AB Journals

African Journal of Environment and Natural Science Research

ISSN 2689-9434 • Volume 9, Issue 4, 2026 • pp. 92–113

RESEARCH ARTICLE Received: 12 Aug 2026, Accepted: 21 Aug 2026, Published: 23 Nov 2026

Determinants of Community Participation in Organic Waste Management in Informal Settlements: Extending the Theory of Planned Behaviour from Kisumu, Kenya

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Abstract

Community participation is essential for managing organic waste in informal settlements, where organic matter dominates household waste streams, yet participation remains persistently low and poorly understood. The Theory of Planned Behaviour, the leading model of waste-related behaviour, was developed largely in high-income settings and has rarely been tested where basic services are absent. This paper reports an explanatory sequential mixed-methods study conducted in the three largest informal settlements in Kisumu, Kenya, combining a stratified random household survey (n = 382) with nine key informant interviews and structured observation. The study reveals a striking intention-behaviour gap: 90.3% of households participated in or expressed willingness to join community-led organic waste management, but only 10.2% actually participated, a paired difference of 80.1 percentage points (95% CI: 76.1-84.1; McNemar $\chi^2 = 304.0$, $p < 0.001$). Participation was driven primarily by community sensitization, awareness of proper practices, and access to collection services rather than by education, income, attitudes, or gender, which operated indirectly. The paper proposes an extended TPB framework integrating six contextual domains and reconceptualizing perceived behavioural control as structurally determined. It posits that household participation in OWM is shaped by both individual factors, such as attitudes and intentions, and contextual factors, including access to waste services, community sensitization, information and resources, gender-related constraints, community organizations, and livelihood opportunities. The framework advances five testable propositions and suggests that combining behaviour-change approaches with infrastructure, institutional, livelihood, and gender-responsive interventions may strengthen participation more effectively and sustainably than approaches focused solely on individual attitudes and intentions.

Keywords: Community Participation, Gender, Informal Settlements, Organic Waste Management, Sustainability, Theory of Planned Behaviour

How to Cite: Kadede, K., Wagah, G. G., & Obange, N. (2026). Determinants of Community Participation in Organic Waste Management in Informal Settlements: Extending the Theory of Planned Behaviour from Kisumu, Kenya. *African Journal of Environment and Natural Science Research*, 9(4), 92–113. https://doi.org/10.52589/AJENSR-YRADAQ1Q

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INTRODUCTION

Background and Context

Sub-Saharan Africa is urbanizing faster than any other region. This growth has created opportunities, but it has also placed severe pressure on basic services. Solid waste management is one of the clearest examples. The World Bank projects that waste generation in sub-Saharan Africa will more than triple by 2050, the fastest increase of any region (Kaza et al., 2018). Many cities cannot collect the waste they already produce. Collection rates fall below 50% in many African cities, and the shortfall is concentrated in informal settlements (Guerrero et al., 2013; UN-Habitat, 2020).

Informal settlements house more than one billion people worldwide (UN-Habitat, 2020). Waste outcomes in these areas are poor mainly for structural rather than behavioural reasons. Roads are often impassable for collection vehicles, land tenure is insecure, municipal budgets frequently do not reach these areas, and residents are poor and politically marginalized (Wilson et al., 2006; Gutberlet et al., 2017). Waste consequently accumulates in drains, roadsides and open spaces, with environmental and health consequences that fall on households already facing high risks (Guerrero et al., 2013; Rotich et al., 2006).

Organic waste is the largest single component of this waste stream and also offers the greatest opportunity for recovery. Regional studies estimate that organic matter makes up 65-75% of municipal waste in East Africa (Okot-Okumu, 2012), although household-level estimates vary with the measurement method used. In the Kisumu study reported below, food and organic waste was the most frequently reported waste type, accounting for 36.4% of all waste-type mentions. Unlike plastics or metals, organic waste can be processed locally at low cost through composting, insect-based feed production or digestion (Zurbrügg et al., 2004; Van Veenhuizen, 2006). Realizing this potential depends, however, on household and community participation, particularly separation at source, which municipalities cannot provide on residents' behalf.

Kenya illustrates the challenge. National policy increasingly promotes segregation, recycling and sustainable waste management (NEMA, 2015), and the Sustainable Waste Management Act, 2022 assigns explicit responsibilities to waste generators (Republic of Kenya, 2022). Implementation is weak and uneven, however, and it is weakest in informal settlements (Haregu et al., 2017). Kisumu, Kenya's third-largest city, is a clear example. The city's overall waste collection rate is estimated at only 20-35%, and services are concentrated in higher-income neighbourhoods (Sibanda et al., 2017). In the informal settlements, community-based organizations (CBOs), self-help groups (SHGs) and informal collectors fill the service gap, but their operations remain fragmented, inconsistent and financially fragile (Gutberlet et al., 2016; Kain et al., 2016).

Problem Statement

Why do residents participate in organic waste management (OWM), or fail to do so? This question is central to waste policy in low-income cities, but the evidence base is limited. Research on waste in African cities has been dominated by technical and system-level analysis, including waste characterization, collection logistics, dumpsite management and governance arrangements (Guerrero et al., 2013; Marshall & Farahbakhsh, 2013; Sibanda et al., 2017; Kain et al., 2016). The behavioural dimension has received far less attention. Four gaps are particularly relevant.

The first is a contextual gap. The Theory of Planned Behaviour (TPB) (Ajzen, 1991) is the dominant framework for explaining recycling and waste-separation behaviour, but its evidence base was developed in high-income and formal urban contexts where bins are available, and collection is reliable (Tonglet et al., 2004; Barr, 2007; Strydom, 2018). In informal settlements, the system itself is often absent, and whether the theory holds under those conditions has rarely been tested.

The second is a theoretical gap concerning the relationship between intention and behaviour. Meta-analytic evidence shows that the TPB explains considerably more variance in intention than in behaviour, and that this gap widens where behaviour depends on external conditions (Armitage & Conner, 2001; Sheeran & Webb, 2016). Standard applications nevertheless continue to treat perceived behavioural control (PBC) as a psychological perception, whereas in settlements lacking bins, collection services or space it is also a material constraint.

The third is a gender gap. Women perform most household waste work in African cities (Van Veenhuizen, 2006; Oteng-Ababio, 2014), but TPB studies typically enter gender as a simple demographic control rather than examining the mechanisms, including unequal access to information, time and resources, through which it shapes participation. The literature can therefore report whether women participate more or less than men, but not why, and not which interventions might change this.

The fourth is an institutional gap. Conventional TPB models contain no variables for municipal capacity, service reliability, policy implementation, or community organizations, although research on service delivery in poor urban areas shows that outcomes depend on co-production between the state and organized communities (Ostrom, 1996; Joshi & Moore, 2004; Gutberlet et al., 2017).

In summary, no existing framework connects individual behavioural drivers with the structural, institutional, and gendered conditions of informal settlements, and evidence from secondary African cities such as Kisumu is particularly scarce. This paper addresses that gap.

Purpose

This paper develops and empirically grounds an extended TPB framework for community participation in OWM in informal settlements. First, it tests core TPB assumptions against original mixed-methods data from Kisumu's informal settlements and documents a large, statistically robust gap between behavioural intention and actual participation that the conventional theory cannot explain. Second, it identifies the structural predictors (sensitization, awareness, and service access) that drive participation, and shows that gender operates indirectly rather than directly. Third, it combines these findings into a framework that integrates six contextual domains with the core TPB constructs and derives five testable propositions. To the authors' knowledge, this is among the first empirically grounded extensions of the TPB developed specifically for organic waste behaviour in an African informal settlement.

