Mineral Occurrences in the Roer-to-Rhine area

Metallic and polymetallic veins occur in the Roer-to-Rhine (R2R) area of interest. These veins host a diversity of minerals that are considered critical raw materials (CRM) for the European Union.

Generalities

Critical raw materials are those of high importance to the EU economy and of high risk associated with their supply (European Commission, 2021). Veins enriched in certain minerals, and often enriched in certain mineral assemblages, are significant potential sources of the following CRM: antimony, baryte, bismuth, cobalt, fluorite (fluorspar) and tungsten. Additionally, CRM are present in the assemblages of arsenic, copper, iron, lead-zinc, manganese and molybdenum veins.

Mineral occurrences in metallic and polymetallic veins may therefore signal interesting areas within the structural framework where the CRM potential can be further explored. Locating and better understanding mineral occurrences and deposits in Europe is therefore crucial for future informed decision making on local resourcing.

Anomalies

The spatial distribution of the different mineral occurrences in the R2R is mainly characterised by two clusters: one in the Variscan deformation front region in the north of the area, and one along the Upper Rhine Graben in the south of the area. These veins are formed due to a variety of petrogenetic features and processes, but in its majority they present strong structural controls and follow discontinuities in the crust.

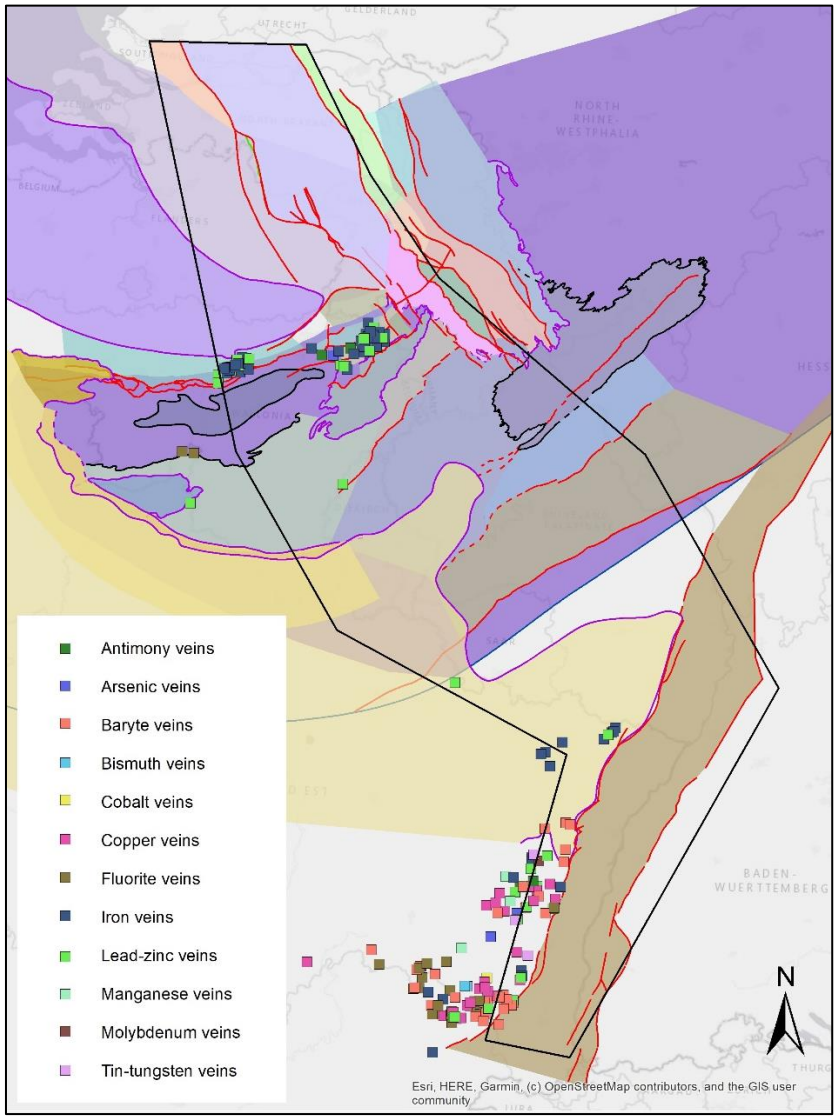

Figure 1: Overview of the distribution of mineral occurrences in the R2R area of interest.

