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The Management of Solid and Liquid Waste in Enugu, Enugu State, Nigeria

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ABSTRACT

The production and disposal of waste are very integral parts of any developing or industrial society. Both domestic and commercial sources of waste have increased significantly in Nigeria over the past decade. The percentage of Nigeria's population living in cities and urban areas has more than doubled in the last 15 years. The cities and urban areas are experiencing continuous growths which contribute to enormous generation of solid and liquid waste.The management of waste is a matter of national and international concern. The volume of waste does not actually constitute the problem but the inability of governments, individuals and waste disposal firms to keep up with the task of managing waste and the environment. In this paper, the attention is focused on domestic waste. Some of the problems which have attended the management of this category of waste in Nigeria today would be highlighted. It is seen that Nigeria has not done well in the direction of tackling the menace of domestic waste. This is even in the face advanced management strategies existing today for domestic waste management which have been adopted in many places. The paper proffers suggestions that can assist in addressing these issues.
***Keywords**: Management, waste, Enugu.*

INTRODUCTION

In industrial production, many materials are employed to manufacture products and because of the scale of the production, a lot of waste is generally produced. The component categories usually include: compostable (includes food, yard, and wood wastes); Paper; plastic; glass; metal; and other (includes ceramics, textiles, leather, rubber, bones, inerts, ashes, coconut husks, bulky wastes, household goods). The improper management of solid waste poses health hazards to the residents causing diseases such as bronchitis and cancer. High level of industrial discharge has effect of upsetting the ecological balance of nature. The microbial degradation of waste in water bodies lead to depletion of oxygen and fishes and other aquatic organisms which require oxygen for survival are thus affected. As a result of the size of the problem, industrial companies employ waste managers to focus solely on the issue of proper and effective disposal of waste. Industrial waste management involves collection, transport, processing or disposal, management and monitoring of industrial waste material. Management of non –hazardous, residential and institutional wastein Nigeria is usually the responsibility of local/state government authorities while management of hazardous commercial and industrial waste is usually the responsibility of the generator. There is no significant waste recovery and reuse activities in Nigerian cities. In most cases, scavenging plays an important role on the economic survival of a number of industries (e.g., steel, pulp and paper).Waste pickers work on dumps and even landfills, while some build squatter colonies on the edges of dumps, sometimes with devastating consequences. Waste pickers are involved in a small-scale recovery and reuse operation. The assessment of industrial waste management problems

greatly varies depending on the nature of industry, their location and mode of disposal of waste. Sound waste management helps in reducing the adverse impacts on the human health and environment, while enhancing the lifestyle and developing the economic state of the country. In order to offer an appropriate solution for better management of industrial solid waste in industrial town like Enugu in South-East of Nigeria, assessment of the approaches of industrial waste management is essential. This paper aims to evaluate some industrial waste management approaches of some industries in Enugu.

STATEMENT OF THE PROBLEM

Inadequate solid waste management which was relatively bearable in most Nigerian states before1980; became impossible now especially with the growing of urbanization, rural urban migration and sitting of buildings and other infrastructures in areas designated as solid waste disposal points. Furthermore the proliferation of public and private schools, hospitals and eating houses generate more than 95% of the refuse in developing Nigerian States.Problem with the disposal of solid waste in Enugu State could be traced to late 70s when rural poverty increased which caused high rural-urban migration. Rapid urban growth in Nigeria accompanied by increasing population, traffic-congestion, air and waste, pollution, capital production of solid waste and non-availability of places designated for waste disposal. In the absence of a regular and efficient solid waste collection system, waste is dumped in open spaces, on access roads and along water courses, which constitutes health hazard. The Enugu State Waste Management Agency has been indicted by many citizens and groups as not doing their work well. This resulted to frequent change of leadership of the Agency. In spite of the frequent change in leadership of ESWAMA the problem of solid waste and its attendant health and fire hazard is still there. There is no gainsaying that problem resulting from poor solid waste management has retard the development of Enugu State in particular and Nigeria at large. Thus, the aim of this paper is to extrapolate the different sources of solid and liquid wastes and ways of managing the waste and indulging in the amazing concept of waste recycling. The objectives of this study included; to assess the effectiveness of the Enugu State Waste Management Agency in the handling of solid waste management, to evaluate the people of Enugu State on the level of their education in relation to environmental matters and to advance some possible remedies to these huge problems and induct the concept of recycling in the people. The study also focuses on the challenges of inadequate disposal services faced by the Enugu State Waste Management Agency.

