



STRATEGIES AND PUBLIC PARTICIPATION IN SOLID WASTE MANAGEMENT IN PORT LOKO CITY

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ABSTRACT

To create a framework for long-term, sustainable solid waste management, this paper examines the Port Loko municipality's solid waste management plan and public involvement. It sets out: to examine the waste management tactics employed by the Port Loko City Council; to evaluate the methods used for solid waste management transportation; to investigate whether dustbins are available for collecting solid waste throughout the city; to determine whether land fill is available; to evaluate the degree of public involvement in the procedures related to solid waste management; to create a framework for long-term, sustainable solid waste management.

The primary means of addressing the objectives was by means of semi-structured interviews and discussions with diverse stakeholders and members of the municipality's community. The current solid waste management system was examined in the study, along with input from the general public, to determine its advantages and disadvantages. It was found that Port Loko City's current solid waste management system is not sustainable. The separation of waste is not provided for. Waste is not being collected or transported in an appropriate or sufficient manner.

Officially, recycling and composting of waste are not permitted. People are not involved in the decision-making process regarding solid waste because the majority of the waste is disposed of in open landfills.

Additionally, the study examined the recently suggested solid waste management system. It was discovered that the recently suggested system, which includes a framework for a two-stream waste segregation system, is superior to the current system. The current waste collection and transportation system is not as good as the proposed one. A key component of the plan is the composting of biodegradable waste. But to create a solid waste management system that is sustainable, important issues were left out of the proposed system.

INTRODUCTION

The issue of solid waste management affects both urban and rural areas. Every individual contributes to this issue by having the potential to produce waste. Producing waste is one thing, but the kind of waste produced is another, and managing or disposing of the waste is a whole other story. It is well known that the rate at which solid waste is produced outpaces the ability to handle it in an environmentally responsible manner. Waste is produced by a variety of industries, including commercial, industrial, and households. Often, local governments or administrative bodies oversee managing the waste.

There is growing agreement that in order to address this issue, which has serious consequences for the environment and public health, the immediate stakeholders in the solid waste problem—that is, the waste generators, or residents in this case—must work together with the authorities. In Sierra Leone, as in many other countries, solid waste management is a major source of concern. African countries, Davidson, Gary (2011).

Waste is defined as any product—liquid, gaseous, solid, or a combination of the above—that is undesired or unnecessary for individuals, businesses, or organizations, according to the Environmental Protection Agency (EPA) (2008) in the context of waste management in Sierra Leone. Municipal solid waste management (MSWM) is the process of managing solid waste,

including its generation, collection, transportation, recovery, and disposal in the most appropriate and appropriate way possible. It combines technology and policy to protect the environment, public health, socioeconomic values, and aesthetics. (Daskalopoulos et al., 2009)

The rapid population and economic growth in developing nations during the past few decades has led to an increase in the consumption of natural resources and, in certain places, a significant amount of waste generation. And as a result of inadequate human and financial resources to address the issue, inappropriate waste disposal has emerged as a problem throughout Africa, most notably in Sierra Leone. Due to a lack of infrastructure and awareness, between 20 and 80 percent of the solid waste in African cities is disposed of by dumping in open areas, waterways, and surface drains. Appropriate disposal of municipal waste is necessary to protect human health, the environment, and natural resource preservation. (UNEP, 2012).

LITERATURE REVIEW

Waste Management Strategies

Waste prevention, recycling (including composting), and combustion are the three primary elements of an integrated municipal waste management strategy, according to the United States Environmental Protection Agency (USEPA) (2013, 2014). These elements led to the classification of five primary activities under integrated solid waste management (waste



prevention, recycling, composting, combustion, and land filling) in a hierarchy. It is evident that the earlier components and the later activities under classification are similar.

In order to lessen the quantity and/or toxicity of discarded waste, waste prevention—also referred to as source reduction—occurs during the design, manufacture, procurement, or use of materials and products. Waste prevention, which is simply defined as "reducing waste by not producing it," is the recommended method for managing solid waste in municipal settings because it lessens the quantity of waste that needs to be managed by the community (Mackanness, 2015). Because of the many benefits that source reduction offers—including reuse activities and the recognition that it is a commonsense approach with significant potential to use resources efficiently, save money, and reduce waste—the Makeni and Bo city councils, in collaboration with Welt Hunger Hilfe, have been taking an increasingly creative approach to solid waste prevention.

Public Participation

Communities are still frequently ignored, even in local decision-making processes, and are viewed as passive recipients of government services in many parts of the world (Tadesse, 2016). In the end, this method leaves people unaware of their potential contributions to the process. Therefore, involvement may be the ingredient lacking in a recipe for improved solid waste management when there are multiple waste management and disposal techniques in place. Public participation has been the focus of extensive research, even in the areas of recycling behavior. (Barr, 2014).

According to research, there is a shortage of landfill space nowadays, but for aesthetic, health, and environmental reasons, communities are also less likely to accept the placement of landfills close to where they live (Barr, 2014). The involvement of the public in solid waste management decisions and practices becomes inevitable as the use of autocratic waste management techniques may no longer be feasible.

According to Read et al. (2008), waste reduction is being promoted by local governments as a more effective method of handling solid waste. Bekin, Carrigan, and Szmigin make the case in their study on waste reduction that it is a more environmentally friendly and involved method of addressing the solid waste issue.

They discovered that there was less production of solid waste in communities that produced some consumables (fruits and vegetables) (Bekin et al., 2017). However, they discovered that these communities had mechanisms in place to guarantee that people understood the necessity of taking intentional steps to address waste from the perspective of sustainable development.

The community members actively participated in recognizing the value of teamwork and, consequently, came to an agreement on such projects. Thus, it makes sense that Read et al. suggested that, despite financial limitations, waste minimization be embraced by both the public and private sectors as a worthwhile endeavor in which to invest for waste management (Read et al., 2008).

