Determinants of households' willingness to pay (WTP) for waste management services in Mbeya City, Tanzania

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ABSTRACT

This study evaluates the determinants of households' willingness to pay for waste management services in Mbeya City, Tanzania. Specifically, the study examines the relationship between socio-economic characteristics of households and their willingness to pay; and analyse how the institutional dynamics shape households' willingness to pay waste collection fees. Three theoretical frameworks, Willingness-to-Pay (WTP), Contingent Valuation Method (CVM), and Transaction Cost Theory (TCT), guided the study. A cross-sectional research design was adopted, and mixed–method approaches were used to integrate quantitative and qualitative data. A sample size of 80 households was drawn from a total of 1,839 households in Pambogo and Makaburini subwards (mitaa). Sample selection was accomplished through stratified, simple random and purposively sampling techniques. Data collection techniques included surveys, in-depth interviews, observation and desk review. Structured questionnaire and interview guides were the instruments of data collection. IBM SPSS version 29 was used to analyze quantitative data where descriptive statistics, chi-square tests, cross-tabulations, and binary logistic regression were operationalized. Thematic analysis was used to analyze qualitative data. Results revealed that willingness to pay is influenced by different factors acting together, financial constraints being principal. The study concludes that willingness to pay is determined by household income, level of education and recommended amount of fee. Other determinants include service reliability, waste management guidelines, legal enforcement, fee collection logistics and limited use of digital technology. To improve willingness to pay, the study recommends for increased public awareness and participation, adoption of differentiated fee structures, strengthening digital payment systems, law enforcement, transparency in revenue management and legal enforcement.

Keywords: Determinants, Fee, Revenue, Willingness-to-Pay, Waste, Waste Management

I. INTRODUCTION

Municipal Solid Waste Management (MSWM) has become a critical component of sustainable urban development, particularly in rapidly growing cities of developing countries (Cayumil et al., 2021; Chernet et al., 2024). Increasing urbanization, industrialization, and population growth have drastically amplified the quantity and complexity of solid waste generated in urban centre. Globally, municipal waste generation was projected to rise from 1.8 billion tonnes by 2019 to 2.24 billion tonnes by the end of 2025, creating major environmental and public health challenges (Frey et al., 2023; Nyampundu et al., 2020; Volsuuri et al., 2023).

Proper solid waste management contributes substantially to environmental protection, improved sanitation, disease prevention, and enhanced urban livability (Cayumil et al., 2021; Debrah et al., 2022; Kamugisha et al., 2019; Nyampundu et al., 2020). It also supports the attainment of several Sustainable Development Goals (SDGs), particularly SDG 6; Clean water and sanitation, SDG 3; Good health and well-being, SDG 11; Sustainable cities and communities, and SDG 12; Responsible consumption and production (Wennersten & Qie, 2018; Zhang et al., 2024).

Across many developing countries, considerable public expenditure is directed toward waste management activities (Mpuya & Munishi, 2024). For instance, Ghana spends approximately USD 290 million annually on waste management, equivalent to 1.6% of its Gross Domestic Product (GDP), while Kenya spends approximately USD 324 million annually, representing nearly 0.9% of its GDP. Similar financial commitments have also been reported in Nigeria, Zambia, Liberia, and Madagascar (Farizal & Ekky, 2019; Lohri et al., 2014; Mpuya & Munishi, 2024; Mushi, 2024). Despite these investments, many municipalities continue to experience inadequate service coverage, poor waste collection efficiency, and financial deficits (Chernet et al., 2024; Ezeudu & Bristow, 2025). In most of these countries, household contributions remain to be the key financing mechanism for sustaining municipal waste management operations (Ezeudu & Bristow, 2025; Frey et al., 2023).

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In Tanzania, solid waste management is guided by the National Environmental Act (EMA) 20 of 2004. Article 114 (2) stipulates that local government authorities shall, with respect to their areas of respective jurisdiction, manage solid waste generated in accordance with sustainable plans introduced by respective local government authority and manage solid waste generated in accordance with sustainable plans produced by respective local government authority (URT, 2009). This involves formulating appropriate policy frameworks, identifying strategies for waste management and administering their implementation. Countrywide, municipal authorities have been outsourcing waste collection services to the private sector where Non-Government Organization, Community Based Organization and other authorised groups are contracted. The contracted groups or companies are responsible for collecting waste from various locations such as residential areas, institutions and waste collection points, and taking it to the disposal site. Waste management fee has been the main source of income to cover for the contractors' daily operations and cost recovery (Rugeiyamu, 2024). Ensuring consistent and sustainable waste collection services, households' willingness to pay is very critical.

1.1 Statement of the Problem

Mbeya city is swiftly urbanizing as a result of natural population increase and in-migration. The city is a business hub of the Southern Highlands of Tanzania (Mbwilo & Mahenge, 2022), thus experiencing significant waste generation. In 2010, Mbeya was among six cities in the country which benefited from the Tanzania Strategic Cities Project-(TSCP) whose objectives was to improve solid waste management systems among others (other cities were Dodoma, Arusha, Mwanza, Tanga, and Dar es Salaam) (WB, 2010). As part of the project, a sanitary landfill was constructed to ensure effective waste management. In addition to that, the city introduced a waste management financing mechanism under which waste generators are required to pay waste management fee monthly. Despite such advances, waste management remains a critical challenge in the city as many households are unwilling to pay the fee, thereby weakening revenue generation and restraining service delivery (Mbwilo & Mahenge, 2022; Mwangomo et al., 2025). Out of approximately 378.2 tonnes of the waste generated daily, only 40% is collected and disposed of; almost 60% remains uncollected (MCC, 2025). Large quantities of the unmanaged waste end up in illegal dumpsites, contributing to environmental pollution, overflowing skips, blocked drainage systems, and public health risks (Gilbert et al., 2021; Kasala, 2014). It is also true that operating a landfill or dumpsite is very expensive, requiring significant amounts of funds from waste management fees.

Previous studies have examined solid waste management challenges in Mbeya (Mlozi, M. 2011; Mgimba and Sanga, 2016; Mwangomo, 2019; Mbwilo & Mahenge, 2022; Mwangomo et al., 2025). Nevertheless, there is limited empirical evidence on what determines households WTP pay waste management fees. This creates a knowledge gap for municipal authorities and waste service providers seeking to improve revenue collection, and enhance sustainable waste management. This study therefore, examined the determinants of households' willingness to pay waste management fees in Mbeya City.

1.2 Research Objective

i. To examine the relationship between socio-economic characteristics of households and their Willingness to Pay
ii. To analyze how the institutional dynamics shape households' willingness to Pay (WTP) fee in Mbeya City, Tanzania.

