

IMPEDIMENTS TO AND OPTIMIZATION STRATEGIES FOR SOLID WASTES COLLECTION AND DISPOSAL AMONG SOLID WASTES MANAGEMENT WORKERS IN ANAMBRA STATE.

BY

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Abstract

This study was embarked upon to find out impediments to and optimization strategies for solid wastes collection and disposal in Anambra State. Five specific objectives with five corresponding research questions, and two null hypotheses guided the study. The population for the study consisted of 285 solid wastes management workers in Anambra State. The population size is manageable, thus, no sampling. A two-section valid and reliable questionnaire served as instrument for data collection. Mean and standard deviation were used to answer research questions 1 to 4, frequencies and percentages were used to answer research question 5, while t-test statistic was used to test the null hypotheses at .05 level of significance. Results showed among others that financial constraint has the greatest mean score of (3.39; SD .874) as an impediment to solid waste collection, and that poor recycling method indicates the highest ($x=3.63$; SD .601) impediment to solid waste disposal in Anambra State. There is no significant difference in the impediments to solid waste collection and disposal in Anambra State based on location. The study recommended among others that solid waste management should be well funded and workers' welfare improved and that modern technologies on waste recycling should be provided and in-service training given to workers on how to use them.

Keywords: *Impediments, Optimization strategies, Solid waste,*

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Introduction

Solid wastes management (SWM) is an increasing environmental health issue globally. It is an issue of great concern because there are impediments to effective collection and disposal of solid wastes in rural and urban areas of nations, especially in developing nations. Hence, there is need for optimization strategies for effective solid wastes collection and disposal in rural and urban areas. United States Department of Agriculture Rural Information Center-USDARIC (2005) reported that solid waste disposal is a major concern in rural areas. The World Health Organization-WHO (2007) reported that globally, about 3-5 million tones of solid wastes are generated in urban centres annually, and that more than 50 per cent of these solid wastes are not cleared at all. Adedeji and Eziyi (2010) observed that Nigerian cities are witnessing high rate of environmental deterioration, and are rated among areas with the lowest livability index in the world as a result of poor solid waste management. Muoghalu (2011) noted that cities in Anambra State are unsanitary. According to the researcher, poor

management of solid waste constitutes a major part of the unsanitary condition of the cities in the State. It appears therefore, that SWM could be one of the challenges facing both rural and urban cities of many nations, Nigeria inclusive and Anambra State in particular.

Poor SWM is a critical issue with far reaching health and environmental consequences. Tay (2007) pointed out that waste generated from various human activities, both industrial and domestic, can result in health hazards, and have negative impacts on the environment. The health hazards posed by solid waste include high prevalence of communicable and non-communicable diseases such as malaria, cholera, typhoid, diarrhoea, acute respiratory infections, tuberculosis and helminthes infections that account for a significant percentage of morbidity and mortality in the nation. Poor solid waste management also causes environmental degradation in form of erosion and flooding in many States, including Anambra State (Ejikeme, 2012).

Waste is relative in meaning. Sometimes, what one regards as wastes may be useful materials for another person. Adewumi (2001) defined waste as a resource in the wrong place. Oyeniyi (2011) opined that waste is any material which has been used and is no longer wanted because the valuable or useful part of it has been taken out. Following from these, wastes are useless materials that can become a resource if treated and recycled well. In this study, wastes are materials that no longer have any value, but can become useful when appropriately placed and safely recycled. Solid waste generation is directly proportional to increased human population and activities. This agrees with Edugreen's (2012) assertion that increased population and urbanization is largely responsible for the increase in solid waste generation. Ezigbo (2012) posited that all aspects of man's economic activities involve generation of wastes. The author further posited that business activities in the society create wastes which are capable of polluting the environment. This may be the case in Anambra State, where increasing population and

economic activities, as a result of the commercial nature of its main cities that attract people into the State, may have contributed to high rate of solid waste generation in the State. However, these situations cannot be without causes. Some factors have been impediments to effective SW collection and disposal processes.

