Willingness to Pay for Sustainable Solid Waste Management in Dodoma Urban District, Tanzania

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Abstract

Waste management is a significant challenge in many developing countries, particularly in urban areas where solid waste management (SWM) remains one of the most costly urban services. Effective management requires community engagement. This study examined the factors influencing households' willingness to pay (WTP) for sustainable SWM and identified the challenges they face in managing solid waste in the Dodoma Urban district. Using a cross-sectional research design, a sample size of 156 respondents was obtained through a combination of probability and non-probability sampling methods. Non-probability sampling was used to select wards, while probability sampling was applied to choose participants from these wards. The analysis revealed that age, income level, awareness, employment status, and the amount of waste generated significantly influence WTP for SWM. Key challenges included inadequate dustbins and refuse dump sites, illegal dumping at unapproved sites, delays in waste collection, and the high cost of services. These challenges highlight the need for improvements in waste management infrastructure and services in Dodoma Urban district. To improve SWM in Dodoma Urban, the study recommends that the government enhance public awareness about sustainable SWM practices, provide income-raising incentives, and work with the private sector to establish more waste dump sites. These measures would help address the challenges and improve waste management efficiency in the district.

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1. Introduction

Solid waste management (SWM) is an essential service involving the collection, treatment, recycling, and disposal of discarded solid material because it has served its purpose or is no longer useful. Waste management has become a great challenge in urban areas of developing countries (Kisoli & Mollel, 2021). However, managing municipal solid waste is the costliest urban service and requires community engagement in the management of municipal solid waste (Kaso et al., 2022). This challenge of waste management/waste collection is exacerbated by rapid population increases in many parts of the world. The global population is growing at a rate of around 0.91% per year in 2024 (up from 0.88% in 2023, and down from 0.98% in 2020, and 1.06% in 2019). The current population increase is estimated at around 73 million people per year. The increasing amount and complexity of waste associated with the modern economy pose significant problems for human health and ecosystems. Every year, an estimated 11.2 billion tonnes of solid waste are collected worldwide, and the decay of the organic proportion of solid waste contributes about 5 percent of global greenhouse gas emissions (Mandpe et al., 2023). Only about 37% of this waste is properly managed (Kuya et al., 2022). In both rural and urban settings, people are often unaware or illiterate about the importance of proper waste management, leading to improper waste disposal practices.

In Africa, with a current population of 1.4 billion based on the latest United Nations estimates, it is evident that waste generation is significant, particularly solid waste that is inadequately managed (Kitole et al., 2024). Currently, about 90% of the waste generated in Africa is disposed of in landfills, typically in uncontrolled and controlled dumpsites. Only about 4% of the waste generated in Africa is recycled, often by informal actors (Tassie & Endalew, 2020). Improper disposal methods, such as landfilling, have detrimental effects on the environment, including habitat destruction, water pollution (rivers, lakes, oceans), and other ecological disruptions (Tassie & Endalew, 2020). These issues not only affect the environment but also pose health risks to humans, leading to diseases and other disasters.

In Tanzania, particularly in urban areas, inadequate and poor solid waste management is a growing public and environmental health concern (Richard & Kimwaga, 2024). The population of Tanzania is estimated to have reached 62 million, according to census data from the Tanzania Bureau of Statistics. Rapid urban development has contributed positively to economic growth by creating job opportunities, improving living standards, and fostering socio-economic development. However, this rapid development also has negative impacts on the environment, generating large amounts of waste. The rapid population increase in urban areas, especially as cities like Dodoma grow, contributes to increased waste production. The government has attempted to address waste management through various initiatives, but many urban residents still lack awareness about the importance of proper waste disposal (Richard & Kimwaga, 2024).

People are not willing to pay for advanced methods for proper waste management (Kuya et al., 2022). The government and other waste collection services commonly use advanced recycling techniques with improved tools to manage waste. However, problems such as inadequate service coverage, irregular waste collection, waste

spillover from bins, and littering are common in Dodoma city despite several efforts to improve waste management services, including the involvement of the public, private sector, and local communities (Kitole et al., 2024). Data from the municipal authorities show that 350 tonnes of solid waste are generated per day, but only 120 tonnes, equivalent to 34%, are collected. The remaining 230 tonnes, about 66% of the daily waste generated, are composted or left at transfer stations (Kitole et al., 2024).

