FRAME
FORECASTING AND ASSESSING EUROPE'S STRATEGIC RAW MATERIALS NEEDS

Newsletter
JUNE 2019

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Issue3, June2019

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 in Europe), WP4 (Critical Raw Materials in phosphate deposits, and associated black shales), WP6 (Conflict Free for the EU) and WP7 (Historical mining sites revisited) have all identified the next steps and courses of action and are gearing to analyse data and or deliver their first maps. Perhaps the most notable is the completion of our Battery Critic Elements Map of Europe work carried out under WP5 (Energy Critical Elements). This remarkable achievement mea that at this stage all project partners have submitted data and all MREG and EuroGeoSurveys members that have da have also submitted data. WP8 (Link to Information Platform) is reaching out to establish networking contacts a homogenisation criteria amongst FRAME partners but also 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 Grou 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 maximum.

Daniel de Oliveira, FRAME Project Coordinator

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Phosphate deposits and sustainability

Sophie Decrée, WP4 Leader, RBINS

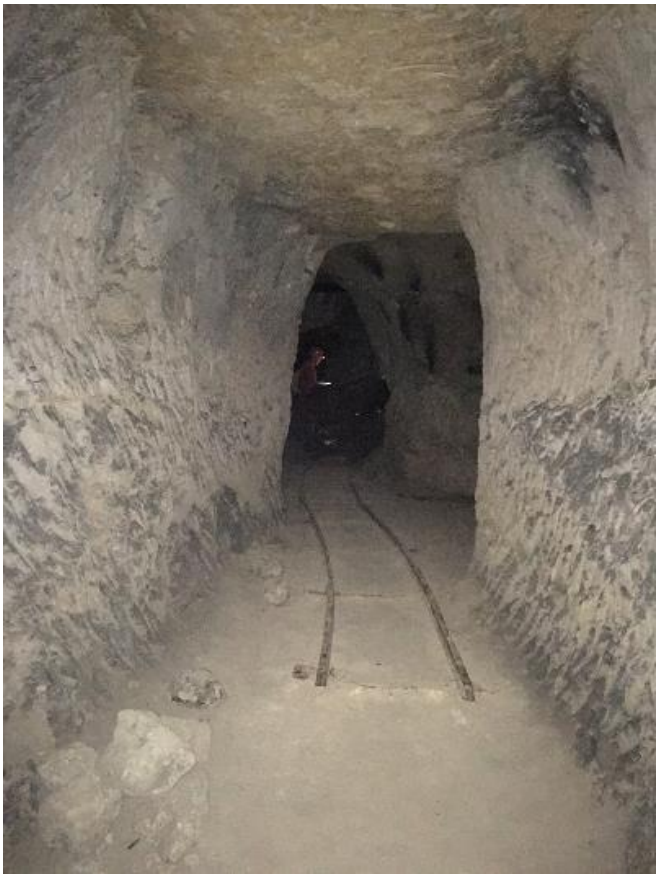
There is a real concern about how to foster new minir activities in Europe in order to ensure a sustainab supply of raw materials from European sources. An issu that is frequently raised relates to the sustainability c mines, regarding different aspects as societal impac environmental issues, and preservation of th 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 economical interesting by-products - that are present in the deposit.

Phosphate deposits constitute a good example of hc this question can be tackled. First, phosphate rocks a 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 f food related to the growth of the world population.

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

Apatites in an Archean carbonatite Siilinjarvi deposit (Finland)



Abandoned phosphate underground exploitation (Cretaceou 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 process of phosphate. In addition, it causes less damages to the environment compared to extraction from more conven 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 li 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 commodities in the deposits, which vary largely from one mineralization type to the other (phosphorite formed in a sedimentary context vs. igneous type, for instar and associated black shales") contributes active 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)3490827 - 31/07/2015

