Deliverable D3.1

Draft inventory of data on raw materials

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Notice

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PURPOSE

Deliverable 3.1 provides an outline of the progress made for the development of a draft metadata inventory containing records of data related to raw materials intelligence.

EXECUTIVE SUMMARY

Deliverable 3.1 presents the progress made in WP3 on the development of a draft data inventory taking place in the first 14 months of the MICA project. WP3 defined a metadata structure based on the metadata standard ISO 19115 and developed a template, which has been used to record information on identified datasets relevant to the concept of the MICA project.

Data gathering has initiated and there are currently approximately 180 metadata records produced which comprise the draft data inventory. The metadata template and subsequent records are linked to the MICA Online Platform and linkages are explained in this report.

An online data portal is currently under development, which will allow access to all the metadata records being produced throughout the life of WP3. This online portal is an additional outcome from the MICA project, which was not initially included at the description of work, but it is seen as essential to assist with the development of records and the communication with the MICA platform.

Future developments, such as additional data capture, the development of an online data portal and others are also discussed for the finalisation of the data inventory and the development of the other Tasks in WP3.

DELIVERABLE REPORT

1. Introduction

Data is the foundation of information, knowledge, and intelligence. Without data no analysis or interpretation can be undertaken to derive meaningful results or provide answers to questions and issues that may arise related to raw materials. Data comprises facts and figures produced through various processes, such as surveys, experimentation, measurements and so on. Data can be used on their own or in combination with other data to produce information on raw materials, models and methods that explore certain issues or areas of interest, scenarios and others.

As seen in Figure 1, there are several steps between data and intelligence, which involve different levels of interpretation and analysis of data to take place and questions to be posed. Raw materials intelligence is not just about having the knowledge to provide answers to questions, but also about asking the right questions. This requires a deeper understanding of a specific subject and it may result in additional data, methods and tools being produced. Hence the steps of the pyramid (Figure 1) may be repeated several times in order to enhance understanding in a particular subject and so the uncertainty of existing data, and assumptions made in methods and scenarios is minimised.

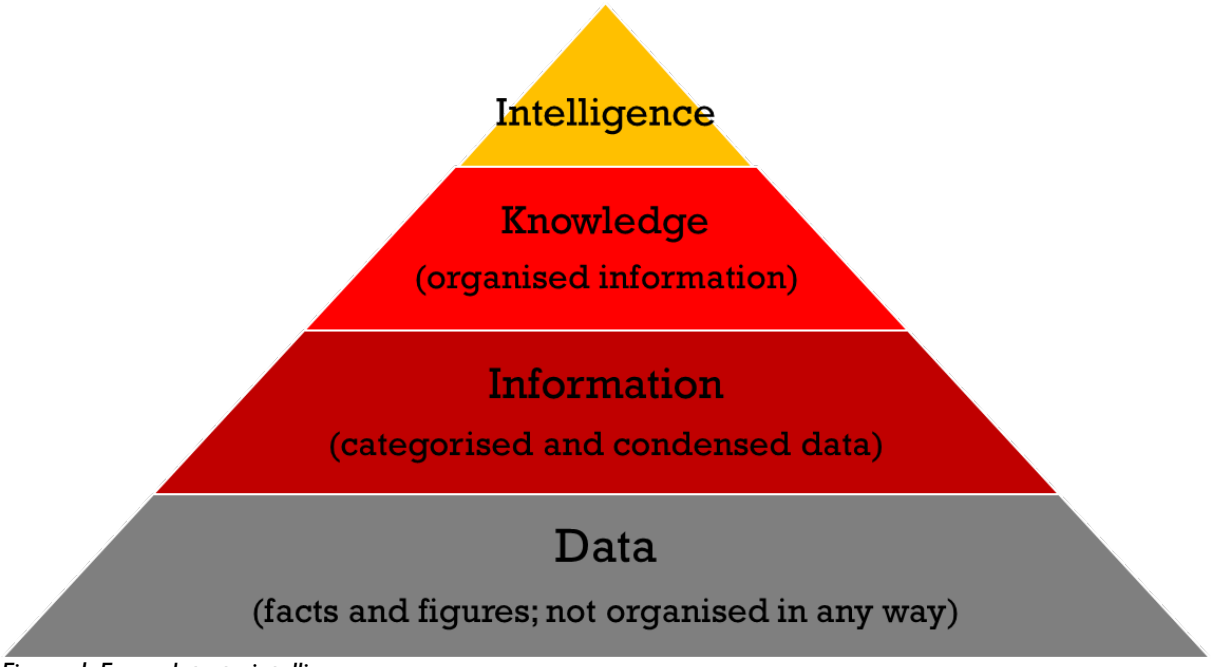

Figure 1 From data to intelligence.

Work Package 3 (WP3) is concerned with the identification of relevant data on raw materials that could be used to satisfy the needs of various stakeholders, including methods and tools that may require such data.

1.1 Objectives

WP3 aims to review and assess datasets relevant to raw materials intelligence that currently or in the future may be used to provide the evidence and knowledge required to support the needs of a range of stakeholders (e.g. decision and policy makers, industry, the research community and the general public).

WP3 does not generate new data, but review existing datasets and develops metadata records for these with the objective to:

- Contribute to the development of the MICA ontology, by providing information on datasets relevant to the domains and concepts constituting the key components of the ontology;
- Understand how existing datasets and combinations of different datasets could be used to satisfy stakeholder needs[1];
- Identify what gaps in raw material intelligence currently exist due to missing data;
- Attempt to assess the uncertainty of the identified datasets using the consortium expertise, but also through expert elicitation.

The role of WP3 is therefore fundamental to the MICA project as data and information comprise the foundation of raw materials intelligence.

Deliverable 3.1 report links to Task 3.1 and specifically to the subtasks:

- T3.1.1 Development of the preliminary structure of the raw materials data inventory;
- T3.1.2 and T.3.1.3 Review of existing raw materials data inventories and other datasets.

The following sections discuss the metadata structure development process, explain how the data inventory links to the MICA ontology, presents what data have been gathered so far and finally provides some preliminary discussion and conclusions that relate to the current status of WP3 and the project overall, including an outline of the next steps for WP3.

[1] The option to select from different sets available was ranked highest, i.e. as the most important requirement to the MICA Online Platform, by the respondents of two stakeholder surveys (cf. Stakeholder Needs Report D2.2 (Erdmann et al. 2016).

2. Metadata structure

There is a need to record information on datasets, data series, services, reports and other resources in a comprehensive and consistent manner, so that the MICA ontology is able to link to the right data, and users are able to derive relevant information of interest. The term metadata refers to descriptive information on datasets. In order to provide metadata records that fit the stakeholder needs a template was developed.

The themes and questions related to raw materials can vary widely, they may be simple or complex, relate to a single commodity or multiple, address primary and/or secondary raw materials, request information which is historic, relates to present times or future projections and so on. The data therefore will vary substantially too. They may be of different type (e.g. geographic, non-geographic data), vary in content, units used, format (e.g. electronic, paper format), availability, accessibility (e.g. confidentiality issues), quality and many more. The metadata structure should be able to provide all essential information to users to assist them to extract the requested information and knowledge.

