

SOLID WASTE MANAGEMENT IN ANAMBRA STATE, NIGERIA: IMPEDIMENTS AND OPTIMIZATION STRATEGIES

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ABSTRACT

The study was aimed at identifying impediments to solid waste management in Anambra State, Nigeria with the view to determining optimization strategies for effective solid waste management in Anambra State. The study area included two major cities in Anambra State. The study utilized the descriptive cross-sectional research design. Population for the study consisted of all the workers in Anambra State Waste Management Agency. Questionnaire was administered to the workers using purposive sampling technique to select workers who are engaged with solid waste management. Data were analyzed using statistical package for social sciences version 22. Mean, standard deviation and percentages were used to answer the research questions while t-test statistic was used to test the null hypotheses. Results show that financial constraints and ineffective collection methods are the major impediments to solid waste collection. Non-compliance of people to disposing waste at designated dumpsites is the major impediment to solid waste storage while bad road network poses highest impediment to solid waste transportation. Absence of appropriate technologies and poor recycling methods pose greater impediment to solid waste treatment and disposal. The study found a significant difference in the impediments to solid waste management based on gender unlike job status and job experience. Also, majority of the respondents proffered organizing seminar, workshops and in-service training for workers as educational optimization strategy, and upgrading workers' working conditions as attitudinal optimization strategy for solid waste management in Anambra State. Based on these findings, the study recommends that: solid waste management should be well funded and workers' welfare improved; roads and inter streets road networks should be improved; modern technologies should be provided and adopted and in-service training given to workers on how to use them.

KEY WORDS: Solid waste, Impediments, Optimization strategies, Management, Environmental pollution

INTRODUCTION

Solid waste management (SWM) is a serious challenge in many developing nations such as Nigeria. Mmom and Mmom (2011) reported that in many developing countries, less than 50 per cent of solid wastes are collected and only an insignificant fraction are disposed off appropriately. Adedeji and Eziyi (2010) posited that Nigerian cities are witnessing high rate of environmental deterioration and are rated among areas with the lowest liveability index in the world as a result of poor solid waste management. Poor solid waste

management are critical issues with far reaching health and environmental consequences. Tay (2007) pointed out that without an effective and efficient-SWM programme, waste generated from various human activities, both individual and domestic, can result in health hazards and have negative impacts on the environment. Some of the health hazards posed by solid waste include high prevalence of communicable and non-communicable diseases such as malaria, typhoid, cholera, diarrhoea, acute respiratory infections, tuberculosis and helminthes infections that account for a significant percentage of morbidity and mortality in Nigeria (Sani, 2012).

Therefore, it becomes imperative to determine optimized strategies for effective solid waste management in Nigeria.

Waste is relative in meaning. Sometimes, what an individual regards as waste may be a raw material for another individual. Oyeniyi (2011) defined waste as any material which has been used and is no longer wanted because the valuable or useful part of it has been taken out. Ezigbo (2012) opined that waste are discarded materials resulting from domestic and community activities, and from industrial, commercial, and agricultural operations such as sewage, household rubbish, manufacturing activities among others. From the foregoing, waste are discarded materials that their owners no longer see any value in them. Waste can exist in solid, liquid and gaseous forms depending on the state of matter that make up the waste. Waste materials in liquid forms are liquid waste example waste water; waste materials in gaseous forms are gaseous waste example carbon (iv) oxide while waste in solid forms are solid waste. Examples are garbage, rubbish among other solid wastes. This study focuses on solid waste.

Solid wastes have been defined severally in literature. Babayemi and Dauda (2009) defined solid waste as non-liquid and non-gaseous products of human activities, regarded as being useless. The World Health Organization (2011) stated that solid waste include all non-liquid wastes generated by human activity. Contextually, solid waste refers to discarded useless concrete materials. Solid waste generation is directly proportional to increased human population and activities. Urbanization and increased population (Edugreen, 2012), and economic activities (Ezigbo, 2012) increase solid waste generation. This appears to be the case in Anambra State because the largest market in West African is located in Anmabra State which attracts so many people to settle in the State, thus, the State is currently the most populated State in South Eastern Nigeria with very high economic activities. Okpala (2010) noted that an overall assessment of Anambra State with respect to solid waste management has not improved from the general status of other Nigerian States. According to the author, Nigerian States like Lagos, Cross River, Enugu and Imo have attained a commendable environmental status unlike Anambra State.

