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TITLE: Ecosystem management tools to study natural habitats as wave damping structures and coastal protection mechanisms

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ABSTRACT:

Tropical countries have island and continental ecosystems of great value for tourism, fisheries and also for their conservation development potential. These natural habitats, including among other beaches, seagrass beds, mangrove forests and coral reefs can dissipate wave energy acting as barriers against high waves and high water levels to eventually protect coastal infrastructure and communities. However, in recent decades, they have been subject to strong anthropic pressure and extreme events due to natural causes as well as to climate change. Therefore, the global trend is to understand the eco-systemic services that these natural environments can provide and their economic value in terms of reducing damages caused by coastal erosion and flooding. A methodological framework is presented in order to quantify the impact of natural ecosystems in coastal protection and their environmental assessment based on numerical models available in the literature. In addition to the methodology, a study of a typical Caribbean fringing coral reef and its response to different sea level rise and extreme events scenarios was conducted. The contribution of these efforts from a technological and scientific point of view, lies in the integration of different disciplines required to combine the physical properties of hydrodynamic studies with biological factors as an input to provide practical socio-economic and environmental solutions in those regions in which these ecosystems predominate. Furthermore, a numerical modeling tool to study wave energy dissipation, focusing the analysis on the impact of natural ecosystems (coral reefs) on coastal erosion and flooding was implemented. This information will help coastal managers and decision-makers understand the coastal protection services provided by nearshore habitats in order to improve and design new coastal development strategies under global change scenarios.

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