

Water quality changes in the Mid-Nakdong River due to Weir Constructions

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(a) Purpose of study or research hypothesis

Understanding the effect of various factors on the water quality variation is essential for a proper management of water resources. In mid-stream of Nakdong river, nutrients from different pollutant sources have been causes for eutrophication. Eutrophication will affect the water ecosystem and the environment by facilitating excessive growth of algal bloom. In this study, spatial variations of water quality were examined in mid-stream of the Nakdong river from Gangjeong Weir (Dalsung Monitoring Station by Korean MOE) to Dalsung Weir (Goryeong station) before and after weir construction. To examine the changes of eutrophication due to weir construction, a four years' water quality data between 2005 and 2008 and an eight years' water quality data after weir construction between 2013 and 2020 were used. Years between 2009 and 2012 were excluded when instream constructions were active. Water quality data also were collected from the Gemuho river (Geumhogang6 Station), a major tributary to the study site.

(b) Key issue(s) or problem(s) addressed

In the Nakdong river, 8 in-stream weirs were constructed. The restoration project has changed the water quality and hydrodynamic characteristics of the river. However, after weir construction, eutrophication continues to be a serious problem. Due to this situation, identifying the factors affecting water quality variation and causes of eutrophication is addressed for the management of water quality of Nakdong river.

(c) Methodology or approach used

To understand the correlation between water quality variables and identify the factors which contributes for the increase of eutrophication, multivariate statistical analysis (Principal component analysis) is used. To verify the adequacy of PCA, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test were performed. In order to determine the number of components, an eigenvalue greater than one was considered.

(d) Results or conclusions derived from the project

The result showed that even after weir construction, the water quality variables show that it is high enough to maintain the eutrophic state of the Nakdong river. From PCA result, the Principal components explains 73.3%, 71.4%, and 87.9% of the total variance in the Dalseong, Goryeong, and Gemuhokang6 stations. In Dalseong station, Principal component1 explains 39.1% and in Goryeong station it explains 43.5% of the variance containing Temp, DO, TN, TP, and EC. This component represents the influence of pollutants from agricultural and treatment plants from the catchment area. In Gemuhokang6 station, Principal component1 explains 50.1% of the total variance containing Chl-a, BOD, COD, pH and Temp. This component can be attributed to organic pollutants related to human activity and animal matters (urban wastewater). In conclusion, managing urban wastewater coming from Daegu city and pollutants from agricultural and treatment plant can improve the water quality of the Nakdong river.

(e) Implications of the project relevant to congress themes

Due to nutrients coming from catchment area and urban wastewater, eutrophication is a major concern for

the water ecosystem and environment of Nakdong river. It would be necessary to evaluate appropriate level of total waste load to the study site including from the Geumho River. Then the waste load reduction must be allocated among major boundary locations by either WWTPs or controlling nonpoint source loads

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