Federal Polytechnic Ilaro

Journal of Pure & Applied Sciences
{FEPI- JOPAS}

Published by:

The School of Pure and Applied Science

The Federal Polytechnic Ilaro, Ogun State, Nigeria.

https://fepi-jopas.federalpolyilaro.edu.ng

E-mail:fepi.jopas@federalpolyilaro.edu.ng

ISSN: 2714-2531

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FOREWORD

It is with great delight I welcome you to volume 4 issue 2 of Federal Polytechnic – Journal of Pure and Applied Sciences (FEPI-JOPAS). It is a peer-reviewed open-access multi-disciplinary Journal of global recognition which is referenced and indexed in African Journal Online (AJOL). It is a highly commendable Journal that publishes excellent research contributions and exhibiting also special attention to experience papers coming from the many application areas of pure and applied Sciences. FEPI-JOPAS publishes full-length research work, short communications, critical reviews and other review articles.

The aim of FEPI-JOPAS is to provide intellectual bedrock for both indigenous and international scholars with quality research outputs to express and communicate their research findings to a broader populace. It serves as a valuable platform for the dissemination of information to 21st Century researchers, professionals, policymakers, manufacturers, production staff, R & D personnel as well as governmental and non-governmental agencies. It also aimed to provide a platform for academics and industry practitioners to share cases on the application of management concepts to complex real-world situations in pure and applied sciences and related fields.

This volume 4 issue 2 of FEPI-JOPAS is loaded with quantum and well-featured diversity of trending topics in applied and basic research. These hot and trending topics are: Sustainable Art and Design: Activating Sighting as the Phenomenon of Representational Drawing; Assessment of Heavy Metals in Processed Meat (Tinko) Sold within Igbesa Community; The Hypoglycemic Effect of Musa Sapientum in Alloxan Induced Diabetic Albino Wistar Rat; Rainwater Quality Evaluation for Agricultural Use: Case Study of a Portland cement Producing Area; Analytical Approach to Investigating the Influence of Blood Group and Blood Genotype on the Performance of Students of Federal Polytechnic, Ilaro; Dough Mixing Time: Impact on Dough Properties, Bread-Baking Quality and Consumer Acceptability; Chemical Composition of Harvested Rainwater Around a Cement Factory in Ibeshe, Yewa North, Ogun State.

Furthermore, other topics to be encountered in this issue that have added colour and beauty to this edition are: Physicochemical properties and sensory evaluation of milk candy ‘toffee’ (a

NIGERIA candy) enrich with coconut, tigernut and groundnut; Informal Settlements in Developing Countries: Issues, Challenges and Prospects; Comparison of Sensory Properties of Meals Produced from Cowpea and Pigeon Pea; Automated Lecture Timetable Generation Using Genetic Algorithm; Septic Tanks Contamination in Groundwater Quality around Elementary Schools in Ibadan, Oyo State Nigeria; and Waste Disposal Systems in Some Selected Abattoirs Located in Ilaro Metropolis. FEPI-JOPAS has been centered on discerning the changing needs of the academic world and is committed to advancing research around the world by publishing the latest research in various academic fields and ensuring that the resources are accessible in print, digital, and online formats.

In addition, I would like to thank many people who worked so hard to ensure that publishing this issue 2 of volume 4 is a reality. I would like to thank the Editorial Board for their guidance and the publishing team for the continued support and effort in streamlining the publication process. I am grateful to the reviewers who provided timely and constructive reviews for the papers assigned to them. The authors are solely responsible for the information, date and authenticity of data provided in their articles submitted for publication in the Federal Polytechnic Ilaro – Journal of Pure and Applied Sciences (FEPI-JOPAS).

I am looking forward to receiving your manuscripts for the subsequent publications. You can visit our website (https://fepi-jopas.federalpolyilaro.edu.ng) for more information, or contact us via e-mail us at fepi.jopas@federalpolyilaro.edu.ng

Thank you and best regards.

