FRAME
FORECASTING AND ASSESSING EUROPE'S STRATEGIC RAW MATERIALS NEEDS

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Issue 3, June 2019

M12! Twelve months of work and a third of the way through the project

Tangible project results are beginning to surface in FRAME. WP3 (Critical and Strategic Raw Materials Map of Europe), WP4 (Critical Raw Materials in phosphate deposits, and associated black shales), WP6 (Conflict free Nb-Ta for the EU) and WP7 (Historical mining sites revisited) have all identified the next steps and courses of action and are gearing up to analyse data and or deliver their first maps. Perhaps the most notable is the completion of our Battery Critical Elements Map of Europe – work carried out under WP5 (Energy Critical Elements). This remarkable achievement means that at this stage all project partners have submitted data and all MREG and EuroGeoSurveys members that have data have also submitted data. WP8 (Link to Information Platform) is reaching out to establish networking contacts and homogenisation criteria amongst FRAME partners but also the other GeoERA projects as well as other (ongoing) H2020 projects, e.g. ORAMA.

The FRAME WP leaders met at NGU in Trondheim in a B2B meeting with the Mineral Resources Expert Group of EuroGeoSurveys. This meeting was used as a measure of what has been done and what needs to be done in order to secure deliverable due dates. Work is progressing well and communication/interaction between partners is at a maximum.

Daniel de Oliveira, FRAME Project Coordinator

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Phosphate deposits and sustainability

Sophie Decrée, WP4 Leader, RBINS

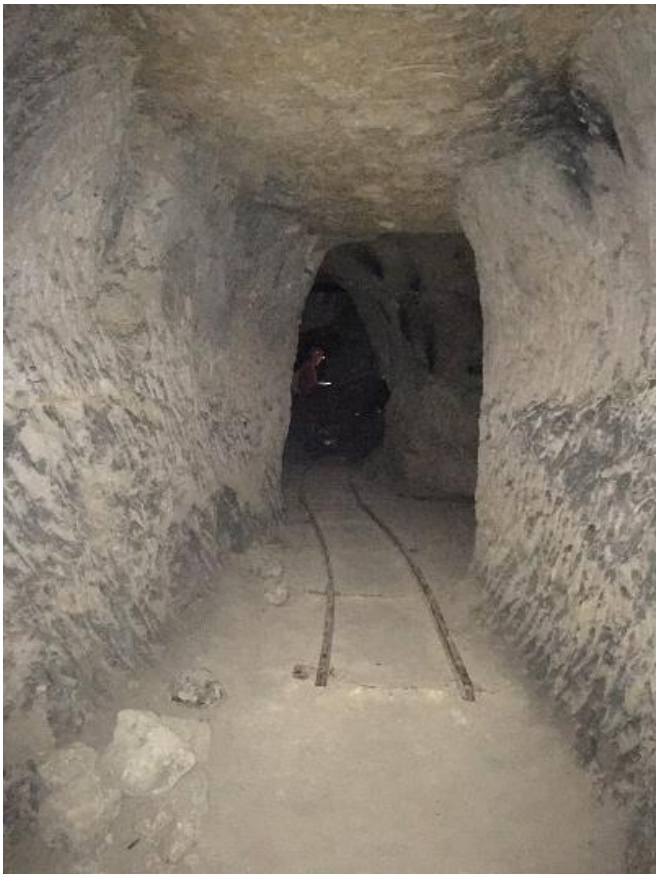
There is a real concern about how to foster new mining activities in Europe in order to ensure a sustainable supply of raw materials from European sources. An issue that is frequently raised relates to the sustainability of mines, regarding different aspects as societal impacts, environmental issues, and preservation of the landscapes.

One of the ways to contribute to sustainable mining is surely to consider and valorize all the commodities – i.e., the main resource of the deposit and economically interesting by-products - that are present in the deposit.

Phosphate deposits constitute a good example of how this question can be tackled. First, phosphate rocks are listed as Critical Raw Materials (CRM) by the EC since 2014. Phosphate – under the form of apatite - is mainly used to produce fertilizers (82% of the production). It is consequently needed to satisfy the growing demand for food related to the growth of the world population.

Europe is a net importer of phosphates, as it is for other by-products that can be potentially recovered from phosphate mineralizations, namely the Rare Earth Elements, Fluorspar and Vanadium.

