Innovations

Exploring the Role of Scavengers in Sustained Solid Waste Management; A Study of Warri Delta State, Nigeria

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Abstract
Introduction*: With the growing mammoth of uncollected waste littering the streets of Warri despite the fact that scavenging is a lucrative venture that can eradicate the waste at same time provide income for those within the sector yet this opportunity has not been properly harnessed.* ***Methods****: the paper adopted a mixed research data collection technique involving the combination of qualitative and quantitative instruments.* ***Findings:*** *Among others it was found that scavengers within the study help to recycle solid waste materials, as most of the scavengers pick iron leftovers which they resale to iron smatters. Again, it was also found that's cavengers contribute to reduce incidents of flood in the society through solid waste collection from neighborhoods. Secondly, scavengers help to reduce the burden of dirt and filth from the environment which is hazardous to human health. The study also found that scavengers are treated with disdain and seen as socially unfit individuals.* ***Conclusion:*** *The activities of scavengers though has consistently remained unrecognized; it has become very useful in the drive to friendly eco-system. Therefore, this paper recommends that the government should harness and organize the activities of scavengers into fitting informal sector as these could help to reduce youth unemployment and further improve on livability of cities.*

Keywords: 1.*Scavengers, 2.Solid Waste, 3.Sustainability, 4.Informal,5. Environmental*

Introduction

Solid waste (SW) mismanagement is a global issue in terms of environmental contamination, social inclusion, and economic sustainability which requires integrated assessments and holistic approaches for its solution (Gupta, Yadav & Kumar, 2015). The problem of solid waste is management is common to transition and developing countries where the unsustainable management of SW is common (World Bank, 2012).Differences should be highlighted between developing big cities and rural areas, where management issues are different, specifically regarding the amount of waste generated and the Solid Waste Management (SWM) facilities available (Bing et al., 2015). However, both suffer negative economic legislatives, political, technical and operational limitations. One of the simplest and commonest identified ways of solid waste management is via the activities of scavengers who go about from place to place gathering solid waste for commercial and economic purposes. Okoye (2010) defined

scavenger as a person who picks up recyclable/reusable materials from mixed solid wastes stream whenever it may be temporally accessible or disposed of or of further use and/or processing.

Adewole (2009), argued that scavengers are normally part of the socio-economic structure; their displacement from a disposal site can have many direct and indirect consequences. He also opined that unsupervised and uncontrolled scavenging is detrimental to the health and safety of the scavenger as well as personnel operating the facility. Scavenging is common occurrence in the third world countries, because of high unemployment, widespread poverty and lack of a safety net for the poor (Medina, 2010).Similarly,Ackeman (2005) supported by asserting that scavenging provides a spontaneous labour incentive solution, becoming an alternative means of achieving an integral solid waste management system.
Kristiana, Aguilar and Erian (2014), to reduce and segregate waste at source conflicts of interest has ensued between the government and scavengers. Again, waste recycling in many low-income countries is driven by the informal sector, often with minimal input from state institutions (Ezeah, Clive, Paul, Mbeng and Nzeadibe, 2014). Generally, informal recycling companies involved in the recovery, processing/transformation and trading on materials recovered from waste (Nzeadibe&Iwuoba, 2008; Wilson, Araba, Chiwah&Cheesam, 2009), thereby it must be noted that scavenging plays very important role especially the fact that it represents an income-generating activity and waste management system in developing countries like Nigeria. Medina (2001) elaborated that the recovery of materials from solid wastes, if organized properly, can generate a livelihood for unskilled workers in a developing country environment.Notwithstanding, the activities of scavengers has equally been associated with insecurity Bajah (2022), argued that it was in order to contain security threat posed by scavengers that the authorities evicted them from the city. Similarly, Adewole (2022) stated that the ban on scavengers activities is due to the acts of criminality and threat to peaceful inter-ethnic relationships posed by the scavengers in the state.