Prof. Olayinka Oyewale AJANI

(Editor-in-Chief)

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Waste Disposal Systems in Some Selected Abattoirs Located in Ilaro Metropolis.

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Abstract

This paper assesses the waste disposal systems in some selected abattoirs in Ilaro, Ogun State, Nigeria. The study objectives consist of various types of waste generated, methods of disposal and management, and challenges involved. The population of the study encompasses of all the users, managers, and immediate residents of Alapoka and Sabo Abattoirs and six (6) slaughter labs in Ilaro, Yewa South Local Government area of Ogun State. Purposive sampling technique was adopted, Fourty-eight (48) questionnaires was distributed for various stakeholders. Descriptive and Mann-Whitney U nonparametric statistical methodology was employed in the analysis of the data collected for this study. Findings show that immediate environment suffered environmental degradation, offensive odour, disease transmission and soil erosion within the study areas, as evidenced from the p-values 0.689, 0.684, 0.660 and 0.906 > 0.05 level of significance in the effect of waste management. Therefore, regular awareness through seminars and workshops needs to be organised by the various stakeholders in the meat industry and adequate planning and design need to be enforce to enhance uniformity and compatibility of uses and enhances mobility within the abattoir.

Keywords: Abattoir, Disposal, Effects, Environment, Managements

INTRODUCTION

Abattoir activities and locational distributions pose serious threat to human health and quality of life in urban areas in Nigeria. Most of abattoir activities and locational distributions are characterized by poor design, inadequacy facilities and deteriorating environment which pose serious threat to human health and quality of life in urban areas in Nigeria. The global demand is alarming in the past 50 years, meat production per year is more than 340 million tones yearly (Ritchie and Roser, 2017). The productions have negative impact on the environment. The activities of Nigerian abattoirs pose serious challenges on both the human and environment. This effect were manifested due to inadequate and non-availability of needed facilities, therefore, aided environment pollution. Abattoir waste disposal strategies are very crucial to management of slaughterhouse. The inability of waste manager to inculcate adequate disposal management strategies has increases situations in our urban center in Nigeria (Okereke, *et. al.,* 2019). Ogunseye, *et.al.,* (2021) concluded that there should be provision of basic facilities such as electricity supply, water supply, refrigeration system, adequate slab for butchering and rinsing, also improvement on road network to facilitate the accessibility for waste disposal.

The urban areas are faced with various types of waste including abattoir waste. The high rate of meat consumption contributed to the volume of waste realized from various abattoirs sited at strategic locations mostly close to rivers or brooks. Abattoir wastes are animal faces, blood, fat, borne, and animal urine (Bandaw and Herago, 2017). It shows that abattoir waste consists of various pollutants, it requires proper handling and adequate facilities to monitor various activities within not to pose danger to the immediate environment. A high number of abattoirs in Nigeria do not have the facilities required to handle the waste generated (Mamhobu-Amadi *et.al.,* 2019; Fearon, et.al., 2014).

Therefore, the challenges posed by these insufficiencies may result in poor abattoir management (Meharu, 2019). One of the issues associated with abattoirs in a developing country is poor waste collection and disposal management within the area. Therefore, wastes generated by abattoir activities not only pose a significant challenge to the operations within the place but pose environmental problems in the immediate environment (Ekpo, 2019). Abattoir pollutants have an adverse effect on individuals' health and also the environment if not properly managed and controlled by the stakeholders involves in maintaining adequate sanitation. Adegbola and Adewoye (2012) and Ajanaku *et al.* (2018) affirmed that there is a strong correlation between leachates from the abattoir location and sampled wells in the immediate environment. It shows that abattoir waste has an adverse effect on groundwater which is capable of causing scarcity of water within residential areas.

