Environmental Engineering and Management Journal

August 2025, Vol. 24, No. 8, 1827-1837
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu
http://doi.org/10.30638/eemj.2025.142

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SPATIAL-TEMPORAL SURFACE WATER QUALITY VARIATIONS IN THE HUAIHE RIVER BASIN AND QUANTITATION OF THE INFLUENCING FACTORS

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Abstract

Studying spatial-temporal variations in surface water quality provides dynamic information for identifying pollution sources, assessing water quality, and improving the river environment. It is important to quantify the contributions of climate change and human activities to surface water quality (SWQ) changes. Monthly data for 22 indicators between 2011 and 2018 in the Huaihe River Basin (HRB) were used to identify spatial and temporal SWQ variations in the HRB by performing multivariate statistical techniques, gray correlation, and slope changing ratio of cumulative quantity. The contributions of influencing factors were quantified. Permanganate index (COD_{Mn}), 5-day biological oxygen demand (BOD_5), ammonium nitrogen (NH_3-N), total phosphorus (TP), and fluoride (F^-) were the main pollutants. The HRB could be divided into four areas in terms of pollution severity. Very polluted areas were mainly along the north of WangBeng and BengHong region, East and West Lake areas and Middle Canal zone. HRB water quality improved between 2011 and 2018. A water quality inflection point occurred in 2015. The chemical oxygen demand (COD) and NH_3-N fluxes were the main anthropogenic factors contributing to SWQ changes. The COD flux contributed most to SWQ change in areas I and II (27.55% and 34.39%, respectively). The NH_3-N flux contributed most to SWQ change in areas III and IV (35.62% and 31.53%, respectively). The results improve our understanding of water quality responses to rainfall and human activities and our ability to manage water and prevent and control pollution.

Key words: contribution rate, Huaihe River Basin, spatial-temporal variation, surface water quality

Received: September, 2023; Revised final: November, 2024; Accepted: December, 2024; Published in final edited form: August, 2025

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