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Original Paper

Assessment of the Compatibility of Abattoir and Residential Land Uses in Jos Metropolis, Nigeria

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Abstract

This paper assesses the compatibility of abattoir and residential land uses in Jos metropolis, Nigeria by examining the spatial locations of abattoirs, and determining and examining the level of compliance of the abattoirs with the requirements for their establishment. The targeted households considered reside between 1 and 200 meters away from the abattoirs. A systematic sampling technique was employed to select 220 respondents from an estimated 2200 household heads to form the sampled population. The instruments of data collection were questionnaires, satellite images, ArcGIS, physical observation, GPS device and camera. The Data collected were both qualitative and quantitative. Data were analysed using multiple analytical methods and presented in figure and plates. The study revealed that, major abattoirs (Giring and Bukuru) existed on site before residential buildings swamped the areas. Gyel and Yanshanu abattoirs sprang up immediately after the Jos civil unrest in residential areas despite their incompatibility. The results revealed that all the all the Abattoirs did not follow the standard for siting as they were located within residential areas. Twenty-seven (27%) of the houses are (200m) away with 44% of the residents having spent more than 16 years in the neighborhoods; 85% experienced disturbing smell in their environment as the predominant pollution is air pollution, this was attested by 46%. The fact that the abattoirs are located within residential neighborhoods shows clearly their incompatibility. Based on the results obtained, recommendations were made and a framework developed for a specific spatial location and operation of abattoirs within permissible radius to provide information for policy makers, practitioners and the academia.

Keywords

assessment, compatibility, abattoir, residential, land uses

1. Introduction

Land use planning produces a blue print to guide development, siting of facilities and establishes principles and policies applicable to all development based on compatibility. The impact of poor physical or land use planning, poor monitoring and implementation of land use plan today in developing counties is visualized in the development and cohabiting of incompatible land uses, thus negating the core interest of land use planning to guide development and integrate land uses based on the principles of compatibility and prevent conflict between land uses (Hashem & Balakrishnan, 2014). The rapid rate of urbanization in developing countries and lack of an efficient plan has made Mosadeghi, et al., (2015) to express their thought because it contrib gutes to urban sprawl. This spread of development usually engulf incompatible land uses that land use planning frowned at when developments are allowed to go on unchecked.

The demand of the growing urban population and expansion of urban areas has led to sitting of facilities without the consideration of compatibility of the facility to the adjoining land use. This is compounded by poor monitoring and implementation or absence of land use planning in urban areas, pressure on the existing facilities, distance to facilities and people safety to accessing such facilities due to civil unrest which lures provisions and development of such facilities in the directions of such demand without commiserate consideration of its compatibility to the existing land uses. Olawuni, et al. (2017) express that, urban environment attracts various developmental activities to cater for its incessantly growing population. They went further to outline such activities to include (industries, construction, farming, agricultural processing and manufacturing, among others). Abattoir is one of those which handled processing of animals in urban areas and is of particular concerned; this is due to changes in food consumption pattern which serves as a major driving force influencing the global demand for livestock product as noted by Adeyemo (2002). Akinnubi, et al. (2017) observe that animal processing starts from abattoir (slaughterhouse). This comprises of slaughtering, bleeding, hide or hair removal, evisceration, offal removal, carcass washing, trimming, and carcass dressing. Further stages that can be term as secondary operations also occur on the same premises which include cutting, deboning, grinding, and processing into consumed products.

In the processing of the animal, waste materials in most cases, are rid of without respect to thorough environmental management practices (Fearon et al., 2014), thus making them harmful to humans and other terrestrial and aquatic life, thereby making abattoir incompatible to residential land uses. Compatibility of land uses should be basis for location of abattoirs because Osibanjo and Adie (2007) observed that abattoirs are sources of pollution as they are characterized with highly organic solid and liquid wastes and fat. In corroboration of the aforementioned observation, Ukpong (2012) asserts**,** in spite of the public and international agencies policy focused on this problem, the situation is degenerating and therefore demands greater attention. These degenerating activities at the slaughterhouses have greatly

increased the volume of effluents and animals waste released into the environment with negative socioeconomic and health implications. Both Chukwu, (2008) and Nwanta et al., (2011) reported that, waste generated from abattoir contains contaminants that pollute the environment, penetrate the ground water and spoil its quality. According to Ezeoha (2000), several studies have shown that the environments near all abattoirs in Nigeria produce aggressive odors and rear mosquitoes as a result of the mounted solid wastes, feces, carcass, horns and scraps of tissue. After heavy rainfall, the heaps of solid waste usually scatter and extend to other areas of the neighborhood. In a related study by Bello and Odeyemi (2009), it was revealed that, the health and quality of life of individual in environment where abattoir activities take place are negatively obstructed and injurious to life. It is against this background that this paper seeks to assess the compatibility of abattoir and residential land uses in Jos metropolis, Nigeria with a view to make recommendations for the appropriate location of the abattoir. This will be achieved through the determination of the spatial locations of abattoirs, examination of the location in compliance with the requirements for its establishment within Jos metropolis, Nigeria.

