

ID: W2306287609

TITLE: Reef to island sediment connections on a Maldivian carbonate platform: using benthic ecology and biosedimentary depositional facies to examine island building potential

AUTHOR: ['Kyle M. Morgan', 'Paul S. Kench']

ABSTRACT:

Abstract Reef islands are low-lying accumulations of unconsolidated sediment formed from the skeletal remains of carbonate-producing reef organisms and are therefore perceived as highly vulnerable to environmental change. However, basic elements of island composition are not well described and given their high inter- and intra-basinal variability a better understanding of reef and island sedimentary environments (and the connections between them) are needed to predict future morphological response. Here, we use detailed ecological and sedimentological datasets to delineate key sediment production zones and biosedimentary depositional facies across the surface of Vabbinfaru platform, Maldives. Field measurements of platform hydrodynamics are applied to sedimentary deposits to determine the potential mobility of grains and identify transport pathways. Carbonate production was dominated by coral framework (mean: 52%) within a narrow zone on the outer reef rim (22% of platform area) resulting in coral-rich detrital sediments (reef: 51%, island: 64%) that closely resemble living assemblages. The net transfer of sediment occurred lagoonward by wave-driven processes leading to a decrease in grain size towards the island ($R^2 = 0.502$) which acts as a major control on depositional facies development within the lagoon. Island sediments were distinct from reefal deposits, comprising a restricted suite of durable sands (mean: 1.34 ϕ) throughout long-term development. Our findings suggest that the production, breakdown and redistribution of coral-derived sediment by platform currents is fundamental to future island stability at Vabbinfaru, and although alterations away from current ecological states may reduce sediment supply, the timescales over which island morphological response will occur depends upon phase lags between initial coral mortality and the conversion of this material into island-grade sand. Copyright © 2016 John Wiley & Sons, Ltd.

SOURCE: Earth surface processes and landforms

PDF URL: None

CITED BY COUNT: 26

PUBLICATION YEAR: 2016

TYPE: article

CONCEPTS: ['Reef', 'Sedimentary depositional environment', 'Facies', 'Benthic zone', 'Geology', 'Sediment', 'Coral reef', 'Sedimentary rock', 'Carbonate platform', 'Carbonate', 'Coral', 'Oceanography', 'Ecology', 'Paleontology', 'Structural basin', 'Materials science', 'Biology', 'Metallurgy']