II. LITERATURE REVIEW

2.1 Theoretical Review

The concept of Willingness to Pay (WTP) has been widely applied in environmental economics to assess household readiness to afford financial contributions for public services such as waste management (Hasanov, 2024). WTP is derived from economic utility theory, which suggests that individuals are usually willing to pay for a good or service when the perceived benefits of the services offset the related costs (Cuypers et al., 2021; Ferreira & Marques, 2015; Hasanov, 2024; Hoyos & Mariel, 2010). Apart from the perceived benefits, WTP can also be determined by other factors such as household income, knowledge and awareness about the negative impact of poor waste management. In some cases, people may avoid paying fees due the existing gaps in the system that allow for unregulated waste disposal. Moreover, some waste generators perceive the proposed fee as too high or disproportionate to the quantity of waste they generate, or the quality of service they are provided with.

Collecting waste from source of generation, transporting it, and disposing it of, is very expensive. It requires adequate financial budget to cover the costs (Doussoulin & Colther, 2022; Gilbert et al., 2021); that is why economic instruments such as Polluter Pays Principle are important for promoting accountability and environmental responsibility. It is imperative to ensure every waste generator bears the cost of waste management proportional to the quantity of the generated waste.

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WTP for waste management fee can also be evaluated using Contingent Valuation Method (CVM). CVM has frequently been used to estimate the monetary value households attach to non-market environmental services including waste handling (Hasanov, 2024; Hoyos & Mariel, 2010). With CVM, people are asked how much they would be willing to pay (WTP) for a specific service or improvement if it were available, or how much they would accept as compensation to give it up (Chernet et al., 2024; Hoyos & Mariel, 2010). In this aspect, the value (of the good or service) is based on a hypothetical setting and not an actual transaction (Ferreira & Marques, 2015). Unless people have a broader understanding of the socio-economic and environmental benefits associated with proper waste management, they may not be willing to pay for it. Being able to comprehend the consequences of poor waste management in a short, medium or long term enhances someone's willingness to pay waste management fee.

Transaction Cost Theory (TCT) is another hypothesis which can explains households' or individuals' willingness to pay the fee. TCT contend that institutional inefficiencies such as poor coordination, weak accountability, lack of transparency, and ineffective enforcement mechanisms can increase hidden costs and/or reduce willingness to pay, even when households recognize the importance of the service being delivered (Mroczek, 2014; Rindfleisch, 2020). Institutional inefficiencies allow for violation of the established rules, regulations and bylaws regarding waste management. For the case of willingness to pay, such inefficiencies create loopholes for dodging payments, unfair allocation of fee to different waste generators, poor record keeping and unfair service provision which demoralize households' enthusiasm to pay.

2.2 Empirical Review

Empirical evidence shows that households are generally willing to pay for better solid waste management. However, their actual contributions and level of commitment depend on trust in institutions, perceived fairness of payment systems, and the transaction costs involved in service delivery (Apio et al., 2024; Chernet et al., 2024).

2.2.1 Socio-economic characteristic and Willingness to Pay

Research report from different Africa countries show that most of the waste generators particularly households are willing to pay less than 1 USD per month. In Malawi for example, Abgottspon et al. (2025) noted that households were willing to pay an average of Malawian Kwacha (MWK) 1507-(USD 0.90) per month if they did not have to separate their waste themselves, but if they have to separate themselves they would pay only MWK 899 (USD 0.54). This is also an indication that some of the households do not feel responsible for waste separation, believing it is part of the waste collectors' tasks. If they have to, then the waste collection fee should be less.

Tugume et al. (2026) present somewhat similar observations from Mbarara Uganda, where the majority (64.1%) was discovered as willing to pay 1,000 Uganda shillings (UGX)-(USD 0.26) or more for solid waste management. Meanwhile data from Lira, Uganda show that close to a half of the respondents are willing to pay an average of Uganda Shilling (UGX) 3012 -(USD 0.84) per month for better Management (Apio et al., 2024) . From Ga East Municipal in Ghana, Asare et al. (2021) noted that the majority is willing to pay only 3-4 Ghc (UDS 0.45-0.60). Asare's study went further to show different levels of willingness to pay by which a relatively small proportion reported to be willing to pay up to 10 Ghana cedes (Ghc) or more, which is slightly above 1.5 USD per month as long as there are improved waste management services. Several other studies (Mdetele et al., 2022; Rupia, 2022) confirm reliable sources of income to be among the key determinants of willingness to pay.

2.2.2 Institutional dynamics

Institutions play a vital role in waste management, especially when they are functional. This include compliance to fee payment by the residents as well as fee remitance from the municipal authorities to the waste collection companies.

Differentail fee payment is common to many communities, mostly considering income differences. However, municipal authorities and waste collection companies constantly compalin that designated fees are too tittle to cater for operational costs. In Kigali Rwanda for instance there are four different categories; the first category is the most impoverished while the fourth category is the most prosperous. The amount to be paid varies according to household category. While households in the first category are exempted from payment, fees for the remaining categories range from RWF 1,000 (USD 0.99) to RWF 5,000 (USD 4.96) per month (Noorman, 2023). The government's intention is to alleviate the financial burden on low-income households. Nevertheless, waste collection companies have consistently reported inadequate revenue to support the provision of waste collection services.

A study by the Netherland Development Organization (SNV) discovered municipal officials treating waste collection fee as source of revenue for different purposes, thus diverting the collected funds to other priorities instead of remiting it to the waste collection companies (SNV, 2021). This results in low waste collection rate among waste collectors and limits their access to functional equipment. Empirical evidence from other countries confirm that most local authorities do not have enough waste transportation vehicles, but also many existing vehicles are old and

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dysfunctional (Lalitha and Fernando, 2019). This is a major concern not only to the municipal councils but to the contracted waste collection companies as well.

Literature also points out to absence of strict enforcement of laws and penalties and shortage of trucks for waste transportation as among the hindrances to effective fee payment. Studies from different countries including Zimbabwe, Rwanda, Ethiopia and Tanzania (Zhongove et al., 2024; Pellatt & Palfreman, 2023; Nyampundu et al., 2020; Lunojo et al., 2025) further confirm that ineffective implementation of laws and regulations governing SWM remain as central challenge to waste management.

III. METHODOLOGY

3.1 Research Design

The study employed a cross-sectional research design using a mixed-methods approach to evaluate the determinants of Willingness to Pay (WTP) waste management fee. Mixed methods allowed for effective data collection, analysis, and presentation that gave a broader and deeper understanding of the research topic. The study was guided by positivist and objectivist research philosophies. Positivism informed the use of measurable and statistical approaches to examine relationships among different socio-economic variables while the objectivist philosophy complements a positivism by asserting that social phenomena exist independently of individuals' perceptions (Bergmann, 2024; Zimmermann, 2019).