In Anambra State, solid wastes are seen dumped indiscriminately in places that are not designated dumpsites. Nnatu (2018) stated that waste dumping

is the common practice of waste disposal in Nigeria and that uncollected heaps of solid wastes are common while disposal sites have become environmental hazards. Onyido, Okolo, Obiukwu and Amadi (2009) reported presence of vectors of public health diseases in Awka, Anambra State. The study revealed abundance of vectors of parasitic diseases such as bacterial, protozoal and viral infections in the improperly disposed refuse dumps. According to the survey, abundance of these vectors suggests that vector-borne diseases may be prevalent in Awka, Anambra State due to large indiscriminately disposed refuse dumps in the streets. Otti (2010) opined that currently in Onitsha Anambra State, the proportion of non-degradable waste has increased very much and may constitute to erosion. Soil erosion affects more than 70 per cent of lands in Anambra State in form of sheet and gully erosion (Halidu, 2010). Poor management of solid waste can trigger off soil erosion (Tabirsir, 2011). Therefore, Anambra State needs optimization strategies for improved solid waste management.

Solid waste management is the process of collecting; storing, treating and disposing of solid waste in such a way that solid waste are harmless to humans, plants, animals, the ecology and the environment generally (Agwu, 2012). It is the discipline associated with controlling the generation, storage, collection, transfer and transport, processing and disposal of solid waste (Tay, 2012). From the foregoing, solid waste management refers to the task of coordinating available human and material resources in a way that ensures safe removal of solid waste from man's environment. The human resources charged with the responsibility of solid waste management are solid waste management workers. Ogwueleka (2009) stated that management of solid waste in Onitsha, Anambra State is the sole responsibility of Anambra State Waste Management Agency (ASWAMA). Therefore, ASWAMA workers constitute solid waste managers in Anambra State. These workers render paid services of solid waste management to ensure cleanliness of the State. Regrettably, institutions appointed to manage wastes have failed as regards solid waste management (Onibokun and Kumuyi, 1996). These situations cannot be without reasons. Some factors must have been constraining effective solid waste management in Anambra State. Those constraints are impediments.

Impediments are things that tend to hinder

effectiveness of a process. Adeshina (2000) opined that management of solid waste in Nigeria and many other developing countries pose serious challenges due to certain factors. According to Adeshina, such factors include absence or lack of appropriate technologies, financial constraints, and inefficiency in waste management. Ehiemere (2006) found that lack of working materials and inadequate staff was the two main factors that hindered efficient solid waste management. Agunwamba, Egbuniwe and Ogwueleka (2009) found that the few available waste trucks breakdown frequently due to overuse. Awosusi (2010) found that problems of solid waste management agency face in the studied area was shortage of vehicles, shortage of waste containers, and shortage of personnel, poor funding / encouragement by government and lack of dedication to duty. Ezigbo (2012) found that financial constraints and lack of appropriate technologies are the major challenges to waste management among solid waste management agencies. Yeny and Yulinah (2012) found that solid waste collection is hindered by inadequate mechanical equipment, manual collection, lack of transfer station facility, solid waste transportation is hindered by limited application of appropriate methods, lack of solid waste transfer facility, low collection-transportation service, aging of waste transport vehicles, condition of street roads and weakness in organization structure; challenges of solid waste disposal and treatment include high cost in operation and maintenance of appropriate methods such as composting, and weak maintenance and operation of facilities, incomplete separation of non-compostable materials. Devi, Swamy and Nilofer (2016) posited that in developing countries, the poor attitude of waste generators has impeded effective waste management because they commonly throw their wastes on the roads, which is further scattered by rag pickers in search of recyclables, and animals (cows, dogs, pigs, etc.) looking for food. Hence, the need for optimized strategies for effective solid waste management in Anambra State. Otti (2010) recommended that a solid wastes decentralized approach can serve as a better strategy for effective waste management. The author further posited that avoiding multiple handling of solid waste is another veritable strategy for solid waste management, that is, solid waste once collected, should not be transferred anywhere other than the final disposal

site. Uwadiogwu and Chukwu (2010) recommended citizens' mobilization and environmental education, strengthening of public agencies, responsible government, logistics and infrastructural improvement, legislation, appropriate technologies, monitoring and surveillance as strategies for effective solid waste management in Nigeria.

In Nigeria like other nations, certain demographic variable such as gender have been implicated in the study of solid waste management. Raudsepp (2001) found that women were significantly more likely than men to be concerned with environmental problems. According to the researcher, females have been consistently shown to have higher environmentally conscious attitude than men. Elledge, Rosensweig, Warner, Austin and Perez (2002) stated that gender-specific considerations need to be taken into account in looking at waste management.

