Global Scientific JOURNALS

AN EMPIRICAL STUDY OF SOLID WASTE COLLECTION AND MANAGEMENT SYSTEMS IN PUBLIC HOUSING ESTATES IN LAGOS METROPOLIS

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Abstract

Domestic solid waste collection management has become a global concern in ensuring sustainable communities, it has the greatest importance and impact on the environment or the general public's health. The growing population consequent of urbanization has varying effects on domestic solid waste generation and if it is not well managed the residents' well-being is endangered. This study aims at embarking on an empirical study on domestic solid waste collection and management systems in public housing estates to discover strategies for effective solid waste management. A mixed approach research method that involves a systematic review of literature shall be done considering journal articles, conference papers and primary data collected using a structured questionnaire randomly administered to the residents of selected public housing estates in Lagos metropolis. Recommendations shall suggest viable strategies for domestic solid waste collection for more effective solid waste management within the selected public housing estates.

Keywords: Public Housing estates, Solid waste collection, Waste management,

1.0 Introduction.

Domestic solid waste (DSW) collection management has become a global concern in ensuring sustainable communities (Ikhlayel, 2018), it is said to have the greatest importance and impact on the environment or the general public's health (Lami et al., 2019; Wijekoon et al., 2022). Many of the progressive nations of the world are acutely aware of the imminent danger posed by the mounting waste and waste pollution. Several nations, cities and even corporate houses

including private and public housing providers have initiated measures to manage waste in a sustainably state is no exception, a number of initial several been taken to ensure effective management of waste generated within its jurisdiction and discharged into its environment from various sources.

The growing population consequent of urbanization has varying effects on domestic solid waste generation and if it is not well managed the residents' well-being is endangered (Olawoye et al., 2019). Islam et al., (2010) opined that the collection of municipal solid waste is the element that is most crucial and has the most effects on the environment or the general public's health and this is supported by Dehghani et al.,(2021). Domestic solid waste (household waste) is generally defined as waste generated by normal household activities, and this waste collection stems vary throughout the world, from no organized collection at all (Ibáñez-Forés et al., 2018; Sharma et al., 2020), to the collection of well-organized collection systems. Household waste collection can be divided into collection close to properties and collection at drop-off points (bring systems) (Adeyemo, 2019). Lisa, (2019) described domestic solid waste collection to include the initial storage of waste at the household, shop, or business premises, the loading, unloading, and transfer of waste, and all stages of transporting the waste until it reaches its final destination this is also in agreement with other researchers (Coker et al., 2016; Onuminya & Nze, 2017; Shahmoradi, 2013). Solid waste management is often misunderstood to mean recycling, whereas solid waste collection and transportation is the largest drain on municipal finances and the biggest influence on urban life ((EPA), 2020). This study aims to embark on an empirical study on domestic solid waste collection and management systems in public housing estates to discover strategies for effective solid waste management.

i.   Identify the existing waste collection systems (methods) in a public housing estate in the Lagos metropolis.

ii. Examine the types of domestic solid waste collection in the study area.

iii. Investigate existing management systems evaluating the relationship between waste disposal and waste collection frequencies in public housing estates in Lagos metropolis

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2.0 Literature Review

2.1 Solid waste definitions

Waste is a byproduct of many various kinds of operations, including residential, industrial, construction, medical, and agricultural. According to Amasuomo and Baird (2016), the phrase

often refers to products made by human activity and is understood to have an impact on aesthetics, health, and the environment. Since two types of waste cannot be managed in the same way, the type influences the management approach. The degree of risks that each type poses to both people and the environment, if not appropriately controlled, determines the complexity of its administration. According to Kaza et al. (2018), the global waste generation is projected to more than double by 2050, significantly outpacing population growth. Cities with increased economic activity have huge amounts of waste, including hazardous and toxic waste (*Mushtaq Ahemd MEMON*) as the high degree of urbanization in African countries implies a rapid accumulation of waste (Yoada et al., 2014). The daily increase of waste has resulted in a concerted effort towards proper management to reduce human and environmental exposure to disaster.