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Variscan deformation front: in this region, there is a predominance of iron and lead-zinc veins, and antimony and arsenic occurrences are also observed. Although the deposits are located within the domain of the thrust fault system which marks the northernmost Variscan deformation in Europe, the majority of metallic vein deposits is late to post-Variscan. Iron veins are thought to have been intruded at the end of the Variscan orogeny, following the base of the Dinantian limestones (Dejonghe, 1977). For lead-zinc, veins are spatially associated with transverse NNW-SSE faults part of the Rhine graben network which crosscut the ENE-WSW thrust fault system (Dejonghe, 1998).

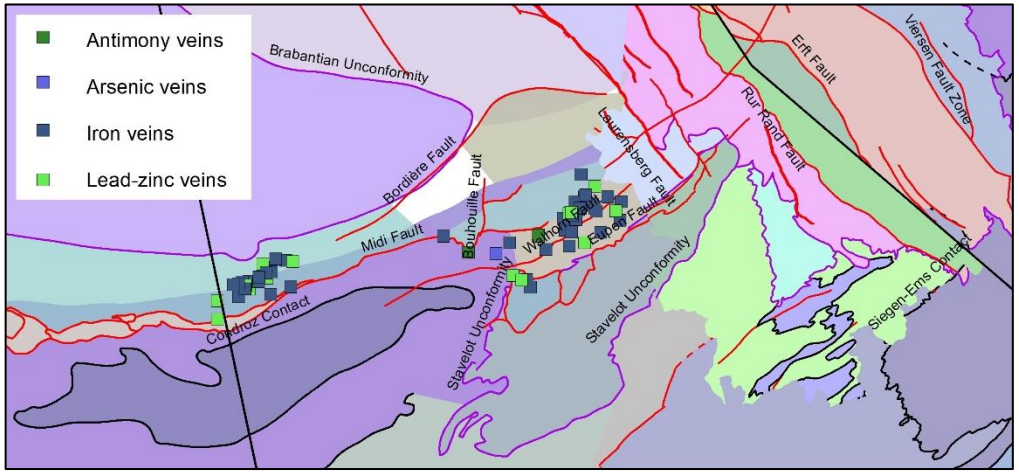

Figure 2: Polymetallic veins in the region dominated by the Variscan deformation front.

Upper Rhine Graben: the western shoulder of the graben, in special the Vosges Massif in France, is renowned for its mineral occurrences with diverse and complex assemblages (e.g. Sainte-Marie-aux-Mines). Although these occurrences fall out of the area covered by the structural framework in detail, clusters and trends can be seen and may be further explored.

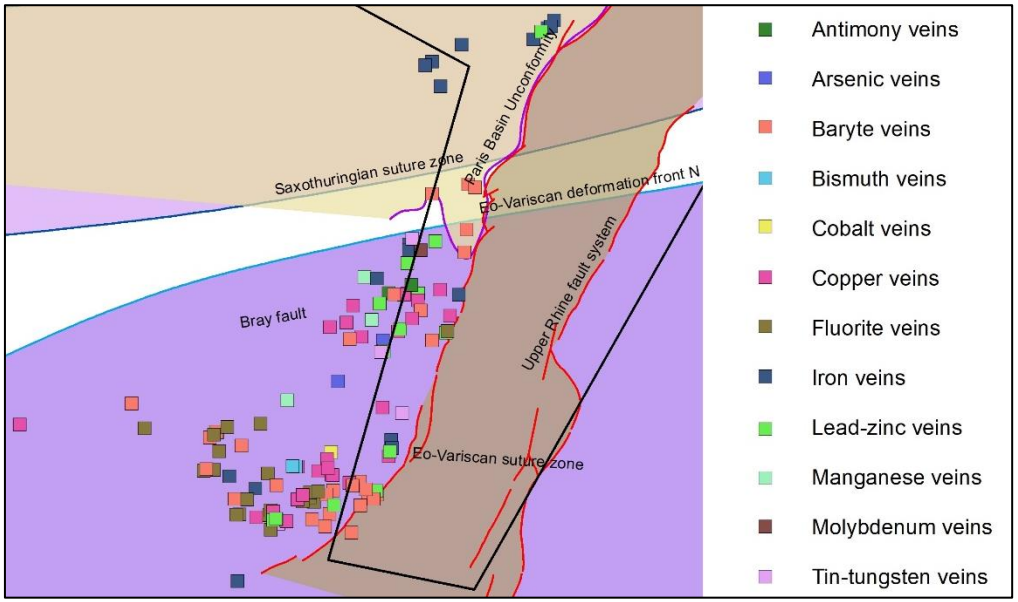

Figure 3: Polymetallic veins in the western shoulder of the Upper Rhine Graben.

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