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## ASSESSMENT OF ABATTOIRS IN KADUNA METROPOLIS, KADUNA STATE, NIGERIA

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**ABSTRACT:** This study assessed the abattoirs in Kaduna metropolis, Nigeria. This came about based on the recognition of the disposal of meat waste as source of environmental pollution in the built environment. The study aimed at assessing the facilities available at abattoirs in the metropolis. This was achieved through the following objectives; identifying the existing abattoirs; assessing the location and their distribution; also assessing the condition/adequacy of the environment. Survey adopted for this study is the survey research method which involved field observation, land use survey. A total of twenty-three slaughterhouses were identified in the study area; two standard abattoirs and twenty-one are substandard. Findings revealed most of the abattoirs are sited without consideration to where, how and what should be done about the waste generated by the abattoir and how this waste will be taken care of; abattoir waste both solid and liquid with exemption of plastics are biodegradable and can be controlled and managed using best practices in waste management and disposal practices. Most of the abattoirs in the metropolis don't have basic ancillary facilities and services necessary for the daily functional operation of an abattoir; abattoirs contribute to the emission of smokes into the atmosphere through the burning of hides and skins, hoofs, heads and tails and bones. The study recommended ten new slaughter houses to be added to the twenty-three existing already. Slaughter houses are to be properly located using the specification of the World Health Organization (WHO) and Food and Agricultural Organization (FAO). The travel distances should be implemented based on the accepted services and travel distance of not more than 1.6km for the slaughter slabs and 3km for the medium and standard abattoirs. The Kaduna Environmental Protection Agency (KEPA) and the ministry of Agriculture should come together and develop a standard on abattoir hygiene to reduce environmental degradation, waste storage, and improve on treatment of abattoir waste management and disposal.

**Key words:** Assessment, Abattoirs, Spatial, Distribution

## INTRODUCTION

### Background of the study

An abattoir is a facility or premises approved and registered by the controlling authority for hygienic slaughtering and inspection of animals, processing and effective preservation and storage of meat products for human consumption (World Health Organization, 2007). It is ultimately derived from the French

verb *abattre*, which means "to strike down" or "fell" (Grandin, 2012) and it has existed as long as there have been settlements too large for individuals to rear their own stock for personal consumption (Grandin and Deesing, 2018). Abattoirs may be classified into categories depending on available facilities; Rural areas: Slaughter Slabs; and Townships: Slaughterhouses (Grandin, 2010)). The animals most commonly slaughtered for food are cattle (beef and veal), sheep (lamb and mutton), pigs (pork), and poultry (Banks and Wang, 2014). Horses are also slaughtered for meat mostly in Europe (Baabereyir, 2009) and parts of Nigeria. Abattoir also known as slaughter house, is a place that is considered for butchery and dressing of animals so as to provide meat for the consumption of the general populace. The animals when being killed and dressed will be cut into pieces for individuals to buy for consumption. According to Brantz (2008), in the early nineteenth century the first communal slaughter house was located in France which was referred to as abattoir. It was a specific place that animals are slaughtered for human consumption. Bello, Kwaga and Raji, (2011) defined abattoir as any place that is approved and registered by the supervisory authority in which animals are slaughtered and dressed for human consumption. Banks and Wang (2004) reported that the first stages in meat processing take place in the abattoir (slaughterhouse). These comprise of slaughtering, bleeding, hide or hair removal, evisceration, offal removal, carcass washing, trimming, and carcass dressing. Further stages that can be termed as secondary operations also occur on the same premises which include cutting, deboning, grinding, and processing into consumed products.

