Electrical Resistivity Survey for Leachate Contamination of Groundwater at a Land fill Site in Accra, Ghana

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Abstract:

Geophysical studies using Electrical Resistivity Imaging (ERI) and Vertical Electrical Soundings (VES) were conducted at a landfill site at Pantang Abloradjei in Accra, Ghana with the goal of determining probable leachate plumes, their thickness, and prospective migration pathways. A total of thirteen (13) profiles with a total distance of 2,800 m (2.8 km) and five (5) vertical Electrical (VES) soundings were carried out. The data obtained from the ERI was analysed using EARTHIMAGER2D modelling program to produce a 2D-Apparent Resistivity pseudo-sections which revealed information about different stratigraphic units, their thicknesses, and apparent resistivity values based on the geology of the area. The VES soundings were analysed using "IPI2Win resistivity sounding inversion software version 3.1.2c by Moscow State University. Results show that Municipal Waste Material has resistivity range between 0.135 Ωm and 1396 Ωm. The low resistivity indicates leachate/peat/clay material whilst resistivity medium to high indicate silty and sandy soils respectively. The leachate's minimum apparent resistivity varies between 1 Ωm to 2.4 Ωm, with a mean value of 2.2 Ωm. Interquartile values, on the other hand, ranged from 2.9 Ωm to 19.3 Ωm. The bedrock minimum apparent resistivity varies between 20 Ωm and 704 Ωm. The subsurface consist of mostly clay/highly weathered rock to moderately weathered bedrock. The plume thickness tend to increase from Northeast to Southwest of the landfill site.