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

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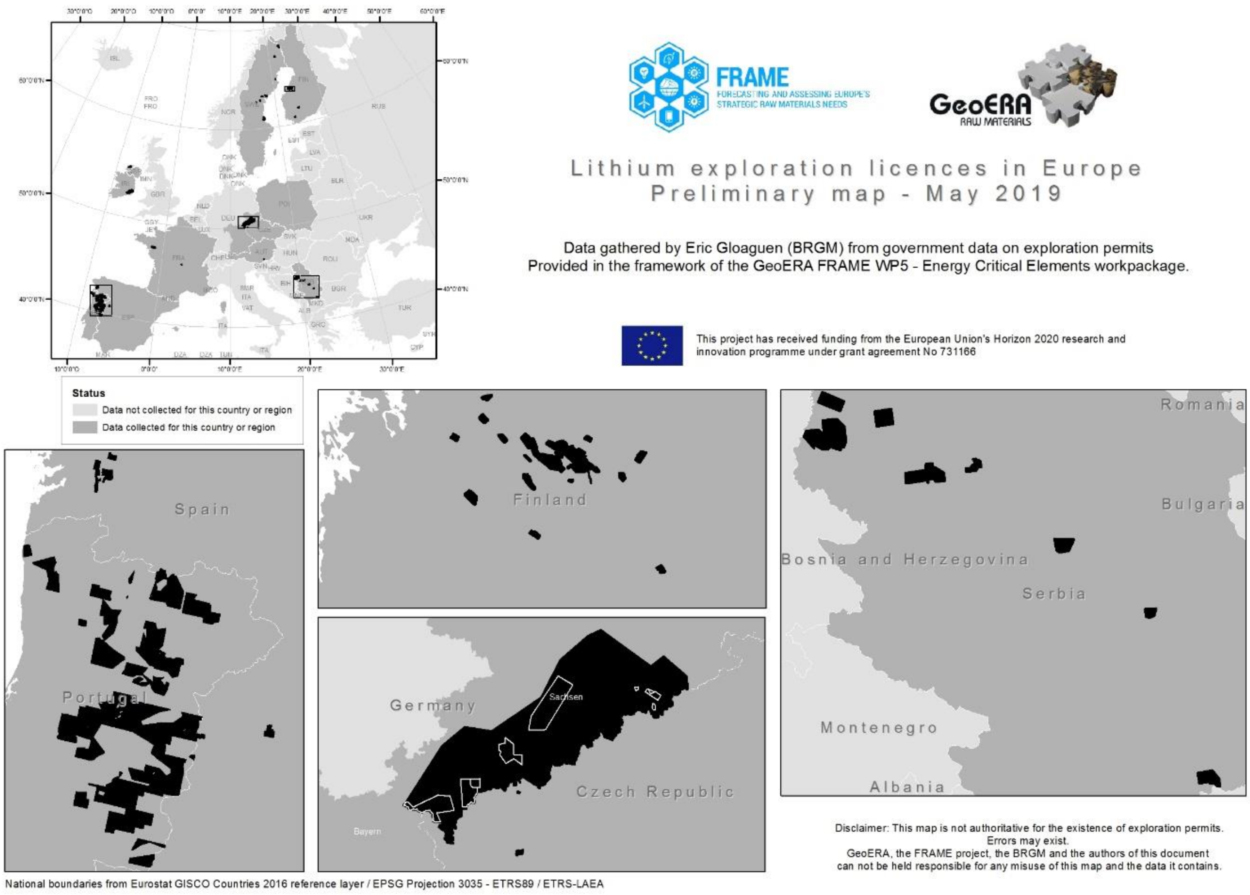
FRAME WP 5: Lithium rush as highlighted by Exploration permits throughout Europe

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

In detail, clusters of exploration permits appea logically in regions where deposits are already know 83 licences in SW Finland (Länsi) and 28 in Sweden, 28 in Ireland (Leinster), German (10)-Czech Republic (8) boundary (Erzgebirge), North Portugal (23), NW Spain (10) (Galicia), Serbia (12, Jadar). Conversely, sev potential zones are still poorly covered by exploratio permits, namely Austria (southern part) and France (French Massif Central, Armorican massi Metallogenical and prospectivity maps that will b provided by the FRAME project will probably highligl new prospective zones for Li-Co-Graphite mineralisations.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GeoERA RAW MATERIALS
Lithium exploration licences in Europe
Preliminary map - May 2019
Data gathered by Eric Gloaguen (BRGM) from government data on exploration permits
Provided in the framework of the GeoERA FRAME WP5 - Energy Critical Elements workpackage.
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731166
Status
Data not collected for this country or region
Data collected for this country or region
Spain
Portugal
Finland
Germany
Sachsen
Czech Republic
Bayern
Romania
Bulgaria
Bosnia and Herzegovina
Serbia
Montenegro
Albania
Disclaimer: This map is not authoritative for the existence of exploration permits.
Errors may exist.
GeoERA, the FRAME project, the BRGM and the authors of this document can not be held responsible for any misuse of this map and the data it contains.
National boundaries from Eurostat GISCO Countries 2016 reference layer / EPSG Projection 3035 - ETRS89 / ETRS-LAEA