A research conducted over a decade ago by Agunwamba and Ogwueleka (2003) pointed out certain impediments to effective SWM in Anambra State. However, the researcher assumed that such study may have prompted a number of efforts including formulation of SWM agencies, to ensure that solid waste no longer constitute to the unsanitary condition of the State. Regrettably, Okpala (2010) stated that Anambra State has not improved with respect to solid waste management. This study therefore seeks to find out the impediments to and optimization strategies for solid waste management in Anambra State.

MATERIALS AND METHODS

Study Area

Anambra State is the most populated State in the South Eastern Nigeria with Onitsha and Nnewi being the busiest cities in the State. The population of the State in 2006 stood at 4,055,048. Recent figures have it that the population of the State is about 8.3 million. One of the largest markets in West Africa based on geographical size and volume of goods is located in Anambra State. Thus, the State generates enormous solid waste because of its dense population and very high volume of commercial activities.

Data Collection

Three sectioned questionnaire containing 38 items on impediments and optimization strategies for

SWM, served as the instrument for data collection. Section A of the instrument comprised of three items to obtain sociodemographic information of the respondents. Section B contains 21 items on impediment to SWM with four response options while section C consists of 14 items on optimization strategies for SWM on two response options. The face validity of the instrument was established by three experts. The internal consistency of the instrument was determined using Cronbach alpha statistics and a reliability co-efficient of 79 was obtained. The index was high enough and therefore considered reliable for use for the study. The instrument were administered to workers in Anambra State Waste Management Agency-ASWAMA using purposive sampling techniques to ensure that field workers who are directly involved with solid waste management were selected. The researchers went to the ASWAMA office and obtained permission, cooperation and time of visit and administer the questionnaire to workers. The manager assembled the workers on an agreed day of visit and the researchers administered the questionnaire to workers by hand and collected the completed ones on the spot. Four days were given to workers who were unable to complete the questionnaire immediately to complete it. One of the researchers returned on the agreed day to collect back the completed questionnaire. This ensured maximum return rate.

Statistical Analysis

The statistical package for social sciences was used to analyse the data. Descriptive statistic of means and standard deviation, frequency and percentage were used to answer the research questions while t-test statistic was used to test the null hypothesis. Impediments to SWM was determined using a criterion mean of 2.5 obtained from the four response options of section B of the instrument. SA was assigned a value of 4, A was assigned a value of 3, D was assigned a value of 2 while SD was assigned a value of 1. Thus, $\frac{4+3+2+1}{4} = \frac{10}{4} = 2.5$

The decision rule was based on the criterion mean of 2.5. Items with mean value that is equal or less than 2.5 is considered "Not an impediment" while items with mean value above 2.5 is considered "impediment".

RESULTS AND DISCUSSION

Table 1 show that respondents indicated that

financial constraints, inefficient collection methods, absence of waste bins at strategic public places, inadequate equipment and manual collection are impediments to solid waste collection. This finding agrees with the findings of Adeshina (2008) who found that financial constraints, absence of appropriate technologies and inefficiency in waste management pose serious challenges to solid waste management. The finding also supports the findings of Yeny and Yulinah (2012) who found that solid waste collection is hindered by manual collection and inadequate mechanical equipment. The table further shows that respondents indicated that solid waste storage is impeded by shortage of waste containers, absence or lack of appropriate technologies, insufficient dumpsites, lack of dedication to duty and non-compliance of people to disposing waste at designated dumpsites. This finding agrees with the findings of Devi, Swamy and Nilofer (2016) who found that poor attitude of waste generators has impeded effective waste management because they commonly throw the waste on the roads which is further scattered by rag pickers in search of recyclables animals (cows, dogs, pigs, etc) looking for food. The findings also agrees with the findings of Awosusi (2010) who found that problems of solid waste management agency face include shortage of vehicles, waste containers, personnel and poor funding and encouragement by government. The table further shows that bad roads in streets, insufficient vehicles, low collection transportation service and lack of sound vehicles as impediments to solid waste transportation. This finding agrees with the findings of Yeny and Yulinah (2012) who found that low collection-transportation services, aging of waste transport vehicles and bad condition of street roads hinder solid waste transportation. The finding also agrees with the finding of Agunwamba, Egbuniwe and Ogwueleka (2009) who found that waste vehicles are few and the few available trucks breakdown frequently due to overuse.

