Knowledge, Attitude and Practice Survey of Source-Separation of Solid Wastes among Workers of a Tertiary Institution in Nigeria

ELEMILE, O.O. G.R.E.E ANA & M.K.C SRIDHAR

Department of Environmental Health Sciences, Faculty of Public Health, University of Ibadan, Ibadan, Nigeria
Email: elemzy2011@gmail.com

Abstract

Source-separation is a solid waste management strategy which aids recycling. This concept is relatively new in Nigeria. The study therefore documented the Knowledge, Attitude and Practice of Source-separation among workers such as Non-Academic Staff and Business Operators at the University of Ibadan, Nigeria. A cross-sectional design was adopted. The non-residential areas of Student Union Building (SUB), Works Department (WD) and Faculty of the Social Sciences (FSS) were purposively selected with 180 business operators at the SUB and 168 Non-Academic Staff at the FSS and WD. A validated questionnaire was used to collect data on source-separation. Descriptive statistics was used to analyze data. Participants' mean age was 30±8.9 years. Majority of the respondents in the locations SUB (72.6%) compared with WD and FSS (67.2%) had no knowledge of recycling. The attitude towards source separation and recycling especially at the SUB was very poor. At the SUB (94.4%) felt waste recycling was not necessary; compared to WD and FSS (53.0%). The practice of source-separation in all locations was very poor; Majority of the respondents at SUB (97.8%), WD and FSS (91.1%) do not separate their waste. The Knowledge, Attitude and Practice about source-separation of wastes were poor. Therefore, advocacy and training are needed to promote the adoption of source-separation in the institution.

Keywords: Source-separation, Waste Segregation, Recycling, Solid Waste Management, University of Ibadan

Introduction

Source separation is widely accepted as a key method for minimizing waste and enhancing recycling and disposal efficiency (Zhang et-al 2012; Kuusiola et-al 2012). Source separation of Municipal Solid Waste (MSW) into various components is an important option towards achieving a sustainable and integrated solid waste management system in Nigeria. Source separated materials readily makes available the necessary raw materials for recycling and composting plants. A relatively small portion of solid waste in addition to the inevitable by-products of composting and recycling will end up on landfills and open dumps in the case of Nigeria. According to McDougall et al. (2001), separation of organic waste from the MSW stream represents an opportunity to reduce the quantity of waste entering landfills in developing countries by up to 50% by weight. Source separation increases the value of MSW and promotes cost recovery schemes in addition to prolonging the lifespan of the landfills.

University of Ibadan is a large community with a population of about 33,481 people (Oyedele, 2013). It comprises thirteen faculties and four institutes, four centres, student's hostels, junior and senior staff quarters, markets, commercial, utility and recreational areas. The wastes generated on campus presently are enormous and usually the generation rate and disposal rates do not match (Elemile, 2009). This has public health consequences through pollution of air, water and soil besides breeding of vectors. The attitude of people to solid waste management such as sorting or segregation of waste at source is also of great concern.

The concept of source-separation as a waste management strategy is relatively new in Nigeria. The study was therefore aimed at obtaining available information on the knowledge, attitude and practice of source-separation of solid wastes among different categories of workers in tertiary institutions such as the University of Ibadan, in South West Nigeria.

Methodology

The study location

Ibadan is the capital of Oyo State in Nigeria and the largest city in West Africa. It is an indigenous African town that lies between latitude 7 ^{o} 23' 47 ^{o} N and 3^{o} 55 0^{o} east of prime meridian (Wikipedia, 2014). Ibadan is located in southwestern Nigeria in the southeastern part of Oyo State about 120 km east of the border with the Republic of Benin in the forest zone close to the boundary between the forest and the savanna. The city ranges in

elevation from 150 m in the valley area, to 275 m above sea level on the major north-south ridge which crosses the central part of the city. The city's total area is 1,190 square miles (3,080 km^2) (Wikipedia, 2014). By the year 2000, it is estimated that Ibadan covered 400 km^2 (Onibokun and Faniran, 1995). Most of the people are engaged in petty trading and small-scale business, while others are civil/public servants. Ibadan is noted for several institutions and over 300 schools made up of both public and private nursery, primary and secondary schools.

The University of Ibadan

The study was carried out in selected areas in the University of Ibadan (UI). The University of Ibadan is made up of 13 Faculties which offer both undergraduate and postgraduate programmes -Arts, The Social Sciences, Science, Education, Agriculture and Forestry, Technology, Basic Medical Sciences, Veterinary Medicine, Pharmacy, Public Health, Law, Clinical Sciences and Dentistry. The Faculties are housed in 205 Academic Blocks; 9 students Hostels; Senior and Junior Staff quarters, commercial centres such as the Students' Union Building and the Black market. Other sections in U.I are: The Central Administration (15 Blocks) which comprises the registry and bursary, the Kenneth Dike Library, University Health Centre, Administrative Blocks (25 Blocks). Estate and Works Department, Waterworks, Workshops and Power house which were housed in 25 blocks. Others are the University Press, Black Market, Sports Complex, Students' Union Building (SUB), Senior Staff Club, Abadina Community Centre, Trenchard Hall, Botanical Garden, Zoological Garden, shops, primary and secondary schools (University Planning Unit, 2007 -2008 Statistics). The university has a total population of 33,481; out of which 29,021 are students with 35% post graduate and 65% undergraduate, 1,197 are academic staff and 3,263 are non-academic staff (Oyedele, 2013). Fig. 1 shows the layout of the University of Ibadan.

Study design

A cross-sectional study design was adopted. The non-residential areas of Student Union Building (SUB), Works Department (WD) and The Faculty of Social Sciences (FSS) were purposively selected. The study involved administration of questionnaire.

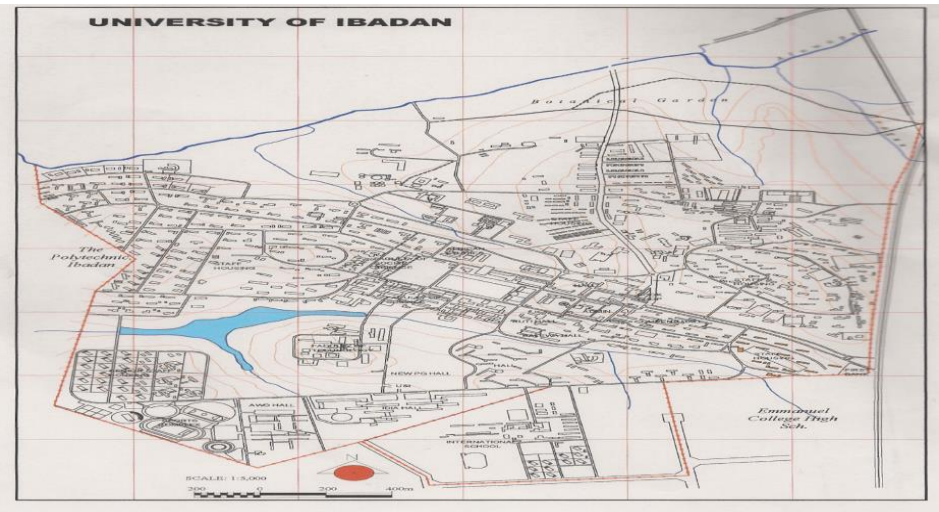

Figure 1: Map of the University of Ibadan

Study population

The study population comprised workers such as Business Operators, and Non Academic Staff (both Senior and Junior) who are domiciled in the Students' Union Building (SUB), the Faculty of the Social Sciences and Works Department of the University of Ibadan respectively.

Sampling technique

The non-residential areas of the University comprising of the Students' Union Building (SUB), University of Ibadan Works Department (WD) and the Faculty of the Social Sciences (FSS) were purposively selected.

Sampling frame

The sampling frame included 180 Business Operators of the SUB and 168 Non-Academic Staff (both Senior and Junior) at the FSS and WD. The sample size was calculated in line with the following conditions: No evidence of any work done on separation of waste at the office and commercial environment in the University of Ibadan. Proportion with good knowledge, attitude and practice of source separation of waste = 50% Precision limit = 7.5% at 95% level of significance.

Ethical clearance

For the purpose of the study consent was obtained from the leadership of the Students' Union Transition Committee (SUTC) and the leaders of the business operators at the SUB.

Questionnaire administration

A 53-item, semi-structured, interviewer-administered questionnaire was developed and used for data collection. The questionnaire was divided into five major sections for ease of administration. The sections included demographics, knowledge about source-separation and waste recycling on campus, attitude towards Source-separation of solid waste on campus, practice of source separation and waste recycling on campus and problems of current waste management options on Campus. The questionnaire (348 in number) which included 5 questions having a point each making it a 5-point knowledge scale was then used to elicit information from the study areas namely; the SUB, FSS and WD all in the University of Ibadan. This was done to elicit information on current waste management programmes, to collect baseline data on source separation of solid waste and waste recycling on campus. Four trained Research Assistants conducted face-to-face interviews with respondents (business operators and workers) in the study areas. The interviews were conducted in either English or Yoruba (the language widely spoken in the study area) to ensure good comprehension. The Structured questionnaire was administered to all the research participants. Prior to administration, the questionnaire was pre-tested at the Polytechnic, Ibadan Campus to standardise the instrument. The responses were analysed and corrections were made.

Results and discussion

Socio-demographic characteristics of respondents

A total of 348 respondents comprising 168 from the Faculty of The Social Sciences (FSS) and Works Department (WD), and 180 from the Student Union Building (SUB) were interviewed. The characteristics as shown in Table 1 revealed that there were significant differences in the educational status, marital status, ethnic origin, sex and occupation of workers across the locations.

Table 1: Socio-demographic characteristics of the participants

Demographic Characteristics	FSS + WD N=168(%)	SUB N=180(%)
Age		
<20	5 (3.0)	18 (10)
20-29	36 (21.4)	115 (63.9)
30-39	82 (48.8)	31 (17.2)
40-49	36 (21.4)	14 (7.8)
50+	9 (5.4)	2 (1.1)
Sex		
Male	109 (64.9)	98 (54.4)
Female	59 (35.1)	82 (45.6)
Marital Status		
Single	34 (20.2)	124 (68.9)
Married	124 (73.8)	56 (31.1)
Religion		
Christianity	134(79.8)	145 (80.6)
Islam	34 (20.2)	35 (19.4)
Traditional	0 (0.0)	0 (0.0)
Ethnic Group		
Yoruba	131(80.0)	150 (83.3)
Igbo	33(19.6)	27 (15.0)
Others	4 (2.4)	3(11.7)
Educational Status		
Primary Education	18(10.7)	0 (0.0)
Secondary Education	62(36.9)	105 (58.3)
Tertiary Education	88(52.4)	75 (41.7)
Occupation		
Self employed	29(17.3)	180 (100)
University Staff	139 (82.7)	0 (0.0)
Number of Persons Per Office/Store		
1-5	91 (54.2)	146 (81.1)
6-10	57 (33.9)	16 (8.9)
11+	20 (11.9)	18 (10.0)

Workers who had tertiary education as their highest educational qualification were found mostly at the FSS and WD. Those with secondary education as their highest educational qualification were found mostly at

the Students' Union Building. This may be due to the nature of occupation and the level of education required for such occupations.

More married workers were found at the FSS and WD. In contrast to this more un-married workers were found at the SUB. It is not surprising to find that the highest proportion of self employed workers were found at the SUB because of the predominant commercial activity in place while the university employees were predominant at the WD and the FSS. Male workers were found mostly in all locations. Gender is a variable that has received consistent attention among researchers (Jones & Dunlap, 1992; Arcury & Christianson, 1993 and Petts, 1994). Raudsepp (2001) found that women were significantly more likely than men to be concerned with environmental problems. Females have been consistently shown to have higher environmentally conscious attitudes than men. The common reason advanced for gender differences is the different socialization patterns between boys and girls. More often than not, girls are made to carry out most of all the sweeping and cleaning activities; they are called upon more than their male counterparts to perform maintenance tasks at home or in schools. It would therefore take greater efforts for the concept of source separation to be accepted at the locations.

Knowledge of participants on the source separation and recycling of solid waste

Table 2 refers to the respondents' knowledge on waste recycling and source separation of solid waste. The knowledge of respondents on waste recycling was low. Majority 67.2% at FSS and WD as against 72.6 % at SUB had no knowledge about recycling. FSS and WD (0.6%) in comparison with and SUB (1.2%) respondents reported the reprocessing of waste into useful items. At the FSS and WD 32.2% reported the conversion of waste into other products as against the 4.2% at SUB while 0.0% at the FSS and WD reported the dumping of waste properly in comparison with 21.4% at SUB. The knowledge of participants on source separation was low. Majority 72.8% had no knowledge of waste separation at source at the FSS and WD in comparison with 78.0% at the SUB. About 25.5% (FSS and WD) reported that source-separation indicates separating different waste components using different bins before disposal in comparison with 14.9% at the SUB while 1.7% (FSS and WD) in comparison with 3.5% SUB) revealed that it means separation of papers and nylon from others.

Table 2: Knowledge of respondents on recycling and source separation of solid waste at baseline

Variable	Options	FSS + WD N = 168 (%)	SUB N = 180 (%)
Knowledge on Waste Recycling	No Knowledge	121(67.2)	122(72.6)
	Reprocessing of Waste into Useful Ones	1(0.6)	2(1.2)
	Conversion of Waste into other Products	58(32.2)	7(4.2)
	Reuse of Waste	0(0.0)	1(0.6)
	Dumping of Waste Properly	0(0.0)	36(21.4)
Knowledge about Source Separation of Solid Wastes	No Knowledge	122(72.8)	131(78.0)
	Separation of wastes with different bins before disposal	43(25.5)	25(14.9)
	Separation of waste according to type	0 (0.0)	5(3.0)
	Separation of Paper and Nylon from Others	3(1.7)	6(3.5)
	Separation of Waste into useful and useless products	0(0.0)	1(0.6)

Table 3 shows the proportion of respondents with good knowledge about source-separation of solid waste and recycling which was determined by the use of SPSS version 15.0 which categorized respondents who were able to have at least 3.75 which was the 75th percentile of the total scores of 5.00 as those with good knowledge of source-separation. It could be seen from the survey that the proportion of respondents (16.1%) at the FSS and WD had good knowledge than 8.2% at the SUB, although the knowledge of respondents was generally low. This could be associated with the fact that the respondents at the FSS and WD have a higher level of education. According to Nixon and Saphores, 2009 who referred to De Yong, 1989; Burn and Osakamp 1986, that the level of education of people will influence the knowledge on the environment and waste management. This is because they are more likely to access information from friends, newspaper, television and books. Chanda (1999) also reported that environmental concerns vary according to education and income levels. The low knowledge of respondents in general agrees with the findings of Grodzinska- Jurczak et-al (2003) that the level of knowledge among people regarding municipal waste and waste management is low and incomplete.

Table 3: Determination of proportion of respondents with good knowledge of source-separation of solid waste using percentiles

Percentile	Score	SUB N= 180%	FSS + WD N=168%
100th	5.00	0(0.00)	0(0.00)
75th	3.75	15(8.2)	27(16.1)
50th	2.50	48(26.7)	76(45.2)
25th	1.25	59(32.8)	34(20.2)
0th	0.00	58(32.2)	31(18.5)

Participants' attitude towards source separation and recycling of solid waste

Table 4 shows the attitude of workers towards waste recycling and source separation at baseline. The result of the survey revealed that the respondents at the SUB generally had poor attitudes. At the FSS and WD, 53% of the respondents agreed that waste recycling was not necessary in the University of Ibadan Community in comparison with 94.4 % at the SUB. 70.2% of respondents at the FSS and WD agreed that individual separation of waste was necessary for proper separation of waste as against the 12.8% at the SUB. 66.7% agreed that solid waste has monetary value as against the 2.8% at the SUB while 64.9% of the respondents at the FSS and WD agreed that a single unit bin with three compartment would enhance source separation of waste in comparison with 9.5% of respondents at the SUB.

It was also observed that there was a significant difference ($P<0.05$) in the attitude of workers at the locations. The good attitude at the FSS and WD agrees with Kallegren and Wood (1986) which states that knowledge which stems out of the fact that the respondents possess a higher level of education may be seen as a key variable affecting levels of environmental action including attitude. The personal experience of receiving training based on the nature of their job is also a factor that may influence attitudes and behaviours according to Kallegren and Wood (1986); Oskamp et al (1991) and Daneshvary et al (1998).

Office/shop solid waste management practices in the study locations

The results (Table 5) showed the source-separation' practice of workers at baseline; the practice of source separation before disposal at all locations was very poor; Majority 91.7% at the FSS and WD as against and 97.8% at the SUB do not separate their waste. Majority of the respondents

91.7% at FSS and WD as against 86.1% at the SUB respectively utilized the campus waste bins as their method of waste disposal while the materials of containers utilized were plastic baskets (FSS and WD) 78.0%, and (SUB) 88.9% at the same locations respectively (Figures 1 and 2). Table 6 refers to the characteristics of the waste bins in use at the three locations. It revealed that at the FSS and WD (82.1%) as against SUB (90.0%) had only one refuse bin in their offices/shops. Also majority at FSS and WD (64.9%) as against SUB (82.2%) utilize 0.01m^3 capacity bin, while most of the general bins were located along the road FSS and WD (69.6%) as against SUB (96.1%). The frequency of disposal for majority of respondents was daily according to FSS and WD (72.0%) in comparison with SUB (90.6%) respectively. It can be observed that there are no significant differences in the practices of solid waste management between the two groups. This might be as a result of the fact that the university is a controlled environment where activities such as solid wastes management are regulated and handled by the University. This agrees with the findings of Okeniyi and Anwan (2012 who reported that most universities like the Covenant University manages its waste generation through its institutional owned disposal system that uses delivery trucks to deliver wastes to municipal landfill sites. Therefore the issue of waste management is not a concern to the workers of the university which makes the practices of solid waste management similar among the respondents.

Proportion of participant's attitude towards waste recycling and source-separation

Statements	Options	FSS + WD N = 168 (%)	SUB N = 180 (%)	P< 0.05
Waste recycling is not necessary in the University of Ibadan community	Agree	89 (53.0)	170 (94.4)	0.000
	Disagree	79(47.0)	10 (5.6)	
Individual separation of waste at the shop/office is necessary for proper management of waste	Agree	118 (70.2)	23 (12.8)	0.000
	Disagree	50 (29.8)	157 (87.2)	
Solid waste has monetary value	Agree	112 (66.7)	5 (2.8)	0.000
	Disagree	56 (33.3)	175 (97.2)	
A single waste disposal bin with separate compartments for different component of waste would enhance source separation of solid waste.	Agree	109(64.9)	17 (9.5%)	0.000
	Disagree	57(35.1)	163 (90.5)	

Table 5: Practices of source-separation at office/shop before disposal by respondents

Responses	FSS+ WDN = 168 (%)	SUB N = 180 (%)
Sell	0(0.0%)	4(2.2%)
Reuse	13(7.7%)	0(0.0%)
Process	1(0.6%)	0(0.0%)
No	154(91.7%)	176(97.8%)

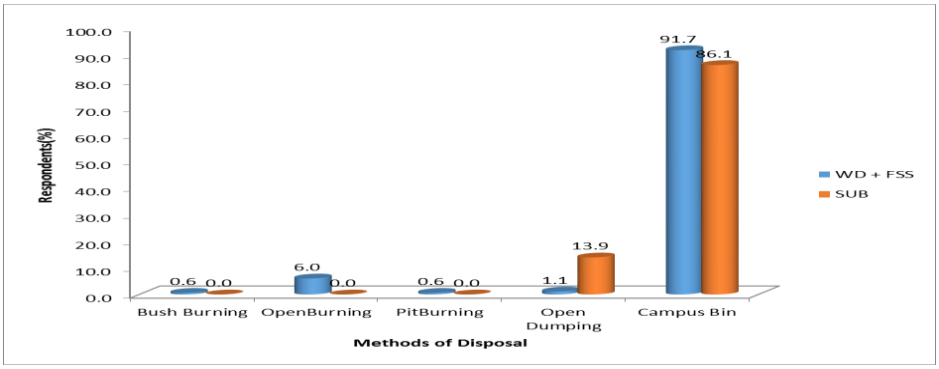

Figure 1: Waste disposal methods employed by participants

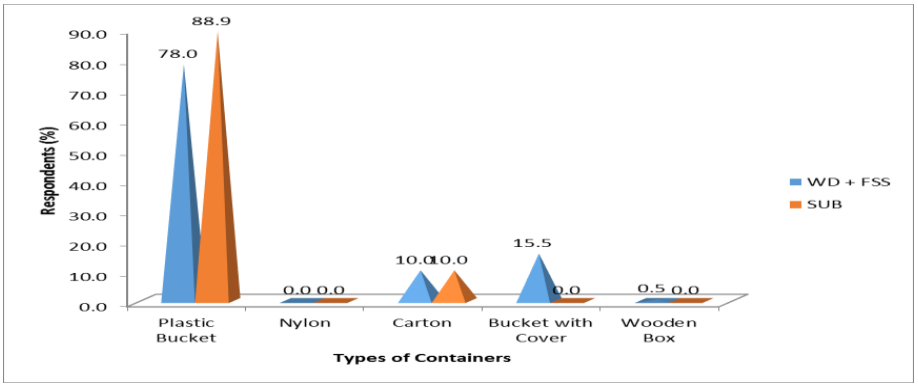

Figure 2: Types of containers used for storing solid waste at the shop/office

Table 6: Participants' waste bins practices at the study locations

Variable	Options	FSS + WDN = 168(%)	SUBN = 180 (%)
Number of Bins	1	138(82.1)	162(90.0)
	2+	30(17.9)	18(10.0)
Capacity of Bin	0.01 m^3 (Small)	109(64.9)	148(82.2)
	0.05 m^3 (Medium)	50(29.7)	32(17.8)
	0.21 m^3 (Large)	9(5.4)	0 (0.0)
Location of Bin	Along the corridor	31(18.5)	3(1.7)
	In the Shop/office	20(11.9)	4(2.2)
	Along the road	117(69.6)	173(96.1)
Frequency of Disposal	Once a day	121(72.0)	163(90.6)
	Twice a day	27(16.1)	13(7.2)
	Every two days	7(4.2)	2(1.1)
	Once a week	13(7.7)	2(1.1)

Conclusion

The study was carried out with the intent of documenting the knowledge, attitude and practices among workers on the source-separation and recycling of solid waste in a tertiary institution where the level of knowledge is expected to be high. There were significant differences between the knowledge and attitudes of source-separation of solid wastes among the non-academic staff and business operators in the University of Ibadan while there was no significant difference in the practice. The study also indicated that the level of knowledge is low and the attitude and practices are no better than those normally found in the communities. There is need for creating more awareness through educational interventions at all levels in the institutional system. For effective waste management in the institution, the following interventions may be implemented for sustainability.

1. There is need for the establishment of a Campus Waste Management Committee which is to be saddled with the responsibility of properly monitoring solid waste collection, segregation and possible recycling activities.
2. The Institution's Authorities should enact appropriate laws on sanitation and sanction the violators if necessary.
3. Environmental corps may be formed to enforce sanitation regulations on campus.
4. Public Environmental Awareness programmes and educational activities may be organized periodically for the people on campus.

References

Arcury, T. A. and E.H. Christianson (1993). Rural-Urban Differences in Environmental Knowledge and Actions. *Journal of Environmental Education, 25(1), 19-25.*

Burn, S.M. and Oskamp, S. (1986). Increasing Community Recycling with Persuasive Communication and Public Commitment. *Journal of Applied Social Psychology, Volume 16, Pg*29-41

Chanda, R. (1999). Correlates and Dimensions of Environmental Quality Concern among Residents of an African Subtropical City: *Botswana Journal of Environmental Education, 30(2), 31-39.*

Daneshvary, N., R. Daneshvary and R. Schwer (1998). Solid Waste Recycling Behaviour and Support for Curb-Side Textile Recycling; *Environment and Behaviour* Vol. 30:2 Pg144 – 16.1

DeYoung, R. (1989). Encouraging Environmentally Appropriate Behavior: The role of Intrinsic Motivation. *Journal of Environmental Systems Vol.* 15 Pg 281-291.

Elemile, O. (2009). Effects of Training and Provision of a Waste Collection Bin on Source-separation of Solid Wastes among Workers of the University of Ibadan. MPH Dissertation. Department of EMSEH University of Ibadan, Ibadan, Nigeria. Pg 130.

Grodzinska-Jurczak, M., A. Bartosiewicz and A. Twardowska (2003). Evaluating the Impact of a School Waste Education Programe upon Students', Parents' and Teachers' Environmental Knowledge, Attitude and Behaviour *Institute of Environmental Sciences, Jagiellonian University, Gronostajowa*, Vol. 3 Pg30-43.

Jones, R.E. and R.E. Dunlap (1992). The Social Bases of Environmental Concern have they changed over time? Rural Sociology, 57(1), 134 - 144.

Kallegren, C.A. and W. Wood (1986). Access to Attitude Relevant Information in Memory as a Determinant of Attitude Behaviour Consistency *Journal of Experimental Social Psychology* Vol. 22:4 Pg 328-338.

Kuusiola, T., M. Wierink and K. Heiskanen (2012). Comparison of Collection Schemes of Municipal Solid Waste Metallic Fraction: The Impacts on Global Warming Potential for the Case of the Helsinki Metropolitan Area, Finland. *Sustainability*, *4*, 2586–2610.

McDougall, F., P. White, M. Franke and P. Hindle (2001). Integrated Solid Waste Management: A Life Cycle Inventory (2nd ed.). Oxford, UK: Blackwell Science.

Nixon, H. and J.M. Saphores (2009). Information and the Decision to Recycle: Results from a Survey of US Households, *Journal of Environmental Planning*. Manage. 52 Pg. 257–277.

Okeniyi J.O. and E.U. Anwan (2012). Solid Wastes Generation in Covenant University, Ota, Nigeria: Characterization and Implication for Sustainable Waste Management *Journal of Material Environmental Sciences. 3 (2) Pg 419 – 424.*

Onibokun, P. and A. Faniran (1995). Urban research in Nigeria. IFRA and CASSAD, Ibadan.

Oskamp, S., M.J. Harrington, T.C. Edwards, D.L. Sherwood, S.M. Okuda and D.C. Swanson (1991). Factors Influencing Household Recycling Behaviour *Environment and Behaviour* Vol. 23:4 Pg 494–519.

Oyedele, D. (8 September 2013). "UI Receives Biggest Allocation of Intervention Funds". Retrieved 19th October 2014.

Petts, J. (1994). Effective Waste Management: Understanding and Dealing with Public Concerns. Waste Management & Research, 12(3), 207-222.

Raudsepp, M. (2001). Some Socio-Demographic and Socio-Psychological Predictor of Environmentalism. Trames, 5(4), 355-367.

Wikipedia (2014) Ibadan https://en.wikipedia.org/wiki/Ibadan: Retrieved 8th May, 2015

Zhang, W.Q., Y. Che, K. Yang, X.Y. Ren and J. Tai (2012) Public Opinion about the Source Separation of Municipal solid waste in Shanghai, China. *Waste Management. Res. 30*, 1261–1271.