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Project Management Plan  
Inception report

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## GENERAL INTRODUCTION

This report describes details in the implementation of Mintell4EU based on discussions at a dedicated Inception Workshop held on November 6<sup>th</sup> at GeoZS in Ljubljana, Slovenia.

The need for a detailed description was identified in the last busy days before submission of the Mintell4EU proposal in January 2018. While the individual work packages are well described in the proposal, it was more difficult to clearly identify tasks that needed to be coordinated across work packages as well as with other related projects as for instance FRAME and MINDeSEA that started in parallel with Mintell4EU. At the Inception Workshop, Mintell4EU work package leads as well as representatives from related projects were participating.



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## 1 STRATEGIC FOCUS

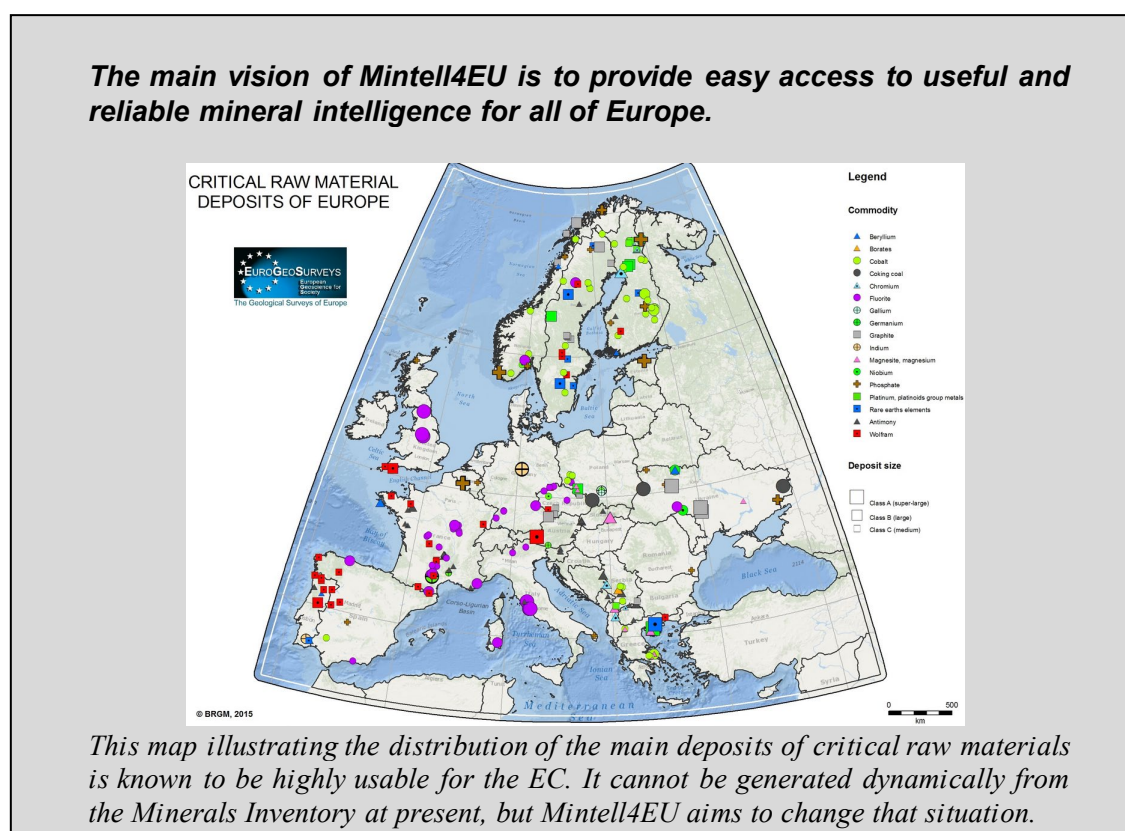
Imagine that someday Europe is facing deficiency in lithium, and that you possess a position in which your role is to secure raw materials for the battery industry. What would be your first reaction?

You would most likely try to get an overview of available lithium resources in Europe. The type of information that would be relevant would be the reserves, resources, production and trade from European countries as well as information whether there are any large deposits that could potentially be exploited in the future to mitigate the situation. To obtain such information, most people would start on the internet by e.g. searching for *lithium in Europe* with a hope to find easy digestible and trustworthy information.

If you were lucky, your search would lead you to a web site with a map depicting the annual production of lithium in all European countries as well as the distribution of large lithium-bearing deposits with associated information relating to their grade, tonnage and degree of historic or present exploitation.

However, today such online facilities are only available to a limited degree, and that is why one of the most important objectives of Mintell4EU is to make up for that situation.

### 1.1 Overview



The above-mentioned vision is well supported by the tasks included in the Mintell4EU project plan. However, the project description is to some degree generic and the Figure 1. The vision statement of Mintell4EU and a map giving an example of the practical implications.



successful delivery of high-quality final project results requires more detailed coordination and prioritisation than is presently included. Hence, the present document aims to set out a common direction for the project and clarify interfaces between individual work packages as well as towards other projects and systems. The content of the report is based on an inception workshop held in Ljubljana on 6<sup>th</sup> November 2018.

Mintell4EU in general has five overall goals;

1. To update the European e-Minerals Yearbook (e-MYB) with up-to-date information on a country level of
  - Production data for 2004 to 2019
  - Import data for 2004 to 2014
  - Export data for 2004 to 2014
  - Resource data (ref. year 2019)
  - Reserve data (ref. year 2019)
  - Exploration data (ref. year 2019)
2. To work on improving and extending the content of the Minerals Inventory – a database with data on mineral occurrences and mines that was initially created in the Minerals4EU project.
3. To integrate the e-MYB with the Minerals Inventory in the “Minerals4EU” database.
4. To test the application of UNFC as a “classification” system for European mineral resources.
5. To ensure that the content of the e-MYB and Minerals Inventory is integrated and disseminated in a user friendly way through the GeoERA Information Platform (an extension to EGD, [The European Geological Data Infrastructure](#)) and that the same information is made available through web service interfaces and APIs for RMIS.

The update to the e-MYB is well reflected in the WP2 description and will not be targeted in this report.

The improvement of the content of the Minerals Inventory is handled by WP3, but since the dataset is truly distributed and relies on a joint and coordinated effort amongst all contributing countries, a stringent and focused work plan is needed to ensure that the end result is targeting strategic needs. This is treated in section 2 of this report.

Mintell4EU is not the only project dealing with minerals intelligence. Other GeoERA projects as well as other H2020 and EIT RM projects also work towards providing minerals intelligence for Europe. Hence, coordination with these projects is needed to avoid duplication and facilitate synergy which is dealt with in section 3.

The integration of the e-MYB with the overall Minerals4EU database is a key activity in WP5. Recommendations for this integration have been developed in the ORAMA project and are described in more details in deliverable D5.3.1 and will be summarized in Section



4, which provides the overview of all technical aspects of the project – also taking into account the dissemination of data through the EGD and provisioning of data through services and APIs for RMIS.