Apatites in an Archean carbonatite - Siilinjarvi deposit (Finland)



Abandoned phosphate underground exploitation (Cretaceous phosphorites) - La Malogne (Belgium)

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The recovery of these elements, which are also listed as CRM, is quite easy and can be achieved during the processing of phosphate. In addition, it causes less damages to the environment compared to extraction from more conventional deposits where these raw materials are usually found.

This practically means that opening a new phosphate exploitation in Europe would help to ensure a supply in a few CRM through a combined and rational exploitation of these resources, with few processing adaptations, and limited impacts on the environment. This is clearly in agreement with the concept of sustainable mining.

Of course, this requires a lot of preliminary works to investigate the question of the abundance of all these commodities in the deposits, which vary largely from one mineralization type to the other (phosphorite formed in a sedimentary context vs. igneous type, for instance). FRAME (via its WP4 "Critical Raw Materials in phosphate deposits and associated black shales") contributes actively to this task, through the assessment of economic potential of igneous and sedimentary phosphate deposits in Europe, especially regarding CRM.

Pockets enriched in phosphates in Pietra Leccese (Tertiary) - Salento Peninsula (Italy)

References:

EC (2015a). Report on Critical Raw Materials for the EU. Report of the Ad hoc Working Group on defining critical raw materials. Ref. Ares(2015)1819503 - 29/04/2015

EC (2015b). Report on Critical Raw Materials for the EU. Critical Raw Materials Profiles. Ref. Ares(2015)3396873 - 14/08/2015

Emsbo, P., McLaughlin, P. I., Breit, G. N., du Bray, E. A., & Koenig, A. E. (2015). Rare earth elements in sedimentary phosphate deposits: solution to the global REE crisis? Gondwana Research, 27(2), 776-785.

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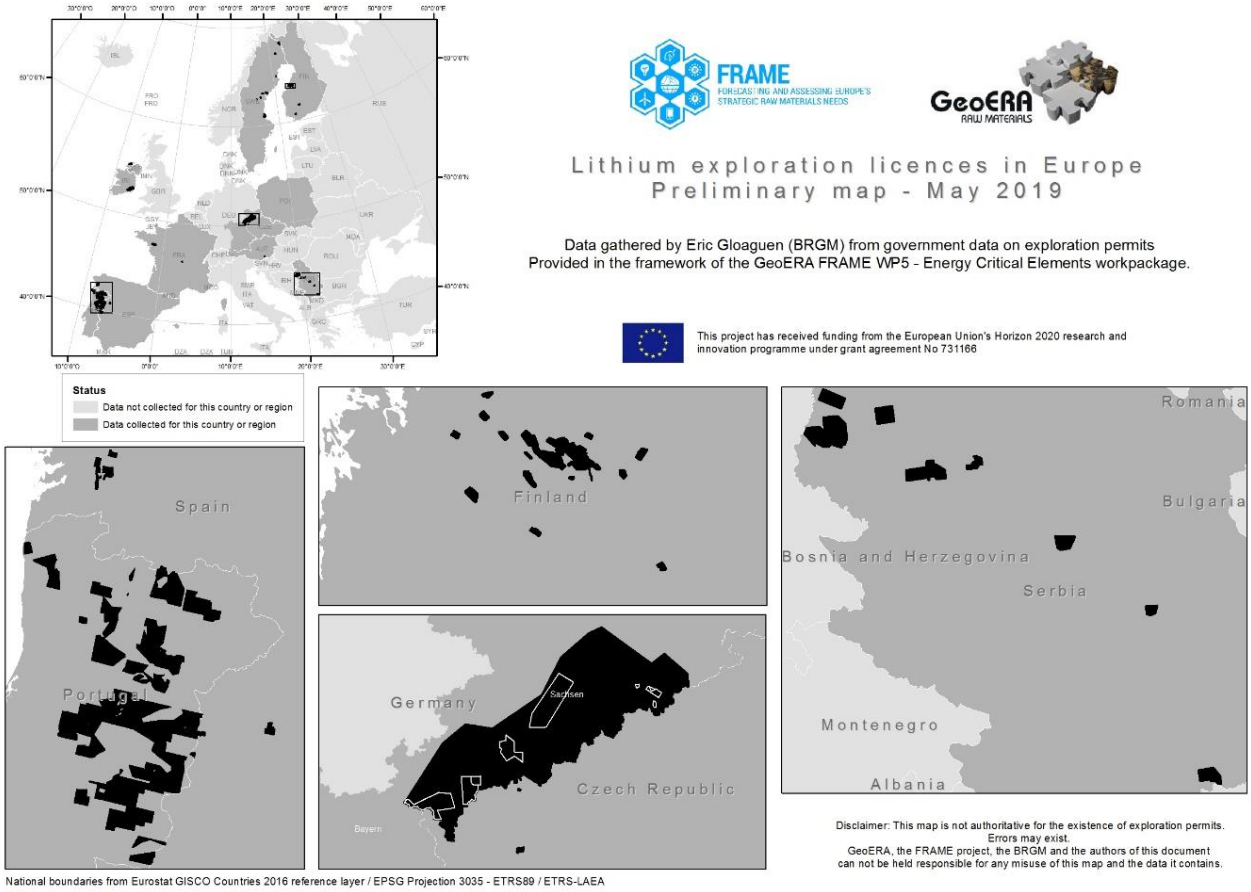
FRAME WP 5: Lithium rush as highlighted by Exploration permits throughout Europe

