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EVALUATION OF THE EROSION AND SCOUR PROTECTION PERFORMANCE OF GEOSYNTHETICS MADE FROM WATER HYACINTH STALKS

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Abstract

Bank erosion and local scour pose significant threats to infrastructure and ecosystems, leading to substantial damage to both property and the environment. Traditionally, synthetic geosynthetics derived from petrochemical-based polymers have been employed to mitigate these issues. However, due to increasing environmental concerns, there is a pressing need to explore sustainable alternatives. This study focuses on utilizing water hyacinth, a highly invasive species, as a raw material for producing geotextiles and geocells to replace conventional plastic-based products. Large-scale open-channel flume experiments were conducted to evaluate the effectiveness of water hyacinth geosynthetics in erosion control and scour protection. Specifically, the study assessed slope deformation in various protection scenarios, including the use of water hyacinth-based geocells and geotextiles, and calculated the corresponding erosion control efficiencies. Additionally, the research measured scour depths around a bridge pier model under different flow conditions, using Froude numbers as a variable. Results indicate that water hyacinth-based geosynthetics can achieve comparable or even superior performance in both erosion control and scour protection, with efficiencies reaching up to 66.34% in certain configurations. This highlights the potential of water hyacinth fiber not only as an eco-friendly alternative to plastics but also as a viable solution for managing its overgrowth in aquatic environments.

Key words: erosion control, geosynthetics alternative, scour protection, UN-SDGS11, water hyacinth

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