The table also shows that absence of appropriate technologies, lack of training of solid waste management staff on waste treatment and recycling, high cost of operation and maintenance impede solid waste treatment. This is in line with the findings of Adeshina (2000) and Ezigbo (2012) who found that absence or lack of appropriate technologies and inefficiency in waste management may prevent effective waste collection, storage, treatment and disposal in many ways. The table also

revealed that lack of dumpsites, poor recycling methods, poor consumption by agriculture and lack of or non-provision of appropriate technologies hinder solid waste disposal. This finding agrees with the findings of Yeny and Yulinah (2012) who found that challenges to effective solid waste disposal are high cost in operation and maintenance of appropriate methods such as composting, and weak maintenance and operation of facilities. The findings also agrees with the findings of Ogwueleka (2009) that lack of expertise and manpower to run solid waste management and non-training of majority of environmental agency workers contribute to the impediments to solid waste management.

These studies have shown that all the items studied pose impediments to solid waste management in Anambra state. These impediments

may lead to poor environmental condition of the state which could predispose to outbreak of several communicable diseases in the state. It could also lead to flooding, erosion and environmental degradation. Therefore, there is need for strategies to optimize SWM in the study area.

Data in Table 2 shows that female respondents have higher mean score (3.38) than the male respondents (3.24). This agrees with the finding of Raudsepp (2001) that women are significantly more likely than men to be concerned with environmental challenges. According to the researcher, females have been consistently shown to have higher environmentally conscious attitude than men. The table also shows that the mean score of the administrative staff (3.31) is greater than those of the field staff (3.27). This funding agrees with the position of Lee, Geon and Benedict (2009) that there

Table 1. Impediments to solid waste management

S/n	Impediments Impediments to solid waste collection	Responses	
		X	SD
1	Financial constraints/lack of fund	3.39*	.874
2	Inefficient collection methods	3.10*	.850
3	Absence of waste bins at strategic public places	2.99*	.973
4	Inadequate equipment	2.78*	.934
5	Manual collection	3.05*	.966
	Cluster mean	3.06	
	Impediments to waste storage		
6	Shortage of waste containers	3.02*	.868
7	Absence or lack of appropriate technologies	3.33*	.665
8	Insufficient dumpsites	3.10*	.831
9	Lack of dedication to duty	3.14*	.749
10	Non-compliance of people to disposing waste at designated dumpsites	3.38*	.886
	Cluster mean	3.19	
	Impediments to waste transportation		
11	Bad roads in streets	3.72*	.624
12	Insufficient waste vehicles	3.59*	.770
13	Low collection transportation service	3.02*	1.07
14	Lack of sound vehicles	3.57*	.761
	Cluster Mean	3.48	
	Impediments to solid waste treatment		
15	Absence of appropriate technologies	3.50*	.681
16	Lack of training of SWM staff on waste treatment and recycling	3.45*	.653
17	High cost of operation and maintenance	3.50*	.681
	Cluster mean	3.48	
	Impediments to solid waste disposal		
18	Lack of sufficient dumpsites	3.21*	.821
19	Poor recycling methods	3.63*	.601
20	Poor consumption by agriculture	2.12*	.914
21	Lack of or non provision of appropriate technologies	3.06*	.953
	Cluster mean	3.00	

X=mean; SD= standard deviation; * = impediment

is a difference between top managers and middle managers in work performance. However, the result disagrees with that of Roebuck, Slighter, and Brush (1995) who asserted that there is no difference in terms of work performance between job positions in an organization.

The table showed the overall t-cal (-5.72) which is less than the overall p-value (.408) of impediments to solid waste management. This implies that there is no significant difference in the impediments to SWM based on job status. These variations could be in terms of education level of the workers in different job position as McBey and Karakowsky (2001) found a casual relationship between education level and work performance. According to these researchers, the lower the education level, the less likely people would have better work performance. Thus the difference in the responses of the administrative and field staff could be in their educational level as most field staff is just labourers with little or no education while most of the administrative staff has higher education. The table further shows that the grand mean score of respondents with 10 years and above job experience is greater (3.32) than those with less than 10 years of job experience (3.23). This difference could be due to the number of working years which contributes to the experiences of the workers. This finding agrees with Shaffril and Uli (2010) assertion that working experience has significant and positive relationship with work performance. The table shows that the overall t-cal (-0.03) which is less than the overall p-value (.414) of impediments solid waste management. This implies that there is no significant difference in the impediments to SWM based on job experience.