According to Food and Agricultural Organization (FAO 2004), it is expected that to assess an abattoir, the travel distance should not be more than 1.6Km for a slaughter slab and 3Km for a moderate to standard abattoir. The abattoir capacity will also be dependent on the mix of animals being slaughtered (WHO, 2007). It has also been on record by World Health Organization (WHO) that, the minimum of 1800m<sup>2</sup> is required to accommodate all requirements for a small and medium size abattoir. According to FAO, an abattoir should not be located close to dwelling, school, churches, mosques, commercial buildings, hospital etc. The site should be accessible from a permanent road to allow a ready transport to both livestock and meat. Most of the slaughter houses are not properly located with consideration to access to water supply and proper waste disposal; this has led to problem of how to dispose both liquid and solid waste. A standard abattoir just like any other



service facility needs basic functional facilities to operate smoothly but that is not the case in most of the existing abattoirs. In some cases, some settlements are not provided with these abattoir facilities and thus there is need to check travel distance and the effect to the environment. Slaughterhouses are regulated by law to ensure good standards of hygiene, the prevention of the spread of diseases and the minimization of needless animal cruelty. The slaughterhouse had to be equipped with a specialized water supply system to effectively clean the operating area of blood and offal, veterinary scientists, refrigeration technology and good waste disposal facility. And in its location, a slaughterhouse should be located in an area which is reasonably free from objectionable odors, smoke and dust. Adequate dust-proof access-ways connecting the slaughterhouse with public roads shall be available. The slaughterhouse must be completely separated from any other buildings used for industrial, commercial, agricultural, residential or other purposes other than connected building used for the processing of the meat.

### **Statement of Problem**

The abattoirs within Kaduna metropolis are faced with numerous challenges such as:

- Poor location of some slaughter houses: Slaughter houses in Kaduna metropolis are not properly located with consideration to access to water supply and proper waste disposal and this has led to problem of how to dispose both liquid and solid waste.
- Poor environmental condition in slaughter houses: the condition of the slaughter houses within Kaduna metropolis is pathetic and this will affect the products in the long run. The drainages to dispose liquid waste are poor if existing, solid wastes are not properly managed and constitute poor hygienic and unpleasant environment.
- Inadequate space in slaughter houses: Abattoirs use facilities such as knife, axe, handsaw and other sharp objects that need ample space for storage to avoid accidents and other unforeseen circumstances.
- Inadequate operational facilities in some abattoirs: a standard abattoir just like any other service facility needs basic functional facilities to operate smoothly but that is not the case in most of the existing abattoirs within Kaduna metropolis.

## **Aim**

The paper assessed the abattoir facilities in Kaduna metropolis, with a view to identifying its challenges and proposed sustainable planning solutions for improvement.

## **METHODOLOGY**

### **Study Area**

This study covered Kaduna Metropolis made up of Kaduna North, Kaduna South, parts of Igabi and Chikun local government areas of Kaduna state. It focused on the assessment of spatial distribution, facilities available and the effects of the abattoirs on their surrounding Environment.

### **Research Design**

A survey research design was adopted for this study. Survey research is a quantitative method for collection of information from a pool of respondents from the field by asking multiple survey questions.

### **Sources of Data Collection**

Primary and Secondary data were collected. The former were collected through Physical survey and Institutional survey. While the later is obtained from publish and unpublished materials including text books, website, thesis, Journals, magazines, newspapers, and many more which will help in giving an insight to the work and many more. Physical Surveys: Reconnaissance survey was carried out, location potentials and constraints were observed and taken note of including the obstacles to be encountered in the area. Infrastructure survey was also conducted in the study area. The base map was updated and the site was visited and the abattoir facilities within the metropolis were identified and geotagged. The total number were listed and grouped into class and functions.

**Institutional Survey:** The government agencies (Ministry of agriculture) and trade unions in charge of abattoirs were interviewed.

### **Sampling Techniques**

On sampling techniques, a hundred percent survey was conducted on the agencies and trade union in charge of the location and management of abattoirs within Kaduna metropolis.



### Sampling size

According to the reconnaissance's survey 23 slaughter houses were identified, two are standards abattoirs while 21 are slaughter slaps. The sample size was determined using Yamane's statistical method for sample size calculation and sample size of 11 was used.

**Table 1: Sample selection from the four clusters**

No. of elements	Clusters			
	Part of Chikun	Part of Igabi	Kaduna south	Kaduna north
Total no. of elements	6	3	6	8
Selected elements	3	1	3	4

### Method of Data Collection and Presentation

The data collected during the course of the institutional survey were analyzed using statistical methods and the information was presented using tables, charts, and pictures.