The increasing population and urbanization in Dodoma and other Tanzanian cities are expected to escalate waste generation. This study aims to examine factors affecting the willingness to pay for improved solid waste management techniques and analyze challenges faced by households in managing solid waste in Dodoma Urban District. It seeks to provide insights into strategies that can enhance waste management practices and community engagement. Studies have shown that factors such as income, awareness, and incentives play a significant role in households' willingness to pay for improved waste management services (Kaso et al., 2022; Dika et al., 2019; Girma et al., 2022). Addressing these issues is crucial for creating a sustainable and efficient waste management system that aligns with socio-economic development goals (Mavroudeas, 2016; Kitole et al., 2024).

Several studies have explored household willingness to pay for improved solid waste management. For instance, Asare et al. (2021) assessed willingness to pay for solid waste management in Ga East Municipal, Ghana, finding that socio-economic factors significantly influence residents' payment willingness. Bamlaku et al. (2019) focused on Ethiopia and found that household willingness to pay for improved waste management services is significantly impacted by factors such as income and education level. In the context of Tanzania, Kitole and Utouh (2024) investigated factors affecting household willingness to pay for garbage collection services in Kampala, Uganda, emphasizing the role of socio-economic variables in payment decisions.

2. Theoretical underpinnings

This study draws upon neo-classical microeconomic theory, which was developed by William Stanley Jevons, Carl Menger, and Léon Walras (Mavroudeas, 2016). This theory provides the context, elements, and certain principles which guide us to model the decision's household willingness to pay for sustainable solid waste management techniques.

According to neoclassical theory, the marginal utility of a good or service decreases as more of it is consumed. This principle implies that individuals may be willing to pay more for the initial improvements in waste management, but as the service becomes more widespread, the additional utility derived from further improvements diminishes, thus reducing their willingness to pay. Also, Neo-classical theory assumes that individuals seek to maximize their utility or satisfaction from consuming goods and services. In the case of waste management, people would be willing to pay for improvements if they believe it enhances their well-being or quality of life. However, Utility is hard to quantify because of the assumption that utility is unobservable (Dannenberg & Estola, 2018).

Numerous branches of neoclassical economics employ a range of approaches. All of the methods are predicated on three fundamental premises: When given the option to choose between identifiable and value-associated outcomes, people act rationally; people act independently based on perfect (complete and relevant) knowledge; and people's goals are to maximize utility rather than profits for businesses. The fundamental presumptions mentioned above have served as the foundation for numerous studies and approaches (Asare et al., 2021). For instance, utility maximization could account for consumer demand for a given good or service. The relationship between supply and demand explains pricing and, by extension, the distribution of production components.

The excessive on mathematical techniques in neoclassical economics has been questioned, casting doubt on neoclassical theory. Empirical science is absent from the study. The study, which is unduly dependent on theoretical models, falls short of providing an understanding of the real economy, especially when it comes to the way a person interacts with the system (Keinerugaba, 2022). Moreover, normative bias could result from it. Neoclassical economics applies to this study since it highlights the choices that consumers make (demand). Several variables, including resource allocation and individual preferences, can affect consumer demand. The value of goods and services therefore surpasses their production costs in neoclassical economics.

3. Empirical review

Various authors provided their insights on WTP for sustainable solid waste management, with Age being an important factor in this aspect. Findings postulate that Folks are more conservative than younger individuals when it comes to paying for better waste management, and this is especially true for elderly adults. Tassie & Endalew, (2020), argued that age is one of the important factor that affect the willingness to pay for SWM. Research indicates that elderly adults are less willing than younger adults to pay for better trash management. However, younger generations are probably more accustomed to cost sharing for things like healthcare, education, and other services. Supporting this idea, the study conducted by Bamlaku et al., (2019), argued that age was significant and negatively affected willingness to pay for improved solid waste management. As a person aged, it significantly decreased the probability of willingness to pay for improved solid waste management.

Education is a key variable that affects participation in the payment of any activity in society. Education correlates positively with willingness to pay, where by the educated person is more likely to be willingly to pay the improved waste management in the society than uneducated one. Asare et al., (2021) illustrated in the study, that when a person is educated more in society he or she is likely to participate in payment will be willing to pay for improved solid waste management (SWM) because he or she knows the importance of managing solid waste in an improved manner. Whereas the one who is not educated or lowly educated is less willing to pay for improved solid waste management. Also, Chang et al., (2024); Kaso et al., (2022) indicated that income was a significant variable with a positive coefficient value. This means that the variable income affects willingness to pay direct proportion. Whereas the person with high income are the ones who are willing to pay for improved solid waste management.

