

## Identification of pollutant sources and evaluation of water quality improvement alternatives of the Geum river

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### Abstract

The aim of this study is to identify the significant pollutant sources from the tributaries that are affecting the water quality of the study site, the Geum River and provide a solution to enhance the water quality. Multivariate statistical analysis modles such as cluster analysis, Principal component analysis (PCA) and positive matrix factorization (PMF) were applied to identify and prioritize the major pollutant sources of the two major tributaries, Gab-cheon and Miho-cheon, of the Geum River. PCA identifies three major pollutant sources for Gab-cheon and Miho-cheon, respectively. For Gab-cheon, wastewater treatment plant (WWTP), urban, and agricultural pollutions are identified as major pollutant sources. For Miho-cheon, agricultural, urban, and forest land are identified as major pollutant sources. On the contrary, PMF identifies three pollutant sources in Gab-cheon, same as PCA result and two pollutant sources in Miho-cheon. Water quality control scenarios are formulated and improvement of water quality in the river locations are simulated and analyzed with the Environmental Fluid Dynamic Code (EFDC) model. Scenario results were evaluated using a water quality index developed by Canadian Council of Ministers of the Environment. PCA and PMF appears to be effective to identify water pollution sources for the Geum river and also its tributaries in detail and thus can be used for the development of water quality improvement alternative of the above water bodies.

**Keywords : Cluster Analysis, PCA, PMF, EFDC, Geum river**

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