## 1.2 Prioritization of Mintell4EU stakeholders

A wide range of user groups are relevant to consider in relation to minerals intelligence. These range from policy makers, decision makers, academia, private companies and the general public. The needs of the various user groups, however, differ considerably and Mintell4EU will focus on the most urgent needs. Exploration companies and academia usually require highly detailed data and information and consider comprehensiveness of data more important than harmonisation. Such material is best suited for detailed studies on a national or regional scale and is in most countries available on the websites of the national geological survey organisations.

What does only to a limited extent exist at present, however, are pan-European overviews of e.g. mineral occurrences and mines and such material is highly relevant for policy and decision makers on a European level. That is also why the European Commission has in the past years funded numerous European projects aiming at compiling such material across Europe's many countries. Hence, the primary stakeholders for the Mintell4EU are the European Commission and decision makers in the Member States and the focus should be on the information and functional needs of this group of end users.

## 1.3 The main use cases to address

To help focusing the efforts in the project, a clear and common view of the primary use cases that need to be addressed is necessary. It was agreed at the inception workshop, that it would be highly beneficial to focus initially on a use case that is known to be relevant to the European Commission and address the commodities on the Strategic Action Plan on Batteries<sup>1</sup>. In future phase, the use cases and list of commodities should then be extended based on experiences gained in the first phase. Accordingly, the use case that should act as a guide for all work in the first year of the project is as follows;

### Use Case 1: Dynamic generation of map showing battery commodities

Upon successful implementation of this use case, a user will be able to access a Web portal (part of EGD), select "Battery Commodities Map" and get an interactive map showing the *most significant* deposits of lithium, cobalt, nickel and graphite across Europe with symbol sizes graduated according to importance (i.e., endowment). Clicking each deposit will provide more detailed information about the deposit. On the map, it should also be possible to choose each commodity individually to only see e.g. lithium deposits. It should also be possible to switch on "Production Data" and select one of the four commodities to see a layer on the map on which each country is colour coded according to the size of yearly production of the given commodity.

This use case requires that the information related to the four mentioned commodities are quality controlled by mineral resources experts for each participating country and

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<sup>1</sup>[https://eur-lex.europa.eu/resource.html?uri=cellar:0e8b694e-59b5-11e8-ab41-01aa75ed71a1.0003.02/DOC\\_3&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:0e8b694e-59b5-11e8-ab41-01aa75ed71a1.0003.02/DOC_3&format=PDF)



that the Minerals Inventory is updated accordingly. The quality control should ensure that the location and name of the deposits are correct and that the necessary attributes to e.g. filter by significance and commodity are filled out consistently. Furthermore, links between deposits and mines should be controlled to make sure that information regarding to which degree a deposit is mined or has been mined can be displayed together with information about the remaining reserves.

The second part of the use case requires that production numbers for the same four commodities are available in the e-Minerals Yearbook and accessible through the same Web portal that displays the data from the Minerals Inventory as described above.

Subsequent use cases to consider:

After finishing the work necessary to fulfil use case 1, it was agreed at the inception workshop to extend the list of commodities to cover all critical raw materials as defined by the EC<sup>2</sup>.

## **2 WORK PLAN FOR MINERALS INVENTORY**

### **2.1 Improved data quality**

Already in the Minerals4EU project, an operational and distributed data management system was developed to provide end users with all available information from primary resources, exploration, production, trade etc. for foresight studies on raw material supply and demand in EU.

The system was designed to allow full access to information related to primary and secondary mineral resources around Europe.

It turned out, that this type of system is crucial for end users in the mining sector. Nevertheless, when using it, these end users identified some deficiencies in data. Currently, the Minerals4EU system is not covering the whole of Europe, and it is not fully harmonized. Furthermore, not all data providers have rights to transmit parts of data because they are confidential, or some do not collect them. Thus, there are differences in the level of data content between countries.

At present, it appears that some mineral occurrences and mines are incorrectly located, or the commodity type is incorrectly given. Also, data on reserves and resources were never really verified. They are often missing, sometimes simply because these data on a deposit scale are confidential.

GeoZS will establish a harvesting reporting system as part of quality assurance procedures to ensure that data harvesting happens correctly. To improve data quality, we need to know the current status of data. For that reason, a Web application will be set up where data providers will be able to review their own harvested data by country and commodities.

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<sup>2</sup> [http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical\\_en](http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en)





The deliverable “Minerals Inventory Report”, planned for M12, will include feedback/responses from data providers, after they have verified the current data on national level as well as a first version of the harvesting quality assurance procedure.

## 2.2 Prioritization of Commodities

The European Commission pays special attention to securing a sustainable supply of Critical Raw Materials and rare earths to EU's industry.

Due to increasing EU demands on critical raw materials (The Raw Material Initiative), batteries (Battery Action Plan) and in conjunction with other GeoERA projects (example FRAME), Mintell4EU will focus on securing reliable access to minerals intelligence related to raw materials, which are of crucial importance to the EU.

Since information on commodities at European level cannot be generated dynamically from the Minerals Inventory at present, we will change approach to categorization of data. The users will be able to choose different contents with tool like drop down list or something similar. For common users it is probably more important, that we enable searching by mineral resource rather than by location. In categorizing, we will consider: at first demands of the EU and industry, reserve quantities, and occurrence frequency.

Since all commodities in database (must) have location data (coordinates) and type of mineral resource, we will be able to produce maps on commodities from the Minerals4EU database and compare results to other existing maps such as the pan-European map from the past ProMine project containing the known and predicted metalliferous and non-metalliferous resources, potentially strategic metals and minerals that are currently not extracted in Europe as well as pan-European map of critical raw materials, elaborated in the FRAME project.

Our starting point for commodity prioritization will be battery elements, in specific lithium, cobalt, graphite and nickel. At the moment, it is difficult to estimate the time needed for production of such maps, because involvement and cooperation among experts from other ongoing interoperable projects is of crucial importance for production of quality maps with reliable information for the EU. If the primary selection of battery elements and creation of pan-European maps of these elements will prove successful, we will try to expand production of maps to other mineral commodities.

## 2.3 Harmonization issues

Mintell4EU's expected improvements are not just about addressing problems of data quality but also take into account current barriers of data harmonization.

The main harmonization issues identified within the current Minerals Inventory can be summarized as:

1. Certain countries are only allowed to disseminate data on commodities on a national level, while others can provide information on single deposits (whether area or point);
2. Misunderstanding of current code lists or their unsuitable use can cause differences between the actual and the reported situation in the countries;





3. Different data providers are using various classifications of mineral resources (UNFC, JORC, etc.) and are reporting quantities in different units.
4. Errors within harvesting system.
5. Typing mistakes leads to for example incorrect coordinates of commodity location.
6. It is different from country to country how many occurrences/deposits that are included in the database.

Outlining harmonization of the data is strongly reliant on the ORAMA project and training sessions, planned within Task 3.3. Until now, three reports, relevant to Mintell4EU, have been completed from the ORAMA project, results of which will be considered for harmonization issues in the Mintell4EU:

- D1.1 Initial analysis for the improvement of statistical data collection methods in Europe;
- D1.2 Final analysis and recommendations for the improvement of statistical data collection methods in Europe for primary raw materials;
- D2.2 Recommendations for improving SRM datasets and harmonisation.

