

Enhancing Soil Strength through Vegetation: Green Mechanics in Geotechnical Engineering

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The interaction between vegetation and soil mechanics is gaining interest due to the demand for sustainable and eco-friendly solutions in engineering practices.

Vegetation's influence extends beyond erosion mitigation; it significantly augments the overall strength and stability of soil structures. This synergy between plants and soil offers innovative approaches to address critical challenges in geotechnical engineering, including slope stability, embankment design, and foundation engineering. As vegetation takes root in the soil, it initiates a series of transformations that affect soil structure, moisture dynamics, and mechanical behavior, ultimately influencing overall soil strength.

In the talk we will see how vegetation's impact on soil is not limited to increased shear strength; it also plays a pivotal role in delaying the attainment of peak shear strength, it increases the water retention properties of the soil, and contributes to soil consolidation. Specifically, we will elucidate how the fibrous network created by plant roots reinforces the soil matrix. Root growth can induce volumetric expansion in dense soils before shear failure, effectively redistributing stresses and delaying shear failure, ultimately contributing to improved soil stability. Finally, because vegetation's influence extends to soil moisture content through transpiration and evapotranspiration processes, experimental results will be presented to show how vegetation improves the water retention capabilities of the soil. Understanding this eco-mechanical interaction is crucial, with implications extending to agriculture, land management, infrastructure design, and environmental conservation.

This abstract represents our exploration of green mechanics in soil mechanics, uncovering how vegetation imparts its strength to the soil mechanics and detailing the research conducted at the University of Twente.

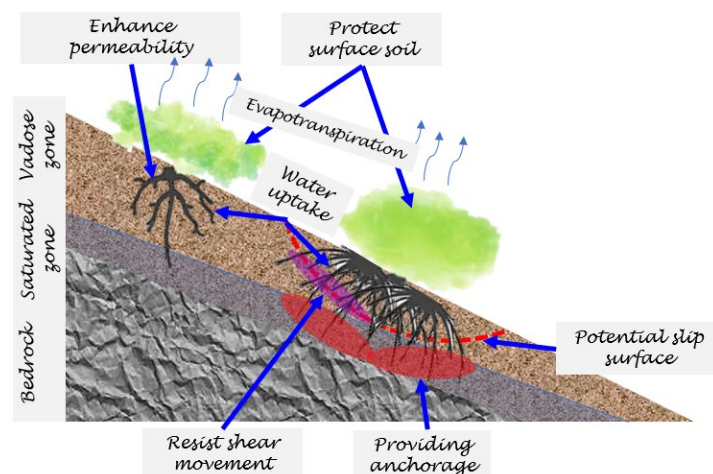


Figure 1 The research presented emphasizes vegetation's role in enhancing the hydro-mechanical strength of soil, particularly in the context of geotechnical engineering.