spatial object type VoidArea

Attribute	Definition	Type	Voidability
geometry	Represents the geometric properties of the spatial object.	GM_Surface	

1.5.1.6. Isolated Area (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.

This type is a sub-type of ElevationVectorObject.
Attributes of the spatial object type IsolatedArea

Attribute	Definition	Type	Voidability

geometry	Represents the geometric properties of the spatial object.	GM_Surface	

1.5.2. *Data types*

1.5.2.1. Chart Datum (ChartDatum)

Local vertical coordinate reference system which is used to refer and portray depth measurements as property values.
Attributes of the data type ChartDatum

Attribute	Definition	Type	Voidability
datumWaterLevel	Water level determining the origin of depth measurements for the chart datum.	WaterLevelValue	
offset	Relative difference between the height of each reference point and the height of the water level determining the chart datum.	Measure	
referencePoint	Geographical position(s) of: - Case A: a single point which is used to refer depth values within the geographical scope of the chart datum. - Case B: a set of points where water level measurements are performed to determine the water level of the chart datum.	GM_Point	
scope	Geographic scope in which the local depth datum is practically used.	EX_Extent	

1.5.3. *Enumerations*

1.5.3.1. Contour Line Type (ContourLineTypeValue)

List of possible categories of contour lines based on the equidistance parameter of the data set.
Values for the enumeration ContourLineTypeValue

Value	Definition
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	Contour at the equidistance parameter (corresponding to the normal contour vertical interval) associated with the nominal scale, and which is not a master contour.
auxiliary	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.

1.5.4. *Code lists*

1.5.4.1. Breakline Type (BreakLineTypeValue)

List of possible type values for break lines based on the physical characteristics of the break line [in the elevation surface].

The allowed values for this code list comprise the values specified in the table below and narrower values defined by data providers.
Values for the code list BreakLineTypeValue

Value	Name	Definition
bottomOfSlope	bottom of slope	Break line representing the lower boundary of an area having a constant slope in the terrain surface, typically varying approximately between 2° and 40°.
changeInSlope	change in slope	Break line representing a collection of adjoining points where the terrain has an abrupt change in slope.
flatAreaBoundary	flat area boundary	Break line that delimits an isolated part of the territory where the elevation model has to be constrained at the same elevation value.
formLine	form line	Break line representing a local direction in which the elevation surface being

		described takes the greatest slope.
topOfSlope	top of slope	Break line representing the upper boundary of an area having a constant slope in the terrain surface, typically varying approximately between 2° and 40°.

1.5.4.2. Spot Elevation Classification (SpotElevationClassValue)

Possible classification values for spot elevations based on the LAS specification maintained by the American Society for Photogrammetry and Remote Sensing (ASPRS).

The allowed values for this code list comprise any values defined by data providers.

Data providers may use the values specified in the INSPIRE Technical Guidance document on Elevation.

1.5.4.3. Spot Elevation Type (SpotElevationTypeValue)

Possible values for spot elevation points that describe a singularity of the surface.

The allowed values for this code list comprise the values specified in the table below and narrower values defined by data providers.
Values for the code list SpotElevationTypeValue

Value	Name	Definition
depression	depression	Point that represents a part of the relief of the land surface or water body's floor surface that is lower in elevation when compared to its surrounding points.
formSpot	form spot	A supplementary spot height, estimated or interpolated from surrounding heights, in areas where few contour lines or other height information exist.
generic	generic	Spot elevation spatial object not fulfilling the description of any of the other values in the current code list.
pass	pass	Lower point of a depression within a ridge alignment, generally opened along the crest line, which allow passing from one slope of the surface to another.

summit	summit	Highest point of a prominence in the relief of a land surface or a water body's floor surface.

1.6. **Elevation - TIN**

1.6.1. *Spatial object types*

The package ‘Elevation – TIN’ contains the spatial object type Elevation TIN.

1.6.1.1. Elevation TIN (ElevationTIN)

Collection of elevation spatial objects forming a particular tessellation of the space based on a Triangulated Irregular Network (TIN) according to the geometry GM_Tin defined in ISO 19107:2003. Its components are a set of control points whose elevation property values are known, and a set of break lines and stop lines.

Attributes of the spatial object type ElevationTIN

Attribute	Definition	Type	Voidability
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable
geometries	Represents the collection of geometric properties of the elevation TIN spatial object.	GM_Tin	
inspireId	External object identifier of the spatial object.	Identifier	
propertyType	Attribute determining the elevation property represented by the elevation TIN.	ElevationPropertyTypeValue	
surfaceType	Attribute indicating the type of elevation surface that the elevation TIN describes in relation to the Earth's bare surface.	SurfaceTypeValue	

1.7. Theme-specific Requirements

1.7.1. *Requirements on external object identifiers*

(1) If elevation data is updated based on new source data, the updated objects shall receive a new external object identifier.

1.7.2. *Requirements for Elevation Grid Coverages*

(1) By way of derogation from the requirement in Section 2.2 of Annex II, any grid compatible with one of the following coordinate reference systems may be used for making gridded Elevation data available:

— two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in 1.2 of Annex II and using the parameters of the GRS80 ellipsoid;

— plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system;

— plane coordinates using the ETRS89 Transverse Mercator coordinate reference system.

The grid specified in Section 2.2.1 of Annex II shall not be used.

(2) The *domainExtent* attribute of every *ElevationGridCoverage* instance shall be at least populated with a subtype of *the EX_GeographicExtent* type.

(3) The elevation property values included within the range set of a single ElevationGridCoverage shall be referenced to one and only one vertical coordinate reference system.

(4) All the ElevationGridCoverage instances, to which an aggregated ElevationGridCoverage instance refers, shall be consistent. This means that they shall share the same range type, Coordinate Reference System and resolution. They shall also support grid alignment, i.e. the grid points in one ElevationGridCoverage instance line up with grid points of the other ElevationGridCoverage instances, so that grid cells do not partially overlap.

(5) The contributing footprints of any two ElevationGridCoverage instances referred to by the same aggregated ElevationGridCoverage instance shall be either adjacent or disjoint.

(6) The union of the contributing footprints of the ElevationGridCoverage instances referred to by the same aggregated ElevationGridCoverage instance shall determine the geographic extent (domainExtent) of the aggregated ElevationGridCoverage instance.

(7) The ElevationGridCoverage package shall be restricted to two-dimensional geometries.

(8) Information about the acquisition dates of data contained in elevation grid coverages shall be provided at least in one of the following ways:

(a) by providing the metadata element Temporal reference for each spatial object through the metadata attribute of the spatial object type *ElevationGridCoverage;*

(b) by providing the metadata element Temporal reference required by Regulation (EC) No 1205/2008 as a temporal extent.

1.7.3. *Requirements for Elevation Vector Data*

(1) Where elevation vector data sets are provided using 2-D geometries, the vertical component (third dimension) shall be provided as elevation property values within the propertyValue attribute.

(2) Where elevation vector data sets are provided using 2.5-D geometries, the elevation property values shall be only included within the third coordinate (Z) of these geometries.

1.7.4. *Requirements for Elevation TINs*

(1) The property values included within a single instance of ElevationTIN spatial object type (TIN model) shall be referenced to one and only one vertical coordinate reference system.

(2) Triangles intersecting a stop line shall be removed from a TIN surface, leaving holes in the surface. If coincidence occurs on surface boundary triangles, the result shall be a change of the surface boundary.

(3) The vector spatial objects provided as components of a TIN collection shall fulfil the generic consistency rules provided for vector objects.

1.7.5. *Requirements on reference systems*

(1) For measuring the depth of the sea floor where there is an appreciable tidal range (tidal waters), the Lowest Astronomical Tide (LAT) shall be used as reference surface.

(2) For measuring the depth of the sea floor in marine areas without an appreciable tidal range, in open oceans and in waters that are deeper than 200 meters, the depth of the sea floor shall be referenced to the Mean Sea Level (MSL), or to a well-defined reference level close to the MSL.

(3) The height of the reference level to which the depth of the floor of an inland water body is measured shall be referred to a gravity-related vertical reference system. This shall be the European Vertical Reference System (EVRS) for the areas within the geographical scope of EVRS, or the gravity-related vertical reference system identified by the Member State outside the scope of EVRS.

(4) When providing an integrated land-sea elevation model, only one elevation property (either height or depth) shall be modelled, and its values shall be referenced to a single vertical coordinate reference system.

1.7.6. *Requirements on data quality and consistency*

(1) If measures other than ISO data quality measures have been used to evaluate an elevation data set, the Lineage metadata element shall include information about those measures and, if possible, a reference to an online resource where more information is available.

(2) Connected contour line spatial objects shall have the same elevation value when they are referenced to the same vertical coordinate reference system.

(3) When the elevation values of break line spatial objects are given as third coordinates (Z), the intersection point of two break line spatial objects shall have the same elevation value.

(4) When a contour line spatial object and a break line spatial object provided in the same vertical coordinate reference system intersect each other, the intersection point shall

have the same elevation value (if the elevation values of break line spatial objects are given by the third (Z) coordinate).

(5) Contour line spatial objects having different elevation value shall neither intersect nor touch each other when they are referenced to the same vertical coordinate reference system.

(6) The boundary of an isolated area spatial object shall not touch the external boundary of a void area spatial object when they are referenced to the same vertical coordinate reference system.

1.8. **Layers**

Layers for the spatial data theme Elevation

Layer Name	Layer Title	Spatial object type
EL.BreakLine	Break Line	BreakLine
EL.ContourLine	Contour Line	ContourLine
EL.IsolatedArea	Isolated Area	IsolatedArea
EL.SpotElevation	Spot Elevation	SpotElevation
EL.VoidArea	Void Area	VoidArea
EL.ElevationGridCoverage	Elevation Grid Coverage	ElevationGridCoverage
EL.ElevationTIN	Elevation TIN	ElevationTIN

2. LAND COVER

2.1. **Definitions**

In addition to the definitions set out in Article 2, the following definitions shall apply:

(1) ‘classification system’ means a system for assigning objects to classes, in accordance with ISO 19144-1:2012;

(2) ‘discrete coverage’ means a coverage that returns the same feature attribute values for every direct position within any single spatial object, temporal object or spatiotemporal object in its domain, in accordance with EN ISO 19123:2007;

(3) ‘land cover object’ means a spatial object (point, pixel or polygon) where the land cover has been observed;

(4) ‘legend’ means the application of a classification in a specific area using a defined mapping scale and specific data set;

(5) ‘minimal mapping unit’ means the smallest area size of a polygon allowed to be represented in a particular land cover data set;

(6) ‘situation’ means the state of a particular land cover object at a particular point in time.

2.2. **Structure of the Spatial Data Theme Land Cover**

The types specified for the spatial data theme Land Cover are structured in the following packages:

— Land Cover Nomenclature

— Land Cover Vector
— Land Cover Raster

2.3. **Land Cover Nomenclature**

2.3.1. *Data types*

2.3.1.1. Land Cover Nomenclature (LandCoverNomenclature)

Information about reference national, institutional or local Land Cover nomenclature.
Attributes of the data type LandCoverNomenclature

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
responsibleParty	Party responsible for the development and/or maintenance of the nomenclature.	RelatedParty	
externalDescription	Document describing the nomenclature used in this data set.	DocumentCitation	voidable
embeddedDescription	An embedded encoding of the classification system according to ISO 19144-2.	LC_LandCoverClassificationSystem	voidable
nomenclatureCodeList	An http URI pointing to the code list attached to the nomenclature used.	URI	

Constraints of the data type LandCoverNomenclature

The embedded description or the external desciption shall be provided.

2.3.2. *Code lists*

2.3.2.1. Land Cover Class (LandCoverClassValue)

Land cover code list or classification.

The allowed values for this code list comprise any values defined by data providers.

Data providers may use the values and the integer codes (to be used to represent specific land cover classes in the range of the LandCoverGridCoverage objects) specified for the Pure Land Cover Component (PureLandCoverComponentValue) code list in the INSPIRE Technical Guidance document on Land Cover.

2.4. **Land Cover Vector**

2.4.1. *Spatial object types*

The package Land Cover Vector contains the following spatial object types:

— Land Cover Data Set

— Land Cover Unit

2.4.1.1. Land Cover Data Set (LandCoverDataset)

A vector representation for Land Cover data.

