Stable Shores: An Experimental Set-Up to Test Economical Alternatives to Conventional Coastal Erosion Control

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Coastal erosion is responsible for the loss of $500 million in property and 80,000 acres of land annually in the U.S. Prevailing responses take the form of “conventional structures” such as groins and seawalls, which are both costly and ineffective. This project investigated economical alternatives to conventional coastal erosion control. To do so, two novel structures (Bernoullis and Net) were designed and tested against three conventional structures (Seawall, Dutch, and Breakwater) and wetland restoration (Plant). A physical experiment was used to assess the structures’ effectiveness at reducing erosion rates. A bead-in-tube design that converted the movement of a particle (bead) suspended in water into linear motion recorded erosion rates. Four tubes were used – providing data from four different points across the beach face. A cost analysis of each structure was conducted. A mathematical model for storm surge, developed using data gathered during the experiment, provided additional insight on structure effectiveness. The Bernoullis proved to be the most effective at mitigating erosion. Its six-unit-design allowed it to resist the wave at multiple levels. The Bernoullis were projected to cost 50% less than the best performing conventional structure (Breakwater). Furthermore, the mathematical model indicated that the Bernoullis would cut storm surge by 67%. The success of the Bernoullis informs the Golden Standard: for structures to be effective at controlling erosion they must 1) resist the wave at multiple levels and 2) restrict the vertical oscillations of the wave. This project proves that there are cost effective alternatives to conventional coastal erosion control.

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