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PARTICIPATION IN SUSTAINABLE SOLID WASTE MANAGEMENT PROJECTS AND ITS EFFECTS ON YOUTH EMPOWERMENT IN KISUMU CITY, KENYA

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ABSTRACT

Participation in sustainable solid waste management (SWM) projects is increasingly recognized as a catalyst for youth empowerment in urban Africa. This study examined Participation in Sustainable Solid Waste Management Projects and Its Effects on Youth Empowerment in Kisumu City, Kenya, focusing on how youth involvement in waste collection, disposal, and recycling contributes to social, economic, and innovative empowerment outcomes. Guided by Bronfenbrenner's Ecological Systems Theory, Bandura's Social Cognitive Theory, and Deci and Ryan's Self-Determination Theory, the study analyzed how youth engagement in waste collection, disposal, and recycling influences empowerment outcomes. A cross-sectional design was adopted, targeting 320 youth, with 175 respondents selected through stratified random sampling. Data were collected using structured questionnaires and analyzed using SPSS Version 26. Descriptive statistics summarized the data, while ordinal regression assessed relationships among variables. Findings revealed a strong, positive, and statistically significant relationship between youth participation in SWM activities and empowerment outcomes. Waste collection ($\beta = 1.719$, $p < .05$), waste disposal ($\beta = 2.188$, $p < .05$), and recycling ($\beta = 4.625$, $p < .05$) significantly influenced empowerment, accounting for 59.3 percent of its variation. The study concludes that youth participation enhances environmental awareness, leadership, social inclusion, and economic independence. It recommends that policymakers, NGOs, and local governments strengthen youth engagement through capacity building, financial support, and improved waste infrastructure.

KEYWORDS: *Youth participation; Solid waste management; Empowerment; Environmental sustainability; Kisumu City; Kenya; Sustainable development; Recycling; Waste collection; Social inclusion*

1.0 INTRODUCTION

1.1 Background of the Study

Solid waste management (SWM) is a persistent environmental and developmental challenge worldwide, especially in rapidly urbanizing cities where population growth, consumption patterns, and inadequate infrastructure intensify waste accumulation (Mukherjee Basu & Punjabi, 2020; Kumar, 2023). In Kenya, these pressures are sharply evident in Kisumu City, where irregular waste collection, limited disposal facilities, and widespread open dumping continue to degrade the urban environment and threaten the ecological integrity of Lake Victoria (Kinyili, 2025; Onyango, Otieno, & Achieng, 2024). These systemic challenges highlight the urgent need for sustainable, inclusive, and community-driven approaches to waste management.

Youth participation in sustainable SWM projects represents a transformative opportunity to address these gaps. Although young people possess the creativity, energy, and adaptability needed to drive environmental change, their involvement remains limited due to institutional barriers, insufficient financing, and the persistent social stigma associated with waste-related work (APHRC, 2022; UN-Habitat, 2022). Yet global evidence—from Brazil, India, South Africa, and other emerging economies—demonstrates that youth engagement in waste collection, recycling, and disposal initiatives fosters innovation, employment creation, and environmental stewardship (Medina, 2020; Banerjee & Sarkhel, 2019; Adeleke, Sibanda, & Pretorius, 2021). When youth are meaningfully integrated into sustainable waste systems, the outcomes extend beyond environmental improvements to include leadership development, entrepreneurship, and enhanced social inclusion.

In the African context, youth-led recycling and waste recovery initiatives have shown significant potential in promoting livelihood opportunities and advancing circular economy goals (Adegbite & Aina, 2019; Godfrey & Oelofse, 2017). In Kisumu City, projects such as KIWAN SACCO and the Maendeleo Material Recovery Center illustrate this transformative role. However, despite progressive frameworks like the Sustainable Waste Management Act (2022), enforcement weaknesses, infrastructural deficits, and limited strategic support continue to restrict youth engagement in sustainable SWM activities (County Government of Kisumu, 2023). Strengthening youth participation in sustainable SWM—through waste collection, disposal, and recycling—is therefore critical not only for environmental sustainability but also for enhancing youth empowerment in terms of economic independence, social capital, and innovative capability.