Very important guidelines are expected to be introduced from D3.1: Compatibility of improved datasets with the INSPIRE Directive and existing data models, and identification of necessary evolutions as well.

We will study above mentioned reports to identify all synergies and direct content related to our activities in the Mintell4EU. We will use best practices described in technical guidelines of the ORAMA, as example for data quality and harmonization improvements.

We will approach harmonisation issues also by setting up a strong network, through which we will strengthen the importance of good and reliable data providers. Not only with a list of partners in the consortium, but also with contacts of other projects, e.g. FRAME and strong support from MREG, maybe the EuroGeoSurveys' ExCom and linkage to EIT as user and producer of information. See section 7 below for more about the sustainability of the databases.

### **2.3.1 Selected level of harmonisation (ambition)**

Already emphasised in the project proposal there is a strong risk of incomplete harmonization despite the best efforts of the ORAMA project. Proposed risk-mitigation measure is to conduct survey to collect non-harmonised data and be clear in their publication what system(s) of reporting is/are.

Our ambition is to overcome above mention risk through:

- strong network and good communication among data providers to achieve bigger involvement of data providers, of which not only transmission of data is expected but also their active response at all times;
- transparent and understandable process of data collection and review, tailored upon user's needs;
- development of new training materials;
- education of data providers through workshops to become capable and reliable data providers;
- improvement of harvesting system and its quality assurance.



## 2.4 How to approach full coverage

One of project objectives is to extend spatial coverage of data, currently stored in the Minerals4EU system.

Mintell4EU will expand network of data providers from addressed area (area of EU and its Member States) by:

1. Upgrading or maintaining existing data coverage (data from countries, involved in projects Minerals4EU and ProSUM (mining waste part));
2. Involving of new data providers from:
  - a. RESEERVE project - extension of coverage of West Balkan (contact GeoZS);
  - b. Italy (ISPRA), that for the first time provided an excel sheet with commodities (contact BRGM and GEUS);
  - c. Germany, where a new agreement between the German Länder and BGR will enable availability of data (contact GEUS and BGR);
  - d. Estonia, haven't deliver any data yet, but there are promising opportunities for their delivery (contact GEUS);
  - e. ProMine project, in case we do not obtain data for a particular country, we can display ProMine data in a way that would be compatible to Mintells4EU's specifications.

Due to above mentioned different sources of data, we do not know precisely to what extent the harmonization can be carried out. Only data providers within Mintell4EU are expected to modify and update their data according to ORAMA guidelines. Data for countries, that were data providers in Minerals4EU for Mining Waste data, will be adapted to technical modifications of the database, but the data will probably remain of the same quality. New data providers (from RESEERVE project) will deliver data in line with modifications, but they will be able to deliver only limited information, required in the Minerals Inventory.

### 2.4.1 *Selected level of coverage (ambition)*

Our ambition is to gather data from countries in Figure 2.

Countries, marked in yellow, are data providers in Mintell4EU project. Countries, marked in blue colour, indicate data providers from Minerals4EU, which are not participating in the Mintell4EU, but we will use their data. Countries marked in purple, are data providers from RESEERVE projects, that are not already part of Mintell4EU.

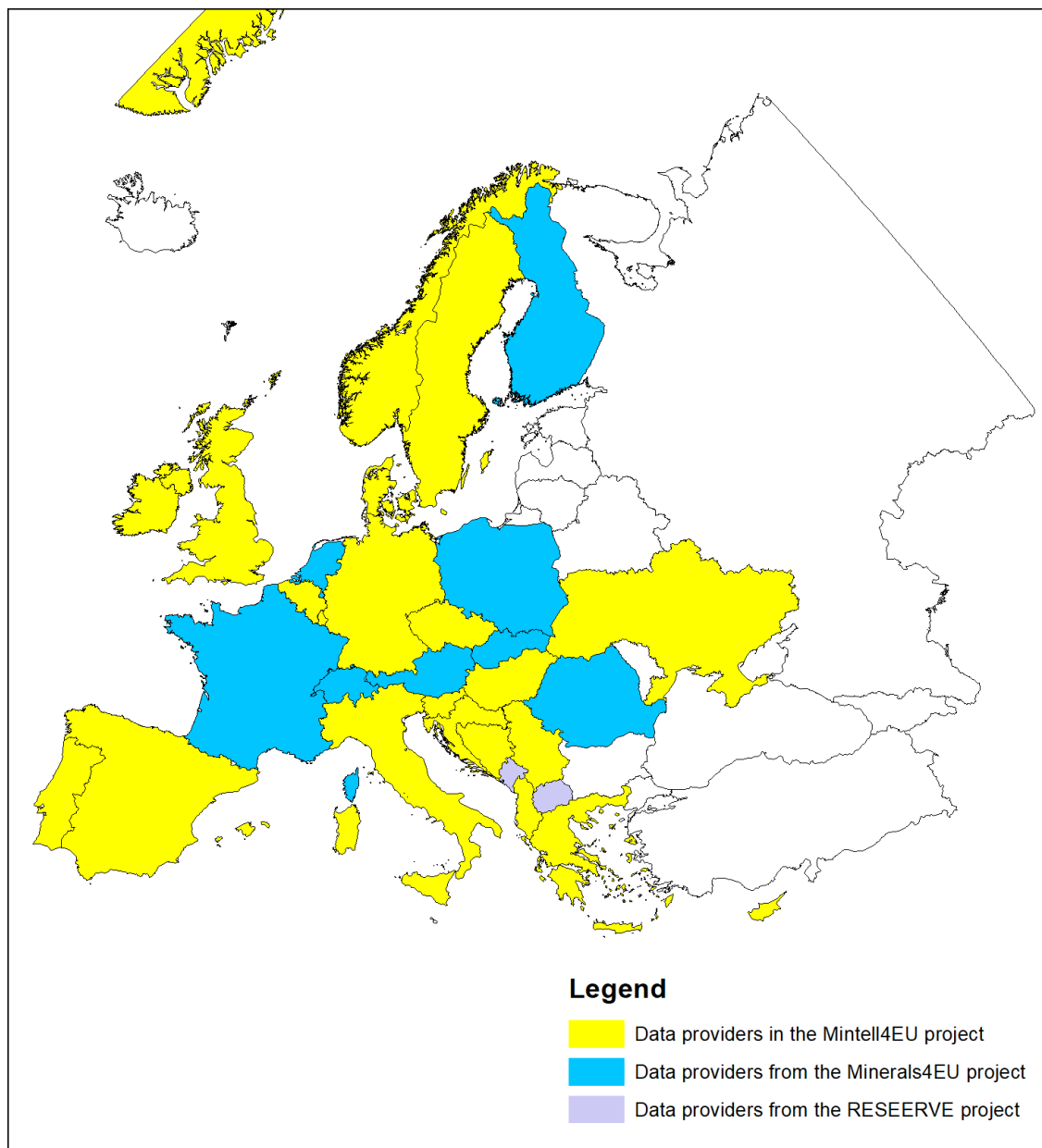


Figure 2. Overview of possible extension of spatial coverage in Mintell4EU, combining data providers from Mintell4EU, Minerals4EU and RESEERVE projects. Possible extension using data from the ProMine project is excluded from the figure with respect to a certain degree of ambiguity.

