Evaluation of overwash vulnerability and shoreline dynamics in cyclone-prone Sagar Island, Sundarbans (India)

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Abstract	Situated in the climatically vulnerable Sundarbans region, Sagar Island has increasingly been subjected to intense cyclonic events, including Yaas, Amphan, Bulbul, and Aila, leading to significant alterations in its coastal morphology. This study aims to elucidate the overwash vulnerability and shoreline dynamics in Sagar Island, spanning the period from 2000 to 2020. Utilizing satellite imagery, the study employs three indices-Overwash Shoreline Ratio (OSR), Maximum Overwash Intrusion Recurrence (MOIR), and Complete Barrier Overwash (CBO)-to assess overwash vulnerability. These indices collectively indicate a heightened susceptibility to overwash intrusion, with a particular focus on the years following severe cyclonic events. Additionally, shoreline change dynamics were quantitatively analyzed using the Digital Shoreline Analysis System (DSAS) tool, revealing a strong positive correlation between shoreline recession and climatic variables. Interlinkages between overwash vulnerability and shoreline dynamics were established, confirming that both phenomena are exacerbated by climate change and extreme weather events. The study's findings have critical implications for a broad range of sectors such as agriculture, fisheries, transportation, and ecosystem conservation. The research un-derscores the urgency for an integrated coastal management strategy that considers both overwash vulnerability and shoreline change dynamics to enhance sustainability and resilience. This study contributes to the global discourse on coastal dynamics, serving as a benchmark for climate adaptation measures in other cyclone-prone regions.
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