Marine Processes in the Northern Lobe of Mahakam Delta and Marangkayu Spit Bar: Implication on Paleogeography Model in the Subsurface

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Morphological components of the northern lobe of the Mahakam Delta combined with the adjacent shoreline of Muara Badak and the Marangkayu Spit Bar to the north of the delta are being investigated to reveal the interplay between fluvial and marine processes in the making. These specific areas are hypothetically considered as analogues to the paleogeography of the reservoir sections in the subsurface of Semberah Field, which is located 15-20 KM inland to the west and parallel to the shoreline. Bathymetric survey, bottom grab sampling, and shallow sediment coring were conducted in 4 locations representing upper delta plain, lower delta plain, upper shore-face and fore-shore. Surface sediment observations were also performed in the spit bar area.

Measurements of present-day current direction and grain-size distribution along the shorelines suggest at least two terrestrial sources of sediment provenance filling in the area. In the northern lobe of the Mahakam Delta, the tidal effect is more pronounced than waves, while in the Marangkayu Spit Bar wave action is dominant. In both areas, fluvial processes can still be seen acting dominantly on certain sub-environments. Brackish water, clay drapes, flaser and wavy ripple lamination and suspension feeder burrows characterize the delta plains of the northern lobe of Mahakam Delta. Saline sea water, trough cross bedding, low angle parallel bedding and sand burrows are typically observed in the Marangkayu Spit Bar area.

Analyzing the present-day shoreline of Northern Lobe of Mahakam Delta - Marangkayu Spit Bar as analogues for the Miocene subsurface environment in Semberah field, we found a very pronounced one-to-one matching. Further mapping and comparison of sand body geometries between the two realms are needed to advance the analogy.