## 2.5 Time schedule

For a quality implementation of the proposed Minerals Inventory work plan the timeline in Figure 3 should be followed. As can be seen, activities are strongly related to projects ORAMA and RESEERVE, as well as to responses from data providers.

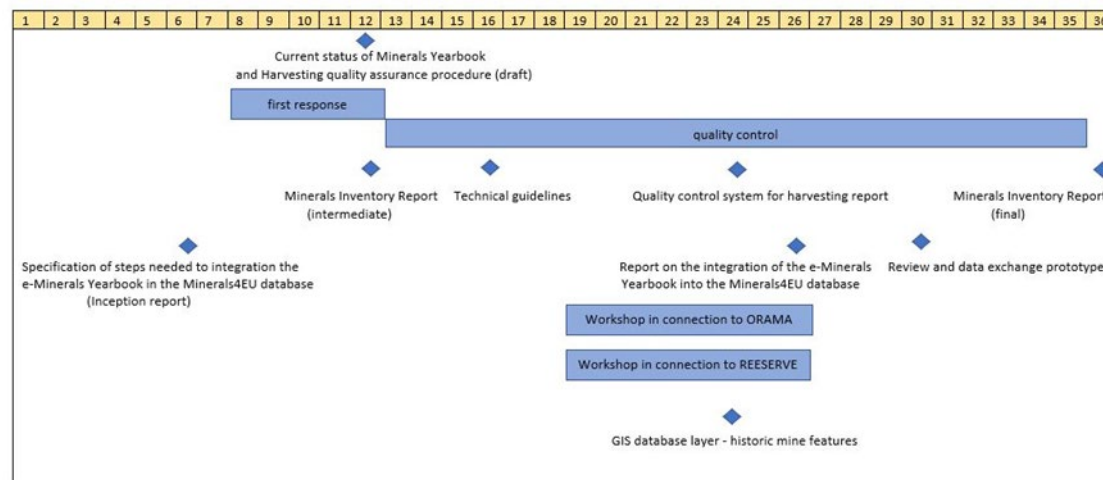


Figure 3. The figure shows the timeline to be followed for a quality implementation of the proposed Minerals Inventory work plan.

### 3 COORDINATION WITH OTHER PROJECTS AND PROGRAMMES

Mintell4EU builds on other projects dealing with raw materials, both ongoing and already finalised projects. Mintell4EU will set up synergies and cooperate with ongoing projects having similar activities, especially the ones described below.

Besides, Mintell4EU are in close dialogue with DG GROW to ensure the best possible matching of expectations.

In Figure 4 below the relationship between Mintell4EU and the related projects is illustrated and in the following section we will go more into detail with the projects and how they relate to Mintell4EU. The first four are FRAME, MINDeSEA, EuroLithos and GIP-P. All those are, like Mintell4EU, GeoERA projects.

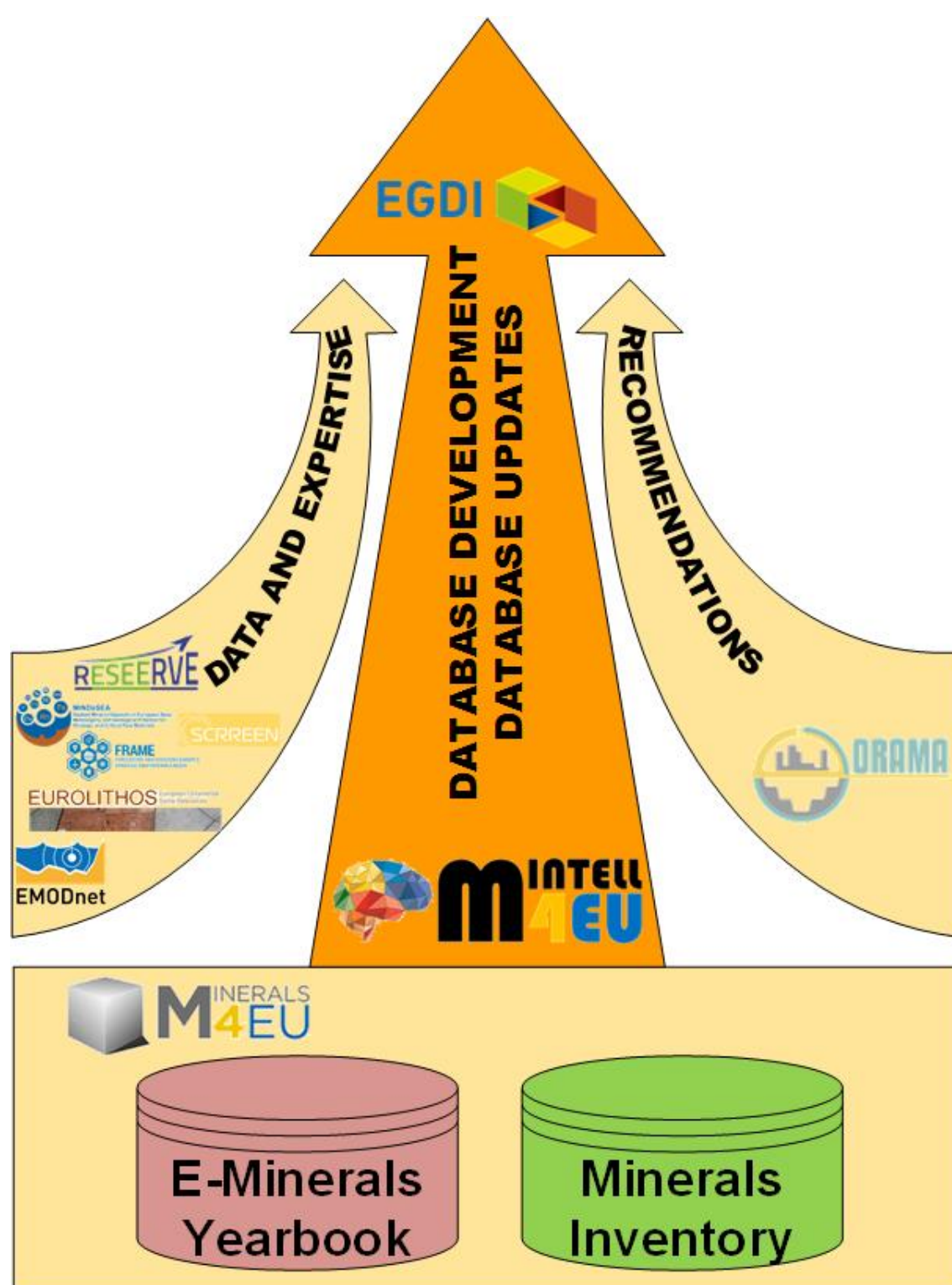


Figure 4. Schematic overview of the relationship between projects. In general, Mintell4EU will integrate and improve the e-MYB and Minerals Inventory from the past Minerals4EU project by bringing in data and geological expertise from a number of ongoing projects and by building on recommendations from the ORAMA project.