LITERATURE REVIEW

Organic Waste Management in Informal Settlements

Global waste generation is increasing fastest in low- and middle-income countries, where rapid urbanization has outpaced investment in waste infrastructure and services (Hoornweg & Bhada-Tata, 2012; Kaza et al., 2018; Guerrero et al., 2013). The burden is greatest in informal

settlements, where poor road access, overcrowding and weak municipal services result in irregular collection, open dumping and burning (Rotich et al., 2006; Okot-Okumu, 2012).

Organic waste forms the largest share of household waste in these settings, accounting for up to 80% of municipal waste in parts of sub-Saharan Africa (Miezah et al., 2015). Yet its recovery remains largely underutilized. Weak collection systems, limited waste separation at source, and low awareness constrain composting, recycling, and other resource recovery options (Guerrero et al., 2013; Oberlin, 2011). Although community-based recovery systems have improved sanitation and generated livelihoods in similar low-income settings (Mongkolnchaiarunya, 2005; Oberlin, 2011), their success depends on households separating and managing organic waste appropriately. Household behaviour is therefore central to the effectiveness of sustainable OWM.

Community Participation and Waste Management

Community participation is widely recognized as central to sustainable waste management in low-income cities. The theoretical basis is co-production. Essential services in under-served areas are delivered most effectively when the state and organized citizens contribute jointly rather than when either acts alone (Ostrom, 1996; Joshi & Moore, 2004). Waste management fits this logic closely, since separation occurs inside households while collection and treatment require systems beyond them. Neither side can succeed without the other.

The empirical record supports this position. Evidence from Africa and Asia shows that successful community-based waste systems depend on local ownership, citizen engagement, awareness creation and institutional support (Ahmed & Ali, 2006; Mongkolnchaiarunya, 2005; Oberlin, 2011). Participation improves sanitation outcomes, strengthens accountability and sustains compliance with segregation and disposal norms (Apinhapath, 2014; Permana et al., 2015). Yala municipality in Thailand and community composting programs in Dhaka and Dar es Salaam show a similar pattern, in which durable results follow when residents co-own the system (Mongkolnchaiarunya, 2005; Zurbrügg et al., 2004; Oberlin, 2011).

Participation is not automatic. It is shaped by environmental awareness, socio-economic status, infrastructure availability, trust in local governance and perceptions of collective responsibility (Guerrero et al., 2013; Permana et al., 2015). In informal settlements, it is further shaped by histories of exclusion and municipal neglect (Gutberlet et al., 2017). Residents who have never received a service may reasonably doubt that their own effort will make a difference. Understanding these dynamics is therefore a prerequisite for designing workable interventions.

Gender and Organic Waste Management

Waste work is strongly gendered. In most African informal settlements, women hold primary responsibility for household sanitation, food preparation, caregiving and waste handling (Van Veenhuizen, 2006). This places women at the centre of waste separation, disposal and the environmental education of children. Women consequently hold substantial practical knowledge about waste and sanitation (Oteng-Ababio, 2014). Research also finds that women tend to express stronger pro-environmental attitudes and to engage more in waste-reduction behaviour than men (Kollmuss & Agyeman, 2002).

Women's participation nevertheless takes place under constraint. Limited decision-making power, economic insecurity, time poverty, and unequal access to resources restrict their engagement in community initiatives despite their central household role (Oteng-Ababio,

2014; UN Women, 2020). Women carry most of the responsibility for household waste management but often have less access to the information, time, and community structures needed for active participation. This disconnect is rarely reflected in behavioural models of waste management.

Community-based OWM also offers a pathway to women's empowerment. Composting, recycling, and waste-based enterprises can strengthen livelihoods, build social capital, and improve economic resilience (Gutberlet et al., 2016; Medina, 2000). In Kisumu, where many women face socio-economic challenges, these benefits are particularly important. OWM can therefore serve as more than an environmental intervention. It can also promote women's empowerment, sustainable livelihoods, and community resilience.

The Theory of Planned Behaviour and Environmental Action

The TPB holds that behaviour follows from behavioural intention, and that intention is shaped by three constructs (Ajzen, 1991). Attitudes are a person's positive or negative evaluation of the behaviour. Subjective norms are perceived social expectations about whether one should perform it. PBC is the perceived ease or difficulty of performing it, and it influences behaviour both indirectly through intention and directly where actual control is limited (Ajzen, 2020). The model has been applied widely to recycling, waste separation, and plastic reduction (Tonglet et al., 2004; Barr, 2007; Hasan et al., 2015; Strydom, 2018; Apinhapath, 2014).

Three limitations are important for informal settlements. First, the theory is individualistic, treating behaviour as the outcome of personal psychology. In informal settlements, however, behaviour is jointly produced by individuals and the systems around them, including poverty, infrastructure deficits, weak governance and unreliable services (Guerrero et al., 2013; Wilson et al., 2006). Steg and Vlek (2009) argue that contextual factors can enable, constrain or override motivational ones, and Barr (2007) showed empirically that situational access to services can matter as much as attitudes even in a high-income country. The TPB has no explicit place for such factors.

Second, the theory overstates the power of intention. Armitage and Conner's (2001) meta-analysis of 185 studies found that the TPB explains substantially more variance in intention than in actual behaviour. Webb and Sheeran (2006) showed experimentally that even medium-to-large changes in intention generate only small-to-medium changes in behaviour. The gap widens where behaviour depends on external conditions (Sheeran, 2002; Sheeran & Webb, 2016). Where residents cannot act on their intentions, measuring intention alone is misleading, since it overestimates the effect of awareness campaigns and underestimates the effect of service provision.

Third, the theory omits institutions. Municipal capacity, policy implementation, service reliability, and community organizations all shape behaviour in informal settlements (Kain et al., 2016; Haregu et al., 2017). The co-production literature shows that these arrangements are not background conditions but active determinants of what citizens can contribute (Ostrom, 1996; Joshi & Moore, 2004). None of this appears in conventional TPB models. These limitations define the gap this paper addresses.

METHODOLOGY

The study adopted a pragmatic paradigm and an explanatory sequential mixed-methods design, appropriate for measuring participation and explaining factors influencing it (Creswell & Plano Clark, 2018). A structured cross-sectional household survey was conducted first, followed by nine key informant interviews and structured observation of waste management practices and environmental conditions to triangulate findings. The study was conducted in Manyatta, Nyalenda and Obunga, Kisumu City's three largest informal settlements, purposively selected based on population size, waste management challenges and socio-economic diversity. Using the household as the unit of analysis, the County Government of Kisumu's 2017 settlement-level records were used for proportional allocation, followed by multistage sampling involving sub-settlement stratification, proportional allocation, and random selection of households. Fisher's formula ($n = Z^2PQ/d^2$; Z=1.96, P=Q=0.5, d=0.05) yielded 384 households; 382 valid responses were analyzed after excluding two incomplete questionnaires (99.5%). Key informants comprised one senior County Department of Environment official and eight representatives of private waste collectors, SHGs and CBOs, purposively selected based on institutional roles until thematic saturation was reached (Guest et al., 2006). Instruments were pilot-tested, refined and excluded from analysis (Mugenda & Mugenda, 2003); reliability was supported through piloting, standardized interviewer training and triangulation, as constructs were primarily single categorical or binary measures. Quantitative data were analyzed using descriptive statistics, Pearson's chi-square or Fisher's exact test, and binary logistic regression with adjusted odds ratios (AORs) and 95% confidence intervals (CIs), while qualitative data were analyzed in Dedoose using deductive and inductive content analysis (Elo & Kyngäs, 2008). Ethical approval was obtained from MUSERC (MUSERC/01459/25) and NACOSTI (159900), and informed consent, confidentiality and anonymity were maintained; photographs excluded identifiable individuals.

