

Constraints in Adopting Communal Systems in Solid Waste Management in Peri-Urban Area of Abeokuta for Sustainable Technologies

¹Salako, S. G., ³Oloruntoba, E. O., Adegbite, A. A² and ³Hameed, T.B

¹Department of Environmental Health Sciences, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria

²Department of Water and Sanitation Technology, Ogun State College of Health Technology, Ilese-Ijebu, Ogun State,

³Department of Environmental Health Sciences, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria

E-mail: oscar_ssg2002@yahoo.com

*Corresponding Author:
Salako, S. G., as above

Keywords:

Communal systems, constraint, peri-urban area, pollution, solid waste, community participation

Abstract

The solid waste management systems in a developing country are characterized by problems of low or no service coverage, open dumping and open burning of the wastes. Different approaches to waste management are not sustainable due to lack of community participation. The study was carried out at Akole-Oke Ata, a peri-urban area of Abeokuta, to determine the acceptability of communal waste management systems that can be adopted to foster community participation in waste management. The study combined both Focus Group Discussion and Questionnaire Administration Methodologies. The researchers attended the three (3) Community Development Associations (CDAs) meetings that operate within the study area, where the discussions on the subject matter were made part of the meeting agendas and thereafter opinionated self-structured questionnaires, through convenience sampling technique were administered to one hundred and fifty household (150) respondents representing each household. About seventy-five (75%) of the questionnaires were retrieved after the meetings and the rest retrieved at different households. The data collected were analysed with graph pad prism version 6.1, to determine if the level of education, income, location of the system and family household number can influence the respondents' acceptability and adoption of a sustainable system. The results on demographic characteristics of the respondents showed that ninety-five (95) are graduates, forty (40) with secondary school certificate and primary leaving certificates while the rest of the respondents fifteen (15) do not have any educational certificate. Then, the income of the respondents showed that twenty (20) of the respondents earn between 10,000-20,000 Naira monthly, forty (40) respondents earn between 20,001-40,000 Naira monthly and majority of the respondents (90) earn more than 40,000 Naira, while responses for the distance from proposed sites showed that 0-300cm indicated by twenty (20) respondents, distance between 301-600 cm indicated by 30 respondents and a hundred (100) respondents indicated distance of more than 100cm from their houses and the responses on the household size showed that eight (8) respondents household size is between 0-2, one hundred and thirty (130) respondents are with household size of between 3-6, while the rest twenty (20) respondents contain household size of more than 6. The results analysed showed that the level of education, monthly income, location to the proposed system, and family

household number might be the constraints for the respondents that significantly determined the acceptability of establishing a communal solid waste management system. The study concluded that the respondents in the study area do not accept communal waste management and the rejection might be due to; finance for the construction of the system, as well as and for the operation and maintenance, question of who pays for the expenses and who owns the system, location of proposed site to households is another factor because of the nuisance associated with solid waste management. Therefore, the study concludes that relevant government agencies should create awareness and provide funding as well as institutional framework support and use of functional community development associations that fits peri-urban settings.

Contraintes liées à l'adoption de systèmes communautaires de gestion des déchets solides dans les zones périurbaines d'Abeokuta pour les technologies durables