Data in Table 3 showed that majority (94%) of the

respondents preferred organizing seminar, workshops, and in-service training for workers as educational optimization strategy. This finding differs from the assertion of Onyeonoro, *et al.* (2011) on public health implications of household solid waste management in Awka which indicated that very few (4%) of the respondents suggested massive educational campaigns as ways to improve waste management. This difference in the findings of these two studies may be due to the different population by these studies because while Onyeonoro, *et al.* (2011) used households, the present study used solid waste management workers. Also, most of the respondents (91.5%) indicated street to street collection of waste at least twice as a behavioural strategy, (90.4%) indicated covering of transport vehicles to prevent spread and dispersal of waste while waste vehicle is in motion, (89.4%) indicated composting of biodegradable waste to be used as organic fertilizer while approximately 87 per cent indicated emptying of waste bins into designated public places and placing large mammoth bins at strategic public places as behavioural strategies for effective SWM. Table 3 further shows that 93.3 per cent and 91.55 per cent of the respondents indicated provision of more collection vehicles and establishment of material and recovering/ recycling facilities as technological strategies while (88.7%, 86.5%, and 83.3%) of the respondents indicated provision of waste processing material, incinerators for waste treatment and street motorist to collect waste as technological strategies for optimized SWM in Anambra State. These findings partly agrees with Uwadiegwu and Chukwu (2010)'s recommended strategies for SWM in Nigeria. Again, 94.3 per cent and 93.65 per cent of the respondents indicated that improved road network,

Table 2. Socio Demographic Variables and Impediments to Solid Waste Management

Sl. No.	Variables	WC		WS		WTra		WTrt		WD		t-cal	p-value
		X	SD	X	SD	X	SD	X	SD	X	SD		
1.	Male	2.98	.956	3.12	.834	3.43	.802	3.52	.641	3.24	.806	1.04	.364
	Female	3.27	.764	3.39	.645	3.62	.741	3.40	.745	3.24	.857		
2.	Job status											-5.72	.408
	Admin	3.07	.851	3.24	.823	3.55	.746	3.53	.790	3.14	.891		
	Field	3.06	.928	3.19	.791	3.46	.811	3.48	.650	3.16	.806		
3.	Job Experience											-0.03	.414
	<10 yrs	3.05	.963	3.20	.819	3.43	.845	3.46	.673	3.18	.821		
	10yrs & above	3.12	.707	3.20	.645	3.65	.576	3.58	.663	3.05	.781		

KEY: WC= waste collection, WS= waste storage, WTra= waste transportation, WTrt= waste treatment, WD= waste disposal, X- mean, SD= standard deviation

Table 3. Optimization Strategies for Solid Waste Management

Sl. No.	Optimization Strategies	Frequency	Percentage (%)
Educational Strategies			
1	Organizing seminars, workshops and in-service training for SWM workers	266	94.3
2	Training of SWM workers on the use of appropriate technologies	262	92.9
3	Sensitization of people on need for good sanitation of their environment	258	91.5
Attitudinal Strategies			
4	Prompt payment of salaries	282	100
5	Giving incentives to workers	282	100
6	Upgrading workers working conditions	282	100
7	SWM workers' commitment to duties	252	89.4
8	Prompt payment of sanitation levies	261	92.6
Behavioural Strategies			
9	Covering of transport vehicles to prevent spread and dispersal of waste	255	90.4
10	Composting of biodegradable waste to be used as organic fertilizer	252	89.4
11	Emptying of waste bins into designated public waste bins	247	87.6
12	Placing mammoth bins located at strategic public places	246	87.2
13	Street to street collection of waste twice a week	258	91.5
Technological Strategies			
14	Provision of more waste collection vehicles	264	93.3
15	Establishment of material and recovering/ recycling facilities as	258	91.5
16	technological strategies	251	88.7
17	Provision of waste processing material	249	86.5
18	Provision of incinerators for waste treatment	240	83.3
	Provision of street motorist to collect waste		

and improved inter street road network as optimized strategies for improved good transport network for effective SWM while (88.7% and 77.3%) of the respondents indicated provision of modern transporting facilities and filling of pot holes as optimization strategies for SWM in Anambra State. This findings supports Ogwueleka (2009) view that poor cities networks, traffic congestion and narrow roads, contribute serious impediments to solid waste management in Nigeria. Therefore, it is very pertinent that road networks should be improved for optimized SWM. When these strategies are put in place, it is expected that there will be appropriate management of solid waste leading to improved health and sanitary condition in Anambra State.

