



Methodological Evaluation of Water Treatment Facilities Systems in Senegal Using Panel Data Estimation for Cost-Effectiveness Analysis

Mahammed Sène¹, Amadou Diop^{1,2}, Ibrahima Kane³, Mamoudou Ndiaye⁴

¹ Université Alioune Diop de Bambey (UADB)

² Department of Civil Engineering, Institut Sénégalais de Recherches Agricoles (ISRA)

³ Department of Sustainable Systems, Institut Sénégalais de Recherches Agricoles (ISRA)

⁴ Institut Pasteur de Dakar

Published: 22 January 2005 | Received: 20 August 2004 | Accepted: 24 November 2004

Correspondence: msne@outlook.com

DOI: [10.5281/zenodo.18814223](https://doi.org/10.5281/zenodo.18814223)

Author notes

Mahammed Sène is affiliated with Université Alioune Diop de Bambey (UADB) and focuses on Engineering research in Africa.

Amadou Diop is affiliated with Université Alioune Diop de Bambey (UADB) and focuses on Engineering research in Africa.

Ibrahima Kane is affiliated with Department of Sustainable Systems, Institut Sénégalais de Recherches Agricoles (ISRA) and focuses on Engineering research in Africa.

Mamoudou Ndiaye is affiliated with Institut Pasteur de Dakar and focuses on Engineering research in Africa.

Abstract

This study addresses a current research gap in Engineering concerning Methodological evaluation of water treatment facilities systems in Senegal: panel-data estimation for measuring cost-effectiveness in Senegal. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of water treatment facilities systems in Senegal: panel-data estimation for measuring cost-effectiveness, Senegal, Africa, Engineering, methodology paper This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \varepsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: African Geography, Panel Data, Econometrics, Cost-Benefit Analysis, Water Resource Management, Time Series Analysis, Stochastic Frontier Analysis

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ **REQUEST FULL PAPER**

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge