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Residents' Perceptions and Attitudes towards Municipal Solid Waste Management Practices in Freetown Central Zone, Sierra Leone.

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Abstract: *Solid waste management has not only become a daunting task, but also an obvious apprehension in many urban cities, especially for developing nations. Sierra Leone is no exception to such apprehension. The issue is exacerbated particularly for municipal authorities who lack the capacity and basic required logistics to manage the escalating waste condition. Freetown is a mix and most rapidly growing municipality in Sierra Leone, as it is the hub for all major commercial activities. The unappealing piles of solid waste and wind-blown litter on major streets in Freetown have greatly compromised its environmental quality, natural beauty and aesthetic appearance. This paper is aimed at assessing residents' perceptions and attitudes towards municipality solid waste management practices in the Freetown Central Zone. To achieve the aim of this study, the Theory of Planned Behaviour which offers a framework for studying human behaviour, directed the study. Using a structured survey electronic questionnaire and thorough interview guide, data was collected from 273 arbitrarily selected household respondents. It was established from the assessment that residents recognized solid waste management as a principal problem in the environment. Approaches to managing municipality solid waste problems will require the provision of sufficient skips, waste bins, and place them at suitable locations accessible to the communities. Even where there are deficiencies in the enforcement of rules and regulations, utilizing community commitment and neighbourhood passion can help in enhancing an effective solid waste management practice in the study area. Additionally, rigorous public education and payment of subsidies by municipality authorities for waste management services should be prioritized to model the existing perception and attitude of residents of the study area. The findings of this study will help open the minds of stakeholders about the concept of perception and attitude to attaining a sustainably cleaner environment. Finally, this research will aid policymakers to consider restructuring existing solid waste management policy to incorporate the circular economy paradigm and factor the role of attitude and perception of waste producers.*

Keywords: *Residents, Attitudes, Perceptions, Behaviour, Municipality Solid Waste, Environment.*

1. INTRODUCTION

Irrespective of residents' background, municipality solid waste management is one of the principal challenges of urban cities of all magnitudes. It is practically always in the top five of the most challenging problems for city administrators (Scheinberg, Wilson and Rodic-Wiersma, 2010a; Sankoh and Yan, 2013a; Sankoh, Yan and Tran, 2013a; Sankoh, 2020). Solid Waste generation, collection, transport and disposal have been part of human life from antiquity, but they have over the past decades become difficult across nations of the world. Consequently, most urban city governments are faced with growing problems concerning effective solid waste management. The quality of waste management facilities is a good pointer of a city's governance (Sankoh and Yan, 2013b). How waste is produced and discarded gives us a key insight into how people live. If a city is dirty, the local administration may be considered ineffective or its residents may be accused of littering (Scheinberg, Wilson and Rodic-Wiersma, 2010b). From an environmental perspective, solid waste management is a serious problem because, as far as people have been living in established communities, solid waste generation becomes an inevitable daily activity both in developing and developed countries. According to (Weisberg, 1992), in March 1987, a barge laden with approximately 3,200 tonnes of garbage set out from Islip in search of a dumpsite. The refuse had been turned away from a landfill in Islip, New York. The barge travelled 10,000 kilometres and stopped at several foreign ports, but found none of them willing to accept its

harmful load. The three-month odyssey took the barge to Mexico, Belize, and the Bahamas before it returned into New York, still fully loaded with the garbage. The content of the barge was finally predisposed in high seas. The futile voyage made headlines, giving many North Americans their first inkling of an impending crisis. Mexico City, which is one of the largest cities in the world produces approximately 10,000 tonnes of trash each day(Suleman, Simon and Richard, 2015). Up until recently, these torrents of waste were left in massive heaps unprotected to the wind, flies, rodents and other pests.

The situation in Africa is not different. Recent studies have revealed that the problem of waste management has become overwhelming and threatens to demoralize the efforts of most city administrations. The city environment of many African nations is branded by loads of garbage, clogged drains, overflowing waste containers, blocked streams and foul-smelling channels etc. Research carried out by authors such as (Sood, 2004; Gogra *et al.*, 2010a) on solid waste management practices in Freetown, gives the impression to suggest that the majority of residents had no appreciation for the beauty of the city. Furthermore, the attitude and perception of residents suggest that they can live vulnerably among an accumulative heap of municipality solid waste.

At present, municipal solid waste collection and disposal are mostly thought-provoking in cities of developing nations. It is believed that urban solid waste management problems have been associated with rapid urbanization in Africa nations. Moreover, with increasing industrialization and urbanization, the production of waste now surpasses the safe disposal rate. This is completely common in most African cities (Hofny-Collins, 2006). It is purported that the greater the society's population and material wealth, the greater the quantity and diversity of waste produced (Scharfe, 2010).

Therefore, as the population increases, income rises, and consumption patterns vary, the size of discarded materials continues to increase correspondingly. In low-income countries, the main problems are connected to the collection, with a large amount of all solid waste produced in third world cities remains uncollected or poorly collected and managed. Whereas, in high-income nations, the problems usually centre on the difficulties and astronomical cost of disposing of the colossal quantity of waste generated by households and industries (Raj, 2000).

The attitudes and perceptions of residents are of distinct attention when examining and managing the socio-cultural, economic and environmental facades of any country, particularly when it has to do with attracting tourists and investors for its economic development. A few studies (Gogra *et al.*, 2010b; Sankoh and Yan, 2013c; Sankoh, Yan and Tran, 2013b) have been carried out on various aspects of solid waste in Freetown and Sierra Leone at Large. However, residents' perceptions and attitudes towards municipal solid waste management have not been given in-depth analysis. Therefore, there is a need to assess the residents' perceptions and attitudes in Freetown, a fast-growing and commercial hub for investors and tourists towards solid waste management. This is the primary aim of this study.

PERCEPTIONS, ATTITUDES AND WASTE MANAGEMENT

Several authors have attempted to explain the concept of perception and attitude. The term "Perception" is generally understood to mean the principal course by which human beings acquire knowledge of the world. According to (Gibson and Tierney, 2006), it comprises the actions of our sense organs (sight, hearing, touch, taste and smell) in responding to external stimulation. In a major advance, (Mariwah, Kendie and Dei, 2010) stated that perceptions are motivated by our knowledge, resources, beliefs, values and norms etc., but can be moulded without practice and knowledge of the object or person. Attitude, as described by Ajzen (2002a) is a concept towards a general feeling of favourableness or unfavourableness for the concept by an individual or group of individuals. Rendition by (Zelezny and Schultz, 2000; Chen and Chai, 2010) describes attitude by taking environmental concerns into perspective. They use the term to describe the intrinsic concept in a person's self with an awareness of the degree of attachment between self and the environment. Attitude acts as a substantial precursor to the behavioural intent which is labelled as the degree of favourable or unfavourable estimation of the behaviour under study (Ajzen, 2002b). As opposed by Warner (1998) there is no such thing as right or wrong attitude except within a specific cultural setting and belief system. On the other hand, even within an identical culture, our behaviour can be stimulated by several factors and these develop over time, sometimes consciously or unconsciously. Ajzen further accentuated that a positive attitude towards a certain behaviour fortifies the intention to accomplish that behaviour.

