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HOUSEHOLDS' WILLINGNESS TO PAY (WTP) FOR SOLID WASTE MANAGEMENT IN SOUTH-SOUTH, NIGERIA

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ABSTRACT

Solid waste management (SWM) remains a critical environmental challenge in developing regions, particularly in South-South Nigeria, where households' willingness to pay (WTP) for SWM services is inadequately understood. This study provides a novel empirical analysis of the socio-economic determinants influencing WTP, using a structured survey and multistage sampling of 395 households. By applying descriptive and inferential statistics, the study uncovers key demographic patterns with the majority of the households as females (51.9%), married (42.5%), and between 41-60 years of age (47.1%). Most respondents who attended up to tertiary education (50.1%) were civil servants (41.5%), and earned a monthly income above N50,000 (58.7%). The findings reveal that household size, income level, and education significantly shape WTP, with financial constraints emerging as the primary barrier. Notably, 42% of households perceived SWM as a governmental responsibility, with declining service payments. The study contributes to knowledge by quantifying environmental concerns associated with poor waste management, highlighting air pollution (mean = 3.79) and flooding due to blocked drains as dominant hazards. Water pollution and outbreaks of infectious diseases were also affected, as they ranked 3rd and 4th with mean values of 2.33 and 2.25, respectively. Furthermore, the marginal effect in terms of gender (coefficient -0.052, $p = 0.668$) suggests that being female (coded as 1) is associated with a lower probability of WTP for SWMS, and its effect is not statistically significant. On the other hand, a one-unit increase in age decreases WTP by 0.118, statistically significant at the 5% level. This implies that older individuals exhibit a declining likelihood of WTP, while higher education (coefficient=0.082, $p < 0.05$) and increased income (coefficient=1.756, $p < 0.05$) enhance the probability of willingness to pay. With an R-squared value of 0.962, the model demonstrates robust explanatory power. Policy implications suggest the need for targeted awareness campaigns and subsidy mechanisms to increase WTP among lower-income demographics. Additionally, integrating SWM costs into municipal budgets and incentivizing sustainable practices could enhance household participation, ultimately mitigating environmental hazards. This study justifies SWM reforms, advocating collaborative governance to ensure efficiency and sustainability in waste management systems.

KEYWORDS: Waste, Households, Environmental sustainability, Bidding price, WTP, CVM, Logit

1. INTRODUCTION

According to the Environmental Protection Agency of the United States (EPA), Solid waste encompasses all trash and garbage, sludge from water supply treatment facilities, ash from air pollution control facilities, and other waste materials from business, industry, mining, agriculture, and community operations. Solid waste includes all rubbish, refuse, and waste generated from leisure-time activities (Emri *et al*, 2019). The four (4) main types of solid waste are municipal solid waste, agricultural waste, industrial waste, and hazardous waste. Municipal solid waste (MSW) is commonly used to describe the wide range of garbage produced in urban areas. Agricultural waste, on the other hand, refers to waste produced from various agricultural processes. Risky waste is goods made from industrial, hospital, and home trash that can contain hazardous materials. These wastes could be explosive, flammable, corrosive, or react with other compounds (Abas *et al*, 2021). Factors such as rising urbanization, higher living standards, and the quickening pace of technological development have all contributed to an increase in the amount and variety of waste generated by industrial, residential, and other activities.

The inappropriate processing and disposal of solid waste puts human health in danger and severely impacts the economy, the environment, and the natural world (Ezeah *et al*, 2011; Effiong *et al*, 2024). It happens throughout a person's lifetime, regardless of how much garbage they produce. According to Etuk and Effiong (2016), a country's metropolitan areas make a lot of waste, similar to the United States, which climbed from 88.1 million tons in 1960 to 250.4 million tons in 2011, a nearly threefold rise. The volume of waste generated in many developing countries exceeds the local governments' or authorities' ability to collect and dispose of it in urban areas. According to studies by Addai and Danso-Abbeam (2014), the bulk of household solid waste is disposed of in residential areas through open dumping, burning, and throwing into bushes, streets, and drainage channels.

Numerous variables are easily responsible for the rise in the waste stream. These include increased consumer spending, cheaper goods, the lack of built-in obsolescence, the proliferation of packaging, shifting customer tastes and consumption patterns, and convenience-related product demand (Aggrey & Douglason, 2010; Asikong *et al*, 2020). This is because the town is an industrial center that houses a variety of businesses. The amount of rubbish produced in the state's capital has significantly increased due to

population growth. It is impossible to overstate the negative repercussions of incorrect solid waste disposal, including contamination of the air, land, and water and issues with human and animal health (Okere *et al*, 2021).

The unpleasant sights and smells from trash dumps significantly reduce the aesthetic value of the environment and tourism. Open waste dumps, which serve as a haven and breeding ground for most mice, flies, mosquitoes, and other vermin, can cause harm and other injuries. Adopting trash reduction, reuse, recycling, recovery methods, and charging systems is necessary to reduce household solid waste in the nation (Agbayi & Nwadiaro, 2019; Boateng *et al*, 2016). In Nigeria, the government mainly provides waste management services to the three tiers of government agencies responsible for carrying out its implementation. This mindset partly results from the idea that environmental deterioration and the production of urban solid waste are unavoidable growth costs. The appropriate authorities should take the necessary actions to manage garbage in light of the detrimental consequences on the environment and public health, especially in a densely populated area like the South-South region of Nigeria. Households must be involved in the issue of improper domestic solid waste collection and disposal, and payment schemes must be put in place, as is the case in most developed countries (Afroz *et al*, 2009; Amfo-Otu *et al.*, 2012). Considering the issues and the requirement to manage household solid waste for environmental and health reasons properly, this study aims to ascertain residents' willingness to pay for upgraded SWMs.