Considering all the above and following a review of different metadata standards, the WP3 team developed a metadata structure based on the standard ISO 19115-1[2] .ISO 19115 defines the schema required for describing geographic information by means of metadata. It defines:

- Mandatory and conditional metadata sections, entities and elements;
- The minimum set of metadata required to serve most metadata applications (e.g. data identification, fit-for use, access etc.);
- Optional metadata elements for more extensive descriptions;
- A method for extending metadata to fit specific needs.

One of the issues with ISO 19115 is that it relates primarily to geographic datasets in digital form. This is the case with many of the other metadata standards reviewed by the WP3 team, but the principles of the chosen ISO can be extended to include other types of datasets including non-geographic data, maps, textual documents, charts and others. Also, ISO 19115 is aligned with the INSPIRE Directive requirements and implementing rules for metadata[3]. Therefore by using it, INSPIRE compliant metadata are produced, which is an important requirement for the MICA platform.

The metadata structure has been subjected to several revisions over the past 14 months following consultation with experts within the consortium, revisions of the MICA ontology and after exploring several different types of datasets. The metadata structure originally started with the development of a spreadsheet form, which was used throughout the past 14 months in data gathering, but is currently being transformed into an online template and ultimately an online metadata inventory (MICA data portal). This is an added value element to the MICA project

[2] ISO 19115-1:2014. Geographic information – Metadata – Part 1 – Fundamentals.
[3] EC and JRC (2013). Inspire Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119.

provided by the WP3 team, which will enhance interoperability with the MICA ontology currently being developed by WP6 and allow users from across the consortium to use it to produce metadata records.

2.1 Metadata template

The key sections of the metadata template are outlined in Figure 2. The metadata template and therefore each record consist of five different sections with information that are completed and presented to users. The detailed template is shown in Appendix A, page 20.

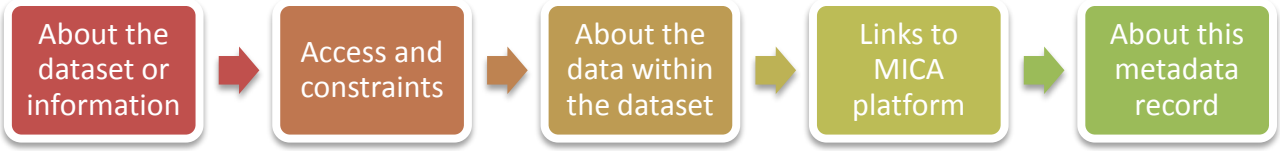

Figure 2 Sections of the metadata template.

The section '*About the dataset or information*' provides key descriptive information regarding the dataset and includes the fields shown in Table 1.

Table 1 Fields included in the 'About the dataset or information' section of the template.

Fields	Explanation
Dataset title	The name of the dataset
Date of creation/ publication/ revision	Date on which the dataset was created or/and published or/and revised
Edition	Edition number or reference year
Dataset abstract	Brief description of the dataset and/or the data it contains.
Status	For example, time series, snapshot data, historical archive
Language	The default is English but multiple/other languages may be entered
Web address	URL if the dataset can be found in electronic format
Contact information	For example contact organisation and address
Frequency of update	For example, annual, six-monthly, monthly, weekly
Geographical coverage	For example, a continent, region, individual country
Mineral commodities	These include both primary and secondary raw materials. Individual commodities or groups can be picked up (see Appendix B for full list)
Temporal extent	For example, historic times, present, future etc.
Dataset themes	A list of different themes is available and the most relevant one to the described dataset are selected
Information or data class	For example, general descriptive information (reports, websites), spatial data, statistical data, metadata, other information (software models, infographics)
Information or data type	For example, dataset (e.g. an inventory, database or compilation of data), series (e.g. a collection of maps), an individual item (e.g. website, paper)

The section on '*Access and constraints*' provides information about access, confidentiality and any limitations that may be available, which could constraint access and use of a resource. The fields of this section are presented in Table 2.

Table 2 Fields included in the 'Access and constraints' section of the template.

Fields	Explanation
Access	For example, access to a resource may be available for free for all purposes, available for free for non-commercial purposes, available upon registration only and so on .
Confidentiality	This field provides information about confidentiality issues that may exist with a specified resource.
Limitations	It includes information about additional limitations and legal constraints that may apply.

The section '*About the data contained within the dataset*' provides additional information about the data and information included within a resource, such as the method of data generation, as well as qualitative information about data quality and uncertainty.

Table 3 Fields included in the 'About the data contained within the dataset' section of the template.

Fields	Explanation
Requirement for data generation	For example, legal, voluntary, other
Method of data or information generation	Depending on the data class selected in the previous section of the template, a list of potential methods of data/information generation is presented. For example, for general descriptive information, the method may be academic research or expert consultation. For spatial data, the method of data generation may include GIS, digitised paper maps, direct measurements, interpolating from point data etc.
Purpose of data or information generation	Provides a description of the reasons behind the data/information generated.
Data quality and uncertainty – Questions	To capture information on data quality and uncertainty is not a straight forward task. Following several trials with different datasets, it was decided that the incorporation of questions may capture essential information better during the data gathering process. The following questions were included in the template: - Are data or information generation methods formally described? - Are quality assurance procedures described? - Are any uncertainty measures provided (e.g. standard error, confidence interval)? Standard answers (yes, no, unknown) are provided to these questions.
Data quality information	Depending on the data class selected, a distinct list of descriptions on data quality is presented. For example, for spatial data the following descriptions are available: - Information provided on possible sources of digitisation error - Information provided to quantify uncertainty - No information provided on the quality of the spatial data

The next section of the template '*Links to MICA platform*' creates active links to the MICA ontology, by describing the domains and concepts of the ontology that a specific record may relate to. Linking to the MICA ontology is described in more detail in Section 2.3 of this Deliverable report.

The final section of the template '*About this metadata record*' includes information about when this record has been created, by whom and also explains whether a review and validation process took place. The fields included are presented in Table 4.

Table 4 Fields included in the 'About this metadata record' section of the template.

Fields	Explanation
Date record created	Date that the metadata record was created
Record created by	Name of the individual and organisation who created the record
Date record reviewed **Reviewed by** **Approved by**	This information is completed by the reviewer only

2.2 Online metadata inventory

The metadata template presented in Section 2.1 is currently being converted into an online form and inventory. The data created in the form is held in ISO 19139 format (which is the XML encoding of ISO 19115). The online template and inventory is beneficial to the MICA consortium and project for the following reasons:

- The online template provides a consistent format for all consortium participants to use and produce records. The terms and vocabularies used adhere to the principles of ISO 19115 is compliant with the Inspire Directive and follows the terminology of the MICA ontology.
- The online template is user friendly. Metadata records can be created with ease, amended and reviewed as required. Information about amendments done is stored automatically. Advanced functionality, such as adding more than one option in certain fields (e.g. geographical coverage – multiple countries can be added very quickly). Built-in vocabularies assist the fast and standardised development of records. The online template uses terms from the MICA ontology wherever possible.
- All metadata records are stored in electronic format in the portal created. All partners can gain access to the portal and the records that are currently available. Search functionality and filters are built-in to allow users to find data of interest. The metadata is available in a number of XML formats (such as ISO 19139, Dublin core, DCAT RDF) and can be linked to, downloaded directly or harvested through a CSW service.
- Metadata from other catalogues (if harvestable) can be added to the MICA data inventory.