Despite the opportunities inherent in waste management in terms of income generation, however African societies has not adequately explored the opportunities inherent in this. Urban areas in Nigeria today like Warri, are facing the problems of pile heaps of solid wastes in their environment. This is as a result of pressure of population growth, spontaneous urbanization and industrialization. The alarming rate at which heaps of solid wastes occupy most of our cities, coupled with the fact that 87% of Nigerians (EHW, 2011) use methods adjudged as insanitary, has not only constituted visual blight and odour nuisance, but also encouraged the breeding of rodents, mosquitoes and other pests of public health concern with their attendant disease outbreaks. It is common knowledge that markets and motor parks used by hundreds of Nigerians daily are seldom provided with facilities used for solid waste collection and disposal.
As a result of this men and women in markets and motor parks often result into indiscriminate disposal of solid waste into public drains, around street corners, etc. Flooding on our major roads is due largely to silt and solid waste blocking the drains and other outlets provided. The stagnant water in the blocked drains serves as breeding sites for mosquitoes. The high incidence of improper waste management breeds all forms of communicable diseases. Notwithstanding their important role,scavengers are treated with disdain, stigmatized and derided in Nigeria, with little recourse to their contribution towards the reduction of solid waste at dumpsites and economic productivity (Anierobi&Efobi, 2013). Owing to the nature of the work which is not properly organized and well defined, they are seen as being the lowest of the low, relegated to dirty work such as scavenging. Anierobi and Efobi (2013) arguing further on solid waste pickers and urban solid waste management system in Nigerian cities, averred that 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 centers, here in Nigeria, where they are hitherto neglected. Therefore, this study is focused on exploring the role of scavengers in sustained solid wastemanagement; a study of Warri, Delta State, Nigeria.

Study Objectives:
Examine the role of scavengers on sustained solid waste management

Hypotheses

There is no significant relationship between scavenging and solid waste management

Review of Relevant Concepts

Solid Waste

Nelson, Franklin and Joseph (2009), defined solid waste as "solid materials as well as some liquids in containers, which are discarded or rejected as being spent, useless, worthless, or in excess." According to White, Franke and Hindle (1999) solid waste is referred to as "as any substance that has lack of use or value, or useless remains. Waste is a by-product of human activity. Physically it contains the same materials as are found in useful products; it only differs from useful production by its lack of value". Both examples from literature describe the reason for waste generation as either lack of use or lack of value. However, this perspective is not necessarily reflected in legislation.

In the European Union waste is defined as: "Any substance or object which the holder discards or intends or is required to discard." (2008/98/EC, EU waste framework legislation, 2008). The value, or rather lack of value, is in this case not adopted in the definition. National legislation in Namibia, define waste as "any matter, whether gaseous, liquid or solid or any combination thereof, which is from time to time listed by the Minister by regulation as an undesirable or superfluous byproduct, emission, residue or remainder of any process or activity." (Environmental Management Act No.7, 2007).

Sustainable Solid Waste Management

The term sustainable waste management emphasizes a shift from waste disposal to other waste management options that includes energy and material recovery as well as waste reduction and reuse in addition to the aim of decoupling increase in waste generation from economic growth, a natural progression in many nations (Chung & Lo, 2003; European Environment Agency (EEA), 2005). It includes having a strategy in place that is appropriate to the local conditions and has a balance between technical, environmental, social, economic, financial, administrative and political aspects, and is capable of maintaining itself over time without exhausting the resources it needs.

To evaluate waste management systems sustainably, the issue of measure of sustainable development arises - this requires transparent and reliable measurement element that must be agreed upon by stakeholders (Murthy, 2002; Joseph, 2006; Lang et al., 2017; Desmond, 2006). While the generic principles of sustainable development consist of social, environmental and economic aspects, the administrative aspect has been evaluated in many studies involving waste management.

Methods of solid waste management and their sustainability in Nigeria Temporary Storage Waste is temporarily stored without separation at the point of generation within households or at communal disposal sites in urban cities in Nigeria. It is a key aspect of the management strategy as it determines to a large extent the efficiency and effectiveness of collection. Within and around households, waste is stored in various sizes of bins and bin bags by the more affluent population and in used baskets and buckets by the less affluent (Abdullahi et al., 2018). Unlike Abuja, the capital city in Nigeria, most environmental agencies have not made provision or specified collection containers (Imam et al., 2018). More than 50% of the dwellers in the cities use communal disposal sites as temporary storage. Waste is transferred from point of generation to these sites situated within each area by household members or contracted private collectors (Dauda &Osita, 2013).

