Assessment of Heavy Metals Contamination in Soils of Mining Area of Tumanyan Region, Armenia: Distribution and Environmental Risks

Hasmik Vardumyan[1*], Abhishek Singh[1], Rupesh Kumar Singh[2],
João Ricardo Sousa[2], Karen Ghazaryan[1]

[1] Faculty of Biology, Yerevan State University, Yerevan, Armenia

[2] Center for the Research and Technology of Agroenvironmental and Biological Sciences (CITAB), Inov4Agro, Universidade Trás-os-Montes e Alto Douro, Vila Real, Portugal

ABSTRACT

Mining activities are a major source of heavy metal pollution in soils, posing significant risks to environmental and human health. This study presents a comprehensive assessment of heavy metal contamination in soils from one of Armenia's key mining regions. Soil samples were collected from surface layers (0–20 cm) across varying proximities to active and abandoned mining sites. The selection of sampling locations was based on accessibility and distance from known contamination sources. Basic soil parameters such as pH, texture, and organic matter content were also recorded to support interpretation. Analytical procedures followed standard protocols using certified reference materials to ensure accuracy. Results indicate that some heavy metals concentration significantly exceed both local and international threshold values, particularly near tailings and core processing zones. Spatial distribution maps show a strong correlation between heavy metals accumulation and distance from mining operations. The ecological risk assessment suggests a high potential for phytotoxicity and food chain contamination in the affected areas. These findings underscore the urgent need for continuous monitoring and the implementation of remediation strategies, such as phytoremediation, to mitigate heavy metal risks in Armenia's mining-influenced zones. The study contributes to the growing body of knowledge on post-mining land use planning and environmental health in the South Caucasus region.

Keywords: copper, soil contamination, mining pollution, heavy metals, environmental risk

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[*]**Corresponding Author:**

Hasmik Vardumyan, Chair of ecology and bioresources management, Faculty of Biology, Yerevan State University, 1 Alex Manoogian str., Yerevan, 0025, Armenia.
Email: hasmik.vardumyan@ysu.am