The MICA data portal is provided through a BGS GeoNetwork server. The service is public and the URL to be used is: http://metadata.bgs.ac.uk/mica (Figure 3).The search interface (Figure 4, page 12) provides various filters that can be used to identify records of interest. WP3 partners will

be provided with login details to enable them to produce new records. All metadata records available in a spreadsheet format will be transformed into online ones and included in the portal. The WP3 team has developed a procedure for undertaking this task and the transposition to online records has started.

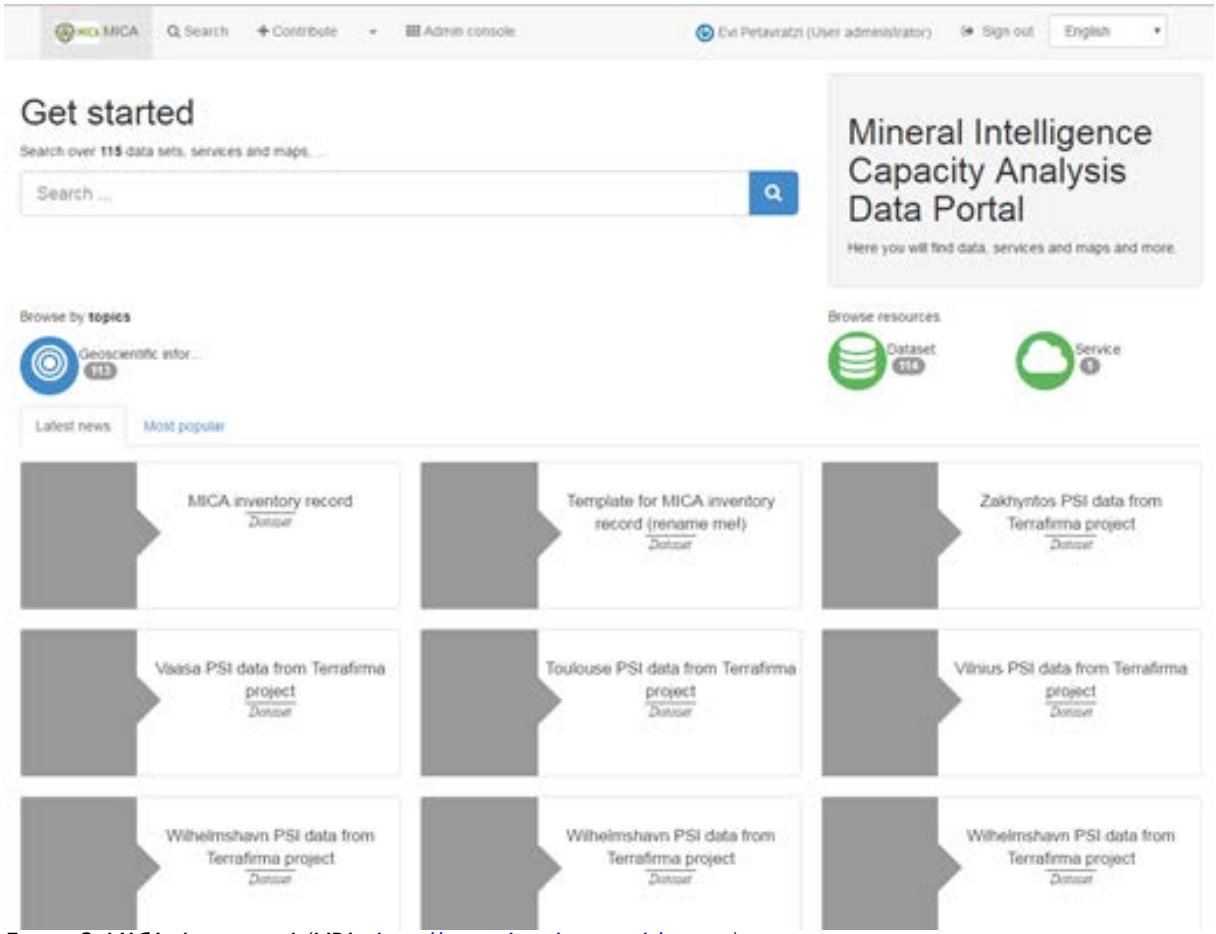

Figure 3 MICA data portal (URL<http://metadata.bgs.ac.uk/mica>).

2.2.1 Moving towards an online inventory

Moving from a spreadsheet template to an online form requires certain adjustments to be undertaken to the vocabularies and fields being in use. The online form utilises a standard metadata template compliant with ISO 19115 and the INSPIRE directive, therefore certain fields that are unique to the MICA project need to be included and others to be mapped to vocabularies used in the template. Also additional links and vocabularies currently being produced for the MICA platform are required to be built-in. Therefore, the online template cannot be finalised prior to the production of all the vocabularies and ontology structure of the MICA platform. For most of the fields a direct match exists, but for a limited number of fields additional terms should be introduced or they should match the MICA ontology (Table 5, Table 6).