The communal disposal sites are open dumps characterized by uncontrolled emissions, presence of rodents and strong odour. Collection and transportation Collection and transport involves both separate or co-mingled collection of solid waste and recyclables; and the transportation to processing and disposal facilities. Collection covers the emptying of bins or/and bin bags within or around the settlement area; and transport refers to the haulage of the collected waste to the disposal facility or treatment plant (Den Boer et al., 2017). Collection is carried out in various ways in different areas in Nigeria. This includes direct collection by the state or local government or indirect collection by appointed private contractors and/or informal waste managers for a fee.

The various ways include: Kerbside collection – waste is collected from herbs of households, where the households are responsible for bringing out the waste to the kerbsides on or before collection days (Abdullahi et al., 2018; Imam

et al., 2018; Agunwamba, 2008). Receptacle or communal centre collection – The communal centre is usually an open space of shallow trench where waste is dumped directly on the ground or in a few cases equipped with large bins into which the waste is discharged and eventually collected (Imam et al., 2018; Dauda &Osita 2003). Door-to-door or house-to-house pick up – The waste is kept temporarily within the properties concerned and generally collected from within the premises on a contract basis between householders and private organizations (Abdullahi et al., 2018; Sangodoyin, 2003). Waste is typically transported by lorries, tippers, loaders, trucks and tractors by formal sector (Dauda &Osita, 2013; Imam et al., 2018) and using hand pushed carts and wheel barrows by the informal sector.

Collection is generally irregular in most cities with communal dumps staying for months without evacuation in many instances (Dauda &Osita, 2003), while kerb side collection ranges from once a week to none at all (Abdulahi et al., 2018). The result of this ineffective and inefficient collection system is uncontrolled emissions of leachate and landfill gases that end up contaminating land and soil as well as polluting the air. This is in addition to nuisance of odour and destruction of landscape from waste heaps along streets and roads. Resource recovery and recycling. The composition of waste in Nigeria suggests a recyclable content of over 40% despite the high decomposable fraction. Recycling rate is estimated at 8-22% of total waste with paper contributing 5- 15%, metal 10-40%, and plastics and glass 20-40% and 25-70% respectively (Wilson et al., 2009).

Methodology

The study was carried out in Warri, Delta State Nigeria in 2020. it adopted the mixed research method comprising quantitative and qualitative data collection techniques. The population of the study are residents of Warri which is one million, three hundred and twenty-four thousand and ninety-four (1,324,094) (Geo-statistics, 2019). The study adopted the purposive sampling technique to select in selecting the area of study and respondents. This was done due to the case relevance of the area to the subject matter of waste management consequently five major roads were selected this includes Airport road, PTI road, Jakpa road, Ekpan road and Refinery road. The respondents were purposively drawn from different professional cadre of the society which includes civil servants, artisans and business owners/traders and scavengers, etc. The criteria for inclusivity are persons within these professions that have resided in Warri for not less than (3) three years and are 18 years and above.

Data Analysis

A sample size of study is 400 respondents generated from the population using the Taro Yamane formula and the major instrument for data collection was questionnaire and structured interview guide.A uniform set of questionnaires validated were administered to all the respondents. The researcher got approval from the respondents before administering the questionnaires. The quantitative data are complemented with qualitative response, including in-depth interviews with relevant persons.The interviewees gave their consent before the in-depth interviews were conducted.Data AnalysisOut of the (400) questionnaires distributed, (384) were correctly filled and returned, giving a response rate of 96 percent.Data were analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequencies and percentages were used to analyze the quantitative data. For the qualitative data, in-depth interviews were subjected to manual content analysis. However, illustrative quotes were identified and organized under distinct themes.

Results

This section presents the socio – demographic attributes of the respondents. The attributes age, gender, marital status and religion of respondents.

