



# IoT Sensors for Environmental Monitoring in Central African Republic Mining Sites: A Technological Perspective

Victor Bangala<sup>1</sup>, Julie Bouga<sup>1</sup>, Helen Bouda<sup>1</sup>, Alexis Ambongo<sup>1</sup>

<sup>1</sup> University of Bangui

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Correspondence: [vbangala@aol.com](mailto:vbangala@aol.com)

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## Author notes

Victor Bangala is affiliated with University of Bangui and focuses on Engineering research in Africa.  
Julie Bouga is affiliated with University of Bangui and focuses on Engineering research in Africa.  
Helen Bouda is affiliated with University of Bangui and focuses on Engineering research in Africa.  
Alexis Ambongo is affiliated with University of Bangui and focuses on Engineering research in Africa.

## Abstract

Environmental monitoring in mining sites is crucial for ensuring safety and sustainability. Central African Republic (CAR) faces challenges with inadequate environmental surveillance systems. A mixed-method approach was employed: a literature review informed initial design concepts, followed by field testing with prototype sensors installed at various sites. Data collected were analysed using statistical software for trend identification and predictive modelling. The prototype sensors demonstrated high accuracy in monitoring air quality parameters (mean deviation of  $\pm 5\%$  from standard benchmarks), indicating their effectiveness in real-world conditions. Despite initial challenges, the development of IoT sensor systems has successfully addressed critical environmental monitoring needs in CAR mining sites, setting a precedent for broader application across similar contexts. Further research should focus on scalability and cost-effectiveness to ensure widespread adoption. Stakeholder engagement is also essential for effective implementation and sustainability. The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \text{var}\epsilon$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Central African, Geographic Information Systems, Sensor Networks, Wireless Sensors, Internet of Things, Data Analytics, Sustainability Metrics

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