Ifegbesa (2010) and Kumar (2012) have accredited attitude to be an important predictor in elucidating intention or behaviour towards solid waste management and the relationship is quite noteworthy. Attitudes could be positively predisposed through sensitivity building movements and education about the negative characteristics of inadequate waste collection concerning human health and environmental conditions. Such education should also inform people of their answerability as waste producers and of their civil liberties as citizens to tolerable solid waste management services (Bernstein, 2004). Hence, the design and application of the MSWM system necessitate an investigation of the present behaviour of key stakeholders and residents of Freetown Central Zone, counting their perception, attitudes and value systems. The fundamental attitudes of the urban residents are themselves influenced by the social and cultural upbringings in which they find themselves. An emphasis by Bernstein (2004) was that fast-growing, but low-income housing settlements are often branded by varied social and ethnic groups. Bernstein further contended that these social diversities powerfully influence the aptitude of communities to bring together local waste management actors. It is stated by Klundert and Lardinois (1995) that people are more apprehensive about waste when it is in their immediate neighbourhoods. Some inhabitants in Freetown discard waste indiscriminately into open places such as; drains and gutters, in that way choking the drainage and forming fertile grounds for insects like mosquitoes to breed on. Some critics attribute these negative attitudes to poverty. Understandably, improved incomes permit people to contribute and invest more in waste collection (Telfer, 2002) Without belittling the poor, however, one does not have to wait for income enhancement before evading the habits of littering or dumping waste indiscriminately, which have grave health consequences on the health of people and also the aesthetic values of the environment.

CONCEPTUAL FRAMEWORKS- "THE THEORY OF PLANNED BEHAVIOUR AND PRED'S BEHAVIOURAL MATRIX"

The Theory of Planned Behaviour

The nature and characteristics of people's behaviour, attitude and perception about solid waste, have a resonating influence on how they will eventually manage it. The Theory of Planned Behaviour, as postulated by Ajzen (2002) has been adopted as a guide in an attempt to describe inhabitants' perception and attitude towards solid waste management practice in Freetown. This theory provides a framework for studying human actions concerning certain belief systems (figure 1). Three theoretically independent prognosticators of human behaviour have been put forward, specifically; behavioural beliefs, normative beliefs and control beliefs (Ajzen, 2002). This theory has been successfully applied in many situations which are not limited to; waste management, travel mode, leisure choice, healthy eating, unprincipled behaviour, etc. This study focused on residents' behaviours in terms of attitude and perception of solid waste management practices.

Ajzen (2002) describes behavioural beliefs as those beliefs in which the likely consequences of the behaviour and the evaluations of these consequences are put into perspective. Whereas, normative beliefs talk about the normative expectations of others and enthusiasm to adapt to these expectations. Control beliefs, which comprise subjective norms and perception of behaviour, look at the presence of factors that may enable or hinder the performance of the behaviour. This framework is appropriate to this study as someone's perceptions and attitude are motivated by his or her knowledge, values, norms and beliefs system which someone may obtain in the absence of knowledge and experience.

A person's motivation to display a particular behaviour is a critical factor in the Theory of Planned Behaviour. According to Ajzen (2002), the more favourable the attitude and subjective norm, the greater the perceived behavioural control, the stronger should be a person's intent to engage in a given behaviour. Intents are, therefore acknowledged to be the instantaneous indication of behaviour. Therefore, to better describe the nature of human behaviour, consideration should be given to antecedents of attitudes, subjective norms, and supposed behavioural control, which in turn reckons for intents and actions. Since the Theory of Planned Behaviour however focuses exclusively on behaviour; overlooking other critical facets such as awareness and knowledge to influence a change, hence, Pred Behavioural Matrix Model plays a part in this study to fortify its lapses.

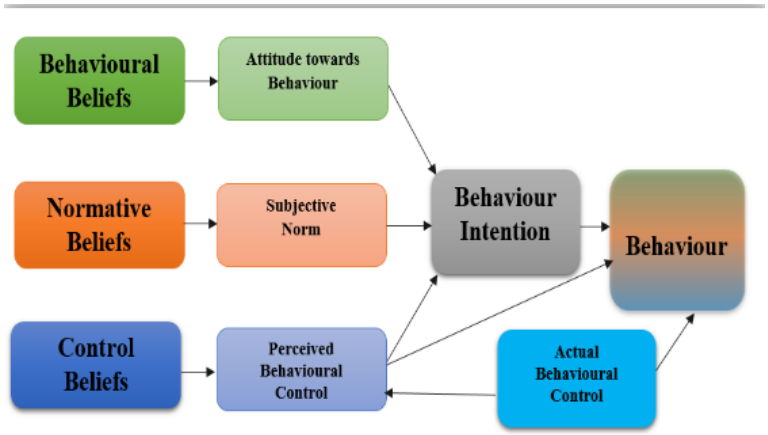

Figure1. *Theory of Planned Behaviour: Source: Ajzen (2002), slightly modified by the author of this research project*

Pred's Behavioural Matrix

Information includes an important constituent for relaying awareness and knowledge on which a good solid disposal practice can be enhanced and achieved. Thus, to evaluate the knowledge and attitudes of residents towards proper solid waste discarding, the Pred's (1967) Behavioural Matrix has been incorporated in this study (Figure 2). Pred hypothesizes that a decision-making state is a function of the quantity and quality of information available in a specific setting. Suffice to say, the willingness of people to exercise suitable solid waste disposal is contingent on the quantity and quality of information they have concerning appropriate waste disposal. For example, if people have poor quality information about solid waste disposal; such as waste is not detrimental or dirty environment and cannot make them get sick, inevitably they will practice inappropriate and unscientific waste disposal regardless of their educational status. In line with Fred's Behaviour Matrix, a strong nexus could be established between the poor and ineffective waste management practices in Freetown Central Zone and residents' perception and attitude towards solid waste. The reason being, residents have not been adequately informed about the perils of waste on the environment. This model further describes that some residents may make good use of the information based on the quality of information they have got (Bnn). Nevertheless, residents deprived of quality information may not be able to make a balanced decision (B11, B 12, and B13). Noted also in this model, others may not have sufficient information but would be able to make balanced decisions (B1n, B2n). At the same time, others may get ideal information but make unreasonable decisions (Bn1, Bn2, and Bn3). Rendering by Pred, amongst these groups are limitless blends of decision-makers built on the quality and quantity of information accessible to them. The model is beneficial in probing the quality and quantity of information accessible to people vis-à-vis solid waste disposal situation in their neighbourhood.