1.1. Research Problem

Any region's aesthetic and environmental quality is closely tied to waste management practices. A clean environment enhances the visual appeal of urban spaces and safeguards public health by reducing exposure to pollutants and disease vectors. Solid waste management (SWM) remains a persistent challenge in South-South Nigeria, exacerbated by rapid urbanization, population growth, and inadequate institutional capacity. Despite government-led initiatives, waste accumulation in metropolitan areas such as Calabar, Port Harcourt, and Benin City continues to degrade environmental quality and public health (Dibia *et al*, 2022).

The South-South region has witnessed a surge in waste generation due to industrial expansion, increased consumerism, and insufficient awareness of proper waste disposal practices. Studies indicate local governments struggle with waste collection

efficiency, landfill management, and recycling infrastructure. In Calabar, once regarded as Nigeria's cleanest city, indiscriminate dumping of solid waste has led to clogged drainage systems, air pollution, and deteriorating urban aesthetics (Alao *et al.*, 2019). The prevalence of open dumpsites and unregulated waste disposal methods further exacerbates environmental hazards, contributing to flooding and water contamination (Amasuomin & Baird, 2016).

Research underscores the importance of household engagement in SWM, emphasizing financial contributions, behavioral shifts, and collaboration with private waste management firms. However, existing policies often fail to incentivize public participation, leading to widespread reluctance among residents to pay for waste disposal services.

The lack of structured waste segregation and recycling programs limits sustainable waste management efforts (Omotayo *et al.*, 2020).

This study addresses the gap in the literature by examining households' willingness to pay for SWM services in South-South Nigeria, offering empirical insights into socio-economic determinants of waste disposal behavior.

By integrating findings from recent studies, the research advocates for environmentally sound, socially acceptable, and economically viable policy frameworks that promote public involvement in waste management. By addressing these concerns, this study aims to contribute to the broader discourse on sustainable urban waste management, ensuring cleaner cities and improved public health outcomes in South-South Nigeria.

The study addressed the following research questions.

1. What are the environmental impacts associated with poor waste management in the region
2. What factors influence households' WTP to pay for waste management services?

1.2. Research Aim

The primary objective of this study is to analyze households' willingness to pay (WTP) for the management of solid waste in South-South Nigeria. The specific objectives were to:

- i) quantify the environmental concerns associated with poor waste management in the region
- ii) determine factors influencing households' WTP for SWM.

1.3. Research Hypothesis

Null (H_0) hypothesis: Households' willingness to pay (WTP) for solid waste management services (SWMs) is not significantly influenced by socio-economic and demographic factors.

2. THEORETICAL FRAMEWORK

2.1. Consumer Theory and Waste Management

Consumer theory posits that individuals allocate resources to maximize satisfaction (utility) given their income and available choices. In the context of SWM, households weigh the benefits of paying for waste disposal against other competing expenditures. Studies indicate that income level, environmental awareness, and perceived service quality significantly influence WTP for SWM services.

A study on household waste disposal behavior in South Africa found that socio-economic factors such as income and education are crucial in determining WTP for waste management services. Similarly, research applying the Theory of Planned Behavior according to Styrdom (2018) suggests that attitudes, social norms, and perceived control influence recycling and waste disposal behaviors.

Understanding consumer behavior is crucial in determining households' willingness to pay for solid waste management services (Ahmed, 2021). According to consumer theory, individuals make purchasing decisions based on their preferences and budget constraints.

To analyze this behavior, economists assume that households act rationally to maximize their utility or satisfaction (Ayenew *et al.*, 2019).

In solid waste management, households weigh the benefits and costs of waste disposal services. As their income increases, they may be willing to pay more for improved waste management services, such as recycling or waste reduction programs.

Conversely, if the cost of waste management services decreases, households may demand more services, such as increased collection frequency or better waste disposal facilities (Ben-Chendo *et al.*, 2018).

Economists make a few assumptions when studying households' willingness to pay for solid waste management services.

Firstly, households are assumed to be rational decision-makers, aiming to get the most value from their money.

Secondly, their preferences for waste management services are consistent over time.

These assumptions enable researchers to predict how households respond to waste management services and price changes.

These stages are outlined in Fig. 1:

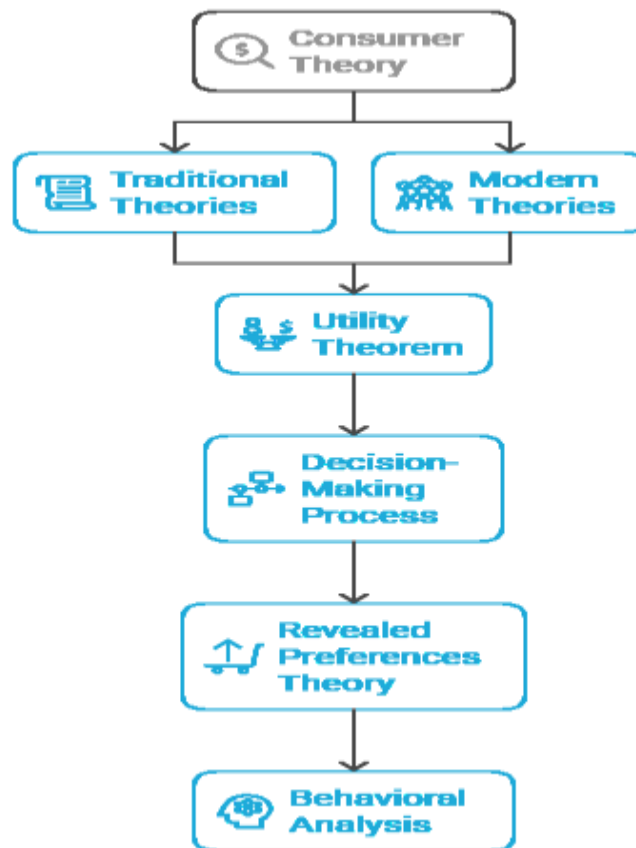


Figure 1: Flow Representation of Consumer Behavior Theory About SWM.