1.1 The Concept and Definition of Abattoirs

According to Gail (1997) cited in Tekki, et al., (2012), the word abattoir is derived from a French term 'Abattre' meaning 'to cause to fall' or 'to bring down that which is standing'. In military vernacular, the term 'Abatage' came to mean the felling of animals in order to feed troops. The activity had to take place in a location, this came to be known as abattoir as expressed by Brantz (2008). Akinnubi et al. (2017) define abattoir as a place considered for butchery and dressing of animals so as to provide meat for consumption of the general populace. Bello et al. (2011) defined abattoir as any place that is approved and registered by the supervisory authority (planning authority) in which animals are slaughtered and dressed for human consumption, while to Gail (1997), abattoir is a facility or a premise 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. The last two definitions of abattoir concerned themselves with an approved location due to the inherent importance of the facilities, its environmental consequences and its effects on morals that slaughter might have on the workers and the observers as a concern raised by Fitzgerald (2010). This brought the issues of compatibility of abattoir to residential land uses to book because incompatible land uses cannot be approved to operate side by side due to the inherent impacts of abattoirs on the people and environment.

1.1.1 Spatial Location of Abattoir

Provision of infrastructures in residential neighbourhoods is key to sustainability and efficiency that physical planning strives to attain. The location of infrastructures in the neighbourhood is very important, as it aims at building a neighbourhood with its infrastructures efficiently distributed, and residents have easy access to at a walk able distance for their households daily needs. Human and environmental impacts of abattoir are the driving force in determining the location of these facilities and its compatibility with residential land use. Despite the growing population and urbanization, rising incomes level and changing consumption habits which lead to growing demand for animal protein, abattoirs cannot be located in an

environment without permission from an environmental or a planning authority. This explains why definitions by Bello et al. (2011), Gail (1997) and others contain these two words “approved location”. Article 4 Paragraph 1 of Japan Abattoir Law No. 114 of 2007, states in clear terms that “General abattoirs or simple abattoirs shall not be established without permits from the Governor of the prefecture”. Article 5 paragraph 1 went further to stipulate that Governors of prefectures may, when there are applications for permits pursuant to the provisions of Paragraph 1 of the preceding article, refuse to grant permits of the same paragraph of said article when the locations of establishment of said abattoirs fall under any of the following items or when considering that the construction or facilities of said abattoirs do not comply with the standards of general abattoirs or simple abattoirs designated by Cabinet Order of Japan:

(1) Locations of crowded housing,

(2) Locations liable to contaminate drinking water intended for public use,

(3) Other locations considered by the governors of prefectures to be liable to cause a hazard in public health. This further explains the incompatibility of abattoirs to residential land uses and this could be the reason abattoir is zoned to industrial land use.

Bello and Oyedemi (2009) believe that the disadvantage of locating some facilities in the neighbourhood outweighs its advantages and that abattoir is one of such facilities. Also that its accessibility and nearness to consumers may present some merits, but its impacts on the built environment and health of residents pose great risk, this further buttresses the incompatibility of abattoirs with residential land uses. A lot of concerns are expressed by different scholars on the danger to health of residents who are neighbours to abattoirs, with many doubting the compatibility of abattoir with residential land use.

A review of the location of abattoirs revealed that, in countries of Western Europe, public authorities tried to concentrate the slaughter of animals outside town walls (Thomas, 1983). Apart from the negative environmental impacts connected to the locations of abattoirs close to residential areas, are its effects on morals of the workers and the observers (Fitzgerald, 2010). He went further to state that; one common theme that linked these developments was an interest in making animal slaughter less visible, hence, abattoirs (slaughterhouses) were increasingly removed from the view of the general public. Philo (1998) believes that violence against the animals “educates men in the practice of violence and cruelty, so that they seem to have no restraint on the use of it”. Kalof (2007) notes that, cholera outbreak in the 1840s eventually brought public health concerns about slaughtering animals in the city to the forefront and public slaughterhouses were subsequently constructed outside the city Centre as opined by Roberts (2005).

The inherent impacts of locating abattoirs close to residential areas made Edwards et al. (1979) to suggest that, the site for abattoir should be chosen well away from town boundaries, including projected town boundaries, as abattoirs located in urban, rural and nominated industrial sites have advantages and disadvantages. They asserted that the advantages of the rural site out-weighed those of the other sites and recommended that a rural location be chosen where possible. Further they recommended that abattoir

should be built on firm gently sloping land away from other buildings, residential areas and factories as argued by Doyin and Agbawheromi (1992).

1.2 Requirement for the Location of Abattoir

Abattoir or slaughterhouse as a facility with economic, human and environment impacts, has attracted the attention of various nations, and has let to outlining requirements for their locations in space. In Nigeria, the Fourth Schedule of the 1999 Constitution of Nigeria, subsection 1(e), states amongst others that, the main functions of the Local Government Councils will be "establishment, maintenance and regulation of slaughter houses, among others". This is based on the inherent impacts of abattoir and explains why abattoirs are established by government. Also, the Philippines DA-Administrative Order No. 28 of (2005), Rule 10.1 states that, "the responsibility for operation of meat establishment such as but not limited to slaughterhouse and poultry dressing plant shall remain with the city or municipality". Rule 10.1.1 further states that, "The city or municipality, in locating, establishing and/or operating meat establishments, shall ensure conformity to applicable local and national policies, standards and guidelines as argued by Istifanus & Bwala, (2017). None of the abattoirs complied with the required of located outside residential areas as abattoirs shared fences with residential buildings. The economic, human and environment impacts are the reason for the development of the requirements for its establishment.

