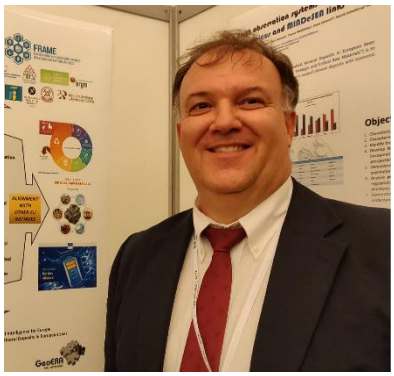
FRAME
FORECASTING AND ASSESSING EUROPE'S STRATEGIC RAW MATERIALS NEEDS

Newsletter
February 2019

www.frame.lneg.pt

Issue 2, February 2019

Eight months into FRAME and the project is beginning to produce meaningful results



The flagship project of EuroGeoSurveys' Mineral Resources Expert Group is entering its ninth month, and the project is beginning to produce meaningful results.

WP2 (Communication, Dissemination, Exploitation) has been in full swing since the word "go". This latest newsletter is a testament of the continued hard work that is constantly undertaken by this dedicated team. During the holiday period, the FRAME website (www.frame.lneg.pt) underwent a seasonal transformation to depict the Christmas holiday season with lots of snowflakes falling across the screens of interested visitors. The team is now preparing the media kit of the project and as soon as this is available, it will be the focus of a short article in a following newsletter.

WP3 (Critical and strategic raw materials map of Europe) has a new leader (see below for further news).WP3 is now busy harmonising existing data sets and ramping up to start production of minerals maps.

WP4 (Critical raw materials in phosphate rocks and associated black shales) has already delivered D4.1 that is one of the focus points of this issue of the Newsletter – see below). Work is progressing within the allotted time scale to refine the data and produce the next deliverable.

The FRAME component of the Energy critical elements (WP5) is cruising along at a steady pace having already produced a map of the ECE, which was delivered to the Commission late last year. The map is now being updated with additional countries' data to produce the most complete picture of the European distribution of Li, Co and C. A version of this map will be exhibited at the PDAC in Toronto in the next couple of weeks and we will report on this in the next newsletter/social media/project site.

WP6 (Conflict free Nb-Ta for the EU) has delivered on Milestone 6.1 and work is progressing to present meaningful data in the very near future.

WP7 (Historical mining sites revisited) has taken its first baby steps to compiling the data on the mining sites and their content in CRM's. This will be the focus of an upcoming newsletter and developing brief news in the project website/social media.

The struggles of WP8 (Link to the information platform) are known and common to the series of Raw Materials, GeoEnergy, Groundwater and Information Platform projects. The solution of a common set of harmonised data variables is now well on its way to being finalised with the help of the teams working in unison towards this common goal.

Daniel de Oliveira, FRAME Project Coordinator

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Generating the Critical and Strategic Minerals Map of Europe

Nikos Arvanitidis, WP3 Leader, SGU

Project FRAME (Forecasting and Assessing Europe's Strategic Raw Materials Needs) is designed to research the critical raw materials (CRM) and strategic minerals (STR) in Europe. There is the expertise and knowledge base to provide a significant innovative contribution towards knowing more about the potential primary deposits, predict new target areas/deposits and to recognize the potential in secondary deposits.

WP 3 (Critical and Strategic Minerals Map) has already started to collect available economic geology data and information in terms of producing a map of the current Critical Raw Materials (Fig.1) and of the strategic raw materials for Europe, including the so-called energy and conflict minerals. WP 3 is making the backbone of the project with links to the other WP's.

In the first Deliverable 3.1 (D3.1) of WP3, the report submitted describes the methodology used for the identification and selection process of the CRM and strategic minerals to be included in the metallogenetic map, linked mainly to information collected from

- Mineralisations and deposits on land and the marine environment (linkages to all relevant WPs of the MINDeSEA project targeting offshore mineral resources).
- Mineralisations and deposits on land and the marine environment in which CRM make associated commodities, e.g. REE in bauxite deposits and manganese nodules; cobalt in nickel deposits and ferromanganese crusts; vanadium in iron-titanium deposits; indium and tellurium in VMS and epithermal gold deposits.
- Secondary resources, in terms of historical and modern mineral-based mining wastes (waste rocks, processing tailings, metallurgical residues) and by-products, e.g. REE in apatite concentrates related to iron extraction and red mud derived from alumina refining; indium in the waste streams of lead-zinc sulphide mining.
- Prospectivity assessments for a continental scale

(Fig.2) approach for a selection of STR and CRM (according to the 2017 CRM list from the European Commission, and based on the availability of data, i.e. known mineral deposits of targeted commodities). These prospectivity assessments will benefit from the latest developments in "data driven" mineral prospectivity methods that allow mapping at continental scale (i.e., CBA, or "Cell Based Association" method developed by BRGM).

