RBINS-CRM-A

Contribution of the Geological Survey of Belgium to the Critical Raw Material act.

Final Report

Contractnr : EC/24RBINS/CRM

RBINS-CRM-Act

Royal Belgian Institute of Natural Sciences, Operational Directorate Earth and History of Life, Geological Survey of Belgium

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NETWORK

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PROJECT WEBSITE, SOCIAL NETWORKS …

A dedicated webpage on gsb.naturalsciences.be is under construction.

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1. EXECUTIVE SUMMARY of this report

The aim of the project is to assume the role of national coordinator for reporting on the establishment of a national exploration program to the European Commission, as well as to develop and continuously update the national Critical Raw Material (CRM) database in accordance with CRM legislation guidelines.
The project can be divided into different tasks: The development and submission of a National Exploration Program for Belgium, adapting and developing the national CRM-database of the GSB according to the guidelines of the CRM legislation, gathering and evaluating of existing geological information and of the collections and executing of additional essential geochemical analysis.
It should be emphasized that this project is just a first step in developing and execution of the Belgium National Exploration Program including the development of a CRM-database.

During the project the GSB has taken up the role of national coordinator for the development and the reporting of a national Critical Raw Material exploration program to the European Commission and submitted the established Critical Raw Material National Exploration Program (CRM-NEP) to the responsible political levels. Within the developed CRM-NEP an overview of all necessary geoscientific exploration activities, including the development of CRM maps, models and databases are listed. These activities are defined conform the CRM act guidelines and are scientifically backboned with past research/knowledge on the subsurface of Belgium.
A new Belgian CRM database has been developed based on the architecture of the existing national INSPIRE-compliant m4eu database. This database has been populated with the data from the GSB's CRM-Atlas database (+/- 300 points) as well as data from a recent study considering phosphate deposits in Belgium and Northern France (+/- 80 points). Preliminary maps have been made aiding with the interpretation of the data and as a starting point to update the CRM-Atlas of Belgium (published in 2024 by GSB), as foreseen in 2026.
Finally, more than 1.800 LIBS analyses are being conducted on Pb-Zn ores, which contain a range of critical raw material commodities. These analyses still need to be integrated in the new developed national CRM database.

2. ACHIEVED WORK

Development of a National Exploration Program:
The GSB has assumed the role of national coordinator for reporting on the establishment of a national exploration program to the European Commission.
- A kick-off meeting with the responsible regional authorities (Department of Environment and Spatial Development of Flanders (dOMG), and the Geological Survey of Wallonia (GSW)) was organized at the GSB on the 17th of January 2025
- A second online meeting took place on the 27th of March to further discuss the content and governance of the NEP activities with the responsible regional authorities
- The final CRM National Exploration Program, on which all consortium partners agreed on, was submitted under coordination by GSB the 27th of May 2025 to the responsible Cabinets for approval.

The Belgian National Exploration Program (NEP) envisions the development of an aligned, science-

based, and sustainable management system for Belgium's critical raw materials, in support of the EU Critical Raw Materials Act and of decision-makers and policy advisors involved in the management and regulation of primary critical raw materials. By identifying subsurface resources and defining their potential for responsible exploitation, the NEP aims to contribute to reducing Belgium's import dependency, strengthening national and regional resilience, and fostering long-term socio-economic development and innovation. Moreover, geological exploration is an essential tool to de-risk policy makers decisions at the relevant political level about Belgium's subsurface potential.
The Belgian NEP is coordinated by the GSB and carried out in collaboration with the Department of Environment and Spatial Development of Flanders (dOMG), and the Geological Survey of Wallonia (GSW). A cornerstone of the NEP is the creation of high-quality, harmonized national geological datasets and CRMA-compliant national thematic maps

The submitted NEP report gives a summary of the up-to-date knowledge base on the different CRM present in the subsurface of Belgium, with as a major guideline the 'CRM atlas of Belgium' published in 2024 by the GSB. This includes a list of existing databases, maps and archives, a summary of existing sample collections, geophysical data from aero magnetic, radiometric, gravimetric and seismic reflections executed and an outline of previous geochemical campaigns.
The report finally gives an overview of recommended future geoscientific exploration activities to identify and map critical raw materials in Belgium. This is subdivided in exploration areas. For each area the scope, objective and expected impact are summarized, including gaps identified and exploration techniques to fill these gaps.