The public's involvement in waste management, and specifically in solid waste management, has become essential and can take many forms. In order to address the waste problem, Tsai (2017) claims that a cooperative society offers a chance for "creativity and innovation." Tsai's observation highlights the significance of the public's willingness to collaborate on waste-related issues. It takes mutual comprehension and consensus for members of the public to cooperate. When unity is attained, it creates an environment that is conducive to the emergence of innovative approaches to managing waste in a way that is both sustainable and agreeable. As a result, the public now has an obligation to cooperate in solid waste management, among other

Transportation

In addition to collecting recyclables and solid waste, the functional aspect of collection also involves moving these materials to the site where the collection vehicle is emptied after collection. Wastes from secondary locations must be collected by the appropriate city authority, who must then transport them in trucks or motor vehicles and dispose of them in the approved landfill outside of the city. NGOs and CBOs do, however, gather waste from bin locations and dispose of it in skips. Typically, collection vehicles include tipping trucks (container carriers), normal trucks, open trucks, dump trucks, and tractors.

Availability of Dustbins

Waste is collected in most areas using large (15 m³) containers that are picked up and emptied by Waste Management Units (WMU). In some locations, smaller containers have been positioned and emptied by the WMU at the disposal site; in other locations, the tractor-trailer system is employed. In both systems, it is typically necessary for households, businesses, and institutions to transport their waste to designated containers. The Waste Management Unit (WMU) is not only in charge of collecting waste; it also has to enforce waste management regulations so that all waste generators pay for the services rendered and use the containers or tractor-trailers as part of the waste management system. Sichaaza (2008).

Land Fielding

This offers a safer substitute for the careless disposal of solid waste. It is obvious that improper waste management can endanger both human health and the environment, which is why it is necessary to establish special locations, or landfills, to handle waste that cannot be recycled or composted. "Containers shatter, releasing their contents. Rainwater and liquids dumped in the landfill mix and seep through the trash. They could wash with soluble hazardous materials, creating leachate. Leachates will either percolate through the soil until they reach an impermeable layer or flow downhill over surface land. Both surface and groundwater can become contaminated by leachates. (2017) Bernard et al.

A standard landfill is designed in a way that it can protect ground water from contamination, and also avoids fires that would break out as a result of methane emission. Bernard (2017)



Gaps in the Research

Specifically in Port Loko city, in a developing nation like Sierra Leone, the challenges surrounding solid waste management are extremely challenging to handle. Lack of infrastructure and funding to handle solid waste creates a vicious cycle whereby low-quality service delivery results in fewer people being willing to pay for those services, which further depletes the resource base, and so on. The issue is made even more difficult by the city's and population's rapid urbanization and growth, which significantly increase waste production and the need for waste retrieval services in urban areas.

METHODOLOGY

Study Population

The study was carried out in Port Loko, the capital and headquarters of the recently formed North/West Region, which is situated 72 kilometers to the north and west of Sierra Leone's capital, Freetown. The population of Sierra Leone is 44,900, according to statistics from the 2015 census.

The resident leaders were included in the study population as well. The community leaders who speak for the people living in a specific home are known as resident leaders. Solid waste management is one of the issues that the resident leaders are in charge of handling as part of their duty to address matters that impact the residents. All adults who are 18 years of age or older and who are able to provide information on solid waste management are included in this group.

The methodology of this study was based on the research survey approach which is a method of systematically obtaining standard information about the Strategy and public participation of solid waste management in Port Loko city. The importance of the survey was to standardize the information obtained. A questionnaire with questions which were semi-structured and interview guides was used to assess the strategy used by city council and the public participation towards solid waste management in Port Loko city.

This research was included in the wide category of descriptive studies. More specifically, within this wide field of descriptive studies, the survey research approach was used. The descriptive design was chosen because it provides a precise description of the traits of a given phenomenon, community, or individual. The methodical gathering and presentation of data is a

requirement of the descriptive study. In essence, the design makes it easier to gather information that gives a thorough account of the phenomenon, group, or community as it occurs in the wild. Learning about the phenomenon is a descriptive study's primary goal.

Both qualitative and quantitative data were gathered for the study to meet its primary goal. Data that can be used to draw statistical conclusions about all variable outcomes and is displayed numerically on graphs, frequency tables, bar charts, pie charts, histograms, and pictograms is known as quantitative data. Analyzing qualitative data enables the interpretation of phenomena.

Thirty (30) respondents with a target population of four hundred (400) people and ten council staff members with a target population of fifty-four (54) staff members were chosen from among six streets in the three main sections of the city.

Respondents were asked questions about the survey's independent variables on the questionnaire. Thirty (30) responders from six different streets took part in the study, making up 7.5% of all participants. Four hundred (400) people made up the local population, or 7.5% of the total, while ten (10) council employees, representing both the higher and lower ranks, were also interviewed, making up 18.5% of the council staff overall. The local population is greater than the council because they are the biggest generators and the ones who deal with solid waste issues the most directly.

RESULTS AND DISCUSSIONS

This study set out to look into Port Loko City's solid waste management plan and public involvement in it. Utilizing a primary data collection tool, the strategy and public involvement in Port Loko City's solid waste management were analyzed. To forecast the effect of the intervention variable on the five distinct dependent variables (transportation, public participation, dustbins, and landfill), statistical tools such as frequency tables, bar charts, and pie charts were employed. This chapter describes the study sample and uses basic descriptive statistical tools (frequency tables, bar charts, and pie charts) to analyze the data for each research question. A summary of the analysis is also included. With Excel, statistical analysis was carried out.

DESCRIPTIVE STATISTICS

Table 1: Frequency and percentage distribution of respondents as part of the waste management processes in the study area, Port Loko city.