Furthermore, Girma et al., (2022), in the study they conducted findings and empirical results show that attending education about solid waste management positively affects the willingness to pay for improved municipal solid waste collection

Household size is also one of the key factors for determining the willingness to pay for improved solid waste management. Study by Bamlaku et al., (2019) illustrated that household size was statistically significant but negatively relation to WTP. However, Kaso et al., (2022), indicated that family size was a significant variable with a positive relationship. The study suggested that having a larger family size increased the probability of willingness to pay for improved solid waste management. Also, study by Mulat et al., (2019), implicates employment status of respondents affect the willingness to pay of a respondent positively whereby a person who is employed increases the probability of paying for improved solid waste management rather than a person who is not employed.

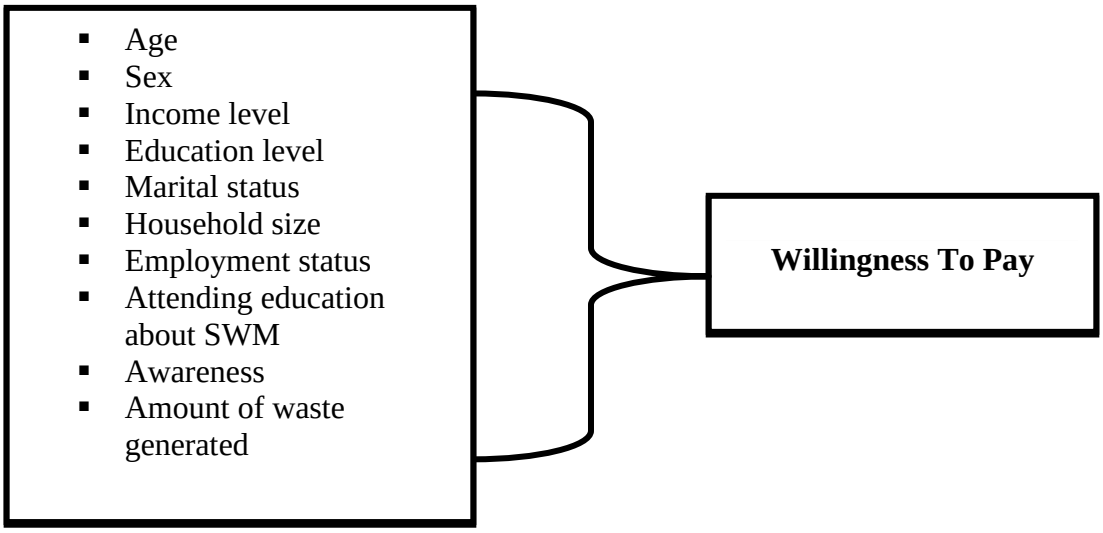
Awareness is also one of the crucial factors which affect the willingness to pay for improved SWM. The study conducted by Dika et al., (2019), the results showed that awareness affected the WTP for improved SWM positively rather than the person who is not aware of improved SWM. Findings from (Kaso et al, 2022) argued that being married increases the probability of a person being willing to pay for improved solid waste management rather than a person who is not married.

The amount of waste produced is also one of the interesting and crucial factors that can affect willingness to pay for improved SWM techniques. Every household waste is generated every day it just depends on the amount of waste produced from one household to another household. (Kaso et al., (2022); Bamlaku et al., (2019) These similar studies both argued that the amount of waste generated affects positively the willingness to pay for improved SWM. As households generate more waste increases the probability of willingness to pay for improved solid waste management.

Asare et al., (2021) postulated various number of challenges that face household in accessing reliable waste management services. Such as inadequate dustbins and refuse dump sites, delays in collection of waste, distance from dumpsites, no waste management programs in the municipal, dumping refuse at unapproved sites, cost of service, and lastly the stench in dumping areas. The study indicated inadequate dustbins and refuse dump sites and delay in collection of waste as the most critical challenges while the cost of service and the stench in dumping areas as the least challenging problem faced by households in accessing reliable waste management services ranked according to their means.

