



Deliverable D5.7.1

Recommendations for integration of results into the GeoERA Information Platform Authors and affiliation: Mikael Pedersen & Frands Schjøth (GEUS)

E-mail of lead author: **mp@geus.dk**

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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. This report describes how these two datasets are integrated in the general EGDI architecture and the steps needed for future maintenance. Furthermore, it is described how the API's towards the RMIS are integrated with the system.





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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 5.7.1 and aims at describing how the results coming out of Mintell4EU should be integrated in the overall EGDI architecture and how the data should be maintained in the future.

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 just finished ORAMA projects have extended and/or improved this common knowledge base. At the same time 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.





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.





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 INTEGRATION OF RESULTS FROM MINTELL4EU IN THE GEOERA INFORMATION PLATFORM (EGDI)

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 (WP3)
 - i. Mineral occurrences
 - ii. Mines
- E-Minerals yearbook, including (WP2)
 - 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)

Further products that should be taken into consideration are;

- Results from the UNFC pilot (WP4)
- API's towards JRC's RMIS (WP5)

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, not least the recently ended ORAMA project, that successfully produced a number of technical guidelines. 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).



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





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.

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 and a prototype has been developed, see figure 4.



Figure 4. The preliminary integration of the e-MYB data in the EGDI portal. In this example the production of fluorite across Europe and the temporal development in production in the individual countries represented as a time series.





5 DISSEMINATION OF PROJECT RESULTS THROUGH THE EGDI PORTAL AND OTHER SOURCES

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. These APIs also should be part of the EGDI system so that any future changes to e.g. the data model of the minerals inventory or e-MYB will be accompanied by consequence corrections in the APIs.



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





6 FUTURE MAINTAINANCE OF PROJECT RESULTS

6.1 Minerals Inventory

The functioning of the overall data flow for new and updated minerals inventory data very much depend on the harvesting system, which again depends on well-functioning data provision systems at the data provider's ends. The recently ended ORAMA project successfully produced a number of technical guidelines and training material including

- description of recommended tool stacks
- guidance to data harmonization
- guidance to population of the local database
- guidance to setting up WFS services

The work taking place in WP3 already follows these guidelines, and it is crucial for the sustainability of the system that these are also respected in the future, and that the guidelines are kept updated.

6.2 E-MYB

The ORAMA project also produced a data flow for feeding of the e-MYB, which was further described in D5.3.1. Updates to the e-MYB dataset cannot be automated as much as is the case for the minerals inventory as it depends of an organization that compiles the statistical data based on various types of input (some also confidential) from a number of disperse sources. Nonetheless, future maintenance of the data should follow the recommendations from the ORAMA project in which case dissemination of new data will happen more or less automatically.



Figure 6. 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.





6.3 Web Portals

Mintell4EU will in cooperation with the GeoERA Information Platform project set up a web viewer on the EGDI portal dedicated to disseminating the various results of the project. Since other projects such as FRAME are also dependent on data in the databases, it is crucial that the initiatives are coordinated. Importantly, the databases have a lifetime far beyond the GeoERA projects and it is therefore important that parts of the views and functionality developed within the two projects are also transferred to the more general raw materials part of the EGDI system so that users of the system will be able to find mineral intelligence irrespective of what project produced it – however with good metadata describing the lineage of the datasets.

6.4 APIs

A number of prototype web APIs are implemented as part of WP5. Their implementation is also part of the overall EGDI architecture, which ensures that databases and APIs can be maintained in a coordinated manner in the future. In the last part of Mintell4EU, work will be carried out to ensure proper reuse of logic in the portal front end and APIs so that results from one interface (e.g. used on the RMIS platform) mirrors results from similar queries on the EGDI portal. Furthermore, the prototypes will be properly documented allowing future implementation of a fully flexed API system.