Dependent variable	Dependent variable	Frequency	Percentage
WASTE STRATEGY			
choice of current waste service			
	waste containers to households	6	20%
	waste containers to specific locations	0	0%
	timely collection	3	10%
	sensitization campaigns	1	3%
	employ more workers	20	67%
	TOTAL	30	100%



Do you sort wastes		
Yes	4	13%
No	26	87%
TOTAL	30	100%
Are you reusing wastes		
Yes	24	80%
No	6	20%
TOTAL	30	100%
Wastes reused		
Rubbers	22	73%
cans	6	20%
Bottles	1	3%
Others	1	3%
TOTAL	30	100%
PUBLIC PARTICIPATION		
Wastes found outside your home		
pick and put in a container	5	17%
No action	25	83%
TOTAL	30	100%
Reduce waste generated		
Ye	23	77%
No	7	23%
TOTAL	30	100%
Willing to pay for waste in future		
Yes	24	80%
No	6	20%
TOTAL	30	100%
Necessary to work together		
Ye	28	93%
No	2	7%
TOTAL	30	100%
Constraints in managing wastes		
Transportation	18	60%
Personnel	4	13%
Personal protective equipment	0	0%
Community participation	4	13%
Processing or treatment	2	7%



Disposal	0	0%
Equipment	2	7%
TOTAL	30	100%

TRANSPORTATION

Disposal of wastes from home/shop

Myself	23	77%
Housekeeper	6	20%
someone else at home	1	3%
Private collector	0	0%
city council	0	0%
TOTAL	30	100%

Outlook about public containers

Far away from the houses	22	73%
Too small to contain wastes	6	20%
Produce unpleasant smell	2	7%
Nothing wrong with them	0	0%
No communal containers	0	0%
TOTAL	30	100%

Primary responsibility for collection

Local council	27	90%
Private company	0	0%
Neighborhood groups	3	10%
Others	0	0%
TOTAL	30	100%

Enough vehicle to do the job

Yes	7	23%
No	23	77%
TOTAL	30	100%

DUSTBIN AVAILABILITY

Waste containers at home/shop

Yes	7	13%
No	23	87%
TOTAL	30	100%

Waste containers by other entity

Ye	0	0%
No	30	100%
TOTAL	30	100%

How do you dispose wastes

open pit burying	23	77%
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Open pit dumping	6	20%
Recycling	1	3%
Composting for manure	0	0%
TOTAL	30	100%
Amount of bins in your locality		
5	23	77%
10	5	17%
15	0	0%
None	2	7%
TOTAL	30	100%
LANDFILL		
Place for disposal		
Landfill	24	80%
Skip	2	7%
An open pit	4	13%
Others	0	0%
TOTAL	30	100%
Landfill fenced		
Yes	0	0%
No	30	100%
TOTAL	30	100%
Conducive for public health		
Yes	2	7%
No	28	93%
TOTAL	30	100%
Are people scavenging the landfill		
Yes	27	90%
No	3	10%
TOTAL	30	100%
What are they looking for		
Rubbers or plastics	23	77%
Bottles	5	17%
Cans	2	7%
Metals	0	0%
TOTAL	30	100%

Source: field work 2018

Table 1 shows the totality of results which indicates the characteristics of the respondents in Port Loko city. The table indicates that there are a total number of 30 respondents who must have known about wastes management. This can also be

stated as 100% of 30 respondents had known issues of waste management in Port Loko city.

The table also illustrates the service the municipality to improve upon; it provides ways for the respondents to answer what is



best needed to improve the present services. out of the five options listed, 6(20%) says provision of waste containers to household is necessary, 3(10%) says timely collection of waste should be done, 1(3.3%) sensitization campaigns are necessary and 20(66.6%) which is the highest frequency says employing more workers to do the job is necessary. This shows that, there are more improvement needed to add more workers to the waste collection management in Port Loko city

The table also showed if waste is sorted before disposal, out of the 30 respondents, 4(13%) indicated YES and 26(87%) indicated NO, meaning people are not sorting waste before disposal

The findings from the table revealed that the majority 24(80%) of respondents reused items from their wastes, and 6(20%) are not reusing waste items from their wastes.

From the above findings revealed that, 22 (74%) which is the highest are reusing plastic rubbers from their wastes 6(20%) are reusing cans 1(3%) reuses bottles and another 1(3%) are reusing other wastes.

From the table it is understood that 25(83%) the highest percentage took no action towards waste found on the street and 5(17%) will always pick wastes on floor and put in a nearby container

Through the table, 23(77%) are willing to reduce waste generated through help from council and 7(23%) indicated that they will not be able to do nothing towards reducing wastes generated.

Moreover the table indicated that, 24(80%) expresses willingness to pay for their wastes in future while 6(20%) are not willing to pay for their wastes as it is the sole responsibility of the city council.

Furthermore, the table showed that 28(93%) sees the necessity to work together to improve waste management and 2(7%) indicates unnecessary to work together to improve waste management.

Also from the table 18(60%) the highest number of respondents for this question said transportation is their major constraint, 4(13%) showed that, the number of personnel is another constraint 4(13%) indicated community participation as a constraint 2(7%) showed the process and treatment as constraints and 2(7%) also indicated that, lack of equipment is another constraint.

This is seeking to know the individual responsible to collect waste from homes/stall/shops. Out of the 30 respondents interviewed, 23(77%) of householders says they are doing it personally, 6(20%) says their house keepers, and 1(3%) says someone else in the home is taking the wastes for disposal.

The table specified that, 22(73%) showed containers are too far from their houses, 6(20%) illustrated that, the containers are too small to occupy the amount of waste generated in their area, 2(7%) showed containers produces pungent smell which most times disturb the breathing area around the vicinity.

From the above table 27(90%) showed local council has the primary responsibility to manage wastes, 3(10%) believes that, neighborhood youth groups/CBOs/NGOs.