Also, a study by Kuya et al.,(2022) explained that respondents faced various constraints when paying for improved solid waste management. Principal component analysis was used to analyze the constraints (challenges) that respondents faced. These constraints included a lack of incinerators, lack of vehicles, lack of public containers, lack of drainage facilities, lack of street cleaners, and poor government policy. The lack of an incinerator with an Eigen-value of 3.3544 explained 16.41% of all retained constraints facing respondents. All retained constraints explained 86.79% of all variables included in the model. The Chi-square value of 2067.328 was statistically significant at 1% probability level."(Kuya et al., 2022)

Figure 1: Conceptual framework



Source: Authors' design (2024)

4. Methodology

This study was conducted in the Dodoma Urban district which is populated with around 765,179 people with a density of 290/km² (760/sq mi) according to the 2022 national census. The study was conducted in four selected wards which are Nzunguni, Makulu, Nkuhungu, and Makole. These wards were chosen for this study because they have a variety of people with different categories and living standards.

The study employed a cross-sectional research design since data from the study population was gathered at one point in time, without repetition from the sample population. The unit of analysis were households living among the chosen wards in Dodoma urban districts. To obtain a representative sample size the study utilized both probability sampling and non-probability sampling, whereby in probability sampling there was an equal chance for each household to participate, while in non-probability sampling, Purposive sampling was used to choose representatives wards for this particular study. The wards chosen were Nzunguni, Makulu, Nkuhungu, and Makole, because these four wards have people of different varieties and people with different classes. Through Yamane's (1967) a margin of error of 0.08 resulted in a 156 sample size. Primary data were collected through a structured questionnaire to gather details from the households.

Logit Model

In this study, a binary logistic regression model was employed to assess the willingness to pay for sustainable solid waste management:

Based on the theoretical framework and empirical review, a binary logistic regression model was employed to assess the WTP for sustainable solid waste management. It was followed by a binary logistic regression model since the dependent variable is binary (1 for WTP and 0 for Not WTP) to analyze this the model is expressed in the form of;

$$P_r = \left(y_i = \frac{1}{x_i \beta_i} \right) = 1 - F(x_i \beta_i)$$ …….. (1)

Where $F(.)$ is a cumulative distribution function, a continuous, strictly increasing function that takes a real value and returns a value that ranges from 0 to 1.

The binary logistic model was chosen over another model in this study because the binary Logit model has slightly flatter tails (or longer tails), which makes estimation more accurate, whereas the probit curve approaches the axes more quickly or cuts the small value of X's axes curve (Damodar, 2004; Menard, 2002). Furthermore, the slope coefficients are not directly comparable, allowing the Logit slope coefficient to approximate a probit coefficient (Davidson and Mackinnon, 1984).

The logistic model for this study is shown below;

LogitY_t = ln($\frac{pi}{1-pi!}$) = βo + β1(AGE) + β2(SEX) + β3(INC) + β4(EDN)+ β5(ES)+ β6(HS) + β7(OCC)+ β8(AWA)+ β9(MRT_STS) + β10(AMT) +μ……..(2)

(Willingness to pay for improved solid waste management) Where Yt = 1 if the household member is willing to pay (WTP), 0 if the household member is not willing to pay (Not WTP)

- β_0 is the intercept term, representing the expected level of willingness to pay (WTP) when all independent variables are zero.

-$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, and\ \beta_{th}$are the regression coefficients associated with each independent variable, indicating the strength and direction of their impact on WTP.

- $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, and\ X_{th}$ are independent variables that are hypothesized to influence the dependent variable

- μ represents the error term.

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu$$…….. (3)

5. Results and discussions

The sample consists of 156 individuals, with an average age of approximately 30.61 years. The standard deviation of 10.98 years suggests that ages are spread out significantly around the mean, indicating a diverse age range within the sample. The youngest individual is 18 years old, while the oldest is 81 years old, showing a wide spectrum of age groups in the dataset. This variation could imply different life stages and potentially different needs, behaviors, or economic circumstances across the sample population.

The average income for individuals in this sample is $606,070.50, with a standard deviation of $768,227.90. This large standard deviation indicates considerable income variability among the individuals, suggesting that some individuals earn much more or less than the average. The minimum income recorded is $40,000, while the maximum is $5,450,000, reflecting a significant income disparity within the group. This could be indicative of varying economic statuses, career stages, or financial management among individuals in the sample.

