Establishing the European Geological Surveys Research Area to deliver a Geological Service for Europe

Authors and affiliation:

BRGM	**M. Beaufils**
	S. Grellet
ISPRA	**C. Cipolloni**
	M.P. Congi
BGS	**M. Sen**
	E. Lewis
	J. Passmore
BGR	**A.A. Maul**
	B. Zehner
MBFSZ	**L. Sőrés**

E-mail of lead author:
m.beaufils@brgm.fr

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INTRODUCTION

Objectives and contents of D3.2.1:

The GeoERA projects aim at providing several kinds of deliverables. Some are very similar between projects, other are more specific.

D3.2.1 aims at providing a gap analysis between GeoERA projects requirements (D.2.1.1) and best candidate data models and standards to expose the data (D.3.1); It also includes a proposition of a roadmap to enhance model / standard capacities to cover GeoERA project's needs.

Sources of needs expression from the projects and versions considered for D3.2:

Name of the document	Date / version
D2.1.1, Potential synergies and overlaps between the projects.	Version: 30/06/2019
D3.1, Data models, Standard Guidelines and Toolkits.	Version: 02/05/2019

Relevant data models identified by D3.1 and versions considered for D3.2:

Name of the standard	Date / version / URL
OGC GeoSciML	4.1 Rev 16-008 https://docs.opengeospatial.org/is/16-008/16-008.html
OGC GWML2	2.2 Rev 16-032r2 http://docs.opengeospatial.org/is/16-032r2/16-032r2.html
EarthResourceML	2.0 October 2013 http://www.earthresourceml.org/earthresourceml/2.0/doc/ERML_HTML_Documentation/
INSPIRE AC-MF (Atmospheric Conditions - Meteorological geographical features).	Revision 4618 https://inspire.ec.europa.eu/data-model/approved/r4618-ir/html/ This version corresponds to the content of the Implementing Rules (EU) No 1089/2010, No 102/2011, No 1253/2013 and the latest publicly available version of the data specifications of Annex I, II+III.
INSPIRE AF (Agricultural and aquaculture facilities)	
INSPIRE EF (Environmental Monitoring Facility)	
INSPIRE ER (Earth Resources)	

INSPIRE GE (Geology)	
INSPIRE LU (Land Use)	
INSPIRE MR (Mineral Resources)	
INSPIRE OF (Ocean Features)	
INSPIRE SO (Soil)	
INSPIRE NZ (Natural Risk Zones)	
EPOS BoreholeView	https://forge.brgm.fr/svnrepository/epos/trunk/Documents/HTML_documentation/index.htm
EPOS ModelView	https://forge.brgm.fr/svnrepository/epos/trunk/Documents/HTML_documentation/index.htm. The data model is still being developed, so depending on the final version the applicability for the GSPs must be evaluated.
ISO 19156 : Observations & Measurements	2.0 Rev 10-025r1 (OGC) https://www.opengeospatial.org/standards/om
WaterML 2 - Part 1 / Timeseries	2.0.1 Rev 10-126r4 https://portal.opengeospatial.org/files/?artifact_id=57222
Coverages	2.1 Rev 17-089r1 (OGC) https://www.opengeospatial.org/standards/wcs#downloads

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DEFINITIONS AND ABBREVIATIONS

GeoERA: Establishing the European Geological Surveys Research Area to deliver a Geological Service for Europe

EGDI: European Geological Data Infrastructure

GIP-P: GeoERA Information Platform Project

GSPs: Geoscientific projects within GeoERA

WP: work package

Specific GeoERA GSPs:

3DGEO-EU (in tables abbreviated as 3D): 3D geomodelling for Europe.

GARAH (in tables abbreviated as GA): Geological Analysis and Resource Assessment of selected Hydrocarbon systems.

GeoConnect³d (in tables abbreviated as Ge^3): Cross-border, cross-thematic multiscale framework for combining geological models and data for resource appraisal and policy support.

HIKE (in tables abbreviated as HI): Hazard and Impact Knowledge for Europe.

HotLime (in tables abbreviated as Hot): Mapping and Assessment of Geothermal Plays in Deep Carbonate Rocks – Cross-domain Implications and Impacts

MUSE (in tables abbreviated as MU): Managing Urban Shallow Geothermal Energy.

HOVER (in tables abbreviated as HO): Hydrological processes and Geological settings over Europe controlling dissolved geogenic and anthropogenic elements in groundwater of relevance to human health and the status of dependent ecosystems.

RESOURCE (in tables abbreviated as RE): Resources of groundwater harmonized at cross-border and pan- European scale.

TACTIC (in tables abbreviated as TA): Tools for Assessment of Climate change Impact on groundwater and adaptation Strategies.

VoGERA (in tables abbreviated as Vo): Vulnerability of Shallow Groundwater Resources to Deep Subsurface Energy-Related Activities.

EuroLithos (in tables abbreviated as Eur): European Ornamental stone resources.

FRAME (in tables abbreviated as FR): Forecasting and Assessing Europe's Strategic Raw Materials needs

MINDeSEA (in tables abbreviated as MS): Seabed Mineral Deposits in European Seas: Metallogeny and Geological Potential for Strategic and Critical Raw Materials.

Mintell4EU (in tables abbreviated as Mt): Mineral Intelligence for Europe.

DOCUMENT OVERVIEW

D3.2.1 is organised in three distinct parts.

First is about general recommendations for the description of data from the GeoERA projects. It proposes more detail than D3.1 with the attempt to connect to WP5. Then it introduces how data could be described and exposed in GeoERA.

Second is about recommendations per project. It mainly relies on comments on D2.1.1 file and is based on an iterative process with WP2.

Third takes in consideration the proposals for identified gaps, based on a table to acquire for each gap possible remedial action.

GENERAL RECOMMENDATIONS

Observations and measurements:

Those processes are the first step of any scientific method. It consists in collecting of evidences on the field, describing them, including data collection, processing, interpretation, performing some experiences on them to assess specific parameters and properties.

Results from observations and measurements are very dependent to the context in which they have been obtained. The ISO 19156: Observations & Measurements standard enable to specify this context by defining:

- The location in which the O&M have been obtained,
- The time and date,
- The feature of interest,
- The observed property,
- The procedure or observing method, that can include information about the author of the O&M and technical specification of the device that was used to perform the O&M,
- The associated O&Ms, in case for example that one O&M is derived from one or more other O&M.
- The result that can be expressed in several ways.

ISO 19156 is then a good way to declare actions of O&M that have been performed and facilitate their citation for interpretation and modeling.

Campaign:

This can be seen as an investigation survey, in which some people are mandated to go on the field and collect data, generally on a specific area and during a restricted time period. A campaign is a common way to group some observations and measurements and access them. When several data of the same type are collected during a campaign they are often, but not always, associated to the same method and the same data provider.

Using modelling tools or interpreting data available from former data collection campains is also Observation in a more generic sense. Such kind of observations are often grouped and carried out in a common way. This may be considered as a Campain as well. The aim of such Campains is creating Models.

Models:

The objective of campaigns and collection of observations and measurements in general is to provide a better knowledge of the Earth, or at least on a specific area and in a specific domain.

Interpretation and modeling process enable to go from individual, domain specific, spatially and timely located information to more global rules or comprehension of the composition and behavior of the Earth. As for O&M, results of interpretation and modeling can have different representations. It can be for example 3D models, 2D maps that can themselves be exposed with different formats. Models are always constracted in a processing chain as a sequence of different Observations.

Two kind of approach can be used to provide description of an area: the feature approach and the coverage approach.

Both approaches imply that, as a result, different kind of properties are assigned to a confined spatial domain. In signal processing this procedure is called “sampling”. The standard description of such relationships between features of interest, observations and results is possible by using the Sampling Feature schema in O&M. Models are intellectual constructions that

- represent knowledge about the investigated features (sampledFeature)
- are related to a series of Observations (relatedObservation)
- are represented by property sets or spatial coverages of any forms (result)

This is exactly what Sampling Features are designed for. They provide a universal approach in describing Models and may greatly simplify the handling of diversity in the geoscience domain. The INSPIRE GE (Geology) model. [INSPIRE TWG *Geology*, 2013]

Feature approach

The main philosophy of this approach aims at dividing the Earth into components that have (some) homogeneous properties. Those components are then associated to geometries that, when they are assembled, enable to build 2D maps or even 3D models.

Of course, the feature approach implies that we have enough information about the Earth at that place to pretend to be able to propose a decomposition of it and associate geometries to those components.

Coverage approach

This approach does not aim at providing a decomposition of the Earth into features. It mostly aims at associating some values regarding a specific property to several locations that are organized to build a grid. This approach is is frequently used in such cases, where physical features cannot be identified, for example in oceanography and meteorology. Much attention shall be paid to the choice of the size of the cell that can be used.

RECOMMENDATIONS PER PROJECT

Those recommendations are based on the requirements expressed by WP2 in D.2.1.1 (version of the doc considered is indicated on page 3).

First step is the general concept mapping: for each product identified by WP2, one or several concepts from existing data models are proposed. This action adjusts and complete what was proposed in D3.1.

Second step is relate to property mapping: for each attribute identified by WP2, one or several existing properties from the mapped concepts are proposed.

For those two steps, comments and questions are also formulated in order to get more details from WP2 to refine the mapping.

GEO-ENERGY

A1. 3DGEO-EU (latest update: 28-Jan-2019)

The following data have been gathered from GIP-P D2.2.1 "*First report describing the requirements to the Information Platform by the Geo-energy, Groundwater and Raw Materials themes*" (28-Jan-2019).

Maps to: several products in one table. See inside table below.
Comment:
Question:

Need expression from D2.1.1	**D.3.2.x Maps to**	**Comment**	**Question**
2.5D Time model (xyz)			

2.5D Velocity maps (xyz)	Each model shall be declared according to EPOS:ModelView with links to available representations or outputs (2D maps, 2.5 models, 3D models). The GeoFeature concept in EPOS:ModelView enable to define the objects that are inside the model.		
3D Structural model			
3D Harmonized model of lithostratigraphic layers			
3D Harmonized model of lithostratigraphic layers			
2D Maps of Cenozoic reservoirs (extent + depth)			
2D Map of extent & depth of salt/fresh groundwater barrier			
Geothermal properties related to wells (porosity & permeability) + 2D Geothermal property maps	Wells shall be described according to GWML2:Well See above for 2D maps.		
Example datasets and models containing uncertainty information	Details needed.		
Uncertainty in geomodels	Needs precision on the way uncertainty is expected to be provided.		

Fault database (HIKE)	Attention shall be paid on the connection between “HIKE output format” and “3DGEO-EU expected input format”.		

A2. GARAH (latest update: 31-Jan-2019)

The following data have been gathered from GARAH D4.1 “*Preliminary data selection to provide relevant information in assessing hydrocarbon resources in subsurface*”.

Product: Basin outline (polygons)
Maps to: N/A
Comment:
Question: details are needed to understand the underlying object to be exchanged. It this a river basin, hydrogeological basin, mine basin?...

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
Name	NAME		Text	/	/	/

Product: Formation outline (polygons)
Maps to: GeoSciML:gsmlb:GeologicUnit
Question: 2 attributes are about hydrogeological properties. Is this a geo or hydrogeological feature?
Comment:

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
Name	NAME		Text	gsmlb:GeologicUnit/gml:name		
Country	COUNTRY		Text			Possibly in metadata but need to clarify the role of the country classification here?
Age	AGE		Text	gsmlb:GeologicUnit/gsmlb:geologicHistory/gsmlb:GeologicEvent/gsmlb:youngerNamedAge and olderNamedAge using CGI/INSPIRE vocabulary		
Lithology	LITHOLOGY		Text	gsmlb:GeologicUnit/gsmlb:composition/gsmlb:CompositionPart/gsmlb:material/gsmlb:RockMaterial/gsmlb:lithology	Using CGI/INSPIRE vocabulary if can map terms. Missing are role and proprotion information.	Will there only be one lithology or might this map to several?
Depth top max	DEP_TOP_MAX	Metre (m)	Numerical (Double)	gsmlb:MappedFeature/gsmlb:shape	There is nowhere to put this except by making crude gsmlb:shape properties with simple geometry of polygon outline extruded	

					between top and bottom depths.	
Depth top min	DEP_TOP_MIN	Metre (m)	Numerical (Double)		Comment as for DEP_TOP_MAX (see line above)	
Thickness	THICK_AGV	Metre (m)	Numerical (Double)	gsmlb:GeologicUnit/gsmlb:gbUnitDescription/gsmle:GeologicUnitDescription/gsmle:unitThickness		
Volume?	VOLUME	Cubic kilo Metre (km3)	Numerical (Double)	gsmlb:MappedFeature/gsmlb:shape	Nowhere to put this except by having gsmlb:shape be a 3D shape with the appropriate volume. This would be difficult to calculate as well.	#GAP: Might be worth adding an extension as a subtype of gsmlb:GeologicUnitAbstractDescription called something like HydrocarbonReservoirDescription to carry the extra properties wanted here?
Net/gross	NET_GROSS	ratio	Numerical (Double)			#GAP: Don't know what this is but maybe add extension as property of HydrocarbonReservoirDescription as above or alternatively as a soft-typed property gsmlb:GeologicUnit/gsmlb:gbMaterialDescription/gsmle:PhysicalDescription

Porosity	POR_AGV	%	Numerical (Double)	GroundWaterML2: GW_UnitVoidProperty:gwPermeability		Comment as for NET_GROSS or maybe there is a specific place for this in GWML? *we can map to GWML2 But does that mean the whole feature should be mapped to GW_HydrogeoUnit (subtype gsmlb:GeologicUnit) Is Garah about hydrogeounit ?*
Permeability	PERMEA_AGV	milliDarcies (mD)	Numerical (Double)	GroundWaterML2: GW_UnitVoidProperty:gwPorosity		Comment as for NET_GROSS or maybe there is a specific place for this in GWML? *we can map to GWML2 But does that mean the whole feature should be mapped to GW_HydrogeoUnit (subtype gsmlb:GeologicUnit) Is Garah about hydrogeounit ?*

Product: Play outline (polygons)
Maps to: GeoSciML:gsmlb:GeologicUnit
Question:

Comment: Play is understood here as a Petroleum terminology. Schlumberger definition of 'Play' maps quite well to GeologicUnit (https://www.glossary.oilfield.slb.com/en/Terms/p/play.aspx). Theoretically, could be mapped to ERML/ERML Lite (MineralOccurrenceView) but the emphasis for ERML is on land-based mines and mining, not hydrocarbon exploration/wells.

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
Name	NAME		Text		Same as Formation outline product.	
Country	COUNTRY		Text		Same as Formation outline product.	
Age	AGE		Text		Same as Formation outline product.	
Lithology	LITHOLOGY		Text		Same as Formation outline product.	
Depth top max below sea level	DEP_TOP_MAX	Metre (m)	Numerical (Double)		Same as Formation outline product.	
Depth top min below sea level	DEP_TOP_MIN	Metre (m)	Numerical (Double)		Same as Formation outline product.	
Thickness average	THICK_AGV	Metre (m)	Numerical (Double)		Same as Formation outline product.	

Volume	VOLUME	Cubic kilo Metre (km3)	Numerical (Double)		Same as Formation outline product.	
Net/gross	NET_GROSS	ratio	Numerical (Double)		Same as Formation outline product.	
Porosity	POR_AGV	%	Numerical (Double)		Same as Formation outline product.	
Permeability	PERMEA_AGV	milliDarcies (mD)	Numerical (Double)		Same as Formation outline product.	
Salinity	SALINITY		Numerical (Double)		Comment as for NET_GROSS	
TOC content	TOC	**%**	Numerical (Double)		Comment as for NET_GROSS	
TOC type	TOC_TYPE		Text		Maybe add extension as property of HydrocarbonReservoirDescription as above (see Formation)	Can a controlled vocabulary be made for this property?
Thermal maturity	THERM_MAT		Text		Maybe add extension as property of HydrocarbonReservoirDescription as above (see Formation)	Can a controlled vocabulary be made for this property?
Mineralogy	MINERALOGY		Text			Need more information on what this field might contain. Would ERML be relevant?~ Other than the comment generally on suitability of Play to ERML in general, this is more of a

						vobulary issue. Not sure though if Commodity would match, this more of a host rock mineal assmblage. ERML-Lite has hooks hostGeologicUnit_uri and mineralDepositModel_uri but there ar no controlled vocabs.
Pressure regime	PRESS_REG		Text		Maybe add extension as property of HydrocarbonReservoirDescription as above (see Formation)	Can a controlled vocabulary be made for this property?
Structural complexity	STRUC_COMP		Text		Maybe add extension as property of HydrocarbonReservoirDescription as above (see Formation)	Can a controlled vocabulary be made for this property?
Hydrocarbon content	HC_TYPE		Text		Maybe add extension as property of HydrocarbonReservoirDescription as above (see Formation)	Can a controlled vocabulary be made for this property?
Play status	PLAY _STAT		Text		Maybe add extension as property of HydrocarbonReservoirDescription as above (see Formation)	Can a controlled vocabulary be made for this property?

Product: Exploration wells (points)

Maps to: EPOS:BoreholeView Or GeoSciML:BoreholeView
Question:
Comment:

Attributes	Column name (max. 10 characters)	Units	Field type	D.3.2.x Maps to	Comment	Question
Name	NAME		Text			
Latitude	LAT		Coordinate		What is the original CRS? Coordinates in original CRS shall be used for location. Converted coordinates would then be indicative	
Longitude	LONG		Coordinate			
x-utm	X_UTM		Coordinate			Why using UTM instead of ETRS89? Overseas departements?
y-utm	Y_UTM		Coordinate			
UTM zone	UTM_ZONE		Text			
Country	COUNTRY		Text			
Year	YEAR		Numerical (Short integer)			Date of the measurement?
Depth (below sea level)	DEPTH	Metre (m) Feet?	Numerical (Double)			Conventions for depth expression needed (especially for multi country wells).
Operational status	OPR_STATUS		Text			Use a codelist for Operational status?

Hydrocarbon content*	HC_CONT	Oil, condensate, gas or mixed	Text			What is expected? Basic info such as YES/NO or details? If details, shall link to a proper O&M.

Product: Hydrocarbon fields (polygons)

Maps to:

Question: Is this the description of a Exploited resource or an Administrative Unit?

Comment: Age and Lithologie seems to be inherited from the formation

Attributes:	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
Name	NAME		Text			
Country	COUNTRY		Text			
On or offshore	ON_OFFSHOR		Text			
Age	AGE		Text			
Formation	FM		Text			
Lithology	LITHOLOGY		Text			
Discovery year	DISCOV_Y		Numerical (Double)			
Hydrocarbon content*	HC_CONT	Oil, condensate, gas or mixed	Text			

Status	STATUS	Pending production, Producing, depleted, abandon	Text			
Operator	OPERATOR		Text			
Operational status	OPR_STATUS		Text			

Product: Faults (lines)

Maps to:

Question: Details needed. Especially if compliance with HIKE is expected.

Comment:

Attributes	Column name (max. 10 characters)	Units	Field type	D.3.2.x Maps to	Comment	Question
Name	NAME		Text			

Product: Geothermal gradients

Maps to: Observations & Measurements:OM_Observation

Question: Procedure / observation method, Observation dates shall be described.

Comment: Several measurements. Shall be described with ISO19156.

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question

ID name	ID		Text			
Latitude	LAT	DD	Double	Location of OM_Observation:featureOfInterest		
Longitude	LONG	DD	Double			
Water depth	DEPTH	Metres	Long integer signed			
Heat flow	HEATFLOW	mW m-2	Double	OM_Observation:result		Should they be considered as separated Observations or a complex one ?
Thermal Conductivity	T_CONDUC	W m-1 K-1	Double	OM_Observation:result		
Geothermal Gradient	GEO_GRAD	mK m-1	Double	OM_Observation:result		
Geothermal Gradient - 2	GEO_GRAD2	Celsius/ 100 m	Double	OM_Observation:result		
Data source	SOURCE		Text	OM_Observation:metadata :MD_Metadata		

Product: Seafloor temperature (points)

Maps to: Observations & Measurements:OM_Observation

Question: Procedure / observation method, Observation dates shall be described.