Source: Author's Conceptualization

By understanding households' willingness to pay for solid waste management services, policymakers can design more effective waste management systems that meet households' needs and preferences. This may involve implementing user fees, subsidies, or other pricing mechanisms.

2.2. Theory Of Utility and Waste Management

Utility theory explains how individuals derive satisfaction from consuming goods and services. Households in South-South Nigeria assess the utility of SWM services based on factors such as cleanliness, health benefits, and environmental sustainability. If the perceived utility of waste management services outweighs the cost, households are more likely to pay for them (Mohammed *et al*, 2014).

Empirical studies highlight that households with higher environmental awareness and financial stability exhibit greater WTP for improved SWM services (Yaro *et al*, 2019). Additionally, behavioral economic models suggest that monetary incentives and awareness campaigns can enhance WTP by increasing perceived utility. Regarding solid waste management, households benefit from services that

meet their basic needs, such as clean-living environments and reliable waste disposal. Utility theory helps us understand how households make decisions about waste management services based on their preferences and values.

In the context of solid waste management, households' willingness to pay for services depends on the perceived benefits and value they receive. For instance, households may prioritize waste collection services that ensure regular disposal, recycling, or proper waste management. By evaluating these services against their needs and preferences, households determine their willingness to pay (Ramadhan, 2015). By understanding households' decision-making processes and values, such as problem identification, decision criteria, generating and evaluating alternatives, and selecting the best options, policymakers can design waste management services that meet their needs and preferences, and set prices that reflect households' willingness to pay.

2.3. Revealed Preferences Theory and Waste Management

According to Prof. Samuelson, preference theory

examines consumers' preferences for a set of products and a foundation based on market-observed consumer behavior. The theory is predicated on the notion that customer preferences are manifested in their buying habits.

Revealed preference theory offers valuable insights into households' willingness to pay for solid waste management services. This theory is based on the idea that households' preferences are revealed through their actual market behavior, such as purchasing decisions. By analyzing these decisions, researchers can infer households' preferences for different waste management services (Veronica *et al*, 2019).

In the context of solid waste management, revealed preference theory suggests that households' willingness to pay for services is influenced by their observed behavior. For instance, if households pay for private waste collection services over municipal services, it may indicate a preference for private services' perceived quality or reliability. By examining these choices, policymakers can better understand households' willingness to pay for specific waste management services.

The revealed preference approach has advantages over other methods, such as the ordinal utility approach, as it is based on actual market behavior rather than hypothetical scenarios or psychological assumptions (Dagnew *et al*, 2012). This approach allows researchers to analyze households' consistent decision-making patterns and develop a more accurate understanding of their willingness to pay for solid waste management services. By applying revealed preference theory, policymakers can design waste management services that meet households' needs and preferences, and set prices that reflect their willingness to pay.

2.4. Methodological Approach/Literature

2.4.1. Bidding Price/Game

The bidding game is "an elicitation method modeled on the real-life situation in which individuals are asked to state the price in an auction," according to Banga *et al*. (2011). Because the method involves a yes/no response, it is considered straightforward, and the open-ended question elicits the most desire to pay for the commodity. For this reason, respondents are comfortable with the method (Onukogu *et al*, 2017).

Additionally, iteration enables the responders to consider and assess a particular commodity's value carefully. The initial amounts may impact answers to the amounts one is willing to pay (starting point bias), which is one of its drawbacks. Second, it

encourages "yes-saying" to avoid embarrassment in front of others, which results in unreasonably high bid amounts, especially if one maintains a respectable status in the community, for saying no or less amounts (Bamlaka *et al*, 2019).

2.4.2. Services For Environmental SWM

Solid waste management (SWM) is a system for efficiently managing trash production, storage, collection, transport, processing, and usage in a hygienic, aesthetically pleasing, and economically viable way. It comprises all tasks related to administration, finances, law, and planning, as well as the components of waste treatment. Ekere *et al*. (2010) discovered that, despite possible regional variations in waste management, there are some fundamental steps or routes that waste must take from generation to transit recycling or landfills.

Since most cities struggle with urban sprawl, population growth, and suburban development, dealing with large amounts of waste is challenging in developing nations. These circumstances have undoubtedly put more stress on urban facilities. The collecting and management of waste is one area where this strain has become particularly apparent. The management, storage, collection, and disposal of these wastes can pose environmental and public health risks.

Waste management is a primary environmental concern that affects the entire world. Waste management refers to carefully applying all available tools to dispose of discarded products in a way that does not harm the environment. Solid waste management in urban regions is a significant issue that urban planners face everywhere. Solid waste management is the practice of gathering, moving, and disposing of waste materials in a practical, economical, and environmentally sensible manner. Most towns in developing nations like Nigeria are struggling with this, especially Calabar South, one of the local government areas of Cross River State. The problem of garbage collection and management, which is present in most Nigerian metropolitan areas, is also present in the study region. Waste management efforts in the research region were characterized by problems such as insufficient or no micro waste bins and inconsistent evacuation times, among others (Nkansah *et al*, 2013). They remarked that the rapid urban population growth, residents' high consumption habits, and the ineffectiveness of the authorities, whose legislative duties include effective waste management in cities, are the three primary causes of the urban trash crisis.