Table 1: Socio-Demographic Characteristics of the Respondents

Variable		Frequency	Percentage
Gender	Male	104	29.0
	Female	280	73.0
	Total	384	100.0
Age	18-25	184	48.0
	26-33	90	23.0
	34 and above	110	29.0
	Total	384	100.0
Marital status	Single	165	43.0
	Married	200	52.0
	Divorced	19	5.0
	Total	384	100.0
Occupation	Unemployed	162	42.0
	Trader/business owner	109	28.0
	Civil servants	74	19.0
	Artisans	39	10.0
	Total	384	100.0
Religion	Christianity	321	84.0
	Islam	24	6.0
	African Traditional Religion	39	10.0
	Total	384	100.0

Source: Fieldwork, 2020

Table 1 shows the socio-demographic characteristics of the respondents. With regard to gender it could be observed that a majority of the respondents are females with (73.0%)while males are(27.0%). In terms of age distribution, a majority of the respondents were between the age of (18 – 25) with (48%). Other age categories were (26 – 33) with (23%) 34 and above with (29%). Marital status of the respondents revealed that majority of the respondents are married (52%), singles (43%), while divorceswere (5%). Occupational distribution of the respondents revealed that majority of the respondents are unemployed (42%), traders/farmers (28%), and civil servants (9%) while artisans (10%). Religious affiliation of the respondents revealed that (84%) of the respondents are Christians, (6%) are Islam, while (10%) are African Traditional Religion worshipper.

Substantive Issues

Summery Table on Respondents' Responses on the role of scavengers on sustained solid waste management

Table 2. Mean scores and standard deviation on scavengers and sustained solid waste mgt.

Source: Fieldwork, 2020

S/N	ITEMS	Mean	Std Deviation	Remark
1.	Scavengers play role in solid waste management.	2.71	.89	Agree
2.	Scavengers help to reduce solid waste in the society	2.61	.79	Agree
3.	Scavengers help to recycle solid waste materials	2.60	.92	Agree
4.	Scavengers contribute to reduce incidents of flood in the society through solid waste collection from neighborhoods	3.03	.96	Agree
5.	Scavengers help to reduce the burden of dirt and filth from the environment which is hazardous to human health	2.89	.83	Agree
6.	Scavengers contribute to insecurity through vandalism and theft of personal properties.	3.02	.94	Agreed

Data in table 1.2 shows the mean scores and standard deviation analysis onthe role of scavengers on sustained solid waste management. Results of the analysis, shows that respondents agreed on all the items. Specifically, respondents agreed that scavengers play role in solid waste management, scavengers help to reduce solid waste in the society, scavengers help to recycle solid waste materials, scavengers contribute to reduce incidents of flood in the society through solid waste collection from neighborhoods, scavenger help to reduce the burden of dirt and filth from the environment which is hazardous to human healthand indeed the activities of scavengers contributes to insecurity with mean scores of 2.71, 2.61, 2.60, 3.03, 2.89 and 3.02 respectively.

This implies that scavengers play role in solid waste management, scavengers help to reduce solid waste in the society, scavengers help to recycle solid waste materials, scavengers contribute to reduce incidents of flood in the society through solid waste collection from neighborhoods and scavenger help to reduce the burden of dirt and filth from the environment which is hazardous to human health.Although they also contribute to criminality.

The qualitative data supported the quantitative findings as the respondent argued thus; we see them daily, though they play important role but people don't really appreciate them as they deserve (**Female, Retired teacher, 76 years old).**

Another respondent stated thus;

I think those scavengers are very important they help to pick solid waste, though some people claim they still iron often. However, I think there are very essential as they are help in our environment to be clean **(Male, Civil servant, 42 years of age)**

Another respondent stated;

If only the government will organize them, maybe equip them with modern tools you never know many more youths will join the business **(Male, artisan, 47 years of age)**

Hypothesis One

Ho: There is no significant relationship between scavenging and solid waste management

Hi: There is a significant relationship between scavenging and solid waste management

Table 1.3: Pearson correlation analysis for hypothesis one

		Scavenging	Solid waste management
Scavenging	Pearson Correlation	1	.462**
	Sig. (2-tailed)		.168
	N	384	384
Solid waste management	Pearson Correlation	.462**	1
	Sig. (2-tailed)	.168	
	N	384	384

**. Correlation is significant at the 0.05 level (2-tailed).

Decision rule

If the Pearson r calculated value is greater than the Pearson r critical value, reject Ho and retain Hi. At 0.05 level of significant, with a degree of freedom of 383 the critical Pearson r value is 0.1946.Since the calculated Pearson r value of 0.462is greater than the critical Pearson r value of 0.1946, therefore, H_o is rejected and H_i is accepted. it therefore implies that there is a significant relationship between scavenging and solid waste management.

