



Scavenging as a Means of Environmental Management: A Case Study of Nsugbe Solid Waste Dumpsite, Anambra State, Nigeria

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ABSTRACT

Scavenging is a tool for environmental management as it aids in the conservation of natural resources. The objective of this study is to assess scavenging at Nsugbe solid waste dumpsite as a means of environmental management. The instruments used for data collection are observation, questionnaire, interview and physical weighing of scraps recovered and sold by 95 scavengers for a period of 5 months from January- May, 2019 at the waste dumpsite. Data analysis was done using percentages, charts and Pearson Product Moment Correlation Coefficient analysis, while Students T-test was made use of in testing the hypothesis. The major outcomes of the study are: (1) A total of 601.196 metric tons of scraps which would have been thrown into the environment to constitute a hazard were recovered, thereby improving environmental quality; (2) the T-test analysis on quantity of scraps recovered produced the calculated t of 24.396 greater than the tabulated t of 2.09. thus confirming that the quantity of scraps recovered by scavengers at the Nsugbe solid waste dumpsite is significant to the quantity collected and disposed by ASWAMA; and (3) materials scavenged which are either reused or recycled help in the reduction of exploitation of virgin materials for production by industries. The recommendations of the study include: (1) creation of awareness among youths to explore scavenging as a big business; (2) setting up of recycling industries close to the dumpsite or in any part of Anambra State for the scavenged materials as there in none for now; and (3) creation of awareness amongst the scavengers on the occupational health hazards associated with the scavenging business.

Keywords: Solid wastes, dumpsite, scavenging, scavengers, environmental management, scraps.

1. Introduction

Solid waste management is a major challenge nowadays for the administrators, engineers, planners and environmental managers in their collective quest for sustainable development. Extremely large volumes of solid wastes generated mainly in our urban environment need to be collected, transported and finally disposed of safely. These operations ought to be carried out quickly and effectively without incurring excessive cost or damage to the environment which is the resource base upon which our life depends. Regrettably, in many developing democracies, governments and their agencies are incapable of coping with the huge volumes of solid wastes being generated. However, scavenging which is selection of reusable and recyclable solid waste materials from dumpsites helps in reducing this volume.

Scavenging provides a spontaneous labour incentive solution, becoming an alternative means of achieving an integral solid waste management system (Ackeman, 2005). It is a common occurrence in the third world countries, because of high unemployment, widespread poverty and lack of a safety net for the poor (Medina, 2001). Important role of scavenging is the fact that it represents an income-generating activity for the poorest in the developing world (Moreno-Sanchez *et al.*, 2003). They also

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stated that recovery of materials from solid wastes, if organized properly, can generate a livelihood for unskilled workers in a developing country's environment.

People who are engaged in scavenging activities are known as scavengers. In the view of Okoye (2010), scavenger is a person who picks up recyclable/ reusable materials from mixed solid waste stream wherever it may be temporarily accessible or disposed of for further use and/or processing. A waste scavenger is a person who salvages reusable or recyclable materials to sell or for personal consumption (Ebenezer, 2014). Adewole (2009) opined that scavengers were normally part of the socio-economic structure; their displacement from a disposal site could have many direct and indirect consequences. He also asserted that unsupervised and uncontrolled scavenging was detrimental to the health and safety of the scavenger as well as personnel operating the facility. The focus of this study is to assess the type of inorganic wastes collected by the scavengers, the roles they play and their potential contribution to environmental management through waste collection at the Nsugbe dumpsite.

1.2. Statement of the Problem

The problem under investigation is scavenging as a means of environmental management. In the view of Moreno-Sanchez *et al.*, (2003), scavenging has been one of the major economic activities of the local and marginalized people in developing and developed countries, though it is a means of sustainable development, it is faced by a number of challenges which attracted the concern of researchers such as scientists, environmental managers and other environmental regulatory agencies. Nas and Jaffe (2004) reported that scavengers are seen as being the lowest of the low, relegated to dirty work such as scavenging because of their caste. Most scavengers can be considered as a vulnerable segment of the population, due to their daily contact with garbage and their often ragged appearance; they are mostly associated with dirt, squalor, considered as undesirables and sometimes even as criminals (Medina, 2002).