Adapting and developing the national CRM-database of the GSB according to the guidelines of the CRM legislation*:*
During a first technical meeting with regions (10/02/2025), the CRM-act and the m4eu were presented. The scope of this technical meeting was how to exchange information between the GSB and the regional authorities, which data needed to be supplied, and in which format the data should be delivered. It has been decided that the newly developed Belgian CRM database will follow the database architecture of the existing INSPIRE-compliant GSB m4eu database. This m4eu database consists of 136 tables (figure 1), though not all are applicable to the Belgian context. Additionally, nearly half of the tables contain code lists with brief explanations and links to the INSPIRE website for more detailed definitions. A strategy has been defined for populating the newly developed Belgian CRM database, and several scripts have been developed and tested. All the datapoints in GSB's already existing Belgian critical raw material atlas database have been reviewed, compared, and integrated into the newly developed (m4eu-inspired) Belgian CRM database, with in total around 300 new points.

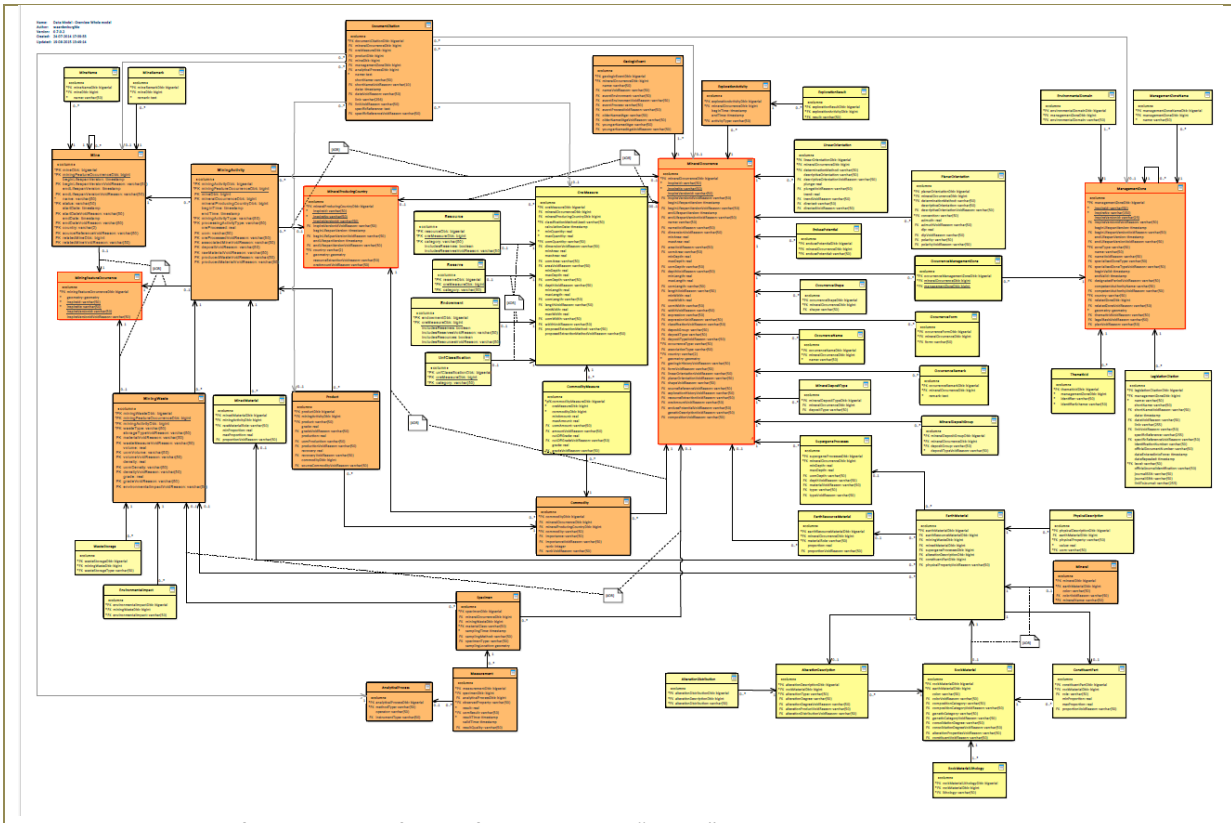

Figure 1: overview of the links and fields of the database "m4eu"