Apparently, 23(77%) indicated that, the available vehicles are not enough to transport wastes while 7 (23%) showed that the available vehicles are enough to do the job

In the table, 26(87%) showed there are no extra containers/cans/skips provided by council in their various houses and shops except those in strategic points and 4(13%) showed council provided containers at some shops

Similarly from the table, 30(100%) showed that, there is no other organization or entity helping in the management of solid apart from city council.

Correspondingly 23(77%) applied open pit burning, 6(20%) uses open pit dumping, and 1(3%) of the total respondents are reusing certain wastes materials.

Likewise, 23(77%) showed 5 cans are located at the extreme end of the city, old Port Loko, 5(17%) showed 10 cans are located at the central business city, the central part of Port Loko, 2(7%) indicated that there are no dustbin cans available in their locality, apparently the interior part of the city, Sendugu

From the table, 26(87%) showed waste is taken to landfill, 4(13%) indicated that, the waste is taken to a skip as a primary collection center.

However 30(100%) showed the entire respondents indicated that, there is no fence around the landfill which poses more threats to the health and safety of residents around the landfill and the city in general.

From the table above, 28(93%) indicates that, the present landfill is absolutely not conducive as per public health laws and 2(7%) affirm it conduciveness

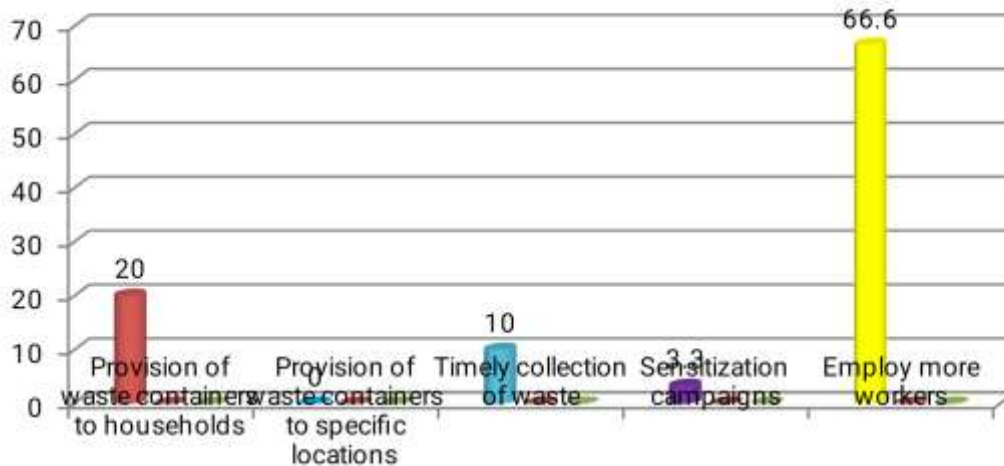
Nevertheless 27(90%) demonstrated that people are always going to the landfill in search of used materials whilst 3(10%) shows people are not doing such.

The table shows that 23(77%) people are looking for plastic rubbers which are in turn used to put ginger beer and other food, 5(17%) showed that they are looking for bottles, 2(7%) shows they are looking for cans which can be later used to make pots and cooking spoons by blacksmiths.

Table 2: represents Frequency and Percentage of respondents indicating the choice of current waste service city council to improve upon

Characteristics	Frequency	Percentage
Waste strategy		
Choice of current waste service		
waste containers to households	6	20%
waste containers to specific locations	0	0%
timely collection	3	10%
sensitization campaigns	1	3%
employ more workers	20	67%
TOTAL	30	100%

Figure 1: represents a bar chart of respondents indicating the choice of current waste service city council to improve upon



Source: field survey 2018

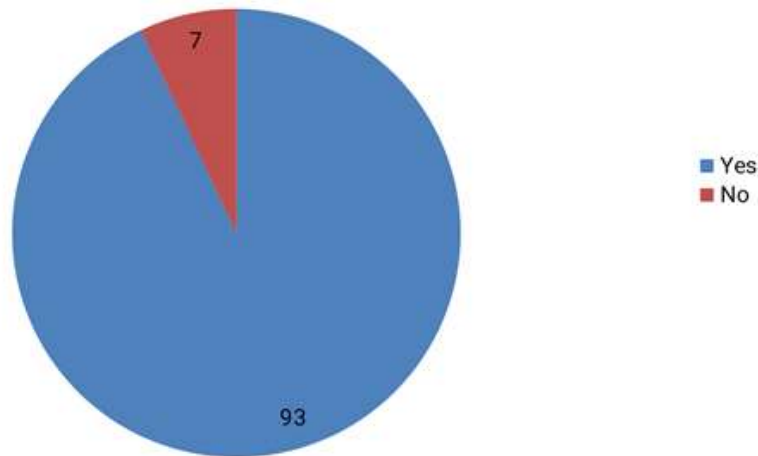
Table 2 Figure 1 illustrates the service the municipality to improve upon, it provides ways for the respondents to answer what is best needed to improve the present services. out of the five options listed, 6(20%) indicated provision of waste

containers to household is necessary, 3(10%) showed timely collection of wastes, 1(3.3%) sensitization campaigns are necessary and 20(66.6%) which is the highest frequency showed employing more workers to do the job is necessary.

Table 3: Shows frequency and Percentage on the necessity for public (city council) and private for partnership for sustainable waste management.

Character	Frequency	Percentage
Necessary to work together with partners?		
Ye	28	93%
No	2	7%
TOTAL	30	100%

Figure 2: Shows a pie chart representing respondents on the need to work together with other colleagues and city council for a sustainable waste management.



Source: field survey 2018.

Table 3 figure 2 showed commitment needed from residents, traders, market vendors and council for a better waste management. 28(93%) shows they committed to work together

to improve waste management and 2(7%) indicates unnecessary to work together to improve waste management.

