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Methodological Evaluation of Water Treatment Facilities in Senegal Using Multilevel Regression Analysis to Measure Yield Improvement

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Abstract

Water treatment facilities in Senegal face challenges related to yield variability due to varying environmental conditions and operational inefficiencies. A multilevel regression model was employed to analyse the impact of different factors on water treatment yields across multiple facilities. The model accounts for both fixed effects (such as facility-specific characteristics) and random effects (site-level variations). The analysis revealed a significant improvement in yield performance with an estimated coefficient of 0.35 on the log scale, indicating a proportionate increase of approximately 40%. Multilevel regression analysis successfully identified key factors contributing to yield improvements and provided robust estimates for these effects. Future studies should explore interventions aimed at enhancing operational efficiency in water treatment facilities within Senegal.

Keywords: *African water resources, Geographic Information Systems (GIS), Multilevel modelling, Regression analysis, Statistical inference, Water yield improvement, Yield variability*