It was not always possible to copy all data available for a datapoint one on one, because some of it has to be translated to the INSPIRE nomenclature or saved in different (sub)tables. Moreover, while filling in the database some issues with the INSPIRE nomenclature were encountered. Experiences and problems were discussed in a follow-up meeting with the regions on 12/05/2025. The meeting also served to align the different parties. The strategy for populating the national CRM database made during the first meeting has been refined taking into account these experiences and problems. Some mandatory fields were indicated: a unique ID (UUID), geographic information, name and the commodities of the datapoint. Apart from this, references of the datapoint have been given a high priority as this enables to review the data and facilitates to populate empty fields of the datapoints later on. Other selected fields are the geological events, processes and geological time of the deposits.

Several important issues still need to be resolved, such as how to link with active databases. It is important to find a way to connect the Belgian CRM database with existing databases and platforms (such as the DOV platform), because this would ensure that new data can be added easily and consistently in the future. Additional challenges to deal with are how to integrate and interpretate different kinds of analyses. In close relationship with this is how to determine the threshold values of a commodity. Finally, there are inconsistencies in how countries apply the INSPIRE classification. To address these issues, we propose organizing a workshop with the collaborating neighbouring countries. The goal would be to harmonize interpretations and ensure a uniform approach across borders.

Gathering and evaluation of existing geological data

For the gathering and evaluation of existing geological data, the GSB's national database of the Critical Raw Materials Atlas served as the foundation. As mentioned all the datapoints of GSB's critical raw material atlas database have been reviewed, compared, and integrated into the newly developed (m4eu-inspired) Belgian CRM database. Following the meeting of 12/05/2025, all references for the CRM-Atlas datapoints have been added to the database as well.

Furthermore, a general list of the processes, events and period for each deposit type and commodity of the CRM-Atlas datapoints has been made. In a next step the occurrences will be grouped according to this list and entered in the database. To facilitate future interpretation a framework for geological events, processes and time frame has been constructed. This framework encompasses the most important geological events in Belgium following inspire nomenclature and can be used to translate to the different deposits.

Preliminary maps have been made in the format of GIS layers (figure 2). These maps together with the afore mentioned geological framework will help to divide the data points for each critical raw material in subgroups based on geological events, processes and geological time as such enabling further filling the database of these points. In a later stage these layers will be adapted for the update of the CRM-atlas, foreseen in 2026 and as a base for newly to develop CRM NEP geoscientific actions (defined in the CRM NEP).