### 3.1 FRAME

FRAME will work on Forecasting and Assessing Europe's Strategic Raw Materials needs. So there is a big common field of work here between the two projects. FRAME will focus on applying new technologies for deep exploration and mining, turning low-grade ores to exploitable resources and reducing generation of mining wastes and large tailings by converting them to exploitable resources. The aim is to provide a significant innovative contribution towards knowing more about the potential primary deposits, predict new target areas/deposits and recognize the potential in secondary deposits.

FRAME will disseminate results, for instance maps showing occurrences of the strategic raw materials, through the EGDl platform and will work closely together with Mintell4EU in ensuring that such maps are delivered according to the same standards, in particular INSPIRE, that we are working on in Mintell4EU.

### 3.2 MINDeSEA

MINDeSEA will work with Metallogeny and Geological Potential for Strategic and Critical Raw Materials in Seabed Mineral Deposits in European Seas. The project will address an integrative metallogenetic study of principal types of seabed mineral resources (hydrothermal sulfides, ferromanganese crusts, phosphorites, marine placers and polymetallic nodules).

One of the objectives of the project will be to develop harmonised mineral maps and datasets of seabed deposits incorporating GSO datasets, along with mineral-potential and prospectivity maps. Such maps will be disseminated through the EGDl portal, and, like in the case of FRAME, there is a need for a close cooperation with Mintell4EU in order to ensure that these new maps are using the same standards as the rest of GeoERA and the Minerals4EU database which is the one used by EGDl.

### 3.3 EuroLithos

The EuroLithos project will deal with European ornamental stone resources. The idea is that increased knowledge of the geology, quality and history of use of natural stone in Europe will stimulate both a more sustainable use of stone resources in Europe for the benefit of SME's and our cultural heritage, and a sound land use management for the safeguarding of ornamental stone deposits.

The project will identify and map the type and quality of construction materials, and provide tools and protocols for the assessment and comparison of deposits. This will result in an ornamental stone knowledge base under the umbrella of EGDl, covering harmonised spatial data on European stone resources, atlas of resources and use, a directory of ornamental stone properties and guidelines for valorising ornamental stone heritage.

The connection to Mintell4EU is not so strong as it is for FRAME and MINDeSEA, but there will nevertheless be a need for coordination regarding the provision of maps to the EGDl.





### 3.4 GIP-P

It is the overall aim of GeoERA to integrate information and knowledge to support sustainable use of the subsurface. The geoscientific projects (GSPs) of GeoERA on subsurface energy, water and raw material resources will produce large amounts of geological data and information and the GeoERA Information Platform Project (GIP-P) will establish a common platform for organising, disseminating and sustaining the digital results of those projects.

The platform will include a central database, a metadatabase, a user-friendly Webportal and a digital archive for organising reports and unstructured data. The portal will include facilities for visualising complex information like 3D/4D geological models. In order to ensure that the needs of the GSPs are fully identified and understood by the experts who will implement the platform, a specific organisation will be set up to liaise between those projects and the GIP-P.

Great effort will be put into adhering to European and international standards in order for the results to be as useful as possible for the whole of GeoERA and its external users thereby maximising the overall impact of the project. Techniques like Linked Open Data and multilingual thesauri will be implemented to ensure maximum interoperability of the data and services.

The platform will be based on a coherent architecture which will take into account experiences gained in previous EU-funded data harmonisation projects. It will reuse a lot of the content and functionality of the European Geological Data Infrastructure (EGDI) and extend this to support the requirements of the GeoERA projects (GSPs).

The GIP-P will therefore be a very important collaborative project for Mintell4EU. The minerals inventory is already handled by the EGDI database developed in Minerals4EU and related projects. Furthermore, Mintell4EU will integrate the e-MYB into the EGDI.

### 3.5 ORAMA

The ORAMA project tackles specific challenges regarding optimising data collection for primary and secondary raw materials in Member States. A cornerstone to the EIP on Raw Materials is the development of the EU knowledge base on primary and secondary raw materials, commenced by a series of European funded projects. As the next iteration, ORAMA addresses specific challenges related to data availability, geographical coverage, accessibility, standardisation, harmonisation, interoperability, quality and thematic coverage in Member States. ORAMA will analyse data collection methods and recommendations from past and ongoing projects to identify best practices, develop practical guidelines and provide training to meet specific needs. Specific actions will notably bear on the following points:

- The improvement of mineral occurrences/deposits 'regular national' datasets with a focus on quality, harmonisation and improvement of the spatial coverage and



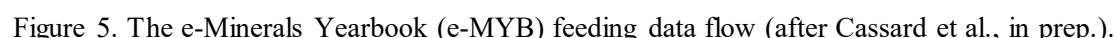


for statistical data aggregated at the national level, the setting up of a dedicated harvesting procedure, while ensuring the compliance with the INSPIRE directive. This action is accompanied by an important update of the INSPIRE Mineral Resource data model as well as the full integration of mining waste into this model.

- Aggregated production data at the national level will contribute to the feeding of the e-MYB. The flow of data from harvesting, feeding of databases managed by the BGS, and then the transfer to the diffusion Minerals4EU/EGDI portal has been conceptualized, and the dedicated data model (M4EU-based) sketched out (see Figure 5).
- The ProSUM Unified data model used for managing Waste Electrical and Electronic Equipment (WEEE), End-of-Life Vehicles (ELV) and Batteries (BATT) data, will be applied to new datasets and outcomes will be combined with primary raw materials data to demonstrate how to create more robust Material Systems Analysis studies and reliable Sankey diagrams for stocks and flows of specific elements and minerals.
- A better consideration of environmental and social approaches will be realized by incorporating new datasets into the e-MYB and via the extension of the perimeter and the granularity of the ontology on mineral resources developed in the H2020 MICA project.

**The three first results are of particular interest for Mintell4EU which will build on them, notably in work package 5.** Information is made accessible and compatible with the JRC's Raw Materials Information System (RMIS 2.0) to feed future edition of the Raw Materials Scoreboard and Criticality Assessment studies.

In the long term, ORAMA empowers the wider EU raw materials community with necessary facts to support policy and sustainable investments decisions in the primary and secondary raw material industries.



The KIC EIT Raw Material programme is financing a project on mineral potential of the ESEE region, because primary and secondary mineral resources are of strategic importance for the EU. Most EU countries are already part of the Minerals4EU Network which provides consistent and organised data information on primary and secondary mineral resources on the European level. The West Balkan region represents a gap in this network.