2.2 Solid waste collection system

Domestic Solid waste (Household waste) collection systems vary throughout the world, from no organized collection (Amasuomo et al., 2016 ; Mihai et al., 2019), to the collection of ten separated recyclable materials at the doorstep in multi-compartment vehicles (Dahlén et al., 2007). Household waste collection can be divided into property-close (curbside) collection and collection at drop-off points (bring systems). Containers with different sizes and shapes are used at drop-off points. In property-close collection, combinations of bins, racks, sacks and bags are used, which are sometimes placed outdoors, sometimes indoors. Source-sorted materials can be collected completely separated or commingled. Commingled collection can be designed either for manual or mechanical sorting at so-called material recovery facilities (MRFs).

Plate 1: Showing waste collection method

Plate 2 : Showing a typical collection vehicle.

When domestic solid waste is not collected household resolve to informal waste operators for waste collection after the initial storage, destination the DSW collected could not be determined (indiscriminate dumping cannot be ruled out).

2.3 Solid waste type generated in typical housing neighborhood

Domestic solid waste are generated in every household and the volume of waste generated is affected by various factors such as income, household size, exposure and seasonal variations. This waste can be classified as food waste, paper waste, clothing waste, garden waste and electronic waste. The size of the household will determine the volume of waste generated at a given time.

2.4 Solid Waste management system

Bacinschi et al. (2010) defined waste management as the collection, transportation, treatment, recycling, disposal, and control of waste materials. It is also known by the terms minimization, reuse, prevention, recycling, recovery, and disposal (Bacinschi et al., 2010). According to UN-HABITAT, the capacity of many local authorities to provide effective waste management services has been strained in recent decades due to rapid urbanization, low levels of revenue collection, and competing needs. As a result, the range of services offered and their quality have gradually decrease (Coffey et al., 2010). Millions of people live in developing countries without waste management system, with widespread landfills in water bodies and uncontrolled landfills (Folorunsho, 2016) which is common with domestic solid waste. Some scholars have considered

the management of DSW from a hierarchical perspective including the reduction strategy of DSW, reuse strategy and the recycling strategy for DSW (Kabirifar et al., 2020).

2.5   Public Housing estates in Lagos

Man requires certain basic needs for his survival out of which shelter (housing) is one. Housing estate provision can be categorized into two types based on the provider as Public and Private housing estates(Opoko & Oluwatayo, 2014). While the private housing estate are provided by individuals and or a group of individuals public housing estates are provided by the government. Public housing estates are becoming the new normal in cities around the world, with a crisis in affordable housing growing by the day in Lagos and other Nigerian cities. Intervention by the government (Federal and State) in housing provision has been on the increase. In Lagos State, public housing estate delivery is within the purview of three governmental agencies; New Town Development Authority (NTDA), Lagos State Development Property Corporation (LSDPC), and Ministry of works and Housing provider of (LAGOSHOM).However, efforts by the Federal Government of Nigeria gave rise to several schemes of low-cost housing for middle-income earners at different section and location within the state. This housing provisions were more than just real estate development rather they represent collaborative efforts between government agencies and private enterprise to uplift people's lives.

Plate 3: Showing a view of LKJ Gardens Igando.

3.0 Method and procedure

A mixed approach that involves an empirical review of literature were used in considering journal articles, and conference papers, along with a quantitative random sampling technique using structured questionnaire to gather primary data from the residents of the public housing

estate in Lagos metropolis. Respondent were chosen to represent household head provided he or she is above the voting age (18years). Lateef Kayode Jakande Gardens (LKJ Gardens) at Igando was randomly chosen as a pilot study, it was designed to accommodate the middle income earners. The result were analysed using descriptive statistics: frequencies, percentages, mean, correlation and regression analysis were carried out to test relationships between values. Graphs and charts were used to further illustrate the results.