Minerals and metals defined as strategic to be addressed by the FRAME project comprise the ones included in the European Critical Raw Materials (CRM) list, the minerals that are used in the Li-battery manufacturing and electric mobility society in general, the minerals needed by the decarbonitisation targets of the Energy Intensive Industries (EII), the minerals and metals which energy transition and low-carbon technologies are dependent on, and the metals required by the electronics and high-tech industry.

The critical and strategic mineral raw materials to be included and targeted in the FRAME project are: Antimony (Sb), Gallium (Ga), Magnesium (Mg), Scandium (Sc), Baryte, Germanium (Ge), Natural graphite, Silicon metal (Si), Beryllium (Be), Hafnium (Hf), Tantalum (Ta), Bismuth (Bi), Helium (He), Niobium (Nb), Tungsten (W), Borate, HREEs-Heavy Rare Earth Elements (Dysprosium-Dy, Erbium-Er, Europium-Eu, Gadolinium-Gd, Holmium-Ho, Lutetium-Lu, Terbium-Tb, Thulium-Tm, Ytterbium-Yb, Yttrium-Y), LREEs-Light Rare Earth Elements (Cerium-Ce, Lanthanum-La, Neodymium-Nd, Praseodymium-Pr, Samarium-Sm), PGMs-Platinum Group Metals (Iridium-Ir, Palladium-Pd, Platinum-Pt, Rhodium-Rh, Ruthenium-Ru), Vanadium (V), Cobalt (Co), Indium (In), Phosphate rock, Fluorspar, Phosphorus (P), Tin (Sn), Nickel (Ni), Manganese (Mn), Copper (Cu), Lithium (Li), Selenium (Se), Tellurium (Te), Iron (Fe), Gold (Au), Silver (Ag), Chrome (Cr), Molybdenum (Mo), Rhenium (Re), Titanium (Ti), Osmium (Os).

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Source

Nikolaos Arvanitidis, Håvard Gautneb, Erik Jonsson, Edward Lynch, Helge Reginiussen, Martiya Sadeghi (2018): Producing a report describing the methodology used for the identification and selection process of the CRM to be included in the metallogenetic map. Deliverable D3.1-report; FRAME project;
http://geoera.eu/wp-content/uploads/2018/10/FRAME_D3.1-1.pdf