Limitation of the Study

The study was conducted using only questionnaire. Use of mixed method approach would have given a more comprehensive view of what solid waste management in the study area looks like. However, this study has provided an insight into solid waste management in Anambra state which has added to the body of knowledge that can be used to design other studies.

Conflicts of interest: The authors declare that they have no conflict of interest

REFERENCES

- Adedeji, D. and Eziyi, O.I. 2010. Urban environmental problems in Nigeria: implications for sustainable development. *Journal of Sustainable Development in Africa*. 12 (1) : 115-118.
- Adeshina, A. 2000. Way out of solid waste crisis in Nigeria: Adiscourse. Business Daily Times.
- Agunwamba, J.C., Egbuniwe, N. and Ogwueleka, T.C. 2003. Least cost management of solid waste collection. *Journal of Solid Waste Technology and Management*. 29(3) : 154-167.
- Agwu, M.O. 2012. Issues and challenges of solid waste management practices in Port Harcourt City, Nigeria: Abehavioural perspective. *American Journal of Social Sciences and Management Sciences*. 2(1) : 234-240.
- Babayemi, J.O. and Dauda, K.T. 2009. Evaluation of solid waste generation, categories and disposal options in developing countries: a case study of Nigeria. *Journal of Applied Sciences and Environmental Management*. 13(3) : 83-88.
- Edugreen.ter.res.in/.what.htm.....www.epa.gov/epaoswer/osw/ and eerc.ra.utk.edu/tnswep/9-12toc.htm
- Ehiemere, I.O. 2006. Solid waste management practices

- in tertiary and secondary level hospitals in enugu urban and safer sharps management intervention programme. An unpublished thesis submitted to the department of Health and Physical Education, university of Nigeria, Nsukka.
- Ezigbo, C.A. 2012. Management of solid waste in Nigeria: challenges and proposed solutions. *Sacha Journal of Environmental Studies*. 2(1) : 159-169.
- Halidu, M. 2010. Nigeria environmental issues: threat to the Nigerian environment. Accessed online, August, 2020. <http://www.ngenvirons.blogspot.com>
- Mmom, P.C. and Mmom, C.F. 2011. Environmental sanitation and public health challenges in a rapidly growing city of the third world: the case of domestic waste and diarrhoea incidence in greater Port Harcourt metropolis, Nigeria. *Asian Journal of Medical Sciences*. 3(3) : 115-120.
- Nnatu, S.O. 2018. Health implications of ineffective solid waste disposal for urban residents: A study of Awka Town, Anambra State. *International Journal of Health and Social Sciences*. 7(3) : 81-93.
- Okpala, S. 2010. Challenges of waste management in Anambra State. *Research Journal of Social Sciences*. 1(1) : 40-50.
- Ogwueleka, T.C. 2009. Route optimization for solid waste collection: Onitsha (Nigeria) case study. *Journal of Applied Sciences & Environmental Management*, 13(2): 37-40.
- Onibokun, A.G. and Kumuyi, D. 1999. Managing the monsters: urban waste and governance in Africa. International development research centre, Ottawa
- Onyido, A.E., Okolo, P.O., Obiukwu, M.O. and Amadi, E.S. 2009. A survey of vectors of public health diseases in undisposed refuse dumps in Awka Town, Anambra State, Southeastern Nigeria. *Research Journal of Parasitology*. 4(1) : 22-27.
- Otti, V.I. 2010. Proposal for solid waste management in Onitsha Metropolis. *VSRD-Technical and Non-Technical Journal*. 1(4) : 251-254.
- Oyeniyi, B.A. 2011. Waste management in contemporary Nigeria: The Abuja Example. *International Journal of Politics and Good Governace*
- Tay, J.H. 2012. Overview of solid waste management in Asian countries. *Journal of Environmental and Biological Sciences*. 13(2) : 234-278.
- Tabirsir, G. 2011. Impact of solid waste on health and environment. Retrieved from <http://www.slideshare.net/tabirsir/impact-of-solid-waste-on-health-and-environment>
- Sani, M. 2012. National Environmental Sanitation Policy Document
- Uwadiogwu, B.O. and Chukwu, K.E. 2013. Strategies for effective urban solid waste management in Nigeria. *European Scientific Journal*. 9(8) : 112-114.
- WHO 2011. Health and environment in sustainability development: five years after the earth summit. Extract from WHO's report to special session on the UN general Assembly.
- Yeny, D. and Yulinah, T. 2012. Solid waste management in Asian developing countries: challenges and opportunities. *Journal of Applied Environmental and Biological Sciences*. 2(7) : 329-335.
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