The environment always threatening with unconducive substances, therefore abattoir residues like blood, faces, intestine content etc have negative effects on the inhabitants through the odours that emanate from the processing. The unhygienic situation of abattoir nationwide demand urgent attention. Despite the awareness of the effects of abattoir waste on the immediate environment. The danger posed to both environment and the health of inhabitants is of great concern. There are unreliable records in assessing waste generated within the abattoir, this make it difficult in planning for waste disposal and management. therefore, in evaluating adequate management, it is important to know the quantity being generated daily, weekly and yearly, their characteristics and existing management facilities Chukwu, et.al., 2011 and Twumasi *et.al.*, 2016).

Abattoir in Nigeria needs to be in line with the rest of the world in terms of facilities, space requirements and management. Inadequacies in these areas contributed to a heap of refuse within the abattoir sites. Secondly, locations very close to water bodies encourage frequent dumping of waste into the water, which can cause environmental pollution. Open burning is mostly practice among the operation and management of abattoir which is harmful to humans and environment. Nuhu *et al*. (2021) pointed out that, abattoir wastes constitute pollution potential which include animal blood, paunch manure, animal faces, the wastewater, the horns and bones. There are capable of causing environmental disorder. Oruonye (2015) studied the challenges of abattoir waste management, the findings show that despite the problem associated with abattoir waste in the study area, the waste in recent times provide job opportunities, improved agricultural products, and reduction of harmful wastes discharged into the water around the abattoir. Bello and Oyedemi (2009) and Abdullahi *et al*., (2015) affirmed that abattoir activities have a direct and indirect impacts on the immediate residential areas. The study also revealed that abattoir activities and management have a negative impact on air and water qualities available in residential areas.

Ezeohaa and Ugwuishiwu (2011) further enquiry into status of abattoir wastes research in Nigeria, the implication of the study is that abattoir wastes need to be managed to achieve stipulated required standards in controlling odour and achieve it safety and economic utilization. Ogunseye, *et al.* (2021) opined on operators' perceptions of abattoir waste management, it was revealed that waste generated within the abattoir is mostly hair, animal dung, and blood, and rudimentary composition is being practiced for proper management. To large extent, the methods used in our abattoir in Nigeria is not acceptable in developed world, the primitive method contributed to the types and volume of waste generated daily in the various abattoir within the country. Waste management practices differ from country to country, and city to city while waste from land uses also differs, therefore, waste generated depends on the activities of that particular area.

MATERIALS AND METHODS

The target population are managers of the abbatoirs, other workers and residents of the area. Total numbers of fifty (23) respondents were conveniently selected from the indeterminate number of butchers in the two abattoir domiciled in the study area. These abattoirs were used to form clusters due to the homogeneity of the characteristics of the target respondents. From each cluster, thirteen (13) respondents was selected purposively at Sabo Abattoir while ten (10) was selected at Alapoka Abattoir for inclusion in the sample. More so, 10 buildings each at Sabo and Alapoka within the

location of abattoirs were purposively selected at two hundred and fifty meter radius (250 m) in which each head of households were administered questionnaires on the effect and health challenges faced due to the waste generated in the study area. The sample size selected is as shown in table 1.

Table 1: Sample size selection

Table 1: Sample size selection

Sample characteristics	Sample		
	Sabo Abattoir	Alapoka Abattoir	Total
Registered butchers	13	10	**23**
Residents	10	10	**20**
Total	**23**	**20**	**43**

Source: Researcher's Self Computation

In this paper, data on the types of waste generated, roles of the agency responsible for waste management, the method used in waste collection transportation and disposal in the area and also data on the health and environmental impacts of improper waste disposal in the study area were collected. Primary and secondary source of data was employed in collecting data for this paper.

Data description and inferential statistical method of data analysis were employed in the analysis of data collected. Taking the data description into consideration, frequency, percentage, and pictorial representations were employed while Mann Whitney U non-parametric test was used to test the respondents' gender and management methods adopted including differences in the residents' perception of the effect of waste management. The rationale behind this analytical technique was due to the fact that respondents' sex and items relating to management methods and effects are non-normally distributed. However, the Mann-Whitney U test is given as

$$U = n_1 n_2 + \frac{n_1(n_2+1)}{2} - \sum_{i=1}^{n} R_i$$

Where:

U is the Mann-Whitney U test; n_1, n_2 are sample size one and two respectively; and R_i is the rank of the sample.

