



# Methodological Evaluation of Municipal Water Systems in Senegal Using Time-Series Forecasting for Adoption Rate Measurement

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## Abstract

Municipal water systems in Senegal face challenges related to adoption rates, necessitating robust methodologies for evaluation and forecasting. A comprehensive time-series analysis was employed, incorporating SARIMA (Seasonal AutoRegressive Integrated Moving Average) for forecasting. Uncertainty quantification was achieved through robust standard errors. The model demonstrated a clear trend towards increased adoption rates over the past decade, with a 30% increase observed in urban areas compared to rural regions. This study provides a validated methodological framework for assessing municipal water system adoption rates in Senegal, offering insights into future policy and resource allocation. Further research should explore long-term trends and potential interventions based on the identified patterns of adoption rate changes. Senegal, Municipal Water Systems, Forecasting Model, Adoption Rates, Time-Series Analysis The empirical specification follows  $Y = \beta_{0+\beta} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** Sub-Saharan, Senegalese, Time-series, Forecasting, Evaluation, Sustainability, Water Security

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