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Integration of the e-Minerals Yearbook into the MIN4EU database

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GENERAL INTRODUCTION

The European Union has identified security of supply, improvement in environmental management and resource efficiency as key challenges for the raw materials sector. Data regarding the location and spatial distribution of primary and secondary raw materials, with respect to exploration, exploitation, production and trade activities, underpin decision making in government and industry. Given the dynamic character of such data, regular updates of comprehensive, reliable and harmonized information across borders are required. The overall aim of MINTELL4EU is to improve the European Knowledge Base on raw materials as there are several sources of non-harmonized data with different coverages developed for different purposes during national and international projects over recent decades. All data are shared at the European Geological Data Infrastructure, EGDl.

Tasks include updating the electronic Minerals Yearbook produced in the Minerals4EU project as well as extending the spatial coverage and quality of data currently in the Minerals Inventory. Furthermore, MINTELL4EU aims to increase the degree of harmonization, communication and interaction between existing data platforms, with the ambition of reaching a fully operational and reliable data knowledge management system, fulfilling the European needs and taking into account the Raw Materials Information System (RMIS) of the European Union. Finally, the applicability of the UNFC classification system for obtaining more accurate Pan-European mineral inventories are tested through a large number of case studies on different commodities across Europe.

MINTELL4EU has 27 partners each representing a national or regional geological survey organisation from 25 European countries.

EXECUTIVE REPORT SUMMARY

This report describes the steps that were undertaken to integrate the e (electronic)-Minerals Yearbook (e-MYB) into the MIN4EU database, review technical solutions and feeding data flow.

This report is partially based on Deliverable D5.3.1 Specification of steps needed for the integration of the e-Minerals Yearbook in the Minerals4EU database.



TABLE OF CONTENTS

1	OVERVIEW.....	4
2	E-MYB DATA MODEL	5
3	UPDATES AND VERIFICATION OF RESOURCES, RESERVES AND EXPLORATION DATA IN E-MINERALS YEARBOOK	7
4	STORAGE, CONTROL AND HARMONISATION OF DATA BY BGS.....	8
5	TRANSFER OF VALIDATED/HARMONIZED DATA TO GEUS AND THEIR VISUALIZATION ON THE EGDI MAP VIEWER.....	9
6	REFERENCES	11

LIST OF ILLUSTRATIONS

Figure 1. <i>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.</i>	4
Figure 2. <i>The e-Minerals Yearbook data model (v2020.8.02)</i>	6
Figure 3. <i>Welcome screen of a dedicated web application for collecting data on production, resources, reserves and exploration.</i>	8
Figure 4. <i>The e-Minerals Yearbook feeding data flow.</i>	9
Figure 5. <i>Example of e-Minerals Yearbook aluminium production data from 2004 presented on the EGDI web viewer.</i>	10

1 OVERVIEW

One of the main goals of the MINTELL4EU was to integrate the e-MYB with the overall data infrastructure of the EGDI, which forms the basis for the 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 are disseminated through the EGDI portal only and not through the Minerals4EU portal as at the end of 2021 the latter will not be operative anymore (**Napaka! Vira sklicevanja ni bilo mogoče najti.**).

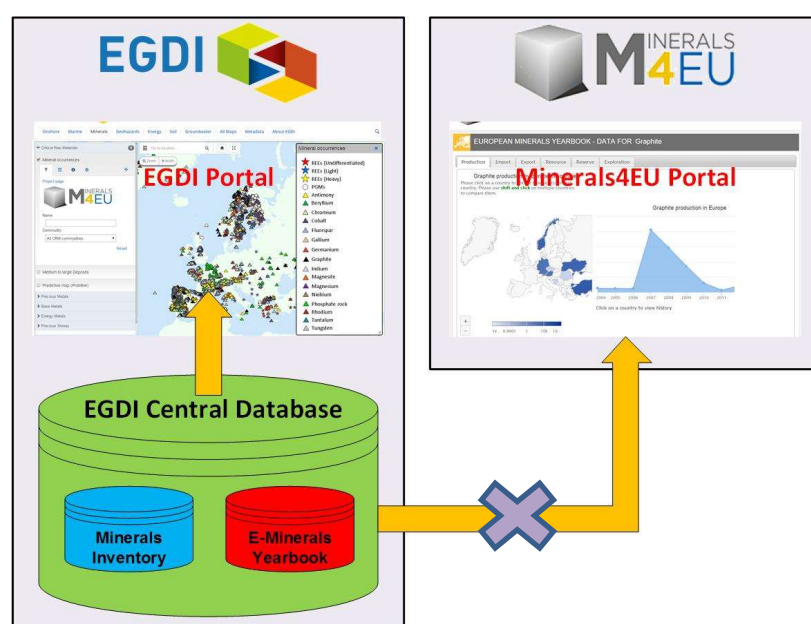


Figure 1. The end goal of MINTELL4EU is to integrate the e-MYB with the Minerals Inventory in the central EGDI database from which data are disseminated through the EGDI portal.