EMPIRICAL FINDINGS FROM THE KISUMU STUDY

Organic Waste Management Practices in the Informal Settlements

Attitudes toward OWM were overwhelmingly positive, and stated willingness was near-universal once enabling conditions were specified. If separate disposal bags or bins were provided, 87.9% of respondents reported being willing or very willing to separate organic waste, and where separation carried an economic benefit, this rose to 93.2%. Overall, 89.2% of households expressed interest in participating in future community-led OWM initiatives. Only 10.2% (39 of 382 households), however, reported current involvement in any community-led OWM activity. That involvement was concentrated in one-off events rather than sustained resource recovery. Clean-up campaigns accounted for half (50.0%) of all reported activities, followed by composting workshops (16.0%), recycling drives (12.0%), educational seminars (12.0%) and regular waste-related community meetings (10.0%).

The difference between 89.2% willingness and 10.2% participation represents a near nine-fold gap between intention and behavior. Under the conventional TPB, attitudes and intentions of this strength should have produced high participation, but they did not. The finding is consistent with meta-analytic evidence that intentions are weak predictors where behavior depends on external enabling conditions (Armitage & Conner, 2001; Webb & Sheeran, 2006; Sheeran & Webb, 2016). It also has a direct practical implication. In Kisumu, further attitude-change campaigning would address a constraint that is largely absent while leaving the binding constraints in place.

The wider practice data support this interpretation. Only 29.8% of households had access to any waste collection service, and among unserved households the reasons given were predominantly supply-side, namely the absence of providers and of nearby collection points, rather than cost or unwillingness. Only 12% practised composting. Burning and indiscriminate dumping remained the main disposal routes. Households attributed their failure to separate organic waste principally to the absence of storage bins and practical information rather than to inconvenience or doubt about the benefits.

Structural Factors Predict Participation

Logistic regression identified the factors that distinguished participants from non-participants. The model was statistically significant overall (LR χ^2=44.67, df=6, p<0.001) and explained approximately 17.7% of the variation in participation (McFadden's R^2=0.177). Three variables were significant independent predictors. Receipt of community sensitization was the strongest. Sensitized households were more than six times as likely to participate (AOR=6.26, 95%CI: 2.88–13.59, p<0.001). Awareness of proper OWM practices nearly tripled the odds of participation (AOR=2.90, 95%CI: 1.38–6.09, p=0.005), and access to waste collection services remained significant after adjustment (AOR=2.21, 95%CI: 1.03–4.74, p=0.042).

Table 1: Binary logistic regression model predicting participation in community organic waste management (N = 382). Model fit: LR χ^2 = 44.67, df = 6, p < 0.001; McFadden's R^2 = 0.177. *p < 0.05.

Predictor	AOR	95% CI	p-value
Secondary education or above	0.97	0.43–2.17	0.934
Access to waste collection services	2.21	1.03–4.74	0.042*
Awareness of proper OWM practices	2.90	1.38–6.09	0.005*
Receipt of community sensitization	6.26	2.88–13.59	<0.001*
Financial constraints (always vs. less often)	2.07	0.91–4.71	0.082
Belief: waste management is solely government responsibility	1.25	0.53–2.96	0.610

Education (AOR=0.97, p=0.934) and the belief that waste management is solely the government's responsibility (AOR=1.25, p=0.610) were not independently associated with participation, and financial constraint reached only borderline significance (AOR=2.07, p=0.082). Household income was likewise non-significant in the gender-specified models. The commonly hypothesized cultural barriers did not appear. Households reporting the influence of traditional beliefs were more, rather than less, likely to participate, which suggests that in this setting local cultural repertoires can support rather than obstruct collective engagement.

The findings suggest a simple pathway. Community sensitization provides residents with information on what to do, how to do it, and where to participate. Awareness turns willingness into practical knowledge, while access to collection services gives households a way to act on that knowledge. These are all external conditions rather than individual characteristics. Participation therefore depended more on access to information, services, and opportunities than on personal characteristics or attitudes. In informal settlements, perceived behavioral control is shaped mainly by the availability of these enabling conditions rather than by individual confidence. This extends the Theory of Planned Behavior to low-resource settings

and is consistent with Barr (2007), who found that access to services strongly influences waste management behavior, particularly where services are limited.

Gender Operates Indirectly Rather Than Directly

Waste management in the study settlements was strongly gendered. Women managed household organic waste in 75.9% of households, and community expectations closely reflected this pattern. This suggests that waste management is mainly viewed as a routine domestic responsibility for women rather than a shared household task. Women also separated waste more consistently than men. However, they reported significantly lower awareness of proper OWM practices than men. This shows a gap between responsibility and access to information. Women carried out most waste-related tasks but had fewer opportunities to receive formal training and sensitization. Similar findings have been reported in other low- and middle-income settings, where women perform most household waste management but have limited access to information, resources, and decision-making opportunities (Gutberlet et al., 2017; Wilson et al., 2006).

Women also identified lack of time, limited financial resources, and safety concerns as the main barriers to participating in community waste management. They considered skills training and financial incentives the most important measures for increasing their participation. These findings are consistent with studies showing that women's participation is often constrained by unpaid care work, limited resources, and restricted access to economic opportunities rather than by lack of interest (UN Women, 2020; Gutberlet et al., 2016).

Despite these differences, gender itself was not significantly associated with community participation. Participation rates were similar for women and men, and respondent gender was not a significant predictor after adjusting for education, income, service access, sensitization, and awareness. Female-headed households also showed higher odds of participation and waste separation, although these associations were not statistically significant. This suggests that gender influences participation indirectly. Women's participation is shaped more by unequal access to information, time, and enabling resources than by gender alone. Similar observations have been reported in studies showing that structural conditions, rather than gender itself, largely determine participation in community environmental activities (Agarwal, 2000; Gutberlet et al., 2017).

These findings have important implications for intervention design. Improving women's participation requires addressing the barriers that limit their engagement. Priority actions include targeted sensitization, practical skills training, flexible programme schedules, and reducing the financial and time costs of participation. This extends the Theory of Planned Behaviour by showing that, in low-resource settings, gender operates mainly through unequal access to enabling conditions rather than as a direct predictor of behaviour.

Institutions and Community Organizations Shape What Is Possible

Key informant interviews placed the household findings within the wider institutional context. The county waste management system was described as underfunded and inadequately equipped, limiting service delivery. Waste that households separated was often mixed again during collection, reducing motivation to separate at source. Enforcement of waste regulations was also constrained by social and political realities in informal settlements. At the time of the study, county waste policies and plans were incomplete, outdated, or not fully aligned with national legislation. Waste data systems were also weak, making planning and monitoring

difficult. Community engagement existed but was largely irregular and focused on awareness rather than sustained participation and feedback.