Discussion of Finding

The study examined the role of scavengers in sustained solid waste management developing society using Warri in Delta State Nigeria as point of departure. This study is essential considering the mounts of waste emerging in the study location despite the global waste management goals for improving sustainability at global level are: to ensure, by 2020, access for all to adequate, safe and affordable Solid Waste collection services; to stop uncontrolled dumping and open burning; to achieve sustainable and environmentally sound management of all wastes, particularly hazardous ones, by 2030 (Wilson &Velis, 2015). Many studies reported possible solutions for improving the SWM in developing countries, such as organic waste buyback programs, with compost or biogas production (Hettinrachchi, Meigoda&Ryu, 2018).This study found that scavengers play essential role in solid waste management. Studies supporting this finding exist as was stated by Adeniyi (1996) scavenging is a serious business in Mexico, Brazil, Colombia and Egypt to mention a few. In Cairo (Egypt)the traditional scavengers have grown so large that they now constitute themselves into private companiesthat are contractually in charge of collection, transportation and recycling of waste.

However, many barriers still remain for improving formal collection, treatment and final disposal (Matter, Ahsan, Marbach&Zurbrugg, 2015). Therefore, environmental contamination remains a big issue worldwide, while common solutions should be identified and implemented considering SWM patterns appropriate for each context. Many reviews were published about SWM in developed and developing countries and about environmental contamination from waste. In particular, about char fuel production (Lohri, Rajabu, Sweeney, Zurbrugg, & Char, 2016), management of waste electric and electronic equipment (WEEE) (Ongondo, Williams &Cherrett, 2011), food waste

management (Thi, Kumar & Lin, 2015) and treatment (Lim, Lee & Wu, 2016) recycling of used batteries (Bernardes, Espinosa &Tenorris, 2004) inclusion of the informal sector and the risks that such activity pose for vulnerable informal workers (Brown &McGranahan, 2016) atmospheric pollution due to SWM household hazardous waste management (Inglezakis, 2015) and healthcare waste (HW) management (Ali, Wang, Chaudhry &Geng, 2017), among others.

Findings from the hypothesis tested revealed that there is a significant relationship between scavenging and solid waste management, which implies scavengers help to manage waste in the state. This finding is in agreement with previous studies. For instance, Ogwueleka, (2009), argued that due to lack of technology and low involvement of private sector in solid waste management, scavenger became the only machinery for recovering recyclable materials from solid waste stream in Nigeria. Nigeria is the most populous country in Africa and ninth most populous country in the world. With population distributed at 48.3% urban and 57.7% rural and population density at 139 people per square km. The country has GDP per capital of $1,800 and population below poverty line is 60%. Scavengers are driven by poverty and desire to earn a living. In Onitsha township Nigeria, 40% of artisans and small-scale industries receive 48% of their raw materials from scavengers (Ogwueleka, 2009).

Waste-pickers play vital roles in solid waste management. In spite of this, they unfortunately have little or no social status. The roles of waste-pickers include: waste collection, separation and reuse, thereby aiding recycling and reducing pressure on the environment. Wastes-pickers at dump sites and on the streets are generally socially marginalized, they live and work without basic economic and social security, under conditions which are extremely hazardous to health and detrimental to family, social and educational development. Waste-pickers are exposed to many health hazards; for instance, they often rummage through decaying organic waste, including toxic medical waste (Ahmed 2006).

Conclusions

There is a significant relationship between scavenging and solid waste management. This is observed in the role they play in solid waste management in the area of helping to rid the environment of solid waste materials.There is a significant relationship between scavenging and environmental pollution reduction. Scavenging help to reduce environmental pollution in the society as solid waste materials that are likely to cause pollution are collected and recycled. There is a significant relationship between scavenging and poverty reduction. Scavengers make a living out of the process of scavenging and this help to reduce the poverty level in the society. It is thus a means of livelihood.

There is a significant relationship between socio-cultural constraints of scavenging and un-sustained solid waste management. The treatment and reaction of members of the society towards scavengers is very bad, as they are treated with scorn and sometimes as people who are near mad people.

