A HOLOCENE SAND BUDGET FOR THE SEASONALLY WET TROPICS REGION OF NORTH QUEENSLAND

Thesis submitted by

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ABSTRACT

The discharge of coastal streams between Bowen and Rollingstone, north Queensland is highly seasonal with ~90% of the total annual discharge typically occurring between December and April. This section of the Queensland coast is referred to as the Seasonally Wet Tropics. In this thesis the abbreviation SWT will be used to refer to the Seasonally Wet Tropics region and seasonally wet tropical systems. Most of the shorelines along this coast are dominated by sand. Previous literature suggests that seasonally wet tropics streams deliver large quantities of sand to the coast. However, little is known regarding the timeframes, pathways and dominant processes of sand delivery. A Holocene sand budget was developed for the SWT coastal zone from the studies of three SWT coastal systems: i) the Haughton River Estuary (Lat. -19.416, Long.147.126); ii) the Elliot River Estuary (Lat.-19.880, Long. 147.885) and iii) the Black River Delta (Lat. 146.651, Long. -19.178). These systems are typical examples of tropical, variable discharge rivers responding to the marked intra and inter-annual variability of the SWT weather and climate. This region is meso tidal and subject to relatively low-energy ambient wave conditions.

Conceptual models of the spatial and temporal patterns of coastal sand transfer for the Haughton and Elliot River Estuaries and the Black River Delta were developed based on historic, sedimentological, stratigraphic and hydrodynamic data. Three different sand transfer processes were observed in each system. The lack of coarse, poorly-sorted, angular sediments within the Haughton River Estuary suggests that the relative proportion of fluvial sediment supplied from the Haughton River is minor compared to the influx of marine sediment via tidal currents. Therefore, the Haughton River Estuary is tide-dominated and a sink for marine sediment. Relatively strong wave and tidal energy dominate sand transfer processes in the Elliot River Estuary, with little evidence to suggest that the Elliot River is contributing significant amounts of fluvial sand to the coast. In contrast, deposits of coarse poorly sorted sediments identified at the mouth of the Black River Delta suggested that the modern Black River exports some fluvial sand to coast, which is transported northwards by relatively strong wave energy and wave generated currents.

To interpret these findings within an evolutionary context, current estimates of fluvial sand delivery reported in the literature were extrapolated over the last 7 ka and compared with Holocene sand stored in onshore coastal deposits, nearshore and on the inner shelf. The results of the Holocene sand budget suggest an apparent deficit of ~6.5×10^8 m^3 of sand (including loss

to the system via longshore drift) suggesting that seasonally wet tropics streams have not been delivering predicted volumes of sand to the coast for at least the last 1.6 ka. It is concluded that the sand derived landforms that dominate the seasonally wet tropics coast are the result of multi-cyclic processes – initiated by the landward movement of marine sand during the Holocene transgression.

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