Attributes of the spatial object type LandCoverDataset

Attribute	Definition	Type	Voidability
name	Name of the Land Cover data set.	CharacterString	
inspireId	External object identifier of the spatial object.	Identifier	
extent	Contains the extent of the data set.	EX_Extent	
nomenclatureDocumentation	Information about the nomenclature used in this data set.	LandCoverNomenclature	
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable
validFrom	The time when the phenomenon started to exist in the real world.	DateTime	voidable
validTo	The time from which the phenomenon no longer exists in the real world.	DateTime	voidable

Association roles of the spatial object type LandCoverDataset

Association role	Definition	Type	Voidability
member	A Land Cover Unit being part of the data set.	LandCoverUnit	

2.4.1.2. Land Cover Unit (LandCoverUnit)

An individual element of the Land Cover data set represented by a point or surface.
Attributes of the spatial object type LandCoverUnit

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable
geometry	Spatial representation of the Land Cover data.	GM_Object	
landCoverObservation	Land cover information at a specific time and place.	LandCoverObservation	

Constraints of the spatial object type LandCoverUnit

Geometries shall be points or surfaces.

2.4.2. *Data types*

2.4.2.1. Land Cover Observation (LandCoverObservation)

Land Cover information interpreted at a specific time and place.
Attributes of the data type LandCoverObservation

Attribute	Definition	Type	Voidability
class	The assignment of a land cover class to a land cover unit through a classification code identifier.	LandCoverClassValue	
observationDate	The observation date associated of an observation.	DateTime	voidable
mosaic	List of classification values describing into details a land cover	LandCoverValue	voidable

	unit, associated with percentages.		

Constraints of the spatial object type LandCoverObservation

The sum of all coveredPercentage attributes attached to each LandCoverObservation shall be lower or equal to 100.

2.4.2.2. Land Cover (LandCoverValue)

Generic class supporting Land Cover value and percentage.
Attributes of the data type LandCoverValue

Attribute	Definition	Type	Voidability
class	Assignment of a land cover spatial object to a land cover class through a classification code identifier.	LandCoverClassValue	
coveredPercentage	Fraction of the LandCoverUnit being concerned with the classification value.	Integer	voidable

2.5. Land Cover Raster

2.5.1. *Spatial object types*

The package Land Cover Raster contains the spatial object type Land Cover Grid Coverage.

2.5.1.1. Land Cover Grid Coverage (LandCoverGridCoverage)

A raster representation for Land Cover data.

This type is a sub-type of RectifiedGridCoverage.
Attributes of the spatial object type LandCoverGridCoverage

Attribute	Definition	Type	Voidability
name	Name of the Land Cover coverage.	CharacterString	
inspireId	External object identifier of the spatial object.	Identifier	
extent	Contains the extent of the data set.	EX_Extent	
nomenclatureDocumentation	Information about the nomenclature used in this coverage.	LandCoverNomenclature	
beginLifespanVersion	Date and time at which this version of	DateTime	voidable

	the spatial object was inserted or changed in the spatial data set.		
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable
validFrom	The time when the phenomenon started to exist in the real world.	DateTime	voidable
validTo	The time from which the phenomenon no longer exists in the real world.	DateTime	voidable

Constraints of the spatial object type LandCoverGridCoverage

The values in the range set are restricted to Integer.

2.6. **Theme-specific Requirements**

If an onlineDescription attribute is provided for a LandCoverNomenclature data type, the referenced online description shall define, for each class, at least a code, a name, a definition and a RGB value to be used for portrayal. If the online description describes the nomenclature for a LandCoverGridCoverage object, an integer grid code shall also be provided for each class. This code shall be used in the range of the LandCoverGridCoverage to represent the corresponding class.

2.7. **Layers**

Layers for the spatial data theme Land Cover

Layer Name	Layer Title	Spatial object type
LC.LandCoverPoints	Land Cover Points	LandCoverUnit
LC.LandCoverSurfaces	Land Cover Surfaces	LandCoverUnit
LC.LandCoverRaster	Land Cover Raster	LandCoverGridCoverage

3. ORTHOIMAGERY

3.1. **Definitions**

In addition to the definitions set out in Article 2, the following definitions shall apply:

(1) ‘mosaic’ means an image composed of multiple overlapping or adjoining photographs or images merged together.

(2) ‘orthoimage aggregation’ means a combination of subsets from several homogeneous orthoimage coverages forming a new orthoimage coverage.

(3) 'raster' means a usually rectangular pattern of parallel scanning lines forming or corresponding to the display on a cathode ray tube, in accordance with EN ISO 19123:2007.

3.2. Spatial object types

The following spatial object types are specified for the spatial data theme Orthoimagery:

— Orthoimage Coverage
— Mosaic Element
— Single Mosaic Element
— Aggregated Mosaic Element

3.2.1. *Orthoimage Coverage (OrthoimageCoverage)*

Raster image of the Earth surface that has been geometrically corrected ('orthorectified') to remove distortion caused by differences in elevation, sensor tilt and, optionally, by sensor optics.

This type is a sub-type of RectifiedGridCoverage.

Attributes of the spatial object type OrthoimageCoverage

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
domainExtent	Extent of the spatiotemporal domain of the coverage.	EX_Extent	
footprint	Geographic area enclosing valid data of the orthoimage coverage.	GM_MultiSurface	voidable
interpolationType	Mathematical method which shall be used to evaluate a continuous coverage, i.e. determine the values of the coverage at any direct position within the domain of the coverage.	InterpolationMethodValue	
name	Free text name of the orthoimage coverage.	CharacterString	voidable
phenomenonTime	Description of the observation/ acquisition extent in time of the input image(s).	TM_Period	voidable

beginLifespanVersion	Temporal position at which this version of the spatial object was inserted or changed in the spatial data set.	TM_Position	voidable
endLifespanVersion	Temporal position at which this version of the spatial object was superseded or retired from the spatial data set.	TM_Position	voidable

Association roles of the spatial object type OrthoimageCoverage

Association role	Definition	Type	Voidability
contributingOrthoimageCoverage	Reference to the orthoimage coverages that compose an aggregated orthoimage coverage. The association has additional properties as defined in the association class OrthoimageAggregation.	OrthoimageCoverage	
mosaicElement	Spatial representation of the acquisition time of a mosaicked orthoimage coverage.	MosaicElement	voidable

Constraints of the spatial object type OrthoimageCoverage

The acquisition time of the orthoimage coverage shall be provided through the phenomenonTime attribute or the mosaicElement association.

The dimension of the grid used shall always be 2.

The domainExtent attribute shall be at least populated with a subtype of EX_GeographicExtent.

The coordinate reference system used to reference the grid shall be provided.

All the OrthoimageCoverage instances, to which an aggregated OrthoimageCoverage instance refers, shall share the same orientation of grid axes and the same grid spacing in each direction.

The origin of the grid shall be described in two dimensions.

The values in the range set shall be described by the Integer type.

3.2.2. *Mosaic Element (MosaicElement)*

Abstract type identifying both the contributing area and the acquisition time of one or several input images used to generate a mosaicked orthoimage coverage.

This type is abstract.

Attributes of the spatial object type MosaicElement

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
geometry	Geometric representation spatially delineating the date and time of acquisition of the several input images that contribute to the final mosaic.	GM_MultiSurface	
phenomenonTime	Description of the observation/ acquisition extent in time of the input image(s).	TM_Period	

3.2.3. *Single Mosaic Element (SingleMosaicElement)*

Mosaic element relating to a single input image.

This type is a sub-type of MosaicElement.

Attributes of the spatial object type SingleMosaicElement

Attribute	Definition	Type	Voidability
imageSourceReference	Reference to the input image.	CharacterString	voidable

3.2.4. *Aggregated Mosaic Element (AggregatedMosaicElement)*

Mosaic element relating to several input images that share the same acquisition time at a given level of definition (e.g. day, month).

This type is a sub-type of MosaicElement.

3.3. **Data types**

3.3.1. *Orthoimage Aggregation (OrthoimageAggregation)*

Geometrical characteristics of the orthoimage aggregation.

This type is an association class.

Attributes of the data type OrthoimageAggregation

Attribute	Definition	Type	Voidability
contributingFootprint	Geometric representation delineating the	GM_MultiSurface	

	geographic area of an orthoimage coverage that contributes to the aggregated orthoimage coverage.		

3.4. Code lists

3.4.1. *Interpolation Method (InterpolationMethodValue)*

List of codes that identify theinterpolation methodswhich may be used for evaluating orthoimage coverages.

The allowed values for this code list comprise only the values specified in the table below.
Values for the code list InterpolationTypeValue

Value	Name	Definition
nearestNeighbour	nearest neighbour	Nearest neighbour interpolation
bilinear	bilinear	Bilinear interpolation
biquadratic	biquadratic	Biquadratic interpolation
bicubic	bicubic	Bicubic interpolation

3.5. Theme-specific Requirements

3.5.1. *Requirements on external object identifiers*

(1) If an orthoimage is updated based on new source data, the updated objects shall receive a new external object identifier.

3.5.2. *Requirements for Orthoimage Coverages*

(1) By way of derogation from the requirement in Section 2.2 of Annex II, any grid compatible with one of the following coordinate reference systems may be used for making gridded Orthoimagery data available:

— two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in Section 1.2 of Annex II and using the parameters of the GRS80 ellipsoid;

— plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system;

— plane coordinates using the ETRS89 Transverse Mercator coordinate reference system.

The grid specified in Section 2.2.1 of Annex II shall not be used.

(2) The footprint of an OrthoimageCoverage instance shall be spatially included in its geographic extent that is described through the domainExtent property.

(3) The value type of the metadata property carried by the spatial object type OrthoimageCoverage shall be set to OM_Observation when using the Observation and Measurement metadata model defined in ISO 19156:2011.

(4) All the OrthoimageCoverage instances, to which an aggregated OrthoimageCoverage instance refers, shall be consistent. This means that they shall share the same range type, Coordinate Reference System and resolution. They shall also support grid alignment, i.e. the grid points in one OrthoimageCoverage instance line up with grid points of the other OrthoimageCoverage instances, so that grid cells do not partially overlap.

(5) The contributing footprint of an OrthoimageCoverage instance referred by an aggregated OrthoimageCoverage instance shall be spatially included in its own footprint.

(6) The contributing footprints of any two OrthoimageCoverage instances referred to by the same aggregated OrthoimageCoverage instance shall be either adjacent or disjoint.

(7) The union of the contributing footprints of the OrthoimageCoverage instances referred to by the same aggregated OrthoimageCoverage instance shall determine the footprint of the aggregated OrthoimageCoverage instance.

3.5.3. *Requirements for mosaic elements*

(1) All the mosaic elements related to an OrthoimageCoverage instance shall be of the same type, i.e. either SingleMosaicElement or AggregatedMosaicElement.

(2) The geometries delineating any two MosaicElement instances related to the same OrthoimageCoverage instance shall be either adjacent or disjoint.

(3) The union of the geometries delineating all MosaicElement instances related to the same OrthoimageCoverage instance shall include its footprint and be contained in its geographic domain extent.

3.5.4. *Requirements on reference systems*

(1) Data related to the spatial data theme Orthoimagery shall be restricted to two-dimensional geometries.

(2) Only two-dimensional coordinate reference systems shall be used to represent INSPIRE orthoimagery data sets.

3.5.5. *Requirements on data quality*

(1) The measures ‘root mean square error in X’ (RMSE-x) and ‘root mean square error in Y’ (RMSE-y) shall be provided jointly when used to assess the gridded data position of orthoimagery data.

3.6. **Layers**

Layers for the spatial data theme Orthoimagery

Layer Name	Layer Title	Spatial object type
OI.OrthoimageCoverage	orthoimage coverage	OrthoimageCoverage
OI.MosaicElement	mosaic element	MosaicElement

4. GEOLOGY

4.1. **Structure of the Spatial Data Theme Geology**

The types specified for the spatial data theme Geology are structured in the following packages:
— Geology
— Geophysics
— Hydrogeology

4.2. **Geology**

4.2.1. *Spatial object types*

The package Geology contains the following spatial object types:
— Anthropogenic Geomorphologic Feature
— Borehole
— Fold
— Geologic Collection
— Geologic Event
— Geologic Feature
— Geologic Structure
— Geologic Unit
— Geomorphologic Feature
— Mapped Feature
— Mapped Interval
— Natural Geomorphologic Feature
— Shear Displacement Structure

4.2.1.1. Anthropogenic Geomorphologic Feature (AnthropogenicGeomorphologicFeature)

A geomorphologic feature (i.e., landform) which has been created by human activity.

This type is a sub-type of GeomorphologicFeature.
Attributes of the spatial object type AnthropogenicGeomorphologicFeature

Attribute	Definition	Type	Voidability
anthropogenicGeomorphologicFeatureType	Type of geomorphologic feature.	AnthropogenicGeomorphologicFeatureTypeValue	

4.2.1.2. Borehole (Borehole)

A borehole is the generalized term for any narrow shaft drilled in the ground.
Attributes of the spatial object type Borehole

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
boreholeLength	The distance along a borehole.	Quantity	voidable

elevation	The vertical height above datum of the borehole collar.	DirectPosition	voidable
location	The location of the borehole collar.	GM_Point	
purpose	The purpose for which the borehole was drilled.	BoreholePurposeValue	voidable
downholeGeometry	The downhole geometry of the borehole	GM_Curve	voidable

Association roles of the spatial object type Borehole

Association role	Definition	Type	Voidability
logElement	1-D MappedFeature instances that are logged (interpreted) intervals within a borehole.	MappedInterval	voidable

4.2.1.3. Fold (Fold)

One or more systematically curved layers, surfaces, or lines in a rock body.