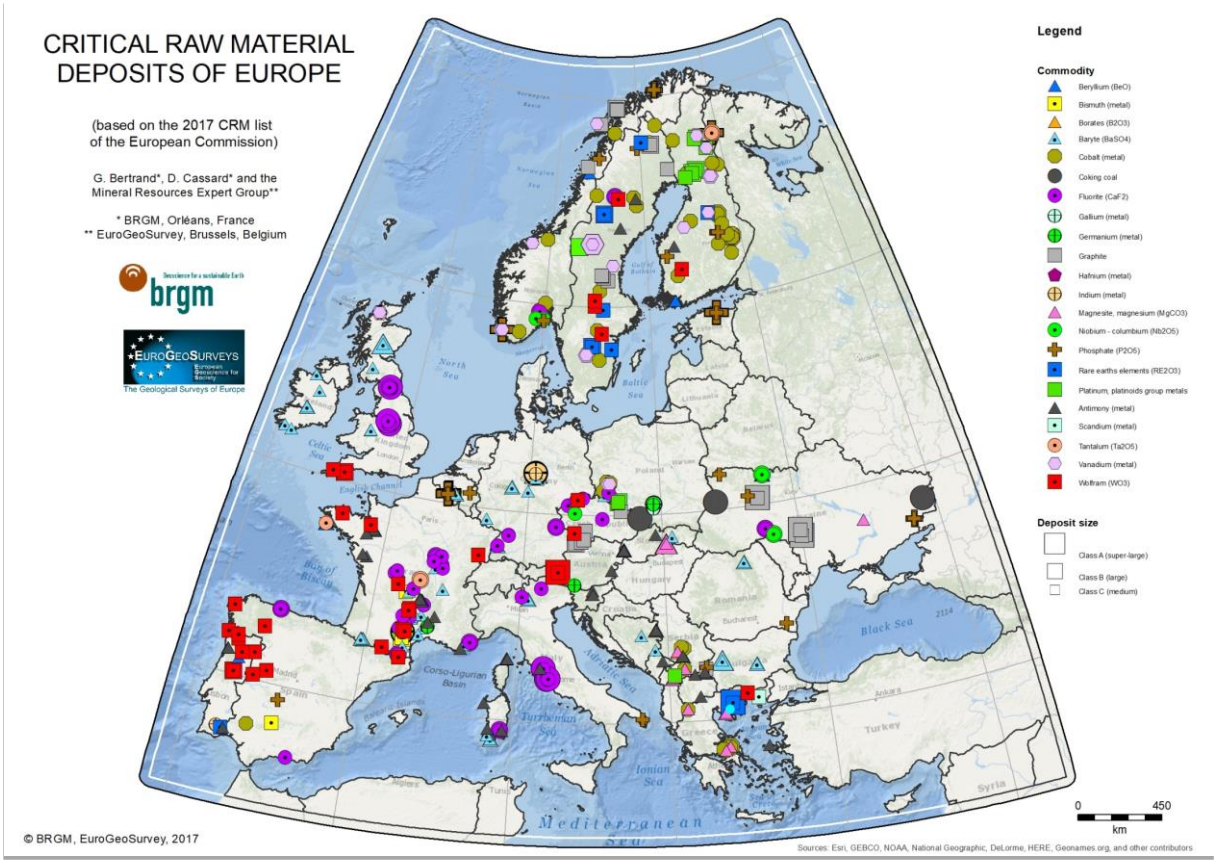

Fig. 1: Initial map of the critical raw materials in Europe prepared by the EuroGeoSurveys Mineral Resources Expert Group.

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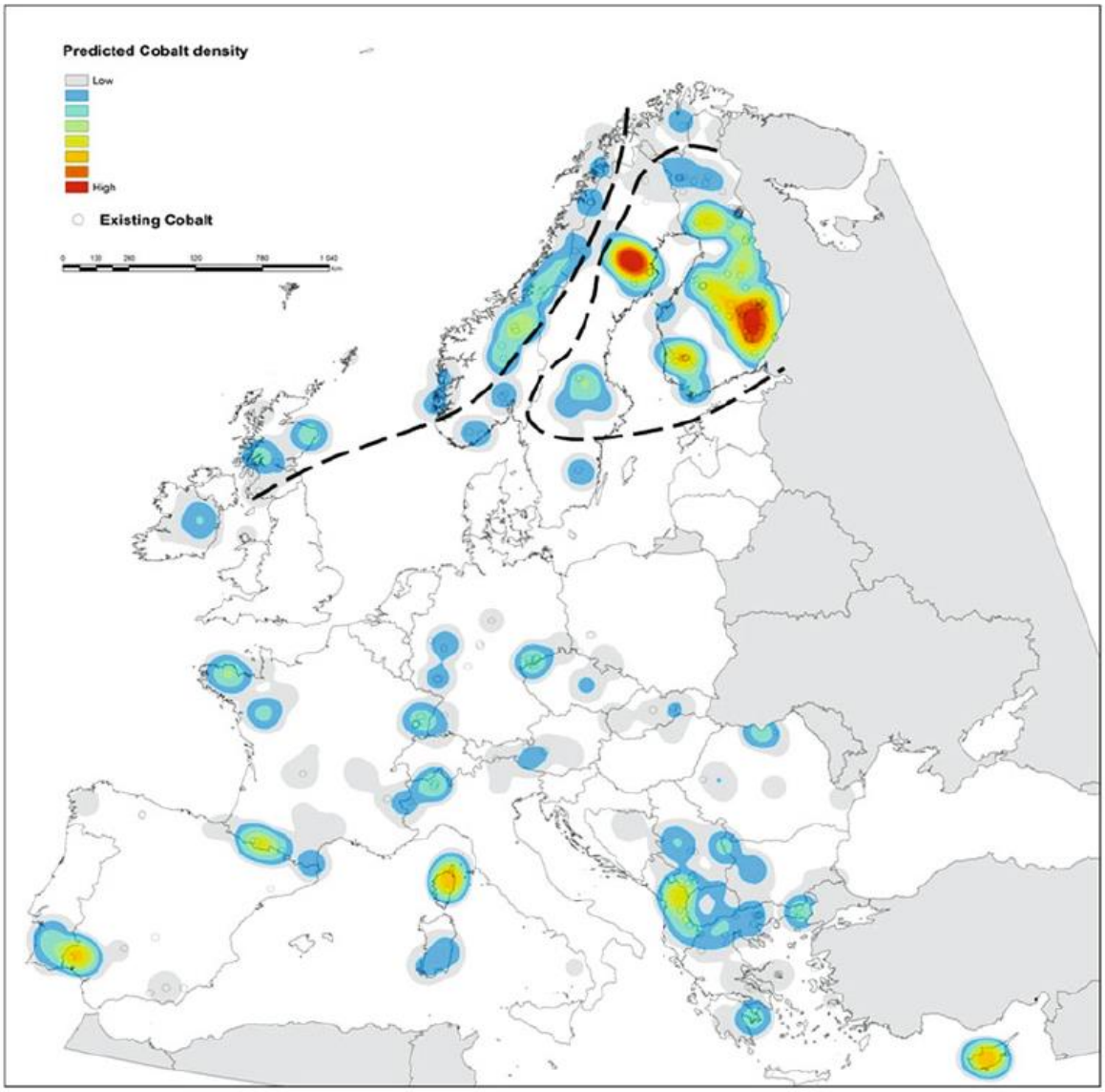