LITERATURE REVIEW

There have been different contributions made by different authors to the concept of 'waste'. Waste is anything that has lost its value, and the by-product of the processed product; according to Medina (2002), improper handling and disposal of solid waste has contributed to the high level of mortality and morbidity witnessed in most urban cities in developing countries of the world. Grasier (2007) described solid waste as any solid material that is discarded.According to Allaby (1988)

waste is any substance, be it solid, liquid, or gaseous, that remains as residue or an incidental by- product of a substance, and for which no other use can be found by the organism or system that produced it.Sule (2001) asserted that most uncontrolled and poorly managed waste are found in fast growing capital cities of the world especially in developing countries where population is always on the increase. He also stated that the problems of the solid waste is not familiar but assume global gargantuan dimensions. In recent years leading to environmental degradation pollution and imbalance, epidemics and diseases, decline in urban quality and fiscal spending on solid waste generation and management. However, many authorities in the field of solid waste have shown that solid waste generation problem and management is not only a social behaviors, but also socio-economic and cultural factors associated with them. These include population growth, urbanization, technological advancement and improvement in the standard of living. Rogdgers (2011) describes waste management as a systematic control of generation, storage, collection, transportation, separation, processing, recovery and disposal of solidwaste. Most wastes generated in cities are from domestic and industrial sources. Industrial wastes are solid, liquid or gaseous waste products released into the environment by industries and factories which can adversely affect human life and property. Sources of these wastes are; iron and steel industry, mines and quarries, greenhouse gases released from chemical plants, burning of fossils in refineries, food industries and nuclear facilities. In most places, solid waste management is accepted as a major aspect of the indigenous community organization and traditional home management; hence every house/compound has a designed area for solid waste collection/disposal and or incineration (Sanda, 2008). In Nigeria, wastes are generated in homes, commercial, industrial sites, hospitals, schools, on streets and even religious areas. These types of waste are the focus of this paper.

METHODOLOGY

The research is a descriptive cross-sectional survey of randomly selected Enugu State city residents using well-structured questionnaire for the purpose of primary data collection on the level of awareness, knowledge and practices of solid waste management in the state. Questionnaires were used to source data from the respondents. They sought to know the extent to which the respondents understood the problem of solid waste management in Nigeria as they were conceptualized in the literature review. The questionnaire was pilot tested and rated highly by raters with extensive experience in the use of the instrument for research purposes. The ease of access to the respondents by the researcher, allowed for a personal administration of the instrument which ensured eightynine percent return rates there by eliminating non-returnbias. In depth interviews were conducted with 200 respondents who are staff of Enugu State Waste Management Agency. The secondary data used include official documents obtained from the Enugu State Ministry of Environment, journals, and textbooks among others.

A total number of 250 people (residents and shop owners above 18 years old) were used for the questionnaire survey

(Table 1) while four groups were interviewed within the area as follows; the elders (comprising of house-hold heads) and youth group (comprising of street-shop owners) around the residential areas and a cross-section of market men and women group within the markets areas. The paper adopted a systemized random sampling technique for this study where, 360 people/respondents (60 questionnaires were distributed in each of the 6 selected study sites) and these made up the targeted population for the study with a predetermined technique of using the first to be met 60 persons in each of the market areas of Ogbete market, Abakpa market and New market while 60 questionnaires were distributed in each of the other three remaining study site of Trans-ekulu, Ogbu-aghor and Ugbo-ezeji where three streets within each the areas were randomly selected and questionnaires administered to the first 60 house- hold heads living in homes that fall within the houses along odd numbered buildings in the streets.