Table 1. Descriptive statistics for continuous variables

Variable	*Observation*	*Mean*	*Std. dev.*	*Minimum*	*Maximum*
Age	156	30.60897	10.97891	18	81
Income	156	606070.5	768227.9	40000	5450000
Household size	156	3	1.831622	1	10

Source: Field data 2024

On average, household size in the sample is 3 members, with a standard deviation of 1.83. This variability indicates that household sizes differ widely, ranging from single-person households to those with up to 10 members. The minimum household size is 1, while the maximum is 10, suggesting diverse living arrangements. This could be influenced by factors such as marital status, family composition, and personal preferences among the individuals. The variability in household sizes highlights the different living situations and demographic characteristics within the sample.

Table 2 Cross-tabulation of willingness to pay against marital status

Willingness to pay	*Marital status*		*Total*
	Not married	Married	
Not willing	17 (10.9%)	35 (22.44%)	52 (33.33%)
Willing	36 (23.07%)	68 (43.59%)	104 (66.67%)
Total	53 (33.97%)	103 (66.03%)	156 (100%)

Source: Field data 2024

Marital status was measured as a categorical variable, results displayed in Table 2, 53 (33.97%) respondents were not married while several 103 (66.03%) household members were married. From the results, it is shown that the majority of the household

members were married. Also, it indicated that married members were willing to pay than those who are not married.

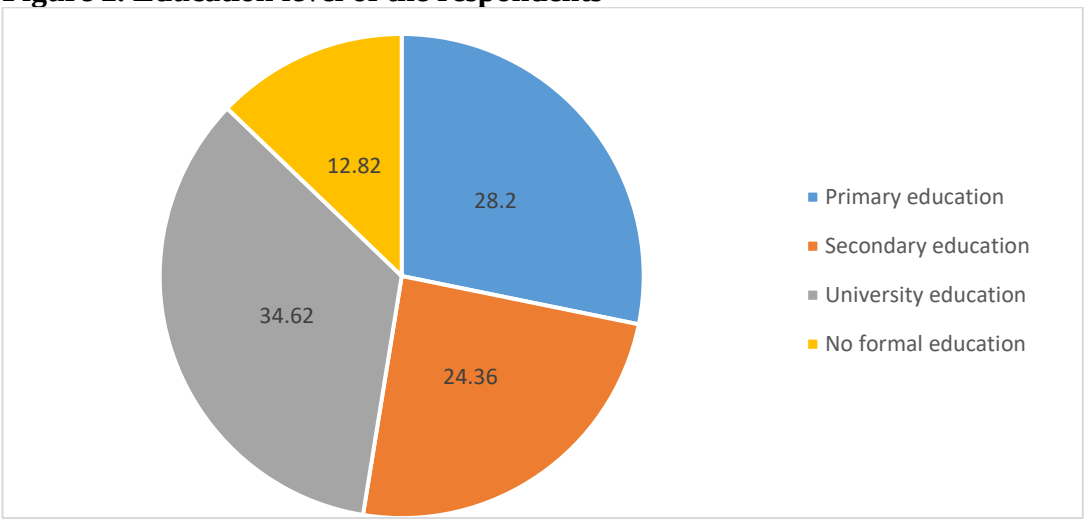
Table 3 Cross-tabulation of willingness to pay against education level

Willingness to pay	*Education level of respondent*				*Total*
	Primary education	Secondary education	University education	No formal education	
Not willing	18(11.54%)	11(7.05%)	15(9.62%)	8(5.13%)	52(33.33%)
Willing	26(16.67%)	27(17.31%)	39(25%)	12(7.69%)	104(66.67%)
Total	44(28.21%)	38(24.36%)	54(34.62%)	20(12.82%)	156(100%)

Source: Field data 2024

The education level of the household members was measured as a categorical variable from primary education, secondary education, university and lastly a member (respondent) with no formal education. From the Table 3 the results display that 44 (28.21%) respondents finished primary school, 38 (24.36%) members finished secondary education followed by 54 (34.62%) respondents attended and finished university education and lastly 20 (12.82%) members had not attended school or have no formal education. The results show that most (majority) are educated with higher percentage having finished university education. And it was noticed that majority who were willing to pay were respondents from university education.