Currently, the MIN4EU DB joins two separate schemas:

1. **public** for MIN4EU DB (Minerals Inventory data) Tables and Views v2020.8.02
2. **myb** for E-mineral yearbook (E-myb data) DB Tables and Views v2020.8.02

Analysis of both schemas can be viewed on

https://db.geo-zs.si/M4EU_v2020.8.01/index.html.

Recommendations for this integration have been drafted in the ORAMA project and are described in more detail in ORAMA deliverable D3.1.

The INSPIRE data model didn't contain elements for aggregated statistical data about mineral resources that are required for the e-Minerals Yearbook hence two possibilities were exploited by the ORAMA project:

- The EarthResourceML-Lite (ERML Lite) approach, schemas that take the form of a flat table of attributes.



- The Operations and Maintenance (O&M) approach planned maintenance actions aimed at preventing breakdowns and failures before they occur.

The ORAMA recommendation (established by a group of experts during the first ORAMA Progress Meeting in Ljubljana, Autumn 2018) was to develop a separate / specific schema based on ERML with extensions mainly because ERML is well known by providers and thus easier to use. It was built as an extension of the Minerals4EU data model, now called MIN4EU database, as a part of EGD database.

2 E-MYB DATA MODEL

To build the new e-Minerals Yearbook data model the following list briefly summarizes the main properties to be considered (based on British Geological Survey (hereinafter referred to as BGS) templates used in the Minerals4EU H2020 project):

- Country
- Year
- Commodity (final commodity list between INSPIRE MR/CGI CommodityCodeValues and BGS list of commodities was coordinated in the best way possible, with a probable loss of precision, BGS list being more detailed for some commodities)
- Classification System (JORC, NI43-101,...including UNFC, etc....)
- Classification sub-categories (inferred, indicated, measured, probable, proven, including UNFC_E, UNFC_F and UNFC_G categories, etc....)
- Quantity (value + unit)
- Statistical Type
 - Production
 - Resource
 - Reserve
 - Exploration
 - Number of active licenses
 - Number of licenses issued
 - Number of companies exploring
 - The area covered by exploration licenses
 - The amount of expenditure incurred
 - Trade (data not harvested, only provided by BGS for diffusion)
 - Import data
 - Export data
- Note/Comment

A new e-Minerals Yearbook (e-MYB) data model (DM) was created (Figure 2), reusing parts of the data model on BGS website for production and trade (import and export data), and extended to evaluate and report data on resource and reserve using UNFC classification as one of the methods used option. This DM was jointly developed by BGS, Geological Survey of Denmark and Greenland (hereinafter referred to as GEUS), Geological Survey of Slovenia (hereinafter referred to as GeoZS) and Bureau de Recherches Géologiques et Minières, France (hereinafter referred to as BRGM).





3 UPDATES AND VERIFICATION OF RESOURCES, RESERVES AND EXPLORATION DATA IN E-MINERALS YEARBOOK

The proposed harvesting procedure for aggregated statistical data was not implemented within the MINTELL4EU project and was omitted since many national providers such as Geological Surveys had no IT staff to create dedicated WFS services. Nevertheless, the concept of harvesting eMYB data was technically proved using GEUS test data, which shows that this solution could be used in the future.

Instead, GeoZS set up a Web interface (Figure 3) called “Mintell4EU minerals survey”, where data on **resources, reserves and exploration** was obtained on a country level. Through assigned passwords, each data provider was able to view and enter new data for their country. Only GeoZS and BGS had administrative rights for data management. The work process was following a sequence of six sub-steps:

- Step 1: Update the list of data providers
- Step 2: Development of a revised BGS questionnaire
- Step 3: Setting up the web interface
- 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 assessment 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 on EGDl

In addition, a user was able to provide data relating to mineral production using this survey form also. Any new mineral production data provided using this form was supplied to the BGS for their annual publication World Mineral Production in addition to the update of the online European Minerals Yearbook.

The INSPIRE code list of commodities (unique for both schemas, public and myb) was used at the data collection step. Guidelines (Appendix I of this report) were created to ease data providers provision of data through the web application.