Comment: Several measurements. Shall be described with ISO19156.

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question

ID name	ID		Text			
Data source	SOURCE		Text	OM_Observation:metadata :MD_Metadata		
Latitude	LAT	DD	Double		O&M location given by Latitude, Longitude and Water depth -> fOI = SF_SamplingPoint VS a spatial area (IHO S-57) VS a generic ontology	
Longitude	LONG	DD	Double			
Water depth	DEPTH	Metres	Long integer signed			
Seafloor temperature	TEMP_SF	Celsius	Double	OM_Observation:result		
Comments	COMMENTS		Text			

Product: Gas hydrates below seafloor (points)
Maps to: Observations & Measurements:OM_Observation
Question:
Comment:

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
ID name	ID		Text	Result of O&M = Depth below seafloor.		
Method	METHOD		Text	OM_Observation:procedure		
Latitude	LAT	DD	Double			

Longitude	LONG	DD	Double		O&M location given by Latitude, Longitude and Water depth -> fOI = SF_SamplingPoint VS a spatial area (IHO S-57) VS a generic ontology	Gas hydrates below seafloor (polygons) defines a 'Area' attribute, could we have it for this feature
Water depth	DEPTH	Metre	Long integer signed			
Depth below seafloor	DEPTH_BSF	Metre	Long integer signed	OM_Observation:result		
Cruise	CRUISE		Text	INSPIRE EF: EnvironmentalMonitoringActivity	It may help to have cruise ID for cross references (eg. Get O&M associated to the cruise)	
Data source	SOURCE		Text	OM_Observation:metadata		
Institution	INSTITUT		Text			
Contact name	CONTACT_N		Text			
E_mail	EMAIL		Text			
References	REFS		Text			
Comments	COMMENTS		Text			

Product: Gas hydrates below seafloor (polygons)

Maps to: Observations & Measurements:OM_Observation

Question:

Comment:

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
ID name	ID		Text			
Method	METHOD		Text	OM_Observation:procedure		
Area	AREA	km2	Double	OM_Observation:featureOfInterest		
Seismic anomaly type	ANOMAL_TYP		Text	OM_Observation:result		
Cruise	CRUISE		Text	INSPIRE EF: EnvironmentalMonitoringActivity	It may help to have cruise ID for cross references (eg. Get O&M associated to the cruise)	
Data source	SOURCE		Text	OM_Observation:metadata		
Institution	INSTITUT		Text			
Contact name	CONTACT_N		Text			
E_mail	EMAIL		Text			
References	REFS		Text			
Comments	COMMENTS		Text			

Product: Gas hydrates below seafloor (lines)
Maps to: Observations & Measurements:OM_Observation

Question:
Comment: featureOfInterest = lines

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
ID name	ID		Text			
Method	METHOD		Text	OM_Observation:procedure		
Data source	SOURCE		Text	OM_Observation:metadata		
Seismic anomaly type	ANOMAL_TYP		Text	OM_Observation:result		
Cruise	CRUISE		Text	INSPIRE EF: EnvironmentalMonitoringActivity	It may help to have cruise ID for cross references (eg. Get O&M associated to the cruise)	
Institution	INSTITUT		Text	OM_Observation:metadata		
Contact name	CONTACT_N		Text			
E-mail	EMAIL		Text			
References	REFS		Text			
Comments	COMMENTS		Text			

Product: Gas hydrates below seafloor (points)

Maps to: Observations & Measurements:OM_Observation

Question: We have twice a product named 'Gas hydrates below seafloor (points)'. It seems there is a mistake on the name of one of them

Comment:

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
ID name	ID		Text	Feature of Interest = points Location of O&M given by Latitude, longitude and Seafloor Depth		
Method	METHOD		Text	OM_Observation:procedure		
Latitude	LAT	DD	Double	Coordinates for OM_Observation:featureOfInterest	O&M location given by Latitude, Longitude and Water depth -> fOI = SF_SamplingPoint VS a spatial area (IHO S-57) VS a generic ontology	
Longitude	LONG	DD	Double			
Seafloor depth	DEPTH_S_M	Metre	Double			

Depth of anomaly TWT bsl	D_BSl_TWT	Second	Double	OM_Observation:result		Shall those 3 results be considered as different observations?
Depth of anomaly TWT bsf	D_BSF_TWT	Second	Double	OM_Observation:result		
Seismic anomaly type	ANOMAL_TYP		Text	OM_Observation:result		
Cruise	CRUISE		Text	INSPIRE EF: EnvironmentalMonitoringActivity	It may help to have cruise ID for cross references (e.g. Get O&M associated to the cruise)	
Data source	SOURCE		Text	OM_Observation:Metadata		
Institution	INSTITUT		Text			
Contact name	CONTACT_N		Text			
E-mail	EMAIL		Text			
References	REFS		Text			
Comments	COMMENTS		Text			

Product: Gas stability map (lines)

Maps to: Probably OM with Features of interests being lines.

Question: Details needed
Comment:

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
Thickness of the Base of Gas Hydrate Stability Zone	BGHSZ	Metre	Double	OM_Observation:result		

Product: Horizon interpretations (lines)
Maps to:
Question: Details needed
Comment:

Attributes	Column name (max. 10 characters)	Units	Field type GIS)	D.3.2.x Maps to	Comment	Question
ID	ID		Text			
Name	NAME		Text			

Product: Fishing activities (polygons)
Maps to: INSPIRE AF is the closest model available

Question: Details needed
Comment:

Attributes	Column name (max. 10 characters)	Units	Field type (GIS)	D.3.2.x Maps to	Comment	Question
Name	NAME		Text	INSPIRE AF af:Site/gml:name		
Activity type	TYPE		Text	af:Site/gml:activity	The classification of the economic activity of the site, according to the NACE rev. 2.0 coding. Accessible at Eurostat repository from URL http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?	Is this the type of fishing activity?

A3. GeoConnect^{3}d (latest update: 26-June-2019)

The following data have been gathered from GIP-P D2.2.1 "*First report describing the requirements to the Information Platform by the Geo-energy, Groundwater and Raw Materials themes*" (28-Jan-2019). This information has been complemented by an update sent by GeoConnect^{3}d on June 2019.

WP3: Roer-to-Rhine

Product: Faults (a simplified version of the fault database of Hike)
Maps to:

Question:
Comment: This is relatively easy to express in GeoSciML if comments on ObjectID and ConceptID (see Geological Units table right after) are taken into account as for HIKE database. The Time of activity seems a bit better than the HIKE Active yes/no. However, after HIKE db is refined, if this is to be a simpler version, it should be a strictly compatible subset, not this slightly varied overlapping set of fields. Inconsistency between even different GeoERA scientific projects isn't really satisfactory.

Attribute	Field name	Format	Description	D.3.2.x Maps to	Comment	Question
Shapefile	N/A	Geometry	Georeferenced polylines (2D and 3D)			
Object ID	FID	Number	Unique object identifier, sequential numbering starting with 0; automatically generated with shapefile			
Concept ID	conceptID	Text (100)	Unique concept identifier will be replaced by the concept's vocabulary URI			What is a "concept"?
Name	name	Text (40)	Name of the object			

Reference surface	refSurface	Text (100)	For 2D objects only: qualitative reference for the elevation / z coordinate needs to be provided (e.g. DTM, top of basement etc.)			
Time of activity	timing	Text (200)	Comma separated list including the tectonic phase(s) during which the fault was active	GeoSciML would have a list of GeologicEvents. Are these named tectonic phases?		This is relatively easy to express in GeoSciML if comments on ObjectID and ConceptID are taken into account as for HIKE database. The Time of activity seems a bit better than the HIKE Active yes/no. However, after HIKE db is refined, if this is to be a simpler version, it should be a strictly compatible subset, not this slightly varied overlapping set of fields. Inconsistency between even different GeoERA scientific projects isn't really satisfactory.

Fault type	faultType	Text (200)	Type of fault mapped (e.g. normal, reverse, thrust, strike-slip etc); number of entries will be the same as time(s) of activity			
Dip direction	dipDir	Date	Dip direction of fault			Date for DipDirection ? Harmonization with HIKE?
Scientific reference	reference	Text (200)	URL or DOI			
Extra information	notes	Text (200)	Other information about the fault			

Product: Geological units

Maps to: GeoSciML:gsmlb:GeologicUnit and GeoSciML:gsmlb:MappedFeature

Question:

Comment:

Attribute	Field name	Format	Description	D.3.2.x Maps to	Comment	Question

Shapefile	N/A	Geometry	Georeferenced objects (2D and 3D)	Gsmlb:MappedFeature/gsmlb:shape		
Object ID	FID	Number	Unique object identifier, sequential numbering starting with 0; automatically generated with shapefile		Will need to clarify if there is a 1-1 relation between MappedFeatures (the geometry objects in shapefile) and the conceptual geological units so what the identifier should apply to.	Can put identifier with a string prefix in gml:identifier but might be better to have a method of assigning identifiers less tied into the file being used to edit the data?
Concept ID	conceptID	Text (100)	Unique concept identifier will be replaced by the concept's vocabulary URI			What is a "concept"?
Name	name	Text (40)	Name of the object	Gsmlb:GeologicUnit/gml:name		
Reference surface	refSurface	Text (100)	For 2D objects only: qualitative reference for	gsmlb:MappedFeature/gsmlb:mappingFrame	Using INSPIRE dictionary possibly with	

			the elevation / z coordinate needs to be provided (e.g. DTM, top of basement etc.)		custom project extensions.	
Scientific reference	reference	Text (200)	URL or DOI	MD_Metadata? CI_Citation?		
Extra information	notes	Text (200)	Other information about the object	Gml:description either for MappedFeature or GeologicUnit		

Other WP3 products:

Need expression from D2.1.1	**D.3.2.x Maps to**	**Comment**	**Question**
2D/3D structural/geological models – attributes not foreseen at this stage		Each model shall be declared according to EPOS:ModelView with links to available representations or outputs (2D maps, 2.5 models, 3D models). The modeledFeature property in EPOS:ModelView enable to define	

		the geological features that are being modeled.	
Geomanifestations (i.e., seismicity, gas, fluid, heat flow, etc.) – final products and attributes are still being defined.			Details needed.
Evaluation of deep geothermal exploitation? – not yet defined	Could probably be done with ISO 19156.	Could probably be done using ISO 19156 Observations & Measurements	Details needed.

WP4: Pannonian Basin (attributes are still being defined)

Need expression from D2.1.1	**D.3.2.x Maps to**	**Comment**	**Question**
3D structural geological models 3D fault plane surfaces Voxel models, derived traffic light maps from a propriety of the model		Each model shall be declared according to EPOS:ModelView with links to available representations or outputs (2D maps, 2.5 models, 3D models). The modeledFeature property in EPOS:ModelView enable to define the geological features that are being modeled	

Seismic data			Details needed.
Information on transport of fluids and heat for geothermal purposes			Details needed.

A4. HIKE (latest update: 09-May-2019)

The following data was shared by HIKE to GIP-P/WP2 on May 9th, 2019.

Product: Faults
Maps to: GeoSciML:gsmlb:ShearDisplacementStructure
Question:
Comment: As the HIKE project description says "This will be achieved through development, demonstration and implementation of harmonized subsurface data sets and methodologies..." we would have expected something compatible with past standards in the first place.

Attribute	Abbr.	attribute keyword in English	Comments	D.3.2.x Maps to	Comment	Question
Country ID*	CNTRY_REG	AT	following ISO 3166-alpha2 (prefix = origin of the data provider)		Reuse of existing codelist.	
		DE-BY				
		…				
ID*	ID	AT-(country-specific				Will ID be the same for lines tracing the same fault on

		ID)	automatically generated, coming from the original database.			different reference surfaces?
		DE-BY-(countryspecific ID)				
		…				
Local Name	NAME	…	any English translation of local names is avoided	gsmlb:ShearDisplacementStructure/gml:name		
Link to project vocabulary	VOC_LINK	…	geographic description of the fault (system/domain/etc..)			The title “vocabulary link” and description “geographic description” are not clear to us.
Type of reference	REF_TYPE	surface	*Surface* is when the top of the fault coincides with the earth's surface. *Top of the fault* and *Base of the fault* do not relate to any specific depth or any stratigraphic unit. In case of *Base of faulted unit,* a *Surface of reference* should be defined. In case of *Specified Depth,* a *Depth of the representation line* should be defined			Will there be cases with more than one faulted unit so there are fault lines drawn for each? REF_TYPE and REF_SURF together in some cases can be mapped to a (possibly custom) gsmlb:MappedFeature/gsmlb:mappingFrame vocabulary value. There isn’t really an equivalent to “top of the
		top of the fault				
		base of the fault				

		base of faulted unit				fault" and "base of the fault" in GeoSciML as far as I can see. Probably would make gsmlb:shape be a surface representing the fault with top and bottom as two parts of boundary but there may be no elevation information. May need to discuss further.
		top of faulted unit				
		specified depth				
Surface of reference	REF_SURF	reference to Stratigraphic Table 2017	Should only be defined if *Type of reference = base of faulted unit/top of faulted unit*	In GeoSciML we could relate a gsmlb:ShearDisplacementStructure to one or more gsmlb:MappedFeatures with different gsmlb:mappingFrame properties which would be equivalent to the surface of reference concept.	There might have to be custom vocabulary entries for the "base/top of faulted unit" pointing to the different units that are to be used. What is "Stratigraphic Table 2017"	
		n/a				
Depth of representation	DEPTH	e.g. 550	Should only be defined if *Type of reference = specified depth*			Not sure of best way of representing this in GeoSciML except perhaps having the gsmlb:shape include the z coordinates and have the

line [m]						mappingFrame value have an extension value of “fixed elevation”. Check if they mean depth rather than elevation; seems unlikely that faults get mapped at a fixed depth?
Surface of reference *	REF_SURF	surface Quaternary Tertiary Zechstein … depth to faulted unit …				Same as REF_SURF above ?
Top/ Base	TOP_BASE	Top Base	Can only be defined if Surface of reference ≠ depth to faulted unit	Is this repeating information in REF_TYPE?		
Depth to faulted unit [m]	DEPTH	e.g. 550	Can only be defined if Surface of reference = depth to faulted unit	Same field name as DEPTH above but I don’t understand comment here. Is this a depth below		

				the depth to the faulted unit?!		
Evaluation method	EVAL_METH	direct observation observed at depth inferred n/a	geosciml	GeoSciML has multiple MappedFeature/observationMethod and GeologicFeature/observationMethod properties. Not sure exactly which the two fields here (EVAL_METH and OBSERV_METH) should match to and whether vocabularies will need extending.		
Observation method	OBSERV_METH	1D resistivity survey 2D resistivity survey 2D seismic survey 3D seismic survey	INSPIRE, multiple entries possible			

		3D resistivity survey				
		airborne geophysical survey				
		ground magnetic survey				
		ground gravity survey				
		borehole logging survey				
		CPT survey				
		frequency domain EM Survey				
		georadar survey				
		magnetotelluric survey				
		seismological survey				
		sonar survey				

		time-domain EM survey				
		VSP survey				
		observed borehole material				
		observed outcrop				
		inferred projection between observed locations				
		n/a				
Principle fault type	FLT_TYPE	normal fault	INSPIRE		Codelist proposal. To be discussed by WP4. We think the terms are in CGI/INSPIRE faultType vocabularies. Can extend if any missing entries and exposed in https://data.geoscience.earth/ncl/	

		right normal fault		gsmlb:ShearDisplacementStructure/gsmlb:faultType		
		left normal fault				
		reverse fault				
		right reverse fault				
		left reverse fault				
		strike slip fault				
		dextral strike slip fault				
		sinistral strike slip fault				
		thrust fault				
		detachment fault				
		horizontal fault				
		extraction fault				

		pure extraction fault				
		mixed extraction fault				
		oblique slip fault				
		scissor fault				
		wrench fault				
		n/a				
Chronostratigraphic age of the youngest faulted unit	Y_A_Unit	Jurassic	Additional attribute for fault that is truncated by an unconformity (TRUNC_TOP) should be part of expert data			GeoSciML has geologicHistory for a ShearDisplacementStructure but this may not be exactly the same concept. Might need to be by connection to the relevant GeologicUnit using a custom GeologicRelation?
		n/a				
Maximum	KIN_DISPL_MAX		elaborated attributes on movement are under discussion (essential or			Has the project examined the GeoSciML model, in particular

displacement [km]			expert data). To be concluded.			DisplacementValue in their discussion?
Sense of movement	FLT_MOVE_SENSE	detachment	geosciml		Codelist proposal. To be discussed by WP4.. In CGI/INSPIRE vocabularies the faultType includes classification on sense of movement and here the example terms are overlapping as well.	
		dextral				
		generic_decollement				
		no_movement_sense				
		normal				
		normal_dextral				
		normal_sinistral				
		reverse				
		reverse_dextral				
		reverse_sinistral				
		sinistral				
		thrust				

		thrust_decollement				
Determination of the fault offset	KIN_DISPL_TYPE	palaeogeography			Codelist proposal. To be discussed by WP4.	Looks a bit like more detailed observation metadata than is provided for in GeoSciML feature model (if we understand correctly) so might need to be presented in some observation view or could just be another observationMethod property on the ShearDisplacementStructure?
		crosscutting (?)				
		well/seismic interpretation				
		paleoseismicity				
		displacement on maps				
		seismicity				
		sediment structures				
		paleostress				
		field observation				
		microfabrics				
Dip	DIP_ANGLE	vertical (90°-85°)	Accurate numbers for direction as well as variation in direction are expert data		Codelist proposal. To be discussed by WP4. We suggest not using a codelist but use the	
		steep (85°-60°)				
		intermediate (60°-30°)				

		flat (30°-5°)			GeoSciML gsmlb:ShearDisplacementStructure/gsmlb:stStructureDescription/gsmle:ShearDisplacementStructureDescription/gsmle:planeOrientation property which uses numeric ranges.	
		horizontal (5°-0°)				
		n/a				
Dip direction	DIP_DIREC	N	Accurate numbers for direction as well as variation in direction are expert data		Codelist proposal. To be discussed by WP4. As for DIP_ANGLE	
		NNE				
		NE				
		ENE				
		E				
		ESE				
		SE				
		SSE				
		S				
		SSW				
		SW				
		WSW				

		W				
		WNW				
		NW				
		NNW				
Strike	STRIKE	N-S	Accurate numbers for direction as well as variation in direction are expert data		Codelist proposal. To be discussed by WP4. As for DIP_ANGLE	
		NNE-SSW				
		NE-SW				
		ENE-WSW				
		E-W				
		WNW-ESE				
		NW-SE				
		NNW-SSE				

References	REF	Geological map of Bavaria 1: 500 000 unpublished data LfU	discussion is not concluded. Reference is probably part of the dataset metadata, but it requires that the dataset is a consistent set of faults (of same origin which might result in data providers providing more than one dataset). Should it be possible to define reference in the metadata of the dataset? All faults then inherit this reference unless a specific reference for an individual fault overwrites the reference of the dataset. To be discussed.	MD_Metadata? CI_Citation?		
		Yes				

Active fault (seismogenic)	ACT_FLT	No				I'm not sure that there is any specific place to label Active/Inactive fault in GeoSciML. The ability to link to dated DisplacementEvents exists but maybe this information will not be available?
		n/a				
Capable fault	CAP_FLT	Yes				Same comment as for ACT_FLT. How is the project going to define these classifications anyway?
		No				
		n/a				
3D-Geometry available	3D_FLT	Yes	This will be subject of discussion.	Alternative could be to have a link to that Geometry. If empty, no geometry available.		
		No				
		n/a				
Related to exploration (minerals, oil & gas, geothermal,	EXPL_FLT	Yes	The use(fulness) of this attribute will be discussed			
		No				
		n/a				?? Akin to EPOS Anthropogenic hazards (EPISODES) ~ https://tcs.ah-epos.eu/ so possibly an episodes identifier could be used?

groundwater)						
Natural or induced seismic activity along the fault	NAT_IND	NATURAL INDUCED	In case of active fault			#GAP: Not in GeoSciML model. Not sure we'd propose anything but project specific extension for this?
(Maximum) magnitude	MAGNITUDE		In case of active fault, Richter magnitude scale			#GAP: Not in GeoSciML model. Would need to be an extension of DisplacementEvent?
Reoccurrence interval of seismic activity	REOC_ITV					#GAP: Not in GeoSciML model. Not sure we'd propose anything but project specific extension for this?

