



Sediment producing calcifying algae and sediment stabilising seagrass as an alternative to coastal engineering

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Extensive development of coastlines and climate change is increasing the vulnerability of beaches to erosion. Beach erosion increases the risk of flooding from storm surges, but also impacts the income from tourism, something of great significance in many tropical countries. Engineering solutions have been developed to combat beach erosion, however, are often expensive, are at the detriment of the natural ecosystem, and generally only provide an unstable temporary solution. By investigating the processes within a natural tropical foreshore ecosystem, we identify seagrass and calcifying macroalgae as a self-sustaining natural solution to maintaining tropical beaches. Utilising a specially designed field flume, combined with long-term sediment dynamic measurements, we directly measured the strong capacity of seagrass to stabilise foreshore sediments, and thereby provide a coastal protection service. This coastal protection is further enhanced by the sediment production by associated calcifying macroalgae that live within and adjacent to tropical seagrass meadows. Examples of tropical beaches with varying levels of this ecosystem type, illustrate the long-term effectiveness of sediment-producing calcifying macroalgae and sediment-stabilising seagrass in maintaining tropical beaches. By preserving and restoring vegetated foreshore ecosystems, tropical beaches will become more resilient to coastal erosion and climate change, thus benefitting both society and the natural environment.