2.4.3. WTP (Willingness to Pay)

A consumer's or buyer's willingness to pay (WTP) reflects the value they place on a product or service. It is a theory used to ascertain how consumers desire to be compensated for their demand for goods and services. It is the most money a person would be willing to spend, give up, or swap for any good, service, or thing. When determining the value for ecosystem protection, estimating WTP plays a significant role. It can be obtained from three valuation methodologies: CVM, Conjoint Analysis, and choice experiments. Numerous variables, including age, family size, sex, marital status, education level, household expenses, garbage produced, and so on, impact people's willingness to pay for non-market items (Bamlaka *et al*, 2019).

2.4.4. Method Of Contingent Valuation

The contingent valuation method (CVM) is a way to gauge a person's worth in something. Instead of inferring them from observed behavior in typical markets, this strategy asks people to indicate their WTP for a specific commodity or willingness to accept (WTA) to give up a good. Resources, products, and services related to the environment are evaluated using contingent valuation. Governmental organizations use the techniques to determine the use and nonuse values of the natural resources they control and manage and to make environmental policy decisions, and methodologies are applied (Agbayi & Nwadiaro, 2019). The concept of contingent valuation emerged to incorporate the advantages of non-marketed environmental commodities and features directly into cost-benefit

analyses.

The contingent valuation method (CVM) remains valuable despite the deep green economists' criticisms. Its ability to provide measurements that can serve as a basis for decision-making in complex situations is so significant that it outweighs its shortcomings (Okere *et al*, 2021). This practical value underscores the continued use of CVM, as it offers a unique approach to understanding individuals' preferences and values in environmental economics.

Several studies have been relatively linked to this study. Still, a dearth has been evident in assessing households' willingness to pay for SWMs, especially in the south-south region of Nigeria, which is known for its increased waste production. In the study carried out by Dagneu *et al*. (2012) on WTP to pay for SWM in Addis Ababa, Ethiopia, they found that a majority of 91% of the households were willing to cooperate with the government in SWM to improve their condition. In another study by Ben-Chendo *et al*. (2018), households generally believed managing waste was the government agencies' job.

Nkansah *et al*. (2015) in their study on Willingness to pay for improved Solid Waste Disposal Services in Tema Metropolis, used Logit regression. They discovered that educational level and monthly income significantly affected the willingness to pay for improved Solid Waste Management Services. On the other hand, (Afroz *et al*, 2009) posited that the more educated a person is, the more they will understand the repercussions of improper solid waste management and will be willing to pay to avoid the risk of being exposed to unhygienic conditions.

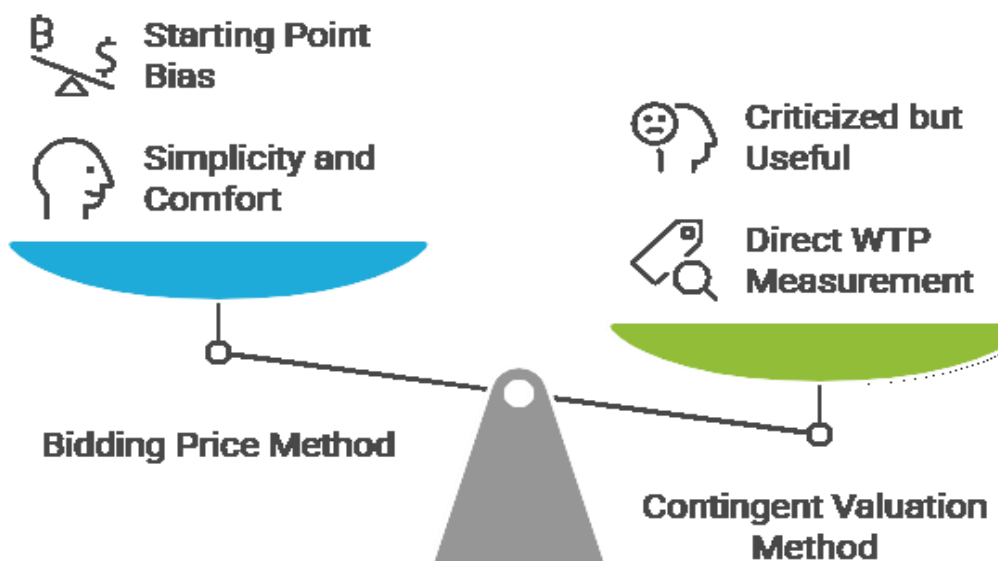


Figure 2: Methodological Approach To WTP.

Source: Author's Conceptualization

Figure 2 presents the methodological approach from a biased starting point of the household, where

she prefers simplicity and comfort to the point where she is helpful in society, having undergone a series of methodological approaches to solid waste management services.

3. RESEARCH METHODOLOGY

3.1. Study Area

The study area, South-South Nigeria, encompasses six states: Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers. The region's temperature ranges from 20°C to 32°C throughout the year, with an average annual temperature of 26°C. The South-South region experiences a tropical monsoon climate, with significant rainfall from May to October, averaging 2,000 mm to 4,000 mm per year. Its longitude and latitude are between 4°E and 9°E and 4°N and 8°N, respectively. However, in line with the study, the South-South region of Nigeria faces significant challenges in solid waste management. Still, households are willing to pay for effective waste management services (NIMET, 2012).

3.2. Sampling Size and Sampling Procedure

As presented in Fig. 3, a multistage sampling technique was used to select households across the six (6) states in the South-South region of Nigeria.

This method ensured representativeness, homogeneity, and unbiased selection of respondents. The selection process followed three key stages:

- Stage 1 – Purposive Selection of four (4) states out of the six (6) South-South states in Nigeria. This was based on the predominance of waste generated.
- Stage 2 - Two (2) LGAs were randomly selected from each state
- Stage 3 - Random selection of five (5) communities from each LGAs, to ensure spatial diversity and representation across different community settings.

