



“Gheorghe Asachi” Technical University of Iasi, Romania



BIOLOGICAL OXYGEN DEMAND FORECASTING FOR RESERVOIR WATER QUALITY MONITORING: A NEW APPROACH

Huu Tuan Do*, Lan Anh Phan Thi²

¹Faculty of Environmental Sciences, VNU University of Science, Vietnam National University, Hanoi, 334 Nguyen Trai Street, Thanh Xuan District, Ha Noi City, Vietnam

²Faculty of Chemistry, VNU University of Science, Vietnam National University, Hanoi, 19 Le Thanh Tong Street, Hoan Kiem District, Ha Noi City, Vietnam

Abstract

In reservoir water quality monitoring, determining Biochemical Oxygen Demand (BOD) parameters is often time-consuming and costly. This study introduced a novel approach for predicting BOD₅ concentration through the Bayesian Model Averaging (BMA). Five best models were built using the BMA to predict BOD₅ in relationship with DO, TSS, COD, NO₃⁻, NO₂⁻, NH₄⁺, Oil and Coliform. The final best selected model showed the relationship of BOD₅ with 4 variables: COD, NO₃⁻, NO₂⁻, and Coliform. BOD₅ received the highest relative importance to NO₂⁻ (0.361), followed by COD (0.214), NO₃⁻ (0.161) and Coliform (0.174) in the selected model. The developed model demonstrated robust performance, achieving an average accuracy of 93.26%. It was found that BMA was an effective method for building pollutant concentration prediction models. The BMA method was capable of using all observed parameters to build a model, thereby selecting the most important and optimal parameters to build a predicting model instead of the parameters selected by the modeler. Compared with methods such as Multiple Linear Regression (MLR), Artificial Neural Networks (ANN), or other artificial intelligence (AI) techniques, the MBA method demonstrated better forecasting result with R² = 0.91. The BMA method proposed the most optimal models with high R² but the least number of dependent variables, facilitating the running of the forecasting model.

Key words: BOD₅, Bayesian Model Averaging, reservoir water quality, water quality

Received: September, 2024; Revised final: May, 2025; Accepted: June, 2025; Published in final edited form: May, 2025

* Author to whom all correspondence should be addressed: e-mail: tuandh@vnu.edu.vn; Phone: +842438584995