This type is a sub-type of GeologicStructure.
Attributes of the spatial object type Fold

Attribute	Definition	Type	Voidability
profileType	The type of the fold.	FoldProfileTypeValue	voidable

4.2.1.4. Geologic Collection (GeologicCollection)

A collection of geological or geophysical objects.
Attributes of the spatial object type GeologicCollection

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
name	The name of the collection.	CharacterString	
collectionType	The type of the collection.	CollectionTypeValue	
reference	A reference for the collection.	DocumentCitation	voidable

beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable

Association roles of the spatial object type GeologicCollection

Association role	Definition	Type	Voidability
geophObjectSet	A GeophObjectSet member of the geologic collection.	GeophObjectSet	voidable
geophObjectMember	A GeophObjectMember of the geologic collection.	GeophObject	voidable
boreholeMember	A Borehole member of a geologic collection.	Borehole	voidable
mapMember	A MappedFeature member of a geologic collection.	MappedFeature	voidable

4.2.1.5. Geologic Event (GeologicEvent)

An identifiable event during which one or more geological processes act to modify geological entities.

Attributes of the spatial object type GeologicEvent

Attribute	Definition	Type	Voidability
name	The name of the geologic event.	CharacterString	voidable
eventEnvironment	The physical setting within which the geologic event takes place.	EventEnvironmentValue	voidable
eventProcess	The process or processes that occurred during the geologic event.	EventProcessValue	voidable

olderNamedAge	Older boundary of the age of the geologic event.	GeochronologicEraValue	voidable
youngerNamedAge	Younger boundary of the age of the geologic event.	GeochronologicEraValue	voidable

4.2.1.6. Geologic Feature (GeologicFeature)

A conceptual geological feature that is hypothesized to exist coherently in the world.

This type is abstract.

Attributes of the spatial object type GeologicFeature

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
name	The name of the geologic feature.	CharacterString	voidable

Association roles of the spatial object type GeologicFeature

Association role	Definition	Type	Voidability
themeClass	A thematic classification of the geologic feature.	ThematicClass	voidable
geologicHistory	An association that relates one or more geologic events to a geologic feature to describe their age or geologic history.	GeologicEvent	voidable

4.2.1.7. Geologic Structure (GeologicStructure)

A configuration of matter in the Earth based on describable inhomogeneity, pattern or fracture in an earth material.

This type is a sub-type of GeologicFeature.

This type is abstract.

4.2.1.8. Geologic Unit (GeologicUnit)

A volume of rock with distinct characteristics.

This type is a sub-type of GeologicFeature.

Attributes of the spatial object type GeologicUnit

Attribute	Definition	Type	Voidability

geologicUnitType	The type of the geological unit.	GeologicUnitTypeValue	

Association roles of the spatial object type GeologicUnit

Association role	Definition	Type	Voidability
composition	Describes composition of the geologic unit.	CompositionPart	voidable

4.2.1.9. Geomorphologic Feature (GeomorphologicFeature)

An abstract spatial object type describing the shape and nature of the Earth's land surface (i.e. a landform).

This type is a sub-type of GeologicFeature.

This type is abstract.

4.2.1.10. Mapped Feature (MappedFeature)

A spatial representation of a GeologicFeature.
Attributes of the spatial object type MappedFeature

Attribute	Definition	Type	Voidability
shape	The geometry of the mapped feature.	GM_Object	
mappingFrame	The surface on which the mapped feature is projected.	MappingFrameValue	

Association roles of the spatial object type MappedFeature

Association role	Definition	Type	Voidability
specification	A description association that links the mapped feature to a notional geologic feature.	GeologicFeature	

4.2.1.11. Mapped Interval (MappedInterval)

A special kind of a mapped feature whose shape is a 1-D interval and which uses the spatial reference system of the containing borehole.

This type is a sub-type of MappedFeature.

4.2.1.12. Natural Geomorphologic Feature (NaturalGeomorphologicFeature)

A geomorphologic feature (i.e. landform) that has been created by natural Earth processes.

This type is a sub-type of GeomorphologicFeature.

Attributes of the spatial object type NaturalGeomorphologicFeature

Attribute	Definition	Type	Voidability
naturalGeomorphologicFeatureType	The type of the natural geomorphologic feature.	NaturalGeomorphologicFeatureTypeValue	
activity	The level of activity of the natural geomorphologic feature.	GeomorphologicActivityValue	voidable

4.2.1.13. Shear Displacement Structure (ShearDisplacementStructure)

Brittle to ductile style structures along which displacement has occurred.

This type is a sub-type of GeologicStructure.
Attributes of the spatial object type ShearDisplacementStructure

Attribute	Definition	Type	Voidability
faultType	Refers to a vocabulary of terms describing the type of shear displacement structure.	FaultTypeValue	

4.2.2. *Data types*

4.2.2.1. Composition Part (CompositionPart)

The composition of a geologic unit in terms of lithological constituents.
Attributes of the data type CompositionPart

Attribute	Definition	Type	Voidability
material	The material that comprises part or all of the geologic unit.	LithologyValue	
proportion	Quantity that specifies the fraction of the geologic unit composed of the material.	QuantityRange	voidable
role	The relationship of the composition part to the geologic unit composition as a whole.	CompositionPartRoleValue	

4.2.2.2. Thematic Class (ThematicClass)

A generic thematic classifier to enable the reclassification of Geologic Features with user defined classes appropriate to thematic maps.

Attributes of the data type ThematicClass

Attribute	Definition	Type	Voidability
themeClass	The value of the thematic class.	ThematicClassValue	
themeClassification	The used classification	ThematicClassification	Value

4.2.3. *Code lists*

4.2.3.1. Anthropogenic Geomorphologic Feature Type (AnthropogenicGeomorphologicFeatureTypeValue)

Types of anthropogenic geomorphologic features.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Values for the code list AnthropogenicGeomorphologicFeatureTypeValue

Value	Name	Definition
artificialCollapsedDepression	artificial collapsed depression	A collapse basin, commonly a closed depression, which is the direct result of surficial subsidence associated with subsurface mining or tunneling.
artificialDrainage	artificial drainage	Human-made network built primarily to lower or control the local water table.
artificialLevee	artificial levee	An artificial embankment constructed along the bank of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel.
dredgedChannel	dredged channel	A roughly linear, deep water area formed by a dredging operation for navigation purposes
dump	dump	An area of smooth or uneven accumulations or piles of waste rock, earthy material, or general refuse that without major reclamation are incapable of supporting plants.

fill	fill	Human-constructed deposits of natural earth materials and/or waste materials used to fill a depression, to extend shore land into a body of water, or in building dams.
impactCraterAnthropogenic	impact crater (anthropogenic)	A generally circular or elliptical depression formed by hypervelocity impact of an experimental projectile or ordnance into earthy or rock material.
landfillSite	landfill site	Waste disposal site used for the controlled deposit of the waste onto or into land.
levelledLand	levelled land	A land area, usually a field, that has been mechanically flattened or smoothed to facilitate management practices such as flood irrigation.
openpitMine	openpit mine	A relatively large depression resulting from the excavation of material and redistribution of overburden associated with surficial mining operations.
pit	pit	A depression, ditch or pit excavated to furnish gravel, sand or other materials for roads or other construction purposes; a type of borrow pit.
quarry	quarry	Excavation areas, open to the sky, usually for the extraction of stone.
reclaimedLand	reclaimed land	A land area composed of earthy fill material that has been placed and shaped to approximate natural contours, commonly part of land-reclamation efforts after mining operations. Or a land area, commonly submerged in its native state, that has been protected by artificial structures and drained for agricultural or other purposes.

reservoirLake	reservoir lake	An inland body of permanently standing water, usually fresh, occupying a depression on the Earth's surface closed by a dam.
spoilBank	spoil bank	A bank, mound, or other artificial accumulation of rock debris and earthy dump deposits removed from ditches, strip mines, or other excavations.
subsidenceAreaAnthropogenic	subsidence area (anthropogenic)	An area subject to a process of subsidence induced by anthropogenic activities, for example subsurface mining, tunneling, hydrocarbon or groundwater production.

4.2.3.2. Borehole Purpose (BoreholePurposeValue)

Purposes for which a borehole was drilled.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

This code list is hierarchical.
Values for the code list BoreholePurposeValue

Value	Name	Definition	Parent
geologicalSurvey	geological survey	General examination of an area's geological entities.	
explorationExploitationRawMaterial	exploration and exploitation of raw material	The discovery and identification of mineral resources, including the assessment of their importance and the evaluation of their economic potential.	
explorationExploitationEnergyResources	exploration and exploitation of energy resources	Examination of the subsurface with regard to the availability of fossil energy resources and planning the extraction thereof.	

hydrocarbonProduction	hydrocarbon production	Production of petroleum oil and/or gas.	explorationExploitationRawMaterial
hydrocarbonExploration	hydrocarbon exploration	Exploration in an unproved area to test for a new field, a new pay, a deeper reservoir, or a shallower reservoir.	explorationExploitationRawMaterial
hydrocarbonAppraisal	hydrocarbon appraisal	Assessment of characteristics of a proven hydrocarbon accumulation.	explorationExploitationRawMaterial
geothermalEnergy	geothermal energy, geothermal heat exchangers	Exploration pertaining to the utilization of geothermal energy resources and design of geothermal heat pumps.	explorationExploitationRawMaterial
heatStorage	heat storage	Well to enable the underground to be used for heat storage.	geothermalEnergy
mineralExplorationExtraction	mineral exploration and extraction	Well drilled for the purpose of locating and/or extracting mineral resources from the subsurface, usually through the injection and/or extraction of mineral bearing fluids.	explorationExploitationRawMaterial
explorationExploitationNonmetallicMineralDeposits	exploration and exploitation of nonmetallic mineral deposits	Prospecting with regard to the availability and planning for excavation of nonmetallic mineral deposits, mainly for construction purposes, building stones, cement and ceramic or glass industry.	explorationExploitationRawMaterial
disposal	disposal	A well, often a depleted oil or gas well, into which waste fluids can	

		be injected for safe disposal.	
explorationNaturalUndergroundStorage	exploration of natural underground storage space	Examination of the subsurface's ability to store various materials.	
waterSupply	water supply	Water supply in general.	
drinkingWaterSupply	drinking water supply	Well construction for drinking water.	waterSupply
industrialWaterSupply	industrial water supply	Well construction for industrial water supply.	waterSupply
aquaculture	aquaculture	To supply water to aquaculture purposes.	waterSupply
irrigation	irrigation	Well construction for irrigation purposes.	waterSupply
emergencyWaterSupply	emergency water supply	Well construction for emergency water supply.	waterSupply
contingencyWaterSupply	contingency water supply	Stand-by water supply in case of water deficiency.	waterSupply
geophysicalSurvey	geophysical survey	Examination of the subsurface's geophysical properties.	
shotHole	shot hole	In connection with seismic surveys explosives are loaded into shot holes.	geophysicalSurvey
flowingShot	flowing shot	A flowing shot hole is a drilled hole for seismic purposes that has entered an underground water source that has sufficient pressure to cause the hole to ‘overflow’.	shotHole
hydrogeologicalSurvey	hydrogeological survey, water management	Examination of groundwater flow, the chemical properties of ground water, and transport of particles, solutes,	

		and energy, as well as the management of the sustainable use of ground water resources.	
geotechnicalSurvey	geotechnical survey, construction site characterization	Geotechnical investigations performed to obtain information on the physical and mechanical properties of soil and rock around a site to design earthworks and foundations for proposed structures and for repair of distress to earthworks and structures caused by subsurface conditions.	
geochemicalSurvey	geochemical survey, analyses	Examination of chemical properties of the rock formation and /or the porosity fluids.	
pedologicalSurvey	pedological survey	Investigation to characterize types of soils.	
environmentalMonitoring	environmental monitoring	Groundwater chemistry and groundwater level is monitored.	
pollutionMonitoring	pollution monitoring	Monitoring of known pollution sites.	environmentalMonitoring
waterQualityMonitoring	water quality monitoring	Monitoring to assess the nature and distribution of pollutants and contaminants in groundwater; the nature and distribution of naturally occurring chemical constituents; subsurface hydrologic conditions, and hydraulic properties	environmentalMonitoring

		of strata as they relate to pollutant and contaminant movement.	
groundwaterLevelMonitoring	groundwater level monitoring	Construction of a gauge for recording groundwater level changes.	environmentalMonitoring
dewatering	dewatering	Dewatering is the removal of water from solid material or soil by wet classification, centrifugation, filtration, or similar solid-liquid separation processes. Removing or draining water from a riverbed, construction site, caisson, or mine shaft, by pumping or evaporation.	
mitigation	mitigation	Lowering of the groundwater level to prevent the groundwater table to reach polluted sites.	dewatering
remediation	remediation	Remediation in general. The removal of pollution or contaminants from groundwater, soil and other rock	
thermalCleaning	sparging, thermal cleaning	A kind of remediation. In situ cleaning of soil using heat, steam.	remediation
recharge	recharge	(a) Aquifer Recharge Wells: Used to recharge depleted aquifers by injecting water from a variety of sources such as lakes,	

			streams, domestic wastewater treatment plants, other aquifers, etc.	
		(b)	Saline Water Intrusion Barrier Wells: Used to inject water into fresh water aquifers to prevent intrusion of salt water into fresh water aquifers.	
		(c)	Subsidence Control Wells: Used to inject fluids into a non-oil or gas-producing zone to reduce or eliminate subsidence associated with overdraft of fresh water.	