Eric Gloaguen (BRGM), Janja Knežević (NGU), Håvard Gautneb (NGU) and Tuomo Törmänen (GTK)

In the framework of the FRAME project, in addition to Europe-scale data on Li-Co-Graphite deposits and occurrences already collected, official published data on exploration permits for lithium granted by governments have been collected by the workpackage WP5 - European Critical Elements. Gathering of these data allow the drawing of a new and original maps for lithium exploration throughout Europe. This map highlights a clear lithium rush with a minimum of 217 valid exploration licences for lithium! At the European scale, these data show a relatively well-distributed exploration activity from North to South of Europe, which is an interesting element in a close supply perspective between the sources of primary Lithium resources and processing/consumption centers.

In detail, clusters of exploration permits appear logically in regions where deposits are already known: 83 licences in SW Finland (Länttä) and 28 in Sweden, 28 in Ireland (Leinster), German (11)-Czech Republic (8) boundary (Erzgebirge), North Portugal (23) - NW Spain (10) (Galicia), Serbia (12, Jadar). Conversely, several potential zones are still poorly covered by exploration permits, namely Austria (southern part) and France (French Massif Central, Armorican massif). Metallogenical and prospectivity maps that will be provided by the FRAME project will probably highlight new prospective zones for Li-Co-Graphite mineralisations.



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FRAME WP 6: Conflict free Nb-Ta for the EU

Helge Reginiussen & Erik Jonsson (SGU), Susana María Timón Sánchez (IGME sp), Rute Salgueiro (LNEG)

Because of their unique properties, the chemically related metals niobium (Nb) and tantalum (Ta) are essential components in a range of applications and products including electronics, steel alloys and superalloys required by European industry. Today, significant amounts of Ta and associated Nb are sourced as so-called conflict minerals from the central African region. On 1 January 2021 the Conflict Minerals Regulation will come into force across the EU meaning that importers of tantalum, tin, tungsten and gold must use due diligence on their supply chain to ensure that the minerals have been sourced responsibly. A main objective of work package 6 of FRAME is to do a survey of the pan-European distribution of the critical metals tantalum and niobium and enhance their exploration interest and potential to produce them ethically and indigenous to the Community.

Nb-Ta mineralisations, and most specifically those enriched in Ta, are typically associated with granites and specifically granitic pegmatites, known from the Palaeoproterozoic bedrock of the Fennoscandian Shield and several younger granites and granitic pegmatite fields in Europe (e.g. the Variscan belt of the Iberian Peninsula and the Massif central of France). Niobium is also present in pyrochlore-group minerals in carbonatitic as well as syenitic rocks, which have a more restricted distribution. In this work package, key areas and deposits on the Iberian Peninsula and in the Fennoscandian shield have been identified as possible candidates for more detailed studies and research. In some of these areas work has commenced, and they are briefly described below. Research on the selected deposits includes field and laboratory studies in which the ore mineralogy of Nb-Ta will be addressed to maximise the usefulness with regards to processing and associated evaluation parameters of their economic potential. Potential by-products, not least of other critical or strategic metals and minerals will be assessed; additionally, also Nb-Ta may be viewed as having potential in the form of by-products from some of these deposits, such as in the case of lithium-mineralised pegmatite systems. This survey and its outcomes aim to form the basis for developing recommendations for future exploration for these metals in Europe.