4.0 Findings and Results

This study was embarked on with three distinctive objectives on domestic solid waste collection and management systems in selected public housing estate in Lagos metropolis to identify the existing waste collection systems (methods) in a public housing estate, examine the types of domestic solid waste collection and to evaluate the relationship between frequency of waste collection and waste disposal in the study area. 55 household respondents were received and analysed, from the demographic characteristics of the respondents' age category 31-40 and 41-50 forms the majority with frequency 28 and 19 representing 50.9% and 34.5% of the entire population respectively. Respondents between age 21-30 were 6 in number representing 10.9% of the population while below 20 (between18-20) years and 51-Above had 1 respondent each representing 1.8%. Measuring the level of education, 53 respondents out of 55 had tertiary education qualification representing 96.4% of the study population while the remaining 2 respondents were shared between primary and secondary school qualification equally.

Table 1: Showing demographic characteristics of the respondents

Age

	Frequency	Percentage	Valid percentage	Cumulative. %
Below 20	1	1.8	1.8	1.8
21-30	6	10.9	10.9	12.7
31-40	28	50.9	50.9	63.6
41-50	19	34.5	34.5	98.2
51-Above	1	1.8	1.8	100.0
Total	55	100.0	100.0	
Education				
Primary	1	1.8	1.8	1.8
Secondary	1	1.8	1.8	3.6
Tertiary	53	96.4	96.4	100.0
Total	55	100.0	100.0	

Income

Below 50,000	1	1.8	1.8	1.8
51,000-100,000	1	1.8	1.8	3.6
101,000-150,000	39	70.9	70.9	74.5
151,000-200,000	14	25.5	25.5	100.0
Total	55	100.0	100.0	

Source: Authors field survey 2022.

The income level characteristics shows that 1 respondent have an income that is below 50,000naira and another respondent with income range between 51,000-100,000 naira both shared 3.6% of the study population whereas 70.9% have income range between 101,000-150,000 and the remaining 25.5% are for respondents with 151,000-200,000 naira income range. Figure 1 shows the graphical representation of the income level with a standard deviation .47 and mean of 3.24 for a population 55 respondents.
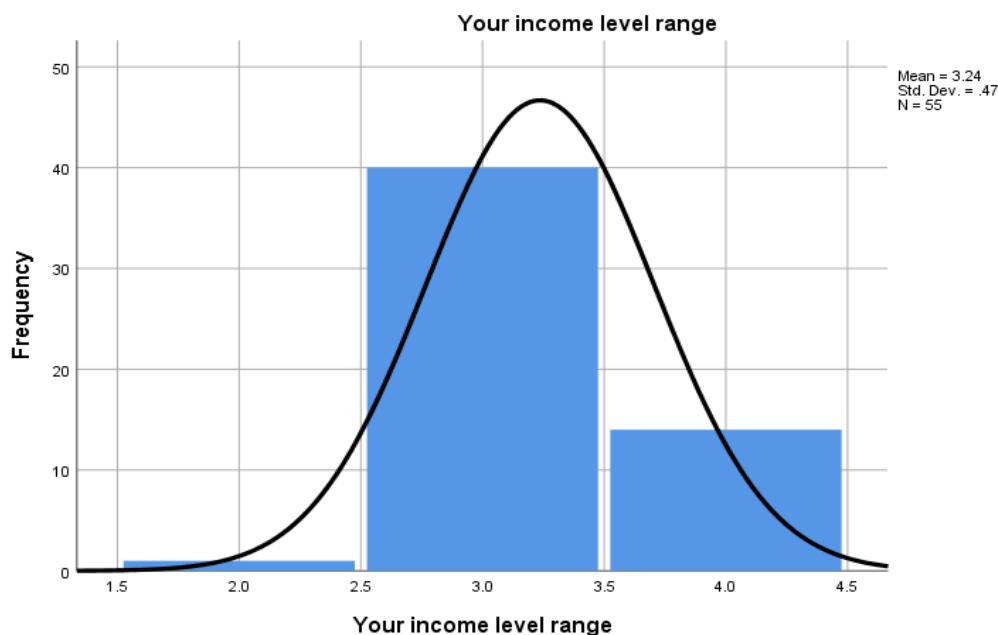