In this context, CBOs, SHGs, youth groups, and private waste collectors had become the main providers of waste services in the study settlements. They organized waste collection, supplied households with separate sacks for organic and inorganic waste, and collected waste on regular schedules using simple equipment such as handcarts. These groups filled important service gaps despite receiving limited financial and institutional support. Similar findings have been reported in Kisumu and other African cities, where community organizations play a central role in waste collection where formal municipal services are weak (Gutberlet et al., 2017; Kain et al., 2016; Okot-Okumu, 2012).

These organizations also created the conditions that enabled participation. They provided sensitization, information, and access to collection services, the same factors identified by the quantitative analysis as the strongest predictors of participation. Where community organizations were active, households had greater opportunities to engage in proper OWM. Where they were absent, participation remained low. This finding supports evidence that community organizations are essential partners in waste service delivery in low-resource settings and should be recognized and strengthened within formal waste management systems (Ahmed & Ali, 2006; Ostrom, 1996; Joshi & Moore, 2004).

Livelihoods and Co-Benefits Motivate Participation

Respondents consistently linked participation in OWM with economic benefits. Willingness to separate organic waste increased from 87.9% if bins or bags were provided to 93.2% if separation also generated income. Key informants explained that the main barrier was not a lack of awareness of the value of organic waste, but the absence of accessible composting sites, buy-back centres, and processing facilities. Composting, black soldier fly production, and recycling were viewed as livelihood opportunities as well as environmental activities. Similar studies have shown that waste-based enterprises can improve incomes and sustain participation in low-income urban communities (Medina, 2000; Wilson et al., 2006; Gutberlet et al., 2017). These findings suggest that economic incentives are important for increasing and sustaining community participation in OWM.

The study also identified broader social benefits of participation. Although few respondents were aware of formal programmes linking waste management with health promotion, many recognized that community waste groups create opportunities for health education, stronger social networks, and women's empowerment. Qualitative findings showed that some community waste organizations had become platforms for leadership, skills development, and community support. Similar evidence suggests that community-based environmental activities strengthen social capital and collective action, creating wider benefits beyond environmental management alone (Cornish & Campbell, 2009; Gutberlet et al., 2017). These co-benefits increase the value of participation and help sustain community engagement beyond routine waste management activities.

DISCUSSION: THE PROPOSED CONCEPTUAL FRAMEWORK - AN EXTENDED THEORY OF PLANNED BEHAVIOR

Comparison with Existing TPB Applications and the Novel Contribution of the Framework

The TPB is widely used to explain environmental behaviors such as waste segregation, recycling, and composting. It proposes that behavior is driven by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). While these constructs explain behavior well in stable, well-serviced settings, they are less suited to informal settlements where participation is strongly influenced by structural and institutional conditions.

The findings only partly support the TPB. Respondents expressed positive attitudes towards community participation, and most agreed that households should manage waste properly and that community participation is important. More than 85% were willing to separate waste and participate in community OWM. However, only about one in ten households actually participated. This large intention–behavior gap suggests that positive attitudes alone are insufficient to drive participation.

Instead, participation was mainly influenced by structural factors. Community sensitization, awareness of proper OWM practices, and access to waste collection services were the strongest predictors of participation. In contrast, respondent gender, household income, and female household headship were not significant after adjustment. These findings suggest that perceived behavioral control depends largely on access to services, information, and participation opportunities rather than on individual confidence alone. Similar studies have shown that environmental behavior is strongly influenced by the availability of supporting infrastructure and institutional support (Barr, 2007; Guerrero et al., 2013).

The study also shows that gender influences participation indirectly. Women managed most household organic waste and separated waste more consistently than men, yet they had lower awareness of proper waste management practices and faced greater constraints related to time, household responsibilities, and limited resources. After these factors were controlled for, gender was no longer a significant predictor of participation. This suggests that the lower participation of women results from unequal access to information and opportunities rather than gender itself. Similar observations have been reported in studies of gender and environmental management in low-income communities (Gutberlet et al., 2017).

Institutions and community organizations also played an important role. Weak waste collection services, inadequate infrastructure, fragmented institutional support, and poor policy implementation reduced opportunities for participation despite positive community attitudes. At the same time, community-based organizations, SHGs, and private waste collectors acted as the main providers of waste collection, sensitization, and resource recovery. These organizations helped shape community norms and increased opportunities for participation, consistent with co-production theory (Ostrom, 1996; Joshi & Moore, 2004).

Economic opportunities further encouraged participation. Respondents consistently linked OWM with income generation through composting, black soldier fly production, recycling, and other waste-to-value activities. Previous studies have similarly shown that livelihood opportunities are important drivers of sustained participation in community waste management (Medina, 2000; Wilson et al., 2006; Gutberlet et al., 2017). These findings suggest that economic incentives strengthen both participation and long-term engagement.

The study also identified wider social benefits. Community waste management groups created opportunities for skills development, women's leadership, social support, and environmental health education. These additional benefits increased the perceived value of participation beyond waste management alone and helped sustain community involvement over time (Cornish & Campbell, 2009; Gutberlet et al., 2017).

Overall, the findings show that participation in community OWM results from the interaction between behavioral intention and structural opportunity. The study therefore extends the TPB by incorporating six contextual domains: (i) infrastructure and service availability, (ii) institutional support and governance, (iii) community sensitization and awareness, (iv) socio-economic vulnerability and livelihood opportunities, (v) gender relations and women's empowerment, and (vi) community organizations as platforms for collective action. Integrating these contextual factors provides a more comprehensive explanation of participation in OWM in informal settlements than the conventional TPB alone.

Core Logic of the Framework

The framework retains the core concepts of the Theory of Planned Behavior. Positive attitudes, such as recognizing the environmental, health, and economic benefits of OWM, increase people's willingness to separate, compost, and recover organic waste (Ajzen, 1991; Hasan et al., 2015). Subjective norms, reflected in community expectations, local leadership, and social networks, encourage participation by promoting responsible waste management (Ahmed & Ali, 2006). Perceived behavioral control also influences participation by shaping both people's intentions and their ability to act (Ajzen, 2020).

However, the framework extends the conventional TPB by recognizing that participation depends on both behavioral intention and enabling conditions. Positive intentions alone are not enough if households lack the services, information, and opportunities needed to participate. The Kisumu findings clearly demonstrate this. Although most households were willing to participate in community OWM, only a small proportion actually did so. Figure 1 presents the proposed framework.