1. Create a West Balkan Mineral Register for primary and secondary mineral resources by mapping the mineral resources of the West Balkan countries: Croatia, Bosnia and Herzegovina, Serbia, Montenegro, FYRO Macedonia and Albania, which are currently not included in the existing data platforms.
2. Create an ESEE mineral community to determine available and further needed information on primary and secondary mineral resources data in West Balkan countries.
3. Increase the capacity of West Balkan countries for management of mineral resources on national level.
4. Ensure a sufficient flow of information on mineral resources for Europe's industry to expand their business and investments in the West Balkan region.
5. Transfer of knowledge of EIT Raw Materials partners to the West Balkan region with the purpose to develop new markets for modern technologies, create opportunities



for start-ups and SMEs, contribute to new jobs opportunities and generate economic added value in the field of mineral resources.

The results of objective 1 will be implemented in Mintell4EU, because the data collected within the RESEERVE will be transmitted into the Minerals Inventory. These will ensure the extension of coverage to the missing area of West Balkan and entries of new data, which will also take into account the harmonisation of the data.

### 3.7 EMODnet

EMODnet-Geology has been running through three project periods starting in 2013 and aims at providing harmonised information on marine geology in Europe. One of the activities in EMODnet-geology has been to compile information about the distribution of offshore raw materials such as aggregate deposits, ferromanganese crusts, evaporates, marine placer deposits, phosphorite and polymetallic sulphides. The data are not currently integrated in the M4EU database.

### 3.8 SCRREEN

SCRREEN aims at gathering European initiatives, associations, clusters, and projects working on CRMs into a long lasting Expert Network on Critical Raw Materials, including the stakeholders, public authorities and civil society representatives.

SCRREEN will contribute to improve the CRM strategy in Europe by (i) compiling primary and secondary resources as well as substitutes of CRMs, (ii) estimating the expected demand of various CRMs in the future and identifying major trends, (iii) providing policy and technology recommendations for actions improving the production and the potential substitution of CRM, (iv) addressing specifically WEEE and other EOL products issues related to their mapping and treatment standardization and (vi) identifying the knowledge gained over the last years and easing the access to these data beyond the project.

The aim is also to organise the global knowledge on CRM in Europe, integrating the data identified in SCRREEN WPs, in relation with the EURMKB objective of the EIP-RM SIP (see Figure 5) and allowing an easy access to the resource, without duplicating existing databases. This will be at the basis of the development of a long lasting network.

In addition to a dedicated portal (<http://screen.brgm-rec.fr/>), two tools will support the Knowledge Management (KM): a **Document Management System (DMS)** and a **Decision Support System (DSS)**, which will be linked to the EC's Raw Material Information System (RMIS).

**The DMS** is a system that aids in the storage, indexing, and retrieval of documents, and will include functions like indexing, searching & retrieval, and a 'Search in one specific domain', i.e. the search functionality will be extended to other metadata databases, thus allowing retrieving 'combined' information, e.g., REE/CRM or WEEE/CRM...

**The DSS** is based on the MICA Expert System and will use the ontology-based Dynamic Decision Graph (DDG) which allows the end user to specify his question and discover all related answers sorted by pertinence. The MICA ontology will be extended to cover all the needs of SCRREEN in two ways: in increasing its perimeter and in increasing its depth or granularity. The DDG will be adapted accordingly and the database of Tools &

Methods behind the graph will be updated with the necessary fact sheets related to CRMs.

In addition, dedicated applications or services are developed on top of the Central Common Diffusion System. (i) a 'Product development risk thermometer', (ii) an application 'Why CRMs matter?', and (iii) a 'Policy recommendation provider', targeting scientific community, stakeholders, society and policy makers respectively.

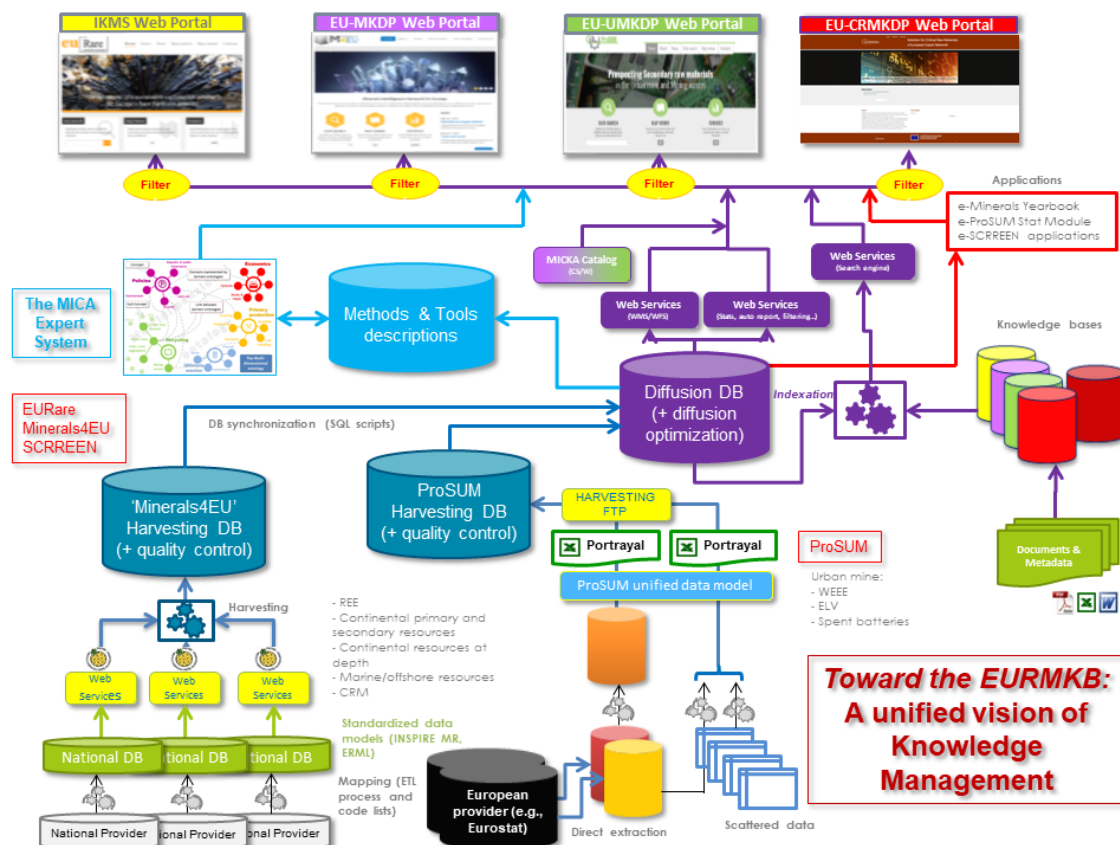


Figure 6. The SCRREEN and MICA platforms, their relationships with other platforms (e.g., Minerals4EU, EURare...) and the building of the EURMKB (after Cassard and Tertre, 2017).

The SCRREEN proposition integrates a longer term vision, and all the developments foreseen here are with the EURMKB and the EGDI in mind.

Among the developments made in the frame of SCRREEN, two are of particular importance for Mintell4EU and notably for WP5. An OpenSearch API has been developed for allowing the RMIS to perform dedicated searches in the SCRREEN CRM Knowledge base. This API will be extended in the frame of WP5 to other Knowledge bases related to REE, ore/mineral deposits, the urban mine. Another API has also been developed allowing the SCRREEN applications to use ProSUM data. This API will be adapted and made available to the JRC's RMIS within Mintell4EU WP5.