The Kenyan Draft Standard Basic Requirements for a Slaughter House (2018) clearly states that, "A slaughterhouse shall 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 standard further states that 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". This could not be unconnected to the impact of the slaughterhouse on the aforementioned land uses. Article 5 paragraph 1 of Japan Abattoir Law states that, locations of abattoirs should comply with the standards of general or simple abattoirs of: Not locating abattoirs in crowded housing; Locations liable to contaminate drinking water intended for public use; and Other locations considered liable to cause hazard in public health. Philippines sanitations code provides that abattoir should be at least 500 meters away from residential areas, schools, churches, and public places (https://www.sunstar.com.ph/ampArticle/300100). Food and Agricultural organization also supports Philippines sanitation code when it states that abattoirs should not be located close to dwellings , schools and other commercial buildings due to possible nuisance from noise, smell etc. and that likely future commercial and residential development should be taken into account, (www.fao.org/3/t0034e/T0034E01.htm). The Ethiopian air transport authority regulation). A minimum buffer distance of 500m downwind of an abattoir and 1000m for a rendering plant is recommended to the nearest residence or residential area, as put forward by Yamane (2016). It is pertinent to note that, a search on the permissible distance of abattoirs to residential building in Nigeria yielded nothing. This could not be unconnected to the less importance attached to land use planning/compatibility in the country.

Despite the impact of abattoir on environmental and human, framework, laws and regulations towards the establishment and management of abattoir are inadequate, weak, or non-existent in Nigeria. The organic proliferation of slaughterhouses in Nigeria attest to that showing failure to guide siting of these facilities in an environmental land use compatible manner. The Registrar, Veterinary Council of Nigeria, Dr. Marcus Avong on 18th Dec., 2015 as reported by *Daily Post* said, "Nigeria lacks standards or regulations for abattoir operations". This can also be used to explain the organic proliferation of abattoirs in Nigeria without considering its compatibility to adjoining land uses. Avong said although it was the council's responsibility to enforce standards in abattoir operations in the country, there was inadequate legal backing to carry out the assignment. Further, the President of the Nigerian Veterinary Association (NVA), Dr. Charles Ibe, as reported by The Guardian of 21st October, 2015 yearned that, because of the absence of laws regulating the operations of these abattoirs, the operators carry out their activities without respect to thorough environmental management practices thus, making them harmful to humans and other terrestrial and aquatic life, Fearon et al. (2014) note that it is pertinent to state that the absence of law to regulate operation of abattoirs in the country has attract legal and illegal abattoirs operating across the length and breadth of our country (Abattoir Acts, 1988, Istifanus & Bwala, 2017). Table 1 shows summary of the review of requirements for the establishment of abattoirs, that if adopted as a framework for the establishment, land use compatibility will be achieved.

Table 1. Requirements for an Abattoir

S/N	Requirement	Description
1	Site	In site selection for abattoir the following should be considered: ✓ The closeness to existing and future housing developments and to land zoned to permit housing or other land uses not compatible with proposed development; ✓ Conformity with civil aviation free corridor regulation; ✓ The site hydrology: flood liability, site drainage and closeness to water courses and ground water resources used for domestic, agricultural or town water supply; ✓ The prevailing wind conditions; ✓ The landform and the likely direction of draft of odor or effect of noise; ✓ Directions of major cattle supply inlets and proximity to cattle market; ✓ The erosion hazard; the local road network; corridors for power and other services; and suitability of the site for possible disposal areas.
2	Environment	✓ No source of contamination (e.g. objectionable odors, smoke, flying ash, etc.) should occur in the environment where an abattoir is placed. E.g. a paint factory, foundry, sewage farm, river, residential area, etc. ✓ Abattoirs are classified as light industries and can cause water pollution. Therefore, abattoirs should be located at reasonable distances away from any river.

		✓ The site where an abattoir is going to be established must be free from big trees that may harbor scavenging birds.
3	Geological structures and features	✓ Drainage is affected by the nature of the soil e.g. sandy or loom, by the water table and the slope of the surface. Therefore, the site which is selected for the establishment of an export abattoir must promote good drainage systems.
4	Services	✓ ***Water supply*:** An adequate supply of potable water must be available. Consideration should also be given to the storage and treatment of water ✓ ***Effluent disposal*:** An effective system for the disposal or removal of effluent and satisfactory means of garbage disposal must be provided. ✓ ***Power source*:** There must be a reliable source of stand-by power for cooling, heating of water, lighting, as well as for the partial or total mechanization of the abattoir. ✓ ***Access roads*:** Access roads to abattoirs should be at least compacted grovel road as per the Ethiopian Rood Authority's Rural Road Standard (RR10). Roadways on the premises must be properly graded, compacted, dust proofed, and drained. The building verge, main internal access road, loading bays and all areas serving vehicular traffic must be either paved or tarred. ✓ ***Isolation*:** An abattoir should be far from residential areas, social services and airfields (according to Ethiopian air transport authority regulation). A minimum buffer distance of 500 m downwind of an abattoir and 1000 m for a rendering plant is recommended to the nearest residence or residential area ***Abattoir compound:*** There has to be a separation either through fence or wall between the clean and dirty areas of the abattoir compound corresponding with the abattoir's internal separation. ✓ ***Abattoir boundary fence:*** The abattoir boundary fence must be either masonry wall or wire mesh with iron poles of about 2 meters high.