Figure 2. Education level of the respondents



Source: Field data 2024

Sex was measured as a categorical variable, The study results showed that 66(42.31%) members were female while a number of 90(57.69%) household members were male. Therefore, from the results majority of respondents were female. Also the table below shows that males (41.67%) were more willing to pay for improved SWM than females (25.0%)

Table 4 Cross tabulation of willingness to pay against sex

Willingness to pay	***Sex of respondent***		***Total***
	Female	Male	
Not willing	27 (17.31%)	25 (16.02%)	52 (33.33%)
Willing	39 (25.0%)	65 (41.67%)	104 (66.67%)
Total	66 (42.31%)	90 (57.69%)	156 (100%)

Source: Field data 2024

5.2 Determinants of willingness to pay for improved solid waste management techniques

For the case of examining determinants of willingness to pay for sustainable solid waste management techniques among household members of DUD, logistic regression was performed to obtain the effect of each determinant (factor), and interpretations were made as follows,

Table 5. Logistic regression model on willingness to pay for sustainable solid waste management

willngnesstopay	*Odds Ratio*	*Std. Err.*	*dy/dx*	*Std. Err.*
sex (ref: female)				
male	1.240316	0.531944	0.0336048	0.0673649
age	0.9424032***	0.02091	-0.0091809***	0.0031746
income	1.000001*	6.68E-07	1.90E-07*	1.00E-07
education_level (ref: no formal education)				
Primary education	1.928032	1.097587	0.1017564	0.0866484
Secondary education	1.43021	0.8353267	0.0571848	0.0934978
niversity education	1.399111	0.9681	0.0537816	0.1090811
attending_eduSWM (ref: not attended)				
attended	1.781044	0.7529068	0.0916195	0.0675782
household_size	1.038511	0.1267874	0.0058482	0.0188871
awareness (ref: not aware)				
aware	3.948093***	1.764616	0.2352405**	0.0766815
employment_status(ref: not employed)				
employed	4.19368***	1.944033	0.2513661**	0.0828316
marital_status (ref: not married)				
married	1.021914	0.4588171	0.0033566**	0.0695573
amount_of_waste	0.6690342**	0.119857	-0.0622024**	0.0261901

Findings from the logistic regression model show that income of a member, age of a household member, awareness, employment status of a respondent, and amount of waste produced statistically significantly affected the willingness to pay for solid waste management in Dodoma Urban district.

Findings from Table 5 results indicated that Income was statistically significant and positively affected willingness to pay for improved solid waste management techniques at a 10% significance level ($p = 0.058$). The results indicated that when

other factors are held constant an increase in income by 1tsh increases the probability of a person being willing to pay for improved solid waste management techniques by 1.90E-05%. Similarly, the study findings were in line with the results found in the studies conducted by Bamlaku et al., (2019); Madukwe et al., (2020) which revealed that income was a significant variable at 5% (p=0.012). The study indicated that improved SWM is a normal good since its demand increases with income, this implies households with high income have more WTP for the SWM than households with low income.

The amount of waste produced was statistically significant and negatively affected willingness to pay for improved solid waste management techniques at a 5% significance level (p = 0.018). The results indicate that when other factors are held constant a marginal increase in the amount of waste produced by a household memberdecreases the probability of a household member being willing to pay by 6.22%. However, Tassie & Endalew, (2020), reveal that the higher the quantity of waste generated, the higher the probability of the households' WTP for improved SWM services.

Results from Table 5, show that Age was statistically significant and negatively affects willingness to pay for improved solid waste management techniques at a 1% significance level (p = 0.004). The results show that the increase in the age of a household member by one (1) year decreases the probability of willingness to pay for improved solid waste management techniques by 0.91809%, ceteris paribus. Study findings matched with the results from the study conducted by Mulat et al., (2019) age was found statistically significant at 5% (p = 0.044). An increase in age of a participant by 1 year increases the WTP for sustainable SWM service. However, the results from a study conducted by Asare et al., (2021) were not similar with the study findings, which implied that 1year increase in the age of respondent decreases the probability of willingness to pay for sustainable SWM.

From the Table 5 the displayed results indicate that awareness was statistically significant and positively affects willingness to pay for improved solid waste management techniques at 1% significance level (p = 0.002). The results show that when other factors are held constant a household member who is aware of improved solid waste management techniques increases the probability of willingness to pay for improved solid waste management techniques by 23.524% compared a household member who is not aware. Similarly Chang et al., (2024) revealed that the deeper the respondents awareness of the environmental protection of waste the more enthusiasm they have for the recycling behaviour, the higher participation in recycling and the higher their WTP for recycling.