However, using probability sampling, given a total population of 30,000 households in the area, using the Taro Yamane sample size formula:

$$\frac{N}{1+N(e^2)}$$

Where n = required sample size

N = total population size (30,000)

e = margin of error (typically 5% or 0.05)

then, $\frac{30,000}{1+30000(0.05^2)} = \frac{30000}{1+75} = \frac{30000}{76} = 395$ households

Thus, **395 households** constituted the study's sample size.

3.3. Justification For the Sample Size

The use of multi-stage random sampling aligns with previous studies conducted in Nigeria. For

instance, a survey on farmers using new media for agricultural information in the South-South region employed a similar multi-stage random sampling technique to select 395 respondents.

3.4. Data Collection

Using the Contingent valuation method, the double-bounded dichotomous choice approach was preferred in this study. In this method, households initially faced a predetermined bid amount based on pilot survey findings. If they accept or reject the first bid, they are presented with a follow-up bid, either higher or lower, depending on their initial response. This structure refines the estimation of their actual WTP, as it establishes more explicit upper and lower bounds compared to the single-bounded approach.

Compared to the single-bid approach, this method provides more efficient estimates by reducing bias and improving the precision of willingness-to-pay (WTP) values. This method was incorporated with an open-ended follow-up questionnaire to enhance the accuracy of the findings by capturing supplementary reasoning behind their responses. Studies by Ayenew et al. (2019) have shown that the double-bounded method tends to yield higher mean WTP values, making it a more reliable choice for policy recommendations.

3.5. Bid Scenario

A structured bid scenario used a monthly garbage fee as the payment vehicle. This approach helped estimate WTP values more accurately by offering households predetermined bid amounts and adjusting subsequent offers based on initial responses.

During the scoping and pilot surveys, five initial bid prices were determined: ₦600, ₦700, ₦800, ₦900, and ₦1000. The bidding process followed a double-bounded dichotomous choice format, where households first encountered an initial bid amount. Their reaction, whether acceptance or rejection, guided the follow-up bid adjustments.

- If a household accepted the initial bid, they were presented with a higher second bid, set at ₦1100, ₦1200, ₦1300, ₦1400, and ₦1500.
- If a household rejected the initial bid, they were instead offered a lower second bid, ranging from ₦100, ₦200, ₦300, ₦400, and ₦500.

To ensure randomness and representativeness, the sampled households were divided into five groups, each receiving different bid structures.

3.6. Data Analysis

The survey data were analyzed using descriptive statistics and econometric models.

Logit regression model:

This model was used to analyze the factors influencing WTP for improved waste.

The maximum WTP was regressed against socioeconomic characteristics of the household.

The model as specified:

$$P_i = \frac{1}{1 + e^{-(\beta_0 - \beta_i x_i)}} \quad (1)$$

Where, $P_i = 0$ for otherwise; $X_i =$ independent variables; $\beta =$ constant term; $\beta =$ coefficient of independent variables; $\varepsilon =$ the error or disturbance term; $i = 1, 2, 3, \dots, n$

$$P_i = (WTP) = \frac{1}{1 + \exp} = \frac{1}{1 + \exp^{-(x1B)}} \quad i = 1 \text{ n} \quad (2)$$

This model was simplified as $Y = \frac{1}{1 + \exp z}$ (3)

Where:

Y responses of household WTP (1= for yes and 0 for No)

$$Z = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + \varepsilon_t \quad (4) \text{ Where,}$$

$X_1 =$ Sex (male =0, female =1)

$X_2 =$ Age (Years)

$X_3 =$ Marital status: (Single) = 1 if Single, 0 otherwise; (Widowed) = 1 if Widowed, 0 otherwise; (Separated) = 1 if separated, 0 otherwise

$X_4 =$ Educational level: (Primary) = 1 if Primary, 0 otherwise; (Secondary) = 1 if Secondary, 0 otherwise (Tertiary) = 1 if Tertiary, 0 otherwise

$X_5 =$ Household size (numbers)

$X_6 =$ Income level (₦)

$X_7 =$ ownership status of household (1=Landlord, 0=Tenant)

$X_8 =$ Solid waste (Kg)

$X_9 =$ Bid amount WTP for SWM in (₦)

$X_{10} =$ Occupation (working = 0, not working = 1)

$\varepsilon_t =$ error term

The study adopted the SPSS statistical software for its regression analysis.

4. RESULTS AND DISCUSSION

4.1. Socioeconomic Characteristics of The Respondents

As presented in Table 1, the sex of the majority (51.9%) of the respondents in the study location was female, while 48.1% were male. This is because women are primarily responsible for waste disposal in various homes. As a result, the study focused more on women, and in cases where both spouses were available, women were considered. This study is similar to Boateng *et al.* (2016) research on WTP for SWMS in Kumasi Metropolis, Ghana. Their findings indicated that females constituted the majority

(61.2%) of respondents willing to pay for improved waste disposal services, highlighting gender-based differences in environmental responsibility and waste management preferences. The study further explored socioeconomic factors influencing WTP, emphasizing the role of education, income levels, and awareness in shaping household decisions regarding waste management. The results are also contrary to the study by Ben-Chendo *et al.* (2018), where the male counterparts were the most dominant in the area (67%).

Households' marital status, as presented in Table 1, showed that most (42.5%) of the respondents were married, while only about 31.9% were single. This result suggests that marital status may influence households' willingness to pay (WTP) for solid waste management services (SWMS). A higher proportion of married respondents could indicate a greater responsibility for household cleanliness and environmental sustainability, as they often manage family-related waste generation. This is in line with Nkansah *et al.* (2015), whose study on determinants of WTP for SWMS in Tema metropolis, Ghana, found that most respondents' marital status (80.1 percent) was married. In the same vein, Ben-Chendo *et al.* (2018) also revealed that most respondents (57.3%) were married. Results also showed that the area's widowed and divorced respondents were 16.2 and 9.4 percent, respectively.