Figure 1: Showing income level range

From objective1 which identified waste collection systems (methods) in a public housing estate in the Lagos metropolis. The waste collection operation system in the study area shows that 1.8% engage in burying of their waste, 10.9% dump their waste by themselves to the dump site, while 50.9% of the waste are collected from door to door leave 34.5% to waste operators and finally 1.8% are left to the informal sectors. In other words about 14.5% of the total waste are not collected by organised sector therefore issues of uncollected waste can be envisaged.

Table 2: Waste collection methods

	Frequency	Percent	Valid Percent	Cumulative Percent
Burying	1	1.8	1.8	1.8
Dump site Collection	6	10.9	10.9	12.7
Door to door collect.	28	50.9	50.9	63.6
Waste operators	19	34.5	34.5	98.2
Informal collectors	1	1.8	1.8	100.0
Total	55	100.0	100.0	

From the second objective examining the characteristics/types of domestic solid waste generated and collected as shown in table 2, result showed that food waste generated and collected from household forms 98.2% of the sampled population, 85.5% agree to the fact that plastic waste collection is next to food waste. From respondents 69.1% generate garden waste while the remaining 30.9% does not generate garden waste. It is however, noted that 29 respondents (52.7%) generate clothing waste while 26 respondents (47.3%) does not generate clothing waste this result is almost similar to electronic waste generated.

Table 3: Showing type of waste generated for collection

Generate food waste

		Frequency	Percentage	Valid percentage	Cumulative. %
Valid	1	54	98.2	98.2	98.2
	2	1	1.8	1.8	100.0
	Total	55	100.0	100.0	

Generate plastic waste

		Frequency	Percentage	Valid percentage	Cumulative. %
Valid	1	47	85.5	85.5	85.5
	2	8	14.5	14.5	100.0
	Total	55	100.0	100.0	

Generate garden waste

		Frequency	Percentage	Valid percentage	Cumulative. %
Valid	1	38	69.1	69.1	69.1
	2	17	30.9	30.9	100.0
	Total	55	100.0	100.0	

Generate clothing waste

		Frequency	Percentage	Valid percentage	Cumulative. %
Valid	1	29	52.7	52.7	52.7
	2	26	47.3	47.3	100.0
	Total	55	100.0	100.0	

Generate electronic waste

		Frequency	Percentage	Valid percentage	Cumulative. %
Valid	1	28	50.9	51.9	51.9
	2	26	47.3	48.1	100.0

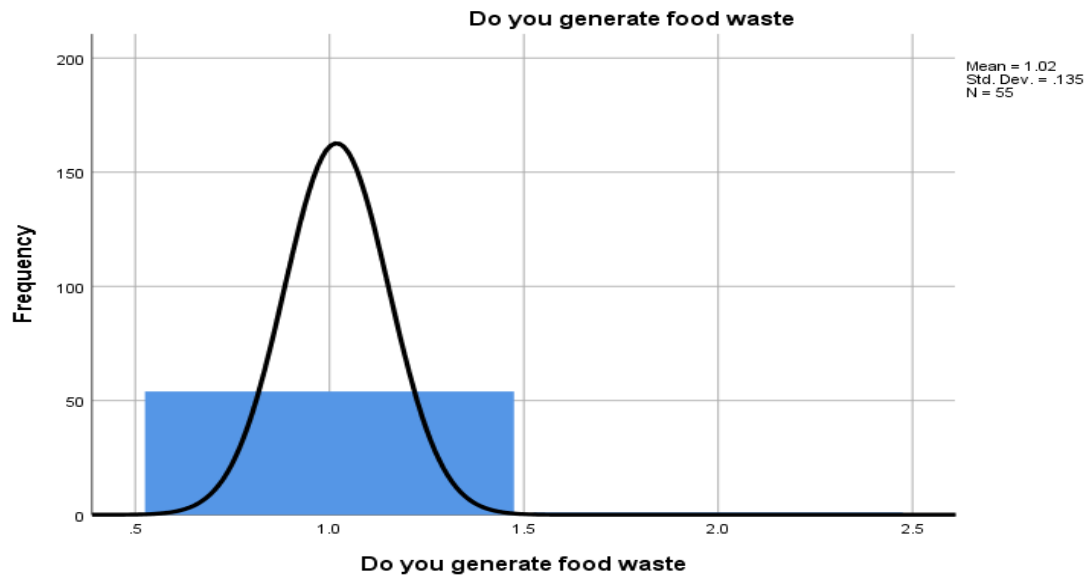|				
Total	54	98.2	100.0	
Missing System	1	1.8		
Total	55	100.0		