Impediments are things that tend to hinder effectiveness of a process. Solid waste collection and disposal as a process are prevented from yielding good results by certain things which may be referred to as impediments. Free online Dictionary (2013) defined an impediment as anything that slows or blocks progress; factor causing trouble in achieving a positive result or tending to produce a negative result. Thus, in this study, impediments are things that prevent efficient solid wastes collection and disposal. Adeshina (2000) opined that management of solid waste in Nigeria and many other developing countries posed serious challenges due to certain factors. According to this researcher, these factors include: absence or lack of appropriate technologies; financial

constraints; and inefficiency in waste management that can prevent effective waste collection and disposal in many ways. In a situation, where appropriate technologies are lacking, overall management of solid waste is hampered. Where there are financial constraints, equipment necessary for waste collection such as waste vehicles may not be purchased. Sometimes, financial constraint may lead to non-repair of available waste collection vehicles that break down. Breaking down of wastes vehicles can be due to overuse, because there is no money to purchase sufficient vehicles needed. As a result, the available vehicles are subjected to use all the time. This is in line with Agunwamba, Egbuniwe and Ogwueleka (2003) observation that the few available waste collection trucks breakdown frequently due to overuse. This may be worsened by the nature of some areas in Nigeria. Some areas in Nigeria have streets that are not motor-able. These areas even though are not designated dumpsites, began to serve as dumpsites, as people carry their waste at nights and dump them at those places, further worsening the situation

of the road in such places.

In Anambra State, solid wastes are seen dumped indiscriminately in places that are not designated dumpsites such as streets, drains, roads, market places, and vehicles' parks. Wastes are indiscriminately dumped by individuals mostly at nights. Most times, these wastes are left unattended to and overtime, turn some part of the street into unsightful dumpsites. During dry season, winds flap these wastes and litter the streets and environment. During rainy season, rain water carries the wastes in the streets into the drainage and roads, and blocks the roads and the drainage, thus causing flooding, which has been a serious environmental health challenge in Anambra State. Sometimes, flood water carries people and gets them injured or dead before they are rescued. The flood sometimes overflows into people's homes, destroying lives and property. In overcoming these situations, Optimization strategies for solid waste collection and disposal are essential.

Optimization strategy refers to

approaches designed to enhance methods of carrying out a task to for best possible result. In this study, optimization strategies for solid waste collection and disposal refer to approaches to be adopted to enhance the efficiency of solid waste management. Uwadiogwu and Chukwu (2010) recommended citizen mobilization and environmental education, strengthening of public agencies, responsible government, logistics and infrastructural improvement, legislation, appropriate technologies, monitoring and surveillance as strategies for SWM in Nigeria. Modebe, Onyeonoro, Ezeama, Ogbuagu and Agam (2011) reported 63% of respondents indicated payment of fines for indiscriminate disposal of wastes, payment of fees for collection by ANSEPA (49%), and massive educational campaigns (4%) as ways to improve SWM among solid waste management workers.

Ogwueleka (2009) stated that management of solid waste in Onitsha, Anambra State, is the sole responsibility of Anambra State Environmental Protection Agency

(ANSEPA). The researchers observed that presently, SWM in Anambra State is solely done by Anambra State Waste Management Agency (ASWAMA). Also, in Onitsha South and North LGA, LAGA International Ltd has the contract to collect and dispose waste at the time of this study. Therefore, the staff of ASWAMA and LAGA International Ltd constitutes the SWM workers in Anambra State. These workers offer the services of solid waste collection and disposal to ensure general cleanliness of the State. Regrettably, it appears that institutions appointed to manage wastes have failed as regards to solid waste collection and disposal, especially as the wastes are generated at the rate beyond their capacity to handle. Nigerian Environmental Study Team (1999) reported that SWM authorities in the country have failed in management of solid wastes. According to the report, in areas where Local Government authorities do the collection, it is often irregular and sporadic. This may be the situation of Local Government Areas in Anambra State where this study was conducted. As a result, solid wastes are left unattended to, buried,

burnt or disposed of indiscriminately by individuals. Thus, solid waste burden has indeed become critical in Nigerian cities, particularly in Anambra State.