In line with the age of the respondents, Table 1 shows that most respondents (47.1%) were 41 to 60, whilst 28.6% were below 40. The age distribution of respondents indicates an economically active population. It also shows that most of them are youth because of the metropolitan nature of the study area, where able-bodied youth migrated from all the surrounding towns, cities, and villages to engage in economic activities. Hence, respondents can work to earn income to pay for waste disposal services. This result is consistent with the study by Nkansah *et al.* (2015).

As presented in Table 1, the educational level of the respondents showed that about 4.8% of the respondents had no formal education; 50.1% had tertiary education, while 24.8% and 21.5% had both primary and secondary education, respectively. This could positively influence the consciousness to maintain proper environmental management and willingness to pay for improved solid waste management services. This recent study is similar to Ekere *et al.* (2010) in Kampala, who showed that most respondents had acquired the best education, indicated by the majority (50.4%) having completed tertiary education. In comparison, only a few (5.6%)

had no formal education. This is probably due to the many academic institutions in the area.

Results of the occupation of the respondents showed that the majority (41.5%) of the respondents were civil servants, while 37.5% were teachers and lecturers. This implies that the respondents were salary earners, which may positively affect their consciousness of maintaining proper environmental management and their willingness to pay for improved solid waste disposal.

Table 1 shows that respondents' sources of income were from personal savings, monthly salaries, friends/families, and so on. The majority (49.1%) of the respondents were monthly salary/wage earners; 32.9 percent had their source of income from personal savings, while 13.2 percent were from friends and families. Since most respondents were monthly salary earners, households in the study areas may be able to pay SWMS. This result is similar to Kinnamon (2006), who discovered that many respondents earn a monthly income from the government (civil servants) compared to fewer businesses/entrepreneurs.

The household size distribution (Table 1) indicated the highest percentage of 42.5% (4 - 6 range) living in the study area. The results show a large household size distribution, which suggests that respondents would generate more waste, which calls for effective waste disposal services in the study area. This study conforms with Addai and Danso-Abeam (2014) on WTP for SWMs in Accra, Ghana, which pointed out that the more people in the household, the more the household will appreciate a clean environment.

In terms of the occupancy status of the households, results showed that 55.2% of the respondents were tenants, while 44.8% were homeowners. This implies that most of the residents in the study area are not local to the city. The high percentage of tenants suggests a transient population, which may pose challenges for waste management initiatives that require long-term commitment and participation. This recent study agreed with Jenkins *et al.* (2003) that most respondents were renting, that is, tenants (68.07%). Most houses are used for commercial purposes, so people rarely construct residential dwellings.

In addition, the monthly income distribution of the respondents (Table 1) showed that 38.5% had an average monthly income below ₦50,000 and 46.6% had an average monthly income above ₦50,000. The rest had a high average monthly income above ₦100,000. When the average monthly income of respondents was compared to the Nigerian

minimum wage, it was noticed that they were not poor. This implies that the respondents could pay waste disposal fees.

The type of household waste being generated/produced by households in the area (Table 1) indicates that inorganic waste accounted for about 45.1% of the kind of waste produced, food leftover (10.9%), food by-product was 36.7%, and household damaged items were the least type of household waste produced (7.3%). The kind of waste produced may influence the respondents' willingness to pay for waste management services. For instance, the high percentage of inorganic waste suggests a need for proper disposal methods, which may motivate respondents to contribute financially. The findings of this study are contrary to those of Ben-Chendo *et al.* (2018) on WTP for SWMS in Owerri Metropolis, Imo state, who found that food by-products accounted for a more significant kind of household solid waste produced (50.0%). These items, when decayed, would be vectors of many diseases, such as epidermis, and therefore became a worrisome issue to the environmental and health well-being of the households.

The study also presented results on the mode of solid waste disposal in the area, with an indication that a large proportion of households (41.3%) showed that the residents engage in waste dumping along streets; 29.4% dump their waste in gutters and open drainages, 12.2% dump in government-designated dumpsites, 10.6% burn their waste, and only 6.6% dump their waste in private solid waste collectors. The mode of solid waste disposal would create a habitat for mosquitoes and rats, harbor germs, and cause air pollution; the aesthetic beauty of the environment is reduced, among others. This data highlights the alarming impact of poor waste disposal on the environment, making the audience more aware of the urgency for change.

When considering the average weight of waste accumulated before disposal, the result showed that 38.5% of the respondents disposed their waste when it was less than 5kg, 29.1% disposed when it was between 5kg and 10kg, 18.2% disposed when the weight was between 11kg and 15kg, giving the large population of the metropolitan city of the study area, this significant magnitude of solid waste generation of each household could be critical and inimical to the environmental health of the community and the entire city at large. The result of this study is similar to that of Tiller and Jakus (2005), who found that most households accumulate about 8kg of waste daily before disposal.

The results also revealed the frequencies of the

households' responses to the bid amount respondents are willing to pay for solid waste management services. The majority (41.3%) of the respondents thought that SWM is the government's responsibility, and they were not willing to commit any of their money to the cause of environmental cleanliness; they bid zero amount. Also, the results revealed that 32.9% were willing to pay between ₦100 - ₦500/10kg of waste, 13.4% were WTP ₦500 - ₦1000/15kg of waste, 7.8% were WTP ₦1000 - ₦1500/20kg of waste, while 4.6% were WTP ₦1500 - ₦2000/>20 kilograms of garbage respectively, giving a total of 58.7%. The result indicated a high willingness to pay, but a low bid amount was committed to solid waste management services in the area.

