Health and environmental risks of slaughterhouses in the city of Douala: case of the Ndokoti pig slaughterhouse

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Abstract

This study raises the problem of the health and environmental risks of the presence of slaughterhouses in an urban area. This study stems from the observation that slaughterhouses are ideal places to deposit multiform sewage and garbage from the said activity. Besides, in such an era where human welfare and environmental sustainability are primordial to mankind, how can slaughterhouses threaten human welfare and the environment? On this view, the research aims at analyzing the health effects and environmental repercussions of slaughterhouses in the city of Douala within the framework of Cameroon becoming an emergent nation. In this perspective, a qualitative approach was adopted with a semi-directive guide administered to the different stakeholders such as the butchers, vendors, customers, and the residents to collect their perceptions on the health effects and environmental repercussions of slaughterhouses. The findings revealed that the geographical position of the slaughterhouse and the associated management system are a permanent threat to human welfare. Moreover, slaughterhouses are subject to the deposition of liquid waste consisting of polluted water from animal dungs and remains of pigs. Organic waste from the slaughter of pigs is also dumped on the street and in the nearby drains, thereby obstructing and deviating the flow of surface water. This further degrades the esthetic nature of the environment and renders it unhealthy. In addition, the landscapes are subjected to air pollution, which often results in ill-health of the local population. This study recommends a proper planning system that is sustainable and less risky to the community.

Keywords : Approche « One Health », savoirs endogènes, intégration, Cameroun, enjeux, perspectives.

Résumé

Cette étude pose la problématique des risques sanitaires et environnementaux de la présence des abattoirs en milieu urbain. Cette étude part du constat selon lequel les abattoirs sont des lieux privilégiés pour le dépôt des eaux usées et les ordures multiformes issues de cette activité. Par ailleurs, à une époque où le bien-être humain et la durabilité environnementale sont primordiaux pour l'humanité, comment les abattoirs peuvent-ils menacer le bien-être humain et l'environnement ? Dans cette optique, la présente étude vise à analyser les effets sanitaires et les répercussions environnementales des abattoirs dans la ville de Douala dans le contexte de l'émergence du Cameroun. Dans cette perspective, une approche qualitative a été adoptée avec un guide semi-directif administré aux différents acteurs tels que les bouchers, les vendeurs, les clients et les riverains pour recueillir leurs perceptions sur les effets sanitaires et les répercussions environnementales des abattoirs. Les résultats ont révélé que la situation géographique de l'abattoir et le système de gestion dudit abattoir constituent une menace permanente pour le bien-être des personnes. De plus, les abattoirs sont sujets au dépôt de déchets liquides constitués d'eaux

polluées provenant des déjections animales et des restes de porcs. Les déchets organiques provenant de l'abattage des porcs sont également déversés dans la rue et dans les égouts voisins, ce qui obstrue