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An Optimization Waste Load Allocation Model in River Systems

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In many river systems, increasing of the waste discharge leads to increasing pollution of these water bodies. While the capacity of the river flow for pollution acceptance is limited and the ability of river to clean itself is restricted, the dischargers have to release their waste into the river after a primary pollution treatment process. Waste Load Allocation as a well-known water quality control strategy is used to determine the optimal pollutant removal at a number of point sources along the river. This paper aim at developing a new approach for treatment and management of wastewater inputs into the river systems, such that water quality standards in these receiving waters are met. In this study, inspired by the fact that cooperation among some single point source waste dischargers can lead to a more waste acceptance capacity and/or more optimum quality control in a river, an efficient approach was implemented to determine both primary waste water treatment levels and/or the best releasing points of the waste into the river. In this methodology, a genetic algorithm is used as an optimization tool to calculate optimal fraction removal levels of each one of single or shared discharger. Besides, a sub-model embedded to optimization model was used to simulate water quality of the river in each one of discharging scenarios based on the modified Streeter and Phelps quality equations. The practical application of the model is illustrated with a case study of the Gharesoo river system in west of Iran.