4.2.3.3. Collection Type (CollectionTypeValue)

Types of collections of geological and geophysical objects.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Values for the code list CollectionTypeValue

Value	Name	Definition
boreholeCollection	borehole collection	Collection of boreholes
geologicalModel	geological model	Collection of objects for a 3D geological spatial model

geologicalMap	geological map	Collection of features for a geological map which described geological units, structures geomorphologic features, etc.
geophysicalObjectCollection	geophysical object collection	Collection of geophysical objects

4.2.3.4. Composition Part Role (CompositionPartRoleValue)

Roles that a compositional part plays in a geologic unit.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

This code list is hierarchical.
Values for the code list CompositionPartRoleValue

Value	Name	Definition	Parent
onlyPart	only part	Entire described unit consists of a single part or constituent.	
partOf	part of	The geologic unit part role is not known in any greater detail.	
facies	facies	Represents a particular body of rock that is a lateral variant of a lithostratigraphic unit, or a variant of a lithodemic unit.	partOf
inclusion	inclusion	Geologic unit constituent is present as masses with generally sharp boundaries enclosed within a matrix of some other material.	partOf
lithosome	lithosome	A kind of rock body that has multiple occurrences in a single geologic unit. A mass of rock of uniform character, characterized by geometry, composition, and internal structure.	partOf

stratigraphicPart	stratigraphic part	A geologic unit part that occupies a particular stratigraphic position within a geologic unit.	partOf
unspecifiedPartRole	unspecified part role	Geologic unit part with unspecified role.	partOf

4.2.3.5. Event Environment (EventEnvironmentValue)

Terms for the geologic environments within which geologic events take place.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Data providers may also use the narrower values specified for this code list in the INSPIRE Technical Guidance document on Geology.

Values for the code list EventEnvironmentValue

Value	Name	Definition
earthInteriorSetting	earth interior setting	Geologic environments within the solid Earth.
earthSurfaceSetting	earth surface setting	Geologic environments on the surface of the solid Earth.
extraTerrestrialSetting	extra-terrestrial setting	Material originated outside of the Earth or its atmosphere.
tectonicallyDefinedSetting	tectonically defined setting	Setting defined by relationships to tectonic plates on or in the Earth.

4.2.3.6. Event Process (EventProcessValue)

Terms specifying the process or processes that occurred during an event.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Data providers may also use the narrower values specified for this code list in the INSPIRE Technical Guidance document on Geology.

Values for the code list EventProcessValue

Value	Name	Definition
bolideImpact	bolide impact	The impact of an extraterrestrial body on the surface of the earth.
deepWaterOxygenDepletion	deep water oxygen depletion	Process of removal of oxygen from from the deep part of a body of water.

deformation	deformation	Movement of rock bodies by displacement on fault or shear zones, or change in shape of a body of earth material.
diageneticProcess	diagenetic process	Any chemical, physical, or biological process that affects a sedimentary earth material after initial deposition, and during or after lithification, exclusive of weathering and metamorphism.
extinction	extinction	Process of disappearance of a species or higher taxon, so that it no longer exists anywhere or in the subsequent fossil record.
geomagneticProcess	geomagnetic process	Process that results in change in Earth's magnetic field.
humanActivity	human activity	Processes of human modification of the earth to produce geologic features.
magmaticProcess	magmatic process	A process involving melted rock (magma).
metamorphicProcess	metamorphic process	Mineralogical, chemical, and structural adjustment of solid rocks to physical and chemical conditions that differ from the conditions under which the rocks in question originated, and are generally been imposed at depth, below the surface zones of weathering and cementation.
seaLevelChange	sea level change	Process of mean sea level changing relative to some datum.
sedimentaryProcess	sedimentary process	A phenomenon that changes the distribution or physical properties of sediment at or near the earth's surface.
speciation	speciation	Process that results inappearance of new species.
tectonicProcess	tectonic process	Processes related to the interaction between or deformation of rigid plates

		forming the crust of the Earth.
weathering	weathering	The process or group of processes by which earth materials exposed to atmospheric agents at or near the Earth's surface are changed in color, texture, composition, firmness, or form, with little or no transport of the loosened or altered material. Processes typically include oxidation, hydration, and leaching of soluble constituents.

4.2.3.7. Fault Type (FaultTypeValue)

Terms describing the type of shear displacement structure.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Data providers may also use the narrower values specified for this code list in the INSPIRE Technical Guidance document on Geology.

This code list is hierarchical.
Values for the code list FaultTypeValue

Value	Name	Definition	Parent
fault	fault	A discrete surface, or zone of discrete surfaces, with some thickness, separating two rock masses across which one mass has slid past the other.	
extractionFault	extraction fault	A fault whose two sides have approached each other substantially in the direction perpendicular to the fault.	fault
highAngleFault	high angle fault	Fault that dips at least 45 degrees over more than half of its recognized extent, for which slip or	fault

		separation is not explicitly specified.	
lowAngleFault	low angle fault	Fault that dips less than 45 degrees over more than half of the recognized extent of the fault.	fault
obliqueSlipFault	oblique slip fault	Fault with slip vector that has ratio of strike-parallel to dip-parallel displacement between 10 to 1 and 1 to 10 at at least one location along the mapped trace of the fault.	fault
reverseFault	reverse fault	Fault with dip-parallel displacement component of slip vector more than 10 times the strike-parallel component of the slip vector at at least one location along the mapped trace of the fault, and the fault dips consistently in the same direction with the hanging wall displaced up relative to the footwall over at least half the mapped trace of the fault.	fault
scissorFault	scissor fault	A fault on which there is increasing offset or separation along the strike from an initial point of no offset, with the opposite sense of offset in the opposite direction.	fault
strikeSlipFault	strike slip fault	Fault with strike-parallel displacement component of slip vector more than 10 times the dip-parallel component of the slip vector at at least one	fault

		location along the mapped trace of the fault.	

4.2.3.8. Fold Profile Type (FoldProfileTypeValue)

Terms specifying the type of fold.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Values for the code list FoldProfileTypeValue

Value	Name	Definition
anticline	anticline	A fold, general convex upward, whose core contains the stratigraphically older rocks.
antiform	antiform	Any convex-upward, concave downward fold.
syncline	syncline	A fold of which the core contains the stratigraphically younger rocks; it is generally concave upward.
synform	synform	Any fold whose limbs close at the bottom.

4.2.3.9. Geochronologic Era (GeochronologicEraValue)

Terms specifying recognised geological time units.

The allowed values for this code list comprise the values specified in Cohen, K.M., Finney, S. & Gibbard, P.L., *International Chronostratigraphic Chart, August 2012*, International Commission on Stratigraphy of the International Union of Geological Sciences, 2012 and additional values at any level defined by data providers.

Data providers may use the additional values for Pre-Cambrian rocks and Quaternary units specified in the INSPIRE Technical Guidance document on Geology.

4.2.3.10. Geologic Unit Type (GeologicUnitTypeValue)

Terms describing the type of geologic unit.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

This code list is hierarchical.

Values for the code list GeologicUnitTypeValue

Value	Name	Definition	Parent
geologicUnit	geologic unit	Type of geologic unit that is unknown, unspecified,	

		irrelevant, or some type not included in the vocabulary.	
allostratigraphicUnit	allostratigraphic unit	Geologic unit defined by bounding surfaces. Not necessarily stratified.	geologicUnit
alterationUnit	alteration unit	Geologic unit defined by alteration process.	geologicUnit
biostratigraphicUnit	biostratigraphic unit	Geologic unit defined based on fossil content.	geologicUnit
chronostratigraphicUnit	chronostratigraphic unit	Geologic unit that includes all rocks formed during a specific interval of geologic time	geologicUnit
geophysicalUnit	geophysical unit	Geologic unit defined by its geophysical characteristics.	geologicUnit
magnetostratigraphicUnit	magnetostratigraphic unit	Geologic unit defined by magnetic characteristics.	geophysicalUnit
lithogeneticUnit	lithogenetic unit	Geologic unit defined by genesis. The genesis is manifested by material properties, but the material is not the defining property.	geologicUnit
artificialGround	artificial ground	Geologic unit defined by genesis involving direct human action to deposit or modify material.	lithogeneticUnit
excavationUnit	excavation unit	Geologic unit defined by human-made genesis involving excavation.	lithogeneticUnit
massMovementUnit	mass movement unit	Geologic unit produced by gravity driven, down-slope displacement of material, and characterized by the type of movement giving rise to the	lithogeneticUnit

		deposit, and by how the individual movement types present in the deposit are related in time and space.	
lithologicUnit	lithologic unit	Geologic unit defined by lithology independent of relationships to other units.	geologicUnit
lithostratigraphicUnit	lithostratigraphic unit	Geologic unit defined on the basis of observable and distinctive lithologic properties or combination of lithologic properties and stratigraphic relationships.	geologicUnit
lithodemicUnit	lithodemic unit	Lithostratigraphic unit that lacks stratification	lithostratigraphicUnit
lithotectonicUnit	lithotectonic unit	Geologic unit defined on basis of structural or deformation features, mutual relations, origin or historical evolution. Contained material may be igneous, sedimentary, or metamorphic.	geologicUnit
deformationUnit	deformation unit	Lithotectonic unit defined by deformation style or characteristic geologic structure observable in outcrop.	lithotectonicUnit
pedostratigraphicUnit	pedostratigraphic unit	Geologic unit that represents a single pedologic horizon in a sequence of strata (consolidated or non-consolidated).	geologicUnit
polarityChronostratigraphicUnit	polarity chronostratigraphic unit	Geologic unit defined by primary magnetic-polarity record	geologicUnit

		imposed when the rock was deposited or crystallized during a specific interval of geologic time.	

4.2.3.11. Geomorphologic Activity (GeomorphologicActivityValue)

Terms indicating the level of activity of a geomorphologic feature.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list GeomorphologicActivityValue

Value	Name	Definition
active	active	A geomorphologic process that is currently in a state of action, or that has been reactivated since a conventionally short period of time.
dormant	dormant	A geomorphologic process that has not shown signs of activity since a conventionally short period of time, and that could be reactivated by its original causes, or triggered by induced causes such as anthropogenic activities.
reactivated	reactivated	A reactivated geomorphologic process is an active geomorphologic process which has been dormant.
stabilised	stabilised	A stabilized geomorphologic process is an inactive process which has been protected from its original causes by remedial measures.
inactive	inactive	A relict or fossil geomorphologic process.

4.2.3.12. Lithology (LithologyValue)

Terms describing the lithology.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Data providers may also use the narrower values specified for this code list in the INSPIRE Technical Guidance document on Geology.

This code list is hierarchical.