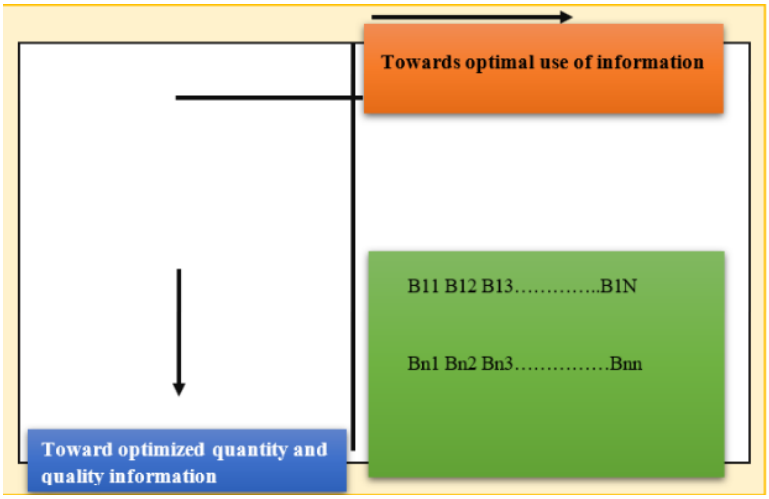

Figure2. *Fred's Behavioural Matrix (Fred, 1967), slightly modified by the author of this research project*

The current study used the Theory of Planned Behaviours mainly as a perception. Like behaviour, is susceptible by our knowledge, norms, beliefs system, and value. However, they can be developed without the experience and knowledge of the person involved. Therefore, the more knowledge residents have on the impacts of waste on health and sanitation, the more probable and richer their judgement is predisposed to be, and the stronger their emotional state of perception and attitude in managing the generated waste.

THE STATUS OF SOLID WASTE MANAGEMENT IN FREETOWN MUNICIPALITY

Municipality Solid waste management is the most persistent environmental problem confronted by the Western urban and rural settlement in Freetown. Sierra Leone's population is 7.8 million and that of the Freetown Metropolitan area is 1.2 million (World Population Prospects - Population Division - United Nations, 2019) and (World Bank Open Data | Data, 2020). Freetown is the largest producer of solid waste in Sierra Leone. Despite a host of policies and regulations, solid waste management in Freetown is taking alarming magnitudes during the past decade, and with each passing day. It is estimated that over 742 tons/day of garbage is created in the Freetown metropolitan area. Moreover, over 84% of the generated waste is biodegradable organic waste, which is mostly from residential and local vegetable markets. Manufacturing wastes comprise typically broken bottles, primarily from local brewery, waste cans, rags and plastic, minor amounts of hazardous wastes etc. These wastes are frequently unbagged and predisposed by the industry at each of the landfills at relatively no cost (World Development Report 2004 : Making services work for poor people - Overview, no date). From the daily waste generated in Freetown, only 30-35% is effectively collected and disposed of in approved dumpsites. Irresponsible and indiscriminate disposal of MSW (Sankoh, Yan and Conteh, 2012; Sankoh, Yan and Tran, 2013b) has contributed to the blockage of drainages and choking, and eventually flooding of streets during heavy rains. A majority of the wastes is produced by households, and in some cases by local Street traders which litter the immediate environs. Inappropriate and unscientific collection and disposal of MSW triggers environmental upheaval, as the city is presently not well equipped with provisions for the execution of integrated waste management Programmes (IWMP) across the constituencies and wards.

The Freetown Western Urban Metropolitan, despite being prototypical for other municipalities in Sierra Leone, managing its generated solid waste has always been a great task for the current wastes collecting agencies and municipal authorities. Thus, the absolute necessity to engage and encourage more services of private waste organizations to ameliorate the burden of waste collection and disposal. A major vital issue is the late collection of household solid waste across many difficult-to-access areas. Even in some easily accessible places, sometimes wastes are not picked until after a week or more Subsequently, the waste containers run-off and litters the backgrounds (figure 3). Another undesirable practice is to overload collection vehicles with waste to reduce the number of anticipated trips, this has demanded attention by environmental activists and has led to a wake-up call to prevail on the pertinent administration to follow contemporary waste transportation guidelines and ethics.

Figure3. *Waste materials on a major street in Freetown Central One not being collected on time*

Research hypothesis

The prime focus of SWM is to reduce and/ or eliminate adverse impressions of waste materials on human health and the environment, and to support the pillars of sustainability by incorporating circular

economic for development and superior quality of life. This should be done in the most resourceful method conceivable to save costs and avert waste build-up.

A hypothesis is a supposition or projected explanation that is promulgated by a researcher on the foundation of a certain indication from a starting point for more search. This research hypothesized the following for Analysis of Residents' Perceptions and Attitudes towards Municipal Solid Waste Management in Freetown Central Zone:

- There is a nexus between residents' "perception and attitude" and the extent to which solid waste can be effectively managed.
- The lifestyle of households and residents, demographic setting and perceived standardization can influence their perception, attitude, type of waste and quantity produced,
- There is a positive relation between imbalanced cultural brought-up and improper waste management practices, poor sanitation and poor health of people. That is, human health is related to indoor and outdoor environment activities.

2. METHODS AND MATERIALS

2.1. Location and Background to the Study

The geographic location of the study area, Freetown (figure 4) is the capital city of Sierra Leone, in West Africa. Freetown was founded on 11th March 1792 and is located on 8.48˚ N and 13.23˚ W with a total area of 357 square kilometres. It is situated along the Atlantic coast on a funnel-shaped igneous intrusion(Chalokwu, 2001; Callegaro *et al.*, 2017).