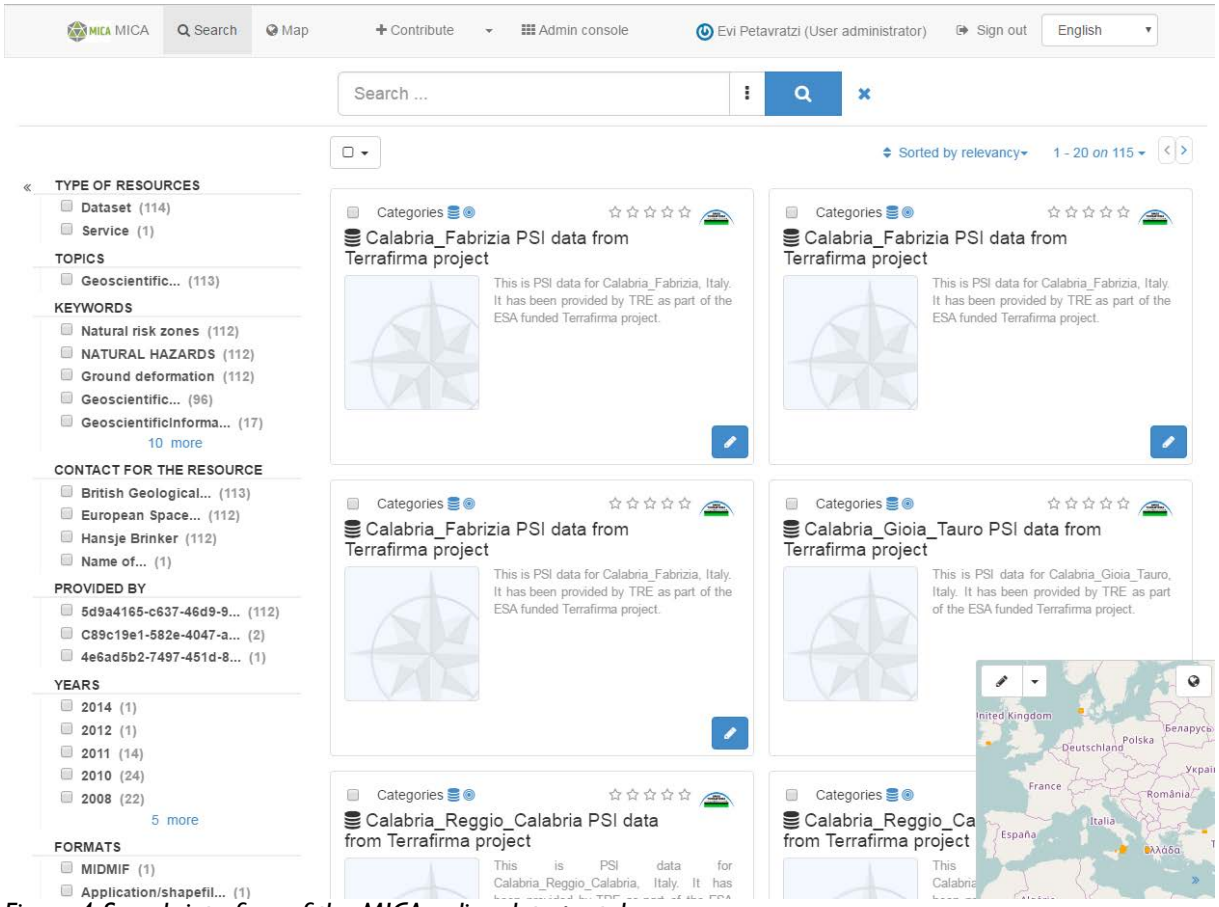

Figure 4 Search interface of the MICA online data portal.

Table 5 Spreadsheet template versus online template. Fields with a direct match.

Spreadsheet template	Online inventory template
Dataset title	Title
Date of creation/ publication/ revision	Date (all three types of dates can be added)
Edition	Edition date
Dataset abstract	Abstract
Status	Status
Dataset language	Language
Dataset web address	Linkage
Dataset contact, city, postcode etc.	Organisation name, city etc.
Frequency of update	Maintenance and update frequency
Keywords	Keywords
Geographical coverage	Continents, Country etc.
Limitations	Use limitation
Purpose of data generation	Purpose
Date record created	Metadata date stamp
Record created by	Metadata contact

Table 6 Spreadsheet template versus online template. Fields that require additional adjustments.

Spreadsheet template	Online inventory template
Temporal extent	The field should match the MICA TemporalScheme Ontology vocabulary
Information or data class	The field should match the MICA DataScheme ontology vocabulary
Commodity list	The field should match the MICA CommoditiesScheme vocabulary
Domains and Concepts	The field should match the MICA DomainScheme vocabulary
Dataset themes	Additional or alternative vocabularies have been produced for these fields and where possible these map to terms specified in ISO 19115.
Information or Data type	
Access	
Confidentiality	
Requirements for data generation	
Method of data generation	
Data or information quality	
Questions on data quality and uncertainty	

2.3 Links to the MICA ontology

Metadata records link to the MICA ontology through the following fields of the template:

- Temporal extent – this field links to the TemporalScheme ontology
- Information or data class – this field links to the DataScheme ontology
- Commodity list – this field links to the CommoditiesScheme ontology
- Domains and Concepts – this field links to the DomainScheme ontology

Especially for the Domains and Concepts field, each metadata record identifies the specific concepts from the MICA main ontology that it is relevant to. The Main Ontology has been first developed using an Excel spreadsheet. The excel file found in Figure 5 can be used to access the latest MICA ontologies structure. The structure of the ontology is still evolving and the MICA ontologies are now accessible through the VocBench application provided by WP6. The template is using the same domains and concepts described in the MICA ontologies. The eight key domains of the MICA ontology are shown in Figure 6.

MICA_WP6 Ontologies_1612201

Figure 5 Active link to the MICA ontologies spreadsheet is provided by clicking the above icon.

Domains

D1 Primary resources

D2 Secondary resources

D3 Industrial processing and transformation

D4 Raw materials economics

D5 Critical raw materials

D6 Raw materials policy and legal framework

D7 Environment and health in a life cycle perspective

D8 International reporting

Concepts

Domain	Concept Level 1	Concept Level 2	Concept Level 3	Concept Level 4	Tick or X
D1 PRIMARY RESOURCES	Mineral exploration	Regional reconnaissance	Preliminary studies (existing data, docs, maps, aerial photographs, reports, articles, monographs, theses...)		
			2D predictive mapping		
			Mineral resources potential assessment / estimating undiscovered resources (e.g., USGS methods)		
			Regional geology		
			Remote sensing (incl. regional geophysics...)		
			Regional geochemistry		
			Regional heavy mineral sampling		
		Detailed surface exploration	Detailed geology		
			Detailed geochemistry		
			Detailed geophysics		
			Detailed heavy mineral sampling		
		Subsurface exploration	Excavation		
			Drilling	Auger drilling	
				Percussion drilling	
				Core drilling	
		Resource assessment	Drilling assessment	Percussion drilling assessment	
				Core drilling assessment	
			Geological interpretation		
				3D geological model	
			Ore beneficiation tests		
			Approximate resource calculation		
				3D 'bloc'model	
		Ore deposit evaluation	Core drilling systematic		
			Mine workings reconnaissance / adit mapping		
			Geostatistical estimates		

Figure 6 MICA ontology Domains and example of concepts associated with the key Domains.

The MICA platform will link to metadata records directly or through the factsheets, docsheets and flowsheets. Factsheets and docsheets are outputs of the MICA platform and users will be able to link to metadata records through them. Links to the MICA data portal will be provided in the factsheets / docsheets, in the sections '*Types of related input data or knowledge needed and their possible sources*' and '*Main publications / references*'.

Consortium partners, who are responsible for producing factsheets and docsheets should follow this procedure to ensure that the MICA data portal and MICA factsheets / docsheets link properly:

1. Literature references, datasets, databases, reports and others used in the production of factsheets / docsheets should be collated.
2. The MICA data portal should then be checked to ensure that relevant metadata records are present. If not, then a record should be produced using the online template.
3. Assuming that the required metadata records are presents, then a permalink should be generated and inserted as a URL in the factsheets / docsheets.
4. For all the MICA factsheets and docsheets metadata records should be created in the MICA data portal.

There are several links between WP3 and WP6. WP3 relies on WP6 to develop vocabularies that can also be used in the metadata template and records. Due to several iterations of the MICA ontologies, which were essential considering the complexity of the project concept including associated technical complexities, the development of the online data portal has not been finalised as yet. However, it is expected that the MICA ontologies will soon be finalised and therefore the MICA data portal can move forward and become available to the consortium.

3. Progress towards data gathering

The data review is 'constrained' by the identified domains & concepts of the MICA ontology (Figure 6). Preliminary data gathering has been undertaken and around 180 records have been produced so far using the spreadsheet template. These include a variety of datasets, reports, articles, databases, inventories from other projects and so on. The breakdown of metadata records per domain is shown in Table 7. A detailed list is also shown in the attached spreadsheet (Figure 7). Several datasets included in the list (Figure 7) required the development of more than one records (e.g. statistical data from Statistics Offices across Europe, or EC pages on critical raw materials). These are presented as a single dataset at the moment in this list. Therefore the overall number of records being produced is more than 180. This list of metadata records comprise the draft MICA inventory, soon to move to an online MICA data portal. The listed metadata records have been produced from the leading WP3 organisation (NERC-BGS). However, moving forward it is expected that all WP3 partners will contribute to this process to ensure that several additional metadata records are created, which will ensure the completeness of the MICA data portal.