Though Agunwamba, Egbuniwe and Ogwueleka (2003) identified some impediments to solid waste management in Onitsha urban city, the study is about ten years ago and the situation may have changed overtime. Also, the study was limited geographically, in the sense that it was conducted in an urban area. Thus, its findings cannot be generalized for both urban and rural areas and for a whole State. However, the present study was conducted in both urban and rural areas of Anambra State. Hence, the present study is imperative.

Purpose of the Study

The purpose of the study was to find out impediments to and optimization strategies for solid wastes collection and disposal among solid wastes management workers in Anambra State. Specifically, the study determined impediments to solid wastes:

1. collection in Anambra State;
2. disposal in Anambra State;
3. collection in Anambra State based on location;
4. disposal in Anambra State based on location; and
5. Optimization strategies for solid waste collection and disposal in Anambra State.

Research Question

The following research questions were posed to guide the study.

1. What are the impediments to solid wastes collection in Anambra State?
2. What are the impediments to solid waste disposal in Anambra State?
3. What are the impediments to solid wastes collection in Anambra State based on location?
4. What are the impediments to solid waste disposal in Anambra State based on location?
5. What are the optimization strategies for solid waste collection and disposal in Anambra State?

Hypotheses

The following null hypotheses were postulated and tested at .05 level of

significance.

1. There is no significant difference in the impediments to solid waste collection based on location.
2. There is no significant difference in the impediments to solid waste disposal based on location.

Methodology

Research design: The descriptive research design was adopted in the study.

Area of the Study: The study was conducted in urban (Onitsha LGA) and rural (Idemili LGA) of Anambra State.

Population for the Study: The population for the study consisted of all SWM workers in Onitsha and Idemili LGAs of Anambra State. The population of SWM workers in Onitsha and Idemili LGAs of Anambra State is 285.

Sample and Sampling Techniques: The population size is manageable, thus there was no sampling.

Instrument for Data Collection: A two-section questionnaire served as

instrument for data collection. Face validity of the instrument was established by three experts from the Department of Health and Physical Education, University of Nigeria, Nsukka. A test-retest method of reliability, using the Pearson Product Moment correlation formular was used to correlate the data generated. The reliability coefficient of .83 was obtained, and was considered high enough and reliable to be used for the study.

Method of Data Collection: Data for this study were collected by the researchers with the help of two assistants. A total of 285 copies of the instrument were administered on the respondents by hand and collected on the same day. A 100 per cent return rate was achieved. However, only 282 copies had properly completed responses, and were used for analysis.

Data Analysis Technique: Responses from section A of the instrument were analyzed using means and standard deviation and while responses from section B of the instrument were analyzed using percentages.

Hypotheses 1 and 2 were tested at .05 level of significance using t-test statistics.

Results and Discussion of Findings

The following findings were made and presented in Tables for the purpose of answering the research questions.

Table 1: Responses on impediments to Solid Waste Collection in Anambra State (n= 282)

S/N	Item Statement	\bar{X}	SD	DEC
1.	Financial constraints/ Lack of fund	3.39	.874	Impediment
2.	Inefficient collection methods	3.10	.850	Impediment
3.	Absence of waste bins at strategic public places	2.99	.973	Impediment
4.	Lack of waste bins in different households	2.78	.934	Impediment
5.	Non-payment of sanitation levies	3.05	.966	Impediment

Note: \bar{X} = Mean, SD= Standard deviation, DEC =Decision

Table 1 above shows that financial constraints have the greatest mean score of (3.39; SD .874) as an impediments to solid waste collection in Anambra State, followed by inefficient collection methods (3.10; SD .850) and non-payment of sanitation levies (3.05; SD .966), while lack of waste bins in different households had the least mean score of (2.78; SD .934) followed by absence of waste bins at strategic public places which has the mean score of (2.99; SD .973). However, all the items contained in Table 1 above are impediments to solid waste collection in Anambra State since each of their mean score is above the criterion mean of (2.50) and their grand mean score (3.06) is also above the criterion mean.

Table 2: Responses on impediments to Solid Waste Disposal in Anambra State (n=282).