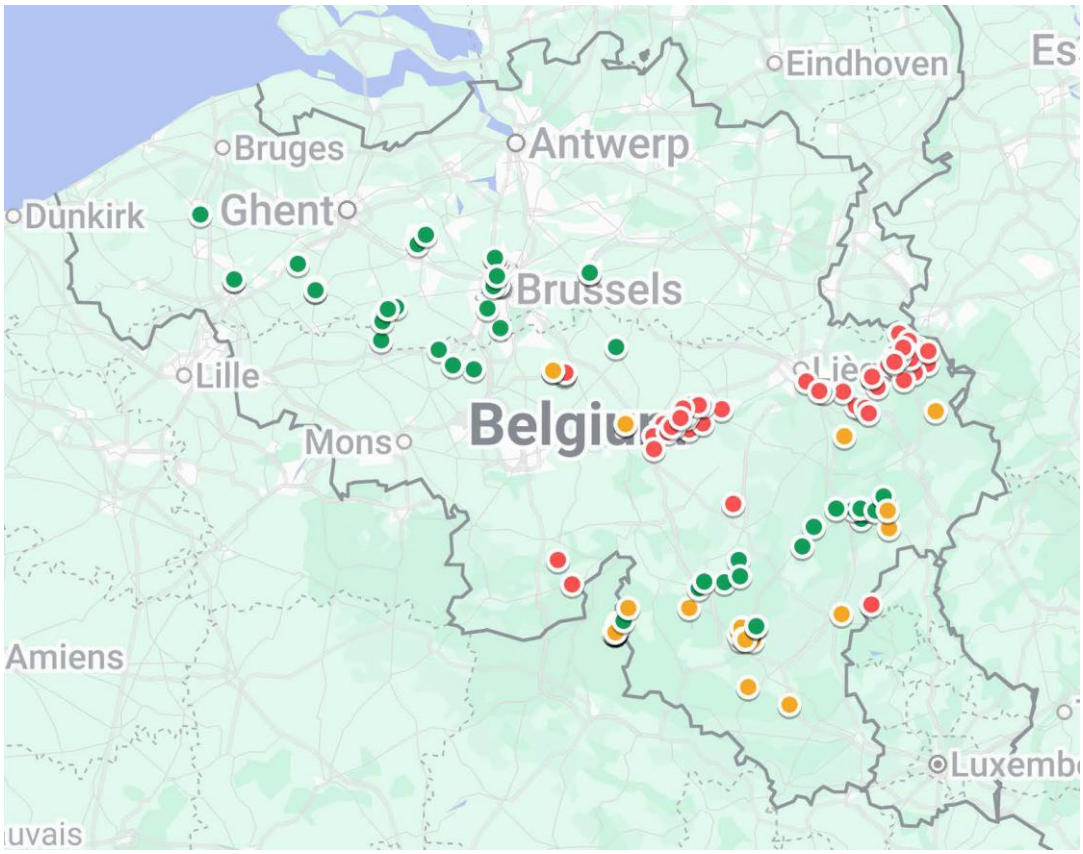

Figure 2: Preliminary map of Au (yellow), Cu (green) and Pb (red) occurrences in Belgium

Looking at integrating data from the collections, some challenges have been encountered, as the samples are organized by mineral name rather than by commodity (Figures 3 and 4). This poses particular difficulties for commodities that are typically present in small amounts or only as trace

elements, such as silver, germanium, and gallium.

Figure 3: plate of the collections with galena minerals

Figure 4: sample of barite mineral

In the frame of this project, it was not feasible to perform chemical analysis on all samples in the collection to determine which commodities are present. Therefore, a selection of more than 1,800 lead-zinc samples has been made and investigated using LIBS.

Lead-zinc deposits occur in various minerals and deposit types, with a wide range of host rock types spread across a large geographical area. Additionally, they are known to contain other commodities such as Fe, Cu, Mn, Ag, As, Tl, Ge, and Ni, among others. The selected samples were chosen to represent the diverse lead-zinc mineralogy found in Belgium (Figures 5 and 6). The data from the analysis are not yet integrated in the newly developed Belgian CRM database.

