

Assessing the Environmental Status of a Mining Site in the Southern Apuseni Mountains (Romania)

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The Southern Apuseni Mountains are an important metallogenic province on a European scale. Some of the gold and silver deposits located in the so-called Golden Quadrilateral have been mined since the Roman times. This area hosts tens of gold-silver epithermal and porphyry copper-gold deposits and prospects. These hydrothermal deposits are related to a complex system of Neogene volcanic and intrusive rocks, which pierced Jurassic ophiolites and Cretaceous flysch sequences. Throughout history, the intensive mining activities have led to significant environmental challenges, including soil and water contamination, deforestation, and heavy metal pollution. As an example, two representative deposits, Rosia Poieni Cu-Au porphyry copper and Rosia Montana Au-Ag epithermal, located just 3 km apart from each other, share some similarities, particularly in terms of their geological setting, but also exhibit key differences in mineralisation, mining impact, and environmental challenges. Rosia Poieni is the largest Romanian porphyry-copper deposit (with a resource of about one billion tonnes of copper ore), with gold and molybdenum byproducts. The mine has been developed as an open pit since the 1970s'. The acid mine drainage is severe, mainly due to the oxidation of sulphides from the waste rock dumps. Active measures to contain the acidity of water are taken at the tailings management facility by releasing lime suspension at the inlet in the tailings impoundment. The MOSMIN project proposes an integration of Earth-observation (EO)-based techniques and in-situ geotechnical and environmental monitoring. The main aspects to be observed are the presence of toxic minerals, soil degradation, air pollution, and acid mine drainage. The satellite-based environmental monitoring is combined with UAV observations and in-situ geochemical analysis. Sentinel-2 and Landsat data facilitate continuous monitoring of vegetation health and water quality, providing insights into the impact of acid mine drainage. Special emphasis is placed on vegetation damage, which is an early indicator of environmental changes. The project will provide innovative services and tools, able to improve the precision and reliability of the environmental monitoring, and contribute to the mitigation of the environmental risks and impact of mining.

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