



Nanofilters in Nairobi: Comparative Performance and Cost-Benefit Analysis of Innovative Water Filtration Systems for Urban Youth Slums,

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Published: 02 September 2004 | **Received:** 21 March 2004 | **Accepted:** 13 July 2004

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DOI: [10.5281/zenodo.18792907](https://doi.org/10.5281/zenodo.18792907)

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Abstract

This study addresses a current research gap in Engineering concerning Innovative Nanotechnology-Based Water Filtration Systems for Urban Youth in Nairobi Slums: Performance Outcomes and Cost-Benefit Analysis in Kenya. 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. Innovative Nanotechnology-Based Water Filtration Systems for Urban Youth in Nairobi Slums: Performance Outcomes and Cost-Benefit Analysis, Kenya, Africa, Engineering, comparative study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Nairobi, Urbanization, Nanotechnology, Filtration, Sustainability, Modelling, Economics

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