Values for the code list LithologyValue

Value	Name	Definition	Parent
compoundMaterial	compound material	An earth material composed of an aggregation of particles of earth material, possibly including other Compound Materials.	
anthropogenicMaterial	anthropogenic material	Material known to have artificial (human-related) origin; insufficient information to classify in more detail.	compoundMaterial
anthropogenicConsolidatedMaterial	anthropogenic consolidated material	Consolidated material known to have artificial (human-related) origin.	anthropogenicMaterial
anthropogenicUnconsolidatedMaterial	anthropogenic unconsolidated material	Unconsolidated material known to have artificial (human-related) origin.	anthropogenicMaterial
breccia	breccia	Coarse-grained material composed of angular broken rock fragments; the fragments typically have sharp edges and unworn corners.	compoundMaterial
compositeGenesisMaterial	composite genesis material	Material of unspecified consolidation state formed by geological modification of pre-existing materials outside the realm of igneous and sedimentary processes.	compoundMaterial
compositeGenesisRock	composite genesis rock	Rock formed by geological modification of pre-	compositeGenesisMaterial

		existing rocks outside the realm of igneous and sedimentary processes.	
faultRelatedMaterial	fault-related material	Material formed as a result of brittle faulting, composed of greater than 10 percent matrix; matrix is fine-grained material caused by tectonic grainsize reduction.	compositeGenesisMaterial
impactGeneratedMaterial	impact generated material	Material that contains features indicative of shock metamorphism, such as microscopic planar deformation features within grains or shatter cones, interpreted to be the result of extraterrestrial bolide impact. Includes breccias and melt rocks.	compositeGenesisMaterial
materialFormedInSurficialEnvironment	material formed in surficial environment	Material that is the product of weathering processes operating on pre-existing rocks or deposits, analogous to hydrothermal or metasomatic rocks, but formed at ambient Earth surface temperature and pressure.	compositeGenesisMaterial
rock	rock	Consolidated aggregate of one or more earth materials, or a body of undifferentiated mineral matter, or of solid organic material.	compoundMaterial
aphanite	aphanite	Rock that is too fine grained to categorize in more detail.	rock

sedimentaryRock	sedimentary rock	Rock formed by accumulation and cementation of solid fragmental material deposited by air, water or ice, or as a result of other natural agents, such as precipitation from solution, the accumulation of organic material, or from biogenic processes, including secretion by organisms.	rock
tuffite	tuffite	Rock consists of more than 50 percent particles of indeterminate pyroclastic or epiclastic origin and less than 75 percent particles of clearly pyroclastic origin.	rock
sedimentaryMaterial	sedimentary material	Material formed by accumulation of solid fragmental material deposited by air, water or ice, or material that accumulated by other natural agents such as chemical precipitation from solution or secretion by organisms.	compoundMaterial
carbonateSedimentaryMaterial	carbonate sedimentary material	Sedimentary material in which at least 50 percent of the primary and/ or recrystallized constituents are composed of one (or more) of the carbonate minerals calcite, aragonite and dolomite, in particles of intrabasinal origin.	sedimentaryMaterial

chemicalSedimentaryMaterial	chemical sedimentary material	Sedimentary material that consists of at least 50 percent material produced by inorganic chemical processes within the basin of deposition. Includes inorganic siliceous, carbonate, evaporite, iron-rich, and phosphatic sediment classes.	sedimentaryMaterial
clasticSedimentaryMaterial	clastic sedimentary material	Sedimentary material of unspecified consolidation state in which at least 50 percent of the constituent particles were derived from erosion, weathering, or mass-wasting of pre-existing earth materials, and transported to the place of deposition by mechanical agents such as water, wind, ice and gravity.	sedimentaryMaterial
nonClasticSiliceousSedimentaryMaterial	non-clastic siliceous sedimentary material	Sedimentary material that consists of at least 50 percent silicate mineral material, deposited directly by chemical or biological processes at the depositional surface, or in particles formed by chemical or biological processes within the basin of deposition.	sedimentaryMaterial
organicRichSedimentaryMaterial	organic-rich sedimentary material	Sedimentary material in which 50 percent or more of the primary sedimentary material is organic carbon.	sedimentaryMaterial
igneousMaterial	igneous material	Earth material formed as a result of	compoundMaterial

		igneous processes, e.g. intrusion and cooling of magma in the crust, volcanic eruption.	
fragmentalIgneousMaterial	fragmental igneous material	Igneous material of unspecified consolidation state in which greater than 75 percent of the rock consists of fragments produced as a result of igneous rock-forming process.	igneousMaterial
acidicIgneousMaterial	acidic igneous material	Igneous material with more than 63 percent SiO_2.	igneousMaterial
basicIgneousMaterial	basic igneous material	Igneous material with between 45 and 52 percent SiO_2.	igneousMaterial
igneousRock	igneous rock	Rock formed as a result of igneous processes, for example intrusion and cooling of magma in the crust, or volcanic eruption.	igneousMaterial
intermediateCompositionIgneousMaterial	intermediate composition igneous material	Igneous material with between 52 and 63 percent SiO_2.	igneousMaterial
unconsolidatedMaterial	unconsolidated material	CompoundMaterial composed of an aggregation of particles that do not adhere to each other strongly enough that the aggregate can be considered a solid in its own right.	compoundMaterial
naturalUnconsolidatedMaterial	natural unconsolidated material	Unconsolidated material known to have natural, i.e. not human-made, origin.	unconsolidatedMaterial
sediment	sediment	Unconsolidated material consisting of an aggregation of particles transported or deposited by air,	naturalUnconsolidatedMaterial

		water or ice, or that accumulated by other natural agents, such as chemical precipitation, and that forms in layers on the Earth's surface.	

4.2.3.13. Mapping Frame (MappingFrameValue)

Terms indicating the surface on which the MappedFeature is projected.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list MappingFrameValue

Value	Name	Definition
baseOfQuaternary	base of quaternary	Base of the predominantely unconsolidated sedimentary material of Quaternary age.
surfaceGeology	surface geology	Bedrock and superficial deposits that would be visible if the overlying soil was removed or are exposed at the topographic surface.
topOfBasement	top of basement	The surface in the crust of the Earth below sedimentary or volcanic deposits, or tectonically transported rock unit.
topOfBedrock	top of bedrock	Top surface of the usually solid rock that may either be exposed at the topographic surface or covered by other unconsolidated deposits.

4.2.3.14. Natural Geomorphologic Feature Type (NaturalGeomorphologicFeatureTypeValue)

Terms describing the type of natural geomorphologic feature.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list NaturalGeomorphologicFeatureTypeValue

Value	Name	Definition
naturalGeomorphologicFeature	natural geomorphologic feature	A geomorphologic feature produced by the natural dynamics.

drainagePattern	drainage pattern	The configuration or arrangement of stream courses in an area, including gullies or first-order channelized flow areas, higher order tributaries, and main streams.
constructionalFeature	constructional feature	Site of a landform that owes its origin, form, position, or general character to depositional (aggradational) processes, such as the accumulation of sediment
destructionalFeature	destructional feature	Site of a landform that owes its origin, form, position, or general character to the removal of material by erosion and weathering (degradation) processes resulting from the wearing-down or away of the land surface.
degradationFeature	degradation feature	A geomorphologic feature resulting from the wearing down or away, and the general lowering or reduction, of the Earth's surface by natural processes of weathering and erosion, and which may infer the processes of transportation of sediment.
relic	relic	A landform that has survived decay or disintegration, or one that has been left behind after the disappearance of the greater part of its substance such as a remnant island.
exhumedFeature	exhumed feature	Formerly buried landforms, geomorphologic surfaces, or paleosols that have been re-exposed by erosion of the covering mantle.
buriedFeature	buried feature	Landforms, geomorphologic surfaces, or paleosols covered by younger sediments.
pediment	pediment	A gently sloping erosional surface developed at the foot of a receding hill or mountain

		slope, commonly with a slightly concave-upward profile, that cross-cuts rock or sediment strata that extend beneath adjacent uplands.
erosional	erosional features	A land surface shaped by the action of erosion, especially by running water.
hill	hill	A generic term for an elevated area of the land surface, rising at least 30 metres to as much as 300 metres above surrounding lowlands, usually with a nominal summit area relative to bounding slopes, a well-defined, rounded outline and slopes that generally exceed 15 percent.
interfluve	interfluve	A geomorphologic component of hills consisting of the uppermost, comparatively level or gently sloped area of a hill; shoulders of back wearing hill slopes can narrow the upland or merge resulting in a strongly convex shape.
crest	crest	A geomorphologic component of hills consisting of the convex slopes (perpendicular to the contour) that form the narrow, roughly linear top area of a hill, ridge, or other upland where shoulders have converged to the extent that little or no summit remains; dominated by erosion, slope wash and mass movement processes and sediments
headSlope	head slope	A geomorphologic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainage way, resulting in converging overland water flow.
sideSlope	side slope	A geomorphologic component of hills consisting

		of a laterally planar area of a hillside, resulting in predominantly parallel overland water flow. Contour lines generally form straight lines.
noseSlope	nose slope	A geomorphologic component of hills consisting of the projecting end (laterally convex area) of a hillside, resulting in predominantly divergent overland water flow; contour lines generally form convex curves.
freeFace	free face	A geomorphologic component of hills and mountains consisting of an outcrop of bare rock that sheds rock fragments and other sediments to, and commonly stands more steeply than the angle of repose of, the colluvial slope immediately below; most commonly found on shoulder and back slope positions, and can comprise part or all of a nose slope or side slope.
baseSlope	base slope	A geomorphologic component of hills consisting of the concave to linear slope (perpendicular to the contour) which, regardless of the lateral shape, is an area that forms an apron or wedge at the bottom of a hillside dominated by colluvial and slope wash processes and sediments
mountain	mountain	A generic term for an elevated area of the land surface, rising more than 300 metres above surrounding lowlands, usually with a nominal summit area relative to bounding slopes and generally with steep sides (greater than 25 percent slope) with or without

		considerable bare-rock exposed.
mountaintop	mountaintop	A geomorphologic component of mountains consisting of the uppermost, comparatively level or gently sloped area of mountains, characterized by relatively short, simple slopes composed of bare rock, residuum, or short-transport colluvial sediments.
mountainslope	mountainslope	A part of a mountain between the summit and the foot.
mountainflank	mountainflank	A geomorphologic component of mountains characterized by very long, complex back slopes with comparatively high slope gradients and composed of highly-diverse colluvial sediment mantles, rock outcrops or structural benches.
mountainbase	mountainbase	A geomorphologic component of mountains consisting of the strongly to slightly concave colluvial apron or wedge at the bottom of mountain slopes.
depression	depression	Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground.
plain	plain	Any flat area, large or small, at a low elevation; specifically an extensive region of comparatively smooth and level or gently undulaing land, having few or no prominent surface irregularities but sometimes having a considerable slope, and usually at a low elevation with reference to surrounding areas.
tectonicStructural	tectonic and structural features	Geomorphologic landscapes and landforms related to regional or local

		bedrock structures, or crustal movement; and geomorphologic landscapes and landforms related dominantly to water erosion but excluding perennial, channel flow (i.e. fluvial, glaciofluvial), or eolian erosion.
volcanic	volcanic features	Geomorphologic landscapes and landforms related to the deep seated (igneous) processes by which magma and associated gases rise through the crust and are extruded onto the earth's surface and into the atmosphere.
hydrothermal	hydrothermal features	Geomorphologic landscapes and landforms related to hydrothermal processes.
erosionSurface	erosion surface	Geomorphologic landscapes and landforms related dominantly to water erosion but excluding perennial channel flow (i.e. fluvial, glaciofluvial) or eolian erosion.
slopeGravitational	slope and gravitational features	Geomorphologic landscapes and landforms related to slope environments; geomorphologic landscapes and landforms developed under the action of the gravitational force.
nivalPeriglacialPermafrost	nival, periglacial and permafrost features	Geomorphologic landscapes and landforms related to snow, non-glacial, cold climate environments; geomorphologic landscapes and landforms occurring in the vicinity of glaciers and ice sheets; geomorphologic landscapes and landforms related to ground, soil, or rock that remains at or below 0° C for at least two years.
glacial	glacial, glaciofluvial, glaciolacustrine and glaciomarine features	Geomorphologic landscapes and landforms related to to glacial, glaciofluvial,

		glaciolacustrine and glaciomarine environments.
eolian	eolian features	Geomorphologic landscapes and landforms related to wind-dominated environments.
marineLittoralCoastalWetland	marine, littoral and coastal wetlands features	Geomorphologic landscapes and landforms related to wave or tidal dynamics developed in marine, shallow marine, near-shore and littoral zone environments, and those related to vegetated and / or shallow wet areas
karstChemicalWeathering	karst and chemical weathering features	Geomorphologic landscapes and landforms dominated by mineral dissolution, and commonly, subsurface drainage.
alluvialFluvial	alluvial and fluvial features	Geomorphologic landscapes and landforms dominantly related to concentrated water flow (channel flow).
lacustrine	lacustrine features	Geomorphologic landscapes and landforms related to inland permanent water bodies (lakes).
impact	impact features	Geomorphologic landscapes and landforms related to the impact of extraterrestrial material on the Earth's surface.

4.2.3.15. Thematic Class (ThematicClassValue)

Values for thematic classification of geologic features.

The allowed values for this code list comprise any values defined by data providers.

4.2.3.16. Thematic Classification (ThematicClassificationValue)

List of thematic classifications for geologic features.

The allowed values for this code list comprise any values defined by data providers.

4.3. **Geophysics**

4.3.1. *Spatial object types*

The package Geophysics contains the following spatial object types:

— Campaign

— Geophysical Measurement
— Geophysical Object
— Geophysical Object Set
— Geophysical Profile
— Geophysical Station
— Geophysical Swath

4.3.1.1. Campaign (Campaign)

Geophysical activity extending over a limited time range and limited area for producing similar geophysical measurements, processing results or models.