Resumé

Les systèmes de gestion des déchets solides dans un pays en développement se caractérisent par des problèmes tels que de déversement à ciel ouvert et de brûlage à ciel ouvert des déchets. Des différentes approches de la gestion des déchets ne sont pas viables en raison du manque de participation de la communauté. L'étude a été réalisée à Akole-Oke Ata, une zone périurbaine d'Abeokuta, afin de déterminer l'acceptabilité des systèmes de gestion des déchets communaux qu'on peut être adopter pour favoriser la participation des communautés à la gestion des déchets. L'étude a combiné les méthodologies de discussion de groupe de discussion et d'administration de questionnaire. Les chercheurs ont assisté aux trois (3) réunions des associations de développement communautaire (ADC) menées dans la zone d'étude, où les discussions sur le sujet ont été intégrées aux ordres du jour et aux questionnaires auto-structurés vérifiés par la suite. à 150 ménages (150) répondants représentant chaque ménage. Environ 75% des questionnaires ont été récupérés après les réunions et le reste a été récupéré dans différents ménages. Les données recueillies ont été analysées avec la version 6.1 du banc de graphes afin de déterminer si le niveau d'instruction, le revenu, la localisation du système et le nombre de ménages familiaux pouvaient influencer l'acceptation et l'adoption d'un système durable. Les personnes interrogées ont indiqué que quatre-vingt-quinze (95) étaient diplômées, quarante (40) avaient un certificat d'études secondaires et des certificats de fin d'études primaires, tandis que les quinze (15) autres n'avaient aucun certificat d'études. Ensuite, le revenu des répondants a montré que vingt (20) des répondants gagnent entre 10,000-20,000 Naira par mois, quarante (40) répondants gagnent entre 20,001 à 40,000 Naira par mois et la majorité des répondants (90) gagnent plus de 40,000 Naira, tandis que les réponses à la distance de la portée des sites proposés ont montré 0-300cm, indiqué par vingt (20) répondants, la distance entre 301-600 cm indiqué par 30 répondants et une centaine (100) des répondants ont indiqué distance de plus de 100cm de leurs maisons et les réponses sur la taille du ménage, il est montré que huit (8) répondants de la taille du ménage sont entre 0-2, cent trente (130) répondants dont la taille du

ménage est comprise entre 3 et 6, tandis que les 20 autres répondants que les résultats analysés ont montré que le niveau d'instruction, le revenu mensuel, l'emplacement du système proposé et le nombre de ménages familiaux pouvaient constituer des contraintes pour les répondants en déterminant de manière significative, l'acceptabilité de la mise en place d'un système commun de gestion des déchets solides. L'étude conclut que les personnes interrogées dans la zone d'étude n'acceptent pas la gestion des déchets communaux et que le rejet peut être dû ; au financement pour la construction du système et pour le fonctionnement. Il y a aussi la question de savoir qui paie pour les dépenses et à qui appartient le système.

Introduction

According to World Bank Report (2016), the global Municipal Solid Waste generation levels are currently approximately 1.3 billion tonnes per year, and are expected to increase to approximately 2.2 billion tonnes per year by 2025 tonnes of solid waste generated (World Bank, 2016). However, the rising amount of the waste means rising costs for governments and environmental pressures (World Bank, 2013). Then, in recognition that the world we inhabit is finite and human activities will continue to result into waste generation, there will be continuous pollution of our environment; be it water resources, land and air due to improper solid waste management. There is need to minimize the adverse environmental effects caused by the indiscriminate disposal of solid wastes, especially hazardous wastes. If the wastes not controlled, the impacts will be difficult to rectify in the future. Hence, the issue of solid-waste management is both timely and important (Abdullahi, *et al.*, 2014; Okonkwo, 2015, Kumari, *et al.*, 2016).

Though, the problem of solid waste management has acquired alarming dimensions especially during the last decade (Singh and Ramanathan, 2010), the present systems of Solid Waste Management, in Nigeria like any other developing country, is burdened with concerns with regard to public health safety and quality of life in our communities (Mowoe, 1990; Ector County Texas, 2016). It is a major economic burden on government agencies and private firms, which are typically responsible for cleaning up

open dump sites created by individuals, communities and solid waste collectors. The poor collection and the disposal practice is another problem, which attracts and promotes the breeding insects, rodents and pathogens that can cause and transmit diseases (Open edu, 2016; Singh and Ramanathan, 2010). As waste generation increases in a geometrical progression, collection and disposal is at an arithmetical progression (Akinwale, 2005). Open burning of solid wastes as one of the common methods of management adversely affects the environment by emitting pollutants into the atmosphere. All the problems highlighted above are being experienced in Nigeria (Ukpong and Udofia, 2011, Butu and Mshelia, 2014). It seems solid waste management continues to remain one of the most neglected areas of urban development, where solid wastes are dumped on major highways, vacant plot of lands in the neighbourhood, around the residential areas, along the road, dumped into drainage channel public places with no segregation practices or waste recycling at the various level of generation that constitute nuisance, and have negative environmental impacts with adverse environmental and health risks (Butu and Mshelia, 2014; Ali, *et al.*, 2014; Illinois EPA, 2015). In Nigeria, there have been considerable development activities on 'wastes to wealth' programme in order to generate income from solid wastes as well as improve waste management issues thereby ensuring environmental suitability (Kingsley and Kingsley, 2012; Sridhar and Hammed, 2014; and Eugene, *et al.*, 2015). The socio-economic and environmental sustainability implications of solid waste management are the

drive for the study being carried out among the residents of peri-urban of Abeokuta (Akole-Oke Ata), a community located along Old Ilaro Abeokuta Road, South-western Nigeria.

