North Brazil Shelf Mangrove Project
Regional Biophysical Review

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1 Executive Summary

This report synthesizes the current understanding of the physical processes and hydrodynamic mechanisms that support mangrove development across the North Brazil Shelf Large Marine Ecosystem (NBS-LME), specifically in Guyana and Suriname, and is intended as a key technical input to orientate planning and awareness building for mangrove conservation and restoration measures and to explore development options that conserve natural processes. The dynamic NBS-LME coastal plain is driven by migration of enormous mud banks that flow northwest as slow-moving waves along the shore from the Amazon river, Brazil to the Orinoco river, Venezuela. Mangroves grow seaward as mud banks pass and erode as the mudflat migrates. Landward from the coastline, the coastal plain has existed in relative stability. Conversion for agriculture and settlement is most intense in Guyana, progressively decreasing through Suriname, French Guiana and Brazil. Drained lands are below sea level, requiring drainage channels and protection by levees from river and tidal flooding. Extensive areas of farmland have been abandoned due to flooding and effects of acidic soils. Ongoing discussion about management of the coastal plain recognizes the importance of ecological conservation, the demand for land conversion to agriculture and settlement, and the growing frequency and scale of flooding from sea level rise.

Mangroves (saline tidal forested wetlands) and coastal swamps (freshwater forested wetlands) are interconnected components of the coastal plain landscape that are at, or just above, sea level. Over thousands of years, organic soils built up in the coastal swamps, while soils are more mineral along the shore. The presence of vegetation both helps to buffer wave energy that drives erosion and to bind soft sediment, although the capacity for mangroves to bind sediments is limited to the upper reaches of the tidal range. As such, mangroves are subject to periods of erosion and accretion with the passage of mud waves. Infrastructure built within the dynamic fringe of the mangroves is subject to periodic erosion threats as passing mud wave troughs lower the shore, and levees further exacerbate erosion by enhancing wave energy and hindering sedimentation on adjacent mudflats. Setting back of infrastructure can help create the space to sustain a mangrove area that responds resiliently to dynamic coastal changes and act to attenuate wave energy.

The existing NBS-LME shoreline is unlikely to be maintained as sea level rises. Rather, the shoreline is likely to retreat, the magnitude of which is dependent on sea level rise. There is likely sufficient sediment for mangroves to build vertically with high rates of sea level rise, but they will likely retreat landwards or shoreline. Where hard coastal flood protection measures exist, however, mangrove migration will be squeezed between rising waters and hard infrastructure. Mangrove afforestation on dynamic mudflats with brushwood fencing will be under increasing erosion pressures as sea level rises. With planning, there is potential to include mangrove restoration on abandoned lands as part of nature-based solutions for climate adaptation, flood risk reduction, and for ecosystem survival.