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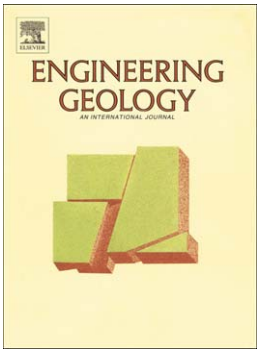

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Application of geophysical methods in the evaluation of anthropogenic transformation of the ground: A Case study of the Warsaw environs, Poland

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Abstract

Near surface geophysical methods, specifically electrical resistivity imaging (ERI) and ground penetrating radar (GPR), were used to evaluate anthropogenic transformation in the Marki area, near Warsaw, Poland. Anthropogenic transformation in this region is indicated by the gradual filling of excavation voids in varved clays with various kinds of waste (both municipal and industrial). The S8 Marki bypass expressway was designed to pass through such an area.

Recreating the bottom relief of the excavated varved clays, and reliably estimating the degree of anthropogenic transformation would be difficult if only traditional, standard geological engineering investigations were applied. Electrical resistivity is a parameter, which reflects the diverse properties of the geological media. When calibrated with drill hole data, the resistivity enabled the accurate determination of the base of the anthropogenic soil. The GPR method, in contrast, was only useful to a limited extent, because of the high attenuation of electromagnetic waves in most of the deposited man-made soils.

From the analysis of the completed surveys, a two-dimensional image of the subsurface ground structure, reflecting the anthropogenic impact on the environment, was obtained. This image was the basis for the development of the schematic model of the geological setting after human interference. The methodologies applied allowed us to interpret the spatial distribution of the different soils, including the anthropogenic soils of low bearing capacity and the probable connection between two aquifers. This information will be crucial for the construction of safe and economic foundations for structures such as roads.

Keywords: anthropogenic soils, complex soil conditions, electrical resistivity imaging (ERI), ground penetrating radar (GPR)

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