## Ancient Mining, Recent Discoveries, and Future Potential for Critical Raw Materials in the Apuseni-Carpathian-Balkan Area of Southeast Europe

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The Apuseni-Carpathian-Balkan (ACB) area of southeast Europe is one of the world's oldest mining districts and played a major role in the history of European civilizations until present day. The rising demand on metals and the increasing risk of supply with mineral raw materials are expected to revive the exploration and mining interest and change the vision for the ACB region. Three main magmatic and metallogenic belts with specific deposit types make the area a premier Cu-Au-(Pb-Zn-Ag) province. The Late Cretaceous (~94–67 Ma) Apuseni-Banat-Timok-Srednogorie belt formed on the European margin during closure of the Neotethys Ocean. The continental margin magmatic activity produced world-class porphyry Cu-Au(-Mo) deposits, high-sulphidation epithermal, as well as VMS-like Cu-Au-Ag(-Pb-Zn), IOCG(?), sediment-hosted and carbonate-replacement deposits. The Cenozoic Serbo-Macedonian-Rhodope belt (<55 Ma) is directly connected to post-collisional episodes of back-arc extension. The magmatism is sourced in the subcontinental mantle lithosphere and lower crust that were enriched during previous subduction. Diverse deposit types include intrusion-related Au-Ag-(W), mesothermal Pb-Zn-(Ag-Au) vein and carbonate replacement, porphyry Cu-Au-(Mo), high- and intermediate-sulphidation epithermal Cu-Pb-Au-Ag-Te, and sedimentary rock-hosted low-sulphidation epithermal Au(-Ag) deposits. The Miocene (13.61–7.24 Ma) Apuseni Mountains district is linked to magmatism generated during the late post-collisional deformation stages and north-eastward incursion of the Adriatic-Pannonian micro-continent that caused extensional strike-slip motions. The Au-Cu-(Te) mineralization is hosted in porphyry and epithermal deposits.

Recent discoveries in the ACB area result from exploration activities including field work, novel geochemical methods, geophysics, and geomodelling. The national legislations are formally not restrictive, but the social acceptance for mining might be low due to environmental and political issues. Critical raw materials have potential as main or by-products but require further studies and assessment.

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