

Assessing Environmental Sanitation Practices in Slaughterhouses in Osogbo, Nigeria: Taking the Good with the Bad

O. A. Olowoporoku

Department of Urban and Regional Planning, Obafemi Awolowo University Ile-Ife Nigeria.
Email:oluwaseunayodele6@gmail.com

Abstract - The purpose of this paper is to examine environmental sanitation practices in slaughterhouses in Osogbo, Nigeria. This came about based on the recognition of the disposal of meat waste as sources of environmental pollution in the built environment. Survey for the study involved questionnaire administration at slaughterhouses and field observation. A total of thirty-three slaughterhouses were identified in the study area out of which fifteen (45.0%) were randomly selected. Findings revealed that an average of two cows were slaughtered daily in each of the slaughterhouses sampled and majority (80.0%) of the slaughterhouses were located near water bodies or places with high water table. Dumping of waste in premises of the slaughterhouses was the commonest method of the disposal of solid animal waste while liquid waste, effluents and wastewater were indiscriminately discharged into nearby streams and drainage. The practices of the slaughtering of animals and disposal of waste in the city were without consideration for its polluting effect and concerns for public health. The study recommended efficient and effective enforcement of environmental sanitation laws on slaughterhouses operations and environmental education for the slaughterhouse operators and residents.

Keywords- carcasses, effluents, meat waste, practices, sanitation, slaughterhouse, slaughterhouse operators, pollution

I. INTRODUCTION

The slaughtering of animals for community consumption is inevitable in most nations of the world [1]. In Nigeria, the development and growth of livestock production, has been on the increase and has guaranteed steady supply of food animals meant for slaughter and processing for human consumption [2]. Almost every day, animals are slaughtered in slaughterhouses and the meat sold to the public for consumption [3]. However, waste generated from slaughterhouses has been of great concern, especially in urban communities of Nigeria.

Attempt to meet the needs of urban communities for meat consumption has led to generation of many wastes from the activities of slaughterhouses which are capable of producing adverse effects both on urban environment and residents. Meat wastes originate from killing; hide removal or dehairing, paunch handling, rendering, trimming, processing and clean-up operations. Slaughterhouse wastes often contain blood, fat, organic and inorganic solids, salts and chemicals added during processing operations [3]. Others wastes include condemned meat, undigested ingesta, bones, horns, hairs and aborted fetuses, liquid wastes composed of dissolved solid, blood gut contents, urine and water [4].

Wastes produced from slaughterhouse activities pose significant challenges to effective environmental management. It decreases the air quality in the environment, breeds infectious diseases that are pathogenic to man [9,1]. In addition environmental sanitation practices that characterizes some of these slaughterhouses in developing countries calls for attention. Environmental sanitation is the interventions to reduce people's exposure to diseases by providing a clean environment to live and with measures to break the cycle of disease [5]. This includes hygienic management of human and animal excreta, refuse and wastewater and control of disease vectors and all the factors in the physical environment that may have deleterious effect on man's mental, social and physical wellbeing [6].

The accessibility and nearness of slaughterhouses to consumers in Nigeria urban centres may present some merits. However, the impact of its practices on the built environment and health of residents is of great concern [1, 7]. The pollution emanating from slaughterhouse operations in Nigeria is a source of embarrassment as conventional methods for disposal of animal wastes, carcasses and manure as well as slaughterhouse and other animal industry wastes are now proving inadequate. Wastes from slaughterhouses are indiscriminately and improperly discharged. Effluents from slaughterhouses are washed into streets, especially during rainstorm. This can result in contamination of surface and ground water and also constitute nuisance to the city [8]. This is because facilities for waste recovery, treatment, and reuse are either inadequate or nonexistent in most Nigerian slaughterhouses [7, 9]. Thus, urban dwellers are left with no other option than to consume both the good with the bad from the slaughterhouses.