The Study Area

Ilaro is a town in Ogun State, Nigeria with over 30,000 people and the headquarters of the Yewa South Local Government, now known as Yewaland which replaced the Egbado division of the formal western state, and later become a part of Ogun state of Nigeria. Ilaro town is about 50km from Abeokuta, the Ogun state capital, and about 100km from Ikeja, the capital city of Lagos state. Other neighbouring towns to Ilaro, headquarters of Yewa land include, Ajilete, Okeodan, Owode, Ibese, Ojaodan, Pahayi, Idogo-Ipaja, Papalanto and Imasayi. Presently, Ilaro town can be accessed through papalanto on the Lagos Abeokuta express way by the Sagamu papa Ilaro Ojaodan expressway. It can also be connected through Ibese where Dangote cement factory is located. Figure 1 shows the locational map of the subject site.

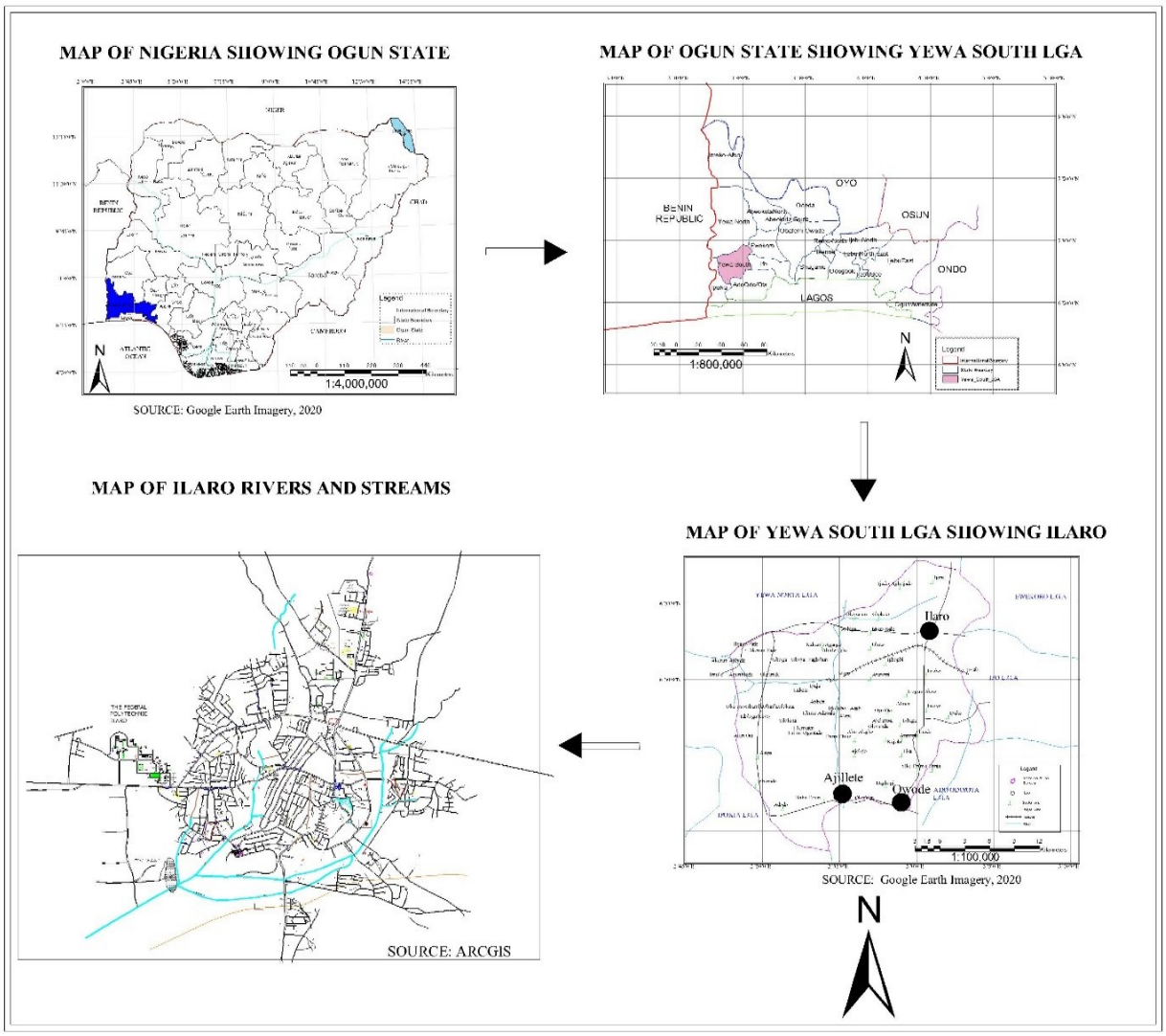

Fig. 1: Locational map of the study area

RESULT AND DISCUSSION

Results and Discussion of Users and Managers of Abattoir in the Area

Table 2: Frequency and Percentage Analysis of Socio-Demographic Characteristics of Abattoir users

s/n	Items		Frequency	Percent
1	Sex	Male	18	78.3
		Female	5	21.7
		Total	**23**	**100**
2	Age range	26-40 years	10	43.5
		41-55 years	8	34.8
		56 years and above	5	21.7
		Total	**23**	**100**
3	Ethnicity	Yoruba	23	100
4	Years of working in the abattoir	1-5 years	7	30.4
		6-10 years	7	30.4
		Above 10 years	9	39.1
		Total	**23**	**100**
5	Marital status	Married	17	73.9
		Separated	6	26.1
		Total	**23**	**100**
6	Highest level of education	No formal education	6	26.1
		Primary education	11	47.8
		Secondary education	4	17.4
		Tertiary education	2	8.7
		Total	**23**	**100**

Source: *Field Survey, 2021*

