Modeling the Influence of Wastewater Treatment Plant Implementation on Enhancing Surface Water Quality

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Abstract

River pollution is a major concern worldwide and in urban areas, untreated wastewater is one of the main contributors to this problem. This study aims to highlight the modeling of the impact of the installation of wastewater treatment plants (WWTPs) on improving the quality of surface waters. The physicochemical parameters of rivers in the ZAT watershed were evaluated through experimental monitoring and surface water quality modeling. The study also evaluated the effectiveness of co-treatment scenarios involving different types of wastewater, including urban wastewater, slaughterhouse wastewater, leachate, and olive mill wastewater. The researchers used a combination of field measurements and computer simulations using the PEGASE model to assess water quality depending on treatment efficiency.

A significant correlation was obtained between measured and simulated values, after the calibration of some model parameters. The model performance showed good statistical agreement for all parameters studied. The outcomes demonstrated a 66.89% improvement in river quality thanks to wastewater treatment before release. River quality was improved by 85.24% by co-treatment when the olive oil manufacturing effluent was diluted by 0.5% (v/v). The study showed that co-treatment of several types of wastewater could significantly improve surface water quality, but careful control of the dilution level of the oil mill wastewater to 0.5% (v/v) was necessary to maintain better treatment capacity. These results have important implications for the planning and implementation of wastewater treatment systems in areas with a variety of discharge types and provide valuable data for decision-makers and stakeholders involved in water resource management.

Keywords: River water quality; modeling; PEGASE; Co-treatment; wastewater treatment plant; wastewater; urban; slaughterhouse; leachate; olive mill.