Source: Standard, 2005.

2. Method

This study defined its target population as all residents of houses located between 1 to 200 meters away from the abattoirs in Jos metropolis. A systematic sampling technique was employed to select 220 respondents from an estimated household heads of 2200 to form the sampled size. The instruments used for data collection include: reconnaissance, questionnaires, satellite images, ArcGIS, physical observation, GPS device and camera. The choice of these instruments is to achieve the objectives of the study.

Jos metropolis is located between latitude 9° 82' - 9° 90' North and longitude 9° 86' - 9° 90' East, see Figure 1. It is situated almost at the geographical Centre of Nigeria and about 179 kilometers from Abuja,

the Federal Capital of Nigeria (Lekwot et al., 2015). The urban landscape of Jos urbanized into a medium-sized city, the transformation of Jos into a city and the civil unrest led to the establishment of new abattoirs in incompatible land areas.

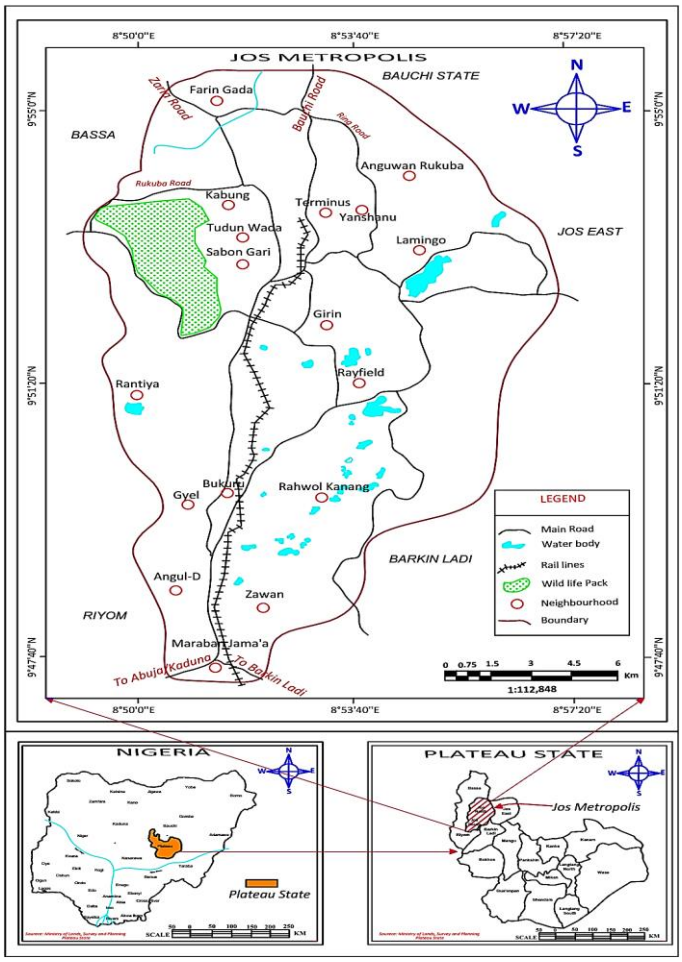

Figure 1. Jos Metropolis in Plateau State, Nigeria.

Data were analyzed using multiple analytical methods and the data presented in figure and plates. Data were sought based on the objectives of the study.

3. Results

This section seeks to discuss the findings from the spatial Location of Abattoir and requirement for the Location of Abattoir as the stated objectives in this paper.

3.1 Location of Abattoirs in Jos Metropolis

Figure 2 shows the location of abattoirs in Jos metropolis, while figures 3-6 show the location of abattoirs with respect to neighbourhoods they are located i.e., location and distance of the abattoirs from residential buildings. The study focuses on four selected abattoirs located at Bukuru, Gyel, Girin and Yanshanu areas of Jos metropolis as shown on Figure 2.