ANALYSIS AND DISCUSSION

In the assessment of the waste management practices in Enugu metropolis, it was discovered that most inhabitants, especially those in the major markets; Ogbete market, Abakpa market and new market disposed their wastes at the designated waste management/dump sites. Table 3 shows that 167 respondents representing 67 percent of the entire study population use the central waste dump sites to dispose their wastes while 20 percent of the respondents disposed their wastes by burning and 8 percent disposed their wastes by burying. Meanwhile 12 respondents representing 5 percent of the entire study population used other means that could be described as indiscriminate dumping as they dump their wastes in unauthorized locations (sites) such as; middle of the road, and uncompleted buildings within their area (Figure 3). Using percentages, the item-by-item analysis further reveals that only 26.2% of the respondents claimed not worried about the solid waste around their environment, 44.3% and 28.8% gave very worried and worried responses respectively. More than 59.4% acknowledged their interest in solid waste management in their environment while 36.2% of the respondents also reported that they placed great importance on the way their neighbors dispose solid waste. 34.0% of the respondents stated —very important, (33.2%) —important, 24.6% —not important, while 16.0% were not sure. More than half (55.8%) of the respondents expressed dissatisfaction with the way solid wastes are disposed within their environment, 33.2% said they are satisfied, while only10.9% are very satisfied with the way wastes are disposed within their environment. In the assessment of the performance level of the government and the waste management agency on waste management in the state by various stakeholders and residents, the study revealed that a total of 17 respondents expressed satisfaction with the waste management system or technique in the study area while the remaining 233 respondents expressed dissatisfaction with the standard and system of waste management in the study area representing 93 percent of the study population. It was also found that a total number of 34 respondents representing 14 percent of the entire study population were of the opinion that there have been improvement in the

waste management system on-like what used to be the case before the last five (5) years while 216 respondents representing 86 percent refused to accept there have been a significant improvement in the waste management system within the last five years comparing its state before this timeFurther investigation suggests that the above position is caused by the unavailability of a holistic approach towards waste management in the area with the scanty refuse dump sites most of which is being centralized making people to have no other option than to travel long distances with their household or generated waste to dump such in the designated dump site which within hours of disposal and evacuation becomes filled up again and poses nuisance and breeding ground for scavengers. In response to the quest of how this menace could be controlled, all the respondents advocated the introduction of door to door waste collection system as the major solution to the waste management problem or challenge faced in the study area. Most of the respondents also expressed dissatisfaction with the levy collected from residents by the government waste management agency (ESWAMA) stating that the current state of the waste management system does not befit the amount paid by residents for such services with a total number of 229 respondents representing 92 percent of the total study population supporting this view. From the above observations, it can be deduced that; the waste management strategy practiced by the Government approved waste management agency in the area is so poor and inefficient that huge waste dumps are found in most available dump sites at every time and much volume of refuse are constantly found littered all around the streets within the study area with the gutters blocked with wastes causing flooding during the raining season. With the findings above, it is being noted that the agency responsible for waste management in the area has succeeded to do more harm than good to the overall sanitation status/situation of the area and it is discovered that the offensive odor emanating from such sites or the rubbish dump in most cases resulted to a depletion in the atmospheric condition and health challenges on residents of such areas.

CONCLUSION AND RECOMMENDATIONS

The paper concludes that the waste management practices in Enugu city is unsatisfactory and good strategies / measures needs to be employed to salvage the situation. Two different waste management options must be combined intelligently in a way as to reduce the environmental, social impact of waste and improving the aesthetic of the city and living conditions of residents within the area. This combined option is called integrated solid waste management and system approach which should be used for the assessment of the competing options. Refuse heaps have taken over Enugu metropolis, a situation which generates fears of an outbreak of epidemic in the state. Residents of Enugu have expressed deep concern over the poor sanitary conditions of some parts of the state. The situation has become unbearable as refuse heaps are littered in unauthorized places. Also, rubbish dumps, hitherto located at strategic locations, are found to overflow with refuse, a development believed to pose health risks for the masses. It has been observed that many sections of the

