

Coastal Impacts of Sea Level Rise

Peter Cowell and Ian Goodwin, School of Geosciences, University of Sydney

Abstract

Evidence for the signal of geomorphic impacts on coasts due to sea level rise at present is hidden amidst noise from other well recognised drivers, including effects of historical climate variability and direct human impacts. We expect that the signal to noise problem will begin to resolve as sea level rise accelerates into the second half of this century. Even then, however, our models show that effects of sea level rise in driving coasts inland account for only about half of the potential response under many conditions (Fig. 1). The modeled effects of increased storms on the coastal geomorphology (eg, expected from intensified east coast lows) is minor compared to responses to other drivers.

For estuaries and their associated coastal lowlands, our model shows that increased sea level (eustatic and storm surge) provides only half the picture. Sedimentation rates are equally important on the climate-change timescale (Fig. 2). Any attempt to model storm inundation in the second half of this century and beyond needs to take into account the evolving geomorphology in estuaries due to the interplay between effects of rising sea level, sedimentation, and the evolving geomorphic state. That is, boundary constraints for storm surge models will be significantly different from that measured at present.

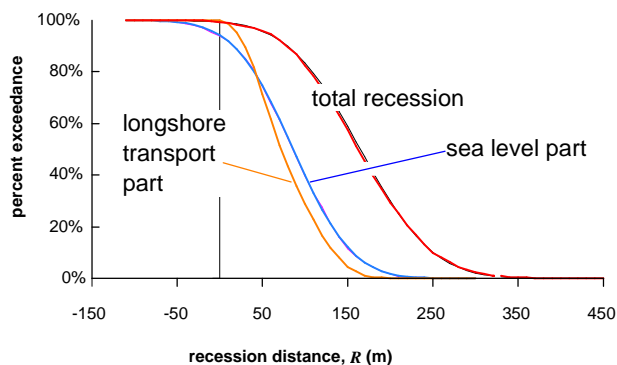


Figure 1. Dune recession distances on the oceanic coast, stochastically generated using the Shoreface Translation Model, incorporating effects of sea-level rise, potential disturbance to the littoral-sand transport budget and variability in dynamic sea bed and beach morphologies, and increased storm erosion.

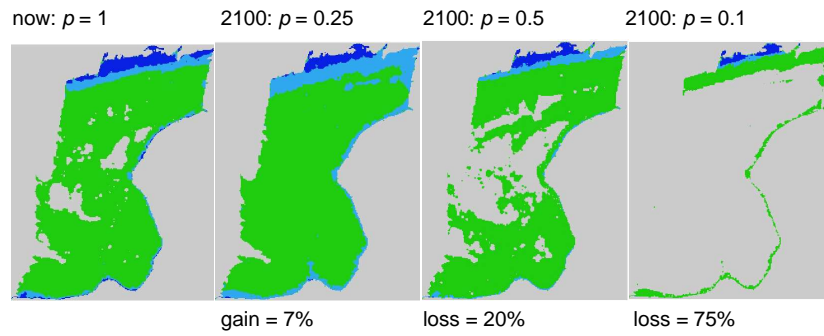


Figure 2. Change in intertidal topography at elevations suitable as mangrove habitat in part of the Hunter River estuary, NSW, modeled stochastically using the Estuarine Sedimentation Model to capture the effects of increased sea levels with sedimentation by 2100.