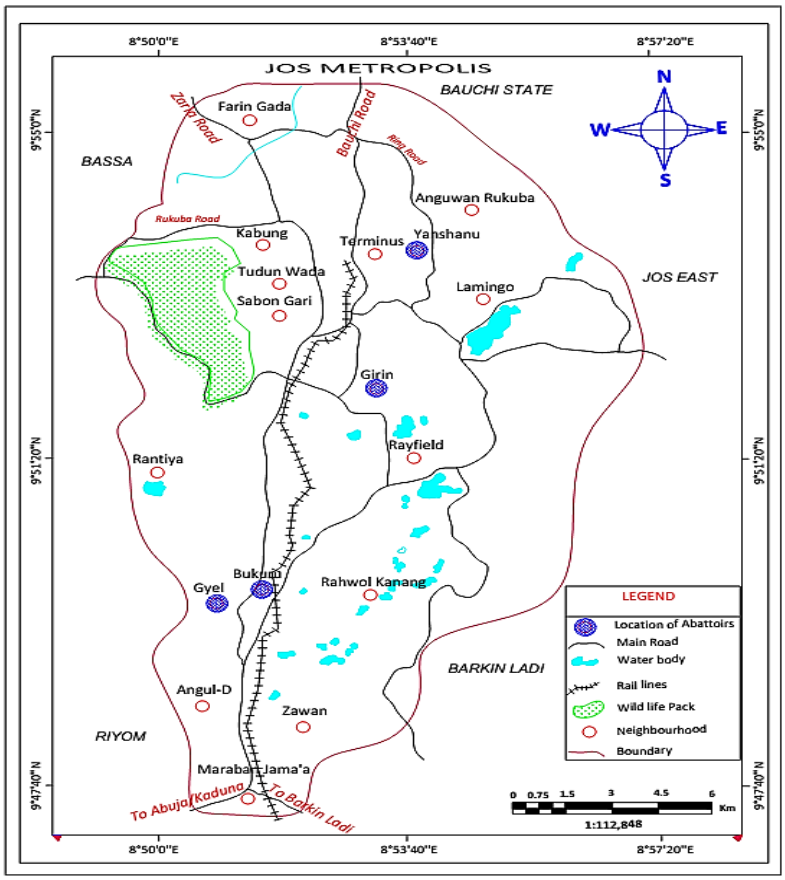

Figure 2. Location of Abattoirs in Jos Metropolis

Source: Author's Field Work, 2020.

It was revealed while carrying out reconnaissance that the major abattoirs, i.e., the Giring and Bukuru abattoirs existed on site before residential building swamped the area. It thus means that the abattoirs were located away from residential and other land uses, as time passed by, uncontrolled sprawling of the urban areas led to development engulfing the facilities. Gyel and Yanshanu abattoirs sprang up immediately after the Jos civil unrest basically because workers and those patronizing the abattoirs, i.e., Giring and Bukuru abattoirs no longer feel safe in those abattoirs, reason why abattoirs are located in residential land uses despite their incompatibility.

3.2 Complying to the Requirements for the Establishment of Abattoirs within Jos Metropolis

Here the study sought to know whether establishment of abattoirs in Jos metropolis complied with the requirement for the establishment; not located in crowded housing or residential areas has helped to reduce the environmental nuisance associated with abattoir locations in residential or housing development.

