

Late Holocene to Present shoreline change at the mouths of the Mekong River delta

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The Holocene Mekong River delta prograded rapidly in a relatively sheltered bight in the South China Sea under the influence of high fluvial sediment supply 5300 to 3500 years ago, developing from an estuary into a delta. This bight infill led to increasing exposure of the prograding shoreline of the delta to ocean waves, resulting in a greater wave influence on the patterns and types of shoreline. In the eastern half of the delta where the river's sediment supply debouched into the South China Sea through several distributary mouths, deltaic progradation has been characterized by the construction of numerous sets of sandy beach ridges. The growth pattern of this sandy river-mouth sector over the last 2500 years has been determined from OSL dating of these beach-ridge deposits, while the most up-to-date shoreline trends (1950-2014) have been highlighted from the analysis of maps and satellite images. The OSL ages show that the total delta area remained nearly constant till about 500 yr BP, following which the mouths sector underwent significant accretion that may reflect changes in catchment land-use as well as in monsoon rainfall and attendant river water and sediment discharge. Since 1950, the trend has been dominantly one of accretion but punctuated by two periods of erosion. The first (1965-1973) occurred in the course of the second Indochina war, and the second more recently from 2003 to 2011, followed by mild recovery between 2011 and 2014. These temporal fluctuations most likely reflect changes in sediment supply caused by the vicissitudes of war and its effect on vegetation cover, as well as variations in monsoon rainfall and discharge, and, for the most recent period, massive sand mining in the river and deltaic channels. Continued accretion of the mouths sector has gone apace, over the recent multi-decadal period, with large-scale erosion of the muddy shores of the delta in the western South China Sea and the Gulf of Thailand, thus suggesting that the mouths sector may be increasingly sequestering sediment to the detriment of the rest of the delta shoreline. Fine-tuned analysis of the spatial pattern of change in the mouths sector shows marked variations that may reflect alongshore transport variations associated with gradients in wave energy caused by the multiple river mouths in a context of increasingly depleted sand supply. Accretion in the mouths sector is likely to be impacted in the coming years by large-scale channel bed sand mining, compounded by sediment trapping by recent dams in China. The overall current status of the entire Mekong delta shoreline, dominated by land loss, highlights increasing vulnerability to perturbations in sediment supply driven by human activities over the last few decades.

Keywords: River delta, Vulnerability, Sediment supply, Mekong