Numerical simulation of Alavian Dam reservoir water quality with CE-QUAL-W2 software

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Abstract

The water quality of dam reservoirs is constantly changing for various reasons such as thermal stratification, accumulation of dissolved solids, long residence time, and stratification. For this reason, the present study uses CE-QUAL-W2 software to investigate the thermal pattern and water quality of the Alaviyan Dam reservoir for 2016. The results illustrate that from mid-June to mid-September, the reservoir experiences relatively strong thermal stratification so that in this period, the temperature difference between the upper and lower layers of the dam averages 12.31 degrees Celsius. Also, due to the active ecosystem in the downstream river and the identification of certain species of fish in it, the difference between the temperature of the river water and the reservoir outlet water is calculated, which is an average of about 6.7 degrees Celsius for the outlet elevation 1530 m in summer, and this value is higher than the allowable value. Due to the occurrence of water quality stratification in the reservoir simultaneously with thermal stratification and reduction of dissolved oxygen concentration in the lower layers of the reservoir in summer to 5.35 mg/L, predicting the reservoir situation for 2021 under different scenarios (climate change and declined River's dissolved oxygen) has chosen as the next aim of this research. The results show that in the most critical conditions (10% increase in air temperature and 10% decrease in dissolved oxygen) the value of this parameter will drop to 4.4 mg/L, which is to be expected in anaerobic conditions and the production of odor, color, and unpleasant taste. Regarding with salinity changes, the results show that the lower layers have more solutes than the upper layers, but due to the low salinity levels in the Sufichai River, this amount in the reservoir in the most critical state does not exceed 125.45 mg/L. In fact, there is a significant difference with the allowable amount announced in the Water Quality Standard of Iran.

Keywords: Water quality, Alaviyan Dam, CE-QUAL-W2 software.

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