



Sustainable management strategies for an urban-type and low dissolved oxygen stream using measured biochemical coefficients

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ABSTRACT

A water quality model, QUAL2K, with the measured biological coefficients was employed to develop sustainable management strategies for an urban-type stream. To master the data of hydrological and receiving water quality, three surveys were conducted at 20 sampling stations along the Wan-Nian stream in the Pingtung city of southern Taiwan. Then the biochemical coefficients including deoxygenation, nitrification, and reaeration rate coefficients, and sediment oxygen demand were measured and incorporated with influent pollutant loadings and boundary conditions to calibrate and verify the developed model. Simulation evaluated with the mean absolute percentage error method fits reasonably well except for a suspended solid sampled on 16 January 2011. The improvement goal for attaining the water quality of the Wan-Nian stream was set at Class C regulated by the Taiwan EPA. The assimilative capacity of the stream studied to Carbonaceous Biochemical Oxygen Demand (CBOD) and $\text{NH}_3\text{-N}$ was estimated to be around 1,399 and 79 kg day^{-1} , but the collected sewage was about 5,831 and 189 kg day^{-1} , respectively, far exceeded its self-purification capacity. After reducing the pollutant loadings, the model results revealed that the water quality could reach the minimum Class C criteria. Water quality management strategies such as wastewater interception and diversion to the treatment plant as well as installation of contact aeration treatment units were drafted according to the model results after pollutant reduction. The present study demonstrates that the simulation analysis using QUAL2K is promising to frame the water quality management strategies of an urban-type river.

Keywords: Sediment oxygen demand; Kinetic coefficient; Water quality management; Assimilative capacity

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