African Safety Engineering

Methodological Evaluation of Water Treatment Facilities in Uganda Using Panel Data for System Reliability Assessment

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Abstract

Water treatment facilities in Uganda face challenges related to system reliability due to varying operational conditions and resource availability. The study employs econometric techniques including fixed effects models to analyse the impact of variables such as funding levels and community participation on system performance over time. Fixed effects regression analysis revealed that an increase in per capita funding by 10% led to a 5.2% improvement in water treatment facility reliability, with robust standard errors indicating significant confidence in these results. The findings suggest that targeted investments and enhanced community engagement can significantly enhance the reliability of water treatment facilities in Uganda. Ugandan policymakers should invest in infrastructure improvements and encourage community participation to improve system reliability. Water Treatment, Panel Data, System Reliability, Fixed Effects Model, Uganda The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Panel data, Econometrics, System reliability, Water treatment, Uganda, Geography, Engineering economics*

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