This study was therefore, carried out to determine the acceptability of communal waste management systems that can be adopted to foster community participation, generate income from waste management and so minimise the negative environmental effects of improper solid waste management.

The following are the broad and specific objectives of the study: To evaluate the constraints in adopting a sustainable solid waste management and communal systems in Peri-Urban settlement of Abeokuta. Then, specifically, (a) identify the residents' level of knowledge about communal disposal waste system and (b) assess the role of education, income, distance from proposed site and household size in acceptance of communal disposal waste system. This research tested the following hypotheses at the 0.05 level of significance.

- i. There is no significant influence of levels in education and acceptance of communal disposal waste system.
- ii. There is no significant difference between income and acceptance of communal disposal waste system.
- iii. There is no significant difference between varying distance from proposed site and acceptance of communal disposal waste system.
- iv. There is no significant difference between household size and acceptance of communal disposal waste system.

Materials and Methods

This research involves an empirical research approach. Data were collected from one hundred and fifty household heads at Akole-Oke Ata Peri Urban of Abeokuta. The heads were identified and served with opinionated self-structured questionnaire on constraints to adopting sustainable solid waste management and Communal Systems in a Peri-Urban settlement.

Sample and Sampling Techniques

The one hundred and fifty household heads were chosen through convenience sampling technique from the study area.

Instrument for Data Collection

The source of data collection was distribution of well-structured questionnaire for the purpose of this research to the respondents. The questionnaire consists of sections, A and B respectively. The section A, deals with the demographic data of the respondents and section B, of the questionnaire centred on eliciting facts in respect of the research hypotheses. The questionnaire was validated by lecturers in the Departments of Water and Sanitation Technology and Environmental Health Sciences, Ogun State College of Health Technology, Ilese-Ijebu.

Data Collection and Data Analysis

The questionnaires for this study were distributed and collected on the spot from the household heads once they finished filling them. The results were analysed using frequency count, simple percentages and chi-square analysis at $p < 0.05$ level of significance.

Result, Presentation and Data Analysis

Results of the Demographic Characteristics

Table 1: Demographic Characteristics of the Respondents

Educational Level of Respondents	Frequency	Percentage (%)
a. No Formal Education	15	10.00
b. SSCE/ Primary Certificate Holders	40	26.67
c. Graduate	95	63.30
Total	150	100
Income of Respondents (Naira)	Frequency	Percentage (%)
a. 10,000-20,000	20	13.33
b. 20,001-40,000	40	26.67
c. >40,000	90	60.00
Total	150	100
Distance between the proposed site& households (m)	Frequency	Percentage (%)
a. 0-300	20	13.33
b. 301-600	300	20.00
c. >600	100	66.67
Total	150	100
Household size	Frequency	Percentage (%)
0-2	7	4.67
3-6	131	87.33
>6	12	8.00
Total	150	100

Results on the acceptability of the Communal Waste Management System and Demographic Characteristics

Responses on household size and acceptability of communal waste management system

Table 2: Showing the Household Size and Acceptability of the Communal Waste System

Number of Family size	Strongly Agreed	Agreed	Strongly Disagreed	Disagreed
0 – 2	1	0	1	7
3 – 6	76	48	4	2
7	1	1	2	9