Net-slip	NET_SLIP		in Metres	gsmlb:ShearDisplacementStructure/gsmlb:stStructureDescription/gsmle:DisplacementValue	There are different subtypes for expressing this in slightly different ways.	
Horizontal throw (component of the netslip)	HOR_THROW		in Metres	See NET_SLIP	See NET_SLIP	
Vertical throw (component of the netslip)	VER_THROW		in Metres	See NET_SLIP	See NET_SLIP	
strike-slip	STRIKE_SLIP		in Metres	See NET_SLIP	See NET_SLIP	
Dip-slip	DIP_SLIP		in Metres	See NET_SLIP	See NET_SLIP	

Rake	RAKE		Rake is usually used by seismologists indicating the geometry of seismic slip vectors. it could change from 0 to 180 for strike-slip/reverse faults, and from 0 to -180 for strike-slip/normal faults. Pitch is used by structural geologists (especially in microtectonic and stress state analyses) and varies from 0 to 90 indicating the sense of faulting. Rake completes the right-hand role conv. Pitch associates Azimuth/Dip conv.	Some combination of gsmlb:ShearDisplacementStructure/gsmlb:stStructureDescription/gsmle:ShearDisplacementStructureDescription/gsmle:planeOrientation and /gsmlb:ShearDisplacementStructure/gsmlb:stStructureDescription/gsmle:DisplacementValue??	Mapping needs to be refined	

Pitch	PITCH		As one should use Trend/plunge for Dipdirection/dip conv. Rake is more comfortable for computer programs, while pitch is easily measured in the field. Source: https://www.researchgate.net /post/Whats_the_basic_differences_between_rake_and_pitch_in_faults_and_if_they_are_same_than_why_we_used_as_different_terms			

Length of fault (horizontal)	LENGTH_HOR		in Metres	This would just be in the geometry in gsmlb:shape in GeoSciML		
Truncate at the top by an unconformity	TRUNC_TOP					#GAP: Not in GeoSciML model. Not sure we'd propose anything but project specific extension for this?

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A5. HOTLIME (latest update: 28-May-2019)

The following data have been gathered from GIP-P D2.2.1 "*First report describing the requirements to the Information Platform by the Geo-energy, Groundwater and Raw Materials themes*" (28-Jan-2019). The information available from that report has been completed with some clarifications emailed by HotLime to GIP-P/WP2 on May 28th, 2019.

Products (Products formats have not been defined yet):

Maps to:
Question: Many products, few information detailing them. More information needed.
Comment:

- boreholes,
- wells,
- temperature maps

- basin outlines
- geothermal gradients,
- horizon interpretations,
- 4D faults (linked to HIKE fault database) and tectonic information,
- groundwater chemistry and bulk permeability,
- lithological (lithology, thickness, etc. of geological units)
- outlines of formations
- physicochemical properties of the rock bodies: temperature distribution, porosity and permeability defining the net/gross of aquifer intervals and their top and bottom seal
- hydrochemical data
- temperature gradients,
- bulk thermal conductivity,
- heat transfer rate,
- synthesis maps

The attributes that will be associated with the different products in EGDI have not been defined yet. Currently, only the attributes for 2.5D grid data on hot lime layers have been tentatively defined. These are:

- depth of top hot lime layer [m],
- gross thickness of the layer [m], ○ net-thickness of the layer [m], porosity [%], ○ permeability [m^2], ○ facies type (text),
- total dissolved solids of hot lime layer fluid [mg/L], ○ temperature at top of layer [°C],
- bulk volumetric heat capacity of the layer [J/m^3 K], ○ heat in place, a.k.a. stored heat [J].

A6. MUSE (latest update: 09-May-2019)

The following data has been extracted from MUSE deliverable *"D5.1 White Book of the web platform related to MUSE".*

Maps to: Several concepts to map to (mix of Geospatial and Observations features)
Question:

Comment: As the HIKE project description says "This will be achieved through development, demonstration and implementation of harmonized subsurface data sets and methodologies..." we would have expected something compatible with past standards in the first place.

Products/parameters	Category	format	Unit	attributes	D.3.2.x Maps to	Comment	Question
Specific annual thermal load (closed systems)	closed-loop potential	raster		Float (Value in SI units)		Fits a generic coverage pattern but it isn't clear what the domain of these values are (linked to particular formations and particular depths?).	Is there any existing property vocabulary to suit or should there be some cross-project property type vocabularies be established?
Outline of groundwater bodies suitable for open loop systems	open-loop potential	raster		Boolean (yes, no)			Any link between groundwater bodies here and identified groundwater bodies elsewhere? Has using vector polygons vs

							Boolean raster been considered?
Specific annual thermal load -open systems	open-loop potential	raster		Float (Value in SI units)		Same as closed systems above.	
Anthropogenic lines: Linear infrastructure (electricity, pipelines, …)	conflict map	vector lines		Type: text		Seems too generic and project specific to use on particular domain models. Could be mapped to various standards.	More information needed
Areas suited for groundwater disposal to surface waters or municipal drains	open-loop potential	raster	Text	Boolean (yes, no)			Has using vector polygons vs Boolean raster been considered?
Average subsurface temperature	closed-loop potential	raster	degC	Float (Value in SI units)			Generic raster. Is there any existing property vocabulary to suit or should

							there be some cross-project property type vocabularies be established? Do these measurements relate to a particular depth or formation?
average temperature	open-loop potential, closed-loop potential	vector points	degC	date of measurement		Observations & Measurements	
Bulk thermal conductivity (for a specific depth interval)	closed-loop potential	raster	W/m/K	Float (Value in SI units)			Is the depth interval the same for whole raster? Is there any existing property vocabulary to suit or should there be some cross-project property type vocabularies be established?

Decision support map for the use of shallow geothermal technologies	general information	raster	Text	?		Coverage?	Detail needed
Depth to water table	open-loop potential	raster	m	Float (Value in SI units)	Intention to rely on a coverage.	Size of the cell to be defined.	
Effective groundwater temperature	open-loop potential	raster	degC	Float (Value in SI units)	Intention to rely on a coverage.	Size of the cell to be defined.	
Existing geological profiles and cross-sections	geology	vector lines		Origin: text			Are the lines here just the traces of profiles without the actual data?
Existing subsurface infrastructure	conflict map	raster	Text	Type: text			Detail needed
Fault systems	conflict map	vector lines	Text	Type: text			Should this use a subset of common HIKE database?
field thermal conductivity	closed-loop potential	vector points	W/m/K	Float (Value in SI units)		O&M?	
Flood risk	conflict map	raster	Text	Text (High, Medium, Low)	Intention to rely on a coverage.	Size of the cell to be defined.	

geothermal energy potential	open-loop potential, closed-loop potential	raster	?	Boolean (yes, no)?	Intention to rely on a coverage.	Size of the cell to be defined.	
Groundwater temperature	open-loop potential	raster (ICGC) point GBA	degC	Float (Value in SI units)	Intention to rely on a coverage.	Size of the cell to be defined.	
Groundwater zones of problematic chemistry	conflict map	raster	Text	Type: text	Intention to rely on a coverage.	Size of the cell to be defined.	
Heat transfer rate	closed-loop potential	raster	W/m	Float (Value in SI units)	Intention to rely on a coverage.	Size of the cell to be defined.	
Hydraulic conductivity	open-loop potential	raster	m/d	Float (Value in SI units)	Intention to rely on a coverage. Shall consider using gwml2:GW_UnitFluidProperty/ gwHydraulicConductivity	Size of the cell to be defined.	
Hydraulic productivity	open-loop potential	raster	l/s	Float (Value in SI units)	Intention to rely on a coverage.	Size of the cell to be defined.	
Hydraulic transmissivity	open-loop potential, geothermal storage	raster	m^2/d	Float (Value in SI units)	Intention to rely on a coverage. Size of the cell to be defined.	Size of the cell to be defined.	*Lot of rasters / expected. Should we define a grid and attach*

					Shall consider using gwml2:GW_UnitFluidProperty/ gwTransmissivity		*o&m to some cells instead?*
Hydraulically separated groundwater bodies	conflict map	raster	Text	Boolean (yes, no)		GWML2 ?	
Interval thermal conductivities derived from TRT measurements	closed-loop potential	vector points		Float (Value in SI units)		O&M?	
Karst areas including cavities	conflict map	raster	Text	Boolean (yes, no)	Intention to rely on a coverage.	Size of the cell to be defined.	
karst features	conflict map	vector		Karst Feature: text?			
Landfills, contaminated areas	conflict map	raster	Text	Type: text: (landfill, spill), Certainty. text :(detected, expected)	Intention to rely on a coverage.	Size of the cell to be defined.	
Landslides	conflict map	vector	Text	Boolean (yes, no)?			

Lithology of a specific geological unit	Geology	raster	Text	Lithology, text. From national or international codelist	Try to map values to CGI/INSPIRE lithology dictionary.	Using GeoSciML structure would require vector outline of lithologically defined geological units, otherwise leave as coverage with vocabulary values.	
Location of existing geothermal utilizations	conflict map	vector points	Text	Type (text from codelist)		Kind of LandUse? Or INSPIRE Production and Industrial Facility (PF)?	What is meant by utilizations?
Location of existing other groundwater use than for geothermal reasons	conflict map	vector points	Text	Type: text, ID: text (i public)		Locations of GWML2:Well?	
Mining areas	conflict map	raster	Text	Boolean (yes, no)	Intention to rely on a coverage.	Size of the cell to be defined.	
Natural reserves and protection areas	conflict map	raster	Text	Type: text	INSPIRE Natural Risk Zones?		
Net aquifer thickness	open-loop potential	raster	m	Float (Value in SI units)			

Outline of groundwater bodies suitable for Aquifer Thermal Energy Storage (ATES)	geothermal storage	raster	Text	Boolean (yes, no)			
Overpressured or artesian groundwater areas	conflict map	raster	Text	Boolean (yes, no)			
Specific thermal capacity - closed loop systems	closed-loop potential	raster	MW/ha	Float (Value in SI units)			
Specific thermal capacity - open loop systems	open-loop potential	raster	kW/ha	Float (Value in SI units)			
Specific yield	open-loop potential	raster	m3/h/m	Float (Value in SI units)			
Subsurface temperature profiles	open-loop potential, geothermal storage	vector points	degC	?? Origin: text			
Surface temperature	closed-loop potential	raster	degC	Float (Value in SI units)			

temperature at different depths in boreholes	closed-loop potential	vector points	degC	Float (Value in SI units), Date: date of measurement? depth (m) decimal, BoreholeID (text)			
Temperature gradient	closed-loop potential	raster	°C/100m	Float (Value in SI units)			
Thermal conductivity of unsaturated sediments	closed-loop potential	vector points	W/m/K	Float (Value in SI units)			
Thermal productivity	open-loop potential	raster	degC	Float (Value in SI units)			
Top of a geological unit	Geology	raster	m above sea level	Float (Value in SI units), Unit: text			
				from national codelist			
Traffic light map closed loop system	general information	raster	Text	Possibilities: text or integer for (green, yellow, red), "What_to_do": text			

Traffic light map open loop system	general information	raster	Text	Possibilities: text or integer for (green, yellow, red), "What_to_do": text			
Water level	open-loop potential	vector points	m b. sea-level	Float (Value in SI units)	INSPIRE Environmental Facility / PiezoMetres		
Water protection zones	conflict map	raster	Text	Type: text	INSPIRE Natural Risk Zones		
Aquifer pressure	geothermal storage	raster	Text	Float (Value in SI units)			
Electrical conductivity (average)	general information	raster		Float (Value in SI units)			
Recharge Capacity Index	conflict map	raster	Text	Index: integer?			
Zones with restrictions to drilling	conflict map	raster	Text	Text (specific description of the restriction)			

A7. HOVER (latest update: May-2019)

The information presented here has been extracted from HOVER D2.2a *"Data requirements for data to EGDI".*

WP3 Hydro-geochemistry and health products

Product descriptions

Title and description		**Thermal and natural mineral waters in Europe**	**Report on mineral and thermal waters in participating countries**	**European exposure maps of selected elements (and indicators)**
Product Type	**Georeferenced Information** Vector / raster	vector		vector
	Not Georeferenced Information		X	
Data sources		specific questionnaire Data collection questionnaire	Reports and contribution from participants	Specific questionnaires, output of Task

Spatial dimension		polygon (1km x 1km) based on https://www.eea.europa.eu/data-andmaps/data/eeareference-grids-2	Not relevant	polygon (1km x 1km) based on https://www.eea.europa.eu/dataand-maps/data/eea-referencegrids-2
Temporal dimension	**static**	X	Not relevant	x
	dynamic: real time (yes/no)		Not relevant	
Scale		1:1,500,000	Not relevant	1:1,500,000
Coverage		participating countries in WP3	participating countries in WP3	participating countries in WP3 or pilot countries for WP3.2 to WP3.4
Projection system.		ETRS_1989_LAEA	Not relevant	ETRS_1989_LAEA
Delivery Format to EGDI	**Web services** (WMS, WFS, WCS, etc.)	WMS		WMS
	Files uploaded (shapefiles,			
	ESRI GRID, ASCII, etc.)			

	Not Georeferenced information (PDF, JPG; TXT, etc.)		PDF	
Metadata:	**Metadata provider** (IGME, GBA, etc.)	GBA	Not relevant	GBA
	Metadata collection (Harvesting/direct editing)	direct editing	Not relevant	direct editing

Main layer: Name of water source and general information
Maps to: GWML2:GW_ Spring

Question:
Comment:

Attribute	Field	unit	type	explanation	D.3.2.x Maps to	Comment	Question
N1	name of source		Text	name of source from the list of recognized natural mineral waters, otherwise a name for the thermal water source	GW_Spring:gwSpringName		

N2	official name of natural mineral water		Text	Please, provide the trade description from the list of recognized natural mineral waters; not relevant for thermal waters	GW_Spring:gwSpringName		
N3	country		Text				
G1	classification		Choose from list*		GW_Spring:gwSpringCauseType		Is this 'The cause of the spring e.g. artesian, geyser, perched, etc.' ?
G2	location		choose country specific grid cell ID	download country specific grids from https://www.eea.europa.eu/dataand-maps/data/eea-reference-grids-2	GW_Spring:gwSpringLocation		
G3	type of water source		Choose from list*		GW_Spring:gwSpringType		Is this 'Type of spring e.g. mineral, thermal, saline, etc.' ?
G4	intended use 1		Choose from list*			# GAP: specialzation needd	
G5	intended use 2		Choose from				

			list*				
G6	intended use 3		Choose from list*				
G7	yield class	l/s	Choose from list*	extraction allowed by water law	GW_Spring:gwSpringLicence		

Second layer: Aquifer information
Maps to: GWML2:GW_ HydrogeoUnit

Question:
Comment: a GW_ HydrogeoUnit is a subtype of GeoSciML:gsmlb:GeologicUnit, thus several attributes describing an hydrogeounit do come from GeoSciML.

Attributes	Field	unit	type	explanation	D 3.2 Maps to	Comments	Questions
B1	If borehole: true vertical depth	m	number	below terrain	What is this information if not from boreholes? Is it using the EEA grids as described above; in which case surely there could be 0 or more boreholes in any grid polygon? These are described as vector layers but, as they are using square grid shaped polygon cells they could also be presented as a raster coverage.		

B2	If borehole: screen or open hole: FROM (true vertical depth)	m	number	below terrain			
B3	If borehole: screen or open hole: TO (true vertical depth)	m	number	below terrain			
B4	Aquifer media type		choose ID from INSPIRE code list	http://inspire.ec.europa.eu/codelist/ AquiferMediaTypeValue			
B5	Aquifer type		choose ID from INSPIRE code list	http://inspire.ec.europa.eu/codelist/ AquiferTypeValue			
B6	Lithology of the aquifer 1		choose ID from INSPIRE code list	http://inspire.ec.europa.eu/codelist/L ithologyValue	gsmlb:GeologicUnit/gsmlb:composition/gsmlb:CompositionPart/.. ..gsmlb:material/gsmlb:RockMaterial/gsmlb:lithology	Rows B6 to B11 are following the 1GE flat file pattern which can be turned into	
B7	Proportion, lithology of the aquifer 1		choose from CGI Geoscience codelist	http://resource.geosciml.org/classifie r/cgi/proportionterm	gsmlb:GeologicUnit/gsmlb:composition/gsmlb:CompositionPart/.. ..gsmlb:proportion/gsmlb:GSML_QuantityRange Should use numeric range for proportion rather than proportion term for GeoSciML v4.1		

B8	Lithology of the aquifer 2		choose ID from INSPIRE code list	http://inspire.ec.europa.eu/codelist/L ithologyValue	gsmlb:GeologicUnit/gsmlb:composition/gsmlb:CompositionPart/.. ..gsmlb:material/gsmlb:RockMaterial/gsmlb:lithology	lithology properties on multiple CompositionParts on a GeologicUnit. There needs to be a gsmlb:CompositionPart/gsmlb:role property added but these could just be assigned http://resource.geosciml.org/classifier/cgi/geologicunitpartrole/unspecified_part	
B9	Proportion, lithology of the aquifer 2		choose from CGI Geoscience codelist	http://resource.geosciml.org/classifie r/cgi/proportionterm	gsmlb:GeologicUnit/gsmlb:composition/gsmlb:CompositionPart/.. ..gsmlb:proportion/gsmlb:GSML_QuantityRange Should use numeric range for proportion rather than proportion term for GeoSciML v4.1		
B10	Lithology of the aquifer 3		choose ID from INSPIRE code list	http://inspire.ec.europa.eu/codelist/L ithologyValue	gsmlb:GeologicUnit/gsmlb:composition/gsmlb:CompositionPart/.. ..gsmlb:material/gsmlb:RockMaterial/gsmlb:lithology		
B11	Proportion, lithology of the aquifer 3		choose from CGI Geoscience codelist	http://resource.geosciml.org/classifie r/cgi/proportionterm	gsmlb:GeologicUnit/gsmlb:composition/gsmlb:CompositionPart/.. ..gsmlb:proportion/gsmlb:GSML_QuantityRange Should use numeric range for proportion rather than proportion term for GeoSciML v4.1		

						_role if no more specific value can be decided.	
B12	Aquifer, younger age		choose ID from INSPIRE code list	http://inspire.ec.europa.eu/codelist/GeochronologicEraValue/	/gsmlb:GeologicUnit/gsmlb:geologicHistory/gsmlb:GeologicEvent/gsmlb:youngerNamedAge		
B13	Aquifer, older age		choose ID from INSPIRE code list	http://inspire.ec.europa.eu/codelist/GeochronologicEraValue/	/gsmlb:GeologicUnit/gsmlb:geologicHistory/gsmlb:GeologicEvent/gsmlb:olderNamedAge		

Third layer: Groundwater age information

Maps to:

Question: Is this one layer? it could be multiple coverages each representing an element/pH etc.