## 4 TECHNICAL ASPECTS

### 4.1 Integration of e-MYB in M4EU database

One of the main goals of the Mintell4EU is to integrate the e-MYB with the overall data infrastructure of the EGDI, which forms the basis for GeoERA Information Platform. Having the e-MYB maintained in the EGDI database, that already holds the Minerals Inventory will ensure its long-term sustainability. The data from the e-MYB and Minerals Inventory will be disseminated through a number of channels including the EGDI portal and the already existing Minerals4EU portal. (Figure 7).

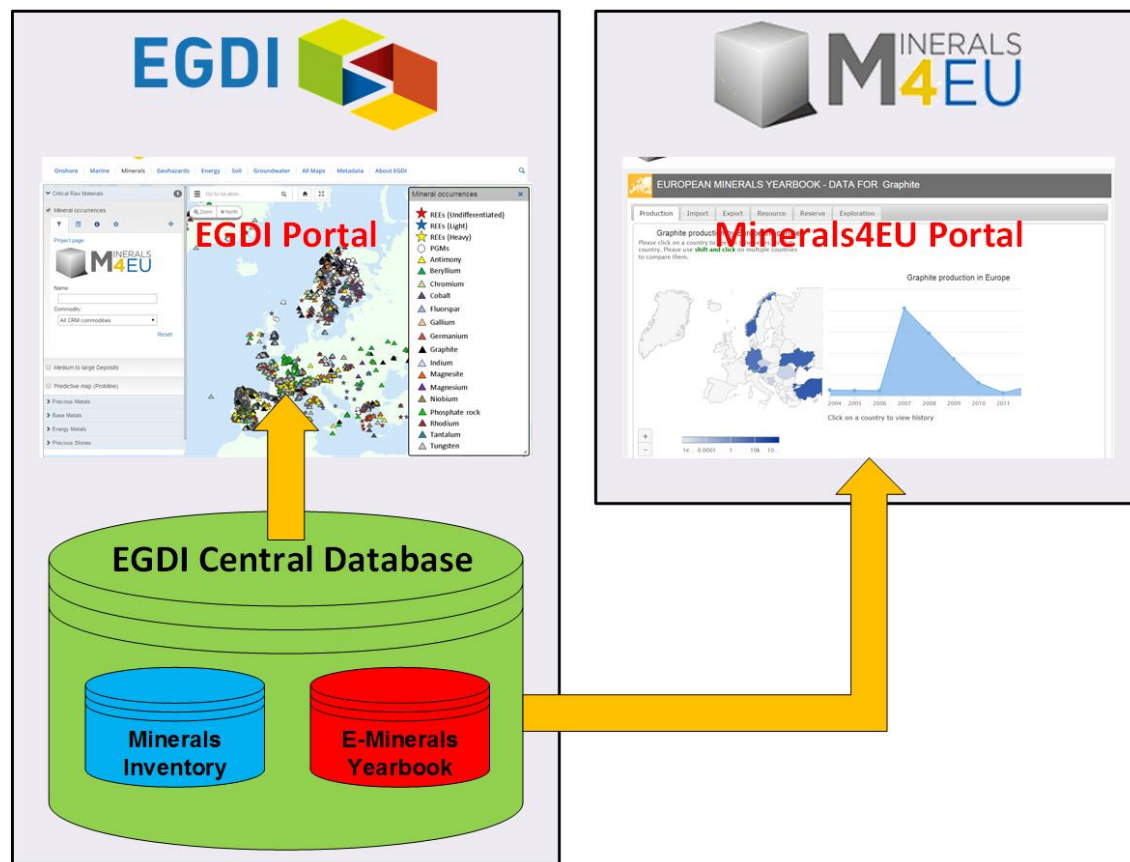


Figure 7. The end goal of Mintell4EU is to integrate the E-MYB with the Minerals Inventory in the central EGDI database from which data are disseminated through the EGDI portal, the Minerals4EU portal and other channels.

A new e-Minerals Yearbook (e-MYB) data model (DM) will be created that will reuse parts of the BGS website data model for production and trade (import and export data). This DM will thus be jointly developed by BGS, BRGM, GeoZS and GEUS. It will be used (i) to harvest National Providers databases (DBs), (ii) to build a Web application for countries/institutions not having harvestable data from DBs and (iii) to build the Harvesting database. BGS will receive a dump of this DB which will be used in the following way: (i) the creation of a copy of the GeoZS' Harvesting DB to store exploration,





reserves and resources data, (ii) extraction from this DB of production data (if harvested/provided) which will then be incorporated into the BGS World Mineral Statistics DB. Validated data of the 5 types of data, coming thus from two different DBs (exploration, resources & reserves data, BUT NOT PRODUCTION, from the BGS Copy of the Harvesting DB, and production and trade data from the BGS website DB), will be provided by BGS to BRGM for the update of the previous version of the e-MYB via a Web service based on the Minerals4EU/ORAMA e-Minerals Yearbook data model.

#### **4.2 Synergies between APIs for RMIS and dissemination through EGD**

Task 5.1 and related deliverable (Cassard and Tertre, submitted) of this project examines how data and information can be delivered from the databases developed under the previous projects (including Minerals4EU, ProSUM, SCRREEN, etc.) to the RMIS system of JRC. It is likely that the best solution will be to develop specific APIs which can be exploited by the RMIS rather than relying on WMS and/or WFS services as the underlying data models may change. By introducing an API layer between the databases delivering the data and information on one side and the RMIS applications on the other side such changes in data models can be implemented without influencing the provision of data and services.

The development of such API functions with aggregated or otherwise processed data and information may be of benefit for the EGD also as some of the data and information might be relevant to disseminate through this channel also, probably in combination with other information from EGD. In such cases it is very important that EGD uses the same APIs as RMIS will be using so that a user will get exactly the same answers to the same questions irrespectively of whether these are posed to EGD or RMIS. Close coordination between the tasks in WP5 where the API will be developed (T5.4, T5.4 and T5.6) and where the integration of the data, search and other functionalities in EGD will be handled (T5.7) as well as with the GIP-project is crucial to achieving this. Specific coordination meetings and similar will be organised to take care of this.

#### **4.3 Verification and updates of resources, reserves and exploration data in the e-Minerals Yearbook**

Data related to mineral resources, reserves and exploration in Europe was collected for the purpose of the Minerals4EU project. We intend to review the survey forms (questionnaire used for mineral resources and reserves data and five metrics for exploration data) and utilise the lessons learned from the Minerals4EU project to make small revisions to the forms to improve their ease of completion. The improvement of the survey forms will be more technical in terms of optimization of data input.

These revised forms will then be used to conduct a new survey of mineral resources, reserves and exploration across Europe with a reference year of 2019.

At the moment, the only resources or reserves data available are shown in the Minerals4EU e-MYB, which at best relates to 2013 but in many cases is historical data. This new survey will have a reference year of 2019, so there will be a gap in years between the two. Technically it will be arranged to fulfil the data for missing years, but it might lead to a lower response rate as it greatly increases the workload that are placed on the data providers.



