



Waste Management Strategies in South African Municipalities Aligning with Circular Economy Principles

Magogo Matheangane¹, Sithole Sibanda^{2,3}, Mphatho Mkhize^{4,5}

¹ South African Institute for Medical Research (SAIMR)

² Department of Interdisciplinary Studies, Graduate School of Business, UCT

³ Department of Interdisciplinary Studies, South African Institute for Medical Research (SAIMR)

⁴ Department of Advanced Studies, Graduate School of Business, UCT

⁵ University of Venda

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Correspondence: mmatheangane@hotmail.com

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Author notes

Magogo Matheangane is affiliated with South African Institute for Medical Research (SAIMR) and focuses on Environmental Science research in Africa.

Sithole Sibanda is affiliated with Department of Interdisciplinary Studies, Graduate School of Business, UCT and focuses on Environmental Science research in Africa.

Mphatho Mkhize is affiliated with Department of Advanced Studies, Graduate School of Business, UCT and focuses on Environmental Science research in Africa.

Abstract

Waste management in South African municipalities is a significant challenge due to inadequate infrastructure and limited resources. The adoption of circular economy principles offers potential solutions for sustainable waste handling. The study will employ a mixed-methods approach including literature reviews, stakeholder consultations, and case studies to assess current waste management practices and identify gaps. Quantitative data from surveys will be analysed using statistical models to evaluate the effectiveness of proposed strategies. A preliminary analysis suggests that implementing circular economy principles could reduce municipal waste by up to 20% through improved recycling rates and resource recovery processes, with a notable theme emerging around community engagement in waste reduction efforts. The research protocol will provide actionable recommendations for municipalities aiming to transition towards more sustainable waste management practices while considering the socio-economic context of South Africa. Municipalities should prioritise stakeholder collaboration and invest in education programmes targeting community members to enhance recycling rates. Implementation strategies should be tailored to local conditions, including economic constraints and cultural factors. The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Geography, Circular Economy, Waste Management, Resource Recovery, Life Cycle Assessment, Sustainable Development, Lean Analysis*

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