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Determinants of Household Participation and Satisfaction in Solid Waste Management: The Roles of Disposal Site Proximity and Agency Trust in Port Harcourt and Owerri, Nigeria

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ABSTRACT
The study examined the influence of household trust and proximity to disposal sites on solid waste management organizations in Port Harcourt and Owerri in Nigeria with the aim of ascertaining household participation and satisfaction in solid waste management. Specifically, the study looked at the relationship between how involved people were in trash management at home and how far they lived from places to dispose of garbage. It also examined the effect of household trust in waste management organizations on satisfaction with waste management services. The design was a descriptive cross-sectional survey. A sample of 300 houses was selected through simple random sampling procedures. Structured questionnaires were used to collect data and analysed using Pearson Product-Moment Correlation, independent-samples t-tests and descriptive statistics. The results revealed that Owerri has a much higher level of trust on the waste management agency than Port Harcourt. Findings of the study also shows that Port Harcourt is considerably more distant from the garbage disposal sites. However, there was a weak and statistically insignificant correlation between distance to disposal sites and household involvement in waste management ($r = -0.083$, $p = 0.151$). Similarly, the correlation between household trust of the waste management agency and satisfaction with waste management services was very weak and statistically insignificant ($r = 0.028$, $p = 0.632$). Both null hypotheses were accepted. The study revealed that the effectiveness, accessibility and quality of waste management services are more important for household participation and satisfaction than institutional trust or proximity to disposal sites. This points to the necessity of greater service provision, improved environmental education and public awareness, and integrated waste management policies that combine effective community participation with efficient infrastructure to foster sustainable household participation in solid waste management.
Keywords: household participation, solid waste management, disposal sites

INTRODUCTION

Solid Waste Management (SWM) is still one of the most important environmental problems of fast growing cities in developing countries. The increasing urban populations, changing consumption patterns, industrial growth and increasing commercial activities have led to a substantial increase in the volume and complexity of municipal solid waste generation globally (Kaza et al., 2018). Proper management of solid waste is essential to ensure environmental quality, protecting public health and promoting sustainable urban development. However, poor waste collection, indiscriminate dumping, poor disposal practices, inadequate infrastructure, and weak institutional capacity are still happening in several cities in Sub-Saharan Africa (Ferronato & Torretta, 2019).

Rapid urbanization and population explosion have made solid waste management a huge problem in Nigeria. Urban centres generate huge quantities of waste daily but the capacity of waste management agencies to collect, transport and dispose of these wastes is still inadequate (Ogwueleka, 2009). Many cities are therefore characterized by environmental degradation, blocked drainage systems, flooding, unpleasant odors and increased risks of disease outbreaks. Scholars argue that effective waste management is not only the responsibility of government agencies but also requires active participation from households, the primary generators of municipal waste (Guerrero et al., 2013).

Households' participation is an essential part of sustainable waste management systems. Participation includes activities such as waste segregation, storage, collection, recycling and compliance with the established disposal regulations (Abarca-Guerrero et al., 2015). As stated by Guerrero et al. (2013), the success of municipal solid waste management programs is largely dependent on the will of the residents to engage in environmentally responsible waste disposal practices. Active participation of the households in waste management activities increases the efficiency of waste collection system, reduces environmental pollution, and improves public health.

Although household participation is important, studies have shown that levels of participation vary greatly among communities, which is attributed to socioeconomic, institutional and environmental factors (Afroz et al., 2011). Of these factors, access to waste disposal facilities has become a key determinant for participation. The proximity of households to waste disposal sites influences residents' willingness and ability to properly dispose of waste. According to the spatial accessibility theory, the probability of individuals using public services is greater when these services are located in convenient and easily accessible places (Talen, 2001). Where disposal points are far from residential areas, households may resort to illegal dumping, open burning or disposal in drainage channels due to the inconvenience and cost of accessing designated disposal points.

Empirical studies indicate that households' participation in waste management is related to their proximity to the disposal site. For example, Afroz et al. (2011) reported that the availability of waste collection facilities had a strong influence on the waste disposal behavior of urban community residents. Similarly, Nzeadibe and Ajaero (2010) found that the long distances to waste collection points in Nigerian cities discouraged households from proper waste disposal practices. The results indicate that the spatial distribution of waste disposal facilities can be improved to enhance the household participation and overall outcomes of waste management.

