



# Methodological Assessment of Municipal Water Systems in South Africa Using Difference-in-Differences Models for Yield Improvement Evaluation

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### Abstract

The South African municipal water systems face challenges in delivering consistent and reliable water supply to its population. A scoping review approach will be employed to identify relevant studies, analyse methodologies used for evaluating municipal water system yields, and assess the applicability of difference-in-differences models in this context. The analysis revealed a need for more robust statistical models like the difference-in-differences (DID) model to accurately measure yield improvements over time. This approach has not been widely applied or evaluated in South African municipal water systems studies. While DID models show promise, their implementation and interpretation require careful consideration of data quality and potential confounding variables. Future research should prioritise data standardisation and comprehensive model validation to ensure reliable yield improvement assessments. Model estimation used  $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{Vert}^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *Sub-Saharan, African, methodology, difference-in-differences, social-choice theory, statistical-methods, governance-analysis*

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