town, the rubbish dumps have notbeen evacuated for several weeks running.For instance, residents of parts of Enugu metropolis like Ogui New Layout, Achara Layout, MaryLand, Garki, Emene, Isieke junction and Ugbene in Abakpa Nike area respectively complained to Insider Weekly that waste disposal officials of Enugu State Waste Management Agency (ESWAMA) had, for inexplicable reasons, not visited for refuse evacuation for weeks now. The consensus is that all the environment-related agencies in the state, including ESWAMA, Enugu State Environmental Protection Agency (ENSEPA), Enugu State Ministry of Environment and, indeed, the present government has failed in the environmental sanitation of Enugu city.Residents are, further, troubled over the stench that oozes out from the numerous abandoned refuse heaps across the capital city. The refuse heapshave, also, remained a breeding ground for mosquitoes which have greatly constituted a health hazard to the people .It should be recalled that Chime's government had, at the end of the first meeting of the State Executive Council (SEC) in January 2012, assured indigenes and residents that necessary machinery had been put in motion for tackling problems of waste management in the state. Chuks Ugwoke, the then Commissioner for Information and Culture, said the state government was making arrangements with the management of ESWAMA for sustainable refuse disposal and urban waste management in the state. Ugwoke restated government's determination and commitment to maintain a healthy and clean environment, as well as to ensure that the issue of waste disposal and management was taken care of and put to rest. But long after this assurance, waste management in Enugu state, rather than improve, has degenerated to the lowest ebb, with the environment already feared to be contaminated and disease-borne. Findings by Insider Weekly have shown that diarrhea (commonly called running stomach), especially, among the infant population, is on the increase in recent times. This is, often, accompanied by catarrh, cough, cold and fever. And some medical experts have attributed the outbreak of these diseases to the polluted air arising from waste mismanagement. Although it seems easier for a camel to pass through the eye of a needle than for Egwu, the new ESWAMA boss, to grant media interviews, he, also, reportedly blamed the poor sanitary situation in the state on the alleged refusal of most of the residents to pay their bills. Egwu, as it were, assured that his agency would make efforts to dispose the refuse littered all over the Coal-City of Enugu as soon as the refuse disposal equipments were put in order.But the question is: 'How soon will this be?' The paper therefore recommends that penalties must be invoked and culprits punished, so that the enforcement of proper practices are not left to area wide waste management authorities alone. An effective chain in the cycle of timely clearance to designated landfills, dump sites, for incineration and compacting and composting should be integrated into energy and the land reclamation schemes envisioned in the future.

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Figure 1: The map of Enugu, the study area.

Table 1: Population and sample size

S/No	Area	Population
1	Ogbete Market	42
2	Abakpa Market	30
3	New Market	20
4	Trans-Ekulu	50
5	Ogbu-Aghor	53
6	Ugbo-Ezeji	55
7	Total	250

Source: Field survey, 2016

Table 2: Category of Solid Waste Management in the Study Area.

RESPONSE	FREQUENCY	PERCENTAGE %
Municipal/ Domestic Waste	88	35.20
Industrial Waste	107	42.80
Commercial waste	30	12.00
Miscellaneous	25	10.00
Total	250	100.00

Figure 2: Some waste disposal sites in Enugu, 2016.
Source: Field Survey, 2016.

Table 3: Waste Disposal methods By Respondents:

Area	Use of central dump sites	Burning refuse	Burying of refuse	Other Unlawful Measure
Ogbete Market	37	7	-	-
Abakpa Market	28	2	-	-
New Market	16	4	-	-
Trans-Ekulu	30	11	6	3
Ogbu- Aghor	33	10	7	3
Ugbo-Ezeji	25	16	8	6
Total	167	50	21	12

Source: Field Survey, 2016.

