

Measuring treatment effectiveness of urban wetland using hybrid water quality – Artificial neural network (ANN) model

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ABSTRACT

Constructed wetlands are now commonly used as tertiary treatment for urban stormwater. The wetlands have primary advantage over other forms of treatment as they remove dissolved organics and heavy metals in conjunction with other pollutants. The effectiveness of a wetland is a primary concern for validating its compliance with design objectives and regulatory requirements. The treatment in a wetland is however complex and is dependent on input pollutants, hydraulics, physico-chemical balance and biota within the wetland. Several models are available for wetlands but have limitations in simulating the physico-chemical and biological processes within the wetland. The aim of this paper is to introduce a hybrid modelling approach that involves both a deterministic model and artificial neural network (ANN) for testing the effectiveness of a constructed wetland at Olympic Park, Homebush, Sydney, Australia. This novel approach allows a combination of calibrated water quality and neural based models to predict the water quality from the wetland. The models were calibrated and validated using water quality monitoring data measured for eight months in both influent and effluent streams of the wetland. The calibrated hybrid models were then tested for treatment effectiveness for range of wet, dry and median flows conditions within the catchments. A water quality index was developed and used to quantify the effectiveness of the wetland.

Keywords: Water quality modelling; Artificial neural networks; Wetlands; Water quality index

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