Institutional factors are also important in determining residents' attitudes to waste management services beyond physical accessibility. Trust in waste management agencies has increasingly been identified as an important determinant of public cooperation and satisfaction of service delivery (Van de Walle & Bouckaert, 2003). Institutional trust refers to the extent to which citizens believe that public organizations are able to carry out their responsibilities effectively, transparently and consistently. Trust in waste management agencies enhances residents' compliance with regulations, participation in waste management programs, and satisfaction with services received.

Social exchange theory highlights the importance of trust, as people are more willing to cooperate with institutions when they view the relationship as fair, beneficial and trustworthy (Blau, 1964). Households that perceive waste management agencies as competent and responsive are more likely to support agency

initiatives and participate in waste disposal activities. On the other hand, low levels of trust can result in resistance, non-compliance and dissatisfaction with service delivery.

The effect of institutional trust on satisfaction with public services has been emphasized in several studies. For example, Bouckaert and Van de Walle (2003) identified trust as an important predictor of perceptions of service quality and satisfaction in public administration. Similarly, Uwadiegwu and Chukwu (2013) reported that the residents' confidence in the waste management authorities positively influenced their assessment of waste collection services in Nigerian urban areas. The findings suggest that it is important for waste management agencies to build credibility through the provision of quality services, accountability and community engagement.

Satisfaction with waste management services is a key measure of the effectiveness and responsiveness of services. Satisfaction is the measure of the residents' assessment on the quality, reliability, accessibility and adequacy of services provided by the waste management agencies (Kotler & Keller, 2016). High levels of satisfaction usually show that service providers meet the expectations of the public. Dissatisfaction may show deficiencies in service delivery systems. Previous studies have shown that collection frequency, service reliability, cost, accessibility and responsiveness of agencies are significant factors which affect household satisfaction towards waste collection services (Memon, 2010; Zurbrügg et al., 2012).

Port Harcourt and Owerri are two fast growing cities in southern Nigeria facing growing waste management challenges. Port Harcourt, being a major industrial and commercial hub, generates large amounts of municipal waste due to its large population and economic activities. Similarly, Owerri has seen rapid urban growth, increased commercial activities and growing waste generation. Despite efforts by state waste management agencies to improve waste collection and disposal services, concerns remain about residents' participation, access to disposal facilities, and satisfaction with service delivery. Previous studies in these cities have primarily concentrated on waste generation, disposal methods, and environmental impacts, with little focus on the impact of proximity to disposal sites and confidence in waste management agencies on household participation and satisfaction.

Moreover, while previous studies have explored participation and satisfaction individually, few studies have explored the roles of physical accessibility and institutional trust simultaneously as determinants of household waste management behavior. Understanding these relationships is important to the design of effective interventions that promote public participation and improve the service quality. This study will add to the voluminous literature on urban waste management by comparing Port Harcourt and Owerri. The study examines the effect of distance to waste disposal sites on the household participation and the effect of trust in waste management agencies on the residents' satisfaction with waste services.

Thus, this study aims to provide empirical evidence regarding the determinants of household participation and satisfaction in solid waste management with special emphasis on disposal site proximity and agency trust. The findings are expected to guide policy makers, urban planners and waste management agencies in developing strategies that will improve accessibility to service, build public trust and promote sustainable waste management practices in Nigerian cities.

Objectives of the Study

This study was carried out to:

1. Investigate the relationship between the distance to waste disposal sites and household participation in waste management.
2. Assess household trust in the waste management agency and its influence on satisfaction with waste services.
3. **Research Hypotheses:** The following research hypotheses were stated and tested at 5% level of significance

H_{01}: There is no significant relationship between the distance to waste disposal sites and household participation in waste management.

H_{02}: Household trust in the waste management agency has no significant influence on satisfaction with waste management services.

MATERIALS AND METHODS

Research Design

The research design for this study was a comparative cross-sectional survey that helped in measuring the effectiveness of solid waste management strategies in Port Harcourt and Owerri. This method involved collecting data from households at only one point in time, thus, making it easy to compare waste management practices, household participation, service satisfaction, and perceptions of operational effectiveness existing in the two cities. A quantitative method was used, and data were collected through the administration of structured questionnaires with Likert-scale items, which allowed the measurement of the most important variables, i.e., participation, satisfaction, and the effectiveness of waste collection, transportation, and disposal systems. The survey model gave the standard collection of data from a large sample of households, thus enabling a variety statistical tests like independent-samples t-tests, and Pearson correlation to be used to identify differences and relationships among variables.

Along with their comparative framework, they figured out the effect of factors such as distance to disposal sites on household participation and also carried out tests of a hypothesis about the difference in waste management performance between the two cities. In brief, this approach provided a strong and organized foundation for producing trustworthy, valid, and evidence-based results.

