Low-Cost IoT Framework for Urban Slum Environmental Monitoring in Nigeria

Adekunle Adekoya[1]**, Boluwatife Babalola**[2,3]**, Fasil Fasahanusi**[1,4]**, Oluwaseyi Ogunleye**[5]

[1] Nigerian Institute of Advanced Legal Studies (NIALS)

[2] Department of Software Engineering, University of Calabar

[3] Department of Data Science, University of Ibadan

[4] Babcock University

[5] University of Ibadan

Author notes

Adekunle Adekoya is affiliated with Nigerian Institute of Advanced Legal Studies (NIALS) and focuses on Computer Science research in Africa.
Boluwatife Babalola is affiliated with Department of Software Engineering, University of Calabar and focuses on Computer Science research in Africa.
Fasil Fasahanusi is affiliated with Babcock University and focuses on Computer Science research in Africa.
Oluwaseyi Ogunleye is affiliated with University of Ibadan and focuses on Computer Science research in Africa.

Abstract

Urban slums in Nigeria face significant environmental challenges due to inadequate waste management systems and poor air quality. IoT technologies could enhance monitoring of these conditions but are often cost-prohibitive. A mixed-method approach combining IoT sensor design, data collection methods, and statistical analysis was employed. Sensors were designed to operate with minimal power consumption and cost constraints. The low-cost sensors achieved a detection rate of 85% for waste accumulation in slum areas, indicating their effectiveness in monitoring waste management practices. This study demonstrates the feasibility of using IoT technology at a lower cost compared to existing solutions, enhancing environmental monitoring in urban slums. Future research should focus on expanding sensor networks and integrating data with local authorities for improved waste management strategies. Urban Slum, Environmental Monitoring, Internet of Things (IoT), Low-Cost Sensors, Waste Management Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2,$ with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, IoT, Sensors, Wireless Networks, Data Analytics, Sustainability, Energy Harvesting*

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