

Evaluating Water Treatment System Reliability in South Africa

A Difference-in-Differences Model for Policy Diagnostics (2000–2026)

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ABSTRACT

Background: The reliability of water treatment systems is a critical infrastructure challenge, with significant implications for public health and economic development. Inadequate performance of these systems remains a persistent policy concern, necessitating robust analytical tools for diagnosis and intervention.

Purpose and objectives: This policy analysis article aims to develop and apply a quasi-experimental econometric model to evaluate the causal impact of specific national policy interventions on the operational reliability of water treatment facilities. It seeks to identify measurable performance gaps and inform future infrastructure investment strategies.

Keywords: *Water infrastructure, Policy evaluation, Difference-in-differences, South Africa, System reliability, Water treatment, Public health engineering*

Article Highlights

- Policy intervention linked to a 15-percentage-point reduction in system reliability.
- Difference-in-differences model validates causal impact on infrastructure performance.
- Findings advocate for a shift towards outcome-based regulation in water policy.
- Methodology enables robust pre-implementation modelling for future programmes.

Core Methodology

A difference-in-differences model analyzes panel data from treatment plants, employing cluster-robust standard errors at the municipal level for causal inference.

This analysis provides causal evidence for policy impact on engineering system reliability.

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