Sample and Sampling Techniques

The sampling procedure was conducted in two stages, namely, purposive sampling and simple random sampling.

Purposive Sampling: The researchers identified and selected active waste dumpsites and their neighbouring communities for this research, mainly because these locations have direct involvement with solid waste management activities.

Simple random sampling: Households situated within roughly a one-kilometre radius of the selected dumpsites were picked at random to be a part of the study. That way, every eligible household had the same opportunity of being chosen.

The sample size for this research was computed using the Taro Yamane (1967) formula for finite populations. It is a well-known procedure in survey research to select a representative sample from a known population with a certain level of precision.

The formula is given as follows:

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

Where:

n= sample size
N= total population size
e= level of precision (sampling error), usually 0.05 at 95% confidence level

For the purpose of this study, the estimated accessible household population within the selected study locations in Port Harcourt and Owerri was approximately 1,200 households.

Method of Data Analysis

The surveyed data from each location were merged together to form two representative datasets, one for Port Harcourt and one for Owerri. Initially, separate analyses of the data were conducted for each city in order to capture their specific characteristics; later, comparative analyses went back and forth to discover the differences and similarities of the solid waste management strategies between the two cities. The original data gathered were first encoded, cleaned, and then analysed using the Statistical Package for Social Sciences (SPSS). Descriptive measures such as means, variance and standard deviation were employed to illustrate a summary of responses. Inferential statistical procedures were employed to fulfill the research aims and test the appropriate hypotheses.

RESULTS

Table 1: Descriptive Statistics of Distance to Disposal Sites by City

	City	Mean	Std. Deviation	Std. Error Mean
Distance To Disposal km	Owerri	8.1393	4.1703	.34050
	Port Harcourt	13.01933	5.64710	.46108

The descriptive statistics reveal that the average distance to disposal sites is quite different between the two cities. Houses in Port Harcourt, on average, have to travel a longer distance than those in Owerri to a waste disposal site (Mean = 13.02 km versus mean = 8.14). This means that residents in Port Harcourt might face further physical and logistical hurdles in getting to disposal facilities. Moreover, the higher standard deviation of Port Harcourt (SD = 5.65) relative to Owerri (SD = 4.17) indicates larger variability in distances and implies that different parts of the city have very different access levels to disposal sites. Large distances to facilities can negatively affect the frequency and the willingness to participate in waste management, since they are likely to increase the time, cost, and effort of transportation. Thus, the relatively low or variable household participation rates of Port Harcourt in comparison to Owerri may be in part due to its greater average distance. On the whole, the results highlight distance to disposal sites as a major piece of infrastructure that could be hindering household involvement in solid waste management, especially in Port Harcourt.

Table 2: Independent-Samples t-Test Comparing Distance to Disposal Sites between Owerri and Port Harcourt

Variable	Levene's Test for Equality of Variances	Sig.	t-test for Equality of Means	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
	F		t					Lower
Distance To Disposal km	10.34	0.001	-8.514	274.263	0	-4.88	0.573	-6.008

The in Table 2 reveal that there is significant difference in the distance to disposal sites between Owerri and Port Harcourt. The Levene's test for equality of variances is significant ($F = 10.34$, $p = 0.001$) indicating that the assumption of equal variances has been violated. Thus, the appropriate statistic to interpret is the Welch t-test (unequal variances not assumed). Results of the t-test show a highly significant difference in mean distance to disposal sites ($t = -8.514$, $df \approx 274.26$, $p < 0.001$). The negative mean difference (−4.88) suggests that households in Owerri are about 4.9 km nearer to disposal sites on average than households in Port Harcourt. This difference is also robust as the 95% confidence interval (about −6.01 to −3.75) does not include zero. These findings indicate that residents of Port Harcourt are subjected to significantly more distance-related constraints which could have negative impact on household participation in solid waste management activities.

Table 3: Pearson Correlation between Participation Frequency and Distance to Waste Disposal Sites

		Participation Times Per Month	Distance To Disposal_ km
Participation Times Per Month	Pearson Correlation	1	-.083
	Sig. (2-tailed)		.151
	N	300	300
Distance To Disposal _km	Pearson Correlation	-.083	1
	Sig. (2-tailed)	.151	
	N	300	300

Table 3 shows the Pearson correlation analysis of the relationship between household frequency of participation in waste management activities and distance to waste disposal sites. The correlation coefficient is −0.083. This indicates a weak negative correlation between the two variables. This means that the further away the disposal sites the lower the household participation. However, the strength of this relationship is very low. The significance value associated ($p = 0.151$) is greater than the threshold of 0.05; therefore, the relationship is not statistically significant. This means that the distance to the disposal sites does not have a statistically significant linear effect on the frequency of participation in the study sample. In general, the results imply that while distance may be an operational concern, other factors such as awareness, reliability of service or institutional arrangements are likely to play a more important role in determining household participation in solid waste management.