Recommendations

- The government should see to it that scavengers are incorporated into the mainstream of labour force in solid waste management in the state so as to make solid waste management very effective, thereby ridding the state of waste.
- The society should be more tolerant and accepting of scavengers, as they are actively involved in the act of waste management and the reduction of solid waste pollution in the society. The barriers rooted in seeing people doing dirty jobs as low class people should be removed as as to encourage scavengers in the act of waste management in the state.
- There should be the involvement of NGOs in partnering with the government to see to it that scavengers, in the informal sector of the economy are provided with equipment and proper kits to improve their method and approach to scavenging, so as to encourage their operation in the society

Reference

1. *Adeniyi, K. (1996), "Urban Population Pressure, and the Roles of Household and Scavengers in Solid WasteManagement in Ibadan", in Adetokun and Ajakaiye (Eds.), Population Environment Interactions in Nigeria,Ibadan NISER, Vol. 4, pp. 65-.93*
2. *Agunwamba, J. (2008). Solid waste management in Nigeria: problems and issues. Environmental Management, 22 (6), 849-856.*
3. *Ahmed, S. M. (2006). Using GIS insolid waste planning; A case study for Aurangabad, India. Unpublished Final Master's Thesis. Linkopings University, Sweden.*
4. *Ali, M., Wang, W., Chaudhry, N., &Geng, Y. (2017). Hospital waste management in developing countries: A mini review. Waste Manag. Res, 35, 581–592.*
5. *Anierobi, C.M., &Efobi, K.O. (2013)Waste Pickers and Urban Solid Waste Management System in Nigerian Cities: Between Sustainable Policy Gap and Survivalist Strategy. Journal of Science, Engineering and Technology, 20(1):82-95.*
6. *Abdullahi, Y. A. A., J C; Ahmad, A S; Sirajo, M Z., &Bala, I A. (2018). Developing an integrated sustainable municipal solid waste management for a rapidly growing urban city: A case study of Abuja, Nigeria. Paper presented at the POSTCON: 1st Postgraduate researchers' conference on 'Meeting the environmental challenges in coastal regions of Nigeria'. Dundee, Scotland.*
7. *Aboagye-Larbi, H., Acheampong, P.,Kye, E., &Carbbo, F. (2014). Municipal waste management: inequities and the role of deliberation, Risk Analysis, 20(6), 821–832.*
8. *Ackerman, F. (2005). Material flows for a sustainable city. International Review for Environmental Strategies, 5 (2): 499 – 510.*
9. *Adan, D., Cruz, W., &Palaypay, S. (2012). Characterization of domestic and market solid wastes at source in Lagos metropolis, Lagos, Nigeria. African Journal of Environmental Science and Technology, 3(123), 430-437.*
10. *Adewole, A.T. (2009). Waste management towards sustainable development in Nigeria: A case study of Lagos State. International NGO Journal, 4 (4):173-179.*
11. *Bernardes, A.M., Espinosa, D.C.R., &Tenório, J.A.S. (2004). Recycling of batteries: A review of current processes and technologies. J. Power Sources, 130, 291–298.*
12. *Bing X., Bloemhof J.M., Ramos T.R.P., Barbosa-Povoa A.P., Wong C.Y., & van der Vorst J.G.A.J. (2016). Research challenges in municipal solid waste logistics management. Waste Manag, 48, 584–592.*
13. *Brown, D., &McGranahan, G. (2016). The urban informal economy, local inclusion and achieving a global green transformation. Habitat Int, 53, 97–105.*
14. *Chung, S.S. & Lo, C.W.H. (2003) Evaluating sustainability in waste management: the case of construction and demolition, chemical and clinical wastes in Hong Kong, Resources, Conservationand Recycling, 37, 119-145.*
15. *Dauda, M., &Osita, O. (2013). Solid waste management and re-use in Maiduguri, Nigeria. Paper presented at the 29th WEDC International Conference: Towards the millennium goals, Abuja, Nigeria.*
16. *Den Boer, J., Den Boer, E., & Jager, J. (2017). LCA-IWM: A decision support tool for sustainability assessment of waste management systems. Waste Management, 27(8), 1032-1045.*
17. *Desmond, M. (2006). Municipal solid waste management in Ireland: assessing for sustainability. Irish Geography, 39(1), 22-33.Energy from Solid Waste. Stockholms University.*
18. *Ejares, J. A., Paler, M., Kristina O., Aguilar, M., &Erian L.(2014). Socio-demographic profile of scavenging households in Umapad dumpsite, Mandaue City Cebu, Philippines. Journal of Sustainable Development Studies, 6(1):175-192.*
19. *Ezeah, C., Clive, L.R., Paul, S.P., Mbeng, O.L., and Nzeadibe, T.C. (2014). Evaluation of public health impacts of waste Scavenging in Abuja Nigeria, Using Q Methodology.*

