

## Geotechnical Engineering Solutions for Adaptation

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**Abstract :** Geotechnical engineering is a multidisciplinary field that encompasses the study of soil, rock, and groundwater properties and their interactions with civil engineering structures. This research paper provides an in-depth overview of geotechnical engineering, covering its fundamental principles, applications in civil infrastructure projects, and the challenges faced by practitioners in the field. Through a comprehensive examination of soil mechanics, foundation design, slope stability analysis, and geotechnical site investigation techniques, this paper aims to highlight the importance of geotechnical engineering in ensuring the safety, stability, and sustainability of infrastructure development. Additionally, it discusses emerging trends, innovative technologies, and future directions in geotechnical engineering research and practice.

**Keywords :** sustainable geotechnical engineering solutions, education and training for future generations geotechnical engineers, integration of geotechnical engineering and structural engineering, use of AI in geotechnical engineering modelling

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