4.2. Household Decisions to Pay for SWM Services in The Study Area

Table 2 shows that solid waste management practices in the study area are deplorable, with a mean value of 1.79. This suggests that solid waste management practices in the study area are highly unsatisfactory, reflecting poor waste disposal systems, inadequate infrastructure, and possibly low public awareness or participation in waste management programs. Others may include financial constraints and institutional weakness resulting from ineffective policy enforcement, lack of funding, or poor stakeholder coordination.

These findings are similar to those of Banga *et al.* (2011) on WTP for solid waste management services in Uganda. The respondents revealed that waste management services in the area were poor and, therefore, would seek improved services that would encourage households to want to pay for improved Solid Waste Management (SWM) services. The results further revealed that most respondents observed that air pollution was a significant occurrence in the study area, with a mean value of 3.79. However, this mean value is slightly above the flood due to blocked gutters/drains. Water pollution and outbreaks of infectious diseases were also affected, as they ranked 3rd and 4th with mean values of 2.33 and 2.25, respectively. These findings were in line with the results of Ben-Chendo *et al.* (2018), who found waste management practices detrimental and causing environmental deterioration.

A large proportion of the respondents strongly agreed that it is the sole responsibility of the government to manage waste, which could be due to the successes of past governments in properly managing waste; the majority of household heads are

civil servants and pay their taxes to the government, and would not want to incur an additional cost on waste management. Businesses/entrepreneurs also pay sanitation levies to the government monthly. This result agrees with Smith (2020), who discovered that about 31.3% thought managing waste in the study area was the government agencies' job.

Financial constraint was the primary reason respondents could not pay, as they answered affirmatively to financial capacity as a constraint, with a mean value of 3.63. The implication is that many respondents may wish to pay for standardized SWMs but are not financially buoyant enough to do so. This result contradicts Dagnew *et al.* (2012) in their study on WTP to pay for SWMS in Addis Ababa, Ethiopia, which found that a majority of 91% of the households were willing to cooperate with the government in SWM to improve their condition.

4.3. Factors Influencing a Household's Willingness and Unwillingness to Pay for Solid Waste Management Services

This analysis was explained based on the marginal effects estimates, which represent how a one-unit change in the variable impacts households' willingness to pay (WTP) for solid waste management services. The logistic regression analysis aims to model the relationship between various predictor variables and a binary outcome variable. The results (Table 3) indicate the direction and significance of each predictor variable's effect on the outcome. The marginal effect in terms of gender (coefficient -0.052, $p = 0.668$) suggests that being female (coded as 1) is associated with a lower probability of WTP for SWMS. Still, the effect is not statistically significant ($p > 0.05$). Hence, gender does not significantly influence WTP. On the other hand, a one-unit increase in age decreases WTP by 0.118, statistically significant at the 5% level. This implies that older individuals may be less willing to pay for SWMS, possibly due to habitual waste disposal practices or financial constraints. It may also result from older respondents getting used to free government services under previous administrations.

This result is consistent with Johnson (2019), who hypothesized that these characteristics have little influence on consumers' WTP for better SWM options. However, Bamlaka *et al.* (2019) noted that when all other things are held constant, elderly persons are more prepared to pay. This indicates that senior citizens judge health and environmental issues with greater maturity, perhaps due to their increased experience. They exhibit a high Willingness to Pay

value relative to their age. According to Williams (2018), age has a detrimental impact on willingness to pay for trash management. They also noted that while younger generations may be more experienced with cost sharing and may be prepared to pay, older adults may believe that waste collection is the government's obligation and may be less willing to pay for it. Their WTP for better solid waste management services is significantly impacted because most respondents work as civil officials in a particular area.

Although positive, marital status (coefficient = 0.023, $p = 0.727$) was not statistically significant, implying that marital status has no meaningful effect on WTP. Similarly, a one-unit increase in education level increases WTP by 0.082, which is borderline significant at the 5% level. This implies that higher education levels slightly increase WTP, likely due to better awareness of waste management issues. According to Nkansah *et al.* (2015), in their study in the rural area of Kelantan, Malaysia, using Logit regression, they discovered that educational level and monthly income significantly affected willingness to pay for improved SWMS. According to Davis (2017), the more educated a person is, the more they will understand the repercussions of improper solid waste management and the more willing they will pay to avoid the risk of being exposed to unhygienic conditions. Education is linked to a greater awareness of the solid waste problem and, consequently, a willingness to pay for trash disposal services. These results demonstrate that consumers' willingness to pay for better solid waste disposal services positively correlates with their educational attainment (Effiong *et al.*, 2024).

Results also revealed a positive and non-significant impact on WTP from variables like occupancy, household size, occupation, weight of waste, and bid amount, respectively, indicating that larger households, employment, and amount of waste generated have a higher WTP, but do not significantly influence WTP. This suggests that households are less willing to pay for solid waste management as the cost increases due to their limited budget for solid waste management services, and are unwilling to pay beyond a certain threshold. Monthly income was the most significant among the variables, implying that a one-unit increase in income increases WTP by 1.756, which is highly important at a 1% level. Thus, higher-income households are more willing to pay for improved waste management services.

The model summary indicates a good fit, with a Pseudo R-squared value of 0.962, which predicts a

categorical outcome, an adjusted R-squared value of 0.957, and a standard error of the estimate of 0.52. The significant variables (age, education, and monthly income) suggest that demographic factors determine the outcome. These findings are consistent with previous studies showing that demographic factors, such as age, education, and income, are significant predictors of various outcomes (Smith, 2020; Johnson, 2019). The non-significant variables (gender, marital status, occupancy, household size, occupation, weight of waste, and bid amount) suggest that these factors do not significantly impact the outcome, consistent with previous studies (Williams, 2018; Davis, 2017). The findings have implications for policymakers, practitioners, and researchers.