Fig. 2: Predictive map for cobalt, obtained from the ProMine database.

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Progress Report of FRAME WP4

Sophie Decrée, WP4 Leader, RBINS

This work package (WP4) **"Critical Raw Materials in phosphate deposits, and associated black shales"** is dedicated to the assessment of economic potential of igneous and sedimentary phosphate deposits (and their host black shales) in Europe, especially regarding Critical Raw Materials (CRMs).

During the six first months of this project, the partners of the project have prepared an overview of the phosphate deposits and occurrences in Europe (deliverable D4.1) by compiling an integrated database, based on the literature and older data sources.

The data contributing to the development of the database are meant to give information about the potential in Critical Raw Materials (CRMs) of phosphate mineralization, and help to identify new areas of interest for CRMs, based on criteria as: (i) the different commodities/CRMs associated with phosphate deposits (REE, F, V, U and Y); (ii) the size of the deposits according to their known tonnages; (iii) the type and origin of the phosphorus-phosphate mineralization and deposits; (iv) the age of the deposits/occurrences and the host rock; (v) the commodities/CRMs (Be, Sb, Co, PGM, V and Cr) associated with black shales, when applicable and available.

The data sources used to fill in this new database are ProMine, FODD (Fennoscandian Mineral Deposit Database), SIORMINP (Sistema de Informação de Ocorrências e Recursos Minerais Portugueses), and Mine records database (Ireland). In addition, information extracted from about 56 references, among which very recent ones, are mentioned in the database.

The database compiled for this first deliverable present 429 phosphate deposits and occurrences throughout Europe.

This is undoubtedly one of the most complete (if not the most complete) database about phosphate mineralization in this continent. Taken as a whole, it shows fairly well the diversity and potential regarding phosphate mineralization in Europe.

The maps drawn after the database constitute an added value to the database itself, since they allow visualizing at a glance the most striking features concerning phosphate mineralization in Europe. In the frame of this deliverable, three maps (draft version) have been drawn. The first one (Figure 1) presents the location of phosphate deposits and occurrences in Europe. The size of the symbol used on the map directly relates to the size of the deposit (not yet UNFC compliant, but aiming to at the end of the project). The second map (Figure 2) allows discriminating the different "Mineral Deposit Types" (according to Inspire). This map gives clues about the metallogenic provinces and the genetic type of the phosphate mineralization. The latter has typically an incidence on the potential in CRMs of the deposit. The last map (Figure 3) shows the deposits/occurrences according to their age. This map allows considering the regions where important phosphogenetic event occurred. This is also of interest because the potential in CRMs of sedimentary phosphate deposits is highly dependent on their age and the environment/settings in which they formed. Both maps 2 and 3 aim at identifying new areas of interest for CRMs, and constrain the potential of the deposits. The new geochemical data to acquire in the course of this project will help to better constrain these zones.