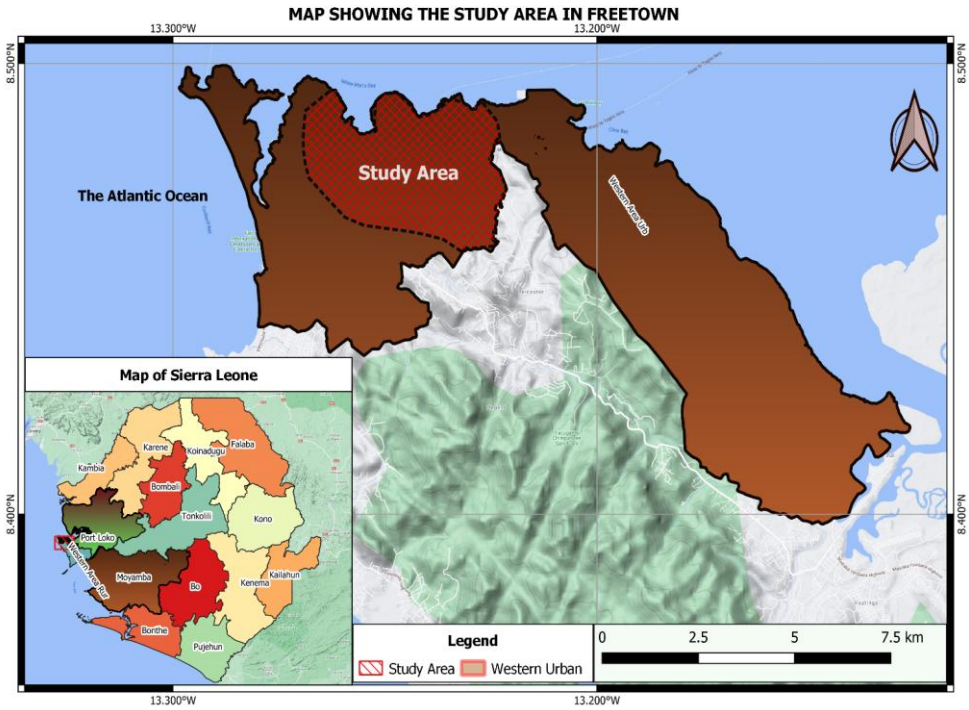

Figure4. *Location of the study area-Freetown Central Zone.*

Freetown lies approximately 47m above sea level, and it has a tropical climate. There is considerable rainfall in most months of the year. According to Peel, Finlayson and McMahon (2007), the classification subtype for this climate is "Am". (Tropical Monsoon Climate. The average temperature in Freetown is 26.2 °C | 79.2 °F. The average rainfall in Freetown is around 3657 mm per year. The warmest month, on middling, is April with an average temperature of 83.0°F (28.3°C). The coolest month on average in July, with an average temperature of 78.0°F (25.6°C

2.2. Research Design

Agbesinyale and Anoff 2010 describe a research design as a plan for conduction research that usually involves specifications of the required elements that need examination, and the procedure to be

employed. A research design helps to pursue relevant information and scrutinize the evidence of research and also assists to answer preliminary questions as decidedly as possible. This study essentially took on a cross-sectional descriptive survey design and employed both quantitative and qualitative research methods. The study was built on such a design because its quantification characteristic helps in consistent benchmarking. According to Bryman(2016), such a cross-sectional study generally lacks internal validity, and to address this concern the qualitative component was integrated into this study.

The qualitative data was used to enrich the descriptions from the quantitative data and thus build the picture of Freetown residents' perceptions and attitudes towards solid waste management practices. In a bid to identify characteristics, frequencies, trends, correlations, and categories, the chosen research design was meant to answer the; "what", "how", "when" and "where" questions rather than just the "why" question.

2.3. Sample Size Determination

Sample size determination is a significant step in any sample survey. Several mathematical formulas (Israel, 1992; Stephanie, 2003; Cochran, 2007) have been in use to determine the appropriate sample size for either a finite or an infinite population. For this study, to determine an appropriate sample size of households to participate, (Cochran, 2007) formula (equation 1and 2) was adopted to determine sample size (n) with the anticipated degree of precision for infinite population size.

$$\boldsymbol{n = \frac{z^2 PQ}{e^2}}$$

Equation 1 Cochran's infinite Sample Size (n) determination

$$\boldsymbol{n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}}}$$

Equation 2 Cochran's finite Sample Size (n) determination

Where:

n= sample size of household heads and respondents

Q= 1-P

P= Sample proportion (the most conservative value)

Z= Standardized normal variable and value that corresponds to 95% confidence interval equal to 1.96

e = Allowable/acceptable level of sampling error (margin of error typically 0.05% ± 5%);

N population size (p = 1,055,964 - based on the 2015 Population and Housing Census); and

P = population proportion (50%; i.e., 0.5 by default).

Besides, an understanding of the population characteristics is pivotal to effectively select the target population variables of the study area in terms of sample size and sample population. Based on the data obtained from Statistic Sierra Leone, the population of WU was 1,055,964 and had a mixed distribution pattern based on age groups (figures 5 and 6). The study area, Central One Zone had a population of 62499 with males to females' ratio of 51: 49 (Stat-SL, 2015).

As stated by many scholars such as Dilma and Wang et al., (2011; 2016), there is no absolute rule on the number of respondents in social surveys as it depends on the desirable margin of error and confidence. Different methods have been applied by scholars to maximize the response rate of the questionnaire, which include: phone conversations, online-based interviews, face-to-face interviews, and postal service (Yoo and Kwak, 2009) etc. In this study, the target population was surveyed through the use of an electronic questionnaire.

Since the target population is known (finite), using Cochran's mathematical relation for a finite population to determine the sample size is ideal. However, Cochran's infinite mathematical (for unknown population) relation was used for this project. The reason being, the variance between

computed output values for both the finite and infinite models are negligible and would have an insignificant impact on the correctness of the project's result (table1)

Table1. *Computation of Sample Size*

Input Variables	Desired values
Confidence Level	0.95
P(Population Proportion)	0.50
Margin of Error/confidence Interval	0.05
Population Size	62,499.00
Z-Score	1.96

Outputs Infinite and Finite Populations	
Sample Size (n) for an Infinite Population	384.16
Sample Size (n) for a finite Population	380.83

Was used preferred to the proposed sample size by Cochran, as the variance between the ideal and the preferred is scientifically and statistially insignificant

Ideal as per Cochran's sample size determination, but was chosen for the purpose of this project.

2.4. Target Population and Sampling Procedure

In this study, adult residents aged fifteen (15) years and above were targeted, as they were matured enough to make a rational decision about solid waste problems, and could answer questions relating to people's attitude and perception and on solid waste disposal in their communities. Freetown municipality consists of three main zones: East-End, Central and West-End Zone. The study area was stratified into low, middle- and high-income areas, based on the Statistics Sierra Leone Population and Housing(Stat-SL, 2015). East-End Zone; represents the low-income area, Central; a middle-income zone, and West-End, high-income area. Each of these zones is divided into constituencies, and the target population includes all the residents within Central Zone constituencies from which the sample population was taken. The central Zone was chosen because it is a middle-income zone with varied demographic characteristics.