According to Anierobi and Efobi (2013), sustainable environmental management efforts in Nigeria should seek to embrace the informal sector operators (scavengers or waste pickers) and incorporate them into the organizational structure of solid waste management system of our urban centres, where they were hitherto neglected while lack of pensions and health insurance affects scavengers' decision that ultimately also affects productivity. Scavengers suffer from serious of occupational health risks. Because of manual handling and lack of protective clothing and equipment, they were undoubtedly exposed to various health risks (Wilson *et al.*, 2006). They also opined that getting direct contact with toxic and infectious components, odour, polluted air and water were most common factors responsible for health risks. Despite the problems facing scavenging and its operators, it has remained a means of solid waste management and indeed environmental management which is the focus of this study.

1.3 Objective of the Study

The objective of the study is to ascertain the quantity of solid wastes disposed and recovered by scavenging at the Nsugbe dumpsite as a means of environmental management.

1.4. Research Hypothesis

H₀: The quantity of wastes recovered by scavengers in Nsugbe Solid Waste Dumpsite is not significant to the quantity collected and disposed by Anambra State Waste Management Agency (ASWAMA).

1.5. Area of Study

Nsugbe is a town in Anambra East Local Government Area, Anambra State, Nigeria that lies within latitudes 6° 15' 60" N, 6° 26' 37"N and longitudes 6° 48' 59" E, 6° 82' 04"E (Figure 1). Nsugbe solid waste dumpsite is a new site mapped out by Anambra State Government due to on-going construction work at Obosi solid waste dumpsite. It lies at latitude 6° 23' 38"N and longitude 6° 82' 53"E (Figure 2). It is bordered by Onitsha in the south, Nkwele-Ezunanka on the east, Omambala River in the west and Aguleri in the north

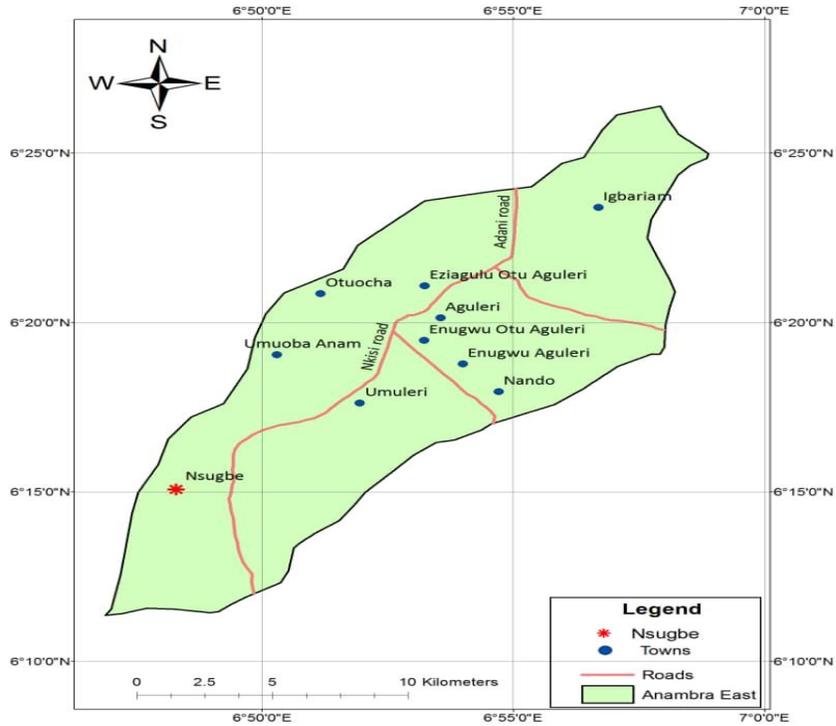


Fig. 1: Location of Nsugbe in the map of Anambra East Local Government Area
Source: Splendour GIS Services, Awka, Anambra State 2019.