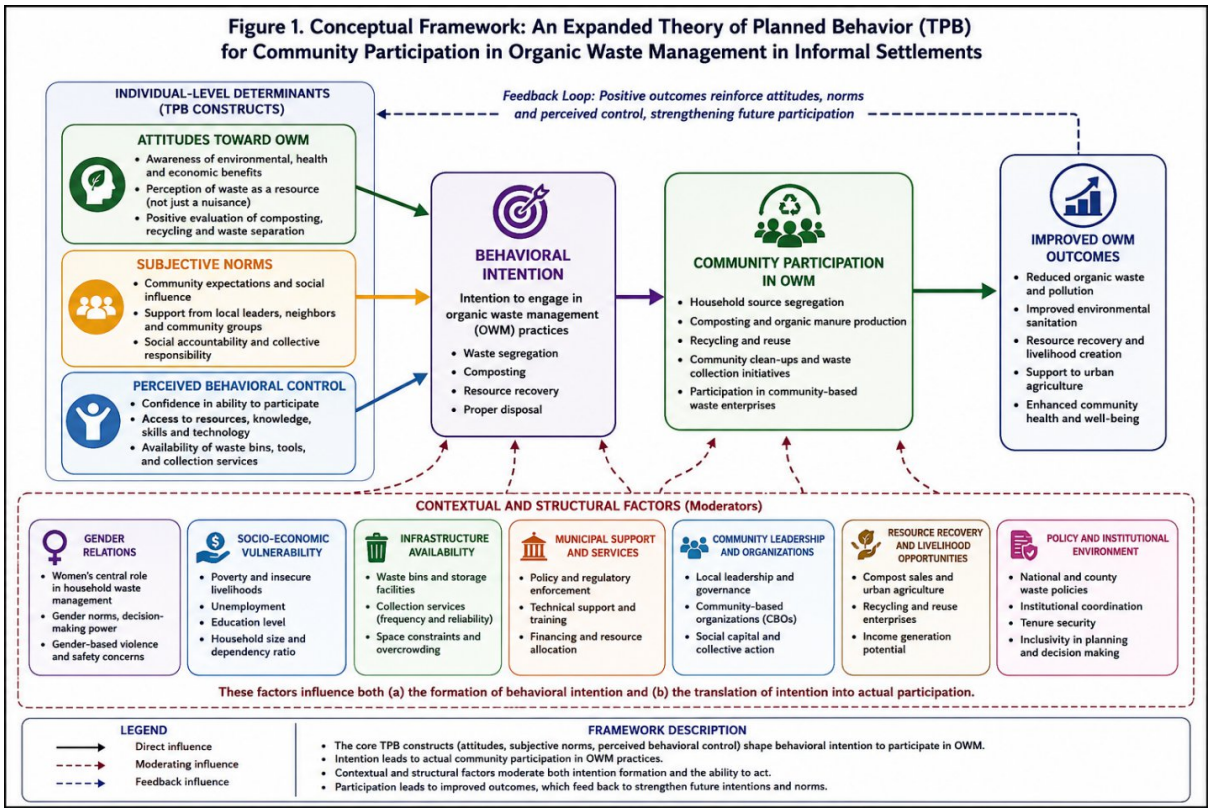

Figure 1: The extended Theory of Planned Behavior Conceptual framework, integrating the core constructs (attitudes, subjective norms and perceived behavioral control) with the contextual domains that enable, constrain and moderate participation.

The Six Contextual Domains

The framework integrates six contextual domains, each supported by the Kisumu evidence, that moderate the pathway from intention to participation:

i. **Infrastructure and service availability**: Access to collection services independently predicted participation, yet most households had none. Bins, collection points and reliable service convert willingness into action (Guerrero et al., 2013; Sibanda et al., 2017). Without them, separated waste has no destination and the behavior is not sustained.

ii. **Institutional support and governance**: Municipal capacity, policy implementation and coordination determine the reliability of enabling conditions (Kain et al., 2016; Haregu et al., 2017). In Kisumu, weak county capacity and collection that re-mixed separated waste suppressed household behavior. Co-production arrangements between municipalities and organized communities are the institutional form this support takes in practice (Ostrom, 1996; Joshi & Moore, 2004).

iii. **Community sensitization and awareness**: Sensitization and awareness of proper OWM practices were the strongest predictors of participation in Kisumu. Information functions as an enabling resource rather than only as an input to attitudes, since it tells residents what to do, how to do it, and where to take part.

iv. **Socio-economic vulnerability and livelihood opportunities:** Poverty constrains participation, while waste-to-value opportunities such as composting, black soldier fly farming and recycling enterprise create incentives that sustain it (Oberlin, 2011; Gutberlet et al., 2016; Medina, 2000). Willingness to separate rose sharply when an economic return was attached.

v. **Gender relations and women's empowerment**: Gender operates indirectly, through unequal access to knowledge, time and resources. Women managed waste in most households but reported considerably lower formal awareness than men. Gender-responsive design is therefore an enabling condition rather than an optional addition (Oteng-Ababio, 2014; Van Veenhuizen, 2006).

vi. **Community organizations as platforms for collective action**: CBOs, SHGs and collector associations link households to information, services and markets, and reinforce norms of participation (Ahmed & Ali, 2006; Gutberlet et al., 2017). In the study settlements, they, rather than county government, were the principal providers of the existing waste collection that existed. They are the mechanism through which domains 1-5 reach households.

The six domains are closely linked: Community organizations deliver sensitization and provide waste collection services. Institutional support determines whether these organizations can operate effectively. Livelihood opportunities help sustain their activities, while gender relations influence who can participate at the household level. The framework therefore suggests that interventions addressing several domains at the same time are likely to be more effective than those focusing on a single factor. Table 2 summarizes the six domains, the supporting evidence from Kisumu, their contribution to the extended TPB framework, and the corresponding intervention priorities.

Table 2: The six contextual domains: supporting evidence, theoretical extension and intervention levers

Contextual domain	Key Kisumu evidence	Theoretical extension of TPB	Primary intervention lever
1. Infrastructure & service availability	Service access predicted participation (AOR = 2.21); only 29.8% had access; unserved households cited absent providers and collection points	Re-specifies perceived behavioral control as structurally determined	Bins, collection points, reliable decentralized collection
2. Institutional support & governance	Underfunded county function; separated waste re-mixed in transport; incomplete or expired county instruments; weak information systems	Adds institutional determinants absent from conventional TPB	Institutionalized municipal–community co-production
3. Community sensitization & awareness	Sensitization (AOR = 6.26) and OWM awareness (AOR = 2.90) were the strongest independent predictors	Treats information as an enabling resource, not only an input to attitudes	Household sensitization, deliberately targeted to women
4. Socio-economic vulnerability & livelihoods	Willingness to separate rose from 87.9% to 93.2% when tied to economic benefit; income itself non-significant	Adds economic motivation to intention formation and persistence	Composting, black soldier fly, and recycling enterprise support

Contextual domain	Key Kisumu evidence	Theoretical extension of TPB	Primary intervention lever
5. Gender relations & women's empowerment	Women managed waste in 75.9% of households but reported lower awareness (30.4% vs 54.0%); gender non-significant after adjustment (AOR = 1.23)	Models gender as an indirect pathway through mediating constraints	Gender-responsive scheduling, information, and resources
6. Community organizations & collective action	CBOs, SHGs and youth groups were the principal providers of collection, sensitization and market links	Adds organizational platforms shaping both norms and control	Fund and partner with CBOs as core delivery agents

Testable Propositions

Economic opportunity emerged as a motivational amplifier: willingness to separate rose when an economic return was attached, and composting, black soldier fly production and recycling were viewed as livelihood opportunities as well as environmental activities. This is consistent with studies showing that waste-based enterprises can improve incomes and sustain participation in low-income urban communities (Medina, 2000; Wilson et al., 2006; Gutberlet et al., 2017). The wider social benefits observed, health education, stronger social networks, leadership and skills development, and women's empowerment, mirror evidence that community-based environmental activities strengthen social capital and collective action (Cornish & Campbell, 2009; Gutberlet et al., 2017), increasing the perceived value of participation and helping sustain engagement beyond routine waste management.