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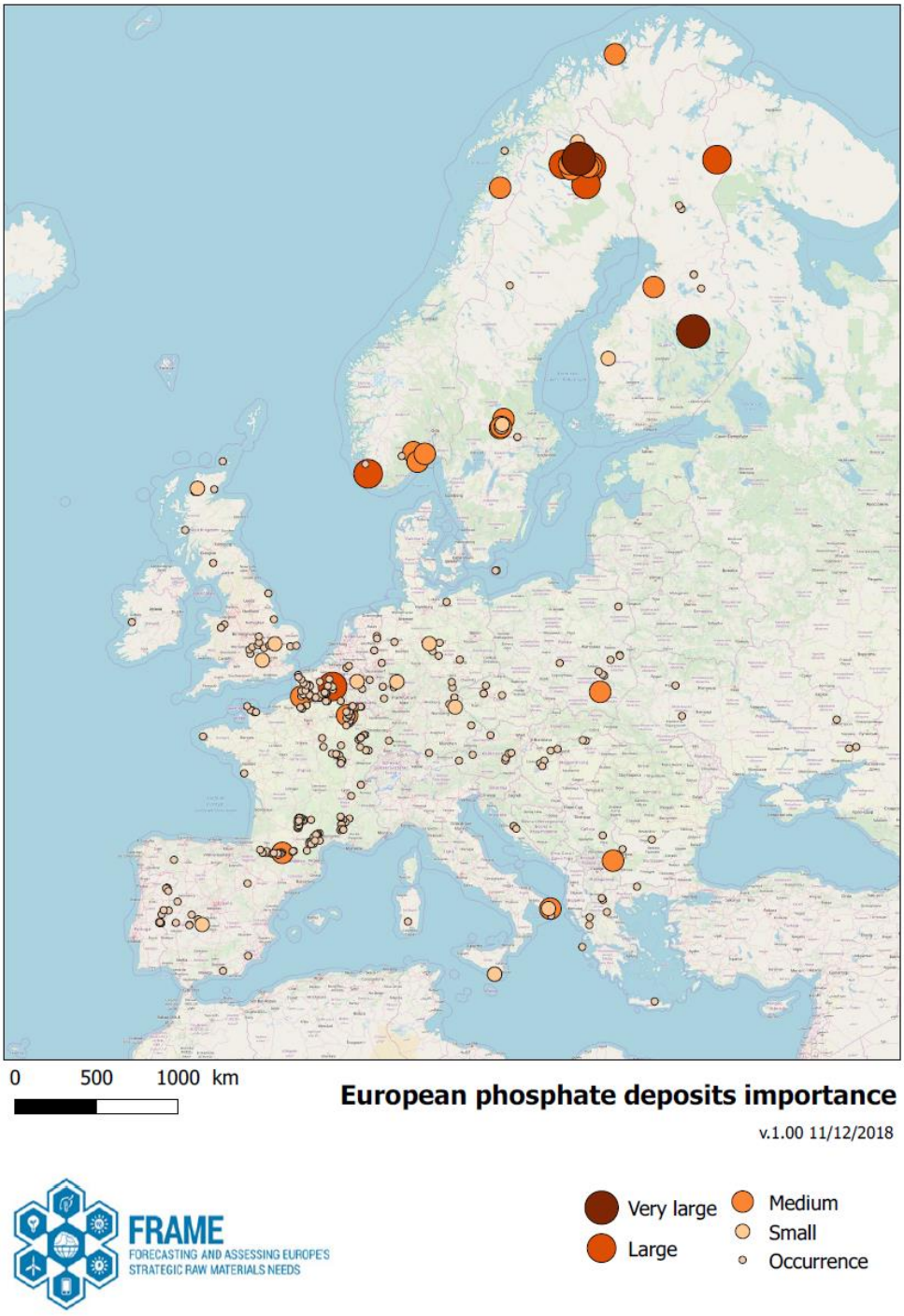

Figure 1. Phosphate deposits and occurrences in Europe. Deposit size: Small (>X) 2,000,000; Medium (>X): 20,000,000; Large (>X): 200,000,000; Very large (>X): 2,000,000,000 tonnes. Draft version of the final map to provide for deliverable D4.5

