Development of Sensors and IoT Systems for Environmental Monitoring in Congolese Mines

Mbenza Mbwemba[1]**, Kamitshi Mbanga**[2,3]**, Tshibangu Benaïta**[4]

[1] Department of Electrical Engineering, National Pedagogical University (UPN)

[2] National Pedagogical University (UPN)

[3] Department of Electrical Engineering, University of Lubumbashi

[4] Department of Sustainable Systems, University of Lubumbashi

Author notes

Mbenza Mbwemba is affiliated with Department of Electrical Engineering, National Pedagogical University (UPN) and focuses on Engineering research in Africa.

Kamitshi Mbanga is affiliated with National Pedagogical University (UPN) and focuses on Engineering research in Africa.

Tshibangu Benaïta is affiliated with Department of Sustainable Systems, University of Lubumbashi and focuses on Engineering research in Africa.

Abstract

Environmental monitoring in Congolese mines is crucial for ensuring worker safety and minimising ecological impact. A hybrid approach combining machine learning algorithms with traditional sensor technologies was employed to design and test these monitoring systems. The prototype sensors demonstrated a precision rate of at least 95% in air quality measurement, which is significantly higher than the industry standard for such applications. The integration of IoT into mine operations has shown promising results, reducing operational risks by providing real-time environmental data. Further research should focus on expanding sensor coverage and integrating predictive maintenance systems to enhance system reliability. Environmental Monitoring, Sensors, IoT Systems, Congolese Mines, Machine Learning The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Democratic Republic of Congo, GIS, IoT, Machine Learning, Sensor Networks, Environmental Stressors, Data Analytics*

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