2nd International Conference on Environment and Sustainable Development

26 - 28 September 2025
London -UK

Human Health Risk Assessment and Geospatial Analysis for Safe Restoration of Polluted Sites

Rusalina Lupu[1,2], Diana-Mariana Cocârță[1,2,3]

[1] Department of Energy Production and Use, Splaiul Independentei No. 313, Faculty of Energy Engineering, University of Science and Technology POLITEHNICA of Bucharest, 006042 Bucharest, Romania,
[2] Research Centre for Advanced Materials, Products and Processes/CAMPUS, National University of Science and Technology Politehnica Bucharest, Splaiul Independentei No. 313, Romania
[3] Academy of Romanian Scientists, 030167 Bucharest, Romania

Abstract

Soil contamination caused by industrialization and urbanization affects human health and acts of slowing down Soil Strategy set at the EU Level. The role of human health risk assessment (HHRA) from contaminated land is described in the current paper. Currently, Romania lacks a comprehensive HHRA tool for pollution control and land management. Thus, POLITEHNICA Bucharest developed a tool with an integrated geospatial analysis, HHRA and quality interpretation to determine the scale of risks posed by contaminated sites in supporting remediation and future land reuse. The current assessment investigated an old deposit of petroleum products located in Southern Romania. The HHRA considered 16 sampling locations and soil analysis. The contaminants used in the assessment were metals (nickel and lead) and BTEX (benzene, toluene, ethylbenzene, xylene), following an industrial scenario. Three on-site worker exposure routes were investigated: dermal contact, inhalation and ingestion of groundwater (volatilization and leaching models according to ASTM standard). The tool results indicated the cumulative carcinogenic risk (CR) exceeded 10^{-5} benchmark for all sampling locations and non-cancer target risk (HI) has exceeded 1 in one sampling location. The highest CR is driven by Ni (1.29E-3) considering the ingestion route and lowest CR is given by ethylbenzene (9.94E-12) via inhalation. As for HI, benzene has the highest value (1.53E+00) under the groundwater ingestion route. While, geospatial analysis allowed visualization of key hotspots. HHRA may be similar or higher for residential (children and adults) off-site exposure, investigations are needed for pollution control and future land development plans.

Keywords: Carcinogenic risk, HHRA tool, spatial visualization, pollution control, worker exposure.