From Table 5, the results displayed show that employment status was statistically significant at 1% significance level (p = 0.002) and positively affected willingness to pay for improved solid waste management techniques. The results indicate that when other factors are held constant an employed household member increases the probability a household member being willing to pay for improved solid waste management techniques by 25.137%compared to unemployed household member. Similarly, findings by Mulat et al., (2019) postulates that Participants who were

employed as civil servant in civil sectors were willing to pay for improved SWM than those who were unemployed.

Futhermore, result indicate that the variable amount of waste produced was statistically significant and negatively affected willingness to pay for improved solid waste management techniques at 5% significance level (p = 0.018). The results indicate that when other factors are held constant a marginal increase in the amount of waste produced by a household member decreases the probability of a household member being willing to pay by 6.2202%. From the study conducted by Tassie & Endalew, (2020), the results were not in line with the study findings. Tassie & Endalew reveled that the higher the quantity of waste generated, the higher the probability of the households' WTP for improved SWM services.

Results from Table 5, show that the variable attending education about solid waste management was statistically insignificant and positively affected willingness to pay for improved solid waste management techniques at (p= 0.175). The results indicated that when other factors are held constant a household member who attended education about solid waste management increased the probability of willingness to pay for improved solid waste management techniques by 9.16% compared to household member who haven't attended education about SWM

5.3 Test for model assumption

5.3.1 Test for model specification to just validate the use of logistic regression

Model specification is very important aspect in econometric analysis and the model needs to be suitably specified to provide consistent and unbiased estimates. In this study the test was run using the link test command and Hosmar-lemeshow (HL) test in STATA software. Starting with link test this test checks specific errors, where the dependent variable is linked with the independent variable.

Table 6 Results for the Link test

Willingness to pay	*Coef.*	*Std. Err.*	*Z*	*P>|z|*	*[95% Conf. Interval}*	
_hat	.9780919	.2026529	4.83	0.000	0.5808994	1.375284
_hatsq	.0226421	.1068455	0.21	0.832	-0.1867712	0.2320553
_cons	-.024096	.2512753	-0.10	0.924	-0.5165873	0.468394

Source: Field data 2024

The P>|Z| of hat should be significant at 1% and the P>|Z| of hat square should be insignificant for the model to be correctly specified. The probability value (P>|Z|) of hat was statistically significant at 1% (p = 0.000) and the probability value (P>|Z|) of hat square was statistically significant at 10% (p = 0.832). From the above observation and results displayed it can be concluded that the model is correctly specified.

5.3.2 Hosmar- lemeshow (HL) test for goodness of fit of logistic regression model

Number of observations =	*156*
Number of covariate patterns =	*156*
Pearson chi2 (83) =	*138.60*
Prob> chi2 =	*0.5885*

The goodness of fit of the model was tested by using Hosmar-lemeshow (HL) test for logistic regression. Stata result shows that p value is 0.5885 which is insignificant since it is above 0.05. The rule of thumb is that when p value is greater than 0.05 the model fit.

5.4 Challenges facing households on sustainable solid waste management practices in Dodoma urban.

Refuse dump sites are proper places that are prepared well for safe and healthy waste disposal. It is a special place for dumping waste only. Example in Dodoma Urban District at Nkuhungu ward there is a large refuse dump site available. From the findings in Table 7, it was found that majority of household members agreed 37.8% that there is a problem of inadequate dustbins and refuse dump sites at most of the wards in DUD which this causes poor management of waste. Findings were in line with Kuya et al., (2022) which revealed that presence of dustbins was very important incentive as 127 respondents with a percent of 42.3% agreed that it was very necessary to have dustbins.

Table 7. Challenges facing household on sustainable solid waste management practices.

Challenges	***Strongly agree***	***agree***	***Neutral***	***disagree***	***Strongly disagree***	***Total***
Inadequate dustbins and refuse dump sites	26.3%	37.8%	19.2%	7.7%	9.0%	100%
Delay in collection	9.6%	26.3%	40.4%	10.3%	13.5%	100%
Distance from dumpsite	15.4%	23.1%	26.9%	8.3%	26.3%	100%
No waste management programs in the district	11.5%	20.5%	26.3%	15.4%	26.3%	100%
Dumping refuse at unapproved sites	35.9%	19.2%	17.9%	16.7%	10.3%	100%
Cost of service	17.3%	21.2%	19.9%	24.4%	17.3%	100%

Source: Field data 2024

From the results, it displayed that majority that is 40.4% of the household members had a neutral answer on the delay in collection of solid waste, though delay in collection is also a significant challenge in Dodoma Urban District because the sum of strong agree and agree is 35.9% while the sum of disagree and strong disagree 26.8% which this results show that a majority of 35.9% household members agreed that there is delay in collection of waste. Similarly Kuya et al., (2022) had the same results that the incentive (earliness and frequency of collection) was voted by a number of 128 respondents as a very significant incentive for SWM giving an extreme important answer.