$\chi^2 = 104.1$ $df = 6$

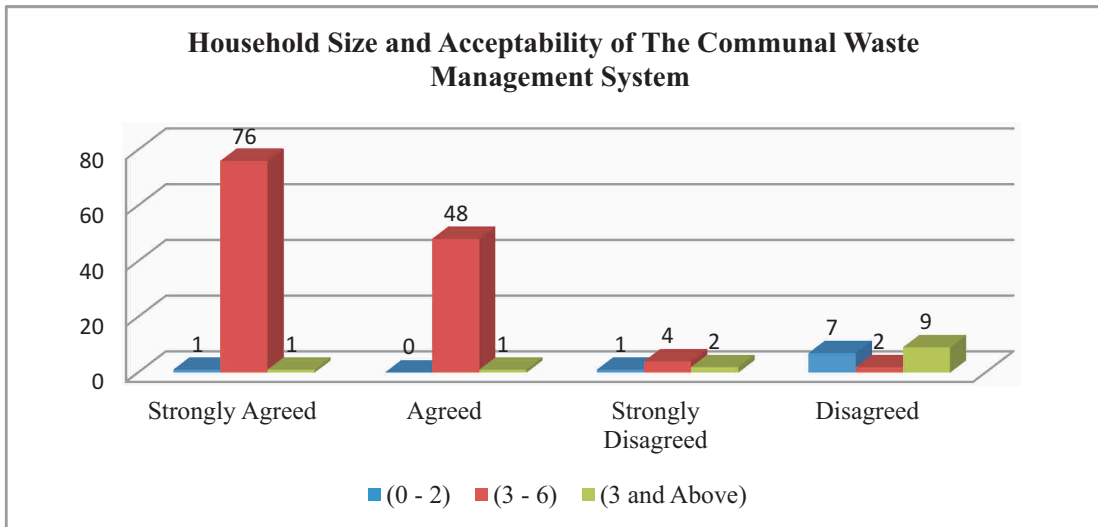


Figure 1: Household size and acceptability of communal waste management system

Responses on level of education and acceptability of communal waste management system

Table 3: Level of Education and Acceptability of the Communal Waste System

Level of Education	Strongly Agree	Agree	Strongly Disagree	Disagree
No formal Education	0	0	13	2
Primary School leaver Certificate/SSCE	2	19	18	1
Graduate	56	30	5	4

$\chi^2 = 83.91 \quad df = 6$

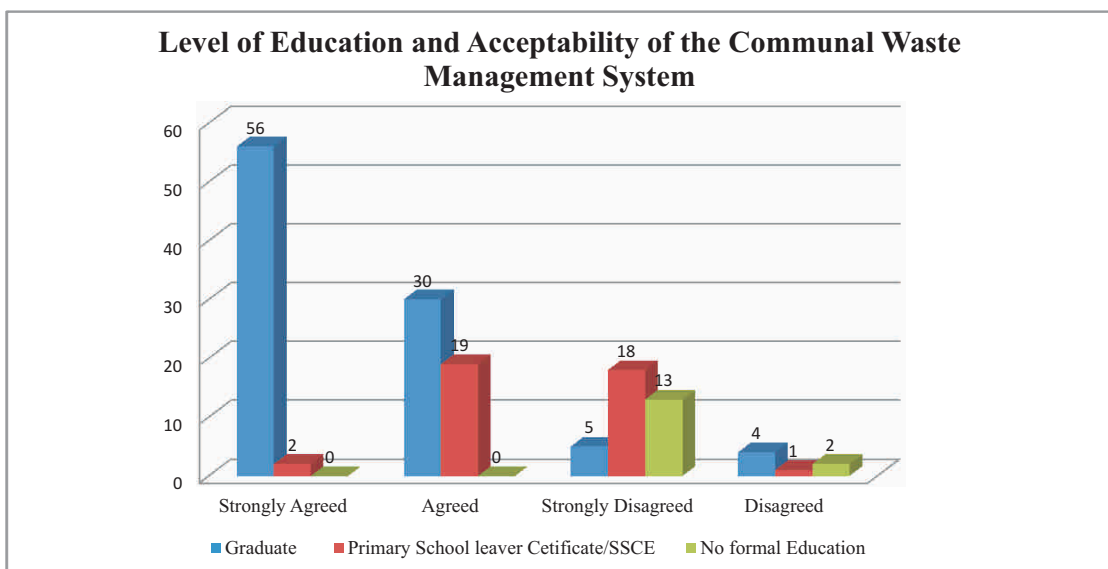


Figure 2: Responses on the level of education and acceptability of communal waste management systems

