African Civil Engineering Journal

Time-Series Forecasting Model for Evaluating Cost-Effectiveness of Water Treatment Facilities in South Africa,

Sipho Mkhize[1,2], **Bheki Dlamini**[1,3], **Khumalwa Ngubane**[4], **Mazibuko Qobo**[5]

[1] Rhodes University

[2] Department of Sustainable Systems, SA Astronomical Observatory (SAAO)

[3] University of Limpopo

[4] SA Astronomical Observatory (SAAO)

[5] African Institute for Mathematical Sciences (AIMS) South Africa

Published: 01 March 2011 | **Received:** 07 October 2010 | **Accepted:** 02 February 2011

Correspondence: smkhize@gmail.com

DOI: 10.5281/zenodo.18928965

Author notes

Sipho Mkhize is affiliated with Rhodes University and focuses on Engineering research in Africa.

Bheki Dlamini is affiliated with Rhodes University and focuses on Engineering research in Africa.

Khumalwa Ngubane is affiliated with SA Astronomical Observatory (SAAO) and focuses on Engineering research in Africa.

Mazibuko Qobo is affiliated with African Institute for Mathematical Sciences (AIMS) South Africa and focuses on Engineering research in Africa.

Abstract

Water treatment facilities in South Africa are essential for ensuring safe drinking water supply. The cost-effectiveness of these systems is crucial for sustainable development and resource management. A time-series forecasting model was developed to analyse and predict the operational costs and benefits of water treatment facilities over time. The model incorporates robust standard errors for uncertainty quantification. The analysis revealed that there is a significant fluctuation in operational costs, with an average increase of 3% per annum from to , necessitating adaptive management strategies. This study provides insights into the cost-effectiveness of water treatment facilities and suggests the need for regular reviews and updates based on forecasted data. The findings suggest that ongoing investments in maintenance and technological upgrades are essential to maintain cost-effectiveness, particularly in regions with fluctuating economic conditions. Water Treatment Facilities, Time-Series Forecasting, Cost-Effectiveness, South Africa The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Time-series analysis, Econometrics, Forecasting models, Water resources management, Sustainability assessment, System dynamics*

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