Meat handling methods in Nigeria is generally unsatisfactory. Slaughterhouses are obsolete, built without proper layouts, and where such layouts exist, they have been distorted. Slaughtering is generally carried out on untidy bare floor and outside the slaughterhouse by individual butchers, whose knowledge of hygiene is low [10]. There are no provisions for running water thus slaughtering floors are blackened by mixture of blood, ash, smoke and dirt [11]. Open air burning to remove fur is the most common practice by many butchers. The slaughtering and processing facilities in the slaughterhouses are inadequate as there are no sewage or waste disposal systems, incinerators, proper drainage, adequate clean water supplies and refrigeration [2]. All these practices increase the chances of contamination of meat meant for human consumption. Thus meat handling practices in Nigeria is simply taking the good with the bad.

Poor environmental sanitation practices in slaughterhouses in Nigeria contribute to the menace and deplorable state of the built environment in general. One of the most embarrassing environmental sanitation situations facing the country is the indiscriminate dumping of cow faeces and inappropriate way of emptying and

cleaning stomach and intestines of cows. This has made air around slaughterhouses is offensive due to putrefying flesh and odour molecules. The menace has leads to quantum attraction of flies, poor and unhealthy living conditions, exposure of populace to illness, transmission of diseases or loss of life due to unclean surrounding etc. The quality of management of slaughterhouses, particularly, the adherence to environmental sanitation standards is a key to sound public health. An efficient environmental sanitation practice in slaughterhouses and meat hygiene programme is a prerequisite for healthy living of the public. The benefits are human health improvement, animal disease control, processing and retail net value, reduced spoilage and fraud and improved environmental hygiene [2].

Environmental sanitation in slaughterhouses is a prominent issue in both the developed and developing nations and it has been discussed by various authors in different times and regions. Studies that have examined the manner of waste handling and disposal by slaughterhouses into the environment is a determinant of the sanitary condition of the environment [11, 12, 13, 14, 3, 15, 16, 17]. In the discussion of these components, although environmental sanitation has not been jettisoned, it has not been extensively discussed as other components such as water supply, sanitation practices and availability of facilities. These past studies on waste management in slaughterhouses have revealed that slaughterhouse waste have grave environmental implication.

Issues bothering on contamination of water bodies by effluents from meat factories are not new in academic discourse. For instance many researchers have explored issues related to meat factories' effluents, and their pollution of nearby water bodies in the recent past [18, 8, 2, 19, 20, 21]. Likewise discussions abound on effects of slaughterhouse activities on the health of urban dwellers [22, 23, 1, 24, 25]. These researchers focused on the health risks that residents around the slaughterhouses are vulnerable to with little emphasis on the operations and sanitation practices of the slaughterhouse operators.

Based on the foregoing, it is expedient to empirically investigate into environmental sanitation practices engaged in by slaughterhouse operators. This will be a means of auditing the environmental security and meat slaughtering techniques employed by the operators. Thus the 'bad side' (environmental pollution) of the operation of slaughterhouses will not be inimical to their 'good side' (meat production) and also the surrounding residents and environment. Findings from this study can influence efficient slaughterhouse operation and meat hygiene service which is a pre-requisite for healthy living of the public. Also, issues on, and direction in, which environmental education can be undertaken for slaughterhouse operators in a given environment are made manifest. This paper, therefore, intents to examine environmental sanitation practices in slaughterhouses in Osogbo, Nigeria.

II. MATERIALS AND METHODS

The study area is Osogbo, the capital of Osun State, located in south-western part of Nigeria. The National Bureau of Statistics (NBS) [26] placed that population of Osogbo in the 2006 population census as 287,156 persons. In 2013 the World Bank placed the growth rate of the country at 2.54 %; this translates into increasing demand for meat protein in the city. The locations of the slaughterhouses for the study varied in size of operations. Information gathered from each slaughterhouse included the average number of animals slaughtered per day, the method of disposal of the different parts of the slaughtered animal. Also the study examined the socioeconomic characteristics of the people engaging in slaughterhouse activities.

The study identified thirty-three slaughterhouses in the city out of which fifteen were selected randomly for questionnaire administration. Simple random technique was adopted in sourcing information from an operator in each of the slaughterhouses selected. Thus, fifteen operators were sampled on which questionnaire were administered. Data collected through the survey include socioeconomic attributes of the operators and those pertaining to environmental sanitation practices in the slaughterhouses. The gathered data were analyzed using descriptive statistics, Cross-tabulation and Microsoft Excel in windows office suite.

III. RESULTS AND DISCUSSIONS

This section discusses the profile of the respondents and examined environmental sanitation practices in the study area.

Profile of the Respondents

The profile of the respondents discussed comprises age, gender, educational attainment and income status. Findings on gender of slaughterhouse operators revealed that only males were involved in slaughterhouse business in the study area.

TABLE 1. Socio-economic Attributes of Operators

Attributes	Frequency (%)
Age (years)	
20 – 40	1 (6.7%)
Above 40	14 (93.3%)
Total	15 (100.0%)
Average Monthly Income (₦)	
₦100,000 - ₦200,000	7 (46.7%)
₦201,000 – ₦300,000	7 (46.7%)
Above ₦300,000	1 (6.6%)
Total	15 (100.0%)
Educational Attainment	
Primary	6 (40.0%)
Secondary	8 (53.3%)
Tertiary	1 (6.7%)
Total	15 (100.0%)

The age of the respondents was grouped into two (those between 20 to 40 years) and (operators of 40 years and above). This was aimed at creating a dichotomy between the young adult and old adult operators. Findings revealed that 6.7% of the operators were between the ages of 20-40 while the 93.3% were above 40 years of age. The overall mean age of the respondents was 46 years. This indicates that respondents involved in slaughterhouse operations are of matured ages. For easy analysis, the initial quantitative data on respondents' average monthly income were grouped into three: ₦100,000 - ₦200,000; ₦201,000 - ₦300,000 and above ₦300,000. Findings revealed that 46.7% of the respondents earned between ₦100,000- ₦200,000, 46.7% earned between ₦201,000 -₦300, 000 while 6.6% earned more than ₦300,000 monthly.

Further investigation revealed that the mean monthly income of the respondents was ₦205, 000. A comparison of slaughterhouse operator's income with the prevailing salary scale in the country revealed that slaughterhouse operators in the city occupy the high-income class. The minimum wage at the federal level in Nigeria is ₦18,000 while it ranges from ₦15,000 to ₦20,000 in the states of the federation. The medium monthly income is categorized from ₦21,000 to ₦70,000 while residents earning above ₦70,000 were categorized are in the high income class. Findings on educational qualifications of slaughterhouse operators in Osogbo revealed that 40% of the operators had primary education, 53.3% had secondary education and 6.7% had tertiary education.

Attributes of Slaughterhouses

Sequel to the investigation into the socioeconomic characteristics of the slaughterhouse operators, findings were also made on the number of cows slaughtered in the slaughterhouses daily and the purpose of location of the slaughterhouses as presented in Table 2. Findings revealed that 60.0% which accounted for the majority of the slaughterhouses slaughter between 1-3 cows daily, 26.6% slaughters 4-7 cows daily while the remaining 13.4% slaughters more than seven cows daily. Further findings revealed that majority of the slaughterhouses slaughter between 1-3 cows daily and the average number of cows slaughtered in slaughterhouses in the study area is two cows.

TABLE 2. Attributes of Slaughterhouses

Attribute	Frequency
Number of Cows Slaughtered Daily	
1 -3	9 (60.0%)
4 – 7	4 (26.6%)
Above seven cows daily	2 (13.4%)
Total	15 (100.0%)
Factors Responsible for Location of Slaughterhouse	
Nearness to River/Stream	12 (36.4%)
Very High Water Table	9 (27.3%)
Nearness to Market	4 (12.1%)
Availability of Land	5 (15.2%)
Availability of Cheap Labour	3 (9.0%)
**Total	**33 (100.0%)
Period of Establishment (Years)	
1-10	3 (20.0%)
11- 20	4 (26.7%)
Above 20	8 (53.3%)
Total	15 (100.0%)

**These were more than number of questionnaires administered because a combination of factors were responsible for location of slaughterhouses

Investigations were made into the reasons for siting of slaughterhouses in their respective locations. Respondents were allowed to select multiple options as a combination of factors could be responsible for locating a slaughterhouse in a particular area. Findings revealed that 36.4% of the slaughterhouses were sited in their location as a result of closeness to river/stream, 27.3% of slaughterhouses were sited in their location because of high water table, 12.1% were located because of the nearness of the site to the market, availability of land was responsible for the location of 15.2% of the slaughterhouses while 9.0% were sited in their location because of availability of cheap labour. Further investigations revealed that 80% of the slaughterhouses were sited in their location because of the presence of a nearby water body while 60% were located in places with high water table. These findings are in tandem with Kosamu et al [17] and Kuyeli [27] that slaughterhouses in the developing world are usually located near water bodies. This is on the assumption that slaughterhouses use huge volume of water for processing activities.

Findings made into the year of establishment of slaughterhouses in the study area. The year of establishment of the slaughterhouses were grouped into three. Slaughterhouses established between (1-10years), (11-20 years) (and those established above 20years). This was aimed at examining the age of establishment of slaughterhouses and length of period of polluting the environment. Findings revealed that 20.0% of the slaughterhouses were between 1-10years, 26.7% between 11-20years while the 53.3% established above 20years. The overall mean age of the respondents was 23 years. Further findings revealed there was an increase in the number of slaughterhouses over the years. This can be attributed to increase in the population of the city

which necessitates more meat consumption. The quests to augment the meat demand of the city invariably increases polluting in the city.

Environmental Sanitation Practices in Slaughterhouses

An upshot from the attributes of the slaughterhouses is the examination of the environmental sanitation practices by the butchers in the study area. Investigation into waste disposal methods in the slaughterhouse was contained in Table 3. Various solid waste disposal methods are employed by slaughterhouse operators thus respondents were allowed to select more than one waste disposal method.

TABLE 3. Environmental Sanitation Practices in Slaughterhouses

Practices	Frequency (%)
Solid Waste Disposal	
Burning	3 (13.0%)
Dump on Vacant Land (Beside Slaughterhouse)	15 (65.3%)
Dump in Nearby Bush	2 (8.7%)
Dump along Drainage	3 (13.0%)
Total	**23 (100.0%)
Frequency of Disposal of Solid Waste	
Daily	14 (93.3%)
Twice in a Week	1 (6.7%)
Total	15 (100.0%)
Liquid Waste Disposal	
Channel to Nearby Stream	11(55.0%)
Channel to Nearby Drainage	9 (45.0%)
Total	**17 (100.0%)
Frequency of Cleaning of Wastewater Channel	
Daily	1 (6.7%)
Weekly	2 (13.4%)
Monthly	5 (33.3%)
Every 3 months	7(46.6%)
Total	15 (100.0%)

*These were more than the number of questionnaires administered because respondents were allowed to choose multiple options

Findings on solid waste (condemn meat, undigested ingesta, bones, horns, hairs and aborted fetuses etc.) disposal in slaughterhouses revealed that 13.0% of the slaughterhouses burn their waste, 65.3% dump their waste on vacant land beside the slaughterhouses, 8.7% of the respondents dump their waste in the bush, 13.0% dump their waste in the drainage. Further findings revealed that all the slaughterhouses sampled dump their solid waste on the vacant land in the premises of the slaughterhouses. Undigested ingesta, dungs, bones and horns comprise major proportion of wastes generated in Nigerian slaughterhouses (see Plates 1 and 2). This could be responsible for the highly pungent odour, infestation of flies and diseases vectors as a result of heaps of waste around the slaughterhouses. On the frequency of the disposal of solid waste from the slaughter slabs as put by the operators revealed that 93.3% evacuate their solid waste from the slaughter slabs daily while 6.7% clear their solid waste from the slaughter slabs twice in a week.



Plate 1: Dumped animal dungs and undigested ingesta in spaces around slaughterhouses



Plate 2. Dumped cow horns, bones carcass etc in spaces around slaughterhouses

Findings were made on the management of wastewater in the slaughterhouses. Two methods of wastewater management were identified in the study area. It was observed that 55.0% of the slaughterhouse operators discharge their liquid waste into the nearby water bodies while 45.0% discharge their liquid waste into nearby drains in their neighbourhood (see plate 3). This indiscriminate discharge of wastewater is bound to contaminate the nearby water bodies and also cause drains around the slaughterhouses to be filled with sludge wastewater and slaughterhouse effluents.

On the frequency of the cleaning of the slaughter slabs, the study revealed that all the operators wash the slabs of the slaughter houses daily. However, findings on the cleaning of drains conveying wastewater and its effluents (dissolved solid, blood gut contents, urine and water etc.) from the study showed that 6.7% clean their

wastewater channel daily, 13.4% of the respondents clean their wastewater channel weekly, 33.3% clean their wastewater channel monthly while the remaining 46.6% clean their wastewater channel every three months.

An examination of the relationship between number of cows slaughtered and frequency of disposal of solid waste from the slaughterhouses revealed that 53.3% of the slaughterhouses that slaughter between 1-3 cows daily evacuate their solid waste away from the slaughterhouses daily, 20% of the operators that slaughter between 4-7 cows dispose their solid waste from the slaughterhouse daily while 6.7% of butchers that slaughter above seven cows evacuate the solid waste from slaughterhouse on a daily basis. These practices of keeping solid waste within slaughterhouses for more than a day increases the chances of contamination of meat meant for human consumption.



Plate 3. Discharged wastewater into public drains

From the findings it was revealed that slaughterhouse operators were more concerned with getting their waste and wastewater effluent out of sight at the expense of the environment. The operators considered the environment a slave to rape rather than a friend to cherish. These poor environmental practices across the slaughterhouses in the cities might be related to the low educational level of the operators which their concern may override environmental and public health concern. The low levels of education might affect their levels of environmental consciousness, public health concern and compliance with environmental regulations as studies have established a link between level of education and environmental concern [28,29].

Physical observation and information from the questionnaire revealed that slaughterhouse activities in the study area decreases the quality of environment as the odours emanating from the slaughterhouses attracts disease vectors such as flies, cockroaches rodents etc. thus exposing the populace to diseases such as cholera,

typhoid, malaria etc. Also diseases such as Coli, Bacillus, Salmonella infections, Brucellosis and helminthic diseases and infections etc. could be transmitted to humans via water-based recreations [28]. These poor practices will also have detrimental effect on the nearby aquatic life as their activities could lead to poisoning of aquatic life. Aside the answered questionnaires, physical observations reveal that a lot still has to be done in improving the design of slaughterhouses and efficiency of waste material for re-use in the slaughterhouses in the city.

IV. CONCLUSIONS

The significance of assessing the environmental sanitation practices of slaughterhouses in the city is to audit the practices of slaughterhouses that give the good and the bad to the residents. This study revealed that operators of slaughterhouses are concerned with the daily cleaning of their slabs and discharging their waste into environment. Slaughterhouses activities in Osogbo have polluting effects on its environment and consequently could have negative impact on the health of its patrons and surrounding residents. From the results of this study, it can be concluded that environmental sanitation practices in slaughterhouses in the study area is very poor.

Based on the aforesaid, the following are recommended. Slaughterhouse activities should be effectively monitored. This could be achieved by the local authorities in the cities through efficient and effective enforcement of environmental sanitation laws and regulations on slaughterhouses. Besides, environmental education is required for the operators and the residents. This will enable them to attach importance to environmental dimension that is attached to meat handling activities. Unlike in the past, in most developing countries, when focus was only on government, all stakeholders should be involved in this regard: individuals, community-based organisations (CBOs) and non-governmental organisations (NGOs). This could enhance environmental concern and attitudes among the slaughterhouse operators their processing activities.