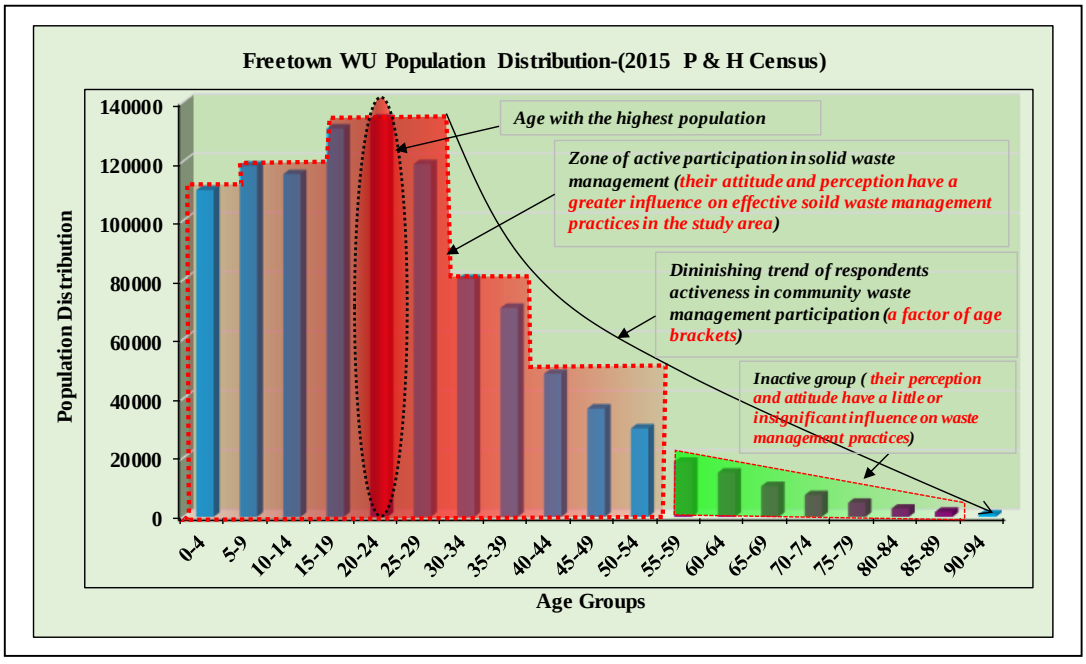

Figure5. *Freetown Urban population Age Distribution Pattern based on 2015 Population & Housing Census. The chart is done by the author of this project. Data Source: (Stats SL Final Summary Results, 2015)*

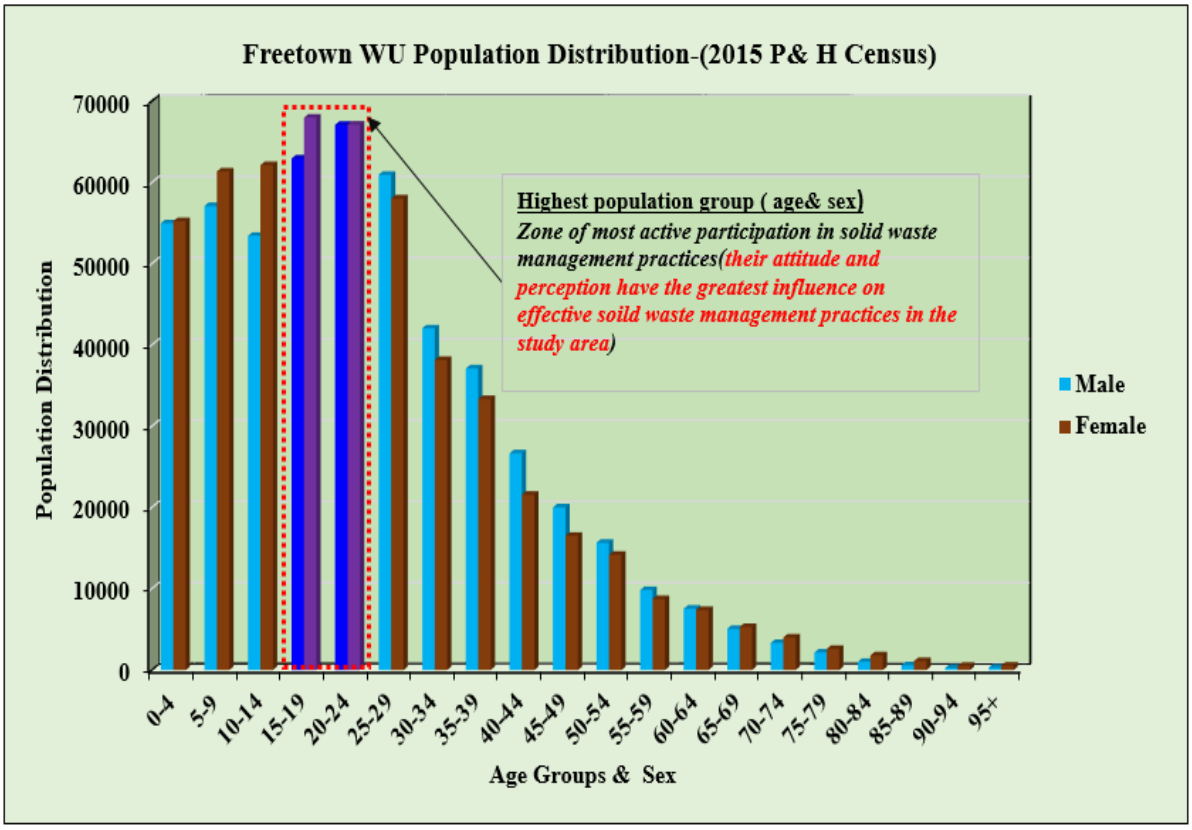

Figure6. *Freetown Urban population age and Sex Distribution pattern based on 2015 Population & Housing Census. The chart is done by the author of this project. Data Source: (Stats SL Final summary Results, 2015)*

2.5. Ethical consideration during data collection

An android-based application for data collection called Kobo Collect was employed to get first-hand primary data from respondents within the study area. Before every interview, a respondent would be asked whether he or she did not mind having him or her interview. For clarification reasons, the purpose of the interview was clearly explained that the information obtained from them would be utilized only for an academic research purpose. Over 72 % of the targeted population agreeably consented to do the interview

A comprehensive questionnaire was used to obtain information from respondents. In this study, both open and close-ended types of questions were asked. The questionnaire was divided into five constituents; ranging from demographic characteristics of respondents, residents' disposal practices to residents' attitudes and perception towards solid waste disposal. Owning to the multidimensional nature of disposal and collection of solid waste in the Central One Zone, the use of a detailed questionnaire enhanced the balances of getting more dependable data and curtailed the chances of prejudiced findings during the study.

3. RESULTS AND DISCUSSIONS

3.1. Demographic Attributes and Respondents Profile

Demographic factors comprise sex, age, educational level, and household size, length of stay in a community and monthly income of households. The target population size was 384. However, due to the COVID 19 pandemic, a number of the target residents had social distancing apprehension. As such, could not participate in the survey. A total of 285 electronic-questionnaires were administered, but only 273 were used for the final data analysis, the rest being rejected due to significant errors and discrepancies. The 273 participants constitute a 96% response rate of the administered electronic-questionnaires (figure 7) of the target population. This is fairly good and statistically accepted for such a cross-sectional survey.