Source: Authors field survey 2022

Figure 2: Showing the generation of food waste

Existing waste management systems in public housing estates in Lagos metropolis
Waste collection method from the study area showed that 1.8% engage in burning as a means of disposing uncollected waste, uncollected waste from the study area amount to 18.2% representing 10 respondents while 34.5% (19 respondents) said waste collection is by door to door method, while 36.4% (20respondents) are collection by waste operators finally, 9.1% (5respondents) are engaging in composting waste materials.

Table 4: Showing waste collection and disposal method
 Waste collection method

		Frequency	Percent	Valid Percent	Cumulative %
Valid	Burning	1	1.8	1.8	1.8
	Uncollected waste	10	18.2	18.2	20.0
	Door to door	19	34.5	34.5	54.5
	Composting	5	9.1	9.1	63.6
	Collection by waste operators	20	36.4	36.4	100.0
	Total	55	100.0	100.0	

Waste disposal method

Valid	Burning	2	3.6	3.6	3.6

Uncollected waste	11	20.0	20.0	23.6
Dropped to waste operators	42	76.4	76.4	100.0
Total	55	100.0	100.0	

Waste disposal method 3.6% favored burning, 20.0% of the waste generated are uncollected while 76.4% are disposed through waste operators as it is shown in table 4.

In evaluating the relationship between frequency of waste disposal and frequency waste collection in response to objective 3, for the Pearson correlation show a significant relationship between frequencies of waste collection as .284 to frequency of waste disposal. The relationship is significant at 0.284>0.05 as shown in Table 5.

Table 5: Showing the relationship between frequency of disposal and collection

Correlations

		Collection frequency	Disposal Frequency
How is the frequency of collection	Pearson Correlation	1	
How often is your waste disposal	Pearson Correlation	.284[*]	1
	Sig. (2-tailed)	.036	
	N	55	55

*. Correlation is significant at the 0.05 level (2-tailed).

Conclusion and Recommendation

Based on the findings, the study came to three conclusions, firstly it was discovered that waste collection systems (methods) in the study area is mainly by waste collector operations which consists of door to door collectors and waste managers, other waste were left in the hands of informal collectors and individual household discretion who either bury the waste or dump into the nearby dumping site and this can easily be regarded as uncollected waste. Secondly, household waste constitute majorly the food waste and plastic waste, other forms of wastes are seldom generated, therefore collection is require when they are generated whereas food and plastic waste are constantly been generated. Lastly the frequency of waste collection and waste disposal are significantly related therefore waste should collected as soon as they are generated so that issues of uncollected waste will not litter the community. This study recommends that food waste and plastic waste be given priority in waste management system and policy to reduce food and plastic waste should be made and implemented. Also the frequency of collection should be increased with respect to number of households and income level while residents be encouraged to separate their waste for the source to facilitate easy collection.

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