



# Bayesian Hierarchical Model for Measuring Adoption Rates in Municipal Water Systems in Rwanda

Kizito Mutabazi<sup>1,2</sup>, Akalingo Bizimungu<sup>2,3</sup>

<sup>1</sup> University of Rwanda

<sup>2</sup> Rwanda Environment Management Authority (REMA)

<sup>3</sup> Department of Cybersecurity, University of Rwanda

Published: 14 September 2001 | Received: 30 April 2001 | Accepted: 16 August 2001

Correspondence: [kmutabazi@gmail.com](mailto:kmutabazi@gmail.com)

DOI: [10.5281/zenodo.18728426](https://doi.org/10.5281/zenodo.18728426)

### Author notes

*Kizito Mutabazi is affiliated with University of Rwanda and focuses on Computer Science research in Africa. Akalingo Bizimungu is affiliated with Department of Cybersecurity, University of Rwanda and focuses on Computer Science research in Africa.*

### Abstract

Municipal water systems in Rwanda face challenges related to adoption rates of new technologies and practices aimed at improving efficiency and sustainability. A Bayesian hierarchical model was developed using data from multiple municipal water systems. The model accounts for variability across different communities and incorporates covariates such as socio-economic status and infrastructure quality to estimate adoption rates accurately. The model revealed significant differences in adoption rates between urban and rural areas, with a clear trend indicating that higher levels of infrastructure investment correlate positively with increased adoption rates. Bayesian hierarchical models provide a robust framework for understanding adoption dynamics in municipal water systems across Rwanda. This methodological advancement offers valuable insights into policy-making and resource allocation strategies. Further research should explore the long-term impacts of adopted technologies on system performance and user satisfaction, as well as the potential for scaling up these findings to other regions with similar contexts. Bayesian hierarchical model, adoption rates, municipal water systems, Rwanda Model estimation used  $\hat{\theta} = \text{argmin}\{\theta\} \text{sumiell}(y_i, f\theta(\xi)) + \lambda l \text{Vert}\theta r \text{Vert} 2^2$ , with performance evaluated using out-of-sample error.

**Keywords:**  
Rwanda

*Geographic*

*Terms:*

*Methodological*  
Bayesian  
Measurement  
Statistical  
Data  
Sustainability

*Hierarchical*

*Terms:*  
Models  
Techniques  
Modelling  
Analysis  
Evaluation

*Theoretical  
Adoption  
Technological  
Hierarchical  
Latent  
Modelling Adoption Processes*

*Bayesian  
Class*

*Terms:  
Rates  
Adoption  
Methods  
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](mailto: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](http://app.parj.africa)



Scan to visit [app.parj.africa](http://app.parj.africa)

**Open Access Scholarship from PARJ**

Empowering African Research | Advancing Global Knowledge