Table 7 Metadata records produced and their links to the MICA Domains.

Domain	No. of records produced
D1 Primary resources	45
D2 Secondary resources	14
D3 Industrial processing and transformation	5
D4 Raw materials economics	27
D5 Critical raw materials	18
D6 Raw materials policy and legal framework	42
D7 Environment and health in a life cycle perspective	4
D8 International reporting	24

MICA_datasets_list_Jan2017.xlsx

Figure 7 Combined list of MICA metadata records produced by January 2017. Access is provided to the list by clicking the above icon.

3.1 Examples of metadata records

Examples of the types of data gathered for some of the domains are shown in Figure 8, Figure 9 and Figure 10. Some individual examples of records are shown in Appendix C, page 27.

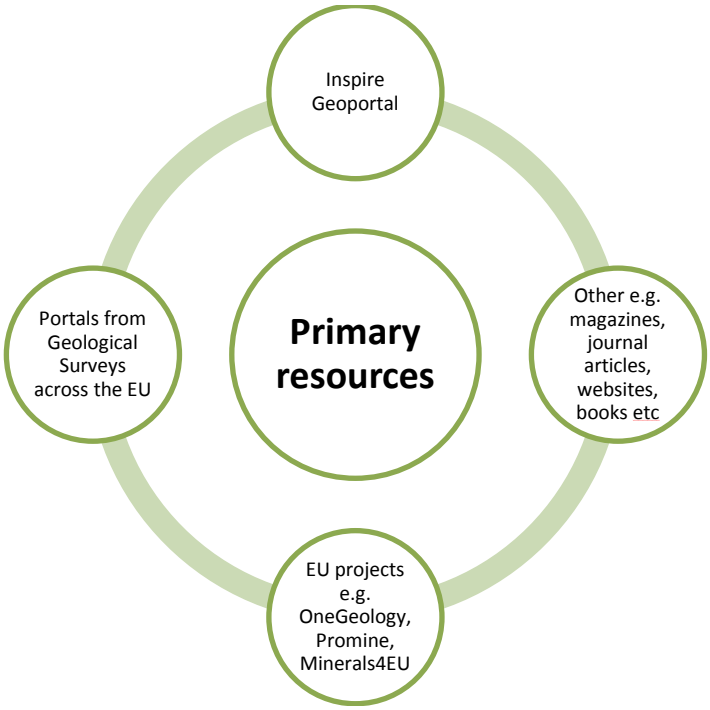

Figure 8 Examples of datasets and information included in the draft MICA inventory for the 'Primary resources' domain.

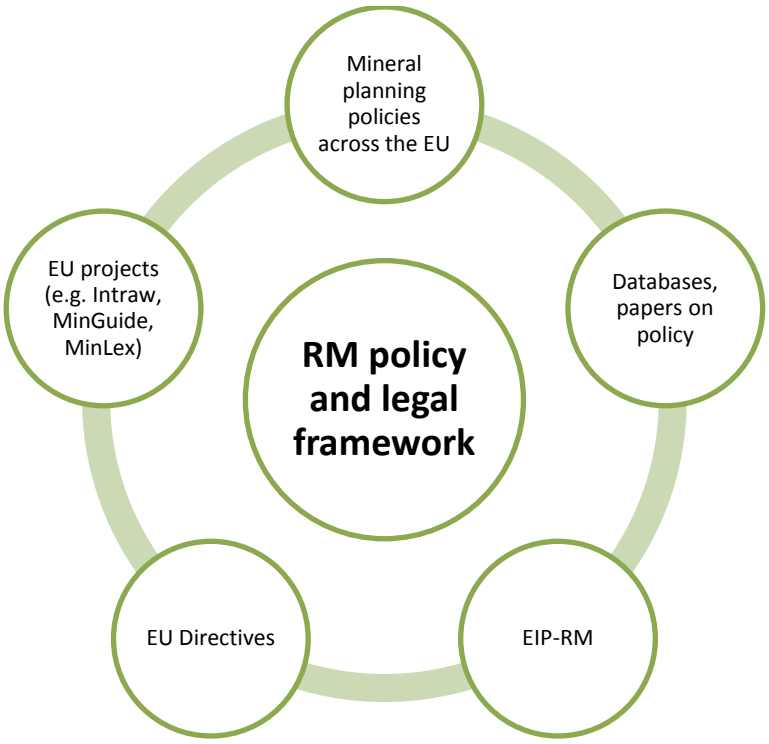

Figure 9 Examples of datasets and information included in the draft MICA inventory for the 'Raw materials and legal framework' domain.

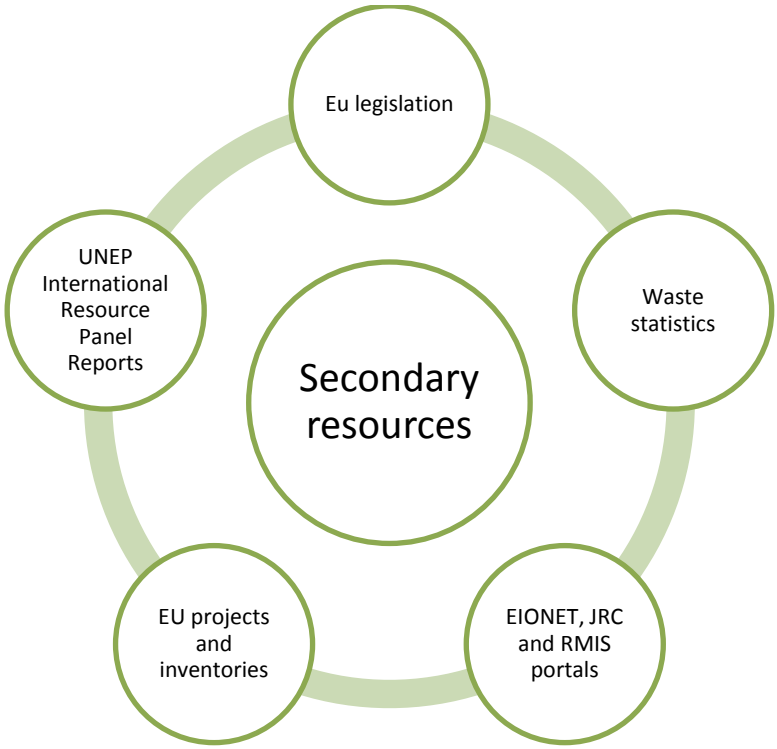

Figure 10 Examples of datasets and information included in the draft MICA inventory for the 'Secondary resources' domain.

4. Conclusion and next steps

WP3 is progressing well with the development of the MICA data inventory. A draft inventory consisting of several records is already in place. A metadata structure and template have been developed and approximately 180 metadata records that are related to the different domains of the MICA platform have been produced. WP3 is currently in the process of finalising the online MICA data portal and the online template. This is provided as an added value element to the project and is expected to allow it to progress more quickly. Substantial effort has been put in this first year towards the development of the MICA ontologies and metadata structure, which was essential for ensuring that the different parts of this project (e.g. metadata records, tools and methods in WP4, vocabularies used in the MICA ontologies, factsheets and so on), all linking with the MICA online platform have been thought through sufficiently to enable its implementation.