## ANALYSIS, RESULTS AND DISCUSSION

The analysis and presentation of data is derived from the information gathered by the researcher in the course of the physical survey, socio-economic survey and secondary data gotten from the site.

### The existing abattoirs in Kaduna metropolis

The existing abattoir within Kaduna metropolis as identified in the course of this research are listed and classified in the table 2 below

**Table 2: Existing abattoirs in Kaduna metropolis**

S/n	Location of abattoir	Class of abattoir
1	Kurmin/Mashi Abattoir	C
2	Badikko Abattoir	C
3	Kakuri Monday Abattoir	C
4	Barnawa Abattoir	C
5	Zango, Tudun Wada Abattoir	B
6	Kakuri/Makera Abattoir	C
7	Malali Abattoir	C
8	UngwanDosa Abattoir	C
9	Kawo Abattoir	B
10	UngwanShanu Abattoir	C
11	Abakwa Abattoir	C
12	UngwanRimi Abattoir	C
13	Kabala Costain Abattoir	C
14	MaranbaRido Abattoir	C
15	Sabon Tasha Abattoir	C
16	Nassarawa Abattoir	C
17	Narayi Abattoir	C
18	Television village Abattoir	C
19	Rido Abattoir	C
20	Rigasa Abattoir	C
21	Maranban Jos Abattoir	C
22	Rigachikun Abattoir	C

Source: Field survey, 2019

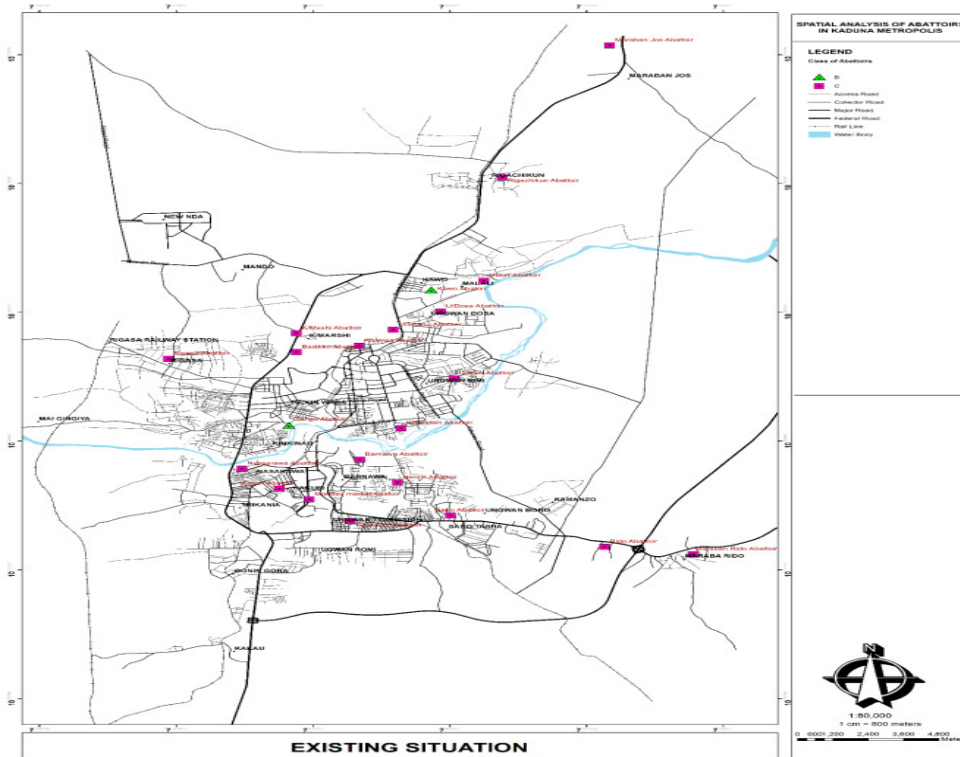


Figure 1: Location of existing abattoirs in Kaduna metropolis  
Source: Geo Eye Images, 2019

