



## **Sedimentation and Its Impact/effects on River System and Reservoir Water Quality: Case study of Mazowe Catchment Zimbabwe**

Colleta Tundu (1), Michael J Tumbare (2), and Jean-Marie Kileshye-Onema (3)

(1) Zimbabwe National Water Authority, Harare, Zimbabwe (ctundu@gmail.com), (2) Department of Civil Engineering, University of Zimbabwe, Harare Zimbabwe (mjtumbare@gmail.com), (3) WaterNet, P.O Box MP 600 Mount Pleasant, Harare, Zimbabwe (jmkileshye-onema@waternetonline.org)

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Colleta Tundu\*, Michael J Tumbare\*, and Jean-Marie Kileshye-Onema\*

(a) Department of Civil Engineering, University of Zimbabwe Box MP167, Mt Pleasant, Harare, Zimbabwe

(b) WaterNet, P.O Box MP 600 Mount Pleasant, Harare, Zimbabwe

\*Email: \* ctundu@gmail.com

### **Abstract**

Sediment delivery into the water sources and bodies results in the reduction of water quality and quantity, increasing costs for water purification whilst reducing the available water for various uses. The paper gives an analysis of sedimentation in one of Zimbabwe's seven river Catchments, the Mazowe Catchment, and its impact on water quality.

The Revised Universal Soil Erosion (RUSLE) model was used to compute soil lost from the Catchment as a result of soil erosion. The model was used in conjunction with GIS remotely sensed data and limited ground observations. Sediment yield estimates for the Catchment were obtained by multiplying the soil lost by the sediment delivery ratio. 100m river delineation was done to calculate the sediment yield in the major rivers within the Catchment. Samples were collected from silt gauging stations for the analysis of the sediment loads and these were compared with the results from the model. Measured sediment load from one of the silt gauging stations (D75) was used for the model calibration. A bathymetric survey was also done on Chimhanda dam, which lies within the Catchment, to determine the level of siltation of the dam, and thus validate the results from the model and silt gauging stations.

The estimated annual soil loss in the Catchment indicates an average soil loss of from 0ton/ha/year to 65ton/ha/year. The annual sediment deposition into Chimhanda dam was estimated to be 330ton with a specific yield of 226ton/km<sup>2</sup>/year from the dam's catchment area. The average siltation rate of the dam was estimated as 6.3% of dam capacity per year. The capacity of the dam has decreased by 39% as of 2015 from its original capacity at construction in 1988. The usefulness/lifespan of the dam will be reduced from the expected 50 years to 37 years at current sedimentation rates. Water quality data from Chimhanda treatment plant water works revealed that the quality of water is deteriorating as a result of increase in sediment accumulation in the dam.

Available historical water quality data for the selected parameters BOD<sub>5</sub>, DO, EC, NO<sub>3</sub>, pH, PO<sub>4</sub>, TDS and turbidity from selected sampling points within the Catchment was analysed. A relationship between sediment yield and water quality parameters was found. It was established that there is a strong relationship between the sediment yield and the water quality parameters. Sediment yield showed high positive correlation with EC (0.7) and turbidity (0.6). The relationship can be used as an indicator of water quality along water bodies in the Catchment.

The study concluded that the Catchment is generally experiencing, on average, moderate soil loss. How-

ever, there are some areas with high soil loss and poor water quality.

#### Key Words

Bathymetry, Sedimentation, Sediment Delivery Ratio, Sediment yield, water quality