Responses on distance from proposed site and acceptability of communal waste management system

Table 4: Distance from the Proposed site and Acceptability of the Communal Waste System

Distance from propose site (m)	Strongly Agreed	Agreed	Strongly Disagreed	Disagreed
0 – 300	1	3	7	9
301 – 600	4	2	14	10
> 600	46	42	8	4

$\chi^2 = 71.08 df = 6$

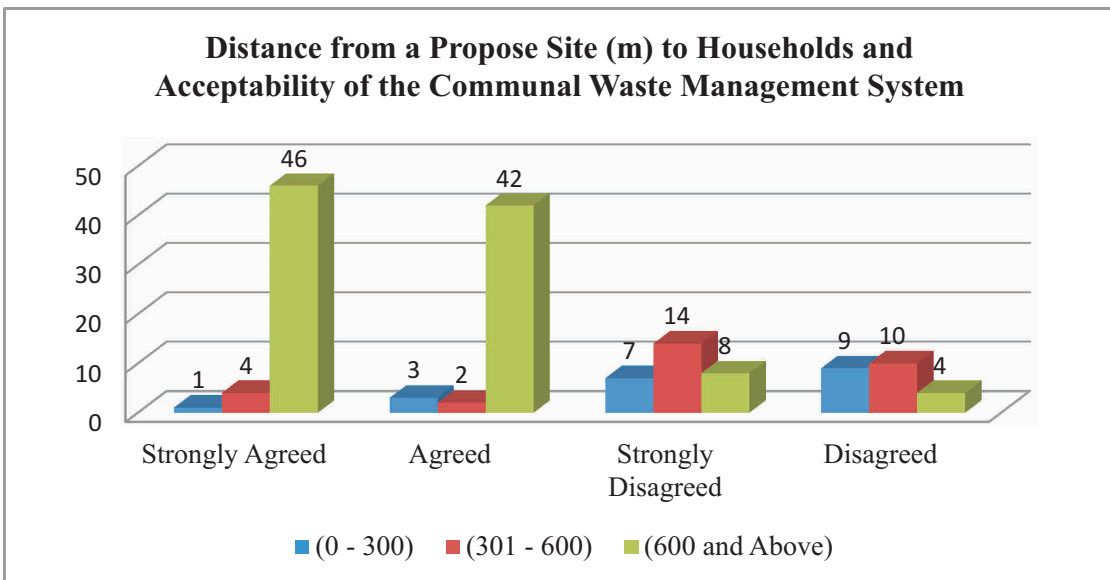


Figure 4: Acceptability of communal waste systems based on the distance of the waste management site and households

Responses on level of income and acceptability of communal waste management system

Table 5: Level of Income and acceptability of the communal waste system

Income (Naira)	Strongly Agree	Agree	Strongly Disagree	Disagree
10,000 – 30,000	2	3	8	7
20,001 – 40,000	23	15	1	1
>40,000	7	7	14	90

