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TITLE: Valuing natural habitats for enhancing coastal resilience: Wetlands reduce property damage from storm surge and sea level rise

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ABSTRACT:

Storm surge and sea level rise (SLR) are affecting coastal communities, properties, and ecosystems. While coastal ecosystems, such as wetlands and marshes, have the capacity to reduce the impacts of storm surge and coastal flooding, the increasing rate of SLR can induce the transformation and migration of these natural habitats. In this study, we combined coastal storm surge modeling and economic analysis to evaluate the role of natural habitats in coastal flood protection. We focused on a selected cross-section of three coastal counties in New Jersey adjacent to the Jacques Cousteau National Estuarine Research Reserve (JCNERR) that is protected by wetlands and marshes. The coupled coastal hydrodynamic and wave models, ADCIRC+SWAN, were applied to simulate flooding from historical and synthetic storms in the Mid-Atlantic US for current and future SLR scenarios. The Sea Level Affecting Marshes Model (SLAMM) was used to project the potential migration and habitat transformation in coastal marshes due to SLR in the year 2050. Furthermore, a counterfactual land cover approach, in which marshes are converted to open water in the model, was implemented for each storm scenario in the present and the future to estimate the amount of flooding that is avoided due to the presence of natural habitats and the subsequent reduction in residential property damage. The results indicate that this salt marshes can reduce up to 14% of both the flood depth and property damage during relatively low intensity storm events, demonstrating the efficacy of natural flood protection for recurrent storm events. Monetarily, this translates to the avoidance of up to \$13.1 and \$32.1 million in residential property damage in the selected coastal counties during the '50-year storm' simulation and hurricane Sandy under current sea level conditions, and in the year '2050 SLR scenario', respectively. This research suggests that protecting and preserving natural habitats can contribute to enhance coastal resilience.

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