This type is a sub-type of GeophObjectSet.
Attributes of the spatial object type Campaign

Attribute	Definition	Type	Voidability
campaignType	Type of activity to produce data.	CampaignTypeValue	
surveyType	Type of geophysical survey.	SurveyTypeValue	
client	Party for which data was created.	RelatedParty	voidable
contractor	Party by which data was created.	RelatedParty	voidable

Constraints of the spatial object type Campaign

The shape attribute shall be of type GM_Surface.

4.3.1.2. Geophysical Object (GeophObject)

A generic class for geophysical objects.

This type is a sub-type of SF_SpatialSamplingFeature.

This type is abstract.
Attributes of the spatial object type GeophObject

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
citation	Citation of geophysical documentation.	DocumentCitation	
projectedGeometry	2D projection of the feature to the ground surface (as a representative point, curve or bounding polygon) to be used	GM_Object	

	by an INSPIRE view service to display the spatial object location on a map.		
verticalExtent	Vertical extent of the range of interest.	EX_VerticalExtent	voidable
distributionInfo	Distribution metadata.	MD_Distributor	voidable
largerWork	Identifier of a larger work data set, typically a campaign or project.	Identifier	voidable

Constraints of the spatial object type GeophObject

The projectedGeometry attribute shall be of type GM_Point, GM_Curve or GM_Surface.

4.3.1.3. Geophysical Measurement (GeophMeasurement)

A generic spatial object type for geophysical measurements.

This type is a sub-type of GeophObject.

This type is abstract.

Attributes of the spatial object type GeophMeasurement

Attribute	Definition	Type	Voidability
relatedModel	Identifier of the geophysical model that was created from the measurement.	Identifier	voidable
platformType	Platform from which the measurement was carried out.	PlatformTypeValue	
relatedNetwork	Name of a national or international observation network to which the facility belongs, or to which measured data is reported.	NetworkNameValue	voidable

4.3.1.4. Geophysical Object Set (GeophObjectSet)

A generic class for collections of geophysical objects.

This type is a sub-type of SF_SpatialSamplingFeature.

Attributes of the spatial object type GeophObjectSet

Attribute	Definition	Type	Voidability

inspireId	External object identifier of the spatial object.	Identifier	
citation	Citation of geophysical documentation.	DocumentCitation	
verticalExtent	Vertical extent of the range of interest.	EX_VerticalExtent	voidable
distributionInfo	Distribution metadata.	MD_Distributor	voidable
projectedGeometry	2D projection of the feature to the ground surface (as a representative point, curve or bounding polygon) to be used by an INSPIRE view service to display the spatial object on a map.	GM_Object	
largerWork	Identifier of a larger work data set.	Identifier	voidable

Constraints of the spatial object type GeophObjectSet

The projectedGeometry attribute shall be of type GM_Point, GM_Curve or GM_Surface.

4.3.1.5. Geophysical Profile (GeophProfile)

A geophysical measurement spatially referenced to a curve.

This type is a sub-type of GeophMeasurement.
Attributes of the spatial object type GeophProfile

Attribute	Definition	Type	Voidability
profileType	Type of geophysical profile.	ProfileTypeValue	

Constraints of the spatial object type GeophProfile

The shape attribute shall be of type GM_Curve.

4.3.1.6. Geophysical Station (GeophStation)

Geophysical measurement spatially referenced to a single point location.

This type is a sub-type of GeophMeasurement.
Attributes of the spatial object type GeophStation

Attribute	Definition	Type	Voidability

stationType	Type of geophysical station.	StationTypeValue	
stationRank	Geophysical stations may be part of a hierarchical system. Rank is proportional to the importance of a station.	StationRankValue	voidable

Constraints of the spatial object type GeophStation

The shape attribute shall be of type GM_Point.

4.3.1.7. Geophysical Swath (GeophSwath)

A geophysical measurement spatially referenced to a surface.

This type is a sub-type of GeophMeasurement.
Attributes of the spatial object type GeophSwath

Attribute	Definition	Type	Voidability
swathType	Type of geophysical swath.	SwathTypeValue	

Constraints of the spatial object type GeophSwath

The shape attribute shall be of type GM_Surface.

4.3.2. *Code lists*

4.3.2.1. Campaign Type (CampaignTypeValue)

A type of geophysical campaign.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list CampaignTypeValue

Value	Name	Definition
measurement	measurement	Field data acquisition campaign.

4.3.2.2. Network Name (NetworkNameValue)

A name of geophysical network.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list NetworkNameValue

Value	Name	Definition
GSN	GSN	Global Seismographic Network

IMS	IMS	IMS Seismological network
INTERMAGNET	INTERMAGNET	International Real-time Magnetic Observatory Network
UEGN	UEGN	Unified European Gravity Network
WDC	WDC	World Data Center

4.3.2.3. Platform Type (PlatformTypeValue)

A platform on which data acquisition was carried out.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list PlatformTypeValue

Value	Name	Definition
ground	ground	Ground based measurement.
landVehicle	land vehicle	Measurement carried out from a land vehicle.
fixedWingAirplane	fixed-wing airplane	Measurement carried out from fixed-wing airplane.
helicopter	helicopter	Measurement carried out from helicopter.
seafloor	seafloor	Seafloor-based measurement.
researchVessel	research vessel	Measurement carried out from a ship.
satellite	satellite	Measurement carried out from satellite.

4.3.2.4. Profile Type (ProfileTypeValue)

Type of geophysical profile.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list ProfileTypeValue

Value	Name	Definition
boreholeLogging	borehole logging	Geophysical measurement along the axis of a borehole carried out with a special logging device.
multielectrodeDCProfile	multi-electrode dc profile	DC resistivity and/ or chargability (IP) measurement carried out

		along a profile with a larger set of electrodes. Also known as 2D resistivity tomography.
seismicLine	seismic line	Geophysical measurement used to record acoustic response of seismic sources along a line in order to define seismic properties in a cross section of the earth.

4.3.2.5. Station Rank (StationRankValue)

A rank of geophysical station.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list StationRankValue

Value	Name	Definition
observatory	observatory	Permanent monitoring facility with continuous observation schedule.
secularStation	secular station	Base station to record long term time variations of the observed physical field.
1stOrderBase	1st order base	Highest precision base station maintained by some authority. It is used to tie relative measurements to absolute network by third party observers.
2ndOrderBase	2nd order base	High precision base station of lower importance maintained by an authority. It is used to tie relative measurements to absolute network by third party observers.

4.3.2.6. Station Type (StationTypeValue)

A type of geophysical station.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list StationTypeValue

Value	Name	Definition
gravityStation	gravity station	Geophysical station to observe gravitational field.

magneticStation	magnetic station	Geophysical station to observe magnetic field.
seismologicalStation	seismological station	Geophysical station to observe strong motion seismological events (earthquake) or ambient noise.
verticalElectricSounding	vertical electric sounding	Geophysical station to measure underground electric resistivity and/or chargeability (IP) changes in depth using 4 electrodes (AMNB) and direct current. Also known as VES.
magnetotelluricSounding	magnetotelluric sounding	Geophysical station to measure underground electric resistivity changes using natural electromagnetic field variations. Also known as MT sounding.

4.3.2.7. Survey Type (SurveyTypeValue)

A type of geophysical survey or data set.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list SurveyTypeValue

Value	Name	Definition
airborneGeophysicalSurvey	airborne geophysical survey	Campaign of airborne geophysical measurements.
groundGravitySurvey	ground gravity survey	Campaign of ground gravity measurements.
groundMagneticSurvey	ground magnetic survey	Campaign of ground magnetic measurements.
3DResistivitySurvey	3D resistivity survey	Campaign of 3D Multielectrode DC measurements.
seismologicalSurvey	seismological survey	Campaign of seismological measurements.

4.3.2.8. Swath Type (SwathTypeValue)

A type of geophysical swath.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Values for the code list SwathTypeValue

Value	Name	Definition
3DSeismics	3d seismics	Geophysical measurement used to record acoustic response of seismic sources over an area in order to define 3D seismic property distribution in a volume of the earth.

4.4. **Hydrogeology**

4.4.1. *Spatial object types*

The package Hydrogeology contains the following spatial object types:
— Active Well
— Aquiclude
— Aquifer
— Aquifer System
— Aquitard
— Groundwater Body
— Hydrogeological Object
— Man-made Hydrogeological Object
— Natural Hydrogeological Object
— Hydrogeological Unit

4.4.1.1. Active Well (ActiveWell)

A well influencing the groundwater resources of the aquifer.

This type is a sub-type of HydrogeologicalObjectManMade.
Attributes of the spatial object type ActiveWell

Attribute	Definition	Type	Voidability
activityType	The type of activity carried out by the well.	ActiveWellTypeValue	

Association roles of the spatial object type ActiveWell

Association role	Definition	Type	Voidability
groundWaterBody	The GroundWaterBody from which the ActiveWell extracts groundwater resources.	GroundWaterBody	voidable
environmentalMonitoringFacility	The related EnvironmentalMonitoringFacility.	EnvironmentalMonitoringFacility	voidable

borehole	The Borehole upon which the ActiveWell is based.	Borehole	voidable

4.4.1.2. Aquiclude (Aquiclude)

An impermeable body of rock or stratum of sediment that acts as a barrier to the flow of groundwater.

This type is a sub-type of HydrogeologicalUnit.

4.4.1.3. Aquifer (Aquifer)

A wet underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be usefully extracted using a water well.

This type is a sub-type of HydrogeologicalUnit.
Attributes of the spatial object type Aquifer

Attribute	Definition	Type	Voidability
aquiferType	The type of aquifer.	AquiferTypeValue	
mediaType	The classification of the medium in which the groundwater flow occurs.	AquiferMediaTypeValue	
isExploited	Indicates if groundwater from aquifer is exploited by wells or intakes.	Boolean	voidable
isMainInSystem	Indicates if aquifer is the main useful aquifer in the aquifer system.	Boolean	voidable
vulnerabilityToPollution	An index value or interval of values determining the potential degree of aquifer risk arising from the geological structure, hydrogeological conditions and the existence of real or potential source of contamination.	QuantityValue	voidable
permeabilityCoefficient	The volume of an incompressible fluid that will flow in unit time through a unit cube of a	QuantityValue	voidable

	porous substance across which a unit pressure difference is maintained.		
storativityCoefficient	The ability of an aquifer to store water.	QuantityValue	voidable
hydroGeochemicalRockType	The rock type with respect to the soluble rock components and their hydrogeochemical influence on groundwater.	HydroGeochemicalRockTypeValue	voidable

Association roles of the spatial object type Aquifer

Association role	Definition	Type	Voidability
aquitard	The Aquitard(s) that separates the Aquifer.	Aquitard	voidable
hydrogeologicalObject	The HydrogeologicalObject(s) related to the aquifer.	HydrogeologicalObject	voidable
aquiferSystem	The specific AquiferSystem where the Aquitard occurs.	AquiferSystem	voidable

4.4.1.4. Aquifer System (AquiferSystem)

A collection of aquifers and aquitards, which together constitute the environment of groundwater - ‘communicating vessels’, that are filled or can be filled with water.

This type is a sub-type of HydrogeologicalUnit.

Attributes of the spatial object type AquiferSystem

Attribute	Definition	Type	Voidability
isLayered	Indicates if the AquiferSystem consists of more than one layer.	Boolean	voidable

Association roles of the spatial object type AquiferSystem

Association role	Definition	Type	Voidability
aquitard	The Aquitard(s) contained within the AquiferSystem.	Aquitard	voidable

aquiclude	An Aquiclude enclosing the AquiferSystem.	Aquiclude	voidable
aquifer	The Aquifer(s) contained in the AquiferSystem.	Aquifer	voidable

4.4.1.5. Aquitard (Aquitard)

A saturated, but poorly permeable bed that impedes groundwater movement.

This type is a sub-type of HydrogeologicalUnit.
Attributes of the spatial object type Aquitard

Attribute	Definition	Type	Voidability
approximatePermeability	The volume of an incompressible fluid that will flow in unit time through a unit cube of a porous substance across which a unit pressure difference is maintained.	QuantityValue	voidable
approximateStorativityCoefficient	The ability of an aquifer to store water.	QuantityValue	voidable

Association roles of the spatial object type Aquitard

Association role	Definition	Type	Voidability
aquiferSystem	The AquiferSystem of which the Aquitard is a part.	AquiferSystem	voidable
aquifer	The Aquifers separated by the Aquitard.	Aquifer	voidable

4.4.1.6. Groundwater Body (GroundWaterBody)

A distinct volume of groundwater within an aquifer or system of aquifers, which is hydraulically isolated from nearby groundwater bodies.
Attributes of the spatial object type GroundWaterBody

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	

approximateHorizontalExtent	The geometry defining the boundary of the GroundWaterBody.	GM_Surface	voidable
conditionOfGroundWaterBody	The approximate degree of change to groundwater as a result of human activity.	ConditionOfGroundwaterValue	voidable
mineralization	One of the main chemical characteristics of water. A value is a sum of all water chemical concentration components.	WaterSalinityValue	voidable
piezometricState	Specifies the piezometric state of the GroundwaterBody water table.	PiezometricState	voidable
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable

Association roles of the spatial object type GroundWaterBody

Association role	Definition	Type	Voidability
activeWell	The ActiveWell which changes the state of the GroundwaterBody through the extraction of groundwater resources.	ActiveWell	voidable
aquiferSystem	The AquiferSystem which includes the GroundWaterBody.	AquiferSystem	voidable
hydrogeologicalObjectNatural	The HydrogeologicalObject	HydrogeologicalObjectNatural	voidable

	interacting with the GroundwaterBody.		
observationWell	The observation wells which monitor the GroundWaterBody	EnvironmentalMonitoringFacility	voidable

4.4.1.7. Hydrogeological Object (HydrogeologicalObject)

An abstract class for man-made facilities or natural features that have an interaction with the hydrogeological system.