Updates of exploration data will follow the same metrics used by Minerals4EU (expenditure, number of exploration licences, number of licenses issued total area under licence and total number of companies exploring) (reference to ORAMA project Deliverable 1.2: Final analysis and recommendations for the improvement of statistical data collection methods in Europe for primary raw materials).

GeoZS will set up a Web-interface, where data on **resources, reserves and exploration** will be visible per country. Through assigned passwords, each data provider will be able to allow view and enter new data for their country, only GeoZS and BGS will have administrative rights. The work process will be a sequence of six sub-steps:

Step 1: Update the list of data providers (BGS will provide existing contact list);

Step 2: Development of a revised questionnaire:

- o guidelines from ORAMA project in November 2019 (different classifications used for reserve and resource data; unification of measurement units; etc.);
- o revisions upon the lessons learned from the Minerals4EU project.

Step 3: Setting up the Web interface

Each data provider will have the possibility to verify and confirm their national data that was reported till now or as described in the project proposal "first, the sub-task will review the data collected by the previous survey..." to identify quality of the data as well as evaluate which exploration metrics are the most valuable;

This Web interface will allow:

- Enter data for reference year 2019 (compulsory for data providers);
- modify/edit data reported in the past (at best till 2013?) (optional for data providers).

Step 4: Implementation of the revised questionnaire and data entries for 2019 according to the revised questionnaire, conducted through the Web interface.

Step 5: Quality control of the data entries for 2019, led by BGS because of their extensive involvement in setting up the e-MYB from the beginning.

Step 6: Update of the European Minerals Yearbook (technical issues are already described and agreed within ORAMA project (D3.1)). No display changes of the e-MYB interface are foreseen, only data updates.





## 5 UNFC

The United Nations Framework Classification for Resources (UNFC) aims to make harmonised inventories by classifying and quantifying projects based on (1) their social and economic favourability, (2) the uncertainty of geological knowledge, and (3) the project maturity. UNFC may therefore be applied across projects from uncertain, reconnaissance stage, and under-explored prospects to well characterized and well assessed resources and reserves. Classification may include both primary and secondary resources.

- In Mintell4EU we will test the application of UNFC as a classification system on several different resource types. Case studies will be performed to test if geological surveys will be able to apply UNFC to the complete range of mineral resources.
- The project will show if the application of UNFC will provide better harmonization of mineral resource data nationally, and across Europe, and to demonstrate the strength of UNFC as a tool for more accurate mineral inventories.
- A Report on harmonization issues, data gaps and challenges, reviewing also the quality of nationally aggregated inventories for selected commodities will be prepared.
- Data will be supplied to WP2,3 and 5 for inclusion in the e-Minerals Yearbook, and Minerals inventory.

There are several parallel activities on UNFC for mineral resources in Europe at the moment, both within research project and at EU commission level. The GeoERA projects FRAME and Eurolithos will both give input data to the UNFC use cases that will be performed in Mintell4EU, respectively on battery raw materials and natural stone. In the ORAMA project the aim is to harmonize data to be used for different international reporting codes and classifications systems as UNFC. Case studies are also developed in this project and we will use these case studies as a support in Mintell4EU's work. ORAMA are also preparing UNFC training material that can be used in Mintell4EU for guidance.

DG GROW plan to develop a guideline on how to apply UNFC on mineral resources and follow both ORAMA and Mintell4EU closely. The results (D4.1 and D4.2) from MINTELL4EU will be valuable to in this work. DG GROW also see the need to have an INSPIRE standard for UNFC data and have initiated work to look into this.

To meet the 2030 Agenda for sustainable development UNECE are now developing a UN-based Resource Management System (UNRMS) to assimilate knowledge available in organizations, countries, companies and academia to create a standardized set of guidelines that help projects to progress from a lower UNFC class to a higher class. ([https://www.unece.org/fileadmin/DAM/energy/se/pp/CSE/EnComm27\\_Sept2018/26.09/srm/06a\\_Igor\\_Shupurov-EGRC\\_e.pdf](https://www.unece.org/fileadmin/DAM/energy/se/pp/CSE/EnComm27_Sept2018/26.09/srm/06a_Igor_Shupurov-EGRC_e.pdf))



## **6 PROVISIONING OF MINTELL4EU RESULTS THROUGH THE EGDI**

Deliverable D5.2 describes how results from the Mintell4EU project (i.e. the Minerals Inventory and e-MYB data) are best integrated with the EGDI infrastructure (with reference to Deliverable D5.3.1) and disseminated through the EGDI Portal. The report provides recommendations regarding the functionality that should be included in the EGDI Portal in order to fulfill the most important use cases and in support of the overall Mintell4EU vision about providing easy access to useful and reliable mineral intelligence for all of Europe. This includes establishing tailor-made landing pages with meaningful URLs, possibilities to generate thematic maps on the fly (for example maps of significant occurrences of battery commodities), user-oriented integration of mineral deposit data from the Minerals Inventory with mineral statistics from the e-MYB and user-oriented labels and detail-pages.



## 7 SUSTAINABILITY

The sustainability of the data and other results that will be produced in Mintell4EU is important. There are two different main aspects to consider: 1) The operation and maintenance ICT system and the data; 2) The maintenance and further extension and harmonisation of the data.

As it has been decided in an early stage of the GeoERA that all databases and software that will be developed under the programme shall be organised and maintained under the EGD platform this will ensure that the ICT related developments of Mintell4EU will also be sustained as a consequence of that. Currently the funding of the operation and basic maintenance of the EGD platform is ensured by the EGS community and this in itself is a big advantage for Mintell4EU (and the other GeoERA projects). Furthermore, it is an advantage for Mintell4EU that several of the key partners in the project (GEUS, GeoZS, BRGM and BGS) are also partners in the EGD Consortium which is carrying out the operations of that platform.

Regarding the data, Mintell4EU as well as the two other GeoERA projects FRAME and MINDeSEA together with the RESEERVE project running in parallel will all provide a substantial improvement in the data coverage and quality. The projects themselves will, however, not guarantee that the data will be maintained after the end of the projects. Cases where databases will need to be updated include the discovery of new occurrences, change of status of an occurrence, deposit or mine, change in the relevance/grouping of commodities (a new list of which minerals are considered to be critical for instance), etc.

One of the purposes of the Minerals4EU project was to establish a so-called "Minerals4EU Permanent Body" which should have as one of its objectives to ensure the maintenance of the Minerals4EU database. This Permanent Body *has* been established as a legal body, but it has not become operational with an ensured funding of its activities. Whether this will happen in the near future is uncertain. Therefore, the further maintenance must still for some period of time rely on specific projects and/or the voluntary contributions to this work by the EuroGeoSurveys Mineral Resources Expert Group (MREG) and its members. In the longer term we must hope for the strategic ambition of the EuroGeoSurveys to establish the Geological Service for Europe which should have as one of its primary goals to maintain data from previous projects.



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## 8 REFERENCES

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