From the frequency and percentage distribution of respondent's socio-demographic information in table 2, item 1 revealed that about 78.3% of them are male while 21.7% were female. This shows that majority of the respondents are female. Users age grouping into consideration, about 43.5% of them are between 26-40 years of age, 34.8% were between 41-55 years, while 21.7% were above 55 years of age. This implies that majority of the respondents fall between

the age range 26-40 years. Distribution of respondent's ethnic group as revealed in item 3 implies that all of them are of the Yoruba ethnic group as none of them are Hausa and/or Igbo to be precise. In addition, about 30.4% of this ethnic groups have been working in the abattoir for the period 1-5 years, while 30.4% and 39.1% have 6-10 years and more than 10 years' experience respectively as a butcher. This implies that majority of the respondents have more than 10 years' experience in the administration and uses of the abattoir, which thereby validate the responses acquired on the waste management and control. It can also be evidenced from item 5 and 6 that majority of the users and managers of the abattoir were married, representing 73.9% of the entire users while fewer of them representing 8.7% have tertiary education.

Plate: 3 Slauthering Slab

Table 3: Respondents Opinion on Types of Waste Generated

Wastes	Response level	Frequency	Percent
Solid Waste	Yes	16	69.6
	No	4	17.4
	I don't know	3	13
	Total	**23**	**100**
Recyclable waste	Yes	18	78.3
	No	3	13
	I don't know	2	8.7
	Total	**23**	**100**
Liquid waste	Yes	23	100

Source: Field Survey, 2021

On the type of wastes generated, result emanating from the respondents indicated that solid wastes, recyclable wastes and liquid wastes were generated, as there are no hazardous and/or organic wastes in their daily operations. More so, result also showed that majority of the respondents representing 69.6%, 78.3% and 100% said that solid wastes, recyclable wastes and liquid wastes were respectively generated in the two abattoir locations in Ilaro metropolis.