Comment:

Attributes	Field	unit	type	explanation	D3.2 Maps to	Comments	Questions
A1	groundwater age		Choose from list*				

Fourth layer: Hydrochemistry
Maps to: Observations & Measurements + see GWML2:GW_constituent

Question:
Comment: Observations done on the aquifer

Attributes	Field	unit	type	explanation	D3.2.x Maps to	Comment	Question
H1	Temperature class	°C	Choose from list*	water temperature at the outlet	OM_Observation:result		
H2	Total dissolved solid class	g/l	Choose from list*		OM_Observation:result		
H3	Specific conductivity	µS/cm; 25°C	Number/Text	representative hydrochemical analysis	OM_Observation:result		
H4	pH		Number/Text	representative hydrochemical analysis	OM_Observation:result		
H5	Redox potential (Eh)	mV	Number/Text	representative hydrochemical analysis	OM_Observation:result		
H6	Oxygen (O2)	mg/l	Number/Text	representative hydrochemical analysis	OM_Observation:result		
H7	Sodium (Na)	mg/l	Number/Text	representative hydrochemical	OM_Observation:result		

				analysis, if under detection limit: <DL			
H8	Potassium (K)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H9	Calcium (Ca)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H10	Magnesium (Mg)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H11	Strontium (Sr)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H12	Barium (Ba)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H13	Iron (Fe total)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		

H14	Manganese (Mn total)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H15	Ammonium (NH4)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H16	Bicarbonate (HCO3)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H17	Carbonate (CO3)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H18	Fluoride (F)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H19	Chloride (Cl)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H20	Bromide (Br)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		

H21	Iodide (I)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H22	Sulphate (SO4)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H23	Nitrate (NO3)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H24	Hydrogen Sulphide (HS)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H25	Aluminium (Al)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H26	Antimony (Sb)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H27	Arsenic (As)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		

H28	Beryllium (Be)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H29	Lead (Pb)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H30	Cadmium (Cd)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H31	Caesium (Cs)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H32	Chrome (Cr)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H33	Cobalt (Co)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H34	Copper (Cu)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		

H35	Lithium (Li)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H36	Molybdenum (Mo)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H37	Nickel (Ni)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H38	Mercury (Hg)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H39	Rubidium (Rb)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H40	Selenium (Se)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H41	Uranium (U)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		

H42	Vanadium (V)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H43	Zinc (Zn)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H44	Tin (Sn)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H45	m-Silic acid (H2SiO3)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H46	o-Boric acid (H3BO3)	mg/l	Number/Text	representative hydrochemical analysis, if under detection limit: <DL	OM_Observation:result		
H47	gas phase dominance	dominance	Choose from list*		OM_Observation:result		

Fifth Layer: Comments

Maps to:

Question: Is this one layer? How is it related to the other layers ? Seems a data model is already in place. Can we have more details ?

Comment:

Attributes	Field	unit	type	explanation	D3.2 Maps to	Comment	Question
C1	free comment		text				

***Lists to choose from for relevant fields**

G1	G3	G4 to G6	G7	A1	H1	H2	H43
classification	**type of water source**	**intended use**	**yield class**	**groundwater age**	**temperature class**	**total dissolved solid class**	**gas phase dominance**
thermal water source	single well	bottled natural mineral water	<5	younger than 60 years	<15	<1	Methane (CH4)

natural mineral water (Directive 2009/54/EC)	well group	natural mineral water publicly available	5-25	older than 60 years	15-20	1-7,5	Carbon dioxide (CO2)
mineral water (national law recognition)	single artesian well	thermal water for balneology	>25	older than 10.000 years	20-30	>14,5	Nitrogen (N2) including noble gases
	artesian well group	thermal water for heating		older than 11.500.000 years	30-40		
	single captured spring	thermal water for electricity production			40-50		
	captured spring group				50-60		

	single gallery				60-70		
	gallery group				70-80		
					80-90		
					90-100		
					>100		

WP4 Linking aquifer microbial ecology and diversity to contaminant transforming processes at groundwater-surface water transition zones.

Product descriptions

Maps to:

Question: Is this only 'report' or is there data associated with it ?

Comment:

Title and description		**Reports on 4-6 pilot sites in Denmark, France, Latvia (and Ireland?)**
Product Type	**Georeferenced Information** Vector / raster	Yes, related to location of pilot

	Not Georeferenced Information	
Data sources		Mainly GEUS and BRGM labs
Spatial dimension		Polygon < 0.01 km2 per pilot? So probably represented as a point with X, Y, Z in relevant European map and projection
Temporal dimension	**static**	x
	dynamic: real time (yes/no)	
Scale		
Coverage		4-6 pilot sites
Projection system.		As requested,
Delivery Format to EGDI	**Web services** (WMS, WFS, WCS, etc.)	Very simple – WMS?
	Files uploaded (shapefiles, ESRI GRID, ASCII, etc.)	
	Not Georeferenced information (PDF, JPG; TXT, etc.)	Reports linked to coordinates / map
Metadata:	**Metadata provider** (IGME, GBA etc .)	GEUS, BRGM, GSI, LEGMC, IGR(?)
	Metadata collection (Harvesting/direct editing)	Direct editing

Product description

Title and description		Conceptual models of nitrate transport in the unsaturated zone	Geo-referenced reports of denitrification potential mapping	Nitrate concentrations in groundwater	Travel times for nitrate in the unsaturated zone	Nitrate stored in the unsaturated zone
Product Type	**Georeferenced Information** Vector / raster	Vector	Vector		Raster	Raster
	Not Georeferenced Information					
Data sources		Hydrogeological map of Europe	WP5 partner reports and country shapefiles			
Spatial dimension		polygon	polygon		raster map	NetCDF
Temporal dimension	**static**	X	X		X	X
	dynamic: real time (yes/no)					

Scale		1:1,500,000	1:1,500,000		1:1,500,000	1:1,500,000
Coverage		Pan European	Pan European		Pan European	Pan European
Projection system.		EPSG 4326	EPSG 4326		EPSG 4326	EPSG 4326
Delivery Format to EGDI	**Web services** (WMS, WFS, WCS, etc.)					
	Files uploaded (shapefiles, ESRI GRID, ASCII, etc.)	Shapefile + report	Shapefile		ASCII grid	NetCDF
	Not Georeferenced information (PDF, JPG; TXT, etc.)	PDF format for the report?				
Metadata:	**Metadata provider** (IGME, GBA, etc.)	BGS	BRGM		BGS	BGS
	Metadata collection (Harvesting/direct editing)	Direct editing	Direct editing		Direct editing	Direct editing

Product: Conceptual models of nitrate transport in the unsaturated zone
Maps to: EPOS:ModelView

Questions:
Is this ‘Product’ planned to be related to the other mentioned here ? (it is just written ‘string’)
Is a more thourough description of the conceptual model is possible ? If yes, its description using EPOS:ModelView would be possible

Comment:

Name of the attribute	Description	Unit	Data type
Conceptual model	Classification of which conceptual model of nitrate transport in the unsaturated zone applies based on link to report		string

Product: Geo-referenced reports of denitrification potential mapping
Maps to:

Question: Is this only ‘report’ or is there data associated with it ?
Comment:

Name of the attribute	Description	Unit	Data type
Name of study	Name of the denitrification potential mapping study linked to accessible report		string

Maps to:

Question: More details ended. Is this value associated to any Hydrogeological Unit? If yes, it could be described using Observations & Measurements and linked back to the corresponding Hydrogeological Unit (or cell if the approach is more raster based).
In the summary table above this product is typed raster, has the raster structure been defined (see RESOURCE project below)?
Comment:

Name of the attribute	Description	Unit	Data type
Unsaturated zone travel time	Estimates of unsaturated zone travel time for nitrate based on conceptual models developed in HOVER WP5 Task 1 and depth to groundwater table data	years	number

Product: Nitrate stored in the unsaturated zone

Maps to:

Question: More details ended. Is this value associated to any Hydrogeological Unit? If yes, it could be described using Observations & Measurements and linked back to the corresponding Hydrogeological Unit (or cell if the approach is more raster based).
In the summary table above this product is typed raster, has the raster structure been defined (see RESOURCE project below)?

Comment:

Name of the attribute	Description	Unit	Data type
Nitrate stored in the unsaturated zone	Estimates of nitrate stored in the unsaturated zone based on conceptual models developed in HOVER WP5 Task 1, depth to groundwater table data and nitrate leaching data.	kt N/ha	number

WP6 Groundwater Age Distributions and residence times in European aquifers ("GADIS")

Maps to:

Question: more details needed as the 3 columns of the table below are not further detailed in a dedicated table

- For "Database structure for storage of probably 10-15 environmental tracers (mainly isotopes)" Observations & Measurements would be a really good candidate probably backed up by GWML2 but we need to know more about the data model. Ideally the database structure should be generated after exchanges with WP3 representatives. This would highly help for interoperability.
- For "Maps and cross sections, potentially one or two examples of 3D representations", EPOS:ModelView would be a good candidate but for this, we need to know more.
- For 'Reports', Is this only 'report' or is there data associated with it ?

Comment:

Product descriptions

Title and description	Database structure for storage of probably 10-15 environmental tracers (mainly isotopes)	Maps and cross sections, potentially one or two examples of 3D representations	Reports

Product Type	**Georeferenced Information** Vector / raster	Database allowing for storage of georeferenced tracer analyses for wells varying in space and time	x	(x)
	Not Georeferenced Information			
Data sources		Existing databases at surveys + additional data from researchers' personal databases	GEUS and others?	GEUS and probably 810 other partners
Spatial dimension		Mainly OD - 1D		
Temporal dimension	**static**	x	x	
	dynamic: real time (yes/no)			
Scale		vary	1:20.000 - 1:100.000?	
Coverage		?	Selected pilots	Selected pilots
Projection system.			As requested	As requested

Delivery Format to EGDI	**Web services** (WMS, WFS, WCS, etc.)	Simple – WMS?	Simple – WMS?	
	Files uploaded (shapefiles, ESRI GRID, ASCII, etc.)	x	x	
	Not Georeferenced information (PDF, JPG; TXT, etc.)		X (potentially)	Pdf report (hopefully georeferenced)
Metadata:	**Metadata provider** (IGME, GBA etc.)	Mainly GEUS, BRGM, TNO, but potentially all partners	GEUS, BRGM? TNO? and possibly 6-7 other partners	GEUS, BRGM, TNO, MBFZS + others?
	Metadata collection (Harvesting/direct editing)	Partly harvesting, partly direct editing.	Partly harvesting, partly direct editing.	Mainly direct editing

Product: Groundwater age distribution for well fields and regional aquifers in 0D3D

Maps to:

Question: More details needed. How will the 3 attributes described below be related to the corresponding hydrogeological unit and well field? Will this be exchanged in vector (feature) or raster (coverage) mode?
How will the well field be structured? A collection of wells, a polygon?

Comment:

Name of the attribute	Description	Unit	Data type
Groundwater mean age	Model and/or tracer estimated mean groundwater age	years	Integer
Groundwater age intervals for regional aquifers	Age intervals to be defined; e.g., tentative classes: 0-70 70-500 500-1000 1000-10.000 >10.000	years	String?

Groundwater age intervals for well fields	Tentative classes: 0-10 10-25 25-70 70-200 >200	years	String?

WP7 Harmonized vulnerability to pollution mapping of the upper aquifer Product descriptions

Maps to:

Question:

- Only ‘report’ or is there data associated with it ?

Comment:

Product descriptions

Maps to:

Question: For ‘Reports’ (last 3 columns), is this only ‘report’ or is there data associated with it ?

Comment:

Title and description		European Groundwater Vulnerability Map to Pollution	Groundwater Vulnerability Map to Pollution in Pilot Areas	2D schematic cross section of the aquifer indicating aquifer vulnerability	Report I on Comparison of internationally commonly applied index methodologies for assessing the vulnerability of the upper aquifer to pollution	Report II on Compilation of the examination results of the data sets of input data for the respective methodologies assessing vulnerability of the upper aquifer to pollution	Report III on Delivery of cross sections and maps of extend of selected aquifers in specific national pilot areas
Product Type	**Georeferenced Information** Vector / raster	Raster	Raster				
	Not Georeferenced Information			x	X	X	X
Data sources		According to questionnaire	According to questionnaire	Not defined yet			
Spatial dimension		Not defined yet, depending on selected input data	Ranging from 50m X 50m to 10km X 10km	Not defined yet			
	static	X		x			

Temporal dimension	**dynamic:** real time (yes/no)						
Scale		1:1,500,000	Ranging from 1:50,000 to 1:1,000,000	Not defined yet			
Coverage		PanEuropean (participating WP partners)	Respective Pilot Areas	In selected pilot areas			
Projection system.		WGS_1984_ Web_Mercator_Auxiliary_ Sphere EPSG: 3857	To be determined				
Delivery Format to EGDI	**Web services** (WMS, WFS, WCS, etc.)	WMS	WMS	WMS and/or WFS			
	Files uploaded (shapefiles, ESRI GRID, ASCII, etc.)						

	Not Georeferenced information (PDF, JPG; TXT, etc.)			JPG or similar	PDF	PDF	PDF
Metadata:	**Metadata provider** (IGME, GBA etc .)	BGR, ICGC	Respective Geological Surveys of the Pilot Areas	Respective Geological Surveys of the selected Pilot Areas			
	Metadata collection (Harvesting/direct editing)	Harvesting	Harvesting	Harvesting			

Product: European Groundwater Vulnerability Map to Pollution according to DRASTIC

Maps to:

Question:

In the summary table above this product is typed raster, has the raster structure been defined (see RESOURCE project below)? Those 3 attributes would then be 'Parameters' of a coverage.

Comment:

Name of the attribute	Description	Unit	Data type

DRASTIC_Value	Calculated DRASTIC Index	-	Integer
DRASTIC_Classes	Vulnerability to Pollution classes: Very low Low Medium High	-	String
Name of the attribute	**Description**	**Unit**	**Data type**
	Very high		

Product: Groundwater Vulnerability Map to Pollution in Pilot Areas.

Maps to: Vulnerability Map candidate will be INSPIRE Natural Risk Zone nz:AbstractExposedElement

Question: Attributes have not been defined yet. More information needed

Comment:

Product: 2D schematic cross section of the aquifer indicating aquifer vulnerability in pilot areas.
Maps to:

Question: Attributes have not been defined yet. More information needed

Comment:

WP8 Effective monitoring of emerging contaminants (ECs).

Product descriptions

Maps to:

Question: For ‘Reports’ (last 2 columns), is this only ‘report’ or is there data associated with it?

Comment:

Title and description		European map that synthesizes the state of knowledge on the presence of selected ECs in groundwater	Critical review report of European monitoring results for organic emerging contaminants	Report with recommendations for monitoring of key parameters with reference to environmental context, geological setting and risk assessment	Report describing new sampling analyses and interlaboratory tests directed towards potential hotspots for emerging contaminants transport
Product Type	**Georeferenced Information** Vector / raster				
	Not Georeferenced Information	Information associated to the centroid of each MS	X	X	X
Data sources		Questionnaires			

Spatial dimension		Different graph provided depending on the zoom scale			
Temporal dimension	**static**	X			
	dynamic: real time (yes/no)				
Scale		1:1,500,000			
Coverage		Pan-European (participating WP partners)			
Projection system.					
Delivery Format to EGDI	**Web services** (WMS, WFS, WCS, etc.)				
	Files uploaded (shapefiles, ESRI GRID, ASCII, etc.)				
	Not Georeferenced information (PDF, JPG; TXT, etc.)	Selected pictures to be shown on the map depending on the zoom scale	PDF	PDF	PDF

Metadata:	**Metadata provider** (IGME, GBA etc.)	WP8 participants			
	Metadata collection (Harvesting/direct editing)	?			

Product: European map that synthesizes the state of knowledge on the presence of selected ECs in groundwater.

Maps to:

Question: More details needed. Will numbers and graphs be shared only in a map? They could be shared in a interoperable datastructure using Observations & Measurements.

Comment:

Numbers and graphs are displayed in the pan-European map for each country. They appear on the map depending on the zoom: from just several groundwater sites to more detailed lists of compounds when the user zooms in on a specific country

Name of the attribute	Description	Unit	Data type
State of the surveillance of ECs in national groundwater	Number of groundwater sites where ECs have been sought over the last 10 years.	Number per year (to be fixed by the WP8 partners)	Histograms Number of sites per year (to be discussed)

Type of ECs sought	Number of molecules sought in groundwater per family type (Pharmaceuticals, industrial, personal care products…)		Radial or camembert graph
Name of the attribute	**Description**	**Unit**	**Data type**
Occurrence of ECs in groundwater	Quantification frequency of selected ECs in GW		Frequency associated to individual molecules

Product: hydrogeological map of Europe.

Maps to:

Question: More details needed. Will this correspond to the first 2 columns of WP8 'Product descriptions'? Namely 'European ap that synthesizes the state of knowledge on the presence of selected ECs in groundwater' and 'Critical review report of European monitoring results for organic emerging contaminants'? If yes, how will data be structured?

Comment:

A8. RESOURCE (latest update: May-2019)

The information presented here has been extracted from Resources D6.1 "*Template that can be used by all participating surveys to collect the required data, Pan-EU Groundwater Resources Map*".

WP6 PAN-EU GW RESOURCE MAP

Product: Pan European groundwater resources map

The pan-EU map is based on the INSPIRE shapefile grid over Europe (https://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2). The cell-id's correspond to the existing 10x10 km INSPIRE shapefile grid over Europe. INSPIRE Code lists and vocabularies will be used on record level whenever possible, with additional codes where necessary

The coordinate system of this grid is ETRS89, with the Lambert Azimuthal Equal Area projection (LAEA).

Maps to: INSPIRE shapefile grid over Europe
Question:
Comment: This is a square grid coverage data set rather than feature based but could be presented as features with square cell geometries in order to use the semantic associated with the feature based GWML2 and GeoSciML.

If presented as a coverage then could add CGI/INSPIRE vocabulary values for fields where applicable like lithology (requires mapping the description to vocabulary terms). GeoSciML can cover the lithology property. It looks like just one lithology property per layer so there wouldn't be more than one composition part unless they manually mapped some descriptions to a list of composition parts.

GWML2 can cover the groundwater related properties.

Main layer

Attributes	Description	Unit	Data type	D.3.2.x Maps to	Comments	Questions
cell-id	Unique identifier for each grid cell.	NA		Typical description of a coverage with several "parameters" observed.		