The Iberian Variscan Massif

The Nb-Ta mineralisations of the Iberian Peninsula (Fig. 1) belongs to the southwestern extension of the European Variscan Belt. From both an economic and a metallogenic point of view, the most interesting Nb-Ta deposits in Spain are those in which mineralisation occurs in small granites, as it appears in the deposits of Golpejas, El Trasquilón, in some occurrences of the Morille-Martinamor district, Fontão and Penouta.

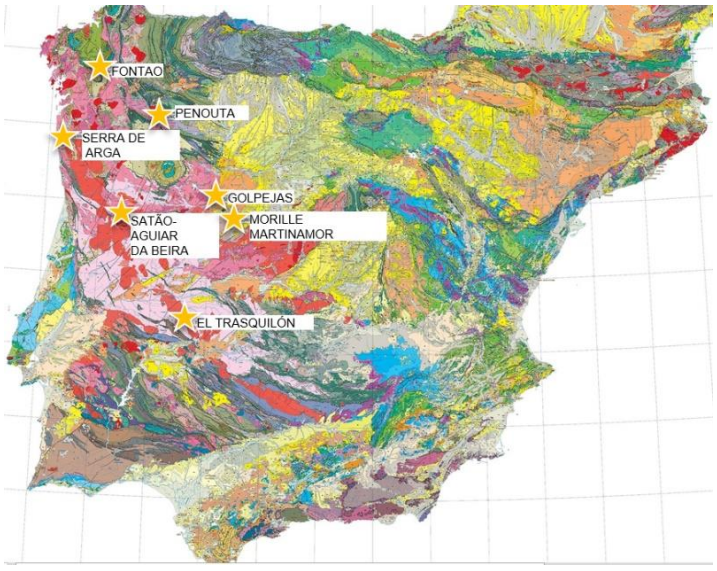

Fig. 1. Examples of Nb-Ta mineralisations in Spain-Portugal

These deposits have been exploited previously for Sn, Ta-Nb, and/or W. Penouta which is the biggest Ta-deposit in Spain was mined intermittently between 1906-1985.

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The mine has recently started reprocessing of old tailings. An important aim of work package 6 is to establish relationships between mineralisations and associated granitic rocks and develop metallogenetic models for their formation. In Portugal the mineralisations are located in the northern part of the country and also comprise Variscan granitic rocks, LCT-type (lithium-cesium-tantalum) pegmatites and associated placers. There are some Nb-Ta potential areas, which includes Serra de Arga and Satão (Viseu). As in Spain, the deposits were exploited for Sn, Ta-Nb and/or W, but also beryllium, quartz and feldspar. Columbite-tantalite production occurred between 1953-1984.

The Palaeoproterozoic Fennoscandian Shield

The majority of Nb-Ta mineralisations in Sweden and Finland are hosted by LCT-type granitic pegmatites (Fig. 2) that occur mainly in regions featuring abundant Palaeoproterozoic low to low medium-grade metamorphosed metasedimentary rocks and associated S-type granites.

Fig. 2. Large crystal aggregate of probably Mn-dominant columbite in situ in the Varuträsk pegmatite underground workings, Sweden. Photo: Erik Jonsson

Some of these have been studied during different (mainly Li-Sn) exploration campaigns. NYF-type (niobium-yttrium-fluorine) granitic pegmatites occur as individual dykes and fields throughout the Proterozoic bedrock of Sweden; notably the discovery location of tantalum was one of these granitic pegmatites. Research in work package 6 will focus on a few selected Swedish deposits and occurrences (Fig. 3) including Järkvissle and Bergby in central Sweden, as well as Stripåsen and other rare-element pegmatites in the Bergslagen province.