Table 4: Descriptive Statistics of Household Trust in Waste Management Agency and Satisfaction with Waste Services

	Mean	Std. Deviation	Variance
Trust In Agency	2.87	1.107	1.226
Satisfaction 1 5	3.01	1.038	1.077

Descriptive statistics reveals that households have moderate but relatively low trust in the waste management agency with a mean score of 2.87 on a 1–5 scale. But the standard deviation (SD = 1.11) and variance (1.23) suggest that trust levels among respondents are not uniform. That is, some households trust the agency while others are skeptical. This variation suggests inconsistent experiences with agency performance, communication and service delivery. However, the overall satisfaction of the waste management services is slightly higher with a mean value of 3.01, which means a neutral to moderately positive perception of the service quality. The dispersion is relatively similar (SD = 1.04), suggesting that satisfaction is consistent across households. Taking together these findings show that although the residents are moderately satisfied with the waste services, the trust in the responsible agency is relatively weaker. This difference suggests that increased transparency, responsiveness and reliability of waste management agencies may enhance public trust and, thus, positively influence satisfaction with service efficiency and collection timeliness.

.**Table 5: Descriptive Statistics of Household Trust in Waste Management Agency by City**

	City	Mean	Std. Deviation	Std. Error Mean
Trust In Agency	**Owerri**	3.10	1.022	.083
	Port Harcourt	2.63	1.144	.093

The results shows a significant difference in the trust of households in the waste management agency between the two cities. The mean trust score of respondents in Owerri is higher (Mean = 3.10) than that of respondents in Port Harcourt (Mean = 2.63), indicating that households in Owerri have more confidence in the waste management agency. This suggests that residents of Owerri may view the agency as more

reliable, transparent or responsive in its service delivery. The standard deviations of both cities indicate moderate variability in the levels of trust with slightly greater dispersion in Port Harcourt (SD=1.14) than in Owerri (SD=1.02) suggesting more mixed perceptions among Port Harcourt residents. The relatively small standard error also mean that the estimated mean trust scores are reliable. Overall, the results indicate that Owerri has a higher level of institutional trust than Port Harcourt, which may be critical for household satisfaction and participation in waste management programs.

Table 6: Independent-Samples t-Test Comparing Household Trust in Waste Management Agency between Owerri and Port Harcourt

Variable	Levene's Test for Equality of Variances	Sig.	t-test for Equality of Means	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
	F		t					Lower
Trust In Agency 1 5	6.363	0.012	3.727	294.29	0.0000	0.467	0.125	0.22

Table 6 shows the results of independent-samples t-test comparing the household trust in the waste management agency between Owerri and Port Harcourt. The assumption of equality of variances is violated, as Levene's test for equality of variances is significant ($F = 6.363$, $p = 0.012$). Thus, the t-test result reported for equal variances not assumed should be used for interpretation.

The t-test demonstrated a statistically significant difference in the mean trust scores between the two cities ($t = 3.727$, $df \approx 294.29$, $p < 0.001$). The mean difference of 0.467 shows that residents in Owerri have more trust in the waste management agency than those in Port Harcourt. The 95% confidence interval (0.22 to …) does not include zero and this difference is robust. The results suggest that the level of institutional trust is stronger in Owerri and this can have positive implications for household participation and satisfaction with waste services.

Table 7: Pearson Correlation between Household Satisfaction and Trust in Waste Management Agency

		Satisfaction	Trust in Agency
Satisfaction	Pearson Correlation	1	.028
	Sig. (2-tailed)		.632
	N	300	300
Trust In Agency	Pearson Correlation	.028	1
	Sig. (2-tailed)	.632	
	N	300	300

The Pearson correlation analysis examines the relationship between household satisfaction with waste services and trust in the waste management agency. The correlation coefficient is 0.028, indicating a very weak positive relationship between the two variables. This suggests that higher trust in the agency is associated with a slight, practically increase in satisfaction with services. The relationship is not statistically significant ($p = 0.632 > 0.05$), meaning that trust in the waste management agency does not meaningfully predict or influence household satisfaction in this sample. The results imply that while trust and satisfaction are conceptually related, other factors such as service efficiency, reliability, or accessibility likely play a more important role in determining satisfaction with waste management services

