Abstract

Kalundu reservoir is one of the water reservoirs in arid and semi-arid lands in Kenya that has been experiencing periodic siltation since 1950s. Lack of data and information on the hydrological processes and land use practices has limited implementation of localized strategies to minimize sedimentation in the reservoir. The objective of this study was to determine the hydrological influences and land use practices that contributed to sedimentation of Kalundu reservoir in the period between (2000 – 2021). Hydrological datasets were acquired from three sampling stations established at different points along Kalundu River. Landsat imagery were used in the Land use and Land Cover analysis. Hydrological analysis showed that during the short rainy season, the mean river discharge ranged from 0.44- 1.00m3 /day and 0.11-0.50m3 /day during the long rains. Sediment load discharged into the reservoir was more during the short rains (134,028.84m3 )than during the long rains (28,448.87 m3 ) with a Trap Efficiency of 47.73%and 55.91%, respectively. The river discharge showed a significant relationship with TSSC (r=0.69, Pvalue=0.03), turbidity in the river (r=0.68, R2=0.45, pvalue=0.03) and sediment load (r=0.68, R2=0.46, pvalue=0.03). This results implied high sediment load is likely to be observed during high flows. From bathymetric analysis, Kalundu reservoir decreased its storage capacity by 70% from 500,000m3 in 2013 to 149,902m3 in 2021. This implied that 350,098m3 of sediments were deposited within that period at an estimated rate of 65,317 tons/yr or 2,722 tons/km2 /yr. The total surface area of the reservoir decreased by 11% from 48,500m2 in 2013 to 43,200m2 in 2021.In 2021, the mean water depth in the reservoir was 2.1m and the deepest part was 3.5m. The Useful Life Span of the dam was estimated to be about 3 years. LULC analysis showed that croplands and built-up areas increased significantly within a period 20 years (2000-2020). Bareland and abandoned croplands were attributed to soil erosion in the study area leading to sedimentation of Kalundu Dam particularly during short rainy seasons. Poor farming practices, urban land development activities, heavy infrastructural development and clearing of natural vegetation in the sub-basin were strongly attributed to the increased sedimentation of the dam in the period between (2010-2020).