Fig. 3. Examples of Nb-Ta mineralisations in Sweden

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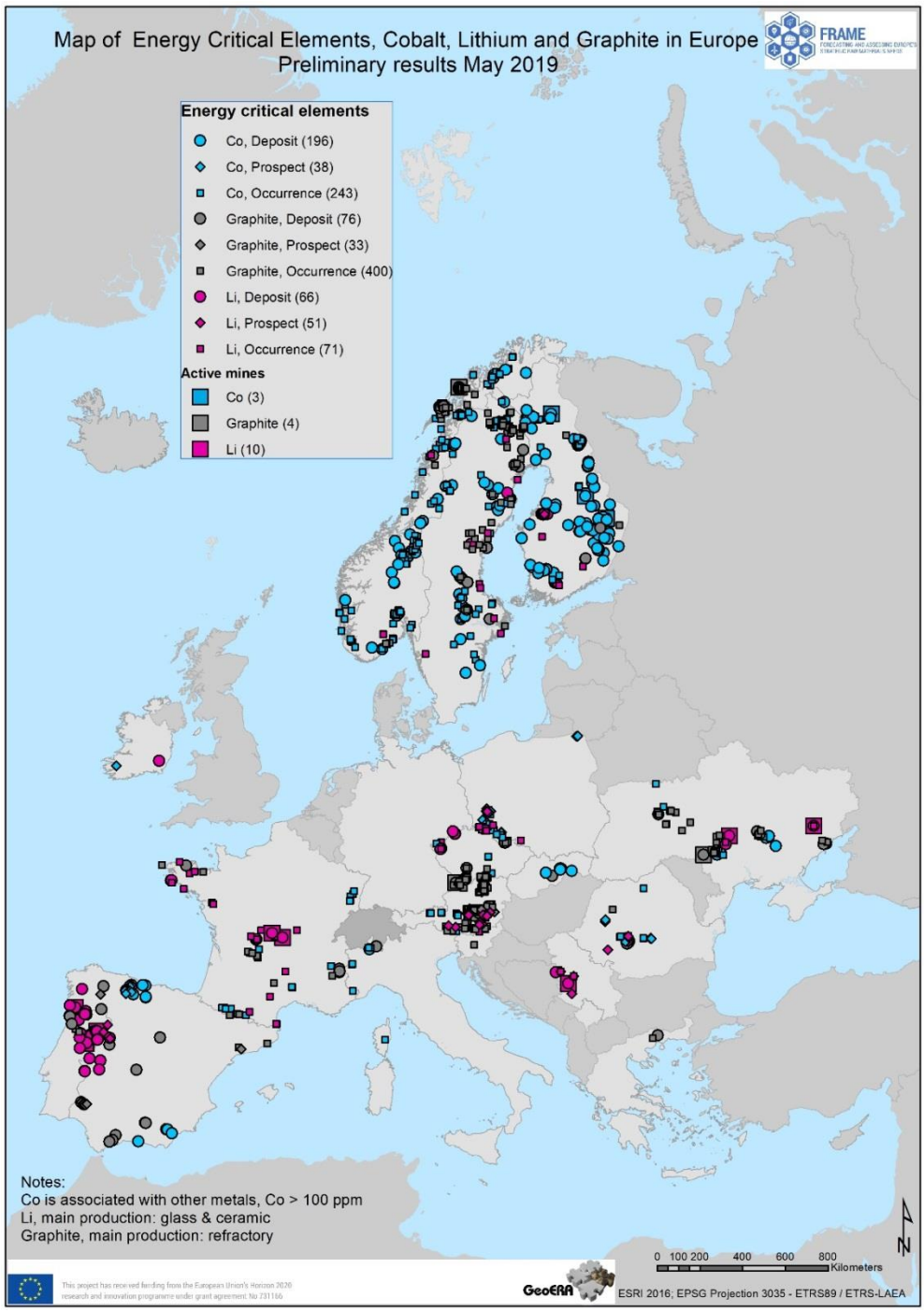
Updated version of the Cobalt – Lithium and Graphite deposit map

Janja Knežević (NGU), Håvard Gautneb (NGU), Eric Gloaguen (BRGM) and Tuomo Törmänen (GTK)

We are pleased to have received data from all FRAME partners and Eurogeosurvey members, that have deposits of these types. We can now see something that would be more closed to the final product.



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There are however some inconsistences and errors in the raw data that will be addressed. The genetic type of quite a lot of deposits are listed as unclassified. This must be improved if there should be possible to do any kind of mineral prospectively mapping (mpm) with the data.

The map is free to use for anyone in their own products if proper reference is given. We will however not distribute the complete raw data set to anyone outside FRAME at this stage.

The WP 5 leads thanks everybody that has contributed with data to this task, and hope for a continued successful cooperation.

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