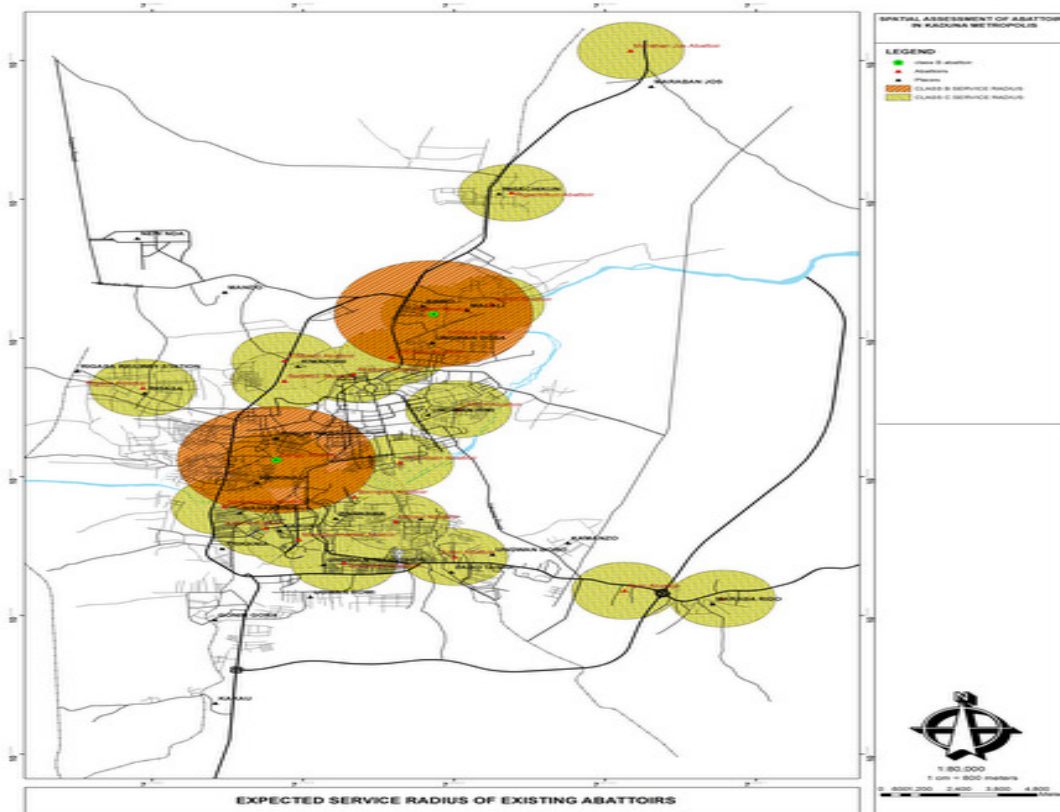


Figure 2: Expected service radius of existing abattoirs  
Source: Geo Eye Images, 2019

Figures 1 and 2 above show how the existing abattoirs distributed within the study area, most of the abattoirs are located within settlements and close to the market.

### Criteria for the Location of Abattoirs

Population: - according to the information gathered from the site on population needed to locate an abattoir or slaughter slab in Kaduna state, it was discovered that population is not a major criteria but rather market (demand) dictates its location for example the Kakuri Monday abattoir was located very close to the Monday regional periodic market. It is poorly located with insufficient land area and proper waste disposal facilities yet it survived. Market demand dictates the number of animals killed per day in the abattoirs and slabs. But for class B abattoirs, government policies dictate that.





Land area: The land area needed to locate an abattoir is a considering factor. For a class B abattoir, not less than 7000m<sup>2</sup> is the minimum land needed. In the case of a class C abattoir, not less than 1800m<sup>2</sup> is needed.

Water supply: there should be adequate supply of water.

Waste disposal: how waste is disposed is a major concern in the location of an abattoir. Consideration is to be given to liquid waste and pollution.

Travel distance: it is expected that not more than 3Km should be travelled to access an abattoir.