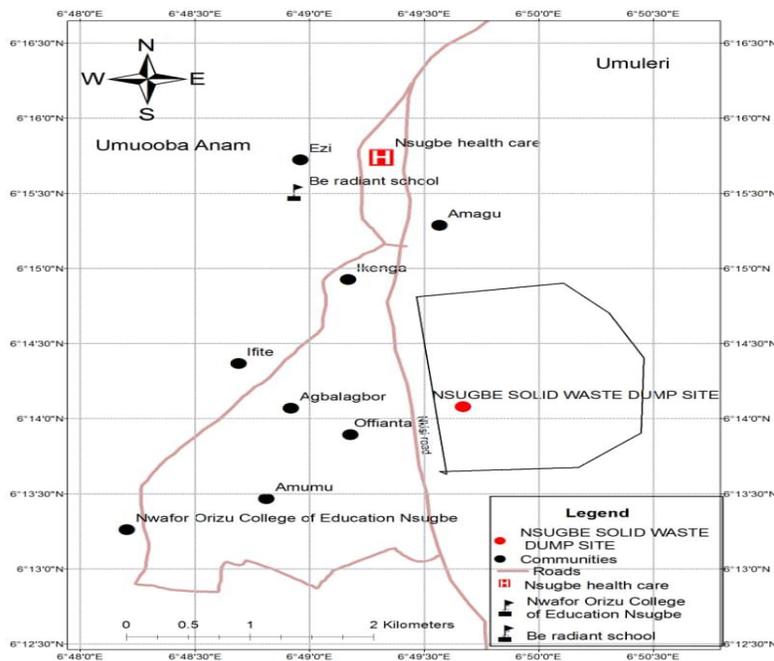


Fig. 2: Location of the Nsugbe solid waste dumpsite in the map of Nsugbe
Source: Splendour GIS, Awka, Anambra State

Nsugbe and its environs are mainly underlain by the Imo Shale Formation. This consists of thick clayey shale, fine textured, dark grey iron stone and sandstone bands. Soils in Nsugbe are classified as lateritic soils. These soils are rich in free iron but have low mineral reserve. Topography of Nsugbe is

undulating which lies at a moderate altitude (75.36m) above sea level. The mean relative humidity in Nsugbe ranges from 70-88% in January to 80-90% in July. The mean annual rainfall in Nsugbe is 1750-2000mm.

The population of Nsugbe was 8306 according to National Population Commission (NPC) (1991). With the approved 2.85% annual population growth rate NPC by (1991), the 2006 population projection figure for the study area was estimated to be 12,661 persons. Using the then 2006 approved growth rate 3.2% by NPC, the 2019 projected population figure for Nsugbe is 19,067 persons. Educational institutions are located in the study area. Nwafor Orizu College of Education is located in Nsugbe. There are over 16 primary and secondary schools with private and government schools as well as vocational centres in Nsugbe.

1.6. Conceptual Framework: Sustainable Waste Management

This study is based on the concept of sustainable waste management. According to De Montfort University Leicester (2012), sustainable waste management can be defined as using material resources efficiently to cut down on the amount of waste produced, and where waste is generated, dealing with it in a way that actively contributes to the economic, social and environmental goals of sustainable development; managing waste is not only how we dispose garbage in landfill, or how much we recycle or what we recycle, but it is also how we do not create waste to start with.

Focus of sustainable waste management in the period 2001–2010 was a clear evidence of reducing of greenhouse gases (GHG) as a result of implemented sustainability criteria and an upward shift in the waste management hierarchy (European Environment Agency, 2013; Karagiannidis *et al.*, 2013). Sustainable development requires viable answers following economic, social, and environmental criteria. Therefore, sustainable waste management has a central role in sustainable development (Cucchiella *et al.*, 2014).

In the opinion of Bako (2008), in Nigeria, sustainable waste management was viewed as sustainable development without jeopardizing future development, i.e. in our efforts to explore and exploit the natural resources to serve us, there was an obvious paradox evident in the need to ensure economic development, while protecting the environment. According to him, it was important to note that there must be a balance between levels of development and the stock of natural resources, that is, development must be at a level that can be sustained without prejudice to the natural environment or to future generations. He also opined that if there is to be sustainable development in waste management in Nigeria, the availability of land for landfill, human resources, plant and equipment and other tools including capital must be readily available.

Additionally, he asserted that the country needed to protect the future for the next generation by cleaning up her environment of all types of wastes, taking into consideration both physical and population development of the states; as such waste management must mean the collection, keeping, treatment and disposal of wastes in such a way as to render it harmless to human and animal life, the ecology and the environment generally. In the context of sustainable waste management, scavenging should be carried out such that wastes do not litter the environment or endanger public health; this is because it removes large amount of solid wastes from the wastes stream and supports reuse and recycling which has been acknowledged as the best method of waste management by researchers.