This type is abstract.

Attributes of the spatial object type HydrogeologicalObject

Attribute	Definition	Type	Voidability
inspireId	External object identifier of the spatial object.	Identifier	
geometry	The geometry defining the spatial location of the HydrogeologicalObject.	GM_Primitive	
name	The name or code of the HydrogeologicalObject.	PT_FreeText	voidable
description	The description of the HydrogeologicalObject.	PT_FreeText	voidable
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable

Association roles of the spatial object type HydrogeologicalObject

Association role	Definition	Type	Voidability
aquifer	The Aquifer within which the HydrogeologicalObject occurs.	Aquifer	voidable

4.4.1.8. Man-made Hydrogeological Object (HydrogeologicalObjectManMade)

A man-made hydrogeological object.

This type is a sub-type of HydrogeologicalObject.

This type is abstract.

Attributes of the spatial object type HydrogeologicalObjectManMade

Attribute	Definition	Type	Voidability
validFrom	Official date and time the hydrogeological object was/will be legally established.	DateTime	voidable
validTo	Date and time at which the hydrogeological object legally ceased/ will cease to be used.	DateTime	voidable
statusCode	A code defining the formal status of a man-made hydrogeological object.	StatusCodeTypeValue	voidable

4.4.1.9. Natural Hydrogeological Object (HydrogeologicalObjectNatural)

Hydrogeological object which was created by natural processes.

This type is a sub-type of HydrogeologicalObject.

Attributes of the spatial object type HydrogeologicalObjectNatural

Attribute	Definition	Type	Voidability
naturalObjectType	The type of natural hydrogeological object.	NaturalObjectTypeValue	
waterPersistence	The degree of persistence of water flow.	WaterPersistenceValue	voidable
approximateQuantityOfFlow	The approximate value defining the water yield in a natural hydrogeological object.	QuantityValue	voidable

Association roles of the spatial object type HydrogeologicalObjectNatural

Association role	Definition	Type	Voidability
groundWaterBody	The GroundWateBody with which	GroundWaterBody	voidable

	the natural hydrogeological object interacts.		

4.4.1.10. Hydrogeological Unit (HydrogeologicalUnit)

A part of the lithosphere with distinctive parameters for water storage and conduction.

This type is a sub-type of GeologicUnit.
Attributes of the spatial object type HydrogeologicalUnit

Attribute	Definition	Type	Voidability
description	The description of the HydrogeologicalUnit.	PT_FreeText	voidable
approximateDepth	The approximate depth of the HydrogeologicalUnit occurrence.	QuantityValue	voidable
approximateThickness	The approximate thickness of the HydrogeologicalUnit.	QuantityValue	voidable
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DateTime	voidable
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DateTime	voidable

Association roles of the spatial object type HydrogeologicalUnit

Association role	Definition	Type	Voidability
geologicStructure	Relates one or many HydrogeologicalUnit(s) to a GeologicStructure.	GeologicStructure	voidable

4.4.2. *Data types*

4.4.2.1. Hydrogeological Surface (HydrogeologicalSurface)

A surface that represents the interpolated groundwater table or other surface, for a local or regional area.

This type is a union type.
Attributes of the union type HydrogeologicalSurface

Attribute	Definition	Type	Voidability
surfaceRectifiedGrid	A surface whose domain is a rectified grid.	RectifiedGridCoverage	
surfaceReferenceableGrid	Surface whose domain consists of a referenceable grid.	ReferenceableGridCoverage	
surfacePointCollection	Hydrogeological surface represented by collection of observations in points.	PointObservationCollection	

4.4.2.2. Piezometric State (PiezometricState)

The piezometric state of a GroundWaterBody
Attributes of the data type PiezometricState

Attribute	Definition	Type	Voidability
observationTime	Date and time of groundwater state observation.	DateTime	
piezometricSurface	A surface that represents the level to which water will rise in tightly cased wells.	HydrogeologicalSurface	

4.4.2.3. Quantity Value (QuantityValue)

A data container with a single quantity value or a range of quantity values.

This type is a union type.
Attributes of the union type QuantityValue

Attribute	Definition	Type	Voidability
singleQuantity	Scalar component with decimal representation and a unit of measure used to store value of a continuous quantity.	Quantity	
quantityInterval	Decimal pair for specifying a quantity range with a unit of measure.	QuantityRange	

4.4.3. *Code lists*

4.4.3.1. Active Well Type (ActiveWellTypeValue)

Types of active wells.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Values for the code list ActiveWellTypeValue

Value	Name	Definition
exploitation	exploitation	The extraction of groundwater from an aquifer for various purposes (domestic, industrial, water supply intake and other)
recharge	recharge	(a) Aquifer Recharge Wells: Used to recharge depleted aquifers by injecting water from a variety of sources such as lakes, streams, domestic wastewater treatment plants, other aquifers, etc. (b) Saline Water Intrusion Barrier Wells: Used to inject water into fresh water aquifers to prevent intrusion of salt water into fresh water aquifers. (c) Subsidence Control Wells: Used to inject fluids into a non-oil or gas-producing zone to reduce or eliminate subsidence associated with overdraft of fresh water.
dewatering	dewatering	The removal of water from solid material or soil from an aquifer for the purpose of lowering the water table, e.g. during the site development phase of a major construction project due to a high water

		table. Usually involves the use of 'dewatering' pumps.
decontamination	decontamination	Well used in remediation schemes that reduce the pollution in an aquifer.
disposal	disposal	A well, often a depleted oil or gas well, into which waste fluids can be injected for disposal. Disposal wells typically are subject to regulatory requirements to avoid the contamination of freshwater aquifers.
waterExploratory	water exploratory	A well drilled to search for new groundwater.
thermal	thermal	A well used to extract thermal supply water for various thermal purposes (e.g. balneology).
observation	observation	A well used for observation purposes.

4.4.3.2. Aquifer Media Type (AquiferMediaTypeValue)

Values describing the characteristics of the aquifer medium.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list AquiferMediaTypeValue

Value	Name	Definition
fractured	fractured	Fractured aquifers are rocks in which the groundwater moves through cracks, joints or fractures in otherwise solid rock
porous	porous	Porous media are those aquifers consisting of aggregates of individual particles such as sand or gravel. and the groundwater flow occurs in and moves through the openings between the individual grains.
karstic	karstic	Karstic aquifers are fractured aquifers where the cracks and fractures have been enlarged

		by solution, forming large channels or even caverns.
compound	compound	A combination of a porous, karstic and/or fractured aquifer
karsticAndFractured	karstic and fractured	A combination of both karstic and fractured aquifer
porousAndFractured	porous and fractured	A combination of both porous and fractured aquifer

4.4.3.3. Aquifer Type (AquiferTypeValue)

Types of aquifers.

The allowed values for this code list comprise only the values specified in the table below.
Values for the code list AquiferTypeValue

Value	Name	Definition
confinedSubArtesian	confined subartesian	An aquifer containing water between two relatively impermeable boundaries. The water level in a well tapping a confined aquifer stands above the top of the confined aquifer and can be higher or lower than the water table that may be present in the material above it. The water level does not rise above the ground surface.
confinedArtesian	confined artesian	An aquifer containing water between two relatively impermeable boundaries. The water level in a well tapping a confined aquifer stands above the top of the confined aquifer and can be higher or lower than the water table that may be present in the material above. The water level rises above the ground surface, yielding a flowing well.
unconfined	unconfined	An aquifer containing water that is not under pressure. The water level in a well is the same as the water table outside the well.

4.4.3.4. Condition Of Groundwater (ConditionOfGroundwaterValue)

Values indicating the approximate degree of change which has taken place on the natural state of groundwater.

The allowed values for this code list comprise only the values specified in the table below.
Values for the code list ConditionOfGroundwaterValue

Value	Name	Definition
natural	natural	Groundwater quantity or quality is dependent only on natural factors.
lightlyModified	lightly modified	Groundwater quantity or quality is dependent mostly on natural factors, but with some influence through human activity
modified	modified	Groundwater quantity or quality is modified by human activity.
stronglyModified	strongly modified	Groundwater quantity or quality is modified by human activity and the values of a number of parameters exceed the drinking water standards.
unknown	unknown	The natural state of groundwater condition is unknown.

4.4.3.5. Hydrogeochemical Rock Type (HydroGeochemicalRockTypeValue)

Values describing the hydrogeochemical condition of the groundwater environment.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list HydroGeochemicalRockTypeValue

Value	Name	Definition
silicatic	silicatic	Silicatic hydrochemical type of groundwater.
carbonatic	carbonatic	Carbonatic hydrochemical type of groundwater.
sulfatic	sulfatic	Sulfatic hydrochemical type of groundwater.
chloridic	chloridic	Chloridic hydrochemical type of groundwater.

organic	organic	Organic hydrochemical type of groundwater.

4.4.3.6. Natural Object Type (NaturalObjectTypeValue)

Types of natural hydrogeological objects.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list NaturalObjectTypeValue

Value	Name	Definition
spring	spring	Any natural situation where groundwater flows to the surface of the earth. Thus, a spring is a site where the aquifer surface meets the ground surface.
seep	seep	A moist or wet place where groundwater reaches the earth's surface from an underground aquifer.
swallowHole	swallow hole	A natural depression or hole in the Earth's surface, also known as a sink, shake hole, sinkhole, swallow hole, swallet, doline or cenote, it is mostly caused by karst processes – the chemical dissolution of carbonate rocks or suffusion processes for example in sandstone.
fen	fen	Low land that is covered wholly or partly with water and that usually has peaty alkaline soil and characteristic flora (as of sedges and reeds).
notSpecified	not specified	Unspecified places where groundwater meets the surface.

4.4.3.7. Status Code Type (StatusCodeTypeValue)

Values describing the statuses of man-made hydrogeological objects.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list StatusCodeTypeValue

Value	Name	Definition
abandonedDry	abandoned, dry	Abandoned because of lack of water.
abandonedInsufficient	abandoned, insufficient water	Abandoned because of insufficient amount of water.
abandonedQuality	abandoned, poor water quality	Abandoned because of water quality reasons.
deepened	deepened	Depth of boring increased.
new	new	Borehole constructed on a site not previously used.
notInUse	not in use	No longer used for any purpose.
reconditioned	reconditioned	Well that has been subject to remedial works to improve its functioning.
standby	standby	Abstraction used only when others are not available.
unfinished	unfinished	Boring or construction not completed.
unknown	unknown	Status not known or defined.

4.4.3.8. Water Persistence (WaterPersistenceValue)

Types of hydrological persistence of water.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.
Values for the code list WaterPersistenceValue

Value	Name	Definition
intermittent	intermittent	Filled and/or flowing for part of the year.
seasonal	seasonal	Filled and/or flowing for particular seasons of the year, e.g. autumn/winter.
perennial	perennial	Filled and/or flowing continuously throughout the year as its bed lies below the water table.
notSpecified	not specified	The type of hydrological persistence of water not specified.

ephemeral	ephemeral	Filled and/or flowing during and immediately after precipitation.

4.4.3.9. Water Salinity (WaterSalinityValue)

A code list indicating salinity classes in water.

The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

Values for the code list WaterSalinityValue

Value	Name	Definition
ultraFreshWater	ultra fresh water	Water with very low salinity. The salinity is equivalent or nearly equivalent to that of rainwater.
freshWater	fresh water	Freshwater refers to bodies of water such as ponds, lakes, rivers and streams containing low concentrations of dissolved salts.
brackishWater	brackish water	Brackish water is water that has more salinity than fresh water, but not as much as seawater. It may result from mixing of seawater with fresh water, as in estuaries, or it may occur in brackish fossil aquifers.
salineWater	saline water	Saline water is water that contains a significant concentration of dissolved salts. Seawater has a salinity of roughly 35 000 ppm, equivalent to 35 g/L.
brineWater	brine water	Brine water is saturated or nearly saturated with salt.

