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## Imaging the underground contaminants in landfill sites using electrical impedance tomography

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rectrical impedance tomography (EIT) is an imaging technique which calculates the electrical conductivity distribution Ewithin a medium. It allows estimation of the spatial distribution of the electrical conductivities within a medium from voltage measurements at its boundaries, using non-invasive imaging technique. In this study, electrical measurements were made on the medium surface to image the underground contaminants within two unconfined landfill sites located in Lagos State, Nigeria. The sites were: Ile-Epo (6.640N to 6.870N, 3.300E to 3.380E) and Solous 1 (6.340N to 6.530N, 3.280E to 3.320E). The Neighbouring and Cross methods of electrical impedance data acquisition techniques were employed, with a view to identifying the presence of contaminants within the sites. The inversion of the data was accomplished using the electrical impedance and diffuse optical reconstruction software toolkits for MATLAB to obtain 3-dimensional electrical conductivity models. The toolkits utilised a finite element model for forward calculations. The scheme utilised in this work is a forward solution, solved using a mesh of 768 finite elements with 205 nodes and 256 boundaries. The results depicted low and high conductivity responses on the landfills, ranging from less than 100mS/m to 1500mS/m, thus, the subsurface of the landfills revealed varying extent of waste decomposition. The high conductivity response of 900mS/m to 1500mS/m is interpreted as conductive leachate contaminants, which are from the decomposing waste materials and have accumulated at several discrete localities within the landfills. It was found that, the contaminants have migrated to depths exceeding 40m, well below the aquifer, and over 25m offsite distance from the landfills in the investigated sites. The study showed that EIT can be used effectively to map areas of active decomposition that are characterised by varying conductivities, hence, a very adaptive tool to realise a systematic survey in landfill sites investigations.

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