Plate 2and 3: Showing borne of the cattle and faeces of the cattle

Table 4: Method used to dispose the waste generated

	Frequency	Percent	Valid Percent	Cumulative Percent
Land surface	12	52.2	52.2	52.2
Pit	4	17.4	17.4	69.6
Water surface	7	30.4	30.4	100.0
Total	23	100.0	100.0	

Source: Field Survey, 2021

Table 4 shows that the majority of the abattoir operators representing 52.2% dispose their waste into land surface, while 30.4% disposes it into water surface as fewer numbers of them uses pit.

Plate: 4 and 5 Showing methods of disposition generated waste

Table 5: Do you have people that purchase the wastes?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	23	100.0	100.0	100.0

Source: Field Survey, 2021

More so, it can be seen in table 4.10 that the operators do have people that purchase the waste.

Table 6: Usefulness of the Abattoir Wastes

	Frequency	Percent	Valid Percent	Cumulative Percent
Manure	8	34.8	34.8	34.8
Production	10	43.5	43.5	78.3
Others	5	21.7	21.7	100.0
Total	23	100.0	100.0	

Source: Field Survey, 2021

From table 6, result indicates that the abattoirs operators opined that the abattoir waste can be used as manure as well as in the production of pets feed. The cattle dung can also be used when mixed with corn chaff to produce feed for pigs.

Table 7: Descriptive Statistics of Respondents Opinion on Waste Management Methods

Waste management methods	Mean	Std. Deviation
Abattoir wastes can is managed and controlled by educating the users on its environmental effects	3.96	.928

Planning the abattoir operations help in managing the waste generated	4.35	.573
Awarding prize to the best abattoir in Ilaro metropolis can trigger effective waste management	4.26	.689
Prosecution of environmental offenders should be advocated	4.43	.590

Strongly Agree (SA) = 4.5 - 5.0; Agree (A) = 3.5 - 4.4; Undecided (U) = 2.5 - 3.4

Disagree (D) = 1.5 - 2.4; Strongly Disagree (SD) = <1.5

Source: Researcher's Self Computations

It can be evidenced from the mean response score and associated standard deviations in table 7 that the respondents agreed that abattoir wastes can be managed and controlled by educating the users about its environmental effects (mean 3.96, standard deviation 0.928); planning the abattoir operations can help in managing the waste generated (mean 4.35, standard deviation 0.573), awarding prize to the best abattoir in Ilaro metropolis can trigger effective waste management (mean 4.26, standard deviation 0.689) and prosecution of environmental offenders should be advocated to curb the menace as agreed by the abattoir operators (mean 4.43, standard deviation 0.59).

Table 8: Mann-Whitney U test for Difference in respondents' opinion on Management Methods Adopted and gender of the respondents

	Abattoir wastes is managed and controlled by educating the users on its environmental effects	Planning the abattoir operations helps in managing the waste generated	Awarding prize to the best operators in terms of waste management	Prosecution of environmental offenders should be advocated
Mann-Whitney U	26.500	43.000	20.000	31.000
Wilcoxon W	41.500	214.000	191.000	46.000
Z	-1.508	-.171	-2.045	-1.180
Asymp. Sig. (2-tailed)	.132	.864	.041	.238

a. Grouping Variable: Sex

Source: Researcher's Self Computations

Significant difference between respondents' opinion based on gender group and waste management method in table 8 revealed that controlling abattoir wastes through educating the users on its environmental effect based the gender groups of the operators are not statistically significant (p-value 0.132 > 0.05

level of significance). The implication of the findings is that there exist no significant difference in the gender of the abattoir operators and the management of abattoir wastes, taking into account educating the users. Other measured waste management method were also found to be statistically not significant as their associated p-values 0.864 and 0.238 > 0.05 significance level. Although, opinion varies from operators to operators based on gender on awarding prize to the best abattoir in the town for effective waste management (p-value 0.041 < 0.05)

4.2 Results and Discussion of Immediate Residents' opinion on the hazard caused by abattoir wastes generated

Table 9: Descriptive Statistics of Residents number of years lived in the area

	Minimum	Maximum	Mean	Std. Deviation
Number of years lived in the area	2	32	8.25	7.580

Source: Field Survey, 2021

Result presented in table 9 indicated that these residents have spent a minimum of 2 years in the area while some of them have spent maximum of 32 years. Result further shows that on average, the respondents have lived in the area for approximately 8 years.

