



Deliverable D5.2

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Version: 25-01-2019

This report is part of a project that has received funding by the European Union's Horizon 2020 research and innovation programme under grant agreement number 731166.



Deliverable Data				
Deliverable number	D5.2			
Dissemination level	Public			
Deliverable name Work package	Recommendations for integration of results into the GeoERA Information Platform WP5, Improvement of KDPs' applications and interaction with the RMIS and the GeoERA Information Plaform			
Lead WP/Deliverable beneficiary	GEUS			
Deliverable status				
Submitted (Authors)	31/12/2018	Mikael Pedersen		
Verified (WP leader)	31/12/2018	Daniel Cassard		
Approved (Coordinator)	31/12/2018	Jørgen Tulstrup		





GENERAL INTRODUCTION

This report describes how results from the Mintell4EU project is best integrated with the GeoERA Information Platform (referred to as EGDI in the document). Recommendations are provided in relation to the integration of the two relevant databases (Minerals Inventory and e-Minerals Yearbook) with reference to other relevant and complementary deliverables and also to the functionality that should be included in the EGDI Portal in order to fulfill the most important use cases.

EXECUTIVE REPORT SUMMARY

An important goal of the Mintell4EU project is to integrate the e-Minerals Yearbook with the Minerals Inventory in the overall EGDI database and make data from the two datasets available on the EGDI Portal. The functionality that is recommended for integration in the EGDI Portal all supports the overall Mintell4EU vision about providing easy access to useful and reliable mineral intelligence for all of Europe.





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1 SCOPE

Mintell4EU is one of the research projects under the GeoERA programme addressing raw materials. It is a prerequisite that all projects under GeoERA will disseminate their results through the "GeoERA Information Platform", which is developed in the crosscutting GIP-P project. It has been decided that the GeoERA Information Platform should build on and extend the already existing European Geological Data Infrastructure (EGDI) and in the remaining part of this report, only the name EGDI will be used.

All research projects under the GeoERA programme are required to have a work package responsible for liaising with the GIP-P project – in the case of Mintell4EU this is WP5. The current report forms deliverable 5.2 and aims at describing how the data coming out of Mintell4EU should be integrated in the overall EGDI, and what functionality in the EGDI portal that is needed in order to satisfy the main use cases discussed in the project.

2 BACKGROUND

The European Commission has contributed financially through several framework programmes to increase knowledge sharing, capacity building as well as cross-border and pan-European research within different geoscience domains. In most cases, data play a central role, and EGS members have many years of experience in working together with the purpose of making geological data FAIR (Findable, Accessible,

Interoperable and Reusable). One good example of this was the OneGeologyEurope project that lasted from 2008-10 in which 20 national geological survey institutions worked together to produce a harmonised geological map of Europe.

Upon the success of OneGeologyEurope, a natural extension came with the increased attention on securing the supply of critical raw materials for European industry. This was partly based on the rare earth element trade dispute that began in 2010 when China imposed strict export quotas for rare earth elements. Such elements are used in a number of high-technology industries, and since China accounts for 97% of the world production, the situation was considered critical. Consequently, the European Commission urgently needed an overview of raw materials resources in Europe. This led to a number of EU projects. Especially one of them had strategic importance for the EGS, namely the Minerals4EU project, where 28 national surveys and other EU organisations cooperated to build the foundation for a European raw materials knowledge base, by extending the OneGeologyEurope philosophy and by complying with and contributing to INSPIRE. Subsequently, other EU projects like EURare, ProSUM, MICA and the recently launched ORAMA projects have extended and/or improved this common knowledge base. At the same time the a number of complementary projects are run under the umbrella of the Knowledge and Innovation Community (KIC) for Raw Materials where a number of geological survey institutions cooperate with universities and industrial partners.





Simultaneously with these raw materials projects, a number of other European data harmonization projects have been carried out within other EGS research areas such as groundwater, energy, geohazards and soil. However, some years ago, it became increasingly clear that there was a need for coordination in order to increase the efficiency, reusability and sustainability – not only to meet European expectation, but also for the sake of geoscientists. This was addressed in the EGS strategy that was published in 2014 and laid the foundation for the European Geological Data Infrastructure (EGDI).

