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Editorial

Special Issue on Geotechnical Engineering Hazards

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Geotechnical engineering is a complex field that deals with various hazards that can impact soil, rock, and other geologic materials. In this regard, safe design and practice in geotechnical engineering require engineers to identify indicators of geotechnical hazards and minimize consequences in the decision-making, investigation, design, and construction phases. A geotechnical engineer can properly identify the hazards and understand the risks associated with a project and provide safe, cost-effective, and sustainable design solutions to address the risks. This special issue on Geotechnical Engineering Hazards features 16 papers that delve into different geotechnical hazards and their impact on the stability of both natural and human-made structures. These papers provide valuable insights into the behavior of geotechnical systems and propose new methods and models for analyzing and predicting geotechnical hazards.

Seismic hazards are a major concern in geotechnical engineering, and six papers in this issue focus on this topic. Paper [1] analyzes ground motion intensity measures and selection techniques for estimating building response. Paper [2] assesses the seismic liquefaction risk of a saturated-calcareous-sand site in a port project in Timor-Leste, while paper [3] examines active deformation patterns in the Northern Birjand Mountains of the Sistan Suture Zone in Iran. Paper [4] investigates faults in the Sistan suture zone and shows the presence of compressional stress, while Paper [5] studies the impact of different seismic waves on high-steep rockslides. Paper [6] discusses the optimization of design for stone columns composite foundation in liquefiable ground improvement, by analysing the factors influencing the liquefaction mitigation effect of the foundation.

The reliability and availability of machines are critical factors in the performance of urban tunneling projects, and Paper [7] investigates the reliability, availability, and maintainability of Earth pressure balance machines in a metro project in Isfahan, Iran. Deep foundation pit projects adjacent to existing underpass tunnels are vulnerable to dynamic coupled risks, and Paper [8] presents a risk coupling analysis model for such projects using the N–K model and dynamic Bayesian network.

Slope stability is another critical aspect of geotechnical engineering as it can pose significant hazards, including landslides and rockfalls, which can cause damage to infrastructure and threaten human lives. Rockfall movement is a significant hazard for infrastructure located in mountainous regions, and Paper [9] presents a numerical investigation on the relationship between damping and coefficient of restitution (COR) in rockfall movement. Paper [10] uses a convolutional neural network for landslide susceptibility assessment, while Paper [11] examines the stability of earth-fill dams under rapid drawdown conditions.

Unsaturated soils are also a major concern in geotechnical engineering, and Paper [12] presents an experimental study on the small-strain shear modulus of unsaturated silty-fine sand. The study proposes an improved prediction model for the shear modulus of unsaturated sand. Paper [13] investigates the swelling effect on repairing cracks in fine-grained clayey soils and proposes ways to mitigate this effect.

The remaining three papers highlight the importance of understanding and mitigating geohazards for the protection of infrastructure and the environment. Paper [14] investigates the structural characteristics of fissures in an active tectonic area in Birjand,

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eastern Iran. Paper [15] presents an efficient analytical approach to calculate the displacement and stress fields of a layered isotropic elastic body with finite thickness, which is useful in analyzing and designing foundation works. Finally, Paper [16] investigates the ability of sand-tire shred mixtures to control surface explosion hazards that can damage underground structures.

The papers in this special issue provide a comprehensive overview of various geotechnical hazards and their impact on natural and human-made structures. They propose new methods and models for analyzing and predicting the behavior of geotechnical systems, and the insights provided can assist engineers in designing and constructing safer and more resilient structures. The lessons learned from these studies and case studies can be applied to future geotechnical engineering projects to identify indicators of geotechnical hazards, assess risks associated with projects, and provide safe, cost-effective, and sustainable design solutions to mitigate hazards. Ultimately, this special issue contributes to advancing the knowledge and understanding of geotechnical engineering hazards, which will enhance the safety and reliability of geotechnical structures and protect the environment.

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