Coastal Wave Attenuation Effect of Rhizophora sp. & Avicennia sp. vs. Vertical Seawalls & Other Man-made Coastal Protections

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In response to the growing concerns of coastal protection brought by climate change and habitat destruction, this experiment attempted to scientifically model the collision behavior between waves and the geometries of coastal protections both natural (mangrove forests) and man-made (vertical seawalls). This experiment was conducted in a system comprising a wave-making device, an incline to encourage wave breaking, and scaled models with similar geometries to their respective protection. In all 3 trials, the protections were compared by how much water they prevented from entering the reservoir as well as the % of the water mitigated that would normally enter the reservoir for that trial. In the experiment, it was found that on average, mangroves attenuated 19.4% more water from entering the reservoir than vertical seawalls. In the aftermath of the experiment, it was concluded that the location of collision for mangroves made them a superior option in the system being modeled as mangroves were able to impact waves earlier due to their location in the intertidal zone which was ahead of the average placement of vertical seawalls. Therefore the coastal protections that stopped the wave earlier prevented the most water from entering as opposed to stopping the wave later. While these results may hint at mangroves being a better option, coastal protections should also be seen as effective for other criteria like cost-effectiveness and longevity. However, this experiment could possibly make the case for the preservation of other naturally occurring coastal protections like sand dunes, rocky beaches, and other wetland ecosystems.

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