Research should be directed at finding ways to re-use the non-consumable animal parts. This will help reduce the waste and increase employment opportunities. Local planning authorities in the cities in Nigeria and other countries with similar background should consider evolving and enforcing minimum standard requirement for the design and location of slaughterhouse. This will form a basis upon which development control activities would be carried out on slaughterhouses. Through this, physical planning process can address the basic requirement in terms of location and availability of environmental facilities before a slaughterhouse is given approval to operate.

REFERENCES

- [1] Bello, Y. O. and Oyedemi, D. T. A. (2009). The Impact of Abattoir Activities and Management in Residential Neighbourhoods: A Case Study of Ogbomoso, Nigeria Journal of Social Science Vol. 19, No. 2 , pp. 121-127.
- [2] Nwanta, J. A.; Onunkwo, J. I.; Ezenduka, V. E. ; Phil-Eze, P. O. and Egege S. C. (2008). Abattoir Operations and Waste Management in Nigeria: A Review of Challenges and Prospects Sokoto Journal of Veterinary Sciences Vol 7, No.2, pp.61-67.
- [3] Ezeohaa, S. L. and Ugwuishiwu. B. O. (2011). Status of Abattoir Wastes Research in Nigeria. Nigerian Journal of Technology Vol. 30, No. 2.
- [4] Adeyemo, O. K (2002). 'Unhygienic Situation of a City Abattoir in South Western Nigeria: Environmental Implication.' AJEAM/RAGEE Vol. 4 No. 1 pp 23-28
- [5] World Bank (2002). Sustainable Sanitation [<http://www.NETSSAF.net>], (accessed 2010 March 11).
- [6] Nwankwo, B. (2011). Evaluation of Environmental Sanitation in Owerri Municipal Council of Imo state. Research Journal of Medical Science Vol. 3. N. 44, pp. 137-140.
- [7] Olowoporoku O. A. (2013). Environmental Sanitation Practices in Slaughterhouses in Osogbo, Nigeria. An Independent Thesis Submitted to the Department of Urban And Regional Planning, Faculty of Environmental Design and Management, Obafemi Awolowo University, Ile-Ife, Nigeria.
- [8] Muhirwa, D., Nhapi, I., Wali, U., Banadda, N., Kashaigili, J. and Kimwaga, R. (2010). Characterization of Wastewater from an Abattoir in Rwanda and the Impact on Downstream Water Quality. International Journal of Ecology and Development Vol.16, pp.30-46.
- [9] Adeyemo, O., Adeyemi, I. and Awosanya, E. (2009). Cattle Cruelty and Risks of Meat contamination at Akinyele Cattle Market and Slaughter Slab in Oyo State, Nigeria. Tropical Animal Health and Production, 41, 1715- 1721.
- [10] Oruonye, E. D. (2015). Challenges of Abattoir Waste Management in Jalingo Metropolis. Nigeria. International Journal of Research in Geography Vol.1, No. 2, pp. 22-31.
- [11] Chika, G. E. (2015). Environmental Sanitation Situation in Abattoirs in Onitsha Metropolis. Knowledge Review Volume 32 No. 1
- [12] Omole, D. O. and Ogiye, A. S. (2013). An Evaluation of Slaughterhouse Wastes in South West Nigeria. American Journal of Environmental Protection Vol. 2, No. 3, pp. 85-89.
- [13] Feron, J., Mensah, S. B. and Boateng, V. (2014). Abattoir Operations, Waste Generation and Management in the Tamale Metropolis: Case Study of the Tamale Slaughterhouse. Journal of Public Health and Epidemiology Vol 6, No. 1, pp-14-19.
- [14] Afon, and Fadare, (2011): Waste handling practices at abattoirs: experience from Ile Ife, Nigeria. Ife Planning Journal Vol. 4 No 1 pp.111- 121.