There are several additional records that should be included in the MICA data portal and in the coming months the efforts of all the partners in WP3 would be towards the development of additional records to cover the wide spectrum of domains and concepts included in the MICA platform.

Next steps, which will permit to finalise the draft MICA inventory include:

- Continuation with data gathering to include more records in the inventory. All WP3 partners to be involved in this process. During the first progress meeting, WP3 partners and Linked Third Parties identified domains and concepts from the main MICA ontology for which metadata records can be contributed. A further discussion will be undertaken with WP3 partners to move this forward.
- Where possible, incorporate existing metadata records from other project libraries e.g. Minerals4EU, EURARE, other. This will accelerate data collection.
- Transfer records from the spreadsheet template into the online inventory template.
- Depending on the outcomes of WP2, new Domains and Concepts may be added in the MICA ontologies. In that case additional datasets should be sought. Any changes to the MICA ontologies will affect WP3 due to the direct linkages to it; therefore WP3 should remain aware of progress made in WP6.
- It is important to finalise the MICA ontologies and related vocabularies, so that WP3 is able to finalise the metadata structure and template and to amend the records collected so far to the final domains and concepts of the MICA platform. The WP3 leader has been working closely with WP6 and contributed to the development of the structure of the main MICA ontology and will continue to do so in the coming months to ensure that the two work packages are aligned and the project is progressing towards the right direction.
- Data validation and review is another point made also during the MICA progress meeting. Ideally the records should be reviewed and validated to ensure information is recorded in a consistent manner and so that 'essential records' are not missed out. A discussion will be undertaken with WP3 partners to move this forward.

Other future actions related to WP3 include:

- Development of case studies on data uncertainty. Two case studies have been discussed and are in the development process at the moment. They will explore data uncertainty through expert elicitation. The aim of the case studies is to develop a general framework upon which an assessment of data uncertainty can be undertaken. The case studies will be presented in the next progress report.
- Initiation of work required in Task 3.2. One of the key requirements of Task 3.2 is to link metadata records to tools and methods discussed in WP4. An ontology on tools and methods has been developed by WP6, which may be used as the basis to link data and methods.
- Delivery of a workshop together with WP4 at the next MICA progress meeting. This next workshop will focus on the development of flowsheets required for the MICA online platform and the participants will attempt for specified topics to define the tools, methods and data required for producing flowsheets.

Appendix A – Metadata template

MICA WP3 - Data Inventory Record			
		Explanatory notes	
About the dataset or information item			
Title		*Free text*	*The name of the dataset*
Date of creation		*Formatted*	*Date on which the dataset was **created** in DD/MM/YYYY format*
Date of publication		*Formatted*	*Date on which the dataset was **published** (if different from above) in DD/MM/YYYY format*
Date of revision		*Formatted*	*Date on which the dataset was **revised** (if different to above) in DD/MM/YYYY format*
Edition		*Free text*	*If there is an edition number or reference year please enter it here, otherwise leave blank*
Abstract		*Free text*	*Brief description of the dataset and/or the data it contains. Try not to replicate items that are included separately elsewhere in this record. If the record relates to spatial data, the map scale should be included in the abstract.*
Status		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list*
Language	English	*Free text*	*The default is English, but change if necessary, enter multiple languages if appropriate*
Web address (if any)		*Free text*	*Use this space to enter a URL if the dataset is electronic. Otherwise, leave blank.*
Contact organisation		*Free text*	*Name of organisation that produced the dataset or publishes it. This may not necessarily be the originator of the data themselves but could be the data compiler or some other relevant contact.*
Contact city		*Free text*	*Please enter the city in which the contact organisation is based (if known)*
Contact postcode		*Free text*	*Please enter the postcode in which the contact organisation is based (if known)*
Contact country		*Free text*	*Please enter the country in which the contact organisation is based*
Frequency of update		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list, please scroll down within the list to see all options*
Geographical coverage		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list, please scroll down within the list to see all options.*
Geographical coverage, box for additional information (if needed)		*Free text*	*If you have selected one of the options for the row above containing the words "please provide more details", use this box to provide additional information.*
Mineral commodities included	See separate sheet "Mineral Commodities"	*Tick boxes*	*Please click on the separate sheet labelled "Mineral Commodities" and indicate which ones are covered by the dataset.*
Temporal Extent		*Dropdown list*	*Timescale covered by dataset. Click in the cell, a downward arrow will appear, click on this arrow and select from the list*

Dataset theme(s)	Production		*Tick boxes*	*Please tick or place an 'X' in the box next to all that are relevant.* *If other themes or topics are relevant but not listed, please enter them under 'Other'.*
	Imports			
	Exports			
	Resources			
	Reserves			
	Exploration			
	Stocks			
	Prices			
	Other economic activities			
	Geochemical			
	Geophysical			
	Geology			
	Mineralogical			
	Minerals			
	Sciences dealing with the composition, structure, origin of the Earth's rocks			
	Risks of earthquakes			
	Volcanic activity			
	Landslides			
	Gravity information			
	Soils			
	Permafrost			
	Hydrogeology			
	Erosion			
	Environmental pollution			
	Waste storage and treatment			
	Waste flows			
	Environmental impact assessment			
	Monitoring environmental risk			
	Nature reserves			
	Landscapes			
	Elevation			
	Health			
	Imagery base maps earth cover			
	Planning cadastre			
	Society			
	Structure			
	Transportation			
	Utilities communication			
	Other (please specify)		*Free text*	
Information or Data class			*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list, please scroll down within the list to see all options.*
Information or Data type			*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list.*