3.2 Study Area

The study was conducted in Mbeya city, Mbeya region in Tanzania. Mbeya city lies between latitudes 8°50' and 8°57' South of the equator and longitudes 33°30' and 35°35' East. It has a total area of 214 square kilometres, 36 wards and 181 subwards (mitaa) (MCC, 2025). The city is a major center for commercial and trading activities in the Southern Highlands Zone and neighbouring countries of Malawi, Zambia and Democratic Republic of Congo (DRC). Mbeya city is characterized by rapid urbanization, population growth, increasing solid waste generation and existence of challenges in waste fee collection.

Two wards, Iyela and Itiji were selected. These wards were deliberately selected because they are peri-urban areas and are dominated by informal settlements. These areas have been encountering irregular waste fee payments and have unregulated waste disposal sites. From these two wards, two sub-wards Pambogo and Makaburini (one from each ward) were sampled for data collection. Pambogo has a total population of 5,137 while Makuburini has 432. Collectively, the two sub-wards have 1839 households in total; 1,727 from Pambogo and the remaining 112 from Makaburini (MCC, 2025).

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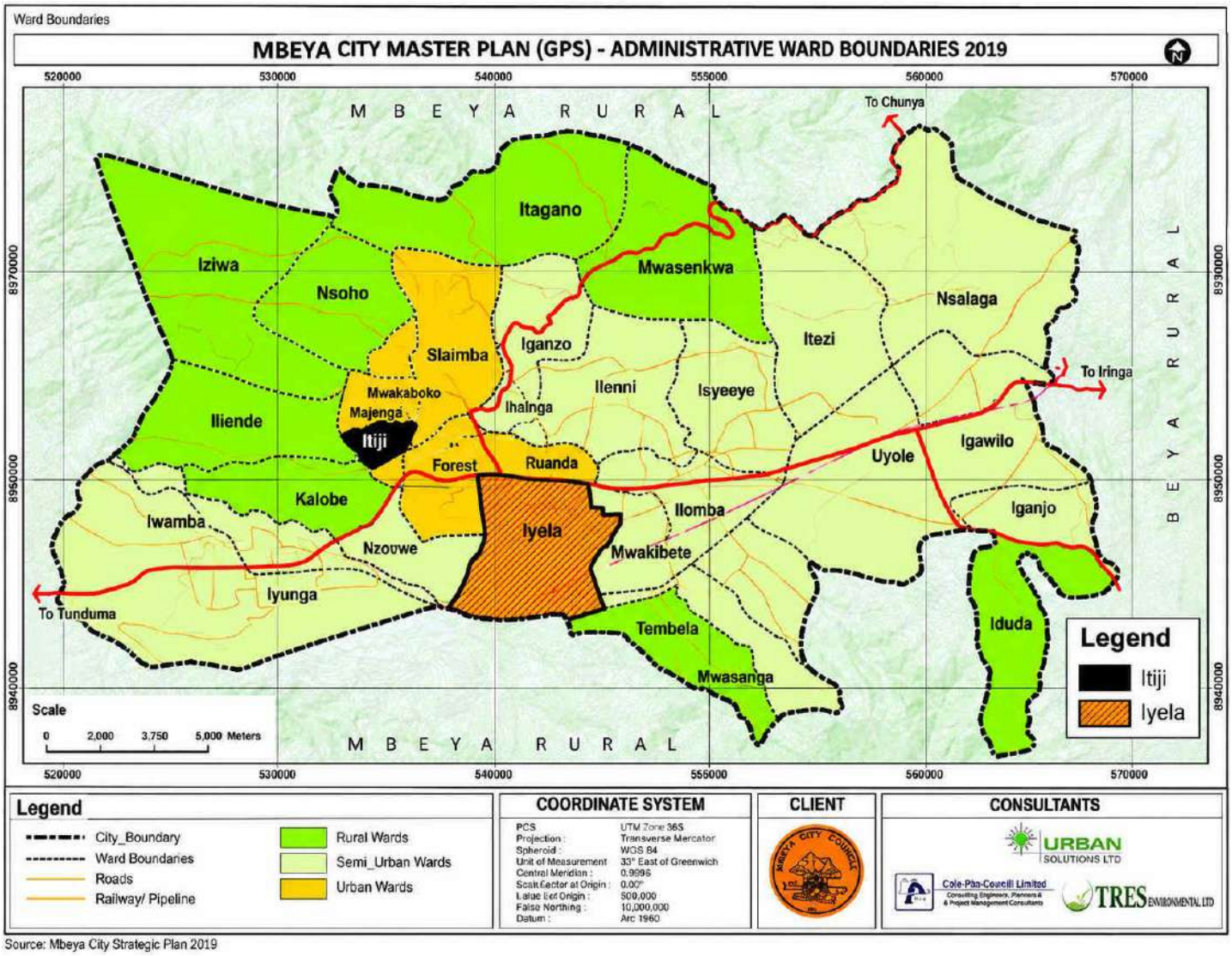


Figure 1
Map of the Study Area
Source: MCC archive (2025)

3.3 Target Population

The target population was Pambogo and Makaburini subwards (mtaa) residents in Iyela and Itiji wards. Households were the unit of analysis, and the unit of inquiry was the heads of households, but in the absence of the head a second person in command was interviewed. Inclusion criterion was households which have lived in the area for at least one year. Exclusion criteria were; non-members of a particular household, people aged below 18 years and households which have lived there for less than a year.

3.4 Sampling and Sample Size

The sampling procedure followed three sequential stages. In the first stage, purposive sampling was applied to select wards. This was followed by selection of the sub-wards which were also purposively chosen based on their relevance to the study objectives. From the selected sub-wards, the study sample was calculated. The sample size was determined using Cochran's (1977) formula. The formula was applied at a 90% confidence level, with a margin of error of 9% (E = 0.09) and a population proportion of 0.5 (0.05 for ±5%).

$$n_0 = \frac{Z^2 p\ (1-p)}{E^2}$$

n_0 = Sample size

Z = Score corresponding to the desired confidence level (for a 90% confidence level; its approximately 1.645)

p = (1-p) Maximum variability that is present in the population which is 0.5

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$E^2 = 0.09$ (9% margin of error)

$$n_0 = \frac{(1.645)\ ^2 \times 0.5\ (1-0.5)}{0.09^2}$$

$$n_0 = \frac{2.706025 \times 0.5 \times 0.5}{0.0081}$$

$$n_0 = \frac{0.67650625}{0.0081}$$

$n_o = 83.51 \approx 84$ respondents

A total sample size of 84 households across the two sub-wards was drawn. However, response rate was 95.2% (80 respondents) since 4.8% (4 respondents) were not returned.

3.5 Data collection instruments and procedures

Instruments of data collection included semi-structured questionnaire, interview guides and observation checklist. Procedures for data collection involved household survey, key informant interview and field observation.

