

## **Coastal Sedimentation and Recent Coastline Changes Along the Seberang Perai Coast, Pulau Pinang**

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The coast of Seberang Perai can be distinctly separated into a northern sandy coast and a southern muddy coast. The mixed sand-mud tidal beach in the north is made up of a clean, fine- to medium-grained sandy supratidal beach, a dirty (muddy) medium- to coarse-grained upper-intertidal sand and a lower-intertidal silty mudflat. The dominant grain size for the sandy supratidal zone display a southward decreasing trend. The grain size ranges between 1.25–2.5  $\phi$  ( $\sim$  0.42–0.18) in the north and between 2.5–3.25  $\phi$  (0.18–0.105 mm) in the south. This segment of the coast is also characterized by intensive infrastructure development. Large scale man-made structures here are the Dermaga Butterworth, Pengkalan Sultan Abdul Halim and the new North Port. A major coastal embankment and beach filling project is being carried out to slow down coastal erosion, and is nearing completion in Bagan Ajam, Bagan Lebai Tahir, Permatang Kucing and Bagan Belat. Muddy intertidal sedimentation prevails along the southern coast from Pengkalan Sultan Abdul Halim in the north, extending southward to the mouth of Sungai Kerian and the northern coast of Kuala Kurau. This coastal mudflat accretion, which may extend seaward several hundreds of metres and may reach a thickness of more than 1 m thick, is undergoing gradual stabilization and prograding seaward. Maps of the southern coast for the year 1962, 1970, 1977, and 1985 show that the mudflat accretion occurred steadily from 1962 to 1977; however, a very marked change in the rate and pattern of mudflat buildout occurred between 1977 and 1985. The buildout near Batu Kawan by 1985 indicate a significant increase in the rate of mudflat accretion. The mainland coastal mudflat has joined up with the mudflat of Pulau Gedung and Pulau Aman. This may have been related to the construction of the Penang Bridge. The marked contrast in coastal sedimentation between the northern and southern coast may be a function of the geology, the climatic regime and the prevailing marine processes. Sandy beach ridges of the Matang Gelugor Member of the Holocene Gula Formation underlies the northern coastal areas while the southern coast is underlain by the older Undifferentiated Member of the Gula Formation which is composed of clay, silt and sand. Climatically, the northern coast received more precipitation than the south. This may have some influence on the weathering pattern and runoff efficiency in the coastal areas. Sediment transport in the Seberang Perai coast may have been affected by both the south-eastward current and the north-westward current (the flood and the ebb current). The southward-fining trend in sand grain size observed along the northern coast of Seberang Perai may have been the result of the south-eastward longshore drift. On the other hand, the southern muddy coast clearly show evidences of northward rivermouths displacements and mudflat 'spits' deflections that must have been caused by the prevailing west-northwest longshore currents.