### **Assessment of the condition of the environment**

#### **Drainages within the Abattoirs:**

Kakuri Makera, the drainage system functions poorly and the flow is stagnant. The drainages are parked full with both dirty water and blood from slaughtered animal. The drainages are constructed with concrete material and channeled directly into a nearby stream without prior treatment. While in Kakuri Arewa Textile, the materials used for drainages here is purely earth worked. This system of drainage allows a lot of seepage into the soil and further down into the underground water source. The drainage is channeled into the old textile waste water drainage without treatment. The Zango Tudun Wada abattoir has a standard concrete laid drainage system. It has a steady flow directly from the slaughter hall and other washing areas within the abattoir to a central collection point. The liquid effluent is not treated before its discharge into the Kaduna River. In Sabon Tasha, the drainages are recently reconstructed using sandcrete block works. The discharge from the abattoir is gradual and is channeled to a big drainage system that flows through Ungwan Pama. The waste is not treated it is just flushed with water. Kawo Abattoir, this abattoir is abandoned. The drainages are standard concrete drainages. But the animal slaughtering and processing is done on a slaughter slab outside with very poor drainage facility.

The liquid waste is then drained into a nearby stream without any form of treatment. This is a very bad practice as it is located not up to 2m away from residential building. In Ungwan Shanu, the abattoir channels liquid waste directly from the slaughter slab to the gutter outside. The drainage flow very slowly and needs to be supported with water to flush away the waste. The liquid effluent is directly flushed into the open drains without any form of treatment. While Ungwan Rimi abattoir collects blood separately. This prevents excess blood from flowing through the drainage systems. The

drainage is made from concrete and though old but still in fairly good condition. Liquid waste is not treated before been flushed into the open drains. The Kabala Costain abattoir, drainage is made from sandcrete blocks and though old but still in good condition. Liquid waste is not treated before been flushed into the open drains. The drainage pattern is not organized and this leads to uneven flow of drainage system. In Rigachikun abattoir, the drainage system in Rigachikun is old and very weak. This allows lots of seepage of liquid effluent from the slaughter slab. The drainage network allows gradual flow of liquid to the open drain. The Maraban Rido slaughter slab is quite new. And the drainages are functional but the error that was discovered in this abattoir like every other abattoir within the Kaduna metropolis in the non-treatment of liquid waste before disposal. In Television, the drainage system here is poor. It is made from sandcrete block but the condition is old. This allows a lot of seepage of liquid effluents from the drainages into the underground water system. The liquid waste is discharged into a public drainage system that is stagnant too.

### **Noise pollution**

Noise pollution, also known as environmental noise or sound pollution, is the propagation of noise with harmful impact on the activity of human or animal life. From the interview conducted on the area of study, the major sources of noise pollution is from the animals that are brought in and are been prepared for slaughtering. The noise is always unbearable during the hours of 5am to 7am. This is the period when the animals are slaughtered. After the 7 am, the noise is less. The only noise after this period is that of customers and axe on bones. From the information gathered, it has been deduced that animals are not stung before slaughtering therefore subjecting them to pain. Formal education is to be given to abattoir workers to reduce animal cruelty and also abattoir noise.

### **Air pollution**

Air pollution occurs when harmful or excessive quantities of substances including gases, particles, and biological molecules are introduced into Earth's atmosphere. In the abattoirs, the interview conducted shows that there are two major sources of air pollution in and around the abattoir. These are smoke from the burning of skins and odour from blood and animal waste.



Plate 1: Smoke emission within the abattoir  
Source: Field survey, 2019

### **Odour from blood and animal waste**

Odour from blood and animal waste is a distinctive, especially an unpleasant one. Odour from blood and animal waste is the major sources of odor in an abattoir according to the interview conducted. This odor is relatively high especially when the sun is high. These can be reduced when proper waste management is employed.



Plate 2: Stagnant blood in a drainage system in one of the abattoirs  
Source: Field survey, 2019

### Water pollution

Water pollution is the contamination of water bodies, usually as a result of human activities. Water pollution results when contaminants are introduced into the water bodies. Two types of water pollution occur within an abattoir according to the information gathered. These are: (i) Surface water pollution (ii) Underground water pollution.