3.6 Data Analysis

IBM SPSS Statistics Version 29 was used to analyse quantitative data thematic analysis was used to make sense of qualitative data. During analysis and presentation of the data, response rate (f=80) was presented as 100%. This number was considered sufficiently high to ensure the reliability and validity of the study findings.

3.7 Ethical Considerations

Before commencement of data collection, the researcher obtained the necessary ethical and administrative permissions from respective authorities in Mbeya City. Through out the research, principles of honesty, integrity, and transparency in data collection analysis, interpretation, and reporting were adhere to. Measures were also taken to minimize potential bias during the research design, data collection, analysis, interpretation, and presentation of findings. Participants were informed about the purpose of the study and their participation was treated as voluntary. Confidentiality and privacy were maintained by ensuring that information provided by respondents was kept secure and was used solely for the purposes of the study. Where participants were below 18 years of age, informed consent was obtained from their parent or legal guardian in accordance with applicable ethical requirements. The identities of participants and any personal information collected during the study were kept confidential and were not disclosed without appropriate authorization.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Respondents demographic characteristic

The presentation of the findings and discussion were guided by the main objective of the study. In addition to that, respondents' demographic data were recorded and analysed to provide contextual information and help the researcher in interpreting and making sense of the data. Table 1 presents the demographic characteristics of the respondents.

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Table 1
Respondents' Demographic Profile

Demographic variable	Characteristics	Frequency	Percentage
Age	16-25	17	21.25
	26-35	19	23.75
	36-45	25	31.25
	46-55	10	12.5
	56+	9	11.25
	Total	**80**	**100**
Sex	Males	30	37.5
	Females	50	62.5
	Total	**80**	**100.0**
Level of education	Non formal	6	7.5
	Primary	11	13.75
	Secondary	32	40.0
	College	31	38.75
	Total	**80**	**10**
Occupation of the respondent	Government employment	14	17.5
	Business	24	30.0
	Farmer	28	35.0
	Unemployed	7	8.75
	Others	7	8.75
	Total	**80**	**100.0**
Households size	1-3 Members	47	58.8
	4-6 Members	28	35.0
	7-9 Members	5	6.2
	Total	**80**	**100.0**

The researcher also sought to understand the average quantity of waste generated by households per day. The results captured variations among the households in the study area as presented in figure 2.

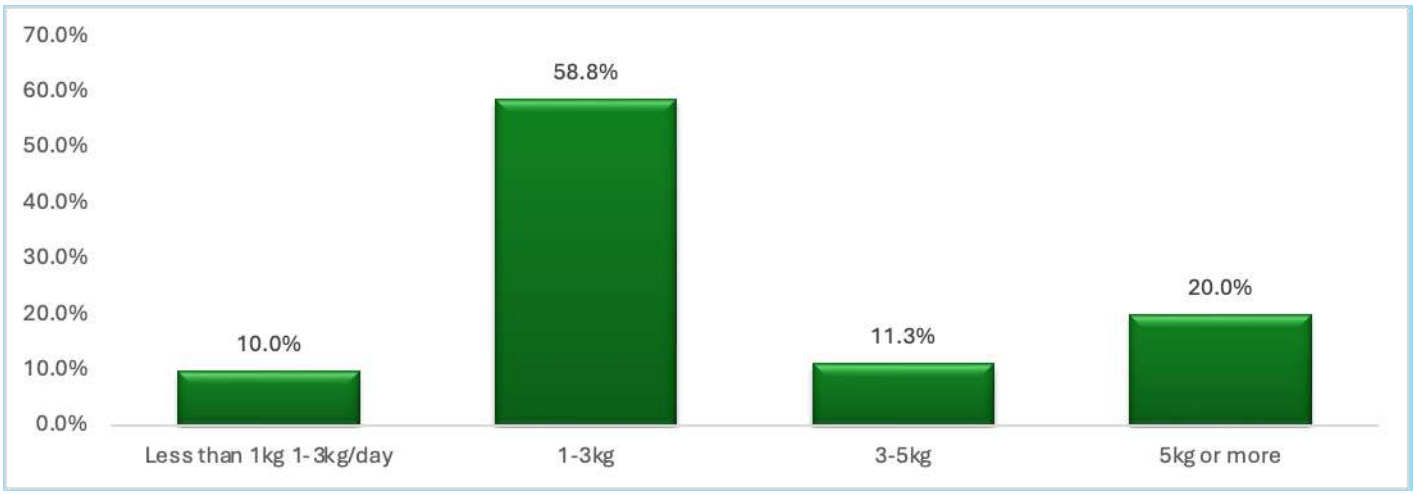


Figure 2
Quantity of Waste Generated per Day
Source: Field survey data (2026)

Field observation also noted large quantities of waste scattered in the neighborhoods. The scattered waste constituted of different waste materials implying that it is unsorted (Plates 1a & 1b). The researcher also noted shortage of workers and inadequate waste management equipment in Itiji (2a & 2b)

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Plate 1a
Unregulated Dumping by the Roadside in the Study Area
Source: Field Observation (2026)



Plate 1b
Unregulated Dumping Close Proximity to the Residence in the Study Area
Source: Field Observation (2026)



Plate 2a
Overflowing and Scattered Waste at the Transfer Station in Itiji
Source Field observation (2026)



Plate 2b
Limited Availability of Functional Equipment at the Transfer Station in Itiji
Source Field observation (2026)

4.2 Institutional Dynamics Shape Households' Willingness to Pay

The study was interested in examining the institutional dynamics governing waste management. This includes clear guidelines, coordination, financing and fee system and operative waste management logistics.

4.2.1 Guidelines Governing Waste Management

The study used a Boolean response question 'agree-disagree' to capture respondents views on the perceived presence of well-defined guidelines. Findings indicated that only a small portion of the respondents (8.75%; f = 7) agreed while the greatest proportion (91.25%; f = 73) disagreed with the opinion as presented in table 2.

Table 2
Awareness of Clear Guidelines

There are clear guidelines that govern the waste management	Frequency	Percent
Agree	7	8.75
Disagree	73	91.25
Total	**80**	**100**

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To determine whether the observed differences were statistically significant, a Pearson Chi-Square test was performed (Table 3).

Table 3

Chi-Square Test Results for Enforcement Effectiveness and Fee Payment Compliance

Chi-Square Test	Value	df	sig. (2-tailed)
Pearson Chi-Square	10.916	2	0.004
Likelihood Ratio	11.483	2	0.003
Linear-by-Linear Association	8.721	1	0.003
No. of Valid Cases	**80**		

4.2.2 Legal enforcement

The study was further interested to explore how respondents perceive the state of legal enforcement on waste management fee compliance. Findings from household survey revealed that 61.25% (*f* = 49) of respondents perceive the existing enforcement mechanisms as weak, while 30.0% (*f* = 24) perceive them as strong. The remaining 8.75% (*f*=7) were uncertain about whether enforcement mechanisms were weak or strong (Table 4).

