



Methodological Evaluation of Municipal Water Systems in Ethiopia Using Panel Data for System Reliability Assessment

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Abstract

Municipal water systems in Ethiopia face challenges related to reliability and sustainability. A systematic literature review was conducted using rigorous inclusion criteria to identify relevant studies. Panel data techniques were applied to analyse the robustness of these methodologies in estimating system reliability across different regions and time periods in Ethiopia. Panel data analysis revealed significant variability in water supply reliability, with a median system availability rate of 75% over five years in selected municipalities. The review identified several methodological strengths but also highlighted the need for more comprehensive datasets to enhance reliability assessments. Researchers should prioritise longitudinal data collection and incorporate expert opinions to improve the accuracy of future reliability estimates. The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Mediterranean, Sub-Saharan, Panel, Econometrics, Water Supply, Sustainability, GIS, Stochastic*

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