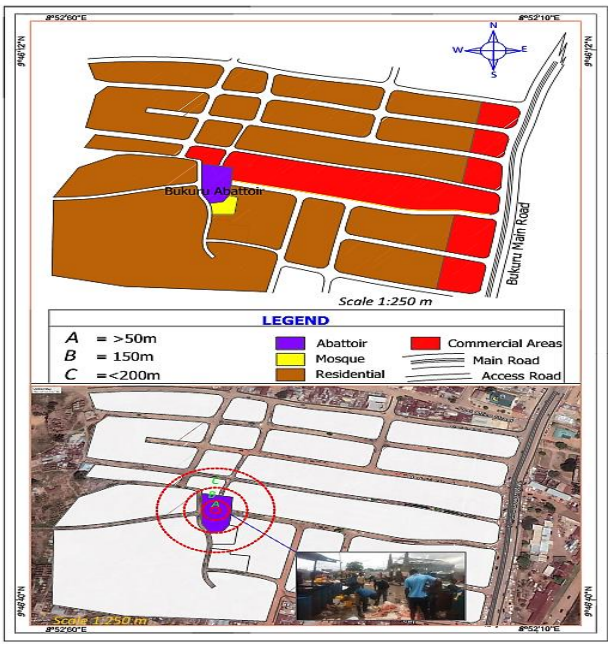

Figure 3. Bukuru Abattoir in Relation to Other Land Uses

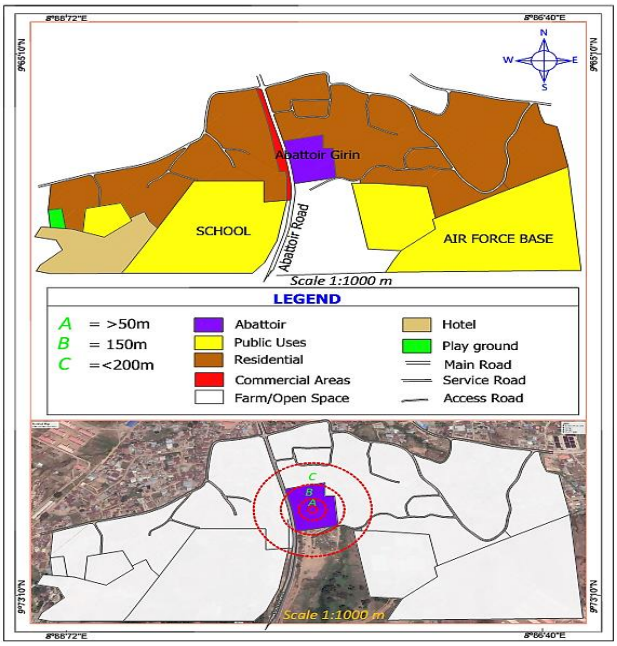

Figure 4. Girin Abattoir in Relation to Other Land Uses

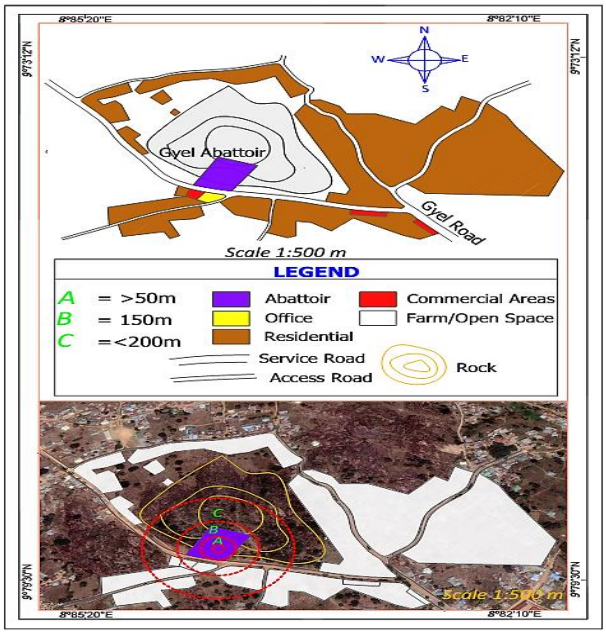

Figure 5. Gyel Abattoir in Relation to Other Land Uses

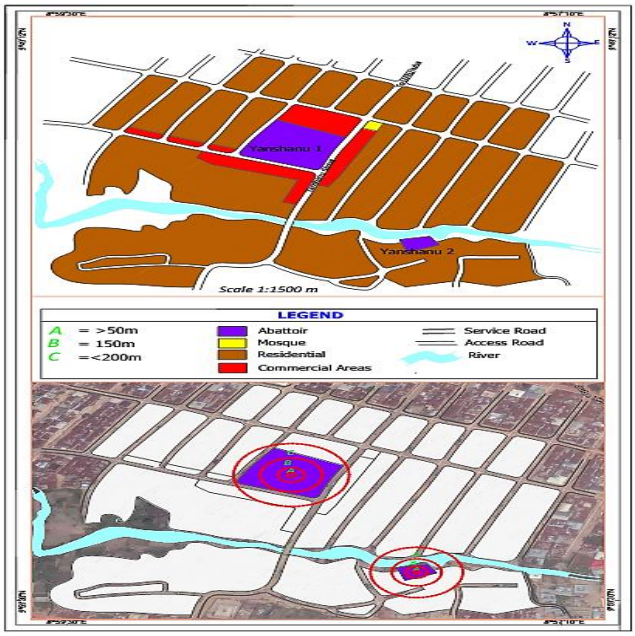

Figure 6. Yanshanu 1&2 Abattoirs in Relation to Other Land Uses

Figures 3 and 4 (Giring and Bukuru) abattoirs were established by government in approved locations that earlier adhered to the requirement for the establishment, but due to urbanization and quest for housing to accommodate the ever increasing population, poor development control and poor implementation of land uses plan, development is seen clearly sharing fence with the abattoirs. Depicting a false picture of what it used to be in some years ago, thus, negating the principle of compatible land uses, as abattoirs are now

at the heart of residential areas they are located. This also explains the influence of facilities loactions in attracting developments around such facilities as expressed by Dung-gwom (2008). Figures 5 and 6 (Gyel and Yanshanu 1&2) are abattoirs that sprang up as a result of the civil unrest, where different faith no longer feel safe either working in the abattoirs or going to buy meats. The two abattoirs are located in the residential areas with all the impacts felt by residents of the adjoining land uses. Clearly, locations of these abattoirs reveal the ineffectiveness of land use planning in regulating the location of facilities in Jos metropolis and the poor land administration in terms of development control among other planning challenges.

Table 2. Compliance with Abattoir Requirements

S/N	Requirement	Description	Findings
1	Site	In site selection for abattoir the following should be considered: ✓ The closeness to existing and future housing developments and to land zoned to permit housing or other land uses not compatible with proposed development; ✓ Conformity with civil aviation free corridor regulation; ✓ The site hydrology: flood liability, site drainage and closeness to water courses and ground water resources used for domestic, agricultural or town water supply; ✓ The prevailing wind conditions; ✓ The landform and the likely direction of draft of odor or effect of noise; ✓ Directions of major cattle supply inlets and proximity to cattle market; ✓ The erosion hazard; the local road network; corridors for power and other services; and suitability of the site for possible disposal areas.	• All abattoirs are surrounded by residential housing. • Only Yanshanu is located within animal market, • These utilities are lacking in all the abattoirs • No room for expansion as all abattoirs surrounding are occupied by housing. • Sanitation is poor in all the abattoirs • Pollution of all kinds are some of the major challenges of residents around abattoirs.
2	Environment	✓ No source of contamination (e.g. objectionable odors, smoke, flying ash, etc.) should occur in the environment where an abattoir is placed. E.g. a paint factory, foundry, sewage farm, river, residential area, etc.	• Poor management of abattoir waste has led to water contamination, and odors in the areas.