Table 4

Perceived enforcement status vs fee compliance (f = 80).

Perceived enforcement effectiveness	Paid the fee in *f* (%)	Did not pay the fee in *f* (%)	Total *f* (%)
Strong Enforcement	20 (83.3)	4 (16.7)	24 (100)
Weak Enforcement	22 (44.9)	27 (55.1)	49 (100)
Not Sure	5 (71.4)	2 (28.6)	7 (100)
Total	**47 (58.8)**	**33 (41.2)**	**80 (100.0)**

4.2.3 Fee collection logistics

Boolean responses indicated that 88.75% (*f* = 71) of the respondents agreed that inadequate transportation and equipment slow down collection activities, while only 11.25% (*f* = 9) of the respondents disagree (see figure 3).

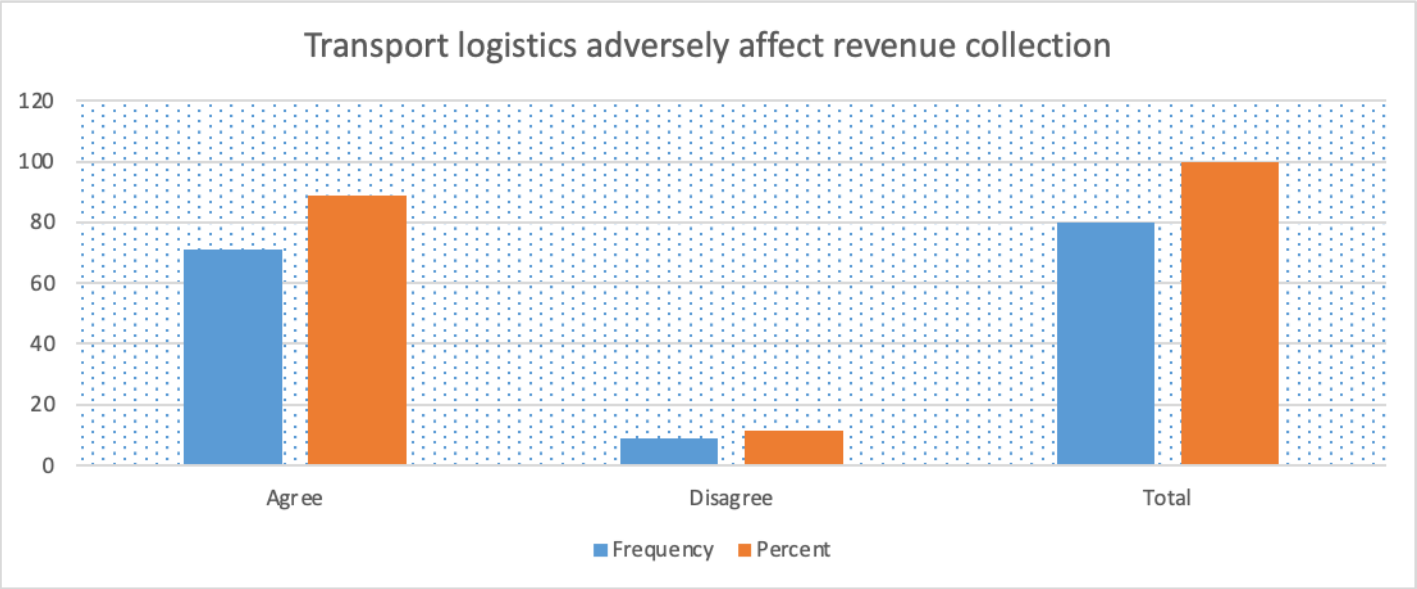


Figure 3

Transport Logistics Adversely Affect Revenue Collection

Source: Field data collection (2026)

4.2.4 Limited Utilization of Digital Technology

Findings from the study revealed limited utilization of digital technology for fee collection. Key informant 3 (KI-3) revealed traditional approaches such as door-to-door collection being unproductive for revenue collection. The key informant said:

> *"...Mobile money transactions are better than handling cash to revenue collectors. Digital payment is very effective because customers feel confident that the money is safe and properly recorded; and will be*

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properly used. Moreover, it allows for monitoring and tracking of the customers. Absence of reliable digital systems and automated payment platforms makes it difficult to monitor collections, verify payments, and generate accurate records for decision-making." (2 March 2026).

Key Informant 2 (KI-2) reported that low revenue collection contributes to budgetary constraints, which limit the availability of adequate staff, waste collection equipment, and funds required to meet overall operational costs. A desk review from the municipal achieves revealed the 2023/2024 and 20204/2025 revenue collections being lower than the estimated target by almost 50% (Table 5):

Table 5

Estimated Vs Collected Revenue for 2023/2024 and 2024/2025

Ward	Subward (mitaa)	2023/2024	Actual Collection	%	2024/2025	Actual Collection	%
Itiji	Makaburini	19,000,000.00	5,374,000.00	28.28	19,000,000.00	9,435,400.00	49.66
	Mbwile	9,000,000.00	3,133,500.00	34.82	9,000,000.00	5,139,900.00	57.11
	Itiji	11,000,000.00	4,950,000.00	45	11,000,000.00	3,280,200.00	29.82
	Mwasanga	6,000,000.00	1,735,200.00	28.92	6,000,000.00	4,140,000.00	69
Sub Total		**45,000,000.00**	**15,192,700.00**	**33.76**	**45,000,000.00**	**21,995,500.00**	**48.87**
Iyela	Block T	32,500,000.00	6,337,500.00	19.5	32,500,000.00	16,042,000.00	49.36
	Iyela I	19,420,000.00	7,612,640.00	39.2	19,420,000.00	11,667,536.00	60.08
	Iyela II	8,613,000.00	4,215,202.20	48.94	8,613,000.00	2,554,615.80	29.66
	Nyibuko	16,860,000.00	4,781,496.00	28.36	16,860,000.00	9,104,400.00	54
	Pambogo	15,920,000.00	6,230,640.00	39.14	15,920,000.00	7,708,054.00	48.42
	Ilembo	3,609,000.00	1,335,330.00	37	3,609,000.00	1,655,448.30	45.87
	Airport	7,465,000.00	5,076,200.00	68	7,465,000.00	4,106,496.50	55.01
	Mapambano	10,613,000.00	5,225,841.20	49.24	10,613,000.00	3,501,228.70	32.99
Sub Total		**115,000,000.00**	**40,814,849.40**	**35.49**	**115,000,000.00**	**56,339,779.30**	**48.99**
Grand Total		**160,000,000.00**	**56,007,549.40**	**35**	**160,000,000.00**	**78,335,279.30**	**48.96**

The study also employed a Binary Logistic Regression analysis to examine the influence of the recommended fee amount and household income on households WTP for waste collection services (Table 6).

