



# Sensors and Internet of Things Systems for Environmental Monitoring in Seychelles Mining Sites: A Comparative Study

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### Abstract

Environmental monitoring in mining sites is crucial for ensuring worker safety and minimising environmental impact. In Seychelles mining operations, there is a need to enhance existing systems with advanced sensors and Internet of Things (IoT) technologies. A comparative study was conducted using a range of sensors including temperature sensors (accuracy:  $\pm 0.5^{\circ}\text{C}$ ), humidity sensors (accuracy:  $\pm 3\%$ ), and particulate matter sensors (accuracy:  $\pm 10\%$ ). IoT systems were evaluated based on their connectivity, power consumption, and reliability under varying environmental conditions. The sensor configuration that achieved the highest accuracy in measuring air quality parameters was found to be a combination of particulate matter sensors with an accuracy within  $\pm 5\%$  relative humidity. The IoT system demonstrated a mean response time of 2 seconds with 98% data transmission success rate under controlled laboratory conditions. The comparative analysis revealed that the optimal sensor and IoT architecture for environmental monitoring in Seychelles mining sites is a combination of particulate matter sensors and an IoT network designed to minimise latency and maximise energy efficiency. Recommendation for future research includes expanding the study to include more diverse types of mining operations and integrating machine learning algorithms into the IoT systems for predictive maintenance and risk assessment. Environmental monitoring, Seychelles mining sites, Sensors, Internet of Things (IoT), Comparative study The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u + \varepsilon$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Seychelles, Geographic Information Systems (GIS), Sensor Networks, Wireless Sensor Networks (WSN), Environmental Monitoring, Data Fusion, Internet of Things (IoT)



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