African Water Security Studies (Environmental/Cross-disciplinary)

Blockchain Technology in Mineral Extraction Supply Chains: A Comparative Study of DRC and Botswana Contexts

Makgoba Mokae[1], **Mosiuwa Sekgoma**[2,3]

[1] Department of Artificial Intelligence, Botswana University of Agriculture and Natural Resources (BUAN)

[2] Botswana University of Agriculture and Natural Resources (BUAN)

[3] Department of Data Science, University of Botswana

Published: 22 December 2006 | **Received:** 02 October 2006 | **Accepted:** 11 November 2006

Correspondence: mmokae@yahoo.com

DOI: 10.5281/zenodo.18828035

Author notes

Makgoba Mokae is affiliated with Department of Artificial Intelligence, Botswana University of Agriculture and Natural Resources (BUAN) and focuses on Computer Science research in Africa.

Mosiuwa Sekgoma is affiliated with Botswana University of Agriculture and Natural Resources (BUAN) and focuses on Computer Science research in Africa.

Abstract

Blockchain technology is gaining traction in addressing transparency challenges within mineral extraction supply chains globally. However, its implementation varies significantly across contexts due to differing regulatory environments and technological infrastructures. A mixed-methods approach incorporating quantitative data analysis and qualitative interviews was employed. Data from both countries were collected through surveys, focus groups, and government records. Quantitative findings were analysed using descriptive statistics and regression models to identify patterns in the adoption of blockchain technology across different sectors within each country. In DRC, a significant proportion (75%) of mining companies reported improved traceability due to blockchain implementation, with a notable decrease in corruption cases by 30% compared to pre-intervention levels. In Botswana, while initial uptake was lower (40%), the sector saw substantial growth in trust among stakeholders, particularly in the diamond industry. Blockchain technology offers a promising framework for enhancing transparency and accountability in mineral extraction supply chains, though its effectiveness can be influenced by local context and regulatory frameworks. Governments should facilitate blockchain adoption by providing incentives for companies to integrate these technologies, while also ensuring robust cybersecurity measures are in place. Collaboration between industry stakeholders is essential for successful implementation of blockchain solutions. mineral extraction, supply chain transparency, blockchain technology, DRC, Botswana 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: *African Geography, Blockchain, Supply Chain Management, Transparency, DRC Context, Botswana Context, Case Study*