### Types of waste generated in an abattoir

From the study undertaken, abattoir waste consists of pollutants such as animal faces, blood, fat, animal trimmings, pauch content and urine. Solid wastes include manure, intestinal contents, hairs, horns, hooves, gallbladders, trimmings, internal organs, bones, condemned carcasses and body parts.



Plate 3: Animal waste heaped for disposal  
Source: Field survey, 2019

### Assessment of the adequacy of the slaughter houses

It has been identified that the number of animals slaughtered in an abattoir is subject to the demand of these meat products. An abattoir might have a capacity to slaughter twenty (20) cows but if market dictates ten (10) then ten cows is what will be slaughtered. Based on the above the analysis was based on adequacy on size, class and travel distance.



**Table 3 Sizes of abattoirs**

Existing abattoir	Standard	Existing size
	<b>Class</b>	<b>Area standard</b>
Kawo	B	7000m <sup>2</sup> and above
Kakurimakera	C	1800m <sup>2</sup> minimum
Kakuri, beside Arewa textile	C	1800m <sup>2</sup> minimum
Marabanrido	C	1800m <sup>2</sup> minimum
Television	C	1800m <sup>2</sup> minimum
Ungwanrimi	C	1800m <sup>2</sup> minimum
Zango, Tudunwada	B	7000m <sup>2</sup> and above
Rigachikun	C	1800m <sup>2</sup> minimum
Ungwanshanu	C	1800m <sup>2</sup> minimum
Sabon tasha	C	1800m <sup>2</sup> minimum
Kabala costain	C	1800m <sup>2</sup> minimum