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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 essenti components in a range of applications and produc including electronics, steel alloys and superalloys requir by European industry. Today, significant amounts of and associated Nb are sourced as-called conflict minerals from the central African region. On 1 Janua 2021 the Conflict Minerals Regulation will come into forc across the EU meaning that importers of tantalum, ti tungsten and gold must use due diligence on their supply chain to ensure that the minerals have been source responsibly. A main objective of work package 6 of FRA is to do a survey of the pan-European distribution of the critical metals tantalum and niobium and enhance the exploration interest and potential to produce them ethically and indigenous to the Community.

Nb-Ta mineralisations, and most specifically thos enriched in Ta, are typically associated with granites a specifically granitic pegmatites, known from the Palaeoproterozoic bedrock of the Fennoscandian Shiel and several younger granites and granitic pegmatite fiel in Europe (e.g. the Variscan belt of the Iberian Peninsu and the Massif central of France). Niobium is also prese in pyrochlore-group minerals in carbonatitic as well as syenitic rocks, which have a more restricted distributio In this work package, key areas and deposits on the Iber Peninsula and in the Fennoscandian shield have be identified as possible candidates for more detailed studi and research. In some of these areas work ha commenced, and they are briefly described belov Research on the selected deposits includes field a laboratory studies in which the ore mineralogy of-Nb-Ta will be addressed to maximise the usefulness with regar to processing and associated evaluation parameters 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 form the basis for developing recommendations fo 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 Europea Variscan Belt. From both an economic and a metalloge 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, Trasquilón, in some occurrences of the Mo-Martinamor district, Fontão and Penouta.

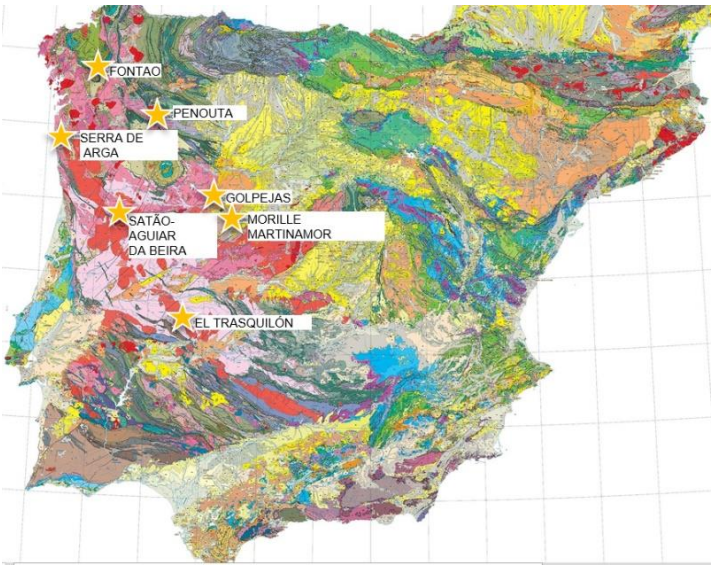

Fig. 1. Examples of Nb-Ta mineralisations in Spain-Portugal

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

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The mine has recently started reprocessing of old tailing
An important aim of work package 6 is to establis
relationships between mineralisations and associate
granitic rocks and develop metallogenetic models for the
formation. In Portugal the mineralisations are located in
the northern part of the country and also compris
Variscan granitic rocks, LCT type (lithium-cesium-
tantalum) pegmatites and associated placers. There a
some Nb-Ta potential areas, which includes Serra de Ar
and Satão (Viseu). As in Spain, the deposits were exploite
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 Swed and
Finland are hosted by LCT type granitic pegmatites (Fig. 2)
that occur mainly in regions featuring abundan
Palaeoproterozoic low to low medium-grade
metamorphosed metasedimentary rocks and associat
S-type granites.