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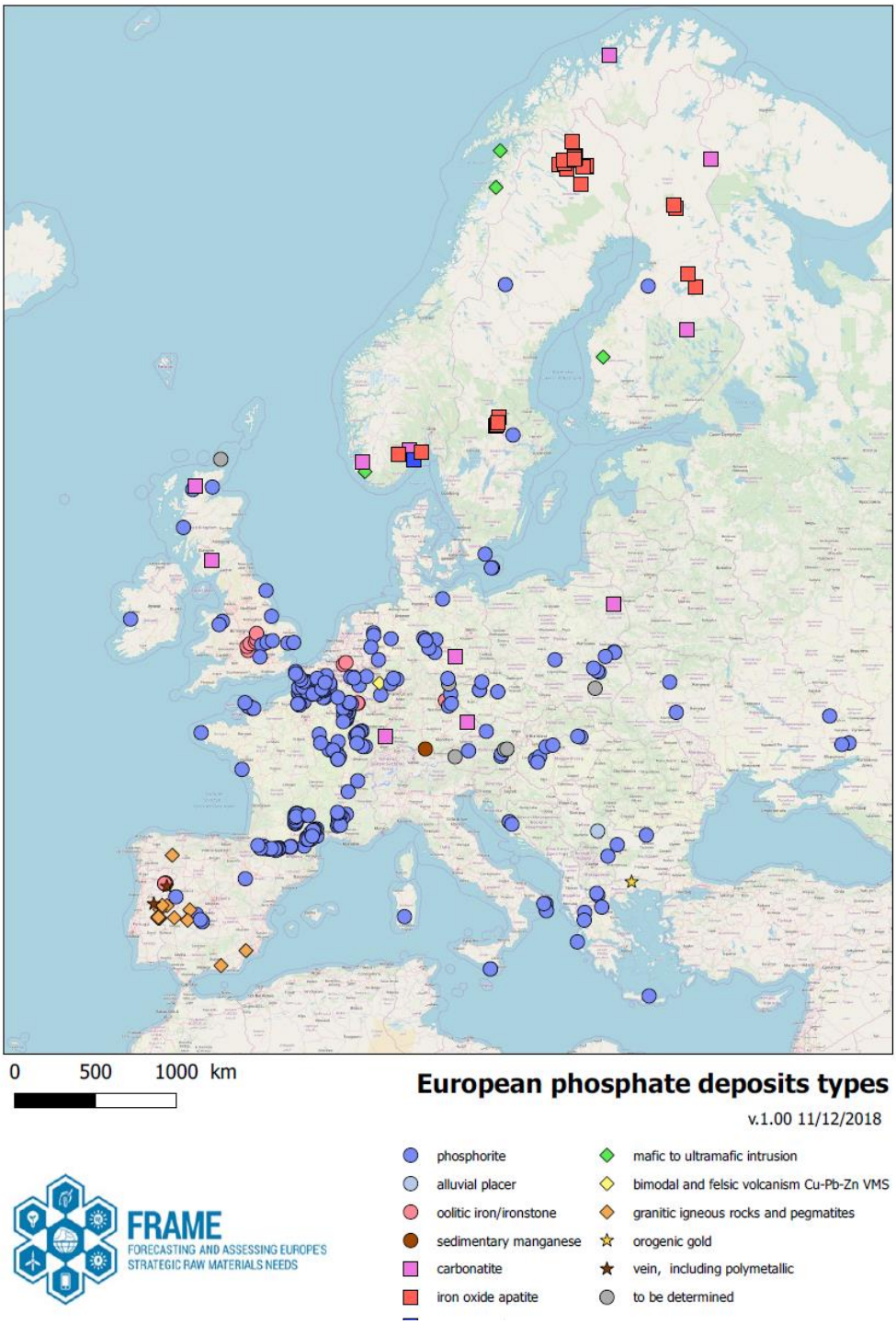

Figure 2. Mineral deposit type of phosphate mineralization and deposits in Europe. Draft version of the final map to provide for deliverable D4.5