2. Materials and Methods

The methods used in the study were observation, interview and physical weighing of waste materials scavenged from the dumpsite. The dumpsite was observed during which data on solid wastes scavenged from the site by 95 scavengers was obtained.

Two major sources of data were used by the researchers in the study. Secondary data were obtained from publications, reviews of academic articles, textbooks, bulletins, internet materials, news articles, research projects, magazines, journal articles, conference/seminar papers, records kept by Anambra State Waste Management Authority (ASWAMA) that disposes wastes with trucks (Plate 1) at the dumpsite and records kept by some scrap dealers operating at the dumpsite. Primary data was collected from field observation and physical weighing of solid waste scavenged, using a weighing balance as depicted in Plate 2.



Plate 1: Truck disposing wastes at Nsugbe dumpsite with scavengers picking the recyclables
Source: Researchers' field survey, 2019

The statistical tools employed in the analysis of data were Pearson Product Moment Correlation Coefficient and Independent t-test. Pearson Product Moment Correlation Coefficient analysis was used to assess the degree of association between the quantity of waste collected and disposed by ASWAMA at the dumpsite and the quantity of scrap recovered by scavengers between January and May 2019, while the independent t-test was used to establish statistically the influence of quantity of scrap recovered on quantity of waste collected and evacuated by ASWAMA in the 5 months. The results obtained formed the basis for discussion, interpretation, making recommendations and conclusions.



Plate 2: One of the Researchers weighing recovered scraps at Nsugbe dumpsite with a scavenger
Source: Researchers' field survey, 2019

The mathematical illustration of Pearson Product Moment Correlation Coefficient used by the researcher is:

$$r = \frac{\frac{1}{n} \sum (a - \bar{a})(b - \bar{b})}{\partial a . \partial b} \dots\dots\dots(1)$$

where,
r = Correlation Coefficient

- n = number of occurrence of scores
- $\sum a$ = sum of a scores
- $\sum b$ = sum of b scores
- $\sum (a-\bar{a})$ = sum of the product of occurrence score a
- $\sum (b-\bar{b})$ = sum of the product of occurrence score b
- $\sum a^2$ = sum of squared a scores
- $\sum b^2$ = sum of squared b scores

Stating independent t-test mathematically:

$$t = \frac{\sqrt{[(\sum a^2 - \frac{(\sum a)^2}{N}) + (\sum b^2 - \frac{(\sum b)^2}{N})]} \times \left[\frac{1}{N_a} + \frac{1}{N_b} \right]}{Na+Nb-2} \dots\dots\dots(2)$$

- where ,
- t = t-test
- \sum = sum of scores
- a = scores in group 1
- b = scores in group 2
- N_a = number of scores in group 1
- N_b = number of scores in group 2

3. Results and Discussion

The results of this study are indicated in Tables 1,3 with interpretations. Records by ASWAMA showed the quantum of wastes disposed off at the dumpsite from January – May 2019 as 67.32, 67.07, 66.98, 60.81 and 54.34 tons respectively giving a total of 31,659 tons for the five months. From weighing the quantities of solid waste recovered by 95 scavengers by the researcher with the assistance of the dumpsite managers and the scavengers themselves the quantities of solid wastes removed from the dumpsite are also indicated in the Table 3.1. For the five months (January-May, 2019) the quantities of nylons, carton papers, metal/aluminium cans and plastic bottles recovered from the dumpsite are 153.547, 154.929, 146.038 and 146.682 tons respectively. Put together, a total of 601.196 tons of solid wastes were removed from the dumpsite during the 5months which represent 3.8% of the total waste dumped at the site.

Table 1: Quantity of Solid Wastes Disposed monthly by ASWAMA and Scrap Recovered monthly by Scavengers

Months	Quantity of wastes disposed every month by ASWAMA (tons)	Quantity of nylons recovered every month (tons)	Quantity of carton papers recovered every month (tons)	Quantity of metals/ aluminium cans recovered every month (tons)	Quantity of plastic bottles recovered every month (tons)	Total quantity of scrap recovered every month (tons) by Scavengers
January	6732	30.174	31.924	28.879	29.718	120.695
February	6709	30.369	30.987	29.857	30.263	121.476
March	6698	31.954	30.121	29.973	27.846	119.894
April	6081	30.048	31.825	29.198	29.121	120.192
May	5439	31.002	30.072	28.131	29.734	118.939
Total	31. 659	153.547	154.929	146.038	146.682	601.196

Source: Researchers’ field survey and ASWAMA’s records, Awka, 2019.