Access and constraints			
Access		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list*
Confidentiality		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list*
Limitations		*Free text*	*Please use this box to briefly describe any legal constraints that may apply to the data or any other limitations on their use.*
About the data contained within the dataset			
Requirement for data generation		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list*
Box for any additional details (if needed)		*Free text*	*If you have selected "Other (please specify)" in the row above, please use this box to provide more details*
Method of data or information generation *(make sure this matches Dataset Class selected)*		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list (you may need to scroll up or down; the top section is relevant to "general descriptive information", the second section is relevant to "spatial data", the third section is relevant to "statistical data", the fourth is relevant to "metadata" and the fifth to "other" classes; if no method is stated then select "unknown or not explained" from the bottom of the list.)*
Box for any additional details (if needed)		*Free text*	*Please use this box to provide more details of method used (if available)*
Are data or information generation methods formally described?		*Yes/No*	*Click in the cell, a downward arrow will appear, click on this arrow and select "yes" or "no" or "unknown" as appropriate*
Purpose of data or information generation		*Free text*	*If information is provided describing the reason(s) for generating the data please enter them briefly here. Otherwise enter "unknown".*
Data or information quality *(make sure this matches Dataset Class selected)*		*Dropdown list*	*Click in the cell, a downward arrow will appear, click on this arrow and select from the list (you may need to scroll up or down; the top section is relevant to "general descriptive information", the second section is relevant to "spatial data", the third section is relevant to "statistical data", the fourth is relevant to "metadata" and the fifth to "other" classes.*
Are quality assurance procedures described?		*Yes/No*	*Click in the cell, a downward arrow will appear, click on this arrow and select "yes" or "no" or "unknown" as appropriate*
Are any uncertainty measures provided (e.g. standard errors, confidence intervals, etc.)?		*Yes/No*	*Click in the cell, a downward arrow will appear, click on this arrow and select "yes" or "no" or "unknown" as appropriate*
Links to MICA platform			
Domains and Concepts	See separate sheet "Domains and Concepts"	*Tick boxes*	*Please click on the separate sheet labelled "Domains and Concepts" and indicate which ones are relevant to this metadata record*
Domains and Concepts, additional comment		*Free text*	*If you think that a category is missing from the "Domains and Concepts" sheet, please enter it here (e.g. if you think that none of the existing categories is suitable for this dataset)*
About this metadata record			
Date record created	12/05/2016	*Formatted*	*Date that this metadata record was created in DD/MM/YYYY format*
Record created by		*Free text*	*Name of individual and organisation who created this metadata record*
Date record reviewed		*Formatted*	*To be completed by reviewer only*
Reviewed by		*Free text*	*To be completed by reviewer only*
Validated	No	*Dropdown list*	*To be completed by reviewer only*

Appendix B – Mineral Commodities

The following mineral commodities are included in the metadata template.

Commodity list
Metals
Precious metals
gold
silver
platinum
palladium
other platinum group metals (rhodium, ruthenium, osmium, iridium)
Base metals
aluminium
copper
lead
tin
zinc
Iron and ferro-alloy metals
chromium
cobalt
iron
manganese
molybdenum
nickel
niobium
tungsten
vanadium
Speciality and rare metals
antimony
beryllium
bismuth
cadmium
cesium
gallium
germanium
hafnium
indium
lithium
magnesium
mercury
rare earths (undifferentiated)
rhenium
rubidium
selenium
tantalum
tellurium

titanium
zirconium
Energy commodities
Coal
anthracite
bituminous coal
other hard coal
lignite
Petroleum and natural gas
crude oil
oil shale
natural gas
Other energy sources
geothermal energy
peat
thorium
uranium
Precious and semi-precious stones
All precious and semi-precious stones
diamonds
emeralds
ruby, sapphire, corundum (gemstone)
other gemstones (e.g. beryl, quartz, tourmaline, garnet, topaz, peridot, zircon etc)
Industrial minerals
arsenic
asbestos
barytes (barite)
borates
bromine
diatomite
feldspar
fluorspar (fluorite)
graphite
gypsum
iodine
magnesite
mercury
mica
natural sodium carbonate (including trona)
nepheline syenite
perlite
salt
sillimanite, kyanite, andalusite
strontium
talc and pyrophyllite

vermiculite
wollastonite
abrasives
sodium sulphate
quartz, quartzite
silica sand
zeolite
Sulphur and Fertiliser minerals
sulphur
pyrite
phosphate rock
potash
Clays
bentonite
fuller's earth, attapulgite, sepiolite
kaolin
other kaolinitic clays (ball clays)
brick or tile clays
other clays
Construction minerals other than clays
crushed rock aggregates
sand and gravel
dimension and building stone
limestone for cement
limestone for lime
dolomite
marble
calcite for filler

Secondary raw materials
mineral waste from construction and demolition
concrete, bricks and gypsum waste
waste hydrocarbonised road-surfacing material
mixed construction wastes
Other mineral waste
asbestos wastes
waste of naturally occurring minerals
artificial mineral waste
waste refractory materials
Combustion wastes
waste from flue gas purification
Slags and ashes from thermal treatment and combustion
Dredging spoil
dredging spoil
Mineral waste from waste treatment and stabilised wastes

waste from waste treatment
solidified or stabilised waste
vitrified wastes
Metallic waste, ferrous
ferrous metal waste and scrap
Metallic waste, non-ferrous
aluminium waste
copper waste
lead waste
other metal wastes
Metallic waste, mixed ferrous and non-ferrous
mixed metallic packaging
other mixed metallic wastes
Glass waste
glass packaging
other glass wastes
Discarded equipment (except discarded vehicles, batteries and accumulators)
discarded electrical and electronic equipment, major household equipment waste only
other discarded electrical and electronic equipment
other discarded machines and equipment components
Discarded vehicles
discarded vehicles
Batteries and accumulators waste
batteries and accumulators wastes

Appendix C – Examples of metadata records produced

Example 1: Polish Geological Survey Data viewer

About the dataset	
Dataset title	Polish geological survey data viewer
Date of creation	
Date of publication	
Date of revision	
Edition	
Dataset abstract	online GIS for the Polish Geological survey showing all their publically available data - including geophysics (magnetometry and gravimetry), geological mapping, borehole data and minerals data including locations of deposits and mines.
Status	
Dataset language	English / Polish
Dataset web address (if any)	http://bazagis.pgi.gov.pl/website/cbdg_en/viewer.htm
Dataset contact	biuro@pgi.gov.pl
Contact city	Warsaw
Contact postcode	00-975
Contact country	Poland
Frequency of update	Unknown
Keywords	Poland geological survey
Geographical coverage of the dataset	Single country (please provide more details)
Geographical coverage, box for additional information (if needed)	Poland (including some offshore area)
Mineral commodities included	See separate sheet "Mineral Commodities"
Temporal Extent	

Dataset theme(s)	Production	
	Imports	
	Exports	
	Resources	x
	Reserves	x
	Exploration	x
	Other economic activities	
	Geochemical	
	Geophysical	x
	Geology	x
	Mineralogical	
	Minerals	x
	Sciences dealing with the composition, structure, origin of the Earth's rocks	x
	Risks of earthquakes	
	Volcanic activity	
	Landslides	
	Gravity information	
	Soils	
	Permafrost	
	Hydrogeology	
	Erosion	
	Environmental pollution	
	Waste storage and treatment	
	Waste flows	
	Environmental impact assessment	
	Monitoring environmental risk	
	Nature reserves	x
	Landscapes	
	Elevation	
	Health	
	Imagery base maps earth cover	
	Planning cadastre	
	Society	
	Structure	
	Transportation	
	Utilities communication	
	Other (please specify)	

Dataset class	General descriptive information / Website / Government organisation
Dataset type	Geographic dataset

Access and constraints	
Access	Available for free for all purposes
Confidentiality	Not confidential
Limitations	

About the data contained within the dataset	
Requirement for data generation	Voluntary
Box for any additional details (if needed)	
Method of data or information generation *(make sure this matches Dataset Class selected)*	GIS product
Box for any additional details (if needed)	
Are data or information generation methods formally described?	No
Purpose of data or information generation	To desseminate PGI's geodata holdings
Data or information quality *(make sure this matches Dataset Class selected)*	Organisation source implies that information should be of good quality
Are quality assurance procedures described?	No
Are any uncertainty measures provided (e.g. standard errors, confidence intervals, etc.)?	No
Links to MICA platform	
Domains and Concepts	See separate sheet "Domains and Concepts"
Domains and Concepts, additional comment	
About this metadata record	
Date record created	12/05/2016
Record created by	

