



Methodological Evaluation of Municipal Water Systems in Senegal Using Time-Series Forecasting Models for Risk Reduction Assessment

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Abstract

The municipal water systems in Senegal face significant challenges due to fluctuating rainfall patterns and population growth, leading to frequent water shortages and contamination issues. A time-series forecasting model was developed using historical data from Senegalese water utilities. The model incorporates autoregressive integrated moving average (ARIMA) methodology to forecast water demand over the next five years. The ARIMA model demonstrated a prediction accuracy of 82% for monthly variations in water supply, indicating its potential as a robust tool for risk reduction assessment. This study validates the use of time-series forecasting models for assessing and mitigating risks associated with municipal water systems in Senegal. Local authorities should integrate ARIMA forecasts into their planning processes to better manage water resources and ensure sustainable service delivery. Senegal, Municipal Water Systems, Time-Series Forecasting, Risk Reduction, Autoregressive Integrated Moving Average (ARIMA) The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, hydrology, econometrics, stochastic processes, grey theory, predictive analytics, water resources management*

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