		✓ Abattoirs are classified as light industries and can cause water pollution. Therefore, abattoirs should be located at reasonable distances away from any river. ✓ The site where an abattoir is going to be established must be free from big trees that may harbor scavenging birds.	• Smoke and flaying ashes are daily occurrences in abattoir vicinities due to roasting of animals with wood and tyres • No abattoir in Jos metropolis is located 50 meters from residential land uses despite other countries recommending 1000 meters
3	Geological structures and features	✓ Drainage is affected by the nature of the soil e.g. sandy or loom, by the water table and the slope of the surface. Therefore, the site which is selected for the establishment of an export abattoir must promote good drainage systems.	All the abattoirs lacks good drainage facilities as the areas are damned, difficult to walk and serves as breeding ground for mosquitoes.
4	Services	✓ ***Water supply*****:** An adequate supply of potable water must be available. Consideration should also be given to the storage and treatment of water	Water supply in abattoirs is very poor as most of the abattoirs rely on water vendors for their supplies
		✓ ***Effluent disposal*****:** An effective system for the disposal or removal of effluent and satisfactory means of garbage disposal must be provided.	Poor disposal of effluent and garbage was observed in all the abattoirs thus contributing to environmental nuisance.
		✓ ***Power source*****:** There must be a reliable source of stand-by power for cooling, heating of water, lighting, as well as for the partial or total mechanization of the abattoir.	Only Giring abattoir has electricity supply which are usually erratic
		✓ ***Access roads*****:** Access roads to abattoirs should be at least compacted grovel road as per the Ethiopian Road Authority's Rural Road Standard (RR10). Roadways on the premises must be properly graded, compacted, dust proofed, and drained. The building verge, main internal access road, loading bays and all areas serving vehicular traffic must be either paved or tarred.	All have access roads to their locations

5	***Isolation***	✓ An abattoir should be far from residential areas, social services and airfields (according to Ethiopian air transport authority regulation). A minimum buffer distance of 500 m downwind of an abattoir and 1000 m for a rendering plant is recommended to the nearest residence or residential area	No abattoir is isolated from residential neighbourbour as some of the abattoirs are sharing fence with residential houses
6	***Abattoir compound/ fence***	There has to be a separation either through fence or wall between the clean and dirty areas of the abattoir compound corresponding with the abattoir's internal separation. The abattoir boundary fence must be either masonry wall or wire mesh with iron poles of about 2 meters high.	Only Giring abattoir is fenced, others are surrounded by houses

Source: Standards, 2005 and Authors Field work, 2022

3.3 Distance of Abattoir/Duration of Stay of Residents

The rationale behind this is to show the permissible distance between location of abattoirs and residence. Therefore, this study sought to determine the distance of the abattoirs from the surrounding residential land uses. A buffering of 50 meters intervals were made. The result shows that, predominantly 27% of the houses are (200m) away from the abattoir, 24% are within a radius of (101-150m), 23% of the houses are within the (151-200m) radius, while 18% and 8% of the houses are within a distance of (50-100m) and below (50m) respectively, see Figures 3, 4, 5, 6 and 8. Despite the incompatibility of the two land uses, and with required 500 meter distance away from the fence of the abattoirs as the permissible distance for housing development as contained in literatures earlier reviewed, residential development in Jos metropolis did not respect this requirement.

The study also sought to know the duration of stay of residents around the abattoirs in Jos metropolis. The result presented on Figure 8, shows majority (44%) of the respondents had lived in the neighborhoods above 16 years, 28% revealed, they lived there between (11-15) years, 22% of the respondents lived in the area for about (6-10 years), while, 6% had lived in the area for the past (2-5) years. Bukuru, and Girin abattoirs have existed over 30 years on site away from residential land uses before other uses encroached on the premises. Bukuru abattoir has existed for over a hundred years; this was the revelation by the chief butcher.

