AFRICAN STRUCTURAL ENGINEERING

CASE STUDY

Evaluating Water Treatment System Performance in Senegal

A Difference-in-Differences Model for Yield Optimisation

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ABSTRACT

Background: Water treatment systems in sub-Saharan regions often operate below design capacity due to operational and maintenance challenges. Quantifying the impact of specific interventions on system yield is complex, as external factors like raw water quality and seasonal demand confound direct before-and-after comparisons.

Purpose and objectives: This case study aimed to develop and apply a robust quasi-experimental methodology to isolate and measure the true effect of a major technical upgrade programme on the volumetric yield of drinking water treatment facilities.

Keywords: *Water treatment, Sub-Saharan Africa, Difference-in-differences, Performance evaluation, Yield optimisation*

Article Highlights

- Difference-in-differences model isolates causal impact from confounding trends
- Technical upgrades caused 18 percentage point yield increase ($p < 0.01$)
- Methodology offers rigorous framework for infrastructure evaluation
- Control group showed no significant trend, validating the approach

Core Methodology

A difference-in-differences model analysed panel data from 12 plants (6 treatment, 6 control) to isolate the causal effect of technical upgrades from external factors.

This study demonstrates how quasi-experimental methods can provide robust evidence for engineering interventions.