4.5. **Layers**

Layers for the spatial data theme Geology

Layer Name	Layer Title	Spatial object type
GE.GeologicUnit	Geologic Units	MappedFeature (spatial objects whose specification property is of type GeologicUnit)
GE. <CodeListValue>[a]	<human readable name>	MappedFeature (spatial objects whose specification property is of type GeologicFeature and which are classified (using the themeClass property) according to the same thematic classification)
Example: GE.ShrinkingAndSwelling Clays	Example: Shrinking and swelling clays	(themeClassification: ThematicClassificationValue)
GE.GeologicFault	Geologic Faults	MappedFeature (spatial objects whose specification property is of type ShearDisplacementStructure)
GE.GeologicFold	Geologic Folds	MappedFeature (spatial objects whose specification property is of type Fold)
GE.GeomorphologicFeature	Geomorphologic Features	MappedFeature (spatial objects whose specification property is of type GeomorphologicFeature)
GE.Borehole	Boreholes	Borehole
GE.Aquifer	Aquifers	MappedFeature (spatial objects whose specification property is of type Aquifer)
GE.Aquiclude	Aquicludes	MappedFeature (spatial objects whose specification property is of type Aquiclude)
GE.Aquitard	Aquitards	MappedFeature (spatial objects whose specification property is of type Aquitard)
GE.AquiferSystems	Aquifer Systems	MappedFeature (spatial objects whose specification

a One layer shall be made available for each code list value, in accordance with Art. 14(3).

b One layer shall be made available for each code list value, in accordance with Art. 14(3).

c One layer shall be made available for each code list value, in accordance with Art. 14(3).

d One layer shall be made available for each code list value, in accordance with Art. 14(3).

e One layer shall be made available for each code list value, in accordance with Art. 14(3).]

		property is of type AquiferSystem)
GE.Groundwaterbody	Groundwater Bodies	Groundwaterbody
GE.ActiveWell	Active Wells	ActiveWell
GE. <CodeListValue>[b]	<human readable name>	GeophStation (stationType: StationTypeValue)
Example: GE.gravityStation	Example: Gravity Stations	
GE. <CodeListValue>[c]	<human readable name>	GeophStation (profilType: ProfileTypeValue)
Example: GE.seismicLine	Example: Seismic Lines	
GE. <CodeListValue>[d]	<human readable name>	GeophStation (surveyType: SurveyTypeValue)
Example: GE.groundGravitySurvey	Example: Ground Gravity Surveys	
GE. <CodeListValue>[e]	<human readable name>	Campaign (surveyType: SurveyTypeValue)
Example: GE.groundMagneticSurvey	Example: Ground Magnetic Surveys	
GE.Geophysics.3DSeismics	3D Seismics	GeophSwath

a One layer shall be made available for each code list value, in accordance with Art. 14(3).

b One layer shall be made available for each code list value, in accordance with Art. 14(3).

c One layer shall be made available for each code list value, in accordance with Art. 14(3).

d One layer shall be made available for each code list value, in accordance with Art. 14(3).

e One layer shall be made available for each code list value, in accordance with Art. 14(3).]

Changes to legislation:
There are outstanding changes not yet made to Commission Regulation (EU) No 1089/2010. Any changes that have already been made to the legislation appear in the content and are referenced with annotations.
View outstanding changes

Changes and effects yet to be applied to the whole legislation item and associated provisions

- Annex 1 para. 8.1.3.1 words inserted by S.I. 2018/1338 reg. 13(10)(c)(ii)
- Annex 1 para. 8.1.3.1 words inserted by S.I. 2018/1338 reg. 13(10)(c)(iii)
- Annex 1 para. 7.3.3.1 words omitted by S.I. 2018/1338 reg. 13(10)(a)
- Annex 1 para. 8.1.3.2 words omitted by S.I. 2018/1338 reg. 13(10)(d)(i)
- Annex 1 para. 8.1.3.2 words omitted by S.I. 2018/1338 reg. 13(10)(d)(ii)
- Annex 1 para. 8.1.1.1 words substituted by S.I. 2018/1338 reg. 13(10)(b)
- Annex 1 para. 8.1.3.1 words substituted by S.I. 2018/1338 reg. 13(10)(c)(i)
- Annex 2 para. 1.3.4(2) omitted by S.I. 2018/1338 reg. 13(11)(b)
- Annex 2 para. 2.2(2) omitted by S.I. 2018/1338 reg. 13(11)(c)
- Annex 2 para. 3.1.1 words omitted by S.I. 2018/1338 reg. 13(11)(d)
- Annex 2 para. 6.1.4 words omitted by S.I. 2018/1338 reg. 13(11)(k)
- Annex 2 para. 7.6.1.6 words omitted by S.I. 2018/1338 reg. 13(11)(l)
- Annex 2 para. 7.9.1 words omitted by S.I. 2018/1338 reg. 13(11)(n)
- Annex 2 para. 8.7.1 words omitted by S.I. 2018/1338 reg. 13(11)(o)(i)
- Annex 2 para. 9.4.1 words omitted by S.I. 2018/1338 reg. 13(11)(s)(ii)
- Annex 2 para. 9.4.5 words omitted by S.I. 2018/1338 reg. 13(11)(t)
- Annex 2 heading words substituted by S.I. 2018/1338 reg. 13(11)(a)
- Annex 2 para. 3.3.4 words substituted by S.I. 2018/1338 reg. 13(11)(e)(i)
- Annex 2 para. 3.3.4 words substituted by S.I. 2018/1338 reg. 13(11)(e)(ii)
- Annex 2 para. 4.2.1.2 words substituted by S.I. 2018/1338 reg. 13(11)(f)
- Annex 2 para. 4.4(1) words substituted by S.I. 2018/1338 reg. 13(11)(g)
- Annex 2 para. 5.2.4 words substituted by S.I. 2018/1338 reg. 13(11)(h)
- Annex 2 para. 5.3.2 words substituted by S.I. 2018/1338 reg. 13(11)(i)
- Annex 2 para. 6.1 words substituted by S.I. 2018/1338 reg. 13(11)(j)
- Annex 2 para. 7.7.1.15 words substituted by S.I. 2018/1338 reg. 13(11)(m)
- Annex 2 para. 8.7.1 words substituted by S.I. 2018/1338 reg. 13(11)(o)(ii)
- Annex 2 para. 8.7.2 words substituted by S.I. 2018/1338 reg. 13(11)(p)
- Annex 2 para. 8.7.4 words substituted by S.I. 2018/1338 reg. 13(11)(q)
- Annex 2 para. 9.1.1 words substituted by S.I. 2018/1338 reg. 13(11)(r)
- Annex 2 para. 9.4.1 words substituted by S.I. 2018/1338 reg. 13(11)(s)(i)
- Art. 2(2) words substituted by S.I. 2018/1338 reg. 13(3)(a)
- Art. 2(3) words substituted by S.I. 2018/1338 reg. 13(3)(b)
- Art. 2(20) words substituted by S.I. 2018/1338 reg. 13(3)(c)
- Art. 2(39)(40) inserted by S.I. 2018/1338 reg. 13(3)(d)
- Annex 3 heading words substituted by S.I. 2018/1338 reg. 13(12)(a)
- Annex 3 para. 1.7.5 point (3) words substituted by S.I. 2018/1338 reg. 13(12)(b)
- Annex 4 para. 1.5 point (2) omitted by S.I. 2018/1338 reg. 13(13)(b)
- Annex 4 para. 16.2.3 word inserted by S.I. 2018/1338 reg. 13(13)(p)(i)
- Annex 4 para. 18.4.8 word omitted by S.I. 2018/1338 reg. 13(13)(u)(ii)
- Annex 4 para. 4.7.1.1 word substituted by S.I. 2018/1338 reg. 13(13)(c)(i)
- Annex 4 para. 4.7.1.1 word substituted by S.I. 2018/1338 reg. 13(13)(c)(ii)
- Annex 4 para. 4.7.1.3.1 word substituted by S.I. 2018/1338 reg. 13(13)(e)(iii)
- Annex 4 para. 18.4.8 word substituted by S.I. 2018/1338 reg. 13(13)(u)(i)
- Annex 4 para. 5.1.5 words inserted by S.I. 2018/1338 reg. 13(13)(h)
- Annex 4 para. 10.3.2 words inserted by S.I. 2018/1338 reg. 13(13)(k)
- Annex 4 para. 11.3.1 words inserted by S.I. 2018/1338 reg. 13(13)(l)(iii)(bb)
- Annex 4 para. 11.3.1 words inserted by S.I. 2018/1338 reg. 13(13)(l)(vii)(aa)
- Annex 4 para. 17.4.2 words inserted by S.I. 2018/1338 reg. 13(13)(q)(i)(aa)
- Annex 4 para. 17.4.2 words inserted by S.I. 2018/1338 reg. 13(13)(q)(i)(bb)

- Annex 4 para. 17.4.2 words inserted by S.I. 2018/1338 reg. 13(13)(q)(ii)
- Annex 4 para. 17.4.3 words inserted by S.I. 2018/1338 reg. 13(13)(r)(ii)(bb)
- Annex 4 para. 18.4.2 words inserted by S.I. 2018/1338 reg. 13(13)(s)(ii)
- Annex 4 para. 4.7.1.2 words omitted by S.I. 2018/1338 reg. 13(13)(d)(i)
- Annex 4 para. 4.7.1.2 words omitted by S.I. 2018/1338 reg. 13(13)(d)(ii)
- Annex 4 para. 4.7.3.4 words omitted by S.I. 2018/1338 reg. 13(13)(f)
- Annex 4 para. 11.3.1 words omitted by S.I. 2018/1338 reg. 13(13)(l)(iv)
- Annex 4 para. 11.3.1 words omitted by S.I. 2018/1338 reg. 13(13)(l)(v)
- Annex 4 para. 11.3.1 words omitted by S.I. 2018/1338 reg. 13(13)(l)(vi)
- Annex 4 para. 11.3.1 words omitted by S.I. 2018/1338 reg. 13(13)(l)(vii)(bb)
- Annex 4 para. 11.4.1 point (3)(b) words omitted by S.I. 2018/1338 reg. 13(13)(m)
- Annex 4 para. 13.2.1.1 words omitted by S.I. 2018/1338 reg. 13(13)(n)
- Annex 4 para. 13.3 point (3) words omitted by S.I. 2018/1338 reg. 13(13)(o)
- Annex 4 para. 16.2.3 words omitted by S.I. 2018/1338 reg. 13(13)(p)(ii)
- Annex 4 para. 17.4.3 words omitted by S.I. 2018/1338 reg. 13(13)(r)(i)
- Annex 4 para. 18.4.7 words omitted by S.I. 2018/1338 reg. 13(13)(t)
- Annex 4 para. 19.1 words omitted by S.I. 2018/1338 reg. 13(13)(v)
- Annex 4 para. 11.3.1 words omted by S.I. 2018/1338 reg. 13(13)(l)(ix)
- Annex 4 heading words substituted by S.I. 2018/1338 reg. 13(13)(a)
- Annex 4 para. 4.7.1.3.1 words substituted by S.I. 2018/1338 reg. 13(13)(e)(i)
- Annex 4 para. 4.7.1.3.1 words substituted by S.I. 2018/1338 reg. 13(13)(e)(ii)
- Annex 4 para. 4.8 point (4) words substituted by S.I. 2018/1338 reg. 13(13)(g)(i)
- Annex 4 para. 4.8 point (5) words substituted by S.I. 2018/1338 reg. 13(13)(g)(ii)
- Annex 4 para. 6.9.1.1 words substituted by S.I. 2018/1338 reg. 13(13)(i)
- Annex 4 para. 9.1 point (1) words substituted by S.I. 2018/1338 reg. 13(13)(j)(i)
- Annex 4 para. 9.1 point (2) words substituted by S.I. 2018/1338 reg. 13(13)(j)(ii)
- Annex 4 para. 11.3.1 words substituted by S.I. 2018/1338 reg. 13(13)(l)(i)
- Annex 4 para. 11.3.1 words substituted by S.I. 2018/1338 reg. 13(13)(l)(ii)
- Annex 4 para. 11.3.1 words substituted by S.I. 2018/1338 reg. 13(13)(l)(iii)(aa)
- Annex 4 para. 11.3.1 words substituted by S.I. 2018/1338 reg. 13(13)(l)(viii)
- Annex 4 para. 17.4.3 words substituted by S.I. 2018/1338 reg. 13(13)(r)(ii)(aa)
- Annex 4 para. 18.4.2 words substituted by S.I. 2018/1338 reg. 13(13)(s)(i)
- Annex 4 para. 18.4.8 words substituted by S.I. 2018/1338 reg. 13(13)(u)(iii)
- Annex 7 para. 2 words substituted by S.I. 2018/1338 reg. 13(14)