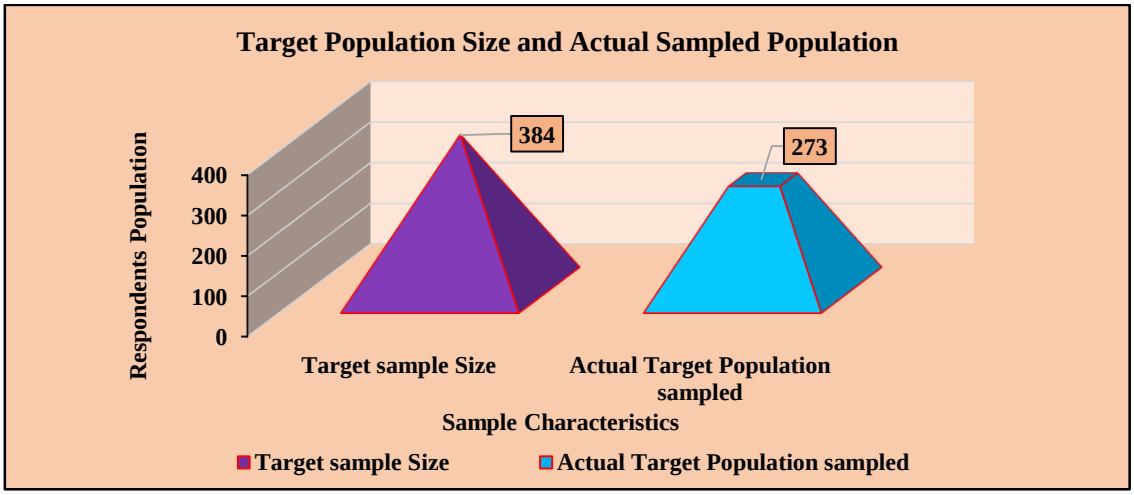

Figure7. *Target Population Size and Actual Population Surveyed. Source: Author's survey data 2021.*

The demographic profile indicates that there were more females (53%) than males (47%), and most of them fall within the age brackets of 26-35(29%), 15-25(24%) and 36-45(22%). In terms of employment, a number of the respondents have self-own businesses (42%). The statistics further show that 22% were unemployed, 15% and14% have private and government employment respectively. Regarding marital status, the majority were married (49%), those singled came second (39%), followed by widowed and separated. Less than 1% of the respondents fell within the divorced category. This study also involved respondents' education level. Close to 92% of the total respondents/residents attained at least a junior secondary school education (that is, a basic level education) which should give them a rudimentary awareness of the impacts of waste on the environment. Thus, should have a positive attitude and perception about waste management practices.

The implication of sex in this study can be considered in two forms; at a household and community levels. At the community level, since there are more females than males, it suggests that a majority of the female residents are either not willing to take part in odd jobs like community waste collection, scavenging, waste picking(***a negative attitude and perception oriented behaviour***) etc. or are not physically strong to undertake an environmentally challenging job (***a "normative belief" oriented***), or may not be permitted by their husbands to involve in waste collection jobs (***attitude and perception oriented behaviour which is encapsulated in the "control belief" system***). However, at the household level, sex has a significant relationship with the attitude and perception of solid waste management practices. The females feel more accountable and responsible for keeping their homes or compounds clean and healthy by properly disposing of solid wastes (***a positive attitude and perception***). As compared with the males, it is the other way round. So, at the household level, there is a perceived better attitude and perception about waste management, as waste is being managed comparatively better than at the community level (***a poor attitude and perception***). The study further reveals that the men who are supposedly responsible to manage solid waste at the community level are less than the women, and are inactive in waste management practice. This suggests that the men have developed a shifted attitude and perception of solid waste management to municipal authorities. Also, out of the total respondents, 79% were within the productive age bracket of 26-35 years that are in employment or self-own businesses. Also, 16% were within the non-energetic and inactive age bracket of 56-65 years (tables 2, 3; figures 8 and 9). Being in informal or formal employment or actively involved in one's own business may somewhat limit the person from communal-related works. This is also perception and attitude-driven.

Table2. *Composite Education Level of Respondents*

Composite Education Level of Respondents		
Level of Education	**Frequency**	**Percentage**
JSS to Master's Level	248	92
Never schooled	11	4
Primary	10	4
Total	**269**	**100**

Table3. *Respondents Education Level by Category*

Respondents Education Level by Category		
Education Level	**Frequency**	**Percentage**
Senior secondary	89	33
Bachelor's Degree	83	31
Vocational training	28	10
Junior secondary	22	8
Master's Degree	13	5
Others	13	5
Never schooled	11	4
Primary	10	4
Total	**269**	**100**