Data were stored in a separate database in MS SQL built up upon the MYB schema and transferred to database in PostgreSQL for publishing of these data on EGDl.



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Welcome to the Mintell4EU minerals survey

Thank you for accepting the invitation to take part in this survey. The purpose of this survey is to obtain the data necessary to update the online [European Minerals Yearbook](#), created in 2015 by the Minerals4EU project.



In the following pages you will be asked to provide statistical data relating to the mineral resources and reserves for your country at a single point in time (31 December 2019). These data should represent as complete a picture as possible within your knowledge, including any estimated figures as well as data reported by companies. The data themselves can be of any age, in other words they could be estimates or reported figures from earlier years, if you believe these resources still exist but more recent data are not available. The resources and reserves data can be compliant with international systems of reporting (e.g. PERC, JORC, UNFC, etc.), or compliant with your country's national reporting code, or estimates which are not compliant with these systems. The system of reporting will also be recorded where there is one.

You will also be asked to provide information regarding mineral exploration activities in your country during the calendar year of 2019. You will have the option to record these activities according to the following metrics: exploration expenditure, number of active licences, number of new licences issued, area covered by exploration activities and number of companies undertaking exploration.

In addition, should you wish to do so, you can also provide data relating to mineral production using this survey form. Any mineral production data you provide using this form will be supplied to the British Geological Survey (BGS) and may be used in their annual publication *World Mineral Production* in addition to the update of the online *European Minerals Yearbook*.

By providing your country's data, of all types, using this survey form you are also providing your consent for these data to be handled, processed and used by GeoZS, BGS and Mintell4EU consortium partners for the purposes of updating the online *European Minerals Yearbook*. These statistical data may also be utilised by the [European Geological Data Infrastructure \(EGDI\)](#) and the [Raw Materials Information System \(RMIS\)](#).

Your personal data collected during the survey, will be stored securely by the Mintell4EU consortium partners and will only be used for the purposes of this survey.

Thank you for taking part.

[Guidelines](#)

[Continue](#)

Figure 3. Welcome screen of a dedicated web application for collecting data on production, resources, reserves and exploration.

4 STORAGE, CONTROL AND HARMONISATION OF DATA BY BGS

GeoZS sent the data on resources, reserves, exploration, UNFC and production (if available) in the form of Excel sheets to BGS to do the quality assessment (QA).

Upon QA, GeoZS updated the MS SQL DB containing validated data through SQL commands, generated from validated Excel sheets. The version was transformed to PostgreSQL database, which was then sent to GEUS.

Only the production data went through BGS' usual quality control and standardisation procedures. Resources and reserves data were not 'standardised' (nor 'harmonised') because that needs to be done by the data providers. This is because the harmonising process needs additional information that BGS will not have access to. BGS did however perform some quality control work (through direct contact with data providers) to ensure it is presented in an appropriate way on the EGDI.

5 TRANSFER OF VALIDATED/HARMONIZED DATA TO GEUS AND THEIR VISUALIZATION ON THE EGD MAP VIEWER

Production & trade data:

- BGS already delivers production and trade data via its website (and will continue to do so). Until now, BGS made data available to BRGM for the e-Minerals Yearbook as part of the Minerals4EU database. The last update was published by BRGM on the 'Minerals4EU' Knowledge Data Platform website in Dec. 2020. Meanwhile, the corresponding functionalities were being developed in the EGD web portal. Consequently, BRGM confirmed in early 2021 that the maintenance of Minerals4EU website and database will be stopped. All activities for publishing data will now be redirected to the EGD as the main infrastructure where information on European mineral resources are presented.
- Mapping data into the eMYB is performed directly by BGS, who collect data on mineral production and trade (import, export) and incorporates them into the BGS World Mineral Statistics DB. Via a WPS service, these data are extracted and sent to GEUS for inclusion into the MIN4EU database for presentation on the EGD.

Resources/reserves/exploration data:

- In parallel, GeoZS collected data on resource, reserves and exploration for the reference year 2019 via the online application described above. These data were gathered in a separate MS SQL database, which, after final Quality Assessment performed by BGS, was transferred to database in PostgreSQL. In that form, data were easily added to the central MIN4EU DB.

In short, validated data of the 5 types of data, coming from two different DBs (exploration, resources & reserves data, BUT NOT PRODUCTION, from the BGS Copy of the harvested DB, and production and trade data from the BGS website DB), was provided by BGS and GeoZS to GEUS for the update of the previous version of the e-MYB via a web service based on the Min4EU e-Minerals Yearbook data model (Figure 4).