From Table 2, the correlation coefficient (r) is 0.7902 and positive. This is an indication of strong positive correlation between x and y – the quantity of solid wastes disposed by ASWAMA and the

quantity of waste materials (scraps) recovered from the dumpsite. This implies that there is a strong positive relationship between the two variables.

Table 2: Pearson’s Product Moment Correlation Coefficient Analysis of Solid Wastes disposed and Scrap Recovered by Scavengers

		Quantity of Wastes Disposed Monthly by ASWAMA	Total Quantity of Scraps Recovered Monthly by scavenger
Quantity of Wastes Disposed Monthly by ASWAMA	Pearson Correlation	1	0.790
	Sig. (2-tailed)		0.112
	N	5	5
Total Quantity of Scraps Recovered Monthly by Scavenger	Pearson Correlation	0.790	1
	Sig. (2-tailed)	0.112	
	N	5	5

Source: Researcher’s field survey, 2019

Table 3 depicts the result of the T-test with the calculated t producing 24.396 greater than the tabulated t of 2.09 at 0.05 level of significance. We therefore, reject the null hypothesis and confirm the alternative hypothesis that the quantity of wastes recovered by scavengers at Nsugbe Solid Waste Dumpsite is statistically significant in terms of overall quantity of wastes collected and disposed off by ASWAMA. This result has amplified and strengthened the earlier result which confirmed that there is a high positive correlation between two variables tested. It implies that scavenging contributes significantly to waste reduction in the study area. This goes to echo and strengthen the work of Enumah (2013), Medina (2010), Igwe *et al.*, (2018) who observed that scavengers are key players in the reduction of quantity of wastes that enter the solid waste stream in landfills. By so doing, scavenging becomes a means of waste management and by extension environmental management because through it wastes are recycled back into nature or market place which reduces pressure on utilization of natural resources. Furthermore, Table 3.1 which depicts total quantity of wastes disposed monthly by ASWAMA to be 31,659 tons is another good proof that scavengers contribute in no small measure to waste reduction in waste management and indeed environmental management which is a very critical component to achieving sustainable human development.

Table 3: T-test on waste disposed and scrap recovered by scavengers

	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Quantity of Wastes Disposed Monthly by ASWAMA	24.396	4	0.000	6331.800000	5624.88665	7038.71335
Total Quantity of Scraps Recovered Monthly by Scavenger	285.422	4	0.000	120.239200	119.06957	121.40883

Source: Researcher’s field survey, 2019

4. Conclusions

The study investigated scavenging at Nsugbe solid waste dumpsite as a means of environmental management. The activities of scavengers were found to have contributed to a reduction in the quantum of solid wastes at the dumpsite in empirical terms. The wastes recovered by the scavengers are either sold in the open markets or sent to recycling plants where they serve as secondary raw materials and are transformed into goods. Therefore, the raw materials that would have been utilized to manufacture such goods are conserved which reduces pressure on them and indeed the environment, thus contributing to environmental management.

5. Recommendations

This study has established in empirical terms that scavenging is a veritable instrument for waste management and by extension environmental management. In the light of this, we recommend as follows:

- a. Government policies and laws should be made to encourage scavengers as agents of environmental management through provision of soft loans, education and safety gadgets.
- b. Institution of poverty reduction program by governments aimed at training the youths to engage in scavenging as a big business so as to reduce the number either seeking air-conditioned office jobs or running to other nations for similar jobs.
- c. Setting up of recycling industries in Anambra State is very important to enable scavengers sell the recovered items rather than doing so outside state.
- d. Employment of scavengers by ASWAMA to recover waste materials from various dumpsites in Anambra State both as a source of internally generated revenue and for purposes of environmental management.
- e. Intensification of health awareness campaign among scavengers is necessary for them to understand the occupational health risks of their career. ASWAMA's role in this direction becomes very expedient.

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