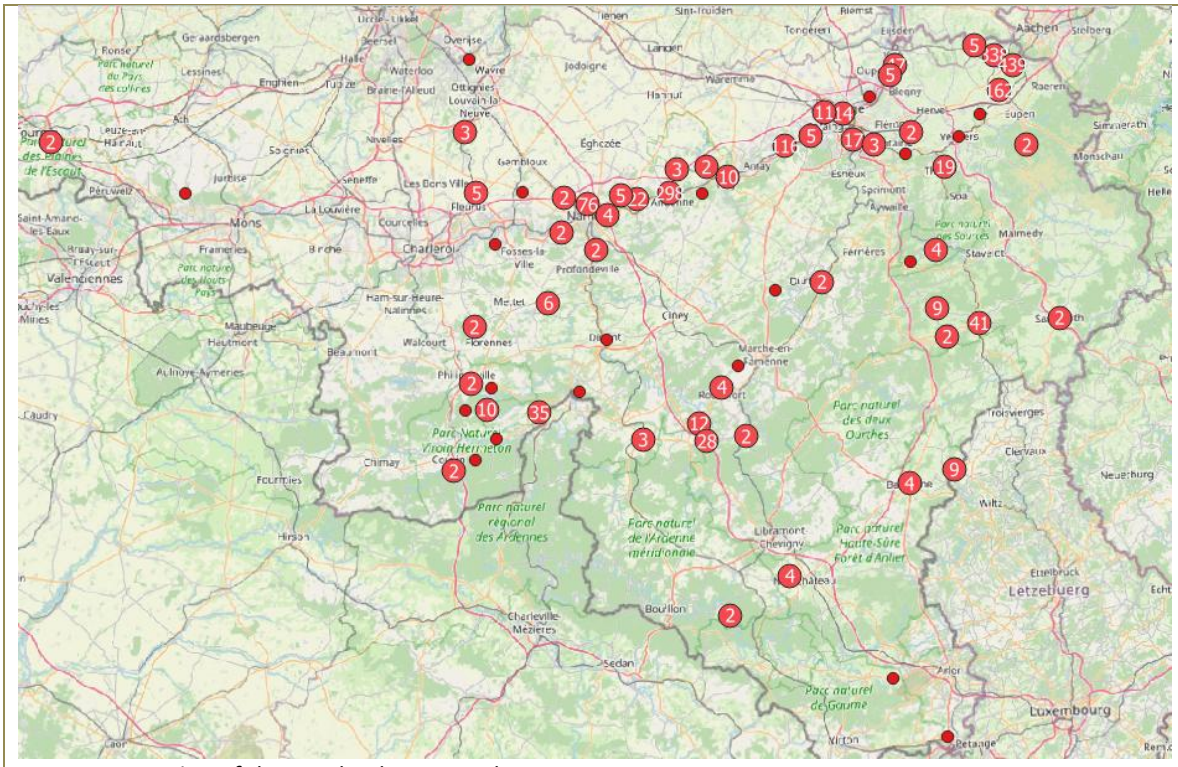

Figure 5: Location of the zinc-lead ore-samples

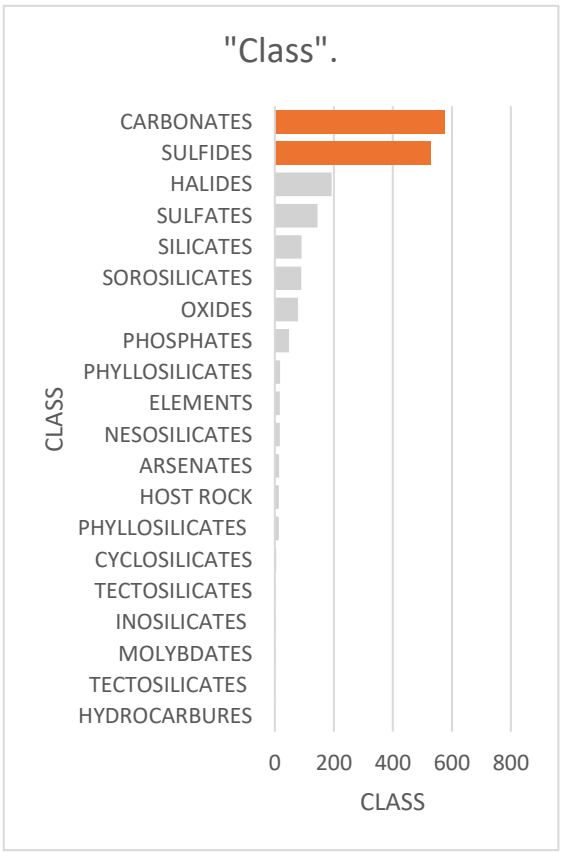

Figure 6: number of samples for each mineral class

To support the creation of prospective phosphate maps for Belgium and northern France, we have compiled a comprehensive literature review and database on phosphate deposits and occurrences in the region (figure 7). This work builds upon existing databases from the Geological Survey of

Belgium and incorporates data from the European ProMine and FRAME projects. As part of the GSEU raw materials initiative, it contributes to regional-scale resource assessments for selected provinces and aids in the development of pan-European maps evaluating the potential and favourability of onshore resources for energy-critical and high-technology elements.
The database provides a structured, geographically classified compilation of information on phosphate deposits and occurrences, including their location, geological age, associated commodities, lithologies, and mineralogy. Additionally, it documents past and potential future mining activities, detailing recorded mining operations, deposit sizes, phosphate and by-product concentrations, and supergene alteration. The database has been developed in compliance with INSPIRE specifications. These data have been compared with the newly developed Belgian CRM database and have been partly integrated into this database (+/- 80 points).

From this work, some future actions on phosphate deposits have been identified (extra funding is needed to develop these actions as part of the NEP):

- Gather additional information from local entities. For instance, it is suggested that many more archives may be retrievable in the Liège province.
- Conduct further comprehensive studies on the formation of deposits: sediments associated with chalk are not yet well understood in the Paris Basin.
- Investigate the link between supergene alteration and phosphate deposits/occurrences.
- Improve the information inventory regarding past mining activities.