Table 4: Mean and standard deviation of respondents' level of Awareness

Questions	Not Sure	Not Worried	Worried	Very Worried	Mean	Standard Deviation
To what extent do you worry about solid wastes in your Environment?	5 (0.8)	170 (26.2)	187 (28.8)	288 (44.3)	3.17	0.84
How interested would you say are in solid wastes in your	Not Sure 37 (5.7)	Not interested 235 (36.2)	Interested 141 (21.7)	Very Interested 237 (3.5)	2.89	0.97

environment						
How important do you regard the way your neighbors do away with Solid wastes?	Not Sure 104 (16.0)	Not important 160 (24.6)	Important 165 (25.4)	Very important 221 (34.0)	2.77	1.08
Are you satisfied with the way neighbors dispose their Solid wastes?	Very dissatisfied -	Dissatisfied 363 (55.8)	Satisfied 216 (33.2)	Very Satisfied 71 (10.9)	2.55	0.68
How satisfied are with the way solid wastes are handled by Enugu city waste Contractors?	Very Dissatisfied 11 (1.7)	Dissatisfied 323 (49.7)	Satisfied 185 (28.5)	Very satisfied 131 (20.02)	2.67	0.81

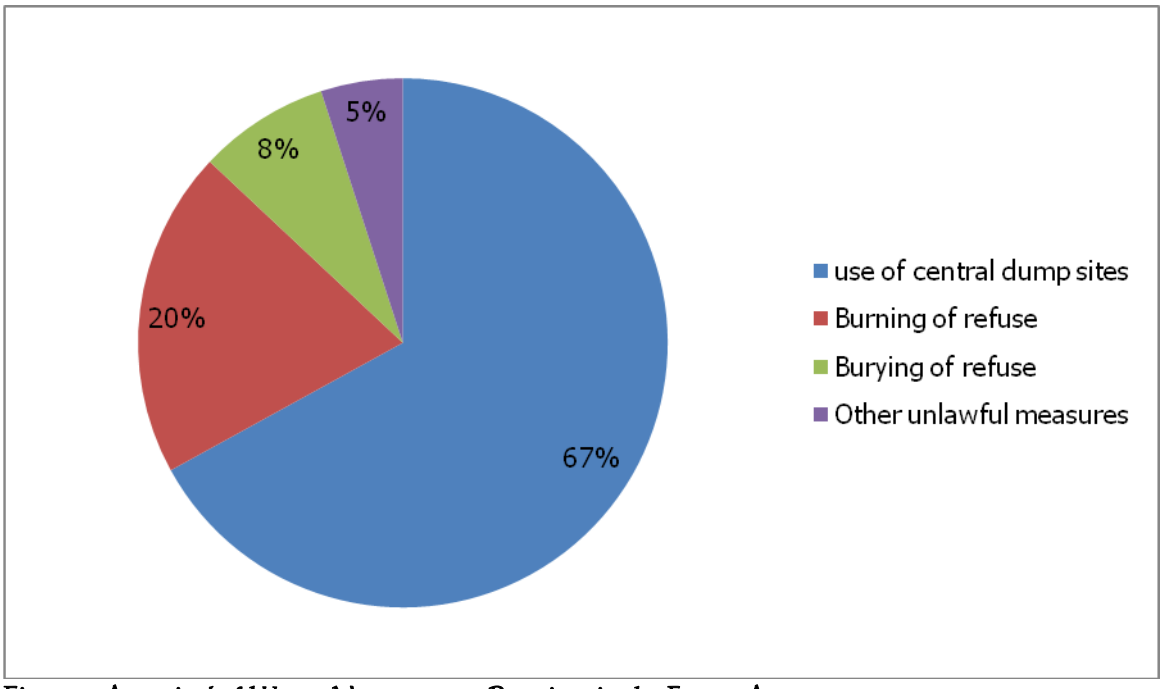

Figure 3: Appraisal of Waste Management Practices in the Enugu Area

Table 5: Rating of Waste management practices of the agency in charge of waste management.

Area	Waste Management Satisfactory	Waste Management Unsatisfactory	Improvement from what used to be(5 years ago)	No improvement from what used to be (5 years ago)	Support a door to door collection system	Waste level too high
Ogbete market	3	39	6	36	42	38
Abakpa market	5	25	10	20	30	25
New Market	3	17	8	12	20	18
Trans-Ekulu	6	44	10	40	50	40
Ogbu-Aghor	0	53	0	53	53	53
Ugbo-Ezeji	0	55	0	55	55	55

Source: Field study, 2016.