Core Logic of the Extended Framework

Overall, the findings show that participation in community OWM results from the interaction between behavioural intention and structural opportunity. The proposed framework retains the core TPB concepts: positive attitudes, such as recognizing the environmental, health, and economic benefits of OWM, increase willingness to separate, compost, and recover organic waste (Ajzen, 1991; Hasan et al., 2015); subjective norms, reflected in community expectations, local leadership, and social networks, encourage participation (Ahmed & Ali, 2006); and perceived behavioural control influences both intentions and the ability to act (Ajzen, 2020). The framework extends the conventional TPB by recognizing that participation depends on both behavioural intention and enabling conditions: positive intentions are not enough if households lack the services, information, and opportunities needed to participate, as the Kisumu findings clearly demonstrate. Figure 1 presents the proposed framework.

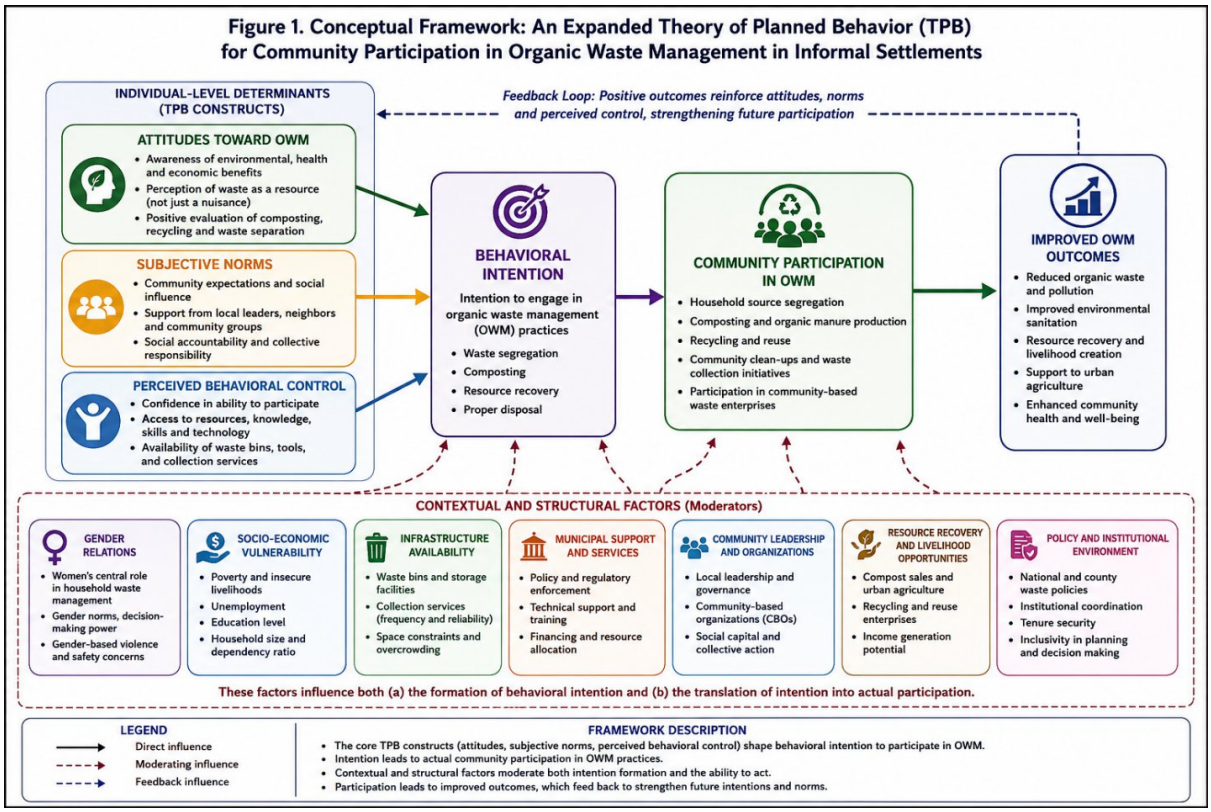

Figure 1: The extended Theory of Planned Behaviour conceptual framework, integrating the core constructs (attitudes, subjective norms and perceived behavioural control) with the contextual domains that enable, constrain and moderate participation.

The Six Contextual Domains

The framework integrates six contextual domains, each supported by the Kisumu evidence, that moderate the pathway from intention to participation. (I) Infrastructure and service availability: access to collection services independently predicted participation, yet most households had none; bins, collection points and reliable service convert willingness into action (Guerrero et al., 2013; Sibanda et al., 2017), and without them separated waste has no destination and the behaviour is not sustained. (ii) Institutional support and governance: municipal capacity, policy implementation and coordination determine the reliability of enabling conditions (Kain et al., 2016; Haregu et al., 2017); in Kisumu, weak county capacity and collection that re-mixed separated waste suppressed household behaviour, and co-production arrangements between municipalities and organized communities are the institutional form this support takes in practice (Ostrom, 1996; Joshi & Moore, 2004). (iii) Community sensitization and awareness: sensitization and awareness of proper OWM practices were the strongest predictors of participation; information functions as an enabling resource rather than only as an input to attitudes, since it tells residents what to do, how to do it, and where to take part. (iv) Socio-economic vulnerability and livelihood opportunities: poverty constrains participation, while waste-to-value opportunities such as composting, black soldier fly farming and recycling enterprise create incentives that sustain it (Oberlin, 2011; Gutberlet et al., 2016; Medina, 2000). (v) Gender relations and women's empowerment: gender operates indirectly, through unequal access to knowledge, time and resources; gender-responsive design is therefore an enabling condition rather than an optional addition (Oteng-Ababio, 2014; Van Veenhuizen, 2006). (vi) Community organizations as platforms for collective action: CBOs,

SHGs and collector associations link households to information, services and markets, and reinforce norms of participation (Ahmed & Ali, 2006; Gutberlet et al., 2017); in the study settlements they, rather than county government, were the principal providers of the waste collection that existed, and they are the mechanism through which domains one to five reach households.

The six domains are closely linked. Community organizations deliver sensitization and provide waste collection services; institutional support determines whether these organizations can operate effectively; livelihood opportunities help sustain their activities; and gender relations influence who can participate at the household level. The framework therefore suggests that interventions addressing several domains at the same time are likely to be more effective than those focusing on a single factor. Table 4 summarizes the six domains, the supporting evidence from Kisumu, their contribution to the extended TPB framework, and the corresponding intervention priorities.

Table 4: The six contextual domains: supporting evidence, theoretical extension and intervention levers

Contextual domain	Key Kisumu evidence	Theoretical extension of TPB	Primary intervention lever
1. Infrastructure & service availability	Service access predicted participation (AOR = 2.21); only 29.8% had access; unserved households cited absent providers and collection points	Re-specifies perceived behavioural control as structurally determined	Bins, collection points, reliable decentralized collection
2. Institutional support & governance	Underfunded county function; separated waste re-mixed in transport; incomplete or expired county instruments; weak information systems	Adds institutional determinants absent from conventional TPB	Institutionalized municipal-community co-production
3. Community sensitization & awareness	Sensitization (AOR = 6.26) and OWM awareness (AOR = 2.90) were the strongest independent predictors	Treats information as an enabling resource, not only an input to attitudes	Household sensitization, deliberately targeted to women
4. Socio-economic vulnerability & livelihoods	Willingness to separate rose from 87.9% to 93.2% when tied to economic benefit; income itself non-significant	Adds economic motivation to intention formation and persistence	Composting, black soldier fly, and recycling enterprise support
5. Gender relations & women's	Women managed waste in 75.9% of households but reported lower	Models gender as an indirect pathway through mediating	Gender-responsive scheduling,

empowerment	awareness (30.4% vs 54.0%); gender non-significant after adjustment (AOR = 1.23)	constraints	information, and resources
6. Community organizations & collective action	CBOs, SHGs and youth groups were the principal providers of collection, sensitization and market links	Adds organizational platforms shaping both norms and control	Fund and partner with CBOs as core delivery agents

Testable Propositions

The framework also generates five testable propositions that can guide future research.