Example 2: World Mineral Statistics

About the dataset	
Dataset title	World Mineral Statistics
Date of creation	01/01/1921
Date of publication	
Date of revision	29/02/2016
Edition	
Dataset abstract	A long-running, continuous dataset containing annual mineral production data by country from 1913 to present; mineral imports and exports for all countries from 1913 to 2002 and for European countries from 2003 to 2014
Status	Time series - ongoing, i.e. repeated time periods and still being updated
Dataset language	English
Dataset web address (if any)	http://www.bgs.ac.uk/mineralsuk/statistics/home.html
Dataset contact	British Geological Survey
Contact city	Nottingham
Contact postcode	NG12 5GG
Contact country	UK
Frequency of update	Annual
Keywords	annual mineral production, all countries, worldwide, imports, exports, Europe
Geographical coverage of the dataset	World; with individual countries listed
Geographical coverage, box for additional information (if needed)	Trade data only available for European countries from 2003 to 2014, production data continues for all countries of the world.
Mineral commodities included	See separate sheet "Mineral Commodities"
Temporal Extent	Mixture of historic (up to 2005) and recent (2006 onwards)

Dataset theme(s)	Production	x
	Imports	x
	Exports	x
	Resources	
	Reserves	
	Exploration	
	Other economic activities	
	Geochemical	
	Geophysical	
	Geology	
	Mineralogical	
	Minerals	
	Sciences dealing with the composition, structure, origin of the Earth's rocks	
	Risks of earthquakes	
	Volcanic activity	
	Landslides	
	Gravity information	
	Soils	
	Permafrost	
	Hydrogeology	
	Erosion	
	Environmental pollution	
	Waste storage and treatment	
	Waste flows	
	Environmental impact assessment	
	Monitoring environmental risk	
	Nature reserves	
	Landscapes	
	Elevation	
	Health	
	Imagery base maps earth cover	
	Planning cadastre	
	Society	
	Structure	
	Transportation	
	Utilities communication	
	Other (please specify)	

Information or Data class	Statistical data / Electronic (Statistical data) (e.g. web portals)
Information or Data type	Dataset (e.g. an inventory, database or compilation of data)

Access and constraints	
Access	Available for free for non-commercial purposes
Confidentiality	Data shown is not confidential but some data may not be included due to confidentiality issues
Limitations	Orgnisation using the data for commercial purposes are supposed to contact BGS first for permission, in reality permission is usually granted at no charge.
About the data contained within the dataset	
Requirement for data generation	Other (please specify) or unknown
Box for any additional details (if needed)	Original data generation is probably a mixture of legal and voluntary. Data compilation is voluntary.
Method of data or information generation *(make sure this matches Dataset Class selected)*	Complete survey (i.e. a survey of all respondents)
Box for any additional details (if needed)	Methods for data collection and quality control have been written down internally but are not externally published.
Are data or information generation methods formally described?	No
Purpose of data or information generation	The data is probably generated for several different purposes, the compilation is done specifically to product the book.
Data or information quality *(make sure this matches Dataset Class selected)*	Appears to be complete (e.g. continuous run of data with no missing years and/or countries and/or commodities from those specified previously)
Are quality assurance procedures described?	No
Are any uncertainty measures provided (e.g. standard errors, confidence intervals, etc.)?	No
Links to MICA platform	
Domains and Concepts	See separate sheet "Domains and Concepts"
Domains and Concepts, additional comment	

Example 3: Minatura2020

About the dataset	
Dataset title	MINATURA2020
Date of creation	28/06/2016
Date of publication	
Date of revision	
Edition	
Dataset abstract	The exploitation of indigenous mineral deposits in Europe is essential if we are to ensure that the needs of European society can be satisfied in a sustainable manner. To achieve this objective, society needs to ensure that effective access is provided to enable the exploration and exploitation of such mineral deposits, without compromising the needs of current or future generations. Accordingly, the potential of exploitable mineral deposits (including abandoned and historic mining sites) needs to be evaluated specifically and in relation to other land use and environmental objectives. The deliberation between mineral exploitation and other land uses objectives is a challenging arena which requires informed evidence.A H2020 funded EU project aiming to develop a concept methodology for the definition and subsequent protection of "mineral deposits of public importance" in order to ensure their "best use" in the future and to be included in a harmonised European regulatory/ guidance/ policy frametwork. Providing a policy-planning framework that aligns with the "sustainability principles" for mining like for other land uses is the key driving force behind MINATURA2020.
Status	Snapshot data, e.g. created at one point in time and not repeated
Dataset language	English
Dataset web address (if any)	English
	http://minatura2020.eu/
Dataset contact	
Contact city	MINPOL - office@minpol.com
Contact postcode	
Contact country	

Frequency of update	Unknown	
Keywords	Mineral deposits of public importance, access to land, land use,	
Geographical coverage of the dataset	Europe - mixture of EU28 members and non-EU28 countries; with each country listed individually	
Geographical coverage, box for additional information (if needed)	The project addresses primarily the EU, but additional partners outside the EU-28 are included, such as Serbia	
Mineral commodities included	See separate sheet "Mineral Commodities"	
Temporal Extent	Near future (2017 to 2021)	

Dataset theme(s)	Production	
	Imports	
	Exports	
	Resources	x
	Reserves	x
	Exploration	x
	Other economic activities	
	Geochemical	
	Geophysical	
	Geology	
	Mineralogical	
	Minerals	x
	Sciences dealing with the composition, structure, origin of the Earth's rocks	
	Risks of earthquakes	
	Volcanic activity	
	Landslides	
	Gravity information	
	Soils	
	Permafrost	
	Hydrogeology	
	Erosion	
	Environmental pollution	
	Waste storage and treatment	
	Waste flows	
	Environmental impact assessment	
	Monitoring environmental risk	
	Nature reserves	x
	Landscapes	
	Elevation	
	Health	
	Imagery base maps earth cover	
	Planning cadastre	x
	Society	x
	Structure	
	Transportation	
	Utilities communication	
	Other (please specify)	

Information or Data class	General descriptive information / Website / Other (Website)
Information or Data type	Individual item (e.g. a one-off academic paper or single website)
Access and constraints	
Access	Available for free for all purposes
Confidentiality	Not confidential
Limitations	

About the data contained within the dataset	
Requirement for data generation	Other (please specify) or unknown
Box for any additional details (if needed)	Project commissioned by the European Commission
Method of data or information generation *(make sure this matches Dataset Class selected)*	General information - method not relevant or not stated
Box for any additional details (if needed)	Project website describing the work undertaken and method followed.
Are data or information generation methods formally described?	Yes
Purpose of data or information generation	To develop a concept and methodology for the definition and subsequent protection of “mineral deposits of public importance” in order to ensure their «best use» in the future in order to be included in a harmonised European regulatory/guidance/policy framework.
Data or information quality *(make sure this matches Dataset Class selected)*	Organisation source implies that information should be of good quality
Are quality assurance procedures described?	No
Are any uncertainty measures provided (e.g. standard errors, confidence intervals, etc.)?	No
Links to MICA platform	
Domains and Concepts	See separate sheet "Domains and Concepts"
Domains and Concepts, additional comment	