Table 10: Descriptive Statistics showing respondents opinion on Effect of Wastes on the Immediate Environment

	N	Minimum	Maximum	Mean	Std. Deviation
Causes offensive odour	20	1	5	2.70	1.081
Causes disease transmission	20	1	5	3.25	1.348
Causes soil erosion in Neighborhood	20	1	5	3.38	1.333
Causes environmental degradation	20	1	5	4.00	0.124

Strongly Agree (SA) = 4.5 - 5.0; Agree (A) = 3.5 - 4.4; Undecided (U) = 2.5 - 3.4

Disagree (D) = 1.5 - 2.4; Strongly Disagree (SD) = <1.5

Source: Researcher's Self Computation

Result of table 10 shows that negative effect of abattoir wastes on the immediate environment is environmental degradation, while the trampling and dumping of animal waste made the entire area unable to grow grasses and some of the stream ways in the area were not used by the residents. The greater number of the respondents said that the abattoir's negative effect on the environment is neither

offensive odour (mean 2.7, standard deviation 1.081) nor disease transmission (mean 3.25, standard deviation 1.348) but was responsible for environmental degradation (mean 4.00, standard deviation 0.125). The result collaborate the work of Adegbola and Adewoye (2012) and Ajanaku, *et.al.,* (2018) on pollution of water and causes environmental degredation in the study area.

Table 11: Mann-Whitney U Test For Difference Between the Gender of the Residents and their Opinion on Effects of Waste Management

Statistics	Causes environmental degradation	Causes offensive odour	Causes disease transmission	Causes soil erosion in neighborhood
Mann-Whitney U	45.00	45.00	44.50	48.50
Wilcoxon W	100.00	100.00	99.50	103.50
Z	-.400	-.406	-.440	-.119
p-value (2-tailed)	.689	.684	.660	.906

a. Grouping Variable:
Sex

Source: Researcher's Self Computation

Result of table 11 revealed that there is no significant difference between the respondents gender and their perceptions on the effect of waste on immediate environment of the two locations under study taking environmental degradation, offensive odour, disease transmission and soil erosion in the neighborhood as a study, as evidenced from the p-values 0.689, 0.684, 0.660 and 0.906 > 0.05 level of significance. The outcome is in line with a study by Ekpo (2019) on environmental problems associated with abattoir operations in urban area

CONCLUSION

The waste generated within abattoirs are of great importance to both animal and human existence but not withstanding it also damage the ecosystem and affect wellbeing of inhabitants. Adequate disposal of abattoir waste is very important aspect of the management to ensure safety and protect meat consumption. The negative effects of indiscriminate disposal resulted into environmental degradation as observed in two abattoirs located in the study areas. Sustainable strategies must be explored in finding last solutions to the menace. The idea of converting the waste to useful substances for further use in farming activities~~.~~ ~~This~~ this will

reduce danger posing into environment and protect the water body around the abattoirs.

The waste generation and disposal need to be revisited to change ways and manners initially involves. Therefore, there should be introduction of environmental friendly strategies. The local government should establish abattoir within the study areas with adequate facilities. The abattoir and slaughter labs needs to visit regularly by government officials to restate rules and regulations binding abattoir operations and activities. The operators needs to be educated on outcome of improper disposal of abattoir waste, therefore, regular awareness through seminars and workshops needs to be organised by the various stakeholders in the meat industry. Adequate planning and design need to be enforce, this will separate various operations and activities to uniformity and compatibility of uses and enhances mobility within the abattoir. The government should encourage further research on health condition of immediate residents to assert the implication of locating abattoir close to residential areas.

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