1.2 Statement of the Problem

Despite existing policies and recovery initiatives, solid waste management (SWM) in Kisumu City remains inefficient. The city generates 400–500 tons of waste daily, yet only 30–40% is collected, while the rest accumulates in open dumpsites and Lake Victoria, posing health and ecological risks (County Government of Kisumu, 2023). Recovery centers handle less than 20 tons daily, reflecting weak infrastructure and policy enforcement. Although youth constitute nearly half the population and face 22% unemployment (KNBS, 2023), their participation in SWM remains limited. Previous studies emphasize environmental and economic outcomes but neglect youth empowerment. This study addresses this gap by examining how youth involvement in collection, disposal, and recycling influences empowerment in Kisumu City.

1.3 The Objectives

This study aimed to investigate how participation in sustainable solid waste management (SWM) projects influences youth empowerment in Kisumu City, Kenya. The focus was on understanding how youth engagement in key SWM activities contributes to social, economic, and innovative empowerment outcomes. Specifically, it sought to examine how involvement in waste collection, disposal, and recycling projects influences empowerment outcomes such as social inclusion, leadership, and economic independence among youth.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Ecological Systems Theory

According to Bronfenbrenner (1979), the Ecological Systems Theory explains how individual behavior is shaped by multiple environmental layers—microsystem, mesosystem, exosystem, and macrosystem. These interconnected systems influence development through interactions between personal and social contexts. In this study, the theory is applied to explain how environmental settings such as families, peer groups, and community institutions affect youth engagement in solid waste management (SWM) activities in Kisumu City.

2.1.2 Social Cognitive Theory

Bandura's (1986) Social Cognitive Theory emphasizes learning through observation, imitation, and reinforcement. It highlights self-efficacy as a key determinant of behavior change, where individuals adopt new practices by observing role models. This theory applies to the study by explaining how youth participation in SWM projects can be enhanced through social learning, peer influence, and recognition of successful environmental initiatives that foster empowerment.

2.1.3 Self-Determination Theory

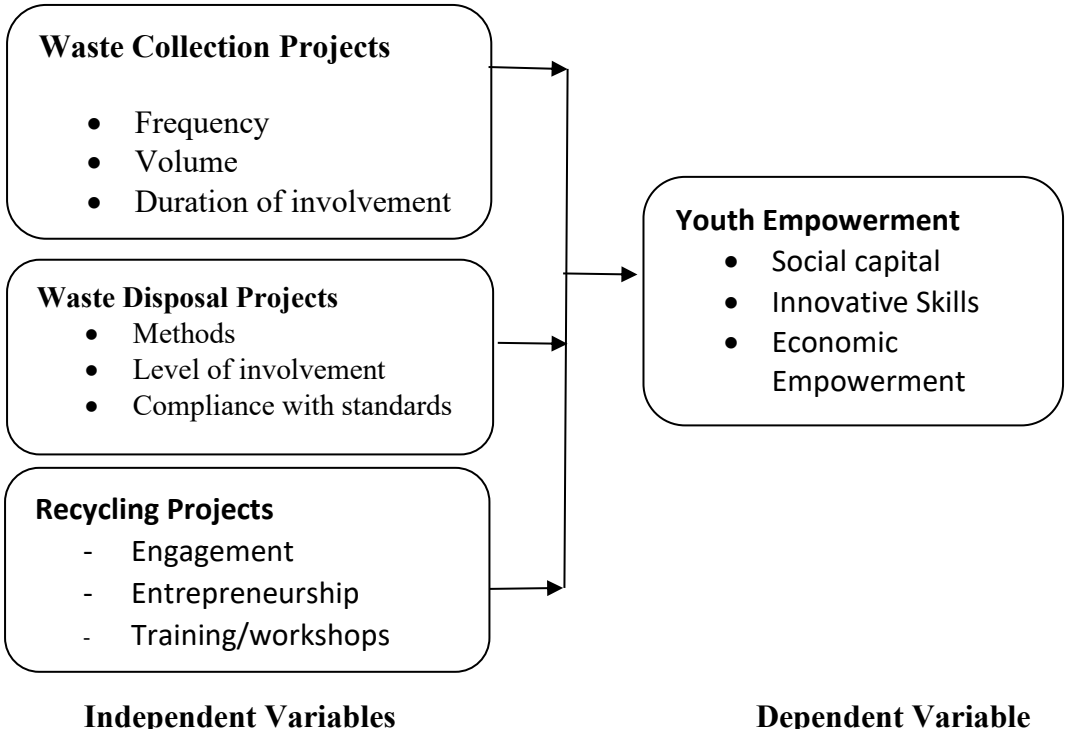
Deci and Ryan's (1985) Self-Determination Theory focuses on intrinsic motivation, driven by autonomy, competence, and relatedness. It underscores how individuals engage in meaningful activities when they feel capable and connected. In this study, the theory explains how voluntary participation in waste collection, disposal, and recycling promotes youth empowerment through creativity, leadership, and self-confidence.

