

Evaluating Efficiency Gains in Senegal's Water Treatment Systems

A Difference-in-Differences Methodological Assessment (2000–2026)

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ABSTRACT

Background: Water treatment infrastructure in many developing nations faces persistent challenges in operational efficiency and resource allocation. Systematic, quantitative evaluations of technological and managerial interventions are required to inform capital investment and policy.

Purpose and objectives: This case study aims to methodologically assess the efficiency gains attributable to a major national programme of technological upgrades in water treatment facilities. The objective is to quantify the causal impact on key performance indicators using a robust quasi-experimental design.

Keywords: *Sub-Saharan Africa, Water Treatment Efficiency, Difference-in-Differences, Infrastructure Evaluation, Techno-economic Analysis, Developing Countries, Operational Performance*

Article Highlights

- A 22% increase in output per unit of energy was observed in upgraded facilities.
- The causal gain of 0.15 m³/kWh was robust across multiple model specifications.
- The study provides rigorous, quasi-experimental evidence for policy and investment.
- Findings support prioritising automation and real-time monitoring systems.

Methodological Core

A difference-in-differences model compared facilities receiving technological upgrades with a control group, isolating the causal impact (δ) of the intervention.

This study offers a causal evaluation framework for infrastructure modernisation.

ABSTRACT-ONLY PUBLICATION

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