

OVERVIEW OF HYDRAULICS AND SIMIYU RIVER SEDIMENT INPUT INTO MAGU BAY, LAKE VICTORIA, TANZANIA

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ABSTRACT

Lake Victoria is experiencing multifaceted environmental and ecological problems. A study of the problems needs a multidisciplinary approach to establish the cause-effect relationships. The study focuses on the hydraulics of Lake Victoria's Magu Bay and Simiyu riverine input of suspended sediments and their distribution in the Bay. Sampling in the river mouth and the Bay was conducted aboard an 8m outboard engine wooden boat. Turbidity, currents speed and direction were measured using an "AANDERAA" multi-sensor self-recording current meter model 9 (RCM9). Water depth was measured using an echo-sounder type FISHIN' BUDDY II. Geographical positions of the sampling locations were obtained using a GPS, Model Garmin 12. Suspended sediment concentrations were determined by sampling the water, filtering and weighing the sediments. Data on rainfall and water discharge were obtained from the Mwanza Meteorological office. Statistical analysis shows that cumulative rainfall of 1043 mm and the respective discharges of 98.5 m³/s have a return period of 5 years. A return period of 50 years is expected to have cumulative rainfall of 1403 mm and discharges of 156.7 m³/s. Concentration of suspended particles was highest at the river mouth (1573 mg/l at station 1) and exponentially decreased as one moves away from the river (0.9 mg/l at station 8, a station that was most off-shore from the river mouth). Also, turbidity was higher towards the river and decreased as one moves away from the river mouth. In the first half a kilometre longitudinally from the river mouth, most of the suspended sediment has been deposited its concentration is attenuated exponentially as $C_s/C_{s0} = e^{-kx}$, where C_s is suspended sediment concentration at distance x from the river mouth and C_{s0} is concentration at $x = 0$ (at the river mouth) and $k = 2.1$ is the attenuation coefficient. Both surface and bottom currents exhibited the same trend as sediment concentration. At the mouth of the river, the surface and bottom current are northward. In the first half kilometre from the river mouth, the current speed has been strongly attenuated from 0.54 m/s to 0.07 m/s. From there onwards, the current speeds are reversed, almost flowing in the opposite direction of the river flow. Simiyu River is a major sediment contributor to the bay ranging from zero on days when there is no water discharge to about 20,000 tons/day in the observed period. It is recommended that a comprehensive and long-term study to cover all river sediment input into the lake be undertaken.

Keywords: Lake Victoria, Magu Bay, hydraulics, sediment transport

1. INTRODUCTION

Lake Victoria, the greatest among the African Great Lakes and the third largest in the World, has a surface area of about 68,800 km². The lake is shared by Kenya (6%), Tanzania (49%) and Uganda (45%). The lake is generally shallow with average and maximum depths of 40m and 80m respectively. The lake occupies a crustal sag between the western and eastern rift shoulders, and was formed as a result of river reversal and ponding during the Cenozoic rifting (Johanson et al., 1996; Stager et al., 1997).

According to Mpendazoe et al. (1993); Hamza (1996) and Mtega and Masanja (1999), pollutant loading in Lake Victoria resulting from land-based activities has received substantial,

though not adequate, attention. Non-point sources of material input into the lake have in many occasions been neglected and in most cases they are merely implicated by circumstantial evidences.

According to Lehman (1996) sedimentation is one of the many causes of ecological changes in the Lake. The accelerated rates of input of nutrients into Lake Victoria in the last four decades has been to a greater extent a result of direct and indirect anthropogenic activities in the watershed. For instance, the proliferating human population is inevitably creating pressure on land use in the catchment area. Land denudation with the concomitant soil erosion is a major problem in poorly managed agricultural, mining and human settlement

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