2.2 Conceptual Review

A conceptual framework is a diagram that shows how the independent variables are associated with dependent variables in a study.

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Figure 1: Conceptual Framework



2.2.1 Youth Participation in Waste Collection Projects and Youth Empowerment

Waste collection projects are an essential aspect of solid waste management (SWM) and a potential driver of youth empowerment in urban areas such as Kisumu City. According to Tsai, Bui, and Tseng (2021), frequent participation in waste collection enhances civic responsibility and teamwork, which in turn strengthens social capital. Similarly, Andeobu, Nnaji, and Agboola (2022) found that regular involvement in collection initiatives promotes leadership and coordination among youth.

Medina (2020) and Silva de Souza Lima Cano et al. (2022) noted that higher waste collection volumes provide income opportunities and stimulate entrepreneurial ventures such as composting and briquette production. Long-term participation also develops competence and networks essential for sustained empowerment (Nguyen et al., 2019; Merrigan, 2020). Despite these benefits, youth involvement in Kisumu remains largely informal and unstructured (County Government of Kisumu, 2023).

Hypothesis 1: Participation in waste collection projects has no significant effect on youth empowerment in Kisumu City.

2.2.2 Youth Participation in Waste Disposal Projects and Youth Empowerment

Waste disposal projects play a central role in SWM and youth empowerment by enhancing public health, environmental awareness, and leadership. According to Mir, Cheema, and Singh (2021), structured disposal practices such as composting and controlled incineration improve community sanitation while promoting technical skill development. Community-driven disposal campaigns also cultivate civic responsibility and visibility among youth leaders (Martinez, Ruiz, & Herrera, 2018; Odhiambo, 2019).

Compliance with environmental standards fosters legitimacy, allowing youth groups to access funding and partnerships (Kim, Lee, & Park, 2020; Wang et al., 2021). However, in Kisumu City, weak enforcement and limited infrastructure hinder youth integration into formal disposal systems (County Government of Kisumu, 2023).

Hypothesis 2: Participation in waste disposal projects has no significant effect on youth empowerment in Kisumu City.

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2.2.3 Youth Participation in Recycling Projects and Youth Empowerment

Recycling projects provide critical platforms for innovation, entrepreneurship, and economic self-reliance among youth. According to Smith and Jones (2017) and Garcia et al. (2019), participation in recycling strengthens teamwork, leadership, and collective problem-solving. Recycling also offers financial benefits as youth transform materials into marketable goods like upcycled furniture, briquettes, and plastics (Nguyen et al., 2020; Wambui, 2019).

Muthoni and Wekesa (2023) highlight that recycling enhances technical and innovative skills through training and exposure to recycling technologies. Despite its potential, challenges such as weak infrastructure, limited incentives, and poor market linkages persist (County Government of Kisumu, 2023).