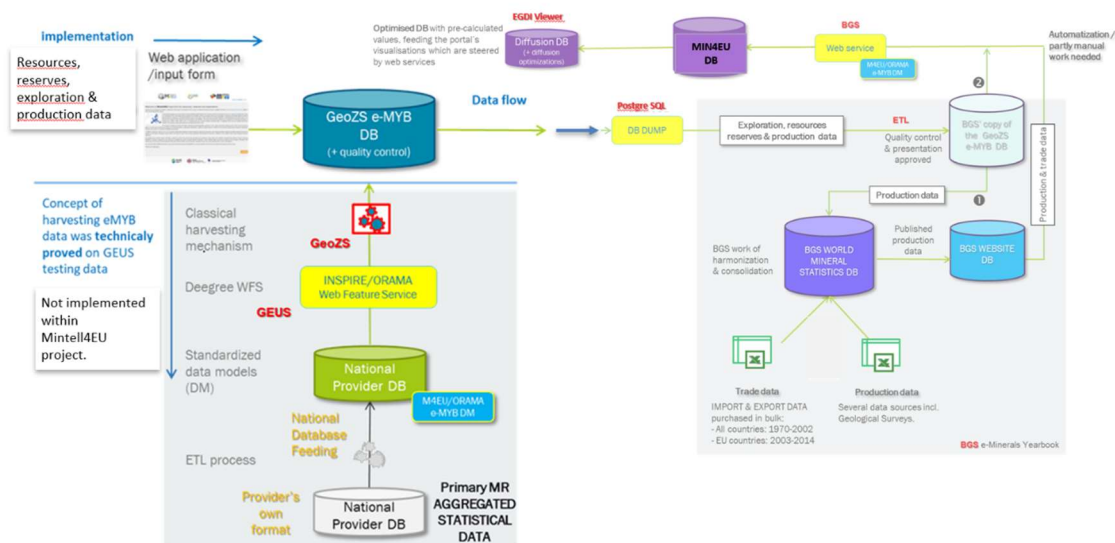


Figure 4. The e-Minerals Yearbook feeding data flow.



Production, import, export, reserve, resource and UNFC data that are collected as part of the e-Minerals Yearbook, are presented on the EGDI map viewer as separate map layers (Figure 5) and can be easily compared to single deposits and mines.

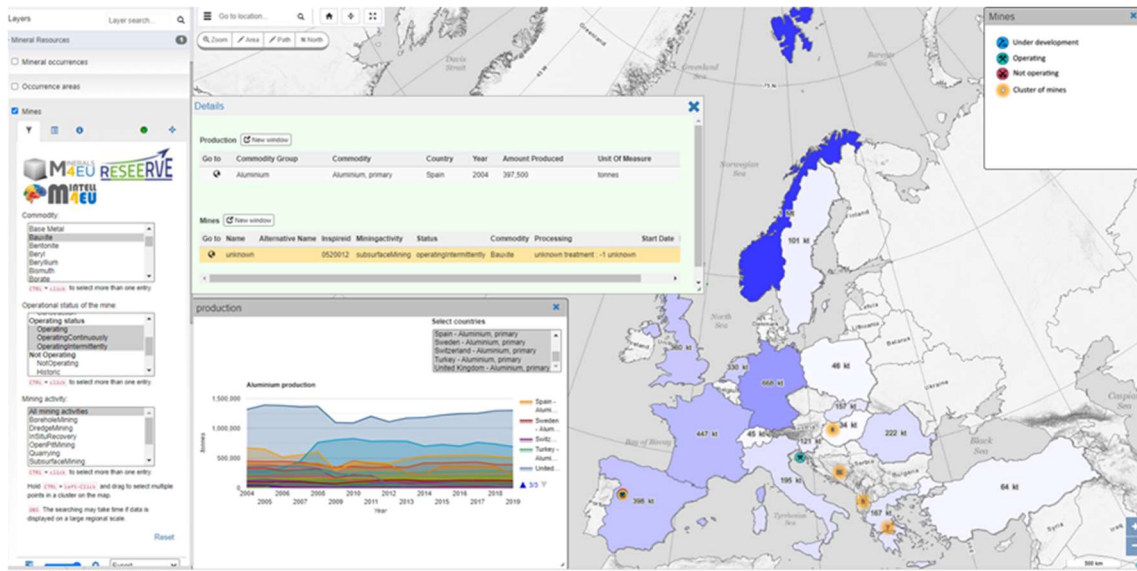


Figure 5. Example of e-Minerals Yearbook aluminium production data from 2004 presented on the EGDI web viewer.



6 REFERENCES

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