Table 6

A Binary Logistic Regression Results for Fee Structure and Household Monthly Income

Waste management fee structure				
Variable	**β (Coefficient)**	**S.E. (Standard Error)**	**Wald χ^2 (Wald Chi-Square Test)**	**p-value**
Fee Amount (TZS)				
2,000	-0.39	0.32	1.49	0.222
5,000	-1.28	0.45	8.09	0.004*
10,000	-2.04	0.6	11.56	0.001*
Household monthly income				
Monthly Household Income (TZS)				
100,000–300,000	0.76	0.34	4.99	0.026*
300,000–600,000	1.21	0.41	8.73	0.003*
Above 600,000	1.68	0.55	9.33	0.002*
Constant	**1.49**	**0.52**	**8.22**	**0.004***

Reference category for waste fee amount = TZS 1,000

Reference category for income = Below TZS 100,000

Model diagnostics: Hosmer Lemeshow test $p > 0.05$; Overall classification accuracy ≈ 75%; Statistically significant at $p < 0.05$.

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4.3 Discussion

4.3.1 Relationship between Socio-Economic Characteristics of Households and their Willingness to Pay

The study constituted a total of 80 respondents (Table 1), both males (32.5%) and females (37.5%) with different socio-economic backgrounds. Respondents' age ranged from 16 to above 55 years. The mean age was 37.4 years while the modal age group was 36-45 years (*f*=25). Female respondents accounted for 62.5% (*f*=50) while males accounted for 37.5% (*f*=30). Majority of the respondents (40%, *f*=32) had secondary school level of education, followed by college graduates (38.75%, *f*=31) and primary school leavers. About 7.5% (*f*-6) had no formal education. The study also found the largest proportion of the respondents being farmers (35.0%) while the least were unemployed (8.75%) and others (8.75%). Many households constituted 1-3 members (58.8%, *f*=46) but a small proportion had up to nine members (see table 1).

The research findings show an over representation of female respondents. The results highly correlate with Mdetele et al. (2022) and slightly relate with Lunojo et al. (2025) who found the proportion of female respondents constituting 65.7% and 51.8% in Morogoro and Njombe (Tanzania) respectively. On the contrary, in similar studies in Delta State, Nigeria (Ohwofasa and Biose, 2023) and Dodoma, Tanzania (Nyampundu et al., 2020) male respondents constituted relatively larger proportion than females (56.7% and 55.0% respectively). Over representation of the female respondents can be related to traditions and customs that women spend comparatively much time at home than the men. As primary breadwinners, majority of the men go out for work, business or other income generating activities, leaving behind the women to assume household chores although it is not always the case. Sometimes men's reluctancy to participate in research and presence of significant number of female-headed households contribute to over representation of women in research studies.

Qualitative findings coined that household financial status highly determine households WTP. Unfortunately, waste is not among the top priorities as confirmed during key informant interview. The key informant narrated; *"non-payment is often linked to competing household expenditure priorities rather than unwillingness to pay*" (KI-1; 26 Feb 2026). It is clear that willingness to pay is shaped not only by awareness of waste management needs but also by household financial decision-making, highlighting the need to engage both waste managers and financial decision makers in efforts to improve waste management fee compliance.

Results further show that more than half of the respondents (78.75%) have secondary or higher levels of education. Different studies confirm that education has a positive relationship with a WTP for waste management services (Girma et al., 2022; Subhan et al., 2014; Addai and Danso-Abbeam; 2014; Banga et al., 2011). Other factors being constant, WTP in the study area is expected to be high as more people have attained relatively higher levels of education, thus are aware of the importance of proper waste management. Nevertheless, the current study results declines this concept, implying that education cannot solely determine WTP. Other factors, such as household income, perceived quality of waste management services, service affordability, household size, and individuals' perceptions of waste-related problems may also influence WTP.

Farming was found to be the dominant occupation in the study area, with field data indicating that 35% (f = 28) of the respondents were farmers. This was followed by the business category, which accounted for approximately 30% (f = 24) of the respondents. The business category comprised small- and medium-scale activities, including hawking, shopkeeping, tailoring, food vending, and other formal and informal enterprises. Public servants constituted 17.5% (f = 14) of the respondents.

Unlike many other occupational groups, government employees generally receive a regular monthly income, which may enable them to budget more consistently for waste management services. In contrast, households dependent on irregular sources of income may face difficulties in paying waste management fees on time, potentially resulting in delayed, partial, or non-payment. Mdetele et al. (2022) convey government employment status in Morogoro as significant predictor of waste management best practices, suggesting that government employees were more capable of meeting waste management-related payments. The relatively large proportion of respondents engaged in occupations characterized by irregular income may face difficulties in fee payment.

Household size determines the quantity of domestic waste generated. Smaller households are generally expected to produce less waste whereas larger households are estimated to generate greater quantities. Majority of respondents (58.75%) reported generating an average of 1–3 kg of waste per day. Under *Pay-as-You Throw* approach, households are expected to pay relative to the quantity of waste they generate, but findings from the study area indicate that households are charged a flat-rate. During data collection, some respondents from smaller households expressed dissatisfaction with the fee arrangement, arguing that they were significantly overcharged. Households generating relatively small quantities of waste perceive the fee as disproportionate to the amount of waste they generate, potentially reducing their willingness to pay, while households generating larger quantities may be paying lower fees relative to the amount of waste they produce.

A volume-based approach promotes payment based on the quantity or volume of waste generated, thereby creating a closer association between waste generation and the cost of waste management services (Romano &

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Masserini, 2023). However, implementing this approach may be challenging because it requires adequate financial resources, personnel, monitoring mechanisms, and considerable time to measure or estimate the waste generated by households and administer differentiated fees accordingly. A common practice in many areas is to categorise fee payers based on the residency or sector (Kamugisha, et al., 2019; Iraguha et al, 2026). This is practical even in Mbeya city where amounts of fee.

Respondents acknowledged that financial constraints pose significant challenges to effective waste management. Approximately 96.25% (f = 77) of the respondents reported that limited financial resources on the service provider's side constrain infrastructure development, recruitment and training of staff, establishment of effective monitoring systems, and procurement of appropriate waste management equipment. During field observation, the researcher noted shortages of waste collection personnel and equipment (Plate 2a & 2b). These shortages contributed to prolonged accumulation of uncollected waste at transfer stations, resulting in overflowing waste and scattered waste within the surrounding areas.