Findings imply that 26.9% of the household members had a neutral answer on the challenge distance from dumpsite, but we notice that this particular challenge is significant because when strong agree and agree are summed up together we got 38.5% which is greater than when disagree and strong agree are summed up together which give a total of 34.6%, this means that most agreed. Findings were consistence with Kuya et al., (2022) whereby distance from the dumpsite was displayed as an incentive of WTP for sustainable SWM which is proximity to the disposal site. This means people with a short distance from dumpsite are less likely to pay than the ones with a long distance from dumpsite.

From Table 7, the results displayed show that the challenge no waste management programs in the district was not a very significant challenge that faced household members because when strongly disagree and disagree were summed up the total of their percentages was 41.7% while when strong agree and agree are summed up the total was 32%. A percent of 26.3% provided a neutral answer. likewise, Asare et al., (2021) suggested that the lack of waste management programs in the district had a significant effect on the practices of sustainable SWM among households of Kakamega town.

From the results displayed in Table 7, show that dumping refuse at unapproved sites was a very significant challenge that faced household members whereby a percent of 35.9% strongly agreed, followed by a percent of 19.2% agreed. A percentage of 17.9% provided a neutral answer and a sum of 27% disagreed that dumping refuse (solid waste) at unapproved sites was a significant challenge. The study aligns with Asare et al., (2021) which indicated that the challenge of dumping refuse at unapproved sites was a significant problem among stakeholders who practiced improved solid waste management in Ga East municipal in Ghana.

Table 7, displays results that show that solid waste collection services aren't that expensive and people can afford that is to say that the cost of service is not a big challenge because the majority of household members a percent of 41.7% provided a sum of disagree and strong disagree answers while a percent of 38.5% was an output of the summation of agree and strong disagree answers. Lastly a percent of 19.9% provided a neutral answer. However, Asare et al., (2021) postulates that the challenge cost of service in Ga East Municipal in Ghana was very great problem. That is to conclude people where not willing to pay because the cost of service was high.

6. Conclusion

Conclusively, the study discovered that the amount of waste generated per week and the age of respondents were statistically significant to willingness to pay for sustainable solid waste management while employment status, awareness about the importance of improved solid waste management and income were significant and had a positive impact on willingness to pay for improved solid waste management. The study revealed various challenges that faced household members practicing improved SWM. These challenges made respondents not participate well in SWM and also they acted as a constraint for households being reluctant to pay for improved SWM. Challenges such as inadequate dustbins and refuse dumpsites, dumping refuse at unapproved sites, delay in collection, cost of service, distance from dumpsites and lastly no waste management programs in the district.

One of the significant factor was awareness, it was noticed that awareness had positive effect on WTP for improved SWM. This means that the government has to try and set programs that will educate the society on the importance of improved SWM so as household to be aware and enhance increase WTP for sustainable SWM among households. Also this can be a call to non-governmental organizations (NGO's) to cooperate with the government in providing education in order to raise the awareness of households on the importance of improved SWM so as to increase WTP for improved SWM.

The government should initiate learning programs concerning waste management to the communities in Dodoma urban. Also the government has to consider providing income raising incentives and seminars among household in Dodoma Urban district. If the government provides income raising incentives and seminars to household on how to increase their income this will significantly increase WTP for improved solid waste management techniques, as the results demonstrated that income had a positive effect on willingness to pay for improved solid waste management techniques Also, the government should increase dustbins in the streets and also build as many as healthy waste dump site so as people manage solid waste properly and avoid dumping refuse at unapproved sites.

Lastly, Dodoma Urban District Authority should increase the frequency of collection of waste and regulate the cost of service to an average level so that everybody can afford to pay for improved SWM. Delay of waste collection is one of the significant challenges that can cause households to lose interest in paying for improved SWM and hence dump solid waste at unapproved sites. The government should also introduce waste management programs in the Dodoma Urban District.

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