Hypothesis 3: Participation in recycling projects has no significant effect on youth empowerment in Kisumu City.

2.3 Empirical Review

Empirical studies from Asia and Latin America demonstrate that youth participation in SWM fosters environmental awareness, leadership, and entrepreneurship (Patel et al., 2018; Nguyen et al., 2020). However, African contexts remain underrepresented, and most studies lack youth-specific focus and longitudinal analysis. Methodological weaknesses, small sample sizes, and overreliance on self-reported data limit generalizability (Johnson et al., 2019; Kim et al., 2020).

The current study addresses these gaps by examining the effect of youth participation in waste collection, disposal, and recycling projects on empowerment in Kisumu City, measured through social capital, innovative skills, and economic empowerment.

3.0 RESEARCH METHODS

3.1 Research Design and Data Collection

A cross-sectional survey design was used to examine how youth participation in solid waste management (SWM) projects relates to empowerment outcomes in Kisumu City. Data were collected once using a structured, self-administered questionnaire with five-point Likert scales aligned to the study variables (waste collection, disposal, recycling, and empowerment). A 10% pilot (n=36) in Nakuru tested clarity and flow; instrument validity was supported by KMO=.726 and Bartlett's χ^2=354.847, p<.001, while reliability met accepted thresholds (overall Cronbach's α=.800; subscales ≥.707). Ethical procedures included university authorization, NACOSTI permitting, informed consent, anonymity, and voluntary participation.

3.2 Population and Sample

The target population comprised 320 youths (18–35 years) actively engaged in SWM through five organized sites: Maendeleo MRC (70), Kondele West MRF (50), Ondiek Estate Pilot—Ten Top Youth (40), KIWAN SACCO (100), and Kibuye Market CBO (60). Stratified random sampling with proportional allocation ensured representation from each site. Using the Krejcie and Morgan approach for N=320 (95% confidence, d=.05, P=.50), the required sample was n=175, distributed proportionally across the strata to minimize selection bias and enhance generalizability.

3.3 Data Processing and Analysis

Completed questionnaires were coded and cleaned, then analyzed in SPSS v26. Descriptive statistics (frequencies, percentages, means, standard deviations) summarized participation patterns and empowerment levels. Inferential analysis employed ordinal logistic regression—specifically the Proportional Odds Model (POM)—to test hypothesized relationships between participation domains and empowerment, with chi-square tests supporting model diagnostics. Statistical significance was set at α=.05.

4.0 RESULTS AND DISCUSSION

4.1 Hypothesis Testing

This section discusses the results of hypothesis testing for each of the three study hypotheses on the effect of youth participation in solid waste management (SWM) projects on youth empowerment in Kisumu City. The discussion links the empirical findings to reviewed literature and the theoretical framework guiding the study; Ecological Systems Theory (EST), Social Cognitive Theory (SCT), and Self-Determination Theory (SDT).

Model Fit and Assumptions

The overall model was significant, $\chi^2(3) = 153.275$, $p < .001$, indicating that the inclusion of predictors improved fit over the intercept-only model. The −2 Log Likelihood declined from 587.207 to 433.932, and the Pseudo R^2

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values (Cox & Snell = .583; Nagelkerke = .593; McFadden = .214) showed that roughly 59 percent of the variance in empowerment was explained by participation in SWM projects. The non-significant Pearson $\chi^2 = 496.989$ ($p = .968$) and Deviance $\chi^2 = 358.881$ ($p = 1.000$) confirmed a satisfactory model fit. Although the Parallel Lines Test was significant ($\chi^2(21) = 216.420$, $p < .001$), the logit link remained acceptable, and the estimates were retained as robust indicators of association.

