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Investigation of Projected Organic Waste Impact on a Tropical Wetland in Singapore

Authors : Swee Yang Low, Dong Eon Kim, Canh Tien Trinh Nguyen, Yixiong Cai, Shie-Yui Liong

Abstract : Nee Soon swamp forest is one of the last vestiges of tropical wetland in Singapore. Understanding the hydrological regime of the swamp forest and implications for water quality is critical to guide stakeholders in implementing effective measures to preserve the wetland against anthropogenic impacts. In particular, although current field measurement data do not indicate a concern with organic pollution, reviewing the ways in which the wetland responds to elevated organic waste influx (and the corresponding impact on dissolved oxygen, DO) can help identify potential hotspots, and the impact on the outflow from the catchment which drains into downstream controlled watercourses. An integrated water quality model is therefore developed in this study to investigate spatial and temporal concentrations of DO levels and organic pollution (as quantified by biochemical oxygen demand, BOD) within the catchment's river network under hypothetical, projected scenarios of spiked upstream inflow. The model was developed using MIKE HYDRO for modelling the study domain, as well as the MIKE ECO Lab numerical laboratory for characterising water quality processes. Model parameters are calibrated against time series of observed discharges at three measurement stations along the river network. Over a simulation period of April 2014 to December 2015, the calibrated model predicted that a continuous spiked inflow of 400 mg/l BOD will elevate downstream concentrations at the catchment outlet to an average of 12 mg/l, from an assumed nominal baseline BOD of 1 mg/l. Levels of DO were decreased from an initial 5 mg/l to 0.4 mg/l. Though a scenario of spiked organic influx at the swamp forest's undeveloped upstream sub-catchments is currently unlikely to occur, the outcomes nevertheless will be beneficial for future planning studies in understanding how the water quality of the catchment will be impacted should urban redevelopment works be considered around the swamp forest.

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