Table 4: Shows frequency and Percentage from respondents on the primary responsibility for the collection of solid wastes.

Characteristics	Frequency	Percentage
Primary responsibility for collection		
Local council	27	90%
Private company	0	0%
Neighborhood groups	3	10%
TOTAL	30	100%

Source data: field survey 2018

Figure 3: Shows a bar chart from respondents on the primary responsibility for the collection of solid wastes.



Table 4 Figure 3 indicated the primary responsibility for the collection of wastes. 27(90%) showed local council has the

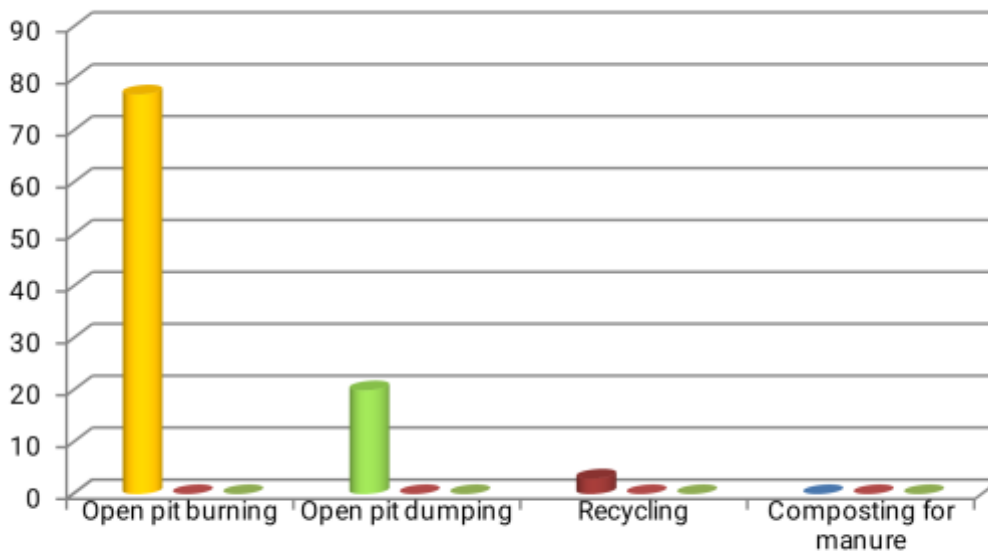
primary responsibility to manage wastes,3(10%) believes that, neighborhood youth groups/CBOs/NGOs.

Table 5: Shows frequency and Percentage from respondents on the disposal of household refuse

Characteristics	Frequency	Percentage
How do you dispose wastes		
open pit burying	23	77%
Open pit dumping	6	20%
Recycling	1	3%
Composting for manure	0	0%
TOTAL	30	100%

Source: Field survey 2018

Figure 4: Shows a bar chart from respondents on the disposal of household refuse.



Source: field survey 2018

Table 5 Figure 4: Showed respondents indicated how they dispose of their waste when there are no recycling methods. 23(77%) showed they always apply open pit burning, 6(20%)

indicated they uses open pit dumping, and 1(3%) they are reusing certain wastes material.

Table 6: Shows frequency and Percentage from respondents on the fencing of the landfill.

Characteristics	Frequency	Percentage
Landfill fenced		
Yes	0	0%
No	30	100%
TOTAL	30	100%

Source: field survey 2018

Figure 5: Shows a pie chart from respondents on the fencing of the landfill.

respondents stated that there is no fence around the landfill which poses more threats to the health and safety of residents around the landfill and the city in general.

Table 6: indicated from respondents if the landfill is well fenced or not. By what was gathered, 30 (100%) of the total



CITY COUNCIL MAIN ANALYSIS

Characteristics	Frequency	Percentage
How do you collect waste		
House to house	0	0%
Dustbins /skips	10	100%
TOTAL	10	100%
People using beans correctly		
Yes	6	60%
somehow	3	30%
No	1	10%
TOTAL	100	100%
Segregation of wastes		
Yes	10	100%
No	0	0%
TOTAL	10	100%
Wastes segregated		
Reuse	4	40%
Recycle	0	0%
Burning	6	60%
TOTAL	10	100%
Constraints in managing waste		
Transportation	6	60%
Personnel	0	0%
Equipment	2	20%
Personal protective Equipment	2	20%
Processing/treatment	0	0%
Disposal	0	0%
TOTAL	10	100%
Limitations in managing waste		
People's attitudes	1	10%
Bins used for wrong purpose	5	50%
Lack of resources	2	20%
Vendors poor cooperation	2	20%
TOTAL	10	100%
Full measures for illegal disposal		
Yes	0	0%
No	10	100%
TOTAL	10	100%
Enough workers for the job		



Yes	7	70%
No	3	30%
TOTAL	10	100%

Dustbins available in main city

15	4	40%
20	4	40%
30 and above	2	20%
TOTAL	10	100%

Transport waste to landfill

Motor vehicles(trucks)	4	40%
Tricycles	6	60%
Wheelbarrow	0	0%
Others	0	0%
TOTAL	10	100%

Source: field survey 2018

Table.7 shows holistic questions and answers from council respondents. 10 people were interviewed from administrators to waste collectors.

From the table, 10(100%) indicated that, city council do not provide cans/skips to shops and households but put in strategic locations.

Also from the table, 6 (60%) indicated that people are using the dustbins correctly, 3(30%) are not too sure whether people are using the bins and 1(10%) people are not using the bins correctly.

The table also showed 10(100%) that waste is always segregated before disposal.

In the table also indicated what people are doing with the segregated wastes 6(60%) says they are reusing it, 4(40%) indicates burning as the only option after segregation

From the table 6(60%) indicated transportation as a major constraint in managing solid wastes,2(20%) indicates equipment to do the job is a challenge, 2(20%) indicated personal protective equipment is a major constraint in managing solid wastes in the municipality

Within the table 1(10%) shows attitudes of people towards waste management is a major limitation in managing wastes at household level,5(50%) shows using the bins/skips for the wrong purpose is a challenge,2(20%) lack of affordable resources, 2(20%) lack of cooperation from vendors

Also in the table, 10(100%) indicated that, there are no applied measures to fight against illegal waste disposal, which poses great threat

From the table, 7 (70%) shows that there are enough workers to do the waste collection job, 3(30%) shows the workers are not enough to do the job

Number of wastes bins/skips available at strategic centers can also be seen in the table 4(40%) shows that there are 15 dustbins available, 4(40%) shows only 20 available and 2(20%) shows 30 and above as the available dustbins/skips in the main city

Also from table, 4(40%) shows that, motor vehicles (trucks) are the means of transporting wastes to the landfill. 6(60%) shows tricycles as the major means of transporting wastes to the landfill.

Table 8: Indicated frequency and percentage of respondents on how waste is collected

Characteristics	Frequency	Percentage
How do you collect waste		
House to house	0	0%
Dustbins /skips	10	100%
TOTAL	10	100

Source: Field Data 2018

Table 8 : Indicated respondents on how waste is collected. 10(100%) showed all skips are fixed in strategic locations, no house to house collection indicated.

Table 9: shows Frequency and percentage on what is being done on segregated wastes

Characteristics	Frequency	Percentage
Wastes segregated		
Reuse	4	40%
Recycle	0	0%
Burning	6	60%
TOTAL	10	100%

Source: Field survey 2018

Figure 7: shows Pie Chart on what is been done on wastes segregated

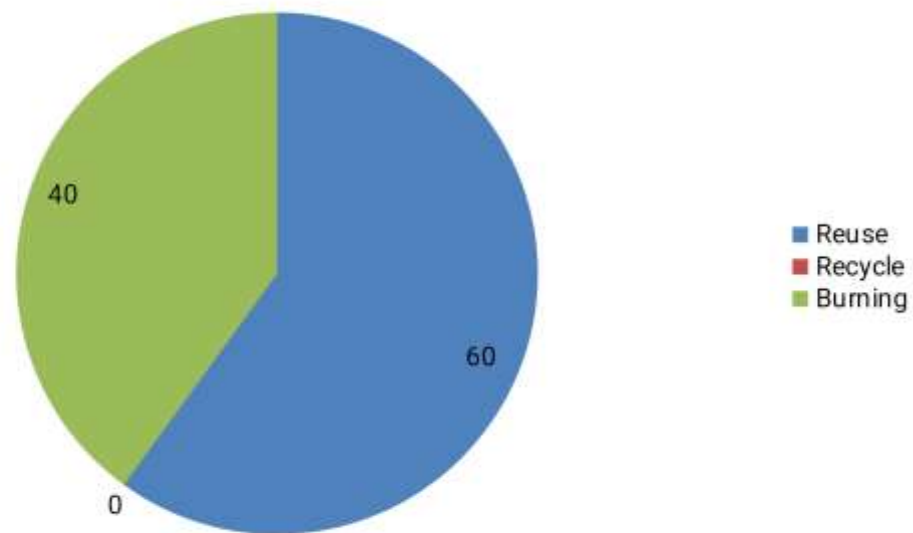


Table 9 Figure 7 indicated what people are doing with the segregated wastes 6(60%) showed they are reusing, 4(40%) indicates burning as the only option after segregation

Table 10: shows frequency and percentage on the constraints faced in managing waste

Characteristics	Frequency	Percentage
Constraints in managing waste		
Transportation	6	60%
Personnel	0	0%
Equipment	2	20%
Personal protective Equipment	2	20%
Processing/treatment	0	0%
Disposal	0	0%
TOTAL	10	100%

Source: Field survey 2018

Figure 8 indicated Pie Chart on the constraints in managing wastes

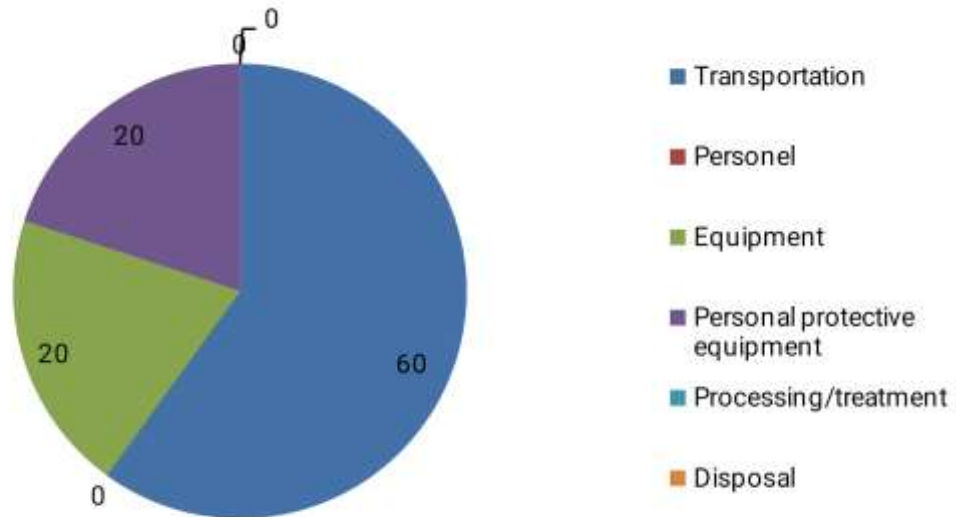


Table 10 Figure 8: shows the constraints faced in managing wastes 6(60%) indicated transportation as a major constraint in managing solid wastes, 2(20%) indicates equipment to do the

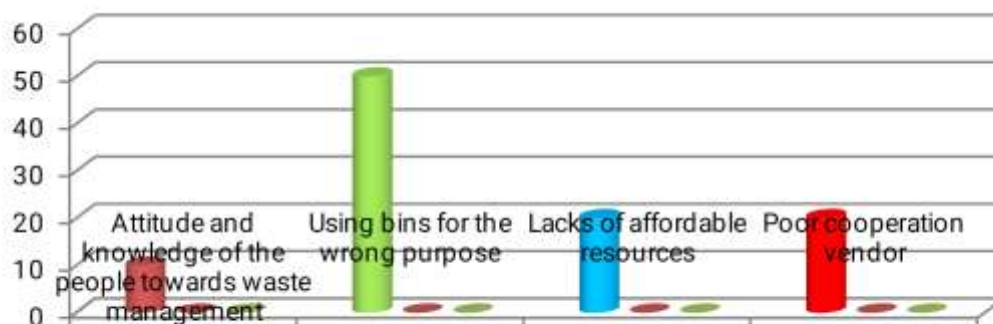
job is a challenge, 2(20%) indicated personal protective equipment is a major constraint in managing solid wastes in the municipality

Table 11 shows frequency and percentage on the limitations in managing wastes at household level

Characteristics	Frequency	Percentage
Limitations in managing waste		
People’s attitudes	1	10%
Bins used for wrong purpose	5	50%
Lack of resources	2	20%
Vendors poor cooperation	2	20%
TOTAL	10	100%

Source: field survey 2018

Figure 9: indicated a histogram on the limitations in managing wastes at household level



SourceSS

Table 11 figure 9 shows the limitations in managing wastes at household level 1(10%) shows attitudes of people towards waste management is a major limitation in managing wastes at

household level,5(50%) shows using the bins/skips for the wrong purpose is a challenge,2(20%) lack of affordable resources, 2(20%) lack of cooperation from vendors

Table 12 illustrates frequency and percentage on how waste is transported to landfill

Characteristics	Frequency	Percentage
Transport waste to landfill		
Motor vehicles(trucks)	4	40%
Tricycles	6	60%
Wheelbarrow	0	0%
Others	0	0%
TOTAL	10	100%

Source: field data 2018

Figure 10 illustrates Pie Chart on how waste is transported to landfill

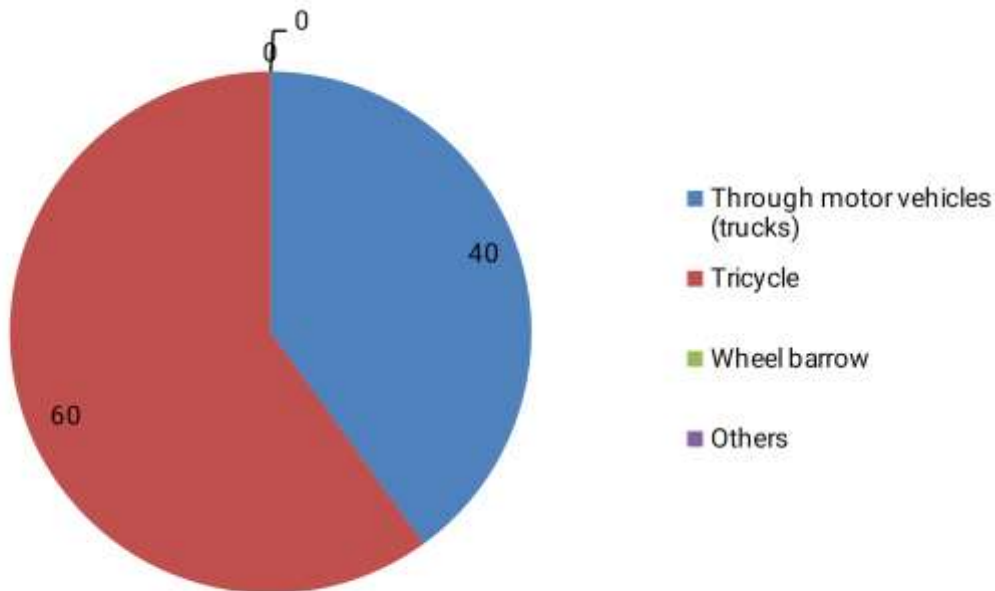


Table 12 Figure 10 illustrates on how waste is transported to landfill 4(40%) shows that, motor vehicles (trucks) are the means of transporting wastes to the landfill. 6(60%) shows tricycles as the major means of transporting wastes to the landfill.

SUMMARY

The results of the data analysis used the sample of respondents in various households and staff from city council on the research conducted based on the strategies and public participation on solid waste management in Port Loko municipality with special consideration on six (6) main streets in the main city. Excel Microsoft 2017 was used to predict the impact of the strategy and public participation on five outcome variables; waste strategy, transportation, public participation, dustbin availability and landfill

The study was based on five research questions. The first research question asked: what waste service would the council need to improve upon? Based on the respondents, the service which needs more improvement by the city council is the employment of more workers 20(67%) with the highest

percentage,6(20%) which indicated the provision of more waste containers had the second highest needed improvement,3(10%) says timely collection of waste also needs improvement. Sensitization campaigns 1(3.3%) is the least needed improvement. This shows that, there are very few workers employed by city council to do the waste management job, therefore, more improvement needed to add more workers to the waste collection management.

On the contrary from the results given by city council 7 (70%) shows that there are enough workers to do the waste collection job, 3(30%) shows the workers are not enough to do the job.

The overall estimation from what was given by the community people and the city council staff one could be able to reaffirm that, more workers are needed in order to have a sustainable waste management.

The second research question asked; what are the available means of transporting solid waste in Port Loko city? Based on the above results from the major stakeholders in waste management within the municipality (council staff), it was found out that 6(60%) shows tricycle is the most regular means



of transporting wastes, 4(40%) also indicated that, motor vehicles (trucks) are the second most regular means of transporting wastes to the landfill and wheelbarrows 0(0%) is not used at all. From the above results, tricycles are the major means of transporting wastes to the landfill.

Similarly, from the community people (household respondents and vendors) also gave major constraints in managing wastes which has a link to the research question. Transportation (18(60%) which shows the highest number of respondents and percentage illustrated that, transportation of solid wastes is a major constraint in the city. 4(13%) the second highest indicated the number of personnel to do the job are very small considering the largeness of the municipality and its population, although 4(13%) again says community participation is a major problem. 2(7%) said that the process and treatment is also another constraint, and 2(7%) also indicated that, equipment are lacking.

The third research question asked; what is the level of public participation towards solid waste management? From the above results, 28(93%) indicated that, the people are very much willing to work with counterparts and city council in the management of solid wastes and 2(7%) expressed their unwillingness to cooperate with city council and other vendor.

The fourth research question asked; what are the measures put in place for primary collection of solid waste? The results from the above analysis indicated that, dustbins/skips are used for the collection of solid wastes before being transported to the final landfill. However, the results indicated that the dustbins/skips are not enough considering the municipal population. Out of 30 respondents, 23(77%) said only five (5) cans/dustbins are located at the extreme end of the city old Port Loko 5(17%) said that, ten (10) cans are located at the central business city, the central part of Port Loko and 2(7%) denied that there are no dustbin/cans available in their locality, apparently the interior part of the city which is Sendugu section.

Similarly, the city council staff also gave different views on the allocation of dustbins/cans/skips at strategic locations 4(40%) shows that there are 15 dustbins/cans/skips are available for old Port Loko 4(40%) said that, twenty (20) are available for sendugu section and 2(20%) indicated that more than thirty (30) are placed in the main central city business center.

The final research question asked; How many landfills available for the disposal of solid waste? Based on the research, there is only a single landfill for the entire municipality for the final disposal of wastes. The major Environmental and Health concerns associated with poor landfill that is not to the standard of a sanitary landfill and even unfenced. Out of 30(100%) of all community respondents and 10(100%) of all council staff interviewed indicated that, the landfill is not conducive according to standards and as per public health needs. There are high tendencies for leachates and its potential for ground and surface water contamination. Leachate is the liquid that drains from a waste dumping site. Its chemical properties are determined by waste composition, apparently leads to waterborne diseases.

In many open disposal areas, fires can burn and smoulder over a prolonged period thereby releasing gases like methane, carbon monoxide, nitrogen oxide, sulphur oxide and dioxins into the atmosphere.

The research study revealed quite a number of negligence towards strategies, practices and attitudes towards solid waste management among the residents in Port Loko city.

LIMITATIONS OF THE STUDY

The study's exclusion of hospital wastes (medical wastes) and other office wastes (industrial wastes) was a significant limitation. The previously mentioned individuals did not receive a questionnaire. Regretfully, there is currently no way to evaluate how this limitation might affect study results. The study is subject to significant limitations that stem from the real-world circumstances, such as political instability, a dearth of baseline data, and researcher bias.

Political Emergencies: It was extremely difficult to get information from city council officials in the research area (Port Loko City), as a new administration was just elected in the recently concluded 2018 general elections. Instead, they had to direct me to contact the district council, which had been handling this for the previous years for the entire district, including the new city. Because my contact people were always changing, I was forced to interview the district council staff—the majority of whom are also new—as well as the municipal authorities as a whole. This made it difficult to gather data.

Lack of baseline data: Even though some studies have been carried out, in terms of Port Loko municipality as a whole, there was no study undertaken to study solid waste management system as a single entity.

Researcher bias: Since I was born and raised in Port Loko City, I am well-versed in the solid waste management situation that exists in the study area. Consequently, I was able to put myself in the people's shoes and comprehend the context of my goals with ease, all the while continuing to observe as an impartial third party. Additionally, I am acquainted with the local language, customs, and culture; these positive biases enabled me to thoroughly examine the context.

Some interviewees found it difficult to relate to me as a researcher because I am a native of Port Loko city.

RECOMMENDATIONS

Having looked at the current solid waste management scenario and issues related to it, the need for the development of a comprehensive and sustainable solid waste management plan is of paramount importance. As outlined, the current plan only covers one aspect of a sustainable waste management system, namely collection and dumping. This will allow the municipal authorities to take an iterative step towards a sustainable solid waste management plan.

In the meantime, there are certain steps that can be undertaken to jump start a long term planning process.



The findings of this study have implications for more research, as does the review of previous literature on public involvement and solid waste management tactics in Port Loko City. The following suggestions, which are from Sierra Leone's perspective—ideally Port Loko city—may be helpful to other nations running programs of a similar nature. The discussion of a few of these ramifications follows.

Only data on solid wastes from households, vendors with special preferences, and city/district councils were included in this study. To enable direct comparison, future research should encompass medical wastes from hospitals, industrial wastes, and other waste types such as electronic and liquid wastes throughout the entire city. This would make it possible to portray the tactics and public involvement in solid waste management in Port Loko city in a more thorough and accurate manner. Additionally, more research should be done to evaluate other CBO and NGO-run organizations in the municipality that offer similar services.

Important information could be obtained by evaluating the effects over the same period and contrasting them with a local government-run program. In order to assess the impact of additional covariates, such as health regulations and awareness-raising campaigns for solid waste management, on wastes management outcomes, more research is required.

LIMITATIONS

It is possible to misquote the real data provided by respondents from the community and the staff of the city council. The central region of Port Loko city is comparatively small, and it is unclear how much SWM services are provided to other nearby communities. The research may not be entirely accurate due to the participation of both literate and illiterate individuals who assisted with data collection and answering.

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