S/N	Item Statements	\bar{X}	SD	DEC
1.	Lack of sufficient dumpsites	3.21	.821	Impediment
2.	Poor recycling methods	3.63	.601	Impediment
3.	Poor consumption by agriculture	2.12	.914	Not impediment
4.	Lack of or non provision appropriate technologies	3.06	.953	Impediment
Grand mean		3.00		Impediment

Table 2 above shows that poor recycling method indicates the highest ($x=3.63$; SD .601) impediments to solid waste disposal in Anambra State followed by lack of sufficient dumpsites and lack of or non provision of appropriate technologies as shown in their mean scores of (3.21; SD .821 and 3.06; SD .953) respectively. Table 5 also shows that poor consumption by agriculture indicated no impediment as shown by the mean score of (2.12; SD .914) which is less than the criterion mean of (2.50). However, the grand mean (3.00) of the items is above the criterion mean of (2.50) which implies that most of these items are impediments to solid waste collection in Anambra State.

Table 3: Responses on impediments to Solid Waste Collection Based on Location.

S/N	Item Statement	Urban (n=226)		Rural (n=56)	
		\bar{X}	SD	\bar{X}	SD
1.	Financial constraints/ Lack of fund	3.31	.920	3.70	.570
2.	Inefficient collection methods	3.06	.872	3.25	.745
3.	Absence of waste bins at strategic public places	2.90	1.02	3.34	.668
4.	Lack of waste bins in different households	2.77	.943	2.80	.903
5.	Non-payment of sanitation levies	3.02	.995	3.18	.834

Table 3 above shows that on impediments to waste collection, Financial constraints was ranked highest ($x=3.70$; SD .570) by respondents working in the rural areas than those in the urban areas ($x=3.31$; SD .920) followed by Inefficient collection methods ($x=3.25$; SD .745) by respondents in the rural areas and ($x=3.06$; SD .872) by those in the urban areas. Absence of waste bins at strategic public places was scored higher ($x=3.34$; SD .668) by respondents in the rural areas than those in the urban areas ($x=2.90$; SD 1.02), Non-payment of sanitation levies was scored higher ($x=3.18$; SD .834) by respondents in the rural areas than those in the urban areas ($x=3.02$; SD .995) and Lack of appropriate technologies was scored ($x=2.80$; SD .903) by respondents in the rural areas and ($x=2.77$; SD .943) by those in the urban areas.

Table 4: Impediments to Solid Waste Disposal in Anambra State Based on Location.

S/N	Item Statement	Urban (n=226)		Rural (n=56)	
		\bar{X}	SD	\bar{X}	SD
1.	Lack of sufficient dumpsites	3.14	.856	3.5	.572
2.	Poor recycling methods	3.59	.635	3.82	.386
3.	Poor consumption by agriculture	2.66	.939	2.95	.773
4.	Lack of or non provision appropriate technologies	2.97	.959	3.41	.848

Table 4 also shows that in the cluster on impediments to waste disposal, Poor recycling methods was ranked highest ($x=3.82$; SD .386) by rural respondents than urban respondents ($x=3.59$; SD .635), followed by Lack of sufficient dumpsites ($x=3.5$; SD .572) by rural respondents and ($x=3.14$; SD .856) by urban respondents, Lack of or non provision of appropriate technologies ($x=3.41$; SD .848) by respondents in the rural areas and ($x=2.97$; SD .959) by urban respondents, and Poor consumption by agriculture ($x=2.66$; SD .939) by rural respondents and ($x=2.95$; SD .773) by urban respondents.