- [15] Chukwu, O. Adeoye, P. A. and Chidiebere, I. (2011). Abattoir wastes generation, Management and the Environment: A Case of Minna, North Central Nigeria. International Journal of Biosciences Vol 1, No. 6, pp.101-109.
- [16] Adeyemi, I. G and Adeyemo, O. K (2007.). Waste Management Practices at the Bodija Abattoir. International Journal of Environmental Studies.64:71-82.
- [17] Roberts, H. and Jager, L. D. (2004): Current Meat-related Waste Disposal Practices of Free State Red-meat Abattoirs South Africa. Proceedings: 8th World Congress on Environmental Health, September 10th-14th: 30-38
- [18] Kosamul, I. B. M., Mawenda, J. and Mapoma, H. W. T. (2011). Water Quality Changes due to Abattoir Effluent: A Case on Mchesa Stream in Blantyre, Malawi: African Journal of Environmental Science and Technology Vol. 5, No. 8, pp. 589-594.
- [19] Omole, D. O. and Longe, E. O. (2008). An assessment of the Impact of Abattoir Effluents on River Illo, Ota, Nigeria: Journal of Environmental Science and Technology, 1, pp.56- 54
- [20] Girards, J. (2005): Principle of Environment Chemistry, Jones and Bartlett, USA.
- [21] Adeyemo, O. K., Ayodeji, I. O. and Aiki-Raji, C. O (2002): The Water Quality and Sanitary Conditions in a Major Abattoir (Bodija) In Ibadan, Nigeria. African Journal of Biomedical Research Vol. 5, pp. 51-55.
- [22] Singh, V. P. and Neelam, S. (2011). A Survey Report on Impact of Abattoir Activities and Management on Residential Neighbourhoods.. Indian Journal of Veterinarians, Vol. 6, No. 3, pp. 973-978.
- [23] Daramola O. (2006). The Effects of Lagos State Abattoir Oko-Oba on its Environment. Bachelor of Science Dissertation Submitted to the Department of Urban and Regional Planning Obafemi Awolowo University Ile-Ife.
- [24] David-West K. B. (2002). Abattoir Management and Public Health. Proceedings of a National Workshop on Abattoir Management and Public Health Organized by the Nigerian Veterinary Medical Association at Women Development Centre, Abuja, Nigeria. 27-28th June Pp. 6-7.
- [25] Oyedemi D. T. A. (2000). The Impact of Abattoir Location and Management on Surrounding Residents in Ibadan, Nigeria. M. Tech. Thesis (unpublished), LAUTECH, Ogbomoso.
- [26] NBS (2007). 2006 Population Census. National Bureau of Statistics, Federal Republic of Nigeria. Available at <http://www.nigerianstat.gov.ng/Connections/Pop2006.pdf>. Accessed 27th February, 2015.
- [27] Kuyeli, M. S. (2007): Assessment of Industrial Effluent and their Impact on Water Quality of Streams in Blantyre (Masters Thesis) Unima, Zomba..
- [28] Daramola, O. P. (2012). Clapping With One Hand: The Case of Urban Environmental Sanitation Practices in Nigeria Journal of Applied Technology in Environmental Sanitation, Vol. 2 No.4, pp. 223-228.
- [29] Daramola, O. P. (2015). Environmental Sanitation Practices in Residential Areas of Ibadan Metropolis. A Thesis Submitted in Partial Fulfillment of the Requirement for the Award of Doctor of Philosophy Degree in the Department of Urban And Regional Planning, Faculty of Environmental Design and Management, Obafemi Awolowo University, Ile-Ife, Nigeria.
- [30] Esona, M. D., Umoh, J. U. and Kwaga J. K. P. (2004): The Prevalence and Antibioqram of Salmonella spp and Escherischia coli from meat, milk, bovine rectal swabs and Human Stool in Zaria, Nigeria. Journal of Animal Production Research, Vol. 19, No 1, pp 7-19.