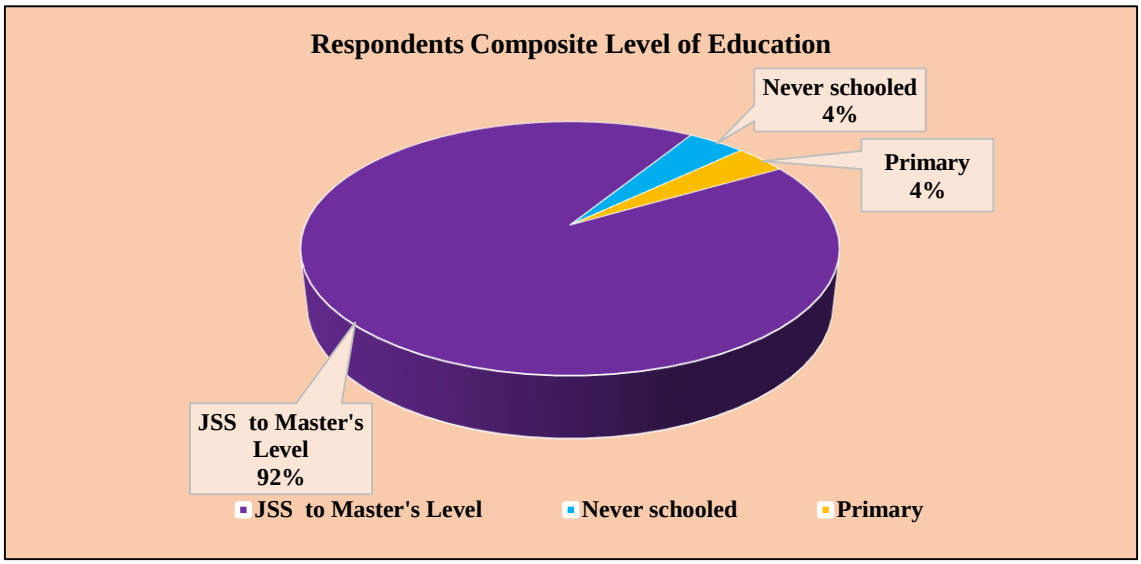

Figure8. *Respondents Composite Level of Education. Author's survey data 2021*

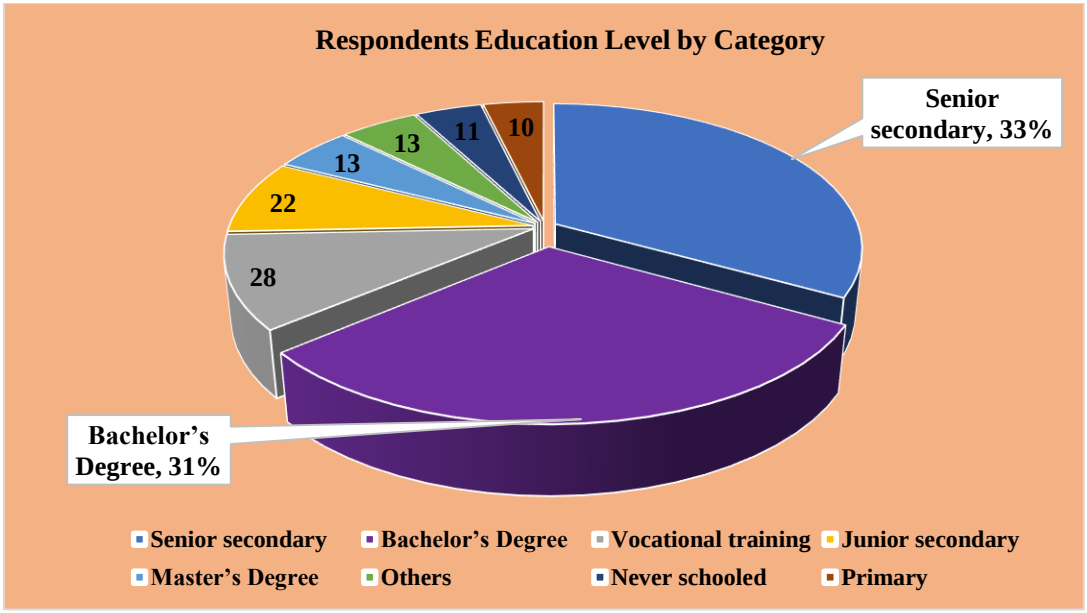

Figure9. *Respondents Education Level by Category. Author's survey data 2021. Author's survey data 2021*

3.2. Attitude and Perception of Residents to Solid Waste Management Services and Practices in Freetown

Residents are usually in households, which are the smallest units of the community in which a person or persons share a common housing apartment. Their attitude and perception have an enormous

influence on waste management practice. When the residents in households are fully thoughtful of their pertinent role in handling waste, it can change their responsive attitude and perception of waste management. Residents are the primary producers of waste right from the local setting in the kitchen, and then in the neighbourhoods. Therefore, at the household level, the responsiveness of sustainable ways of segregating and discarding the waste is very significant, because if that knowledge is put into daily practice, it saves a lot of time at the dumpsites. To draw empirical assertion about the participatory attitude and perception of residents in Freetown Central Zone toward solid waste management, several waste management questions were incorporated into the survey questionnaire. It shows from the survey results that 57% of the respondents have heard and/or know something about solid waste management. Moreover, 64% of the respondents claimed that FCC has never provided any form of education on proper waste disposal. This implies an institutional ineffectiveness of the FCC on solid waste management in the form of providing relevant waste management information (table 4 and figure 10).

Table4. *Two Knowledge-based questions and Answers on Solid Waste Management*

Key Question on SW	Questions	Response	Frequency	Percentage
Are you aware of what is known as solid waste management?	Question 1	Yes	155	57
		No	118	43
Have you ever been educated on proper solid waste disposal by the Freetown City council?	Question 2	Yes	97	36
		No	174	64

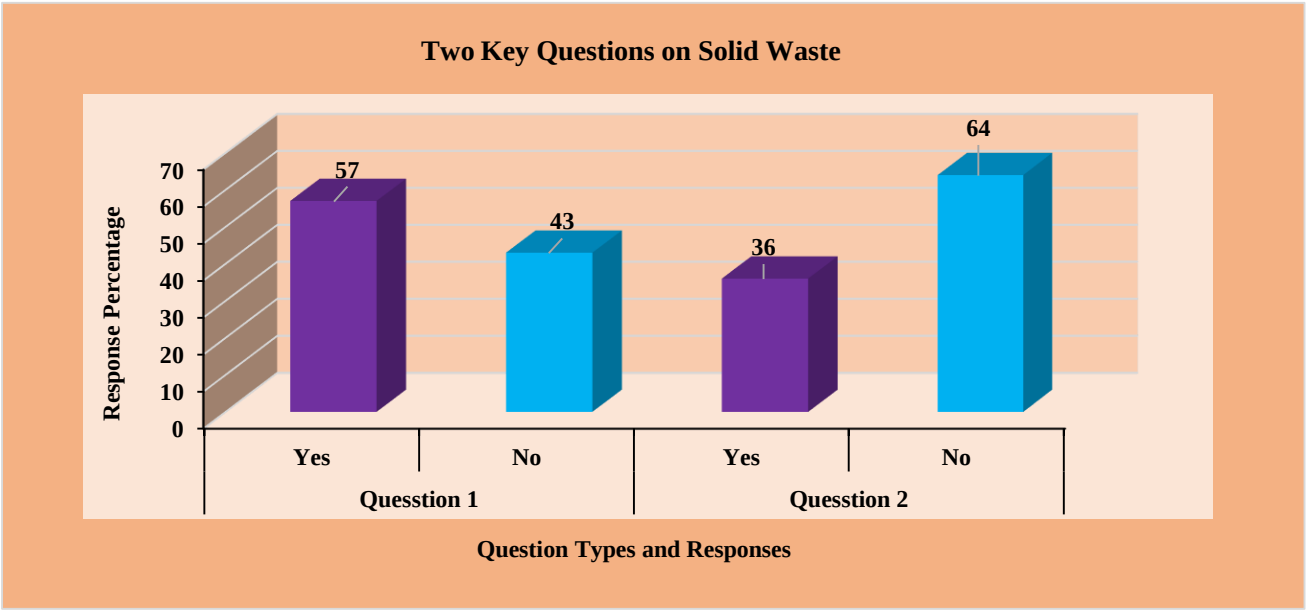

Figure10. *Two Knowledge-based Questions and Answers on Solid Waste Management. Source: Author's survey data 2021*

In this study, findings show that there has been an improvement in the knowledge of residents on solid waste management However, due to poor attitude and perception, putting the knowledge into practice constitutes the major drawback to effective waste management in the study area. It was further observed that sorting of the waste at the source level is a serious problem. Waste is not giving a bare minimum sorting before disposal, in this manner creating a colossal task at the dumpsites. This is a key problem concerning solid waste management in Freetown Central Zone. This was obvious from the bad state of the dumpsites that were scattered with waste not sorted out. Many households have been using self-provided containers that are often not adequate to temporarily store their generated waste materials. But worse still is that refuse is seen indiscriminately dispose of on the ground, thereby making it problematic for collection. Several respondents accredited this problem to the lack of separate bins/containers to put the garbage in, whereas others are too busy to separate the waste they produce. Consequently, they just dispose of waste haphazardly. This implies that that people are conscious of what to do with their waste after they accumulate it, but due to poor attitude and perception which is manifested in negligence, they do not ensure the proper disposal of their waste.

3.3. Access to public and private waste collection services and disposal utilities.

According to the interview conducted with respondents and households' heads, the private service waste collection is more effective and reliable than the public (municipality staff). From physical observations along major streets in Central One, there is an inadequate labour force for waste management. That is, street sweepers, municipality staff service workers for solid waste collection, transportation and disposal are inadequate, and this has resulted in an ineffective system of waste management.

The survey result reveals that the sorting of household solid waste at a source in the communities is less than 9%. The percentage of respondents and households that do not sort solid waste at source is 92 %. According to the respondent, there are no waste collection bins or plastics at the homes and community level to sort (figure 11). The 8% of respondents that manage to sort out their solid waste are those whose earning/income power can permit them to purchase the sorting plastics and bins.