4.4. Conclusion And Recommendations

In Nigeria, particularly in the South-South, governments are generally known to be in charge of managing solid waste. This has led to several environmental and health hazards associated with improper waste management, resulting in environmental degradation. To reduce this effect, assessing households' willingness to pay and participation and collaboration of households with the local authorities and other stakeholders is required to achieve SWMs, as addressed by this study, which was a significant gap from different studies, according to the literature. Results have proven that households' willingness to pay for solid waste management is influenced by various factors such as age, educational level, monthly income, gender, marital status, occupancy, household size, occupation, the weight of waste, and bid amount. The findings of this study can be used to inform policy decisions on solid waste management and to design effective strategies for promoting household participation in solid waste management.

However, the study made the following recommendations:

- ❖ **Implement effective waste management practices:** The government should prioritize proper waste disposal systems and infrastructure to mitigate environmental and health issues.
- ❖ **Increase public awareness:** Public education campaigns can enhance awareness of waste management issues, encouraging households to participate in proper waste disposal practices.
- ❖ **Income-based waste management fees:** Policymakers should consider implementing waste management fees that account for

household income levels, making it more affordable for low-income households.

❖ **Targeted interventions:** Interventions should target specific demographics, such as younger and lower-income households, to increase willingness to pay for improved waste management services.

❖ **Improve funding and policy enforcement:**

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Effective policy enforcement and adequate funding are crucial for improving solid waste management services.

These recommendations consider the study's findings and provide actionable steps for improving solid waste management services in the South-South region of Nigeria.

Table 1: Socioeconomic characteristics of respondents

Variable	Frequency	Percentage
Gender		
Male	190	48.1
Female	205	51.9
Total	395	100
Marital Status		
Single	126	31.9
Married	168	42.5
Divorced	37	9.4
Widow	64	16.2
Total	395	100
Age		
21-40	113	28.6
41-60	186	47.1
61-80	96	24.3
Total	395	100
Level of Education		
No Formal Education	19	4.8
Primary Education	85	21.5
Secondary Education	98	24.8
Tertiary Education	193	50.1
Total	395	100
Occupation		
Civil Servants	164	41.5
Business/Entrepreneur	52	13.2
Artisan/Handwork	31	7.8
Teacher/Lecturer	148	37.5
Total	395	100
Source of Income		
Personal Savings Monthly	130	32.9
Salaries/Wages	194	49.1
Friends/Families	52	13.2
Others	19	4.8
Total	395	100
Household Size		
1 - 3	144	36.5
4 -6	168	42.5
7 - 9	48	12.2
10 - 12	35	8.9
Total	395	100
Occupancy Status		
Owner	177	44.8
Tenant	218	55.2
Total	395	100
Monthly Income		
₦1000-₦50,000	152	38.5
₦51,000 -₦ 100,000	184	46.6
₦101,000 - ₦ 150,000	32	8.1
>₦150,000	27	6.8
Total	395	100
Types of Household Waste Produced		
Food Left-Over	43	10.9
Food By-Products	145	36.7
Inorganic Waste	178	45.1

Household Damaged Items	29	7.3
Total	395	100
Mode of Solid Waste Disposal		
Gutters & Open Drainages	116	29.4
Waste Dumps Along Streets	163	41.3
Govt. Designated Dumpsites	48	12.2
Private Solid Waste Collectors	26	6.6
Burning	42	10.6
Total	395	100
Average Weight of Waste Accumulated before Disposal		
<5kg	152	38.5
5 - 10kg	115	29.1
11- 15kg	72	18.2
15 - 20kg	34	8.6
> 20kg	22	5.6
Total	395	100
Bid Amount (₦)		
Not WTP	163	41.3
100-500	130	32.9
500-1000	53	13.4
1000-1500	31	7.8
1500-2000	18	4.6
Total	395	100

Table 2: Effect Of Solid Waste Management Services in The Area.

S/N	VARIABLES	SA	A	D	SD	MEAN	RANK
1.	The management of solid waste in my area is commendable	5	20	50	75	1.7	
2.	Effect of SWM practices						
	Pollution in the air	105	43	50	75	3.79	1 st
	Pollution in water	24	22	84	20	2.33	3 rd
	Outbreak of diseases	24	33	50	43	2.25	4 th
	Flood due to blocked gutters/ drains	84	51	10	5	3.43	2 nd
3.	The government is responsible for managing waste	89	40	11	10	3.39	
4.	Financial capacity is a constraint in paying for waste	100	35	10	5	3.63	
5.	WTP for SWMS under normal circumstances	25	15	35	75	1.93	

Source: Computed From Field Survey, 2024.

Table 3: Factors Influencing Households' Willingness and Unwillingness to Pay for Swms.

Variable	Coefficient	Std. Error	T	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Gender	-0.052	0.120	-0.431	0.668	-0.290	0.186
Age	-0.118**	0.066	1.799	0.018	-0.012	0.249
Marital Status	0.023	0.066	0.351	0.727	-0.108	0.155
Education	0.082**	0.057	1.447	0.051	-0.031	0.195
Occupancy	0.059	0.084	0.704	0.484	-0.108	0.226
Household Size	0.115*	0.079	1.454	0.149	-0.042	0.272
Occupation	-0.033	0.033	-1.017	0.312	-0.098	0.032
Monthly income	1.756***	0.342	5.134	0.000	1.077	2.436
Weight of waste	0.0457	0.037	0.973	0.219	-0.036	0.047

Bid Amount	0.0792	0.103	1.482	0.462	-0.432	0.209
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***= significant at 1%.

** = significant at 5%

*=significant at 10%

Model Summary	R	Pseudo R-Squared	Adjusted R Square	Std. Error of the Estimate
	0.981 ^a	0.962	0.957	0.52

Source: Computed From Field Survey Data, 2024.

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