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Development of GIS-based geotechnical guidance map for real estate industry

Foundation design of a structure needs soil investigation to avoid failures due to settlements. This soil investigation is expensive and time consuming. Developments of new residential societies in Islamabad involve huge leveling of large sites that is accompanied by heavy land filling. Poor practices of land fill for deep depths cause differential settlements and consolidations of underneath soil that sometimes result in collapse of structures. The extent of filling remains unknown to individual developer unless soil investigation is carried out. Construction cost at such filled sites increases significantly due to the subsoil conditions. Soil investigation cannot be performed on each available site due to involved costs. However, fair estimate of bearing capacity can be made if such tests are already done in the surrounding areas. The proposed geotechnical guidance maps can provide a fair assessment of soil properties. The development of GIS-based guidance map basically correlates the bearing capacity of the site to the extent of cut or fill. Previously, GIS-based approaches have been used to develop maps using extrapolation and interpolations techniques for bearing capacities, underground recharge, soil classification, geological hazards, landslide hazards, socio-economic, and soil liquefaction mapping. No research work has been previously done to develop a relation between bearing capacity and cut or fill. A regression model is developed to establish correlation between cut or fill to the bearing capacity of the soil. Survey data and digital elevation model (DEM) before and after the development is used to estimate cut and fill at site. SPT data of surrounding sites were already available. Google Earth is used for digitization of collected data. Simple regression is performed in MS Excel to find a linear relationship between bearing capacity and cut or fill extent. Few points were considered for data calibration and validation. Resultant GIS-based guidance map are helpful to anticipate the bearing capacity in real estate industry. Application of this technique on additional sites will enhance confidence in the findings and may help in development of more reliable geotechnical maps.

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