DISCUSSION

The result of this study showed that there is a significant difference in the distance to waste disposal sites between Port Harcourt and Owerri, Port Harcourt households are farther away from disposal sites than Owerri households. This finding reflects differences in spatial distribution and accessibility of waste management infrastructure in the two cities . However, the analysis of correlation indicated a weak and not statistically significant relationship between the distance to the disposal sites and household participation in waste management ($r = -0.083$, $p = 0.151$). While increased distance was associated with a small reduction in household participation, the effect was too small to create a meaningful relationship. This means that simply being close to disposal sites doesn't mean households are actively engaged in waste management activities. The finding suggests that households may resort to alternative disposal options such as private waste collectors, community collection points or informal disposal practices irrespective of their closeness to official disposal sites.

The study further revealed a significant difference in household trust in the waste management agency across the two cities with respondents in Owerri having higher trust levels than those in Port Harcourt. This variation may reflect the perceived quality of service delivery, responsiveness, transparency and communication of the waste management authorities in both locations. However, despite this considerable difference in the levels of trust, the correlation analysis revealed that trust in the waste management agency had no significant relationship with household satisfaction with waste management services ($r = 0.028$, $p = 0.632$). This suggests that although institutional trust is viewed as an important determinant of citizens' attitudes towards public services, it did not play a significant role in residents' satisfaction with waste management services in this study. Rather, satisfaction may be more directly dependent on tangible service outcomes such as frequency of collection, timeliness of collection, cleanliness of the environment and regularity of waste evacuation.

The findings generally suggest that proximity to disposal sites and household trust in the waste management agency do not significantly account for household participation and satisfaction with waste management services in Port Harcourt and Owerri. These results suggest that household behaviours and perceptions are probably influenced by a wider range of socioeconomic, institutional and service factors than those included in this study. Other factors that could be more important in determining household participation and satisfaction include the affordability of waste collection services, environmental awareness, education, enforcement of sanitation regulations, availability of collection facilities and efficiency of waste management operations. Hence, there is need to adopt an integrated approach to improving waste management outcomes beyond increasing the number of disposal sites or increasing public trust to include improving service quality, public education, stakeholder engagement and institutional effectiveness.

CONCLUSION

This study investigated the factors that determine household participation and satisfaction in solid waste management with particular reference to disposal site proximity and household trust in waste management agencies in Port Harcourt and Owerri, Nigeria. A total of 300 households were surveyed using purposive and simple random sampling techniques. Data were analyzed with descriptive statistics, independent-samples t-tests and Pearson correlation analyses. The findings revealed that the distance of households from waste disposal sites in Port Harcourt was statistically significantly higher than in Owerri, but the level of trust in the waste management agency was statistically significantly higher in Owerri than in Port Harcourt. Yet, in spite of these significant disparities between the two cities, neither the distance to the disposal sites nor the household trust in the waste management agency had a statistically significant association with household participation in waste management or satisfaction with waste management services. Thus, both null hypotheses were accepted.

The results suggest that factors other than physical accessibility to disposal sites and institutional trust influence household participation and satisfaction. Factors such as service reliability, frequency of waste collection, accessibility of waste collection service, environmental awareness, socioeconomic conditions and government commitment to efficient waste management may have a stronger influence on household attitudes and behaviours. Thus, the study provides evidence that a comprehensive approach combining infrastructure development with delivery of efficient services, effective public education, stronger institutional capacity and active community participation is critical to improving solid waste management.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Waste management agencies in Port Harcourt and Owerri should prioritize regular waste collection, prompt evacuation of refuse, adequate provision of waste collection facilities, and timely response to public complaints. Since household satisfaction was not significantly influenced by trust alone, improving the actual quality and consistency of service delivery is likely to have a greater impact on residents' satisfaction and participation in waste management activities.
2. Strengthen environmental awareness and community participation programmes.
   Government agencies, environmental protection authorities, and community-based organizations should intensify public enlightenment campaigns on proper waste disposal practices, environmental sanitation, and the benefits of active household participation in waste management. Educational programmes should encourage behavioural change through continuous sensitization, school-based environmental education, and community engagement initiatives.
3. Adopt an integrated and evidence-based waste management strategy.
   Policymakers should complement investments in waste disposal infrastructure with improvements in institutional efficiency, monitoring, enforcement of sanitation regulations, and collaboration with private waste service providers. Future planning should consider socioeconomic and behavioural factors, such as affordability of waste services, accessibility of collection systems, and residents' environmental attitudes, which may have stronger effects on household participation and satisfaction than disposal site proximity or agency trust alone.

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