20. *Gupta N., Yadav K.K., & Kumar V. (2015). A review on current status of municipal solid waste management in India. J. Environ. Sci, 37, 206–217.*
21. *Imam, A., Mohammed, B., Wilson, D., & Cheeseman, C. (2018). Solid waste management in Abuja, Nigeria. Waste Management, 28(2), 468-472.*
22. *Inglezakis, V.J., & Moustakas, K. (2015). Household hazardous waste management: A review. J. Environ. Manag, 150, 310–321.*
23. *Lang, D., Scholz, R., Binder, C., Wiek, A., &Stäubli, B. (2017). Sustainability Potential Analysis (SPA) of landfills-a systemic approach: theoretical considerations. Journal of Cleaner Production, 15(17), 1628-1638.*
24. *Lim, S.L., Lee, L.H., & Wu, T.Y. (2016). Sustainability of using composting and vermicomposting technologies for organic solid waste biotransformation: Recent overview, greenhouse gases emissions and economic analysis. J. Clean. Prod, 111, 262–278.*
25. *Lohri, C.R., Rajabu, H.M., Sweeney, D.J., &Zurbrügg, C. (2016). Char fuel production in developing countries—A review of urban biowaste carbonization. Renew. Sustain Energy Rev, 59, 1514–1530.*
26. *Magaji, P., &Dakyes, U. (2011). Evaluation of solid waste management policy in Benin metropolis, Edo State, Nigeria. 10 (1), 1-7.*
27. *Matter, A., Ahsan, M., Marbach, M., &Zurbrügg, C. (2015). Impacts of policy and market incentives for solid waste recycling in Dhaka, Bangladesh. Waste Manag, 39, 321–328.*
28. *Meyer, T. (2017). Estimating the possible range of recycling rates achieved by dump waste pickers: The case of BantarGebang in Indonesia. Waste Manag. Res, 32, 474–481.*
29. *Murthy, A. R. (2002). Ethnic minority groups in Nigeria: Current situation and major problems Commission on human rights. Oxford: Workin group on minorities.*
30. *Nelson, L. N., Franklin, J. A. & Joseph, A. S., (2009). Environemntal engineering: environmental health and safety for municipal infrastructure, land use and planning, and industry. 6th ed. s.l.:John Wiley & Sons.*
31. *Nzeadibe, T.C., &Iwuoha, H.C. (2008). Informal waste recycling in Lagos, Nigeria. Communications in Waste and Resource Management (CWRM), 9(1):24-30.*
32. *Ogu, V. (2000). Stakeholders' partnership approach to infrastructure provision and management in developing world cities: lessons from the Sustainable Ibadan project. Habitat international, 24(4), 517-533.*
33. *Ogwueleka, T.C., (2003). Analysis of urban solid waste in Nsukka, Nigeria. Journal of Solid Waste Technology and. Management, 29 (4): 239-246*
34. *Ogwueleka, T.C., (2003). Analysis of urban solid waste in Nsukka, Nigeria. Journal of Solid Waste Technology and. Management, 29 (4): 239-246*
35. *Ogwueleka, T. (2009). Municipal solid waste characteristics and management in Nigeria Iran. J. Environ. Health. Sci. Eng., 6 (3), 173-180*
36. *Thi, N.B.D., Kumar, G., & Lin, C.Y. (2015). An overview of food waste management in developing countries: Current status and future perspective. J. Environ. Manag, 157, 220–229.*
37. *World Bank. (2012). What a waste: A global review of solid waste management. The World Bank; Washington, DC, USA.*
38. *White, P., Franke, M. &Hindle, P., (1999). Integrated solid waste management: A lifecycle inventory. S.l.:Springer.*
39. *Wilson, D.C., Araba, O., Chinwah, K., & Cheeseman, C. (2009). Building the recycling rate through the informal sector. International Journal of Integrated Waste Management, Science and Technology, 29, 629-635*

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