Attributes	Description	Unit	Data type	D.3.2.x Maps to	Comments	Questions
				Each cell of the coverage is associated to one value per parametre.		
Altitude_surface_level	Average altitude relative to the EU height reference level EVRF2007 (European Vertical Reference Frame).	Metres	number	Parameter #1	Digital Elevation Model may already exist to cover this need.	
GW_level	Average depth to the groundwater level (depth of unsaturated zone) below the surface level.	Metres	number	Parameter #2		
Label_dynamic	Label describing dynamics of the groundwater level. S=Static, K=Karst systems with seasonal groundwater level fluctuation, R=Recovery after mining, P=Groundwater depletion by	NA	Text	Parameter #3		

Attributes	Description	Unit	Data type	D.3.2.x Maps to	Comments	Questions
	pumping					
GW_level_amplitude	If the groundwater level is dynamic, the amplitude	Metres	Number	Parameter #4		What should be put if the groundwater level is not dynamic ?
Unsat_lithology	Simplified lithology of the unsaturated zone	NA	Text	Parameter #5		Consider refering to a codelist for harmonization.
Total_depth_active_layers	This indicates the maximum depth of the layers that are defined are of importance considering the freshwater volume.	Metres	number	Parameter #6		
Label_maximum_depth_active_layers	In this column you can indicate what is used as a label for the maximum depth of the active layers. H=Hydrogeological boundary, C= Based on chloride concentration T=Based on TDS concentration	NA	Text	Parameter #7		

Attributes	Description	Unit	Data type	D.3.2.x Maps to	Comments	Questions
	E=Based on EC					

Rest of the layers

Name of the attribute	Description	Unit	Data type	D.3.2.x Maps to	Comments	Questions
cell-id	Unique identifier for each grid cell.			Typical description of a coverage with several "parameters" observed.	Each cell of the coverage is associated to one value per paraMetre.	
LX_top	The height of the top of the layer in reference to surface level	Metre	number	Parameter #1		
LX_bottom	The height of the bottom of the layer in Metres below surface level.	Metre	number	Parameter #2		
LX_aquifer	If layer is an aquifer	NA	Text (Y/N)	Parameter #3 Boolean		
LX_aquitard	if the layer is an aquitard	NA	Text (Y/N)	Parameter #4		

Name of the attribute	Description	Unit	Data type	D.3.2.x Maps to	Comments	Questions
				Boolean		
LX_lithology	Description of the simplified lithology	NA		Parameter #5 Consider refering to a codelist for harmonization.		
LX_extent	Percentage of the cell that is covered by the layer.		number	Parameter #6		
LX_Confidence_label_delineation	Describes the confidence level for the estimation of layer's depth and extent. EJ = Expert Judgement, MOD = Based on subsurface model, BH = Based on boreholes	NA	Text	Metadata about Parameter #6.		
LX_Porosity	Porosity indicated with two decimals		number	Parameter #7		
LX_kh	Horizontal conductivity in m/d	m/d	number	Parameter #8		

Name of the attribute	Description	Unit	Data type	D.3.2.x Maps to	Comments	Questions
LX_KV	Vertical conductivity in m/d	m/d	number	Parameter #9		
LX_Confidence label_hydraulic_parameters	Indicates the confidence level of the hydraulic parameters. EJ = Expert Judgement, MOD = Based on subsurface model, BH = Based on boreholes			Metadata about Parameters #8, 8 and 9.		One confidence indicator per hydraulic paraMetre?
LX_Paleo	indicating if the groundwater in the layer is Paleogenic	NA	Text (Y/N)	Parameter #10 Boolean		
LX_Artesian	Label indicating if the aquifer is confined/unconfined/Confined artesian (C, U, CA).	NA	Text	Parameter #11		
LX_Thermal	Label indicating if the aquifer is (natural) thermal or not.	NA	Text (Y/N)	Parameter #12 Boolean		

A9. TACTIC (latest update: 28-Jan-2019)

Data extracted from GIP-P D2.2.1 "*First report describing the requirements to the*

Maps to: Maybe more than one.
Question: More details needed. The vulnerability map could be mapped by INSPIRE Natural Risk Zone, while more information concerning the Meteorological aspect are mapped by INSPIRE AC-MF (Atmospheric Conditions and Meteorological Geographical Features) and O&M.
Comment:

WPs	**Data type**	**Format and other information**
WP3 Integrated groundwater - surface water assessment	Documents	Not yet defined
WPs	**Data type**	**Format and other information**
WP4 Assessing groundwater recharge and vulnerability	Map displaying aquifer vulnerability to climate	
	Pan-European netprecipitation and groundwater recharge maps multiple layers with mean, monthly, annual data etc.	
WP5 Assessment of salt-/sea water intrusion status and vulnerability	Documents	

WP6 Groundwater adaptation strategies	Documents	

A10. VOGERA (latest update: Jan-2019)

Information extracted from VoGERA D2.1 "*Data Management Plan*."

The data generated by VoGERA will comprise the following reports:

- Technical report on evidence for potential pathways for groundwater contamination from sub-surface energy activities and data collection plan (D3.1)
- Technical report on the characterization of potential pathways and effects on fluid in the pilot areas (D3.2)
- Groundwater vulnerability assessments for pilot study sites (D3.3)
- Expanded diagrams of conceptual models identifying potential pathways for industrial activity in the deep sub-surface and shallow groundwater vulnerability (D 4.1)
- Common methodology for characterising the vulnerability of shallow groundwater to deep industrial activities (D 4.2)
- The conceptual models of the pathways and the specific (potential) impacts of deep energy activities for groundwater resources at the pilot sites.

D2.2.1 Section 3.2.1 says that VoGERA will not deliver any data as the data will not be open. Section 3.2.2.1 does describe some of the input data they will be using which falls within the scope of GeoSciML and other standards as described in D3.1 Table 3. However, that is very high level and, if the data is not to be delivered, then maybe there is no need to map it to standards?

Maps to:
Question: More details needed.

Comment: Not opening data does not mean they won't be shared accross a group of people (certainly from different organizations). In that case, the benefits of interoperability would remain. Thus this does not mean produced data should not be mapped and shared according to the interoperability relevant standards.

RAW MATERIALS

A11. EUROLITHOS (latest update: 21-June-2019)

The following data have been gathered from EuroLithos D6.1 "*Data and information structure for the knowledge platform on European ornamental stone resources*". This information has been completed by a series of emails exchanged with Eurolithos in May and June of 2019.

The spatial data that Eurolithos will use is already built into Minerals4EU; i.e., points and polygons with properties according to Inspire and Minerals4EU. However, they will be extended with fields for adding unique names for stone types.

Minerals4EU database is used in a heterogeneous way for dimension stones. That is:

- Several countries have not delivered any information for dimension stone at all.
- Several countries have delivered only a few of their dimension stone occurrences.
- The commodity code-list is not suitable.
- Similar dimension stone occurrences are registered in varied ways.

In addition, in order to create a European plot for dimension stone resources, there is the need of:

1. Better guidelines to define which information must be incorporated in the Minerals4EU deliveries and how that must be done.
    - EuroLithos will initiate this.
2. The addition of some minor extensions for product types to the existing Minerals4EU model/DB.

The existing commodity code-list is not enough to describe dimension stone products. But it could be used as described here:

ProductName	Lithology	Colour	?
Code-list 1: Based on EN12440	Minerals4EU code-list	Code-list 2: Proposal from EuroLithos	

Example of Rock Classification according to EN 12670 & EN 12407

Country:	***GREECE***
No.	***1***

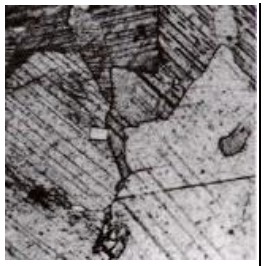
Igneous Rocks	List	Sedimentary Rocks	List	Metamorphic Rocks	List
Plutonic Rocks	--	Arkose	--	Amphibolite	--
Ultrabasic Rocks	--	Carbonates according to dolomite content	--	Calc-schist	--
Volcanic Rocks	--	Greywackes	--	Eclogite	--
Pyroclastic Rocks	--	Limestones	--	Epidotite	--
Igneous Rocks	**List**	**Sedimentary Rocks**	**List**	**Metamorphic Rocks**	**List**
Diabase		Marls	--	Feldspathite	--
		Sandstones	--	Gneiss	--
		Shales	--	Granulite	--

		Gypsum		Greenschist	--
		Calcarenite		Leptite	--
		Chalk		Marble	Calcitic marble
				Micacite chloritite	--
				Migmatite	--
				Ophicalcite	--
				Phyllite	--
				Quartzite	--
				Schist & Slate	--
				Serpentinite	--

The products will be linked to "product sheets"; see here below examples of these product sheets:

Petrographic description of stones

Petrographic examination (EN 12407)			
No	**Macroscopic description**	**Microscopic description**	**Thin section photographic record**
			Parallel to the anisotropy planes (N+…x15)

2.	Green marble, medium and uniformly grained, with dark-green and brownish veining.	Medium grained calcitic marble containing a significant amount of dolomite, with granoblastic texture.	

Photographic record of the Stones

(Note: The pictures should be presented without size reduction and should correspond to a surface area of 150 x 150 mm, at least)

Name of natural stone

(EN 12440): Verde Viana

Petrological family: Calcitic marble **Country:** Portugal

2.

(Surface area: 150 x 150 mm)

Product: Ornamental stones (Points)
Maps to: ERML and several ERML-Lite views (particularly MiningActivityView and MineralOccurrenceView)
Question: Is the product describing a MiningActivity (in ERML sense) ? or other
Comment:

Attributes	description	D.3.2.x Maps to	Comment	Question
Name of place	Quarry name or other geographic			
Stone name	Unique traditional name(s)			
Alternative stone names	Other commercial or trade names			
Deposit type	Dimension stone			
Deposit Group	Bulk rock material			
Enduse potential	Building and dimension stone	http://inspire.ec.europa.eu/codelist/EndusePotentialValue		
Commodity type	basalt dimension stone granite greenstone limestone marble miscellaneous dimension stones onyx sandstone slate	http://inspire.ec.europa.eu/codelist/CommodityCodeValue		

Lithology	LithologyValue (INSPIRE geology)	CGI/INSPIRE lithology vocabulary		
Mineral Occurrence type	Deposit, prospect, occurrence	http://resource.geosciml.org/classifier/cgi/mineral-occurrence-type		
Geologic event	Minerals4EU	ERML-Lite MineActivityView		
Mine status	Minerals4EU	ERML-Lite MineActivityView		
Mining activity type (CGI)**	Minerals4EU			
Exploration activity type (CGI)**	Minerals4EU			
Resource Category (CGI)*	Minerals4EU			
Reserve Category (INSPIRE)**	Minerals4EU			
Endowments**	Minerals4EU			
Documents**	Minerals4EU			
Remarks**	Minerals4EU			

Product: Ornamental stones (Polygons)

Maps to:
Question: It seems from the elements below that there is an underlying model. What is it?
We 2 potential ways here:

- A/ Is it planned to provide the geological units/provinces layer and from them link to a typology of potential stone resources available? In that case, it seems 'Key identity properties of unique stone types' could be a categorization of ornamental stones types. And 'Physical properties of stones' and 'Geochemical information' would be 'generic' observations available at the geological units/provinces layer.
- B/ Is it planned to provide the geological units/provinces layer and with it a layer of stone samples taken from them on which observations are available ('Physical properties of stones' and 'Geochemical information').

Comment:

Attributes	Description: geological units or provinces carrying important stone resources	D.3.2.x Maps to	Comments	Questions
Name of unit	Name of geological unit or province			
Type of unit	Nappe, formation, group, province			
Stone name	Unique traditional name(s)			
Alternative stone names	Other commercial or trade names			
Deposit type	Dimension stone			
Deposit Group	Bulk rock material			
Enduse potential	Building and dimension stone			

Commodity type	basalt dimension stone granite greenstone limestone marble miscellaneous dimension stones onyx sandstone slate			
Lithologies	LithologyValue (INSPIRE geology)	CGI/INSPIRE lithology vocabulary		
Geologic event	Minerals4EU			
Mine status	Minerals4EU			
Documents**	Minerals4EU			
Remarks**	Minerals4EU			

**Optional.

Key identity properties of unique stone types
ID
Name of natural stone (According to EN 12440)
Alternative names
Classification (EN 12670 and Inspire Lithology)
Petrological family/group (EN 12670 & EN 12407 and INSPIRE)

Typical colour
Place of origin
Country

Physical properties of stones
Apparent density (EN 1936), kg/m3
Open porosity (EN 1936), % vol
Water absorption at atmospheric pressure (EN 13755), % wt
Uniaxial Compressive strength (EN 1926), MPa
Flexural strength under concentrated load (EN 12372), Mpa
Freeze-thaw resistance, 48 cycles *(Flexural strength after 48 freeze-thaw cycles (EN 12371 & EN 12372)),* MPa
Abrasion resistance (EN 14157 – Method B), mm3
Breaking load at dowel hole (EN 13364), N
Rupture energy (EN 14158), Joule
Laboratory reference
Sample reference

Geochemical information
SiO_2 (%)
Al_2O_3 (%)
Fe_2O_3 (%)
CaO (%)

MgO (%)
MnO (%)
K_2O (%)
Na_2O (%)
LOI (%)
V (ppm)
Cr (ppm)
Mn (ppm)
Co (ppm)
Ni (ppm)
Cu (ppm)
Zn (ppm)
As (ppm)
Sr (ppm)
Cd (ppm)
Ba (ppm)
Pb (ppm)
Be (ppm)
Rb (ppm)
Bi (ppm)
U (ppm)
Sc (ppm)
Y (ppm)
Th (ppm)

Sb (ppm)
Ta (ppm)
Nb (ppm)
Sample ID
Sample ID
Laboratory reference

A12. FRAME (latest update: 28-Jan-2019)

The following data have been gathered from GIP-P D2.2.1 "*First report describing the requirements to the Information Platform by the Geo-energy, Groundwater and Raw Materials themes*" (28-Jan-2019). The final products and attributes are still being defined by the various FRAME partners.

Maps to:
Question: More details needed. Several maps are mentioned it would be good to have a more detailed description of the objetcs that will be mapped and their attributes (if any).
Will Mineral Occurences and Mines mentioned below be described according to ERML (or ERML-Lite) ?
Comment:

WP3: Critical and Strategic Raw Materials Map of Europe

- Metallogenic map
- Predictivity map
- Prospectivity maps
- Mineral Occurrences and Mines update for CRM

WP4: CRM in phosphate deposits and associated black shales

- Mineral Occurrences and Mines update for phosphate deposits and associated

- New geological, chemical-mineralogical and geochronological data for some deposits

WP5: Energy Critical Elements

- Potential and prospectivity maps
- Mineral Occurrences and Mines update for natural graphite, lithium and cobalt

WP6: Conflict free Nb-Ta for the EU

- Mineral Occurrences and Mines update for Nb-Ta mineralisation

A13. MINDESEA (latest update: June-2019)

The following data have been gathered from GIP-P D2.2.1 "*First report describing the requirements to the Information Platform by the Geo-energy, Groundwater and Raw Materials themes*" (28-Jan-2019) and a series of EXCEL files sent by MINDeSEA to GIPP/WP2 in October 2018 and June 2019.

***Note:** attributes of polygon and point data are the same with the difference that point data also include geographic information (Lat/Long).

Product: Exploration data (Polygons & Points)

Purpose of this dataset is to propose an index of "Cruises exploration data" with context, including associated samples and observations and measurements obtained during this cruise.

Maps to: INSPIRE Environmental Monitoring Facilities:Environmental Monitoring Activity for the description of the cruise / exploration campaign and Environmental Monitoring Facility for devices that were used to get the observations and measurements (if not described, the vessel that carries them).

Question:

Comment:

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
OBJECT ID	FID	Number	Feature ID. An internally generated identification number for each feature. Automatically generated within shape file.	EnvironmentalMonitoringActivity:inspireid		
Shape	SHAPE	Geometry	Polygon	EnvironmentalMonitoringActivity:geometry		Environmental Monitoring Activity : BoundingBox could fit if shape are bbox
Cruise Name	CRUISE	Text (40)	Cruise expedition	EnvironmentalMonitoringActivity:gml:name		
Research Vessel	R_V	Text (40)	Name	EnvironmentalMonitoringFacility:identifier		
Leg Number	LEG_N	Number (Double)	Number of legs within the cruise			What is this ?
Cruise Start Date	CRU_START	Date	yyyy-mm-dd	EnvironmentalMonitoringActivity:activityTime (StartDate)		
Cruise End Date	CRU_END	Date	yyyy-mm-dd	EnvironmentalMonitoringActivity:ActivityTime (EndDate)		
Country Code	CODE	Text (2)	Two letter country code (see INSPIRE CODE:			It seems odd to have a counrty code associated

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
			CountryType)			with a cruise. Are these going to be cruises within the international waters of a single country?
Administration	ADM	Text (40)	Legal status following the division of the Law of the Sea Convention: Territorial sea, Exclusive Economic Zone (EZZ), Continental shelf or International Area	EnvironmentalMonitoringActivity:legalBackground		Is this the legal status of the cruise or the area in which the cruise happens ?
Geographical Area	GEO_AREA	Text (40)	Atlantic Ocean, Mediterranean Sea, etc.			Geographical area of the points / polygons of each exploration data or of the cruise?
Sector	SECTOR	Text (100)	Canary Island Seamount Province, Aeolian Islands, Gulf of Bothnia, etc.			Sector of the points / polygons of each exploration data or of the cruise?

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
Scientific Report	SCI_REP	Text (100)	URL or DOI	EnvironmentalMonitoringActivity:onlineResource		
Year of Database Entry	YEAR	Short Integer	2018, 2019, etc.		This attribute is not available in the model itself, but can manage as baseType in INSPIRE.	
Date of Database Update	UPDATE	Date	dd/mm/yyyy (Date of last update of attributes)		This attribute is not available in the model itself, but can manage as baseType in INSPIRE.	
Exploration	EXPLOR	Text (250)	Works performed: bathymetry and geophysical surveys, sampling, underwater video,	EnvironmentalMonitoringActivity:activityConditions		

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
			mining processing, etc.			
Multibeam	MULTIBEAM	Text (100)	If multibeam data are available. If yes= URL	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Is there a description of the sensor, dates, etc available?
Backscatter	BACKSC	Text (100)	If backscatter data are available. If yes= URL	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Is there a description of the sensor, dates, etc available?
Sub-bottom profiler	SUBBOTTOM	Text (100)	If sub-bottom profiler data are available. If yes= URL	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Is there a description of the sensor, dates, etc available?
Seismic	SEISMIC	Text (100)	If seismic data are available. If yes= Type an URL	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation	Is there a description of the sensor, dates, etc available?

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
					(see INSPIRE D2.9)	
Magnetometry	MAGNETOMER	Text (100)	If magnetoMetre data are available. If yes= URL	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Is there a description of the sensor, dates, etc available?
Gravimetry	GRAVIMETRE	Text (100)	If graviMetre data are available. If yes= URL	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Is there a description of the sensor, dates, etc available?
Other Methods	OTHER_M	Text (100)	add as many fields as needed	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Needs to be defined
Deposit Types	DEPOSIT_TY	Text (500)	Keywords describing briefly the types of deposits located (geological setting, morphology and		To be refined	

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
			structure, rocks/sediments surrounding the ore and minerals of the ore)			
Sampling devices	SAMPLING_D	Text (250)	Box core, corer, dredge, ROV, other	OM_Observation:procedure VS featureOfInterest	To be refined	
Data Scale	SCALE	Text (100)	Specify the scale in which the exploration has been performed	OM_Observation:procedure VS featureOfInterest	To be refined	
Exploration Extent	EXPL_KM2	Number (Double)	Area of the exploration (Sq. Km)	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Is there a description of the sensor, dates, etc available?
Maximum Water Depth (m)	MAX_DEPTH	Number (Double)	Maximum depth to seafloor from sea surface	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.9)	Is there a description of the sensor, dates, etc available?

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
Minimum Water Depth (m)	MIN_DEPTH	Number (Double)	Minimum depth to seafloor from sea surface	EnvironmentalMonitoringFacility:hasObservation	link to an O&M structure observation (see INSPIRE D2.=9)	Is there a description of the sensor, dates, etc available?
Location of samples	SAMP_LOC	Text (250)	Storage location on land	SF_Specimen:currentLocation		
Operator	OPERATOR	Text (250)	Research, exploration or operating agency/company	Environmental Monitoring Activity:responsibleParty		Is the responsible party the operator or the data provider ?
Data Provider	DATA_PROVI	Text (150)	Name of organisation providing data	Environmental Monitoring Activity:responsibleParty		
Data Provider Contact	DATA_CONT	Text (150)	The data providing organisation/institute contact details – email is required		To be refined	
Gallery	GALLERY	Text (100)	Images of the exploration performed (geophysics, sampling, underwater video or photography, etc.)	Environmental Monitoring Activity:onlineResource		

Attributes	Field name	Format	Information	D.3.2.x Maps to	Comment	Question
References	REFERENCES	Text (500)	Bibliographic references (DOI and/or Author, Year & Title if you wish)	Environmental Monitoring Activity:onlineResource		
Comments	COMMENTS	Text (500)	Any additional noteworthy comments or observations	Environmental Monitoring Facility:additionnalDescription		

Product: Marine Placers (Polygons & Points)

Maps to: It's a combination of more data model a deep analysis is required when mode details are acquired.