The present project will (numbers refer to figure 1);

- 1. Improve the quality and coverage of the Minerals Inventory as originally developed in the Minerals4EU project and later integrated with the general EGDI structure.
- 2. Update the e-Minerals Yearbook (e-MYB) that was also originally developed in the Minerals4EU project.
- 3. Integrate e-MYB with the Minerals Inventory.
- 4. Make data from the Minerals Inventory and e-MYB available on the EGDI portal
- 5. Make data from the Minerals Inventory and e-MYB available for RMIS through a number of APIs.
- 6. Make data from the Minerals Inventory and e-MYB available through a number of web services.



Figure 1. Schematic illustration of some of the tasks of the Mintell4EU project.

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3 ARCHITECTURAL OVERVIEW OF THE EGDI

The GeoERA Information Platform will build on and extend the already existing EGDI, which is to be considered an e-infrastructure consisting of central components and distributed data sources. The EGDI currently serves data from a number of previous European projects in a various ways as shown in Figure 2. In a number of cases, the project results have been compiled by a single institution that disseminates them as OGC services (WMS/WFS) that are then rendered by the EGDI portal. In other cases, tabular data are stored in the central EGDI database from which they are visualized and made searchable on the portal. The more advanced parts of the infrastructure utilizes the methodology that were established in the Minerals4EU project for the Minerals Inventory and further developed in a number of other projects. This implies that harmonized data are harvested from WFS services at national level into a central harvesting database from which they are transferred to a central diffusion database suited for integration with the portal. In all cases, data that are considered "EGDI data" are described in the metadata catalogue (MICKA).



Figure 2. The general EGDI architecture consisting of central and distributed components. The figure also illustrates how data are disseminated through various channels such as the EGDI portal and WMS- and API interfaces.

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On the dissemination side, the EGDI portal is the main "window" into the content of the infrastructure, and the GIP-P project will develop functionality in this portal to satisfy the use cases that are described by the thematic GeoERA projects such as Mintell4EU. Importantly, however, is that all datasets available on the portal are also served as WMS services for machine-to-machine integration into e.g. other e-Infrastructures. In the case of the Mintell4EU a more advanced set of API's will make even richer integration possible for systems such as the RMIS.





4 RECOMMENDATIONS FOR DATA INTEGRATION IN THE GEOERA INFORMATION PLATFORM

The data should be integrated with the GeoERA Information Platform (EGDI) are the data that have been promised as deliverables from the Mintell4EU project, namely;

- Minerals Inventory, including
 - i. Mineral occurrences
 - ii. Mines
- E-Minerals yearbook, including
 - i. Production data for 2004 to 2019
 - ii. Import data for 2004 to 2018
 - iii. Export data for 2004 to 2018
 - iv. Resource data (ref. year 2019)
 - v. Reserve data (ref. year 2019)
 - vi. Exploration data (ref. year 2019)

4.1 Minerals Inventory Data

The data in minerals inventory originates at national level and are harvested into the central EGDI harvesting database following methods defined in the Minerals4EU project and refined in successive complementary projects. From the harvesting database, the data are converted into a de-normalized "diffusion database", which is suited for integration with the portal front end (Figure 3). It is recommended to keep the present routines for the integration of Minerals Inventory data into the EGDI.



Figure 3. The content of the Minerals Inventory as presently available on EGDI.

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4.2 e-MYB Data

At present, the e-MYB data are handled more or less manually and made available through the Minerals4EU portal. Deliverable D5.3.1 of the Mintell4EU project describes the steps needed to automate the data transfer, and integrate the statistical data in the EGDI database. These steps are illustrated in Figure 4.



Figure 4. Diagram that illustrates the steps involved in the preparation of the statistical data in the e-MYB and delivery of these data to the diffusion database that will reside as part of the central EGDI database.

From the perspective of being able to integrate e-MYB data with Minerals Inventory data in user-friendly front end applications like the EGDI-portal, this is a good solution. **The main point to observe is, however, that there needs to be consensus about the naming of things (common code lists etc.) in the two databases**, so that a front end application for example can search for Copper in the commodity field of each database and get a comparable and meaningful result back.





5 RECOMMENDATIONS FOR DISSEMINATION OF PROJECT RESULTS THROUGH THE EGDI PORTAL

The integration of project results from the Mintell4EU project through the EGDI Portal should take into account the functionality already available in the Minerals4EU portal as well as the main use cases as defined in the Project Management Report (D1.2).