4.3.2 How Institutional Dynamics Shape Households' Willingness to Pay

The findings indicate limited public knowledge and awareness regarding waste management guidelines, especially residents' rights and responsibilities. Unclear or insufficiently communicated guidelines may also undermine accountability, particularly on the part of service providers, thereby weakening public trust and reducing compliance with waste management requirements. Since guidelines are generally less legally binding than formal regulations, their effectiveness may depend heavily on effective communication, public awareness, and voluntary compliance. Strengthening communication and awareness initiatives is therefore important to ensure that residents understand the applicable guidelines, their responsibilities, and the expected standards of service provision. Evidence from the key informant interview (KI-1) further identified poor communication as one of the factors contributing to limited willingness to pay. The informant explained that:

> "*Many households are aware of the fees that they are required to pay but, have limited understanding of how the charges are determined and managed."* (KI-1; 26 Feb 2026)

This statement justifies SNV's study (2021) that municipal offcials divert the collected funds to other priorities instead of remiting it to the waste collection companies. The statement further suggests limited transparency among the relevant authorities responsible for waste management. Citizens have a legitimate interest in understanding what waste management services entail, how the fees they pay are determined and allocated, and how the revenue collected is utilized. Providing such information may enhance residents' understanding of the costs associated with waste management and strengthen trust between service providers and waste generators, which may in turn encourage compliance with fee payment requirements.

The findings showed that 86.25% (f = 69) of the respondents were of the opinion that a lack of transparency regarding the utilization of waste management fees creates misunderstandings between service providers and waste generators, thereby affecting service coverage and compliance. This finding is consistent with observations reported by Chernet et al. (2024) in Ethiopia, who similarly highlighted the importance of transparency and accountability in waste management.

Examining the relationship between perceived enforcement effectiveness and payment compliance, the Pearson Chi-square test revealed a statistically significant association between perceived enforcement effectiveness and fee payment compliance, $\chi^2(2, N = 80) = 10.916$, $p = 0.004$. Since the p-value was less than the 0.05 significance level, the null hypothesis of no association was rejected. The finding indicates that households' perceptions of enforcement effectiveness are significantly associated with their fee payment behaviour. The result suggests that households who perceive enforcement mechanisms as effective are more likely to comply with waste management fee payment requirements. Conversely, perceptions of weak enforcement would be associated with lower compliance, as households may perceive a reduced likelihood of consequences for non-payment. Therefore, ineffective implementation and enforcement of waste management regulations may undermine fee collection and, consequently, constrain the financial resources available for the provision of effective solid waste management services. These findings concur with Zhongove et al. (2024) and Kamugisha (2019) that ineffective or weak law enforment is a barrier to waste management.

The qualitative findings further reinforce the quantitative results. Key Informant-3 also identified enforcement as an important factor influencing compliance with waste management fee payment requirements. The key informant said:

> "*….fee payment defaulters rarely face legal penalties. As a result, many waste generators perceive fee payment as voluntary*. (2 March 2026).

Another key informant (KI-4) further narrated:

> *"Many residents do not comply with fee payment because there are no legal repercussions for failing to pay the fees, which reduces compliance" (*4 March 2026).

The cross-tabulation results demonstrate notable differences in payment compliance across categories of perceived enforcement effectiveness. Among respondents who perceived enforcement measures as strong, 83.3%

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reported paying waste fees, compared with only 44.9% among those who perceived enforcement as weak. Conversely, more than half (55.1%) of respondents who perceived enforcement as weak reported non-payment of waste collection fees. These findings suggest that weak enforcement undermines compliance with waste management fee obligations, thus contribute to practices such as illegal dumping.

Field observations further supported these findings, revealing instances of unregulated waste disposal that have contributed to the formation of informal dumpsites along roadsides (Plate 1a) and in close proximity to residential areas (Plate 1b). The presence of such informal dumpsites indicates the potential consequences of inadequate enforcement and weak compliance with waste management requirements. In addition to creating environmental nuisances, uncontrolled waste disposal can increase exposure to environmental hazards and conditions conducive to the spread of communicable diseases. Therefore, strengthening enforcement mechanisms, improving monitoring and inspection activities, and ensuring consistent implementation of penalties for non-compliance are required to improve fee payment compliance and more effective waste management practices.

Door-to-door collection was found to be the most commonly used approach in the study area. Results are in consistent with Noorman (2023) from Kigali Rwanda where waste collection companies workers visit households to collect the fees. Although this approach allows revenue collectors to interact directly with waste generators, it is resource-intensive and time-consuming. Its effective implementation requires adequate staffing and reliable transportation to facilitate the mobility of revenue collectors and enable them to reach waste generators efficiently.

Low revenue collection rate is a major constraint to waste collection service provision. The results resemble Biswas and Singh (2021) who found payment rates in Dar es Salaam city being very low (about 30–50 per cent) in both affluent and poor neighbouhoods. Undoubtedly, lower payment rates undermine financial capability of the service provider. In turn, limited financial capability affects the quality and reliability of waste management services, consequently discouraging peoples WTP as confirmed by Key Informant 2 that poor service delivery has discouraged some residents from paying the required fees, thereby contributing to low fee compliance.

Findings from the household survey further confirmed the challenges associated with door-to-door fee collection. Respondents indicated that the approach was less effective, particularly because inadequate transportation logistics sometimes prevented revenue collectors from reaching all households in a timely manner. This situation may create delays in fee collection and weaken the regularity of interactions between revenue collectors and households. The findings therefore suggest that improving transportation logistics, staffing levels, and operational resources could enhance the efficiency of door-to-door fee collection and, in turn, support improved compliance with fee payments.

Technology developments have enabled the application of Unstructured Supplementary Service Data (USSD) or Digital Apps such as Banking Apps and others designed to perform financial activities. These developments have proven to be effective for utility revenue collection such as water and electricity bills. The key informant associated limited use of mobile money transaction to limited fee compliance observed in Iyela and Itiji wards. For two consecutive years 2023/2024 and 2024/2025, actual revenue collections were less than 50% of the total estimated revenue. Under such circumstances, operational approaches that facilitate effective fee payment and collection are essential to ensuring that both customers and service providers fulfill their respective responsibilities. This agrees with Pellatt and Pelfreman (2023) study which reveal how the application of Smart-TRAC technology has helped to improve solid waste management service provision in Dar es Salaam, one of the rapidly growing megacities in Africa.

4.3.3 Binary Logistic Regression Results

4.3.3.1 Association between fee structure and households' willingness to pay

The binary logistics regression results indicate that, willingness to pay in this study was operationalized as households' payment comfortability, where respondents who indicated that they were comfortable paying the prevailing waste collection fee were coded as 1 (willing to pay), while those who reported discomfort were coded as 0 (not willing to pay)**.** This operational definition aligns with the study objective of assessing gaps in households' willingness to pay and their implications for sustainable solid waste management. The predictor variables included the amount of waste collection fee charged and monthly household income.

The findings presented in Table 7 indicate that the amount of fee charged significantly influences households' willingness to pay. Using households paying TZS 1,000 as the reference category, the coefficient for households paying TZS 2,000 was negative ($\beta = -0.39$), indicating a lower likelihood of willingness to pay compared with the reference group. However, this relationship was not statistically significant (Wald $\chi^2 = 1.49$, $p = 0.222$). The odds ratio [Exp (β) = 0.68] suggests that households paying TZS 2,000 were approximately 32% less likely to express willingness to pay than those paying TZS 1,000, although this difference was not statistically significant.