Question: More details needed

Comment:

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
OBJECTID	FID	Number	Feature ID. An internally generated identification number for each feature. Automatically generated within shape file.			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Shape	SHAPE	Geometry	Polygon and Points			
Latitude*	LATITUDE	Number (Double)	Degrees N	Suggest using WGS84 / EPSG:4326.		
Longitude*	LONGITUDE	Number (Double)	Degrees W/ Degrees E			
Country Code	CODE	Text (2)	Two letter country code (see INSPIRE CODE: CountryType)			
Administration	ADM	Text (40)	Legal status following the division of the Law of the Sea Convention: Territorial Sea (TS), Exclusive Economic Zone (EEZ), Extended Continental shelf (ECS) or the Area (A)			Are the Maritime Units?
Geographical Area	GEO_AREA	Text (100)	Atlantic Ocean, Mediterranean Sea, etc..			does a registry exist? as IHO s-57 partition of oceans and see be considered ?

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Sector	SECTOR	Text (100)	Canary Island Seamount Province, Aeolian Islands, Gulf of Bothnia, etc.			does a registry exist? as IHO s-57 partition of oceans and see be considered ?
Occurrence/Deposit name	DEPOS_NAME	Text (40)	Name of occurrence/ deposit			
Mineral Occurrence Type	OCURR_TY	Text (40)	see INSPIRE CODES: OccurrenceTypeType	Do they mean http://inspire.ec.europa.eu/codelist/MineralOccurrenceTypeValue?		
Year of Database Entry	YEAR_DB	Short Integer	2018, 2019, etc.			
Date of Database Update	UPDATE_	Date	dd/mm/yyyy (Date of last update of attributes)			
Deposit Group	DEPOSIT_G	Text (100)	Sediment-related deposits, hydrothermal deposits, volcanogenic deposits, magmatic deposits, metamorphism-related deposits (see			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
			INSPIRE CODES: DepositGroupType)			
Deposit Type	DEPOSIT_TY	Text (100)	**Shoreline or Marine Placer -** this exact wording must be entered in bold type (see INSPIRE CODE: DepositTypeType)			
Setting	SETTING	Text (250)	Description of geological setting (see INSPIRE CODE: EventEnvironmentType)			Do they mean http://inspire.ec.europa.eu/codelist/EventEnvironmentValue ?
Geomorphic Features	GEOMORPH	Text (250)	Geomorphology of area of phosphate deposit occurrence (Epeiric/Continental margin/Seamount/Insular; if known)	This could be a NaturalGeomophologicFeature of GeoSciML		
Event environment	EVENT_ENVI	Text (250)	Environment of formation of the mineral deposit (see INSPIRE CODE:			There isn't a separate INSPIRE vocabulary from Setting above as far as I can see. Is this

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
			EventEnvironmentValue)			just the environment at the time of mineral formation as opposed to host formation formation? I.e. different geological events attached to same GeologicUnit in GeoSciML terms?
Depositional environment	DEPOSITION	Text (250)	Environment of deposition of marine placers: fluvial, aeolian, glaciogenic, beach-nearshore			Again use same http://inspire.ec.europa.eu/codelist/EventEnvironmentValue vocabulary but linked to a different geological event (that of deposition) that above?
Formation	FORMATION	Text (15)	Autochthonous or allochthonous deposit			Is this implicit in selection of a value for event process (http://inspire.ec.europa.eu/codelist/EventProcessValue) but not explicit?

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Source	SOURCE	Text (40)	Possible source rock (onshore or offshore) derived from literature			Link to a GeologicUnit?
Source type	SOURCE_TY	Text (10)	Source type of deposit: primary or secondary			
Host Rock	HOST_ROCK	Text (250)	Substrate rock or sediment surrounding the ore deposit (see INSPIRE CODE: LithologyType)	CGI/INSPIRE lithology vocabulary. Not sure if there will be enough information to provide the description of host rock and the ore as GeoSciML ConstituentParts's or not.		
Metallic Commodity	METAL_COMM	Text (100)	Including precious and non-precious metals (see INSPIRE CODE: CommodityType)			
Other Metals	OTHER_ME	Text (100)	See INSPIRE CODE: CommodityType			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Commodity Group	COMM_G	Text (100)	Base metals, precious metals, energy metals, technological metals (see INSPIRE CODE: CommodityType, parents column K)			Seems it would be better to have multiple commodites, rather than having a specific singular (or primary metal). What if therea re more primaries, or the metal that is primary changes with time...
Ore Minerals	ORE_MIN	Text (250)	Principal minerals/commoditie s (see INSPIRE CODE: MineralNameType)			
Gangue Minerals	GANGUE	Text (250)	Non-economic minerals (see INSPIRE CODE: MineralNameType)			
Ore mineral distribution	ORE_DISTR	Text (250)	Brecciated, banded, micro-layered, etc. (see INSPIRE CODE: ShapeType)			Can't find INSPIRE dictionary ShapeType? The property name seems similar to GeoSciML gsmle:ConstituentPart/g smle:role but I'm not sure.

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Alteration	ALTER_	Text (250)	Alteration minerals formed during/after the process of mineralization (see INSPIRE CODES: AlterationDegreeType, AlterationDsitributionType, AlterationTypeType)			Can't find INSPIRE vocabularies referred to. Properties look like they are handled by GeoSciML gsmle:AlterationDescription. http://resource.geosciml.org/classifier/cgi/alterationtype Not sure if there are vocabularies for degree and distribution?
Morphology	MORPH	Text (250)	Shape and internal structure (thickness) of the mineral deposit (see INSPIRE CODE: FormType)			Can't find INSPIRE vocabulary referred to.
Texture	TEXT	Text (250)	Replacement, bioclastic, banded, columnar, mottled, etc.			This seems to cross over a few different

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
						properties in the GeoSciML model?
Geochemistry	GEOCHEM	Text (100)	Yes or no (link to geochemistry table)			
Number of samples	N	Short Integer	Number of analysed samples		Suggest to associate URI to samples description and link to them.	
Al %	Al_pc	Number (Double)	Average concentration, dry wt	Mostly mappable in ERML / ERML-Lite (CommodityResourceView and MiningActivityView)		Will those fields always be filled? If not, what should be the “none value”? Alternative could be to link to appropriate observations and measurements (as proposed for Exploration Data with “hasObservation”)
Ca %	Ca_pc	Number (Double)	Average concentration, dry wt			
Co %	Co_pc	Number (Double)	Average concentration, dry wt			
Cu %	Cu_pc	Number (Double)	Average concentration, dry wt			
Fe %	Fe_pc	Number (Double)	Average concentration, dry wt			
Mn %	Mn_pc	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Ni %	Ni_pc	Number (Double)	Average concentration, dry wt			
Si %	Si_pc	Number (Double)	Average concentration, dry wt			
Ti %	Ti_pc	Number (Double)	Average concentration, dry wt			
Au (ppm)	**Au_ppm**	Number (Double)	Average concentration, dry wt			
Ce (ppm)	**Ce_ppm**	Number (Double)	Average concentration, dry wt			
Cr (ppm)	**Cr_ppm**	Number (Double)	Average concentration, dry wt			
Dy (ppm)	**Dy_ppm**	Number (Double)	Average concentration, dry wt			
Er (ppm)	**Er_ppm**	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Eu (ppm)	**Eu_ppm**	Number (Double)	Average concentration, dry wt			
Gd (ppm)	**Gd_ppm**	Number (Double)	Average concentration, dry wt			
Ho (ppm)	**Ho_ppm**	Number (Double)	Average concentration, dry wt			
La (ppm)	**La_ppm**	Number (Double)	Average concentration, dry wt			
Lu (ppm)	**Lu_ppm**	Number (Double)	Average concentration, dry wt			
Mo (ppm)	**Mo_ppm**	Number (Double)	Average concentration, dry wt			
Nb (ppm)	**Nb_ppm**	Number (Double)	Average concentration, dry wt			
Nd (ppm)	**Nd_ppm**	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Pb (ppm)	**Pb_ppm**	Number (Double)	Average concentration, dry wt			
Pm (ppm)	**Pm_ppm**	Number (Double)	Average concentration, dry wt			
Pr (ppm)	**Pr_ppm**	Number (Double)	Average concentration, dry wt			
Pt (ppm)	**Pt_ppm**	Number (Double)	Average concentration, dry wt			
Sc (ppm)	**Sc_ppm**	Number (Double)	Average concentration, dry wt			
Sm (ppm)	**Sm_ppm**	Number (Double)	Average concentration, dry wt			
Sn (ppm)	**Sn_ppm**	Number (Double)	Average concentration, dry wt			
Tb (ppm)	**Tb_ppm**	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Te (ppm)	**Te_ppm**	Number (Double)	Average concentration, dry wt			
Ti (ppm)	**Ti_ppm**	Number (Double)	Average concentration, dry wt			
Tl (ppm)	**Tl_ppm**	Number (Double)	Average concentration, dry wt			
Tm (ppm)	**Tm_ppm**	Number (Double)	Average concentration, dry wt			
V (ppm)	**V_ppm**	Number (Double)	Average concentration, dry wt			
W (ppm)	**W_ppm**	Number (Double)	Average concentration, dry wt			
Y (ppm)	**Y_ppm**	Number (Double)	Average concentration, dry wt			
Yb (ppm)	**Yb_ppm**	Number (Double)	Average concentration, dry wt			
Zn (ppm)	**Zn_ppm**	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Zr (ppm)	**Zr_ppm**	Number (Double)	Average concentration, dry wt			
REE (Total %)	REE_pc	Number (Double)	Average concentration, dry wt			
Other Elements	OTHER_E	Number (Double)	Average concentration, dry wt (add as many fields as needed)			
Analytical technique	TECHNIQUE	Text (50)	Technique used (AAS, ICP-MS, ICPAES, XRF etc.) (see INSPIRE CODE: AnalyticalMethodTypeType)			Is it the same method for all the parameters mentionned above? If not, there shall be distinct per paraMetre.
Deposit Size	SIZE	Text (100)	Magnitude of the mineral deposit calculated according to ProMine (unknown, occurrence, small, medium, large, very large) (see INSPIRE CODE: ImportanceType)			
Resources	RESOURCE	No. Double	Resources in Mt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
Reserves	RESERVE	No. Double	Reserves in Mt			
Mined Tonnage	MIN_T	No. Double	in Mt			
Total Tonnage	TOTAL_T	No. Double	in Mt			
Remaining Tonnage	REM_T	No. Double	in Mt			
Resource Reporting Standard/ compliancy	RES_REP	Text (100)	PERC, JORC, NI43-101, etc. (see INSPIRE CODE: ClassificationMethodUsedType)			
Reference for Tonnage Assessment	REF_T	Text (40)	Company ordering the assessment			
Data Scale	SCALE	Text (100)	Specify the scale in which the deposit has been mapped and delivered		A deposit is likely to have been mapped at a number of scales.	
Status	STATUS	Text (250)	e.g. under exploration, research, identified deposits, hypothetical			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
			deposits, etc. (see INSPIRE CODE: MineStatusType)			
Operator	OPERATOR	Text (250)	Research, exploration or operating agency/company			
Exploration Type	EXPLOR_TY	Text (250)	Exploration techniques employed to describe the mineral deposit (see INSPIRE CODE: ExplorationActivityTypeType)			
Cruises	CRUISES	Text (250)	Cruises identification	Suggest an URI that link to the cruise description.		
Sampling Methods	SAMPLING_M	Text (250)	Type of method to recover samples (dredge, ROV…)			Is it the same method for all the samples mentionned above?

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
						If not, there shall be distinct per paraMetre
Sites Number	SITES_NO	Text (250)	Sampling sites identification			
Data Provider	DATA_PROVI	Text (150)	Name of organisation providing data			
Data Provider Contact	DATA_CONT	Text (150)	The data providing organisation/institute contact details – email is required			
Data Holder	DATA_HOLD	Text (150)	Name of the data holder organisation			
Deposit Extent	DEPOS_KM2	No. Double	Area of deposit (Sq. Km)			
Depth to Deposit (m)	DEPTH_TO_D	No. Double	Depth to deposit from sea surface			
Fauna	FAUNA	Text (100)	Type of fauna (e.g. corals…)			
Description	DESCRIPT	Text (500)	Deposit summary and metallogenetic model			
Gallery	GALLERY	Text (100)	Images on the mineralization (geophysical,			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comment	Question
			sampling, textural features, paragenesis, etc.)			
References	REFERENCES	Text (500)	Link to bibliographic references (DOI and/or Author, Year & Title if you wish)			
Comments	COMMENTS	Text (500)	Any additional noteworthy comments or observations			

Product: Phosphorites (Polygons & Points)

Maps to: Can be mapped with ERML2, but not fit for all.

Question:

Comment:

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
OBJECTID	FID	Number	Feature ID. An internally generated identification number for each feature. Automatically generated within shape file.			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Shape	SHAPE	Geometry	Polygon	Mentionned « Polygons and Points » in the title. To be clarified.		
Latitude*	LATITUDE	Number (Double)	Decimal degrees N	Suggest using WGS84 / EPSG:4326.		
Longitude*	LONGITUDE	Number (Double)	Degrees W/ Degrees E			
Country Code	CODE	Text (2)	Two letter country code (see INSPIRE CODE: CountryType)			
Administration	ADM	Text (40)	Legal status following the division of the Law of the Sea Convention: Territorial Sea (TS), Exclusive Economic Zone (EEZ), Extended Continental shelf (ECS) or the Area (A)			
Geographical Area	GEO_AREA	Text (100)	Atlantic Ocean, Mediterranean Sea, etc.			
Sector	SECTOR	Text (100)	Canary Island Seamount Province, Aeolian Islands, Gulf of Bothnia, etc.			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Occurrence/Deposit name	DEPOS_NAME	Text (40)	Name of occurrence/ deposit			
Mineral Occurrence Type	OCURR_TY	Text (40)	see INSPIRE CODES: OccurrenceTypeType			
Year of Discovery	YEAR_DIS	Short Integer	2001, 2016, etc.			
Year of Database Entry	YEAR_DB	Short Integer	2018, 2019, etc.			
Date of Database Update	UPDATE_	Date	dd/mm/yyyy (Date of last update of attributes)			
Deposit Group	DEPOSIT_G	Text (100)	Sediment-related deposits, hydrothermal deposits, volcanogenic deposits, magmatic deposits, metamorphism-related deposits (see INSPIRE CODES: DepositGroupType)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Deposit Type	DEPOSIT_TY	Text (100)	SedimentaryPhosphorite - this exact wording must be entered in bold type (see INSPIRE CODE: DepositTypeType)			
Deposit Sub Type	DEP_SUB_TY	Text (100)	Sub-type: Nodular/Bioclastic/Phosphatisation			
Setting	SETTING	Text (250)	Description of geological setting (see INSPIRE CODE: EventEnvironmentType)	See comments on Marine Placers product table above.		
Geomorphic Features	GEOMORPH	Text (250)	Geomorphology of area of phosphate deposit occurrence (Epeiric/Continental margin/Seamount/Insular; if known)	The description but not the values seem similar to http://resource.geosciml.org/classifier/cgi/geologicunitmorphology ?		
Age	AGE	Text (250)	Age of the mineral deposit and host rock (see INSPIRE CODE: NamedAgeType)	I can't find the INSPIRE vocabulary referred to. Assume they meant http://inspire.ec.europa.eu/codelist/GeochronologicEraValue (CGI		

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
				equivalent also possible).		
Host Rock	HOST_ROCK	Text (250)	Substrate rock or sediment surrounding the ore deposit (see INSPIRE CODE: LithologyType)	See comment on same field in Marine Placers product above.		
Metallic Commodity	METAL_COMM	Text (100)	Including precious and non-precious metals (see INSPIRE CODE: CommodityType)			
Other Metals	OTHER_ME	Text (100)	See INSPIRE CODE: CommodityType			
Commodity Group	COMM_G	Text (100)	Base metals, precious metals, energy metals, technological metals (see INSPIRE CODE: CommodityType, parents column K)			
Ore Minerals	ORE_MIN	Text (250)	Principal minerals/commodities (see			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			INSPIRE CODE: MineralNameType)			
Gangue Minerals	GANGUE	Text (250)	Non-economic minerals (see INSPIRE CODE: MineralNameType)			
Ore mineral distribution	ORE_DISTR	Text (250)	Brecciated, banded, micro-layered, etc. (see INSPIRE CODE: ShapeType)	See comment on same field in Marine Placers product above.		
Alteration	ALTER_	Text (250)	Alteration minerals formed during/after the process of mineralization (see INSPIRE CODES: AlterationDegreeType, AlterationDsitributionType, AlterationTypeType	See comment on same field in Marine Placers product above.		
Morphology	MORPH	Text (250)	Shape and internal structure (thickness) of the mineral deposit (see INSPIRE CODE: FormType)	See comment on same field in Marine Placers product above.		