P1: In informal settlements, community sensitization and access to waste collection services will predict participation more strongly than attitudes or intentions alone.

P2: Interventions that improve enabling conditions, such as waste collection services and community sensitization, will increase participation more than interventions that focus only on changing attitudes.

P3: Reducing gender differences in access to information, time, and resources will increase women's participation, because gender influences participation through these factors rather than directly.

P4: Communities with active community-based organizations and waste groups will have higher participation than similar communities without such organizations, because they provide information, services, and opportunities for engagement.

P5: OWM programmes that provide livelihood opportunities, such as composting, black soldier fly farming, and recycling enterprises, will achieve more sustained participation than programmes that rely only on environmental awareness.

Implication to Research and Practice

Implications for Research

The findings suggest that the TPB should not be applied unchanged in informal settlements. Future studies should measure structural and institutional factors alongside psychological factors and examine the gap between intention and actual behavior rather than assuming that intention leads to participation (Armitage & Conner, 2001; Webb & Sheeran, 2006). The modest explanatory power of the Kisumu model also indicates that other factors, such as community organizations, social networks, and local opportunities, influence participation but are not easily captured in household surveys. Mixed-methods studies are therefore well suited to understanding both the motivations and the conditions that shape participation. Future research should use longitudinal or quasi-experimental designs to test the proposed framework and compare findings across informal settlements in different African cities.

Implications for Policy

The findings have several policy implications. Awareness campaigns alone are unlikely to increase participation, and infrastructure alone is also insufficient. Most households were already willing to participate but lacked the information, services, and opportunities to do so. Effective interventions should therefore combine community sensitization with improved waste collection services, decentralized composting, and consistent implementation of existing waste policies (Haregu et al., 2017; NEMA, 2015).

The qualitative findings also identify several institutional priorities. County waste legislation, policies, and waste management plans should be completed and aligned with the Sustainable Waste Management Act, 2022. Waste that households separate should not be mixed again during collection, as this discourages continued participation. County governments should strengthen waste information systems to support planning, monitoring, and accountability. They should also formalize partnerships with community-based organizations and waste collector groups, recognizing them as key partners in waste service delivery (Ahmed & Ali, 2006; Joshi & Moore, 2004; Kain et al., 2016). Finally, financial and technical support should be directed to these community organizations, since they provide the services and opportunities that enable household participation.

Implications for Practice

At the operational level, the framework highlights several priorities. Sensitization should specifically target women, who manage most household organic waste but have less access to information. Households should be provided with separate waste bags or bins, which respondents identified as the most important practical need. Investment is also needed in composting sites, buy-back centres, and other organic waste processing facilities to support resource recovery (Oberlin, 2011). Women-led waste enterprises should be strengthened, and programmes should be designed around women's time, resource, and safety constraints. Finally, OWM should be integrated with livelihood and broader community development programmes to increase participation and sustain long-term engagement.

Limitations

The study has several limitations. First, it was conducted in one city, so the proposed framework should be tested in other informal settlements to assess its wider applicability. Second, the cross-sectional design identifies associations rather than causal relationships, highlighting the need for longitudinal and intervention studies. Third, participation and willingness were self-reported and may have been overestimated. Fourth, most respondents were women because they were primarily responsible for household waste management. This reduced the precision of gender comparisons. The small number of households participating in OWM and composting also limited some analyses. Finally, the qualitative component included only nine key informant interviews and did not include household focus group discussions, resulting in greater emphasis on institutional and service provider perspectives than on residents' experiences.

CONCLUSION

Organic waste is both a major public health challenge and an underused resource in informal settlements. Managing it effectively depends on community participation. This study shows that the conventional Theory of Planned Behavior does not fully explain participation in these settings. Although most households were willing to participate, very few actually did. Participation depended mainly on community sensitization, awareness of proper OWM practices, and access to waste collection services rather than on individual attitudes alone.

The study proposes an extended TPB framework that integrates six contextual domains: infrastructure and services, institutions and governance, sensitization and awareness, livelihoods, gender relations, and community organizations. The framework shows that participation is shaped by both behavioral and structural factors and provides testable propositions for future research.

The findings also have clear policy implications. Improving OWM requires more than awareness campaigns or infrastructure alone. Effective programmes should combine community sensitization, reliable waste collection services, supportive institutions, livelihood opportunities, and gender-responsive approaches. Community-based organizations should be recognized and supported as key partners in service delivery. Future studies should test the framework in other informal settlements using longitudinal, intervention, and comparative research designs.

Future Research

Future research should test the five propositions advanced by the extended framework, using longitudinal and experimental designs that can trace how changes in enabling conditions translate into sustained participation over time. Comparative studies in other informal settlements and secondary cities would establish whether the structural determination of perceived behavioral control observed in Kisumu generalizes to other low-resource settings. Future studies should also develop direct measures of the six contextual domains, examine the indirect pathways through which gender shapes awareness and participation, and evaluate interventions that pair community sensitization with reliable collection services and livelihood incentives, in order to identify the most cost-effective combinations for scaling up community OWM.

REFERENCES

Agarwal, B. (2000). Conceptualising environmental collective action: Why gender matters. Cambridge Journal of Economics, 24(3), 283-310. https://doi.org/10.1093/cje/24.3.283

Ahmed, S. A., & Ali, S. M. (2006). People as partners: Facilitating people's participation in public-private partnerships for solid waste management. Habitat International, 30(4), 781-796. https://doi.org/10.1016/j.habitatint.2005.09.004

Ajzen, I. (1991). The theory of planned behaviour. Organizational Behaviour and Human Decision Processes, 50(2), 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2020). The theory of planned behaviour: Frequently asked questions. Human Behaviour and Emerging Technologies, 2(4), 314-324. https://doi.org/10.1002/hbe2.195

Apinhapath, C. (2014). Community mapping and theory of planned behaviour as study tools for solid waste management. Journal of Waste Management, 2014, Article 934372. https://doi.org/10.1155/2014/934372

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. British Journal of Social Psychology, 40(4), 471-499. https://doi.org/10.1348/014466601164939

Barr, S. (2007). Factors influencing environmental attitudes and behaviours: A U.K. case study of household waste management. Environment and Behaviour, 39(4), 435-473. https://doi.org/10.1177/0013916505283421

Cornish, F., & Campbell, C. (2009). The social conditions for successful peer education: A comparison of two HIV prevention programs run by sex workers in India and South Africa. American Journal of Community Psychology, 44(1-2), 123-135. https://doi.org/10.1007/s10464-009-9254-8

County Government of Kisumu. (2017). Kisumu City informal settlement household records [Unpublished administrative data]. County Government of Kisumu.

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). SAGE Publications.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. Journal of Advanced Nursing, 62(1), 107-115. https://doi.org/10.1111/j.1365-2648.2007.04569.x

Fisher, A. A., Laing, J. E., & Stoeckel, J. E. (1983). Handbook for family planning operations research design. Population Council.

Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. Waste Management, 33(1), 220-232. https://doi.org/10.1016/j.wasman.2012.09.008

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. Field Methods, 18(1), 59-82. https://doi.org/10.1177/1525822X05279903

Gutberlet, J., Kain, J.-H., Nyakinya, B., Ochieng, D. H., Odhiambo, N., Oloko, M., Omolo, J., Omondi, E., Otieno, S., Zapata, P., & Zapata Campos, M. J. (2016). Socio-environmental entrepreneurship and the provision of critical services in informal settlements. Environment and Urbanization, 28(1), 205-222. https://doi.org/10.1177/0956247815623772

Gutberlet, J., Kain, J.-H., Nyakinya, B., Oloko, M., Zapata, P., & Zapata Campos, M. J. (2017). Bridging weak links of solid waste management in informal settlements. The Journal of Environment & Development, 26(1), 106-131. https://doi.org/10.1177/1070496516672263

Haregu, T. N., Ziraba, A. K., Aboderin, I., Amugsi, D., Muindi, K., & Mberu, B. (2017). An assessment of the evolution of Kenya's solid waste management policies and their implementation in Nairobi and Mombasa: Analysis of policies and practices. Environment and Urbanization, 29(2), 515-532. https://doi.org/10.1177/0956247817700294

Hasan, S. N. M. S., Harun, R., & Hock, L. K. (2015). Application of theory of planned behaviour in measuring the behaviour to reduce plastic consumption among students at Universiti Putra Malaysia, Malaysia. Procedia Environmental Sciences, 30, 195-200. https://doi.org/10.1016/j.proenv.2015.10.035

Hoornweg, D., & Bhada-Tata, P. (2012). What a waste: A global review of solid waste management (Urban Development Series Knowledge Papers No. 15). World Bank.

Joshi, A., & Moore, M. (2004). Institutionalised co-production: Unorthodox public service delivery in challenging environments. Journal of Development Studies, 40(4), 31-49. https://doi.org/10.1080/00220380410001673184

Kain, J.-H., Nyakinya, B., Odhiambo, N., Oloko, M., Omolo, J., Otieno, S., Zapata, P., & Zapata Campos, M. J. (2016). Translating policies into informal settlements' critical services: Reframing, anchoring and muddling through. Public Administration and Development, 36(5), 330-346. https://doi.org/10.1002/pad.1782

Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). What a waste 2.0: A global snapshot of solid waste management to 2050. World Bank. https://doi.org/10.1596/978-1-4648-1329-0

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behaviour? Environmental Education Research, 8(3), 239-260. https://doi.org/10.1080/13504620220145401

Kothari, C. R. (2004). Research methodology: Methods and techniques (2nd ed.). New Age International.

Marshall, R. E., & Farahbakhsh, K. (2013). Systems approaches to integrated solid waste management in developing countries. Waste Management, 33(4), 988-1003. https://doi.org/10.1016/j.wasman.2012.12.023

Medina, M. (2000). Scavenger cooperatives in Asia and Latin America. Resources, Conservation and Recycling, 31(1), 51-69. https://doi.org/10.1016/S0921-3449(00)00071-9

Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., & Mensah, M. Y. (2015). Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. Waste Management, 46, 15-27. https://doi.org/10.1016/j.wasman.2015.09.009

Mongkolnchaiarunya, J. (2005). Promoting a community-based solid-waste management initiative in local government: Yala municipality, Thailand. Habitat International, 29(1), 27-40. https://doi.org/10.1016/S0197-3975(03)00060-2

Mugenda, O. M., & Mugenda, A. G. (2003). Research methods: Quantitative and qualitative approaches. Acts Press.

National Environment Management Authority. (2015). The national solid waste management strategy. NEMA Kenya.

Oberlin, A. S. (2011). Resource recovery through community-based solid waste management: A case study of Kinondoni municipality, Dar es Salaam. In Waste management for resource recovery in developing countries [Institutional report/thesis chapter].

Okot-Okumu, J. (2012). Solid waste management in African cities - East Africa. In L. F. M. Rebellon (Ed.), Waste management: An integrated vision (pp. 3-24). InTech. https://doi.org/10.5772/50241

Ostrom, E. (1996). Crossing the great divide: Coproduction, synergy, and development. World Development, 24(6), 1073-1087. https://doi.org/10.1016/0305-750X(96)00023-X

Oteng-Ababio, M. (2014). Rethinking waste as a resource: Insights from a low-income community in Accra, Ghana. City, Culture and Society, 5(3), 145-155. https://doi.org/10.1016/j.ccs.2014.03.001

Permana, A. S., Towolioe, S., Aziz, N. A., & Ho, C. S. (2015). Sustainable solid waste management practices and perceived cleanliness in a low-income city. Habitat International, 49, 197-205. https://doi.org/10.1016/j.habitatint.2015.05.028

Republic of Kenya. (2022). The Sustainable Waste Management Act, 2022. Government Printer.

Rotich, K. H., Zhao, Y., & Dong, J. (2006). Municipal solid waste management challenges in developing countries - Kenyan case study. Waste Management, 26(1), 92-100. https://doi.org/10.1016/j.wasman.2005.03.007

Sheeran, P. (2002). Intention-behaviour relations: A conceptual and empirical review. European Review of Social Psychology, 12(1), 1-36. https://doi.org/10.1080/14792772143000003

Sheeran, P., & Webb, T. L. (2016). The intention-behaviour gap. Social and Personality Psychology Compass, 10(9), 503-518. https://doi.org/10.1111/spc3.12265

Sibanda, L. K., Obange, N., & Awuor, F. O. (2017). Challenges of solid waste management in Kisumu, Kenya. Urban Forum, 28(4), 387-402. https://doi.org/10.1007/s12132-017-9316-1

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. Journal of Environmental Psychology, 29(3), 309-317. https://doi.org/10.1016/j.jenvp.2008.10.004

Strydom, W. F. (2018). Applying the theory of planned behaviour to recycling behaviour in South Africa. Recycling, 3(3), Article 43. https://doi.org/10.3390/recycling3030043

Tonglet, M., Phillips, P. S., & Read, A. D. (2004). Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: A case study from Brixworth, UK. Resources, Conservation and Recycling, 41(3), 191-214. https://doi.org/10.1016/j.resconrec.2003.11.001

UN Women. (2020). Women's rights in review 25 years after Beijing. UN Women.

UN-Habitat. (2020). World cities report 2020: The value of sustainable urbanization. United Nations Human Settlements Programme.

Van Veenhuizen, R. (Ed.). (2006). Cities farming for the future: Urban agriculture for green and productive cities. RUAF Foundation, IDRC and IIRR.

Webb, T. L., & Sheeran, P. (2006). Does changing behavioural intentions engender behaviour change? A meta-analysis of the experimental evidence. Psychological Bulletin, 132(2), 249-268. https://doi.org/10.1037/0033-2909.132.2.249

Wilson, D. C., Velis, C., & Cheeseman, C. (2006). Role of informal sector recycling in waste management in developing countries. Habitat International, 30(4), 797-808. https://doi.org/10.1016/j.habitatint.2005.09.005

Zurbrügg, C., Drescher, S., Rytz, I., Sinha, A. H. M. M., & Enayetullah, I. (2004). Decentralised composting in Bangladesh, a win-win situation for all stakeholders. Resources, Conservation and Recycling, 43(3), 281-292. https://doi.org/10.1016/j.resconrec.2004.06.005