$\chi^2 = 87.86 df = 6$

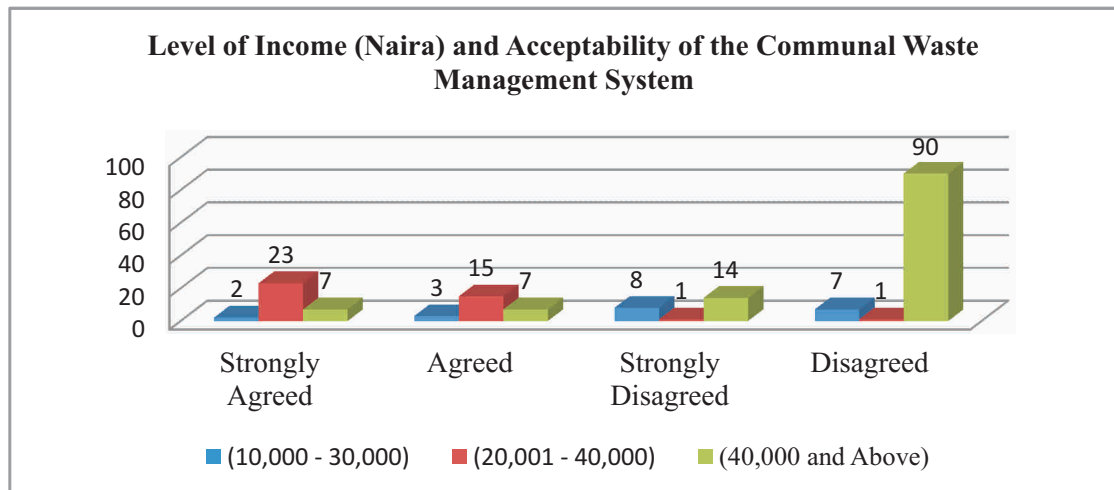


Figure 5: Acceptability of communal waste systems based on the income of the respondent

Results of the Hypotheses Testing

Test of Hypothesis I

- H_0 : There is no significant influence of levels in education and acceptance of communal disposal waste system.
- H_A : There is significant influence of levels in education and acceptance of communal disposal waste system.

Table II shows the various levels of education and their acceptance of the communal disposal waste system. The chi-square value is 83.91 with degree of freedom of 6, also agrees that different level of education determines the acceptance of the communal disposal system, hence the Null Hypothesis is rejected in favour of the Alternate hypothesis which states that: 'there is no significant influence of levels in education and acceptance of communal disposal waste system'.

Test of Hypothesis II

- H_0 : There is no significant difference between income and acceptance of communal disposal waste system.
- H_A : There is significant difference between income and acceptance of communal disposal waste system.

From Table IV, the result shows that differing levels of income indicated different stance in acceptance of the communal waste disposal system. The chi-square value is 87.86 with degree of freedom of 6, hence the null hypothesis is accepted in favour of the alternate hypothesis which states that: 'there is no significant difference between income and acceptance of communal disposal waste system'.

Test of Hypothesis III

- H_0 : There is no significant difference between varying distance from proposed site and acceptance of communal disposal waste system.
- H_A : There is significant difference between varying distance from proposed site and acceptance of communal disposal waste system.

Table IV shows that majority (88) whose houses were far away accepted the notion of a communal system compared with those whose residents were close by. The chi-square value is 71.08 with degree of freedom of 6, hence the null hypothesis is accepted in favour of the alternate hypothesis which states that: 'there is significant difference between varying distance from proposed site and acceptance of communal disposal waste system'.

Test of Hypothesis IV

- H_0 : There is no significant difference between household size and acceptance of communal disposal waste system.
- H_A : There is significant difference between household size and acceptance of communal disposal waste system.

Table 2 shows the results on household size and acceptability of communal waste system. The chi-square value is 104.1 with degree of freedom of 6, hence the null hypothesis is accepted in favour of the alternate hypothesis which states that: 'there is significant difference between household size and acceptance of communal disposal waste system'.

Conclusion and Recommendations

The study concludes that the respondents in the study area do not accept communal waste management and the rejection might be due to; finance for the construction of the system and the operation and maintenance, who pay for the expenses and who owns the system. Location of proposed site to households is another factor because of the nuisance associated with solid waste management. Therefore, study concludes that relevant government agencies should create awareness and provide funding and institutional framework support and use of functional community development associations in the peri-urban areas.

Based on the above findings, the following recommendations were suggested: In the long-term, the local authority needs to take charge of waste collection and disposal, but in the short-term the relevant authority can engage with individuals or informal groups who have interest in the waste sector to raise their capacity to collect, to recover and to recycle materials from the area. Furthermore, the local authority can even allow informal waste managers to levy a direct fee to waste producers. More awareness needs to be enhanced if waste management is to be improved in rapidly urbanising areas and specifically in the study area, the local community needs to be provided with basic information on how to minimise their waste and the role of each member

in ensuring a clean and healthy environment. A community that is aware might be more willing to support efforts to enhance waste management. Waste management firms may need to be introduced to residents and workers which would enhance awareness and responsibility towards proper waste management and lastly greater sensitisation on the need for proper waste management would counter the emerged major constraints.