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Texture	TEXT	Text (250)	Replacement, bioclastic, banded, columnar, mottled, etc.	See comment on same field in Marine Placers product above.		
Geochemistry	GEOCHEM	Text (100)	Yes or no (link to geochemistry table)			
Number of samples	N	Short Integer	Number of analysed samples	Suggest to associate URI to samples description and link to them.		
SiO_2 %	SiO2__pc	Number (Double)	Average concentration, dry wt			Will those fields always be filled?
TiO_2 %	TiO2__pc	Number (Double)	Average concentration, dry wt			
Al_2O_3 %	Al2O3__pc	Number (Double)	Average concentration, dry wt			If not, what should be the "none value"?
Fe_2O_3 %	Fe2O3__pc	Number (Double)	Average concentration, dry wt			
MnO %	MnO__pc	Number (Double)	Average concentration, dry wt			Alternative could be to link to appropriate observations and measurements.
MgO %	MgO__pc	Number (Double)	Average concentration, dry wt			
CaO %	CaO__pc	Number (Double)	Average concentration, dry wt			
Na_2O %	Na2O__pc	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
K_2O %	K2O__pc	Number (Double)	Average concentration, dry wt			
P_2O_5 %	P2O5_pc	Number (Double)	Average concentration, dry wt			
LOI %	LOI_pc	Number (Double)	Average concentration, dry wt			
TOTAL %	TOTAL_pc	Number (Double)	Average concentration, dry wt			
F (ppm)	F_ppm	Number (Double)	Average concentration, dry wt			
Cl (ppm)	Cl_ppm	Number (Double)	Average concentration, dry wt			
Th (ppm)	Th_ppm	Number (Double)	Average concentration, dry wt			
U (ppm)	U_ppm	Number (Double)	Average concentration, dry wt			
Y (ppm)	Y_ppm	Number (Double)	Average concentration, dry wt			
La (ppm)	La_ppm	Number (Double)	Average concentration, dry wt			
Ce (ppm)	Ce_ppm	Number (Double)	Average concentration, dry wt			
Pr (ppm)	Pr_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Nd (ppm)	Nd_ppm	Number (Double)	Average concentration, dry wt			
Pm (ppm)	Pm_ppm	Number (Double)	Average concentration, dry wt			
Sm (ppm)	Sm_ppm	Number (Double)	Average concentration, dry wt			
Eu (ppm)	Eu_ppm	Number (Double)	Average concentration, dry wt			
Gd (ppm)	Gd_ppm	Number (Double)	Average concentration, dry wt			
Tb (ppm)	Tb_ppm	Number (Double)	Average concentration, dry wt			
Dy (ppm)	Dy_ppm	Number (Double)	Average concentration, dry wt			
Ho (ppm)	Ho_ppm	Number (Double)	Average concentration, dry wt			
Er (ppm)	Er_ppm	Number (Double)	Average concentration, dry wt			
Tm (ppm)	Tm_ppm	Number (Double)	Average concentration, dry wt			
Yb (ppm)	Yb_ppm	Number (Double)	Average concentration, dry wt			
Lu (ppm)	Lu_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
REE (Total %)	REE_pc	Number (Double)	Average concentration, dry wt			
Other Elements	OTHER_E	Number (Double)	Average concentration, dry wt (add as many fields as needed)			
Analytical technique	TECHNIQUE	Text (50)	Technique used (AAS, ICP-MS, ICPAES, XRF etc.) (see INSPIRE CODE: AnalyticalMethodTypeType)			Is it the same method for all the parameters mentionned above? If not, there shall be distinct per paraMetre
Deposit Size	SIZE	Text (100)	Magnitude of the mineral deposit calculated according to ProMine (unknown, occurrence, small, medium, large, very large) (see INSPIRE CODE: ImportanceType)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Grade	GRADE	Text (250)	Specify assessments of grade (mean content of phosphorous (P); calcium (Ca); yttrium (Y); rare earth elements (REEs) wt%) or resource potential, if applicable			
Resources	RESOURCE	No. Double	Resources in Mt			
Reserves	RESERVE	No. Double	Reserves in Mt			
Mined Tonnage	MIN_T	No. Double	in Mt			
Total Tonnage	TOTAL_T	No. Double	in Mt			
Remaining Tonnage	REM_T	No. Double	in Mt			
Resource Reporting Standard/ compliancy	RES_REP	Text (100)	PERC, JORC, NI43-101, etc. (see INSPIRE CODE: ClassificationMethodUsedType)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Reference for Tonnage Assessment	REF_T	Text (40)	Company ordering the assessment			
Data Scale	SCALE	Text (100)	Specify the scale in which the deposit has been mapped and delivered			
Status	STATUS	Text (250)	e.g. under exploration, research, identified deposits, hypothetical deposits, etc. (see INSPIRE CODE: MineStatusType)			
Operator	OPERATOR	Text (250)	Research, exploration or operating agency/company			
Exploration Type	EXPLOR_TY	Text (250)	Exploration techniques employed to describe the mineral deposit (see INSPIRE CODE: ExplorationActivityTypeType)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Cruises	CRUISES	Text (250)	Cruises identification	Suggest an URI that link to the cruise description.		
Sampling Methods	SAMPLING_M	Text (250)	Type of method to recover samples (dredge, ROV…)			Is it the same method for all the samples mentionned above? If not, there shall be distinct per paraMetre.
Sites Number	SITES_NO	Text (250)	Sampling sites identification			
Data Provider	DATA_PROVI	Text (150)	Name of organisation providing data			
Data Provider Contact	DATA_CONT	Text (150)	The data providing organisation/institute contact details – email is required			
Deposit Extent	DEPOS_KM2	No. Double	Area of deposit (Sq. Km)			
Depth to Deposit (m)	DEPTH_TO_D	No. Double	Depth to deposit from sea surface			
Fauna	FAUNA	Text (100)	Type of fauna (e.g. corals…)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Description	DESCRIPT	Text (500)	Deposit summary and metallogenetic model			
Gallery	GALLERY	Text (100)	Images on the mineralization (geophysical, sampling, textural features, paragenesis, etc.)			
References	REFERENCES	Text (500)	Link to bibliographic references (DOI and/or Author, Year & Title if you wish)			
Comments	COMMENTS	Text (500)	Any additional noteworthy comments or observations			

Products: Crusts (Polygons & Points)

Maps to: ERML : concept name ?

Question:

Comment:

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
OBJECTID	FID	Number	Feature ID. An internally generated identification number for each feature. Automatically generated within shape file.			
Shape	SHAPE	Geometry	Polygon	Mentionned « Polygons and Points » in the title. To be clarified.		
Latitude*	LATITUDE	Number (Double)	Degrees N	Suggest using WGS84 / EPSG:4326.		
Longitude*	LONGITUDE	Number (Double)	Degrees W/ Degrees E			
Country Code	CODE	Text (2)	Two letter country code (see INSPIRE CODE: CountryType)			
Administration	ADM	Text (40)	Legal status following the division of the Law of the Sea Convention: Territorial Sea (TS), Exclusive Economic Zone (EEZ), Extended			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			Continental shelf (ECS) or the Area (A)			
Geographical Area	GEO_AREA	Text (100)	Atlantic Ocean, Mediterranean Sea, etc..			
Sector	SECTOR	Text (100)	Canary Island Seamount Province, Aeolian Islands, Gulf of Bothnia, etc.			
Occurrence/Deposit name	DEPOS_NAME	Text (40)	Name of occurrence/ deposit			
Mineral Occurrence Type	OCURR_TY	Text (40)	see INSPIRE CODES: OccurrenceTypeType			
Year of Discovery	YEAR_DIS	Short Integer	2001, 2016, etc.			
Year of Database Entry	YEAR_DB	Short Integer	2018, 2019, etc.			
Date of Database Update	UPDATE_	Date	dd/mm/yyyy (Date of last update of attributes)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Deposit Group	DEPOSIT_G	Text (100)	Sediment-related deposits, hydrothermal deposits, volcanogenic deposits, magmatic deposits, metamorphism-related deposits (see INSPIRE CODES: DepositGroupType)			
Deposit Type	DEPOSIT_TY	Text (100)	SedimentaryManganese -this exact wording must be entered in bold type (see INSPIRE CODE: DepositTypeType)			
Setting	SETTING	Text (250)	Description of geological setting (see INSPIRE CODE: EventEnvironmentType)		See comment on same field in Marine Placers product above.	
Geomorphic Features	GEOMORPH	Text (250)	Geomorphology of area of FeMn crust occurrence		See comment on same field in Marine Placers product above.	

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Age	AGE	Text (250)	Age of the mineral deposit and host rock (see INSPIRE CODE: NamedAgeType)		See comment on same field in Marine Placers product above.	
Host Rock	HOST_ROCK	Text (250)	Substrate rock or sediment surrounding the ore deposit (see INSPIRE CODE: LithologyType)		See comment on same field in Marine Placers product above.	
Metallic Commodity	METAL_COMM	Text (100)	Including precious and non-precious metals (see INSPIRE CODE: CommodityType)			
Other Metals	OTHER_ME	Text (100)	See INSPIRE CODE: CommodityType			
Commodity Group	COMM_G	Text (100)	Base metals, precious metals, energy metals, technological metals (see INSPIRE CODE: CommodityType, parents' field)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Ore Minerals	ORE_MIN	Text (250)	Principal minerals/commodities (see INSPIRE CODE: MineralNameType)			
Gangue Minerals	GANGUE	Text (250)	Non-economic minerals (see INSPIRE CODE: MineralNameType)			
Ore mineral distribution	ORE_DISTR	Text (250)	Brecciated, banded, micro-layered, etc. (see INSPIRE CODE: ShapeType)		See comment on same field in Marine Placers product above.	
Alteration	ALTER_	Text (250)	Alteration minerals formed during/after the process of mineralization (see INSPIRE CODES: AlterationDegreeType , AlterationDsitributionType, AlterationTypeType		See comment on same field in Marine Placers product above.	
Morphology	MORPH	Text (250)	Shape and internal structure		See comment on same field in Marine Placers product above.	

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			(thickness) of the mineral deposit (see INSPIRE CODE: FormType)			
Texture	TEXT	Text (250)	Banded, columnar, mottled, etc.		See comment on same field in Marine Placers product above.	
Geochemistry	GEOCHEM	Text (100)	Link to Geochemistry table			
Number of samples	N	Short Integer	Number of analysed samples		Suggest to associate URI to samples description and link to them.	
SiO_2 %	SiO2__pc	Number (Double)	Average concentration, dry wt			Will those fields always be filled? If not, what should be the "none value"? Alternative could be to link to appropriate observations and measurements.
TiO_2 %	TiO2__pc	Number (Double)	Average concentration, dry wt			
Al_2O_3 %	Al2O3__pc	Number (Double)	Average concentration, dry wt			
Fe_2O_3 %	Fe2O3__pc	Number (Double)	Average concentration, dry wt			
MnO %	MnO__pc	Number (Double)	Average concentration, dry wt			
MgO %	MgO__pc	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
CaO %	CaO__pc	Number (Double)	Average concentration, dry wt			
Na_2O %	Na2O__pc	Number (Double)	Average concentration, dry wt			
K_2O %	K2O__pc	Number (Double)	Average concentration, dry wt			
P_2O_5 %	P2O5__pc	Number (Double)	Average concentration, dry wt			
LOI %	LOI__pc	Number (Double)	Average concentration, dry wt			
TOTAL %	TOTAL__pc	Number (Double)	Average concentration, dry wt			
Co %	Co__pc	Number (Double)	Average concentration, dry wt			
Ni %	Ni__pc	Number (Double)	Average concentration, dry wt			
Cu %	Cu__pc	Number (Double)	Average concentration, dry wt			
Zn (ppm)	Zn_ppm	Number (Double)	Average concentration, dry wt			
Nb (ppm)	Nb_ppm	Number (Double)	Average concentration, dry wt			
Mo (ppm)	Mo_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Sc (ppm)	Sc_ppm	Number (Double)	Average concentration, dry wt			
V (ppm)	V_ppm	Number (Double)	Average concentration, dry wt			
Bi (ppm)	Bi_ppm	Number (Double)	Average concentration, dry wt			
Te (ppm)	Te_ppm	Number (Double)	Average concentration, dry wt			
W (ppm)	W_ppm	Number (Double)	Average concentration, dry wt			
Pd (ppb)	Pd_ppb	Number (Double)	Average concentration, dry wt			
Pt (ppb)	Pt_ppb	Number (Double)	Average concentration, dry wt			
Rh (ppb)	Rh_ppb	Number (Double)	Average concentration, dry wt			
Ru (ppb)	Ru_ppb	Number (Double)	Average concentration, dry wt			
Tl (ppm)	Tl_ppm	Number (Double)	Average concentration, dry wt			
Pb (ppm)	Pb_ppm	Number (Double)	Average concentration, dry wt			
Y (ppm)	Y_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
La (ppm)	La_ppm	Number (Double)	Average concentration, dry wt			
Ce (ppm)	Ce_ppm	Number (Double)	Average concentration, dry wt			
Pr (ppm)	Pr_ppm	Number (Double)	Average concentration, dry wt			
Nd (ppm)	Nd_ppm	Number (Double)	Average concentration, dry wt			
Pm (ppm)	Pm_ppm	Number (Double)	Average concentration, dry wt			
Sm (ppm)	Sm_ppm	Number (Double)	Average concentration, dry wt			
Eu (ppm)	Eu_ppm	Number (Double)	Average concentration, dry wt			
Gd (ppm)	Gd_ppm	Number (Double)	Average concentration, dry wt			
Tb (ppm)	Tb_ppm	Number (Double)	Average concentration, dry wt			
Dy (ppm)	Dy_ppm	Number (Double)	Average concentration, dry wt			
Ho (ppm)	Ho_ppm	Number (Double)	Average concentration, dry wt			
Er (ppm)	Er_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Tm (ppm)	Tm_ppm	Number (Double)	Average concentration, dry wt			
Yb (ppm)	Yb_ppm	Number (Double)	Average concentration, dry wt			
Lu (ppm)	Lu_ppm	Number (Double)	Average concentration, dry wt			
REE (Total %)	REE_pc	Number (Double)	Average concentration, dry wt			
Other Elements	OTHER_E	Number (Double)	Average concentration, dry wt (add as many fields as needed)			
Analytical technique	TECHNIQUE	Text (50)	Technique used (AAS, ICP-MS, ICPAES, XRF etc.) (see INSPIRE CODE: AnalyticalMethodTypeType)			
Deposit Size	SIZE	Text (100)	Magnitude of the mineral deposit calculated according to ProMine (unknown, occurrence, small, medium, large, very large) (see INSPIRE			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			CODE: ImportanceType)			
Grade	GRADE	Text (250)	Specify assessments of grade (Mean content of manganese (Mn); iron (Fe); cobalt (Co); nickel (Ni); copper (Cu) wt%) or resource potential, if applicable			
Resources	RESOURCES	No. Double	Resources in Mt			
Reserves	RESERVES	No. Double	Reserves in Mt			
Mined Tonnage	MIN_T	No. Double	in Mt			
Total Tonnage	TOTAL_T	No. Double	in Mt			
Remaining Tonnage	REM_T	No. Double	in Mt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Resource Reporting Standard/ compliancy	RES_REP	Text (100)	PERC, JORC, NI43-101, etc. (see INSPIRE CODE: ClassificationMethodUsedType)			
Reference for Tonnage Assessment	REF_T	Text (40)	Company ordering the assessment			
Data Scale	SCALE	Text (100)	Specify the scale in which the deposit has been mapped and delivered			
Status	STATUS	Text (250)	e.g. under exploration, research, identified deposits, hypothetical deposits, etc. (see INSPIRE CODE: MineStatusType)			
Operator	OPERATOR	Text (250)	Research, exploration or operating agency/company			
Exploration Type	EXPLOR_TY	Text (250)	Exploration techniques employed to describe the			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			mineral deposit (see INSPIRE CODE: ExplorationActivityTypeType)			
Cruises	CRUISE	Text (250)	Cruises identification	Suggest an URI that link to the cruise description.	Suggest an URI that link to the cruise description.	
Sampling Methods	SAMPLING_M	Text (250)	Type of method to recover samples (dredge, ROV…)			Is it the same method for all the samples mentionned above? If not, there shall be distinct per paraMetre.
Sites Number	SITES_NO	Text (250)	Sampling sites identification			
Data Provider	DATA_PROVI	Text (150)	Name of organisation providing data			
Data Provider Contact	DATA_CONT	Text (150)	The data providing organisation/institute contact details – email is required			
Deposit Extent	DEPOS_KM2	No. Double	Area of deposit (Sq. Km)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Depth to Deposit (m)	DEPTH_TO_D	No. Double	Depth to deposit from sea surface			
Fauna	FAUNA	Text (100)	Type of fauna (e.g. corals…)			
Description	DESCRIPT	Text (500)	Deposit summary and metallogenetic model			
Gallery	GALLERY	Text (100)	Images on the mineralization (geophysical, sampling, textural features, paragenesis, etc.)			
References	REFERENCES	Text (500)	Link to bibliographic references (DOI and/or Author, Year & Title if you wish)			
Comments	COMMENTS	Text (500)	Any additional comments or observations			

Product: Polymetallic Nodules (Points)

Maps to: ERML : concept name ?

Question: Need to clarify the main scope of this products

Comment:

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
OBJECTID	FID	Number	Feature ID. An internally generated identification number for each feature. Automatically generated within shape file.			
Shape	SHAPE	Geometry	Points			
Latitude	LAT	Number (Double)	Degrees N	Suggest using WGS84 / EPSG:4326.		
Longitude	LON	Number (Double)	Degrees W/ Degrees E			
Country Code	CODE	Text (2)	Two letter country code (see INSPIRE CODE: CountryType)			
Administration	ADM	Text (40)	Legal status following the division of the Law of the Sea Convention: Territorial Sea (TS), Exclusive Economic Zone (EEZ), Extended Continental shelf (ECS) or the Area (A)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Geographical Area	GEO_AREA	Text (100)	Atlantic Ocean, Mediterranean Sea, etc.			
Sector	SECTOR	Text (100)	Canary Island Seamount Province, Aeolian Islands, Gulf of Bothnia, etc.			
Occurrence/Deposit name	DEPOS_NAME	Text (40)	Name of occurrence/ deposit			
Mineral Occurrence Type	OCURR_TY	Text (40)	see INSPIRE CODES: OccurrenceTypeType			
Year of Discovery	YEAR_DIS	Short Integer (5)	2001, 2016, etc.			
Year of Database Entry	YEAR_DB	Short Integer (5)	2018, 2019, etc.			
Date of Database Update	UPDATE_	Date	dd/mm/yyyy (Date of last update of attributes)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Deposit Group	DEPOSIT_G	Text (100)	Sediment-related deposits, hydrothermal deposits, volcanogenic deposits, magmatic deposits, metamorphism-related deposits (see INSPIRE CODES: DepositGroupType)			
Deposit Type	DEPOSIT_TY	Text (100)	SedimentaryManganese -this exact wording must be entered in bold type (see INSPIRE CODE: DepositTypeType)			
Setting	SETTING	Text (250)	Description of geological setting (see INSPIRE CODE: EventEnvironmentType)			
Geomorphic Features	GEOMORPH	Text (250)	Geomorphology of area of FeMn crust occurrence			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Age	AGE	Text (250)	Age of the mineral deposit and host rock (see INSPIRE CODE: NamedAgeType)			
Host Rock	HOST_ROCK	Text (250)	Substrate rock or sediment surrounding the ore deposit (see INSPIRE CODE: LithologyType)			
Metallic Commodity	METAL_COMM	Text (100)	Including precious and non-precious metals (see INSPIRE CODE: CommodityType)			
Other Metals	OTHER_ME	Text (100)	See INSPIRE CODE: CommodityType			
Commodity Group	COMM_G	Text (100)	Base metals, precious metals, energy metals, technological metals (see INSPIRE CODE: CommodityType, parents column K)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Ore Minerals	ORE_MIN	Text (250)	Principal minerals/commodities (see INSPIRE CODE: MineralNameType)			
Gangue Minerals	GANGUE	Text (250)	Non-economic minerals (see INSPIRE CODE: MineralNameType)			
Ore mineral distribution	ORE_DISTR	Text (250)	Brecciated, banded, micro-layered, etc. (see INSPIRE CODE: ShapeType)			
Alteration	ALTER_	Text (250)	Alteration minerals formed during/after the process of mineralization (see INSPIRE CODES: AlterationDegreeType, AlterationDsitributionType, AlterationTypeType			
Morphology	MORPH	Text (250)	Shape and internal structure (thickness) of the mineral deposit (see			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			INSPIRE CODE: FormType)			
Texture	TEXT	Text (250)	Banded, columnar, mottled, etc.			
Geochemistry	GEOCHEM	Text (100)	Yes, or not (link to geochemistry table)			
Number of samples	N	Short Integer (5)	Number of analysed samples	Suggest to associate URI to samples description and link to them.		
SiO_2 %	SiO2__pc	Number (Double)	Average concentration, dry wt			Will those fields always be filled?
TiO_2 %	TiO2__pc	Number (Double)	Average concentration, dry wt			
Al_2O_3 %	Al2O3__pc	Number (Double)	Average concentration, dry wt			If not, what should be the “none value”?
Fe_2O_3 %	Fe2O3__pc	Number (Double)	Average concentration, dry wt			
MnO %	MnO__pc	Number (Double)	Average concentration, dry wt			Alternative could be to link to appropriate observations and measurements.
MgO %	MgO__pc	Number (Double)	Average concentration, dry wt			
CaO %	CaO__pc	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Na_2O %	Na2O__pc	Number (Double)	Average concentration, dry wt			
K_2O %	K2O__pc	Number (Double)	Average concentration, dry wt			
P_2O_5 %	P2O5__pc	Number (Double)	Average concentration, dry wt			
LOI %	LOI__pc	Number (Double)	Average concentration, dry wt			
TOTAL %	TOTAL__pc	Number (Double)	Average concentration, dry wt			
Co %	Co__pc	Number (Double)	Average concentration, dry wt			
Ni %	Ni__pc	Number (Double)	Average concentration, dry wt			
Cu %	Cu__pc	Number (Double)	Average concentration, dry wt			
Zn (ppm)	Zn_ppm	Number (Double)	Average concentration, dry wt			
Nb (ppm)	Nb_ppm	Number (Double)	Average concentration, dry wt			
Mo (ppm)	Mo_ppm	Number (Double)	Average concentration, dry wt			
Sc (ppm)	Sc_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Ba (ppm)	Ba_ppm	Number (Double)	Average concentration, dry wt			
V (ppm)	V_ppm	Number (Double)	Average concentration, dry wt			
Bi (ppm)	Bi_ppm	Number (Double)	Average concentration, dry wt			
Te (ppm)	Te_ppm	Number (Double)	Average concentration, dry wt			
W (ppm)	W_ppm	Number (Double)	Average concentration, dry wt			
Pd (ppb)	Pd_ppb	Number (Double)	Average concentration, dry wt			
Pt (ppb)	Pt_ppb	Number (Double)	Average concentration, dry wt			
Rh (ppb)	Rh_ppb	Number (Double)	Average concentration, dry wt			
Ru (ppb)	Ru_ppb	Number (Double)	Average concentration, dry wt			
Tl (ppm)	Tl_ppm	Number (Double)	Average concentration, dry wt			
Pb (ppm)	Pb_ppm	Number (Double)	Average concentration, dry wt			
Y (ppm)	Y_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
La (ppm)	La_ppm	Number (Double)	Average concentration, dry wt			
Ce (ppm)	Ce_ppm	Number (Double)	Average concentration, dry wt			
Pr (ppm)	Pr_ppm	Number (Double)	Average concentration, dry wt			
Nd (ppm)	Nd_ppm	Number (Double)	Average concentration, dry wt			
Pm (ppm)	Pm_ppm	Number (Double)	Average concentration, dry wt			
Sm (ppm)	Sm_ppm	Number (Double)	Average concentration, dry wt			
Eu (ppm)	Eu_ppm	Number (Double)	Average concentration, dry wt			
Gd (ppm)	Gd_ppm	Number (Double)	Average concentration, dry wt			
Tb (ppm)	Tb_ppm	Number (Double)	Average concentration, dry wt			
Dy (ppm)	Dy_ppm	Number (Double)	Average concentration, dry wt			
Ho (ppm)	Ho_ppm	Number (Double)	Average concentration, dry wt			
Er (ppm)	Er_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Tm (ppm)	Tm_ppm	Number (Double)	Average concentration, dry wt			
Yb (ppm)	Yb_ppm	Number (Double)	Average concentration, dry wt			
Lu (ppm)	Lu_ppm	Number (Double)	Average concentration, dry wt			
REE (Total %)	REE_pc	Number (Double)	Average concentration, dry wt			
Other Elements	OTHER_E	Number (Double)	Average concentration, dry wt (add as many fields as needed)			
Analytical technique	TECHNIQUE	Text (50)	Technique used (AAS, ICP-MS, ICPAES, XRF etc.) (see INSPIRE CODE: AnalyticalMethodTypeType)			
Abundance (Kg/m2)	ABUND	No. Double	Abundance of the polymetallic nodules expressed as kg/m2			
Deposit Size	SIZE	Text (100)	Magnitude of the mineral deposit calculated according to ProMine (unknown,			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			occurrence, small, medium, large, very large) (see INSPIRE CODE: ImportanceType)			
Grade	GRADE	Text (250)	Specify assessments of grade (Mean content of manganese (Mn); iron (Fe); cobalt (Co); nickel (Ni); copper (Cu) wt%) or resource potential, if applicable			
Resources	RESOURCES	No. Double	Resources in Mt			
Reserves	RESERVES	No. Double	Reserves in Mt			
Mined Tonnage	MIN_T	No. Double	in Mt			
Total Tonnage	TOTAL_T	No. Double	in Mt			
Remaining Tonnage	REM_T	No. Double	in Mt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Resource Reporting Standard/ compliancy	RES_REP	Text (100)	PERC, JORC, NI43-101, etc. (see INSPIRE CODE: ClassificationMethodUsedType)			
Reference for Tonnage Assessment	REF_T	Text (40)	Company ordering the assessment			
Data Scale	SCALE	Text (100)	Specify the scale in which the deposit has been mapped and delivered			
Status	STATUS	Text (250)	e.g. under exploration, research, identified deposits, hypothetical deposits, etc. (see INSPIRE CODE: MineStatusType)			
Operator	OPERATOR	Text (250)	Research, exploration or operating agency/company			
Exploration Type	EXPLOR_TY	Text (250)	Exploration techniques employed to describe the			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			mineral deposit (see INSPIRE CODE: ExplorationActivityTypeType)			
Cruises	CRUISE	Text (250)	Cruises identification	Suggest an URI that link to the cruise description.		
Sampling Methods	SAMPLING_M	Text (250)	Type of method to recover samples (dredge, ROV…)			Is it the same method for all the samples mentionned above? If not, there shall be distinct per paraMetre.
Sites Number	SITES_NO	Text (250)	Sampling sites identification			
Data Provider	DATA_PROVI	Text (150)	Name of organisation providing data			
Data Provider Contact	DATA_CONT	Text (150)	The data providing organisation/institute contact details – email is required			
Deposit Extent	DEPOS_KM2	No. Double	Area of deposit (Sq. Km)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Depth to Deposit (m)	DEPTH_TO_D	No. Double	Depth to deposit from sea surface			
Fauna	FAUNA	Text (100)	Type of fauna (e.g. corals…)			
Description	DESCRIPT	Text (500)	Deposit summary and metallogenetic model			
Gallery	GALLERY	Text (100)	Images on the mineralization (geophysical, sampling, textural features, paragenesis, etc.)			
References	REFERENCES	Text (500)	Link to bibliographic references (DOI and/or Author, Year & Title if you wish)			
Comments	COMMENTS	Text (500)	Any additional comments or observations			

Product: Seafloor Massive Sulphide deposits (points)
Maps to: ERML : concept name ?

Question: Need to clarify the main scope of this products

Comment:

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
OBJECTID	FID	Number	Feature ID. An internally generated identification number for each feature. Automatically generated within shape file.			
Shape	SHAPE	Geometry	Point			
Latitude	LATITUDE	Number (Double)	Degrees N	Suggest using WGS84 / EPSG:4326.		
Longitude	LONGITUDE	Number (Double)	Degrees W/ Degrees E			
Country Code	CODE	Text (2)	Two letter country code (see INSPIRE CODE: CountryType)			
Administration	ADM	Text (40)	Legal status following the division of the Law of the Sea Convention: Territorial Sea (TS), Exclusive Economic Zone (EEZ), Extended Continental shelf (ECS) or the Area (A)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Geographical Area	GEO_AREA	Text (100)	Atlantic Ocean, Mediterranean Sea, etc.			
Sector	SECTOR	Text (100)	Canary Island Seamount Province, Aeolian Islands, Gulf of Bothnia, etc.			
Occurrence/Deposit name	DEPOS_NAME	Text (40)	Name of occurrence/ deposit			
Mineral Occurrence Type	OCURR_TY	Text (40)	see INSPIRE CODES: OccurrenceTypeType			
Year of Discovery	YEAR_DIS	Short Integer	2001, 2016, etc.			
Year of Database Entry	YEAR_DB	Short Integer	2018, 2019, etc.			
Date of Database Update	UPDATE_	Date	dd/mm/yyyy (Date of last update of attributes)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Deposit Group	DEPOSIT_G	Text (100)	MarineVolcanicAssociation- this exact wording must be entered in bold type (see INSPIRE CODE: DepositGroupType). Mineral deposits formed in a marine volcanic environment. Magmatic and hydrothermal fluids react with sea water for giving volcanogenic massive sulphides (VMS), which are at the origin stratiform deposits of Cu, Zn, Pb, Ag, Au.			
Deposit Type	DEPOSIT_TY	Text (40)	Choose between MaficVolcanismMassiveSulphide and BimodalFelsicVolcanism -this exact wording must be entered in bold type (see INSPIRE			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
			CODE: DepositTypeType)			
Hydrothermal activity	HYDR_ACT	Text (40)	Active, inactive			
Distance from rift or active vent sites	RIFT-DIST	Number (Double)	Distance in km			
Age	AGE	Text (250)	Age of the mineral deposit and host rock (see INSPIRE CODE: NamedAgeType)			
Host Rock	HOST_ROCK	Text (250)	Substrate rock or sediment surrounding the ore deposit (see INSPIRE CODE: LithologyType)			
Metallic Commodity	METAL_COMM	Text (100)	Including precious and non-precious metals (see INSPIRE CODE: CommodityType)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Other Metals	OTHER_ME	Text (100)	See INSPIRE CODE: CommodityType			
Commodity Group	COMM_G	Text (100)	Base metals, precious metals, energy metals, technological metals (see INSPIRE CODE: CommodityType, parents column K)			
Ore Minerals	ORE_MIN	Text (250)	Principal minerals/commodities (see INSPIRE CODE: MineralNameType)			
Gangue Minerals	GANGUE	Text (250)	Non-economic minerals (see INSPIRE CODE: MineralNameType)			
Ore mineral distribution	ORE_DISTR	Text (250)	Brecciated, banded, micro-layered, etc. (see INSPIRE CODE: ShapeType)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Alteration	ALTER_	Text (250)	Alteration minerals formed during/after the process of mineralization (see INSPIRE CODES: AlterationDegreeType , AlterationDsitributionType, AlterationTypeType			
Structure	STRUCT	Text (250)	stockwork, chimney, debris flow, etc.			
Morphology	MORPH	Text (250)	Shape and internal structure (thickness) of the mineral deposit (see INSPIRE CODE: FormType)			
Texture	TEXT	Text (250)	Banded, columnar, mottled, etc.			
Genetic type	GEN_TY	Text (250)	e.g. Hannington classification			
Geochemistry	GEOCHEM	Text (100)	Yes or no (link to geochemistry table)			
Number of samples	N	Short Integer (5)	Number of analysed samples	Suggest to associate URI to samples		

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
				description and link to them.		
SiO_2 %	SiO2__pc	Number (Double)	Average concentration, dry wt			Will those fields always be filled?
TiO_2 %	TiO2__pc	Number (Double)	Average concentration, dry wt			
Al_2O_3 %	Al2O3__pc	Number (Double)	Average concentration, dry wt			If not, what should be the “none value”?
Fe_2O_3 %	Fe2O3__pc	Number (Double)	Average concentration, dry wt			
MnO %	MnO__pc	Number (Double)	Average concentration, dry wt			Alternative could be to link to appropriate observations and measurements.
MgO %	MgO__pc	Number (Double)	Average concentration, dry wt			
CaO %	CaO__pc	Number (Double)	Average concentration, dry wt			
Na_2O %	Na2O__pc	Number (Double)	Average concentration, dry wt			
K_2O %	K2O__pc	Number (Double)	Average concentration, dry wt			
P_2O_5 %	P2O5__pc	Number (Double)	Average concentration, dry wt			
SO_2 %	$SO_{2\_\_pc}$	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Ag (ppm)	Ag_ppm	Number (Double)	Average concentration, dry wt			
Au (ppm)	Au_ppm	Number (Double)	Average concentration, dry wt			
Ba (ppm)	Ba_ppm	Number (Double)	Average concentration, dry wt			
Bi (ppm)	Bi_ppm	Number (Double)	Average concentration, dry wt			
Co (ppm)	Co_ppm	Number (Double)	Average concentration, dry wt			
Cr (ppm)	Cr_ppm	Number (Double)	Average concentration, dry wt			
Cu (ppm)	Cu_ppm	Number (Double)	Average concentration, dry wt			
Ga (ppm)	Ga_ppm	Number (Double)	Average concentration, dry wt			
Ge (ppm)	Ge_ppm	Number (Double)	Average concentration, dry wt			
In (ppm)	In_ppm	Number (Double)	Average concentration, dry wt			
Li (ppm)	Li_ppm	Number (Double)	Average concentration, dry wt			
Mo (ppm)	Mo_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Nb (ppm)	Nb_ppm	Number (Double)	Average concentration, dry wt			
Ni (ppm)	Ni_ppm	Number (Double)	Average concentration, dry wt			
Pd (ppm)	Pd_ppm	Number (Double)	Average concentration, dry wt			
Pt (ppm)	Pt_ppm	Number (Double)	Average concentration, dry wt			
Rh (ppm)	Rh_ppm	Number (Double)	Average concentration, dry wt			
Pb (ppm)	Pb_ppm	Number (Double)	Average concentration, dry wt			
Sb (ppm)	Sb_ppm	Number (Double)	Average concentration, dry wt			
Sc (ppm)	Sc_ppm	Number (Double)	Average concentration, dry wt			
Se (ppm)	Se_ppm	Number (Double)	Average concentration, dry wt			
Sn (ppm)	Sn_ppm	Number (Double)	Average concentration, dry wt			
Ta (ppm)	Ta_ppm	Number (Double)	Average concentration, dry wt			
Te (ppm)	Te_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Th (ppm)	Th_ppm	Number (Double)	Average concentration, dry wt			
U (ppm)	U_ppm	Number (Double)	Average concentration, dry wt			
V (ppm)	V_ppm	Number (Double)	Average concentration, dry wt			
W (ppm)	W_ppm	Number (Double)	Average concentration, dry wt			
Y (ppm)	Y_ppm	Number (Double)	Average concentration, dry wt			
Zn (ppm)	Zn_ppm	Number (Double)	Average concentration, dry wt			
Zr (ppm)	Zr_ppm	Number (Double)	Average concentration, dry wt			
La (ppm)	La_ppm	Number (Double)	Average concentration, dry wt			
Ce (ppm)	Ce_ppm	Number (Double)	Average concentration, dry wt			
Pr (ppm)	Pr_ppm	Number (Double)	Average concentration, dry wt			
Nd (ppm)	Nd_ppm	Number (Double)	Average concentration, dry wt			
Pm (ppm)	Pm_ppm	Number (Double)	Average concentration, dry wt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Sm (ppm)	Sm_ppm	Number (Double)	Average concentration, dry wt			
Eu (ppm)	Eu_ppm	Number (Double)	Average concentration, dry wt			
Gd (ppm)	Gd_ppm	Number (Double)	Average concentration, dry wt			
Tb (ppm)	Tb_ppm	Number (Double)	Average concentration, dry wt			
Dy (ppm)	Dy_ppm	Number (Double)	Average concentration, dry wt			
Ho (ppm)	Ho_ppm	Number (Double)	Average concentration, dry wt			
Er (ppm)	Er_ppm	Number (Double)	Average concentration, dry wt			
Tm (ppm)	Tm_ppm	Number (Double)	Average concentration, dry wt			
Yb (ppm)	Yb_ppm	Number (Double)	Average concentration, dry wt			
Lu (ppm)	Lu_ppm	Number (Double)	Average concentration, dry wt			
Analytical technique	TECHNIQUE	Text (50)	Technique used (AAS, ICP-MS, ICPAES, XRF etc.) (see INSPIRE CODE: AnalyticalMethodTypeType)			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Mine Status	STATUS	Text (40)	see INSPIRE CODE: MineStatusType			
Mining Activity Type	MINING_TY	Text (40)	see INSPIRE CODE: MiningActivityTypeType			
Deposit Size	SIZE	Text (100)	Magnitude of the mineral deposit calculated according to ProMine (unknown, occurrence, small, medium, large, very large) (see INSPIRE CODE: ImportanceType)			
Grade	GRADE	Text (250)	Specify assessments of grade (Mean content of manganese (Mn); iron (Fe); cobalt (Co); nickel (Ni); copper (Cu) wt%) or resource potential, if applicable			
Resources	RESOURCES	No. Double	Resources in Mt			
Reserves	RESERVES	No. Double	Reserves in Mt			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Mined Tonnage	MIN_T	No. Double	in Mt			
Total Tonnage	TOTAL_T	No. Double	in Mt			
Remaining Tonnage	REM_T	No. Double	in Mt			
Resource Reporting Standard/ compliancy	RES_REP	Text (100)	PERC, JORC, NI43-101, etc. (see INSPIRE CODE: ClassificationMethodUsedType)			
Reference for Tonnage Assessment	REF_T	Text (40)	Company ordering the assessment			
Data Scale	SCALE	Text (100)	Specify the scale in which the deposit has been mapped and delivered			
Exploration Activity Type	EXPLOR_TY	Text (250)	see INSPIRE CODE: ExplorationActivityTypeType			
Operator	OPERATOR	Text (250)	Research, exploration or operating agency/company			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Cruises	CRUISE	Text (250)	Cruises identification	Suggest an URI that link to the cruise description.		
Sampling Methods	SAMPLING_M	Text (250)	Type of method to recover samples (dredge, ROV…)			Is it the same method for all the samples mentionned above? If not, there shall be distinct per paraMetre.
Data Provider	DATA_PROVI	Text (150)	Name of organisation providing data			
Data Provider Contact	DATA_CONT	Text (150)	The data providing organisation/institute contact details – email is required			
Deposit Extent	DEPOS_KM2	No. Double	Area of deposit (Sq. Km)			
Depth to Deposit (m)	DEPTH_TO_D	No. Double	Depth to deposit from sea surface			
Fauna	FAUNA	Text (100)	Type of fauna (e.g. corals…)			
Description	DESCRIPT	Text (500)	Deposit summary and metallogenetic model			

Attributes	FIELDNAME	Format	Information	D.3.2.x Maps to	Comments	Questions
Gallery	GALLERY	Text (100)	Images on the mineralization (geophysical, sampling, textural features, paragenesis, etc.)			
References	REFERENCES	Text (500)	Link to bibliographic references (DOI and/or Author, Year & Title if you wish)			
Comments	COMMENTS	Text (500)	Any additional comments or observations			

A14. MINTELL4EU (latest update: 27-June-2019)

The following data have been gathered from GIP-P D2.2.1 “First report describing the requirements to the Information Platform by the Geo-energy, Groundwater and Raw Materials themes” (28-Jan-2019), and from an email sent by Mintell4EU to GIP-P/WP2 on June 27th, 2019.

Mintell4EU has a complex, relational structure (harvested from each country into a central harvesting database), which is denormalized before visualisation. Two overall types of geospatial information will be delivered:

Maps to: ERML / ERML-Lite
Question: More details needed.
Comment: Some people from WP3 are also involved in MINTELL4EU. The product described below is not a product of the Mintell4EU project And shouldn't be considered in the gap analysis. This is Minerals4EU/Eurare project ouput and should already be mapped to ERML/ERML-Lite

Product: Points representing mineral occurrences and mines in Europe and Greenland.

Attributes	Example
id_hidden	333491
country	FR
name	FRA-03651
depositgro	metasomatic replacement or hydrothermal shear or vein
commoditie	antimony
commodit_1	antimony
significan	deposit
miningacti	underground mining
rgb	140 47 0

Product: Mineral statistics at country level.

Note the following text taken from a recnet Mintell document, which shows that gap analysis has been carried out by the project, and at the moment no standard is capable of delivering the data.

...A data model (DM) will be used (i) to harvest National Providers aggregated datasets, (ii) to build a Harvesting database and (iii) if possible to provide validated data to BRGM (from BGS). Two options can be envisaged:

To reuse the so-called ‘BGS e-Minerals Yearbook’ data model if this one is adapted to the above mentionned tasks;

To develop a new M4EU/ORAMA e-Minerals Yearbook data model based on ERML-Lite.

However, the ‘BGS e-Minerals Yearbook’ is actually referring to the BGS’s current online data download tool, which elsewhere is referred to as ‘BGS Website DB’. This tool is designed for production and trade data and therefore this data model does not have the required properties for resources, reserves or exploration data.

There is a serious doubt that ERML is able to handle properly this type of aggregated data. Then the normal way to proceed would be:

First, propose to the CGI an evolution of ERML;

Then to develop a new ERML-Lite view ‘Statistical/Aggregated Data’ for building the new M4EU/ORAMA e-Minerals Yearbook data model.

IDENTIFIED GAPS AND ACTION PROPOSAL

GapID	Issue description	Action proposal

The table above is to acquire gap issue arise by the GeoERA projects and will be filled with possible remedial actions. For these actions a specific roadmap on how to fill the gap will be designed and if it's feasible will be implemented during the GeoERA project phase.