In dissimilarity, households paying TZS 5,000 exhibited a statistically significant decline in willingness to pay. The regression coefficient was negative ($\beta = -1.28$, S.E. = 0.45, Wald $\chi^2 = 8.09$, $p = 0.004$), indicating that increasing the waste collection fee to TZS 5,000 significantly reduced households' willingness to pay. The odds ratio [Exp(β) = 0.28] shows that these households were approximately 72% less likely to report willingness to pay than households paying

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TZS 1,000. Similarly, households paying TZS 10,000 showed the strongest negative effect on willingness to pay. The coefficient (β = -2.04, S.E. = 0.60. Wald χ^2 = 11.56, *p* = 0.001) was highly significant. The corresponding odds ratio [Exp(β) = 0.13] indicates that households paying TZS 10,000 were approximately 87% less likely to report willingness to pay compared with households paying TZS 1,000. These findings demonstrate that higher fee charges substantially reduce households' willingness to pay, thereby widening the gap between the fees charged and households' payment capacity.

4.3.3.2 Association between household income and willingness to pay

The analysis further revealed that monthly household income was significantly associated with households' willingness to pay the fee. Compared with households earning below TZS 100,000 per month, those earning TZS 100,000–300,000 had a positive and statistically significant regression coefficient (β = 0.76, S.E. = 0.34, Wald χ^2 = 4.99, p = 0.026). The odds ratio [Exp(β) = 2.14] indicates that households in this income category had approximately 2.14 times the odds of reporting willingness to pay fees compared with households in the reference category.

Similarly, households earning TZS 300,000–600,000 demonstrated a stronger positive association with willingness to pay. The regression coefficient was positive and statistically significant (β = 1.21, S.E. = 0.41, Wald χ^2 = 8.73, p = 0.003). The corresponding odds ratio [Exp(β) = 3.35] indicates that households in this income category had approximately 3.35 times the odds of reporting willingness to pay compared with households earning below TZS 100,000 per month.

The strongest positive association was observed among households earning above TZS 600,000 per month. The regression coefficient was β = 1.68 (S.E. = 0.55, Wald χ^2 = 9.33, p = 0.002), with an odds ratio of Exp(β) = 5.36. This indicates that households in the highest income category had approximately 5.36 times the odds of reporting willingness to pay waste collection fees compared with households earning below TZS 100,000. The results therefore show a consistent positive relationship between household income and willingness to pay, with the odds of willingness to pay increasing across the income categories.

The regression constant was also statistically significant (β = 1.49, S.E. = 0.52, Wald χ^2 = 8.22, p = 0.004), with Exp(β) = 4.99. The constant represents the estimated baseline odds of willingness to pay for a household belonging to all reference categories of the predictor variables. In this case, it corresponds to the baseline odds for households in the reference fee category and the reference income category, holding the other predictors at their reference levels.

Overall, the findings suggest that household income is an important factor associated with willingness to pay waste collection fees. The progressive increase in the odds ratios across income categories indicates that households with higher incomes were more likely to report willingness to pay than lower-income households. This pattern proposes that differences in household economic capacity may influence the affordability and acceptability of the fee. Consequently, consideration of household income and affordability may be important when designing fee structures, aiming to promote payment compliance and support sustainable financing of municipal solid waste management services.

The model achieved an overall classification accuracy of approximately 75%, indicating that it correctly classified about three-quarters of households according to their reported willingness to pay waste collection fees. Furthermore, the non-significant Hosmer–Lemeshow goodness-of-fit test (p > 0.05) suggests that there was no statistically significant difference between the observed and model-predicted outcomes, indicating an adequate fit of the model to the observed data. Taken together, these diagnostic results suggest that the model provides a reasonable basis for examining factors associated with households' willingness to pay waste collection fees in Mbeya City.

The qualitative findings from the key informant interviews further support the quantitative results. Most key informants emphasized that affordability is an important determinant of households' willingness to pay. They further noted that willingness to pay is influenced not only by household income and the amount of the fee charged but also by the reliability of waste collection services, transparency in the management of collected revenues, effective communication between service providers and residents, and the availability of convenient payment mechanisms. Irregular waste collection, weak monitoring mechanisms, and reliance on manual payment procedures were frequently identified as barriers that discourage households from paying waste collection fees.

Overall, the regression results indicate that both fee amount and household income are significantly associated with households' willingness to pay. Higher fee amounts are associated with lower odds of willingness to pay, whereas higher household incomes are associated with higher odds of willingness to pay. The qualitative findings complement these results by highlighting additional service-related and institutional factors that may shape payment behaviour. Taken together, the findings suggest that the existing mismatch between waste fee amounts and households' financial capacity may contribute to gaps in willingness to pay. Addressing these gaps may therefore require greater consideration of household affordability alongside improvements in waste collection reliability, revenue management transparency, communication, legal enforcement mechanisms and improved payment systems.

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V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study findings revealed that willingness to pay is determined by both socio-economic characteristics and institutional dynamics. Households with relatively higher income and education levels were more willing to pay waste collection fees, while low-income households experienced affordability challenges, especially at higher fee levels. Most respondents preferred to fee amounts ranging between TZS 1,000 and TZS 2,000 per month.

The study also identified major challenges of revenue collection and waste management efficiency, including financial constraints, inadequate waste management equipment, weak institutional arrangements, limited public awareness, and lack of transparency in revenue utilization. The chi-square analysis showed that financial constraints are persistent. Irrespective of the high costs associated with waste management, overall, willingness to pay has continued to be relatively lower as a result of low household income, employment status, household size, weak operational guidelines, poor fee collection logistics and limited use of digital technology.

5.2 Recommendations

The study recommends the introduction of income-sensitive fee structures that take into account household income levels and waste generation capacity to improve affordability and compliance. Municipal authorities should also strengthen waste collection infrastructure by investing in adequate transportation facilities, waste collection vehicles, and modern equipment to enhance service reliability, operational efficiency, and the overall effectiveness of waste management.

The study further recommends improving transparency and accountability in revenue management through regular public disclosure on the utilization of the revenue. Environmental education and public awareness campaigns should also be enhanced to increase community participation and understanding of the importance of proper waste management. In addition, Mbeya city should establish clear operational guidelines governing waste management. Moreover, the study recommends adoption of digital payment systems to facilitate convenient payment mechanisms and other technologies such as Smart-TRACS (Pellatt & Palfreman, 2023) to improve revenue collection and increase service users' satisfaction.

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Ethics Statement

We declare that we observed research ethics and citation criteria throughout the study; there was no conflict of interest, and the study was not funded.

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