Source: Field survey, 2019

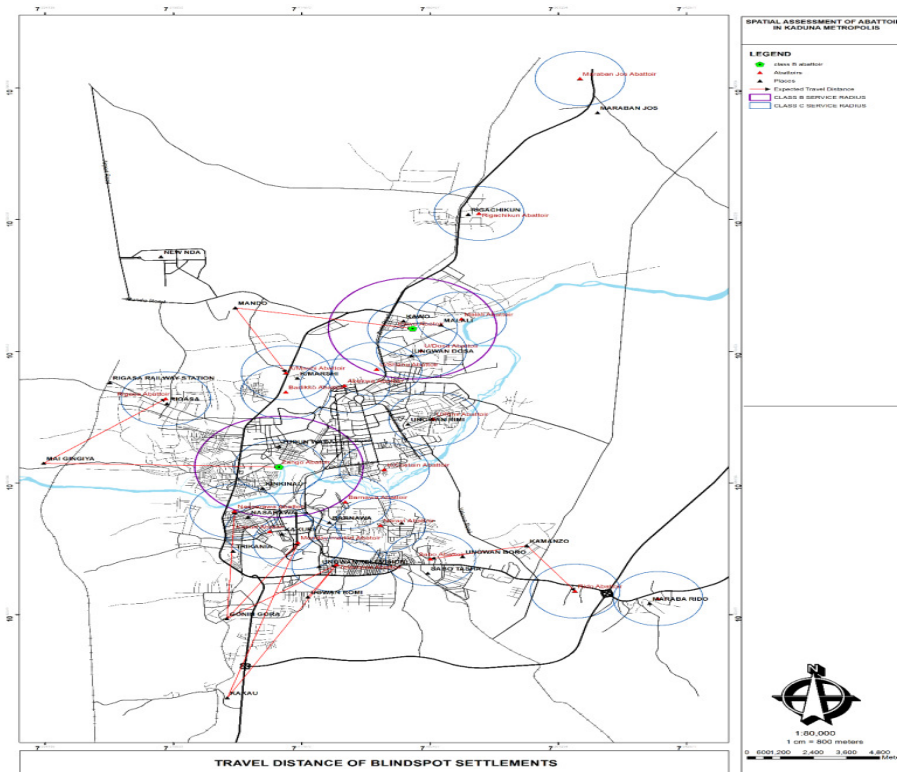


Figure 3: Travel distances of blind spot settlement

Source: Geo Eye Images, 2019

Table 3 shows the sizes of the existing abattoirs within the study area. It also shows the expected standard sizes for these abattoirs. From the information on table 3, 70% of the abattoirs are not up to standard. The abattoir at Zango, in Tudunwada met almost all the standard required of an abattoir. The other abattoirs are below standard in design, space and functions. Figure 3 shows the blind spots within the study area where the abattoir services are not provided. They are faced with the difficulty of travelling distances to access the services of the abattoir facilities. Kakau, for instance has to travel about 11km to access the nearest abattoir; Goningora settlers also have to travel a total distance of 6-8km to access the services of an abattoir. The residents of Kamazo settlement will have a travel distance of not less than 3-4km to access the nearest slaughter slab and a whole 10-15km to assess a class B abattoir. The residents of Mando will also have to travel a distance of not less than 7km to access an abattoir or slaughter slab. Other notable settlements in the list of blind spots are: Juji, Gidan Sarki Lau, Mai Gingiya, Kudenda, Nisi Village and Oil Village among others. These are areas that have significant population that will need abattoirs so as to reduce their travel distances.

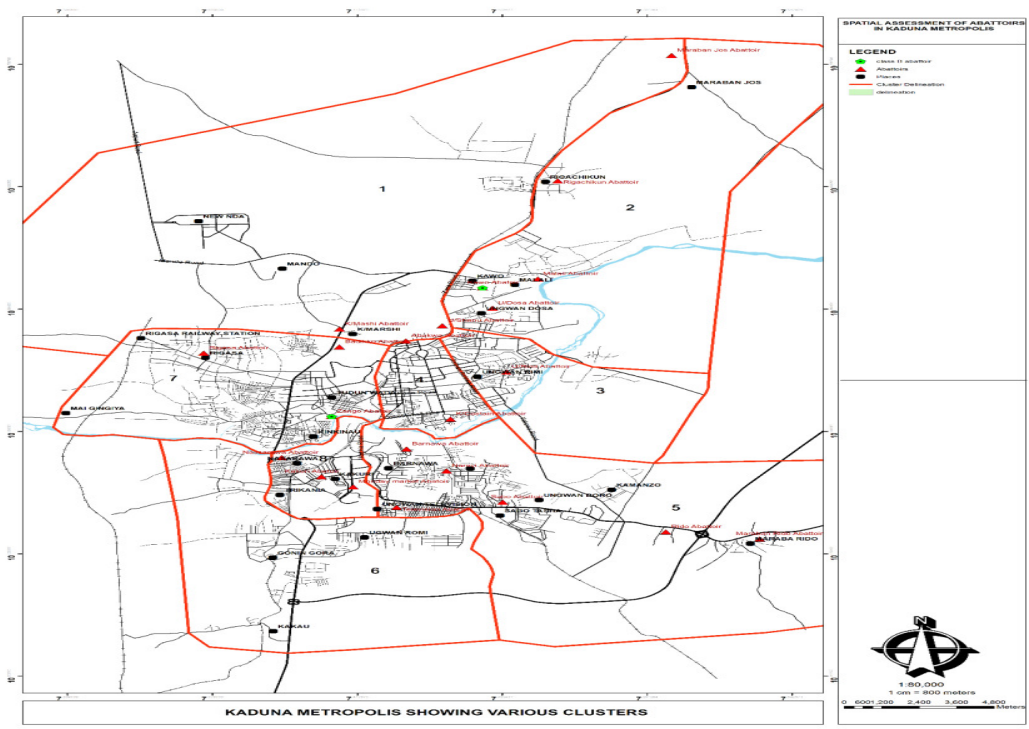


Figure 4: Kaduna Metropolis showing The Various Clusters  
 Source: Geo Eye Images, 2019



With reference to figure 4, the clusters of the abattoirs in relation to travel distance and blind spots are explained. CLUSTER 1- Cluster one has 2 abattoirs which are 20Km apart. CLUSTER 2- Cluster two has 4 abattoirs which are 6Km from Rigachikun to Malali and 7Km from Rigachikun to Kawo Abattoir. CLUSTER 3- Cluster three has 1 abattoir located at U/Rimi. CLUSTER 4- Cluster four has one abattoir located at kabala Costain with a travel distance 3.5Km to U/Rimi abattoir. CLUSTER 5- Cluster five has 6 abattoirs with Kamanzo as a blindspot. CLUSTER 6- Cluster six has no abattoir Kakau travel 8Km to assess the nearest abattoir at Television and Kakuri Monday respectively. Gonin Gora settlement travel 5Km to assess the nearest abattoir. CLUSTER 7- Cluster seven has 3 abattoirs respectively. Mai gingiya travels about 8Km to assess the nearest abattoir. CLUSTER 8- Cluster eight has 3 abattoirs which are evenly distributed.