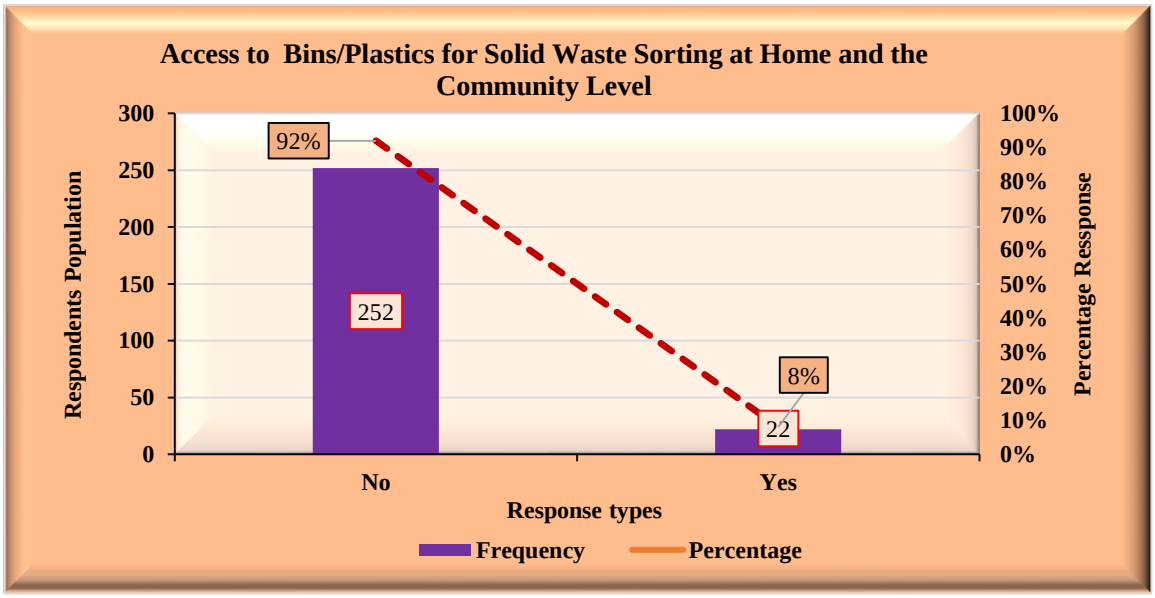

Figure11. *Respondents Access to Sorting Facilities at Household and Community Level Collection Services. Source: Author's survey data 2021*

4. Conclusion and Implications

This study was carried out to evaluate residents' perception and attitude toward solid waste management in the Freetown Central Zone using the "***Theories of Planned Behaviour and Pred's Behavioural Matrix"*** as my conceptual framework. By assessing the perceptions and attitudes of the residents on solid waste management, the perceived health implications of how waste is the disposal of in their community were unravelled. The study deployed an android-based electronic questionnaire to elicit information from households' heads and respondents.

Waste management in Freetown Central Zone remains one of the biggest challenges that the municipality administrators face due to the ever-increasing quantities of diverse material streams, and consumable products which become more and more compounded and varied with economic and demographic growth. It is exceptionally acknowledged that the current solid waste management practice in Freetown Central Zone is ineffective concerning coverage and sanitary treatment of the waste. The solid waste collection service is very low; which implies, majority of the solid waste generated is either disposed of in an uncontrolled or illegal manner. Physical observations in some of the major streets reveal that waste is being indiscriminately deposited in open yards, along the roadsides, open manholes, paved and unpaved gullies.

The initial hypotheses for Analysis of Residents' Perceptions and Attitudes towards Municipal Solid Waste Management in the Freetown Central Zone were:

- There is a nexus between residents' "perception and attitude" and the extent to which solid waste can be effectively managed.

- The lifestyle of households and residents, demographic setting and perceived standardization can influence their perception, attitude, type of waste and quantity produced,
- There is a positive relation between imbalanced cultural brought-up and improper waste management practices, poor sanitation and poor health of people. That is, human health is related to the indoor and outdoor environment,

The findings and analyses of the results from this study have adequately substantiated the claims of the hypotheses, and the main aim of this study on the foundation of the undermentioned conclusions:

Results from the study, as analyzed above in the result and discussion section revealed that a majority of the residents in Freetown Central Zone have a poor perception and attitude towards solid waste management practices. These discovered facts substantiate the assertions of the initial hypotheses promulgated in this study. Public environmental awareness which is lacking in the study area is one of the most important integral indicators for enhancing an improved perception and attitude of the residents and participation in municipal solid waste management. This reflects many features and pointers in the theoretical framework used in this project (**Theories of Planned Behaviour and Pred's Behavioural Matri).** That is, the residents' behavioural beliefs, normative belief and control belief have shaped their knowledge, consideration, perception and attitude towards the existing waste management practices in their communities. This information is useful for policymakers, environmentalists, academics, waste management actors and entrepreneurs in planning for an environment that will be environmentally effective to handle generated waste. Conversely, respondents articulated the opinion that the Freetown City Council, Environmental Protection Agency, manufacturers and individuals should share the responsibility of ensuring appropriate disposal of waste. Similarly, the majority of respondents expect the FCC and constituencies' chancellors to provide free trash cans/moveable dustbins for them in their homes. This may explain why some residents in the Freetown Central Zone had practiced, and continue to practice improper solid waste management. However, some of the respondents did agree that it is a bad practice to litter around when there is no dustbin either at the community or household level. Very nearly, all the respondents irrespective of their constituencies agreed that indiscriminately discarding waste possess a danger to human health and renders the environment aesthetically appalling.

Moreover, the gap between the amount of waste generated and that of waste collected is yet another issue that cannot be overlooked. It was noted that the Freetown Central Zone waste management authorities and other solid waste management actors have not been able to effectively collect more than 45% of the overall waste generated in the Freetown Central Zone. A prompting question could be where does the remaining percentage of the uncollected waste seat in the waste management hierarchy? The author of this dissertation strongly believes that it all what is left haphazardly scattered on roadsides and open yards, unfinished buildings, on-street, gullies etc. This fact is not unconnected to the rapid population growth, perception and attitudinal behaviour of residents in the study area.

RECOMMENDATION

The findings deliberated in this study do not constitute a finite or predictable set of issues that have an all-inclusive influence on the attitude and perception of residents in the management of solid waste in the study area. However, due to the limited scope of the study, other probable causes which could not be merged in the analysis of the findings may be attempted in detail in further researches with similar objectives. It was found that the extra commitment of the municipality authorities and government is vital for enhancing an improved and proper solid waste management system in the Freetown Central O Zone. Even though an overnight change and enhancement in the current waste management practices cannot be guaranteed, or projected without more financial commitments, the existing situation can be enhanced upon if there is sufficient behavioural and attitudinal change by the community residents in the study area.

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