Table 5: Responses on optimization strategies for solid waste collection and disposal (n=282)

S/N	Optimization Strategies	Yes		No	
		f	%	f	%
Educational Strategies					
1.	Organizing seminars, workshops and in-service training for SWM workers	266	94.3	16	5.7
2.	Sensitization of people on the need for good sanitation of their environment	258	91.5	24	8.5
Attitudinal Strategies					
3.	Prompt payment of salaries	257	91.1	25	8.9
4.	Upgrading workers working conditions	265	94.0	17	6.0
5.	SWM commitment to duty	252	89.4	30	10.6
6.	Prompt payment of sanitation levies	261	92.6	21	7.4

Behavioural Strategies

7. Placing mammoth bins located at strategic places of solid waste generated at public places e.g market place	246	87.2	36	12.8
8. Emptying of waste bins into designated public waste bins	247	87.6	35	12.4
9. Street to street collection of wastes twice a week	258	91.5	24	8.5

Technological Strategies

10. Provision of more waste collection vehicles	263	93.3	19	6.7
11. Provision of street motorist to collect wastes (tricycles, trucks)	235	83.3	47	16.7
12. Establishment of materials recovery/recycling facility	258	91.5	24	8.5

Table 5 showed that most (94.3% and 91.5%) of the respondents also indicated organizing seminars, workshops and in-service training for SWM workers and sensitization of people on the need for good sanitation of their environment as educational strategies for SW collection and disposal respectively. Table 5 also shows that majority (94.0%) of the respondents indicated upgrading workers' working conditions as attitudinal optimization strategy for solid wastes collection and disposal in Anambra State. The Table also shows that most (91.5%) of the respondents indicated street to street collection of waste at least twice a week as behavioural optimization strategy, 87% indicated emptying of waste bins into designated public waste bins and placing mammoth bins at strategic places as behavioural optimization strategies for solid waste collection and disposal.

Table 5 further indicates that (93.3% and 91.55) of the respondents indicated provision of more collection vehicles and establishment of material recovering/recycling facilities as technological strategies while 83.3% of the respondents indicated provision of street motorist to collect waste as technological strategies for optimized waste collection and disposal in Anambra State.

Table 6: Summary of t-test Table of no Significant Difference in the Impediments to Solid Waste Management Based on Location.

Impediments to solid waste collection	Urban (n=226)		Rural (n=56)		t-cal	df	P-value
	\bar{X}	SD	\bar{X}	SD			
Impediments to solid waste collection	15.30	2.96	15.30	2.40	-.006	280	.995

Table 6 above shows that in the impediments to solid waste collection, the t-cal (-.006) is less than the p-value (.995) at .05 level of significance and 280 degrees of freedom. This means that there is no significant difference in the impediments to solid waste collection based on location.

Table 7: Summary of t-test Table of no Significant Difference in the Impediments to Solid Waste Disposal Based on Location.

Impediments to solid waste disposal	Urban (n=226)		Rural (n=56)		t-cal	df	P-value
	\bar{X}	SD	\bar{X}	SD			
Impediments to solid waste disposal	12.46	2.21	13.27	2.06	-2.47	280	.014

Table 7 shows that in the impediments to solid waste disposal, the t-cal (-2.47) is less than the p-value (.014) at .05 level of significance and 280 degrees of freedom. This means that there is no significant difference in the impediments to solid waste disposal based on location.

Discussion of Findings

Findings in Table 1 showed that respondents indicated that financial constraints/lack of fund inefficient collection methods, absence of waste bins at strategic public places, lack of waste bins in different households and non-payment of sanitation levies are all impediments to solid waste collection in Anambra State. However, financial constraint and inefficient collection methods had the highest responses while lack of waste bins at strategic public places had the least response. These findings are not surprising as Adeshina (2000) had earlier opined that management of solid waste in Nigeria and many other developing countries posed serious challenges due to certain factors. According to this researcher, these factors include absence or lack of appropriate technologies, financial constraints inefficiency in waste management that can prevent effective waste collection, storage, treatment and disposal in many ways. Similarly, Ogwueleke (2009) posited that certain logistic factors such as poor funding contribute the impediments to management of solid waste in Nigeria. This researcher further

observed that solid waste management in Nigeria is characterized by inefficient collection methods. The finding is also in line with Ezigbo's (2012) finding that financial constraints and lack of appropriate technologies are the major challenges to waste management. Therefore it is not surprising that financial constraints and inefficient collection methods had greater responses indicating that they are major impediments to solid waste management in Anambra State.