References

- Admin. (2015). *The environmental and health implications of solid waste disposal* -. Retrieved August 12, 2016, from Environmental [http://www.truehealthonline.com /the-environmental-and-health-implications-of-solid-waste-disposal](http://www.truehealthonline.com/the-environmental-and-health-implications-of-solid-waste-disposal).
- Akinwale A (2005) Waste management in Nigeria local Governments. International Conference on Energy, Environment and Disasters- INCEED2005, Charlotte, N.C, USA- July 24-30, 2005.
- Ali, S. M., Pervaiz, A., Afzal, B., Hamid, N., Yasmin, A. (2014). Open dumping of municipal solid waste and its hazardous impacts on soil and vegetation diversity at waste dumping sites of Islamabad city. *Journal of King Saud University - Science*, 26 (1), 59–65. doi:10.1016 /j.jksus. 2013.08.003.
- Allen, A., Corubolo, E., Nilvo L A ,Da Silva. (1999). Strategic environmental planning and management for the Peri-urban interface research project environmental Problems and Opportunities of The Peri-Urban Interface and their Impact Upon The Poor Table of Contents. Retrieved from http://www.ucl.ac.uk/dpu-projects/drivers_urb_change/urb_economy/pdf_Urban_Rural/DPU_PUI_Allen_Corubolo_daSilva_Environmental.pdf
- Adegbite, A. A., Salako, S. G., Yusuf-Babatunde, A. M., Lawal, O. A., and KuKu, A. M. (2015b). Assessment of perceived health and environmental problems of household energy consumption among Ileseljebu residents southwestern Nigeria. *Asia Pacific Journal of Energy and Environment*, 2(3), 117–124. doi:10.18034/apjee.v2i3.734
- Batty, S. (2014, April 2). *Open dumping*. Retrieved August 22, 2016, from <http://www.epa.illinois>.