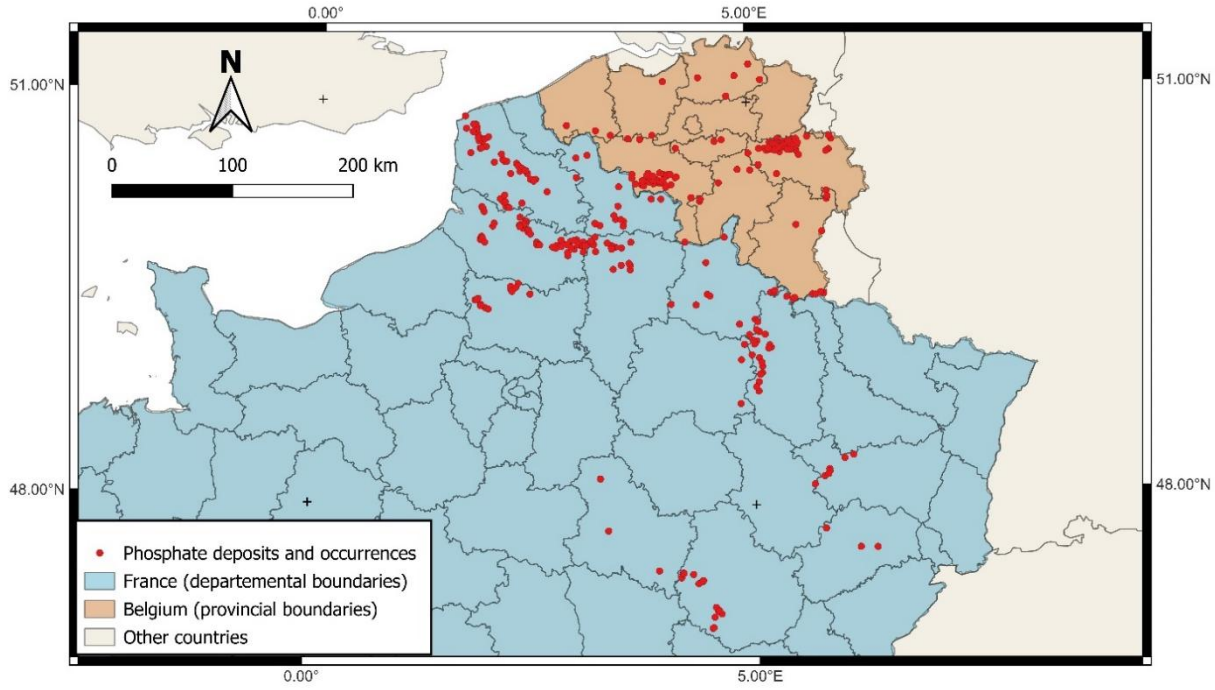

Figure 7: Location of phosphate deposits and occurrences.

3. SUPPORT TO DECISION MAKING

- S. Decrée has presented the activities of the GSB at Fod Economy for the visit of a South-African delegation (Exchanges on the Implementation of the BE CRM Strategy) (December 11th 2024)
- S. Decrée attended the meeting about the EU partnership on December 10 2024, in the frame of the Raw Materials Week
- S. Decrée participated actively and provided expertise for Fod Economy regarding an exercise about graphite risk supply organized by the International Energy Agency on December 13 2024.
- V. Heyvaert participated to the first BE-coordination meeting on the CRM act, representing the BE subgroup on National exploration, coordinated by Fod Economy in 12th February 2025
- V. Heyvaert participated to the EU meeting of the Exploration subgroup of European Critical raw Material Board, representing Belgium, from 05-07/05/2025 in Krakow, Poland.
- V. Heyvaert participated to the second BE-coordination meeting of the CRM act, representing the BE subgroup on National exploration, coordinated by Fod Economy on the 23th of June 2025.
- S. Decrée participated to the Strategic stocks subgroup meeting - 22 May 2025, Brussels

Diffusion of the information – press release:

- "IN KAART - Zelf graven of blijven importeren? HoeEuropa worstelt met zijn grondstoffenstrategie " – VRT News – 02/03/2025
- "Le retour des mines en Wallonie pour les terres rares » - Le Vif – 16/04/2025
- "L'inévitable retour des mines en Wallonie » - Trends Tendance – 01/05/2025
- "Gaan de mijnen straks weer open in Wallonië?" – De Standaard – 25/06/2025
- "Carte: et si la Belgique était une mine d'or… de lithium et autres métaux rares » - RTBF News – 05/07/2025