## Assessment of the facilities within the slaughter houses

Assessment of Abattoirs in Kaduna Metropolis, Kaduna State, Nigeria

Table 4 Assessment of Functional Facilities

Abattoirs	Stockyard	Lairage	Slaughter house hall (bleeding; area, drivetraces, etc.)	Cold storage	Cutting and deboning room	Packaging and despatch section	Condemned meat room	Decayed meat room
Kakuri Makera	Nil	Nil	Yes	Nil	Yes	Nil	Nil	Nil
Kakuri, beside Arewa textile	Nil	Nil	Nil	Nil	Yes	Nil	Nil	Nil
Zango, Tudun Wada	Yes	Yes	Yes	Yes	Yes	Yes	Nil	Yes
Kawo	Nil	Yes	Yes	Nil	Yes	Yes	Nil	Yes
Ung. Shanu	Nil	Nil	Nil	Nil	Yes	Nil	Nil	Nil
Ung. Rimi	Nil	Nil	Nil	Nil	Yes	Nil	Nil	Nil
Kabala Costain	Nil	Nil	Yes	Nil	Yes	Nil	Nil	Nil
Maraban Rido	Nil	Nil	Nil	Nil	Yes	Nil	Nil	Nil
Sabon Tasha	Nil	Nil	Yes	Nil	Yes	Nil	Nil	Nil
Television	Nil	Nil	Yes	Nil	Yes	Nil	Nil	Nil
Rigachikun	Nil	Nil	Nil	Nil	yes	Nil	Nil	Nil

Source: field survey, 2019.





## CONCLUSION AND RECOMMENDATION

The meat processing industry is considered to be an ever-growing industry in Nigeria; and more and bigger abattoirs are yet to be constructed. Abattoir waste management issues will therefore be raised from time to time. It is known that abattoir wastes have pollution potential and these include animal blood, paunch manure, animal faeces, the wastewater, and the horns and bones. The implication of this knowledge is that abattoir wastes should be managed and treated to achieve stipulated effluent standards, odour control, or to exploit the benefits locking in the wastes before safely and economically disposing the ultimate wastes. But in order to optimize abattoir waste management strategies that will ensure reduction of environmental pollution, there is the need for intensive research in all aspects of the problem.

### Recommendations

1. To solve the identified problems of abattoirs within the metropolis, it is recommended to provide additional ten new abattoirs within the metropolis to solve the problem of shortfall and travel distances.
2. Slaughter houses are to be properly located using the specification of the WHO and FAO. The travel distances should be implemented based on the accepted services and travel distance of not more than 1.6km for the slaughter slabs and 3km for the medium and standard abattoirs.
3. The blind spots should be considered in the location of new abattoirs. Settlement that needs to travel more than an average of 2Km to access a slaughter houses should be provided with the required facilities to prevent the development of illegal and substandard abattoirs.
4. The Kaduna Environmental Protection Agency (KEPA) and the Ministry of Agriculture should be come together and develop a standard on abattoir hygiene to reduce environmental degradation, waste storage, and improve on treatment of abattoir waste management and disposal.
5. In the design for slaughter houses, enough considerations should be given to areas where sharp objects are used and appropriate storage should be provided.
6. Operational facilities such as stunning gun and other abattoir facilities should be provided to reduce animal cruelty and also improve meat quality. The use of these facilities should also be given through orientation and abattoir education.
7. The waste generated in the abattoirs like the blood, bones are burnt and sold to those industries producing poultry feeds, while the dung should be disposed to farms as manure.

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