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GRAIN SIZE CHARACTERISTICS AND HUMAN IMPACTS ON SEDIMENT DYNAMICS ALONG THE SOUTHEASTERN COASTLINE OF SRI LANKA

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The southeastern coastline of Sri Lanka experiences active sediment transport through longshore drift and wave-induced currents however, these natural processes are increasingly disrupted by human interventions such as harbour construction and breakwaters. This study investigates grain size characteristics to differentiate natural hydrodynamic influences from anthropogenic impacts, focusing on the Oluvil Harbour and associated coastal structures. Forty sediment samples were collected from Adalachchenai, near the Gal Oya River mouth up to Ninthavur covering a 5 km long beach stripe representing mean sea level and berm zone. Grain size analysis was conducted using mechanical sieving and the results were processed with GRADISTAT v9.1 software. Statistical parameters (mean size, sorting, skewness, and kurtosis) were calculated to assess sediment distribution patterns. Field observations indicate that the Oluvil Harbour and its breakwaters disrupt natural longshore sediment transport, resulting in localized erosion and sediment accumulation. The GSD results revealed that the grain sizes of the collected sediments ranged from 354.19 μm (fine sand) to 625.09 μm (coarse sand), reflecting varying energy regimes, while sorting values (0.86–1.12) indicate moderate to poor sorting influenced by wave action, fluvial input, and anthropogenic disturbances. The skewness values (-0.009 to -0.13) suggest a dominance of coarser particles, and kurtosis values (0.99–1.08) indicate transitional depositional conditions. Adalachchenai exhibits a wave-dominated environment, the Gal Oya River mouth shows fluvial-marine interactions, and Nintavur represents a low-energy setting. These findings emphasize the need for integrated coastal management to balance natural processes and human activities, aiding sustainable coastal management in Sri Lanka and similar regions. Implementing measures such as beach nourishment, sediment bypassing, and adaptive shoreline protection can help mitigate the adverse effects of human interventions.

Keywords: Breakwaters, Coastal Erosion, Grain Size, Human Interventions, Oluvil Harbour