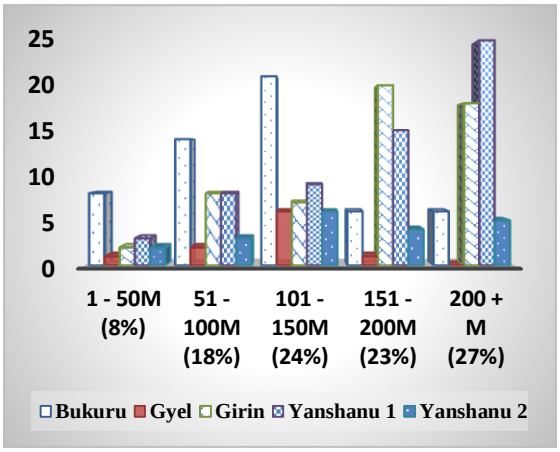

Figure 7. Distance of Abattoir from Residential House

Source: Authors Field Work, 2019

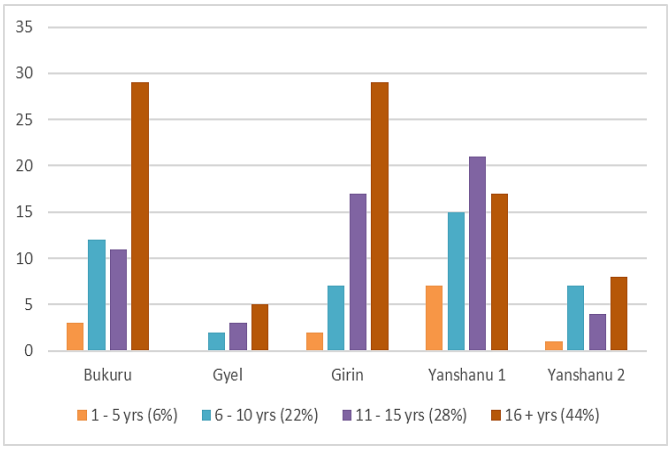

Figure 8. Duration of Stay

Source: Student field work, 2019

3.4 Environmental Challenges (Pollution)

The study sought to know whether residents around abattoir areas experience any form of environmental pollution, the result on this subject is presented on the figure below. The study reveals that all abattoirs present problems to the immediate environment due to the uncontrolled ways in which abattoir wastes are dumped openly. Majority of the respondents, i.e., 85% experienced disturbing smell in their environment, while a significant 15%, revealed they don't experience disturbing smell. These are people who reside beyond 200 meters away from the facilities.

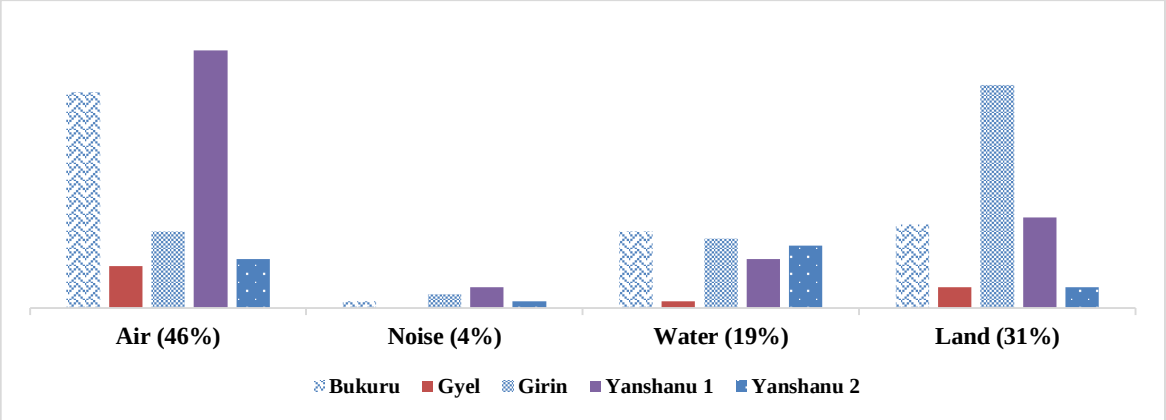

Figure 9. Environmental Pollution

Source: Student field work, 2019

The predominant pollution is air pollution, as attested by 46% of the respondents resulting from roasting of the animal, indiscriminate dumping of waste/heaps of intestinal wastes and burning of unneeded parts such as bones, hooves and horns, plates 1 and 2 present the terrible situation. 31% revealed the effect to be land pollution, while 19% of the respondents attributed the environmental pollution to water and 4% identified noise as one of the pollutions in their residence. The study observed an inverse relationship between air pollution and distance from abattoirs.

Plate 1. Animal Roasting with Tyre, a Source of Air Pollution

Plate 2. Stagnant Water in the Environment in Bukuru Abattoir

3.5 Physical Planning Implication of Abattoir

Uncontrolled cohabitation of abattoirs with residential areas constitutes a threat to human health and environment. Protection of the environment while promoting human health is hinged on the vision of sustainable development. Physical planning is a tool to use in building and sitting infrastructures consciously over time and space. Non adoption of physical planning in sitting infrastructures in the environment is detrimental to achieving the vision of SDGs, the reason the implication is felt in poor condition of the environment, pollution of air and water bodies, piles of abattoir waste visible in the study area, poor visibility, social impacts, health challenges among residents, poor sanitation, etc.

4. Conclusion and Recommendations

The study revealed that, all abattoirs are located within residential neighborhoods of the metropolis with negative effects on the people and environment. The environmental and health challenges faced by residents around abattoir premises show clearly the incompatibility of the two land uses.

Based on the conclusion drawn that subsequent site for establishment of abattoirs should strictly adhere to requirements and measures as well as build a sustainable and pleasant environment, so that healthy condition of people living near the abattoir is guaranteed, the following recommendations are made:

- Various established frameworks and requirements on the location and operation of abattoirs should be adequately enforced within the metropolis without fear or favour;

- All abattoirs should be relocated to a more suitable location out of the metropolis to serve the various areas they are located.
- Buffers should be created to serve as a transitional zone to residential building development and permissible radius or limit to housing development;
- Development should be guided by land use plan and effected through monitoring and control of development;
- Public enlightenment, and re-orientation on the importance of land use compatibility and to protect and maintain the environment through effective environmental management and sanitation should be aired frequently.
- The abattoirs identified in the study lack waste disposal facilities.
- The Abattoir waste should be properly disposed of because of the peculiar nature of abattoir waste; hence, a specific treatment technique should be adopted.
- Butchers should be well trained in best environmental sanitation practices.
- Adequate abattoir facilities such as water, electrical effluent and waste disposal should be provided for better operations.
- Land uses should be zoned, laws and Guidelines should be enforced on zoned land use to control location of abattoirs with incompatible land use.
- Ensure licensing of abattoirs and certification of all operators before operation starts.

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