- gov/topics/waste-management/illegal-dumping/open-dumping/index.
- Bello, A. H. (2011). *Evaluation of constraints affecting solid waste management among health workers and heads of household in Nigeria*. Retrieved from <http://kubanni.abu.edu.ng:8080/jspui/bitstream/123456789/3191/1/EVALUATION%20OF%20CONSTRAINTS%20AFFECTING%20SOLID%20WASTE%20MANAGEMENT%20AMONG%20HEALTH%20WORKERS%20AND%20HEADS%20OF%20HOUSEHOLD%20IN%20NIGERIA.pdf>
- Butu, A. W., Mshelia, S. S. (2014). Municipal solid waste disposal and environmental Issues in Kano Metropolis, Nigeria. *British Journal of Environmental Sciences*, 2(1), 1–16. Retrieved from <http://www.eajournals.org/wp-content/uploads/Municipal-Solid-Waste-Disposal-and-Environmental-Issues-in-Kano-Metropolis-Nigeria.pdf>.
- Egun, Kingsley, N., Kingsley, E. N. (2012). The waste to wealth concept: Waste market operation in Delta State, Nigeria. *Greener Journal of Social Sciences*, 2(6), 2276–7800. Retrieved from <http://www.gjournals.org/GJSC/GJSC%20PDF/2012/December/Egun.pdf>
- Environmental impact of indiscriminate waste disposal “A case study of Nigerian air force base Kaduna.” (2014). Retrieved from https://www.ijecas.org/download_data/view16.pdf
- Eugene, Arthur, E., Rob, I., Nwuzoh, I., Adekoya, A., Egbonwon, D., Kalu, N. (2015, December 2). *How to turn waste to wealth in Nigeria - information guide in Nigeria*. Retrieved August 22, 2016, from Business & Investment, <http://infoguidenigeria.com/waste-to-wealth/>
- Hygiene and environmental health module: 22. Solid waste management. (2016, August 22). Retrieved August 22, 2016, from <http://www.open.edu/openlearnworks/mod/oucontent/view.php?id=209&printable=1>.
- Kumari, A. N., Pathi, T. L., Priya, D. K., Vineel, P. S., Assoc. *Solid waste management*. Retrieved from http://www.ijarse.com/images/fullpdf/1460523518_535V.pdf
- Loiselle, C. G. Profetto-McGrath, J., Polit, D.F, Beck, C.T (2004) ' Canadian essentials of nursing research'. First Edition. New York: Lippincott, Williams & Wilkins. Peer reviewed. 537p
- Mlozi, M. N. (2011). *Assessment of community participation in solid waste management: The Case of Mbeya City Council Tanzania*. By Marietha Ndele Mlozi A Dissertation Submitted In Partial Fulfilment Of The Requirement For The Degree Of Master Of Arts In Rural. Retrieved from <http://suaire.suanet.ac.tz:8080/xmlui/bitstream/handle/123456789/291/Malietha%20Ndele%20Mlozi%20%20Dissertation%202011.pdf?sequence=1&isAllowed=y>
- Mowoe K.M (1990). Quality of life and environmental pollution and protection in Omotola J.A (ed.), *Environmental Law in Nigeria*, Faculty of law, University of Lagos, 1990, 177.
- Ogawa, H. (1999). *Sustainable solid waste management in developing countries*. Retrieved August 24, 2016, from WHO Western Pacific Regional Environmental Health Centre (EHC), <http://www.gdrc.org/uem/waste/swm-fogawal.htm>
- RN, J. P.-M. P., Carmen G. Loiselle PhD RN, Denise F. Polit, Cheryl TB (2006). *Canadian essentials of nursing research*. Retrieved from <https://www.amazon.ca/Canadian-Essentials-Nursing-Research-Loiselle/dp/0781784166>.
- Sangodoyin, A. Y. (1993). Domestic waste disposal in southwest Nigeria. *Environmental Management and Health*, 4(3), 20–23. doi:10.1108/09566169310043061.
- Shaw, A. (2005). Peri-Urban interface of Indian cities: Growth, governance and local initiatives. *Economic and Political Weekly*, 40(2), 129–136. doi:10.2307/4416042.
- Singh, J and Ramanathan, A (2010) *Solid waste management present and future challenges* First Editon I.K international Publishing House Pvt. Ltd New Delhi India ISBN 978-93-80026428.
- Smith, A., Stirling, A. (2009). Peri-urban on the edge of sustainability: Perspectives on Peri-urban dynamics. Retrieved from <http://steps-centre.org/wp-content/uploads/Peri-urban-online-version.pdf>
- Sridhar, M. K. C., Hammed, T. B. (2014). Turning waste to wealth in Nigeria: An overview. *J Hum Ecol*, 46(2), 195–203. Retrieved from [http://www.krepublishers.com/02-Journals/JHE/JHE-46-0-000-14-Web/JHE-46-2-000-14-Abst-PDF/JHE-46-2-195-14-2517-Hammed-T-B/JHE-46-2-195-14-2517-Hammed-T-B-Tx\[10\].pdf](http://www.krepublishers.com/02-Journals/JHE/JHE-46-0-000-14-Web/JHE-46-2-000-14-Abst-PDF/JHE-46-2-195-14-2517-Hammed-T-B/JHE-46-2-195-14-2517-Hammed-T-B-Tx[10].pdf)
- Ukpong, I. E., Udofia, E. P. (2004). *Domestic solid waste management in a rapidly growing Nigerian city of Uyo*. Retrieved from <http://www.krepublishers.com/02-Journals/JHE/JHE-36-0-000-11-Web/JHE-36-3-000-11-Abst-PDF/JHE-36-3-229->

11-2094-Ukpong-I-E/JHE-36-3-229-11-2094-Ukpong-I-E-Tt.pdf

Urban waste management issues. Retrieved August 21, 2016, from <http://www.gdrc.org/uem/waste/uwm-issues.html>

What a waste: a global review of solid waste management. (2016). Retrieved from <http://siteresources.worldbank.org/INTURBAN>

DEVELOPMENT/Resources/336387-1334852610766/Chap3.pdf.

World Bank (2016) Urban waste management issues. Retrieved August 21,

2016, from <http://www.gdrc.org/uem/waste/>
World Bank (2013) Global Waste on Pace to Triple by 2100
<http://www.worldbank.org/en/news/feature/2013/10/30/global-waste-on-pace-to-triple>

