Simulation of organic carbon loading using MIKE 11 model: a case of River Nzoia, Kenya

ABSTRACT

River Nzoia is the largest river draining into the Kenyan portion of Lake Victoria. This river receives both point sources of pollution from industrial and municipal wastes, and non-point sources from agricultural runoff in the catchment. The objective of this study was to simulate dissolved oxygen (DO) and biochemical oxygen demand (BOD) of the middle section of River Nzoia using MIKE 11 model. The model was calibrated using discharge and water quality data for 2009 and validated with March-April 2013 data. The model performance was good with coefficient of determination (R-2) values of between 0.845 and 0.995, Nash-Sutcliffe efficiency values of between 0.748 and 0.993 and percent bias of less than 10 for both calibration and validation of electrical conductivity (EC), DO and BOD. EC and BOD values were lower for April compared to March which could be attributed to dilution during high flows. DO values were above the recommended minimum level of 4 mg/l in all the sections of the river in the wet period but some sections had lower than 4 mg/l during low flow period. The government agencies such as Water Resources Management Authority and National Environment Management Authority should enforce the effluent standards to ensure that industries and wastewater treatment plants adhere to the maximum allowable limit for BOD and also improve their treatment efficiencies of wastewater plants so as to improve the quality of River Nzoia which is important in the overall management of the Lake Victoria basin.

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