Table 1: Results of Regressing of Youth Empowerment on Participation in SWM Projects

Predictor	*β*	SE *β*	Wald's X^2	df	p	Exp(*B*)
Waste Collection	1.719	.847	4.118	1	.042*	1.781
Waste Disposal	2.188	.874	6.262	1	.012*	1.940
Recycling Projects	4.625	.725	40.714	1	.000**	2.172
Constant	-8.443	3.481	5.881	1	.015	.000
Test			**X^2**	**df**	**p**	
Overall model evaluation						
-2 Log Likelihood score test			258.785	2	.000	
Goodness of fit test			496.989	2	.968	

Model Fit: −2 LL = 433.932; $\chi^2(3) = 153.275$ ($p < .001$); Cox & Snell $R^2 = .583$; Nagelkerke $R^2 = .593$; McFadden $R^2 = .214$.
Goodness of Fit: Pearson $\chi^2 = 496.989$ ($p = .968$); Deviance $\chi^2 = 358.881$ ($p = 1.000$).

- $p < .05$; ** $p < .01$

4.1.1 Hypothesis One (H_{01}): Participation in Waste Collection Projects Has No Significant Effect on Youth Empowerment in Kisumu City

Results revealed a significant positive effect of youth participation in waste collection on empowerment ($\beta = 1.719$, $p = .042$, Exp(B) = 1.781). Youth actively involved in collection projects were about 78% more likely to report higher empowerment levels. This supports Tsai et al. (2021) and Medina (2020), who found that frequent collection enhances civic responsibility, teamwork, and income opportunities. Guided by Bronfenbrenner's Ecological Systems Theory, the findings show that youth gain empowerment through active interaction with community and organizational systems.

4.1.2 Hypothesis Two (H_{02}): Participation in Waste Disposal Projects Has No Significant Effect on Youth Empowerment in Kisumu City

The study found a significant positive relationship between waste disposal participation and empowerment ($\beta = 2.188$, $p = .012$, Exp(B) = 1.94). Youth engaged in regulated disposal projects were nearly twice as likely to experience empowerment, consistent with Martinez et al. (2018) and Wang et al. (2021). Under Bandura's Social Cognitive Theory, the results suggest empowerment arises through observational learning, self-efficacy, and reinforcement.

4.1.3 Hypothesis Three (H_{03}): Participation in Recycling Projects Has No Significant Effect on Youth Empowerment in Kisumu City

Recycling showed the strongest positive effect ($\beta = 4.625$, $p < .001$, Exp(B) = 2.172). Active recyclers were over twice as likely to report empowerment, aligning with Nguyen et al. (2020) and Sibanda & Obange (2023). According to Self-Determination Theory, recycling fosters autonomy, competence, and relatedness, driving innovation and sustainable engagement among youth in Kisumu City.

5.0 CONCLUSION AND POLICY IMPLICATIONS

The study concluded that youth participation in solid waste management (SWM)—particularly recycling—significantly enhances empowerment by fulfilling autonomy, competence, and relatedness needs as outlined in Self-Determination Theory. Recycling projects foster innovation, entrepreneurship, and social inclusion, although inadequate financing, limited equipment, and poor market access constrain progress.

Policy Recommendations: The Kisumu County Government should formalize youth involvement in SWM through structured programs supported by contracts, training, and safety equipment. Incentives such as stipends,

grants, and infrastructure investments in transport and recycling facilities can promote motivation and scalability. Strengthened enforcement of waste by-laws and inclusion of environmental education in county development plans will reinforce civic responsibility.

Private Sector and NGOs: Partnerships should provide financing, technical support, and market access to youth-led recycling enterprises. Establishing eco-industrial parks and innovation hubs can generate employment and advance a circular economy. Continuous mentorship and business training will strengthen autonomy and competence among youth.

Community and Youth Organizations: Local leaders should organize neighborhood environmental committees, peer mentorship programs, and awareness campaigns to combat stigma toward waste work and celebrate youth contributions.

Areas for Further Study: Future research should adopt longitudinal and comparative designs, integrate gender and socio-economic analyses, and explore digital innovations in waste management. Further examination of behavioral and motivational factors will enhance understanding of sustained youth engagement and empowerment in environmental governance.

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