5.1 Dissemination Paths

Even though the Minerals Inventory and e-MYB in the future are maintained as part of the EGDI and thereby made available through the EGDI Portal, there are other dissemination paths to consider in the solution architecture (Figure 5). Firstly, the Minerals4EU portal should still be able to present updated minerals intelligence data, and hence a WMS / SQL interface needs to be set up to facilitate this. Furthermore, a part of the Mintell4EU project is to set up API's to allow "rich" integration of the data in JRC's RMIS portal. In this respect it is highly recommended that WP5 in Mintell4EU works closely together with relevant developers from the GIP-P project to ensure consistent handling of these various interfaces. Furthermore, it is important to facilitate functional synergies and make sure that thea data search one platform delivers the same result as a similar search from another platform.



Figure 5. Some of the dissemination channels for data in the Minerals Inventory and e-MYB.





5.2 Recommended Functionality in the EGDI Portal

As stated in the Project Management Report, the *main vision for Mintell4EU is to provide easy access to useful and reliable mineral intelligence for all of Europe*. The implications of this vision was discussed at the inception workshop on 6 November 2018 and influence the recommendations below.

Easy access means (among other things) that people should be able to easily find minerals intelligence in the EGDI system by simple use of a standard internet search engine. This search-find-view flow is schematically illustrated in Figure 6 and can be implemented for example by setting up some tailor-made landing pages with meaningful URL's. As an example http://europe-geology.eu/lgold-deposits

could be the address to a landing page with a dynamic map of Europe with the minerals inventory layer turned on and the commodity filter set to "gold". This kind of functionality is already available in the EGDI system, but a list of relevant landing pages need to be defined. It is recommended that such pages are set up in relation to the commodities that have been prioritized in the Project Management Report namely those relevant to the Battery Action Plan (Lithium, Cobalt, Nickel and Graphite) followed by the remaining commodities on the European Commission's list of Critical Raw Materials.



Figure 6. A tentative use case in which a user search the internet for gold deposits in Europe and get a direct link to a specific landing page for gold on the EGDI Portal.

The Mintell4EU vision mentions "useful information", which is also important to consider when providing access to the Mintell4EU results through the EGDI portal. Useful means different things to different user groups. However, it was decided at the inception workshop to prioritize the use cases of the European Commission. It is known from previous requests that the Commission occasionally needs e.g. maps showing the primary deposits of Critical Raw Materials in Europe (Figure 7), and it was therefore decided at the inception workshop that the primary use case to consider is to be able to generate such maps dynamically, again taking into account the prioritized commodities. For that reason, it is recommended that the EGDI Portal should have functionality that allows a user to select a group of commodities such as "Battery raw materials" and "Critical Raw Materials" and get a map showing the most significant deposits of those commodities with symbol sizes representing the size of the deposit (like in Figure 7). Furthermore, it is recommended that each commodity can be selected individually to generate a similar map only with the selected commodity depicted.



Figure 7. An example of a map of critical raw materials in Europe as requested by the European Commission. EGDI should allow such map to be generated dynamically from the content of the Minerals Inventory.

Another entrance to data that should be implemented in the EGDI portal is on a deposit or mine level. As both can have multiple commodities attached, the use case is different from the one mentioned above. A distinction between occurrences and deposits would be beneficial to allow users to e.g. only show significant deposits bearing a certain commodity. On a mine level, a similar entrance should allow to choose between active and closed mines. Emphasis should be put on making the map depiction of deposits userful as exemplified in Figure 8. When zooming in to a certain level of detail, it is recommended that each deposit is labelled with its name followed by a list of commodities and a symbol illustrating whether the deposit is mined (crossed hammers) or has been mined (the same symbol, but upside-down). Furthermore, it is recommended that clicking on a deposit result in a pop-up-box with a few important and human readable information from the database such as illustrated in Figure 8.







Figure 8. Example of useful representation of mineral deposits on a web map.

Regarding the e-MYB, it is recommended to adopt as much functionality as possible from the Minerals4EU portal. This includes the possibility to see maps with the each country colored according to e.g. the size of the trade of a certain commodity. Consideration should also be given on the portal to how results from the Minerals Inventory can best be shown together with data from e-MYB. It would for example be useful to be able to e.g. see the largest deposits of Nickel on top of a map illustrating the production of Nickel in individual countries as illustrated in Figure 9. Being able to generate a pdf-report for selected commodities on-demand containing the same data as shown in Figure 9 would be a useful extension that should be considered if there are enough resources.



Figure 9. Example of a useful integration of data from the Minerals Inventory (in this case Nickel Deposits) with production numbers from the e-MYB.

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