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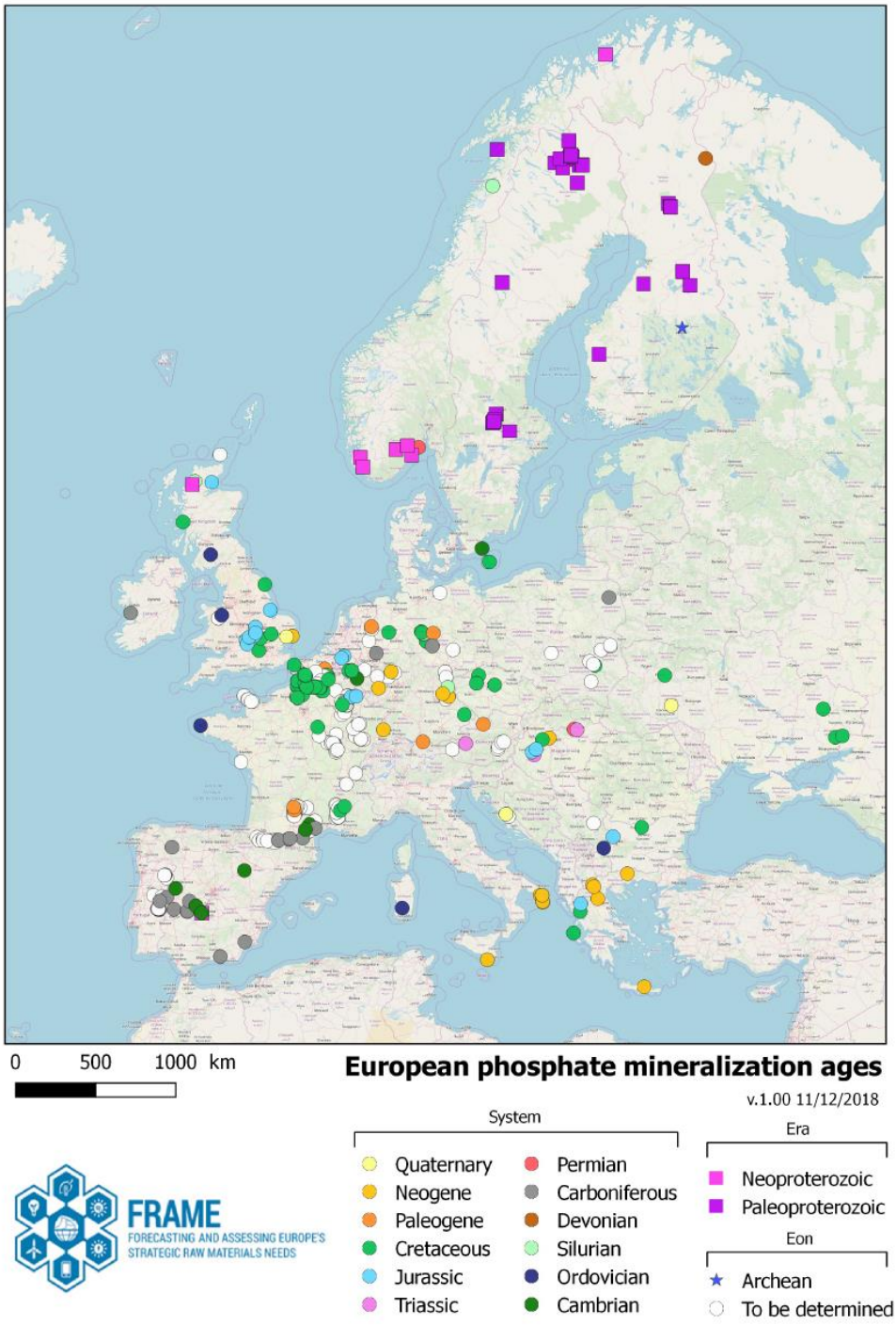

Figure 3. Map illustrating the phosphate deposits/occurrences according to their age System/Period for Phanerozoic mineralization, Era for Proterozoic mineralization, and Eon for Archean mineralization). Draft version of the final map to provide for deliverable D4.5

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Nikolaos Arvanitidis is to retire in March of this year

Nikos Arvanitidis

"Nikos", as he is known to anybody that knows him, was a fundamental piece in the whole GeoERA concept and instrumental in the inception of FRAME. FRAME thanks Nikos for all the insight, discussion and foresight regarding mineral deposits and wish him a very well earned, prosperous but most of all, healthy retirement. Thank you Nikos.

He steps down as WP3 leader leaving in his place Martiya Sadeghi also of the Swedish Geological Survey to whom we wish all the best in the coming months and tasks. Martiya is an exploration geologist focused on spatial analysis, ore deposit GIS-modeling and applied geochemistry. He is associated editor to the journal of Geochemical Exploration (JGE) and GEEA and fellow in society of Economic Geologist (SEG). Amongst his many facets, he is an expert on Critical Raw Materials. Welcome Martiya.

Martiya Sadeghi

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