

## MORFODINAMIKA DAN KARAKTERISTIK UKURAN BUTIR SEDIMEN DASAR MUARA SUNGAI PROGO DAERAH ISTIMEWA YOGYAKARTA

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### INTISARI

Morfodinamika muara dapat mengganggu fungsi muara sehingga penting untuk mengkaji proses dan faktor yang memengaruhinya berupa karakteristik sedimen yang menentukan sedimentasi pada muara. Muara Sungai Progo mengalami perubahan morfologi akibat tingginya sedimentasi, tetapi penelitian terkait proses morfodinamika muara dan karakteristik sedimennya masih terbatas. Penelitian ini bertujuan untuk mengidentifikasi morfodinamika muara Sungai Progo berdasarkan perubahan bentuk dan morfologi dasar muara antarmusim; serta mendeskripsikan karakteristik ukuran butir sedimen dasar muara Sungai Progo pada kondisi morfologi yang berbeda. Waktu penelitian dilakukan pada musim hujan dan musim transisi I. Morfodinamika muara Sungai Progo diidentifikasi berdasarkan interpretasi bentuk muara serta pengukuran batimetri pada kedua musim, kemudian dibandingkan kondisi antarmusim melalui selisih kedalaman, *overlay*, dan *cut and fill*. Karakteristik ukuran butir sedimen dasar muara Sungai Progo diperoleh secara *systematic sampling* pada kedua musim dan diuji dengan metode ayakan lalu dideskripsikan secara statistik dari komputasi program GRADISTAT V.8.

Hasil penelitian menunjukkan bahwa muara Sungai Progo berjenis *barrier estuary* dengan ciri morfologi khas bura yang mengalami perubahan bentuk menjorok ke dalam muara. Perubahan morfologi dasar muara ditunjukkan oleh volume erosi sebesar 198.136,37 m<sup>3</sup> dan deposisi sebesar 56.975,44 m<sup>3</sup> akibat banjir dari puncak debit musim hujan. Dominasi erosi tersebar di bagian utara hingga barat daya muara, sementara deposisi dominan di sisi timur. Adapun pada sisi selatan muara justru didominasi erosi di timur dan deposisi di ujung barat akibat pembiasan gelombang oleh arus laut. Karakteristik sedimen dasar antarmusim mengalami peningkatan fraksi sedimen kasar, sortasi bertambah buruk, kemencengan ke arah sedimen halus, serta kurtosis yang lebih mendatar akibat fluktuasi energi transpor sedimen saat banjir. Karakteristik sedimen awal menunjukkan pola yang acak terhadap morfodinamika ketika terjadi banjir, tetapi perubahan karakteristik sedimen cukup berkaitan dengan sebaran morfologi dasar muara. Sedimen dasar pada morfologi curam di bagian utara hingga barat daya didominasi erosi dan peningkatan sedimen kerikil, kecuali di barat laut yang mengalami peningkatan sedimen halus sehingga berpotensi meningkatkan erosi ke tepi barat. Sedimen dasar pada morfologi dangkal di sisi timur mengalami deposisi dan peningkatan sedimen kerikil yang berpotensi menyebabkan pendangkalan, sementara sedimen pasir dapat terendapkan lebih jauh ke selatan.

Kata Kunci: Batimetri, Morfodinamika, Muara Sungai Progo, Ukuran Butir Sedimen

MORPHODYNAMICS AND BED SEDIMENT GRAIN SIZE  
CHARACTERISTICS OF PROGO RIVER ESTUARY DAERAH ISTIMEWA  
YOGYAKARTA

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ABSTRACT

Estuarine morphodynamics can disrupt estuarine function, making it crucial to examine the processes and factors influencing them, particularly the sediment characteristics that determine sedimentation in the estuary. The Progo River estuary undergoes morphological changes due to high sedimentation, however research related to estuarine morphodynamic processes and sediment characteristics remains limited. This study aims to identify the morphodynamics of the Progo River estuary based on changes in the shape and morphology of the estuary floor between seasons; and to describe the grain size characteristics of the Progo River estuary bed sediment under different morphological conditions. The study was conducted in the rainy season and the first transition season. The morphodynamics of the Progo River estuary were identified based on the interpretation of the estuary shape and bathymetric measurements in both seasons, followed by comparison between seasons through depth differences, overlay, also cut and fill. The grain size characteristics of the Progo River estuary bed sediment were obtained through systematic sampling in both seasons and tested using the sieve method, they were then statistically described using the GRADISTAT V.8 computational program.

The results of the study indicate that the Progo River estuary is a barrier estuary with typical spit morphology that has undergone changes in shape jutting into the estuary. Morphologic changes of the estuary floor are indicated by the volume of erosion of 198,136.37 m<sup>3</sup> and deposition of 56,975.44 m<sup>3</sup> due to flooding from the peak discharge of the rainy season. Erosion is dominant in the north to the southwest of the estuary, while deposition is dominant on the east side. The south side of estuary is dominated by erosion in the east and deposition at the western end due to wave refraction by ocean currents. The characteristics of the bottom sediment between seasons experience an increase in the coarse sediment fraction, an increase of poor sorting, skewness towards fine sediment, and flatter kurtosis due to fluctuations in sediment transport energy during floods. The initial sediment characteristics show a random pattern to morphodynamics during floods, but changes in sediment characteristics are quite related to the distribution of the estuary floor morphology. Bed sediment along the steep morphology in the north to southwest is dominated by erosion and increased gravel sedimentation, except in the northwest where fine sediment increases that will potentially increase erosion to the west bank. Bed sediment along the shallow morphology on the east side experiences deposition and increased gravel sedimentation that will potentially cause siltation, while sandy sediments may be deposited further south.

Keywords: Bathymetry, Morphodynamics, Progo River Estuary, Sediment Grain Size