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

Some of these have been studied during different (mair
Li-Sn) exploration campaigns. NYF type (niobium-
yttrium-fluorine) granitic pegmatites occur as individua
dykes and fields throughout the Proterozoic bedrock
Sweden; notably the discovery location of tantalum wa
one of these granitic pegmatites. Research in wo
package 6 will focus on a few selected Swedish deposits
and occurrences (Fig. 3) including Järkvissle and Bergby i
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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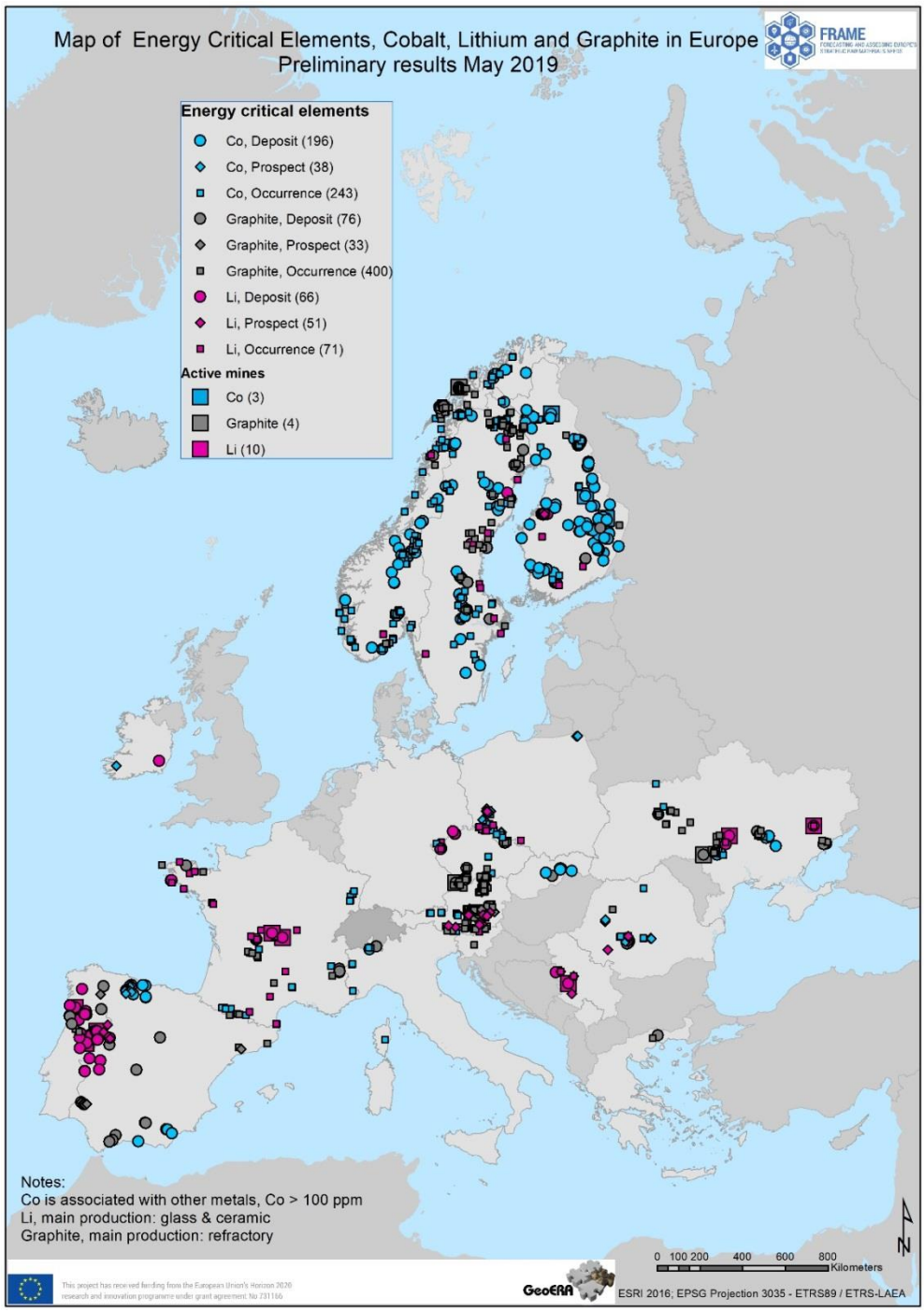
Updated version of the Cobalt, Lithium and Graphite deposit map

W l· y ƨ l· Y y Ŝ Ò Ŝ Ø ƛ ŏ ó b D ¦ ú Σ I ň Ø l· NJ Ř D l· dz ű y Ŝ ō ó b D ¦ ú Σ 9 NJ ƛ Ŏ

We are pleased to have received data from all FRAME partners and Eurogeosurvey members, that have depc 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 r 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 distribu 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 suc cooperation.

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