Findings in Table 2 showed that poor recycling method poses the highest (3.63) impediments to solid waste disposal in Anambra State. This finding is expected and therefore not surprising because Ogwueleka (2009) observed that solid waste management in Nigeria is characterized by improper disposal of solid waste. He further posited that lack of expertise and manpower to run solid waste management programme, little or no functional background or training in engineering and management of majority of environmental agency workers, no reliable measurement of generated waste, contribute the

impediments to management of solid waste in Nigeria.

Findings in Table 3 and 4 showed that the grand mean score of the urban (3.22) respondents is less than the grand mean scores of the rural (3.50) respondents. This finding is not expected and therefore surprising because Edugreen (2012) had earlier asserted that increased population and urbanization is largely responsible for the increase in solid waste generation. Also, Ezigbo (2012) had earlier posited that all aspects of man's economic activities involve generation of wastes. He further opined that business activities in the society create wastes which are capable of polluting the environment. However, this finding may be due to the very small number of solid waste management workers in the rural area which made waste management services almost unavailable in the rural areas, thus, Ogwueleka (2009) observed that there is inadequate service coverage in most urban areas, while in rural areas, there is no waste collection. He further stated that rural dwellers have no access to waste

collection services. According to him, they dump waste at any vacant plot, public space, and river or burn it in their backyard thereby polluting the air.

Findings in Table 5 showed that majority (94%) of the respondents, preferred organizing seminar, workshops and in-service training for workers as the educational optimization strategy. This finding differs with the findings of Modebe, Onyeonoro, Ezeama, Ogbuagu and Agam (2011) on public health implications of household solid waste management in Awka which indicated that very few (4%) of their respondents suggested massive educational campaigns as ways to improve waste management (optimization strategies for SWM). This difference in the findings of these two studies may be due to the different research design adopted by these studies because while the study by Onyeonoro, Ezeama, Ogbuagu and Agam (2011) utilized the cross-sectional design, the present study utilized the descriptive research design. Again, the difference may be in the population used for the study as

the study by Onyeonoro, Ezeama, Ogbuagu and Agam (2011) used households, the present study used solid waste management workers as the population for the study.

Findings in Table 6 also showed that most (91.5%) of the respondents indicated street to street collection of waste at least twice a week as behavioural optimization strategy, 87 per cent indicated emptying of waste bins into designated public waste bins and placing mammoth bins at strategic places as behavioural optimization strategies for SWM. Table 5 further showed that (93.3% & 91.55%) of the respondents indicated provision of more collection vehicles and establishment of material recovering/recycling facilities as technological strategies while 83.3% of the respondents indicated provision street motorist to collect waste as technological strategies for optimized waste collection and disposal in Anambra State. These findings partly agrees with Uwadiogwu and Chukwu (2010)'s recommendation for optimized waste management in Nigeria. According to them, citizens'

mobilization and environmental education, strengthening of public agencies, responsible government, logistics and infrastructural improvement, legislation, appropriate technologies, monitoring and surveillance as strategies for SWM in Nigeria.

Table 6 above shows that in the impediments to solid waste collection, the t-cal (-.006) is less than the p-value (.995) at .05 level of significance and 280 degrees of freedom. This means that there is no significant difference in the impediments to solid waste collection based on location. Also, Table 7 shows that in the impediments to solid waste disposal, the t-cal (-2.47) is less than the p-value (.014) at .05 level of significance and 280 degrees of freedom. This means that there is no significant difference in the impediments to solid waste disposal based on location. Therefore the null hypothesis of no significant difference in the impediments to solid waste collection and disposal based on location is accepted.

Conclusion

Based on the findings of the study and discussion, the following conclusions were drawn: financial constraints poses greater impediment to solid waste collection; poor recycling method indicates the highest impediments to solid waste disposal; and that there is no significant difference in the impediments to solid waste collection and disposal based on location (t-cal < p-value at .05).

Recommendations

Based on the findings of this study, the discussion and conclusions herein, the study recommends that:

1. Solid waste management should be well funded and workers' welfare improved.
2. Modern technologies on waste recycling should be provided and in-service training given to workers on how to use them.

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