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Original Research

Changes in Water and Sediment Quality of a River Being Impounded and Differences Among Functional Zones of the New Large Tropical Hydroelectric Reservoir

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Abstract

Though more large tropical reservoirs are being constructed to meet the increasing energy demand, knowledge on the impact of damming a tropical river and the differences along the river after its impoundment is scarce. Thus, the present study aimed to increase our understanding of such differences both longitudinally and vertically. Water and sediment samples were collected at three different functional zones in the Murum River basin 10 months after impoundment began. Results show that the impoundment has an impact on both the water and sediment. Longitudinal variations of water and sediment characteristics were observed at different functional zones. The upstream riverine zone subjected to anthropogenic activities serves as the main input of suspended solids and nutrients to the reservoir. The nitrogen changed from a high nitrate and low ammonia condition prior to impoundment to a low nitrate and high ammonia condition due to the accumulation of organic matter and slow nitrification rate after impoundment. In the transitional and lacustrine zones, vertical stratifications of dissolved oxygen and temperature were observed. The thickness of a well-oxygenated column for sensitive aquatic organisms was only 2 m at some stations. Water quality in all zones showed impairment during the filling phase as compared to the good water quality index before impoundment. The reduction of suspended solids in the surface water column in the transitional and lacustrine zones is a positive change for aquatic organisms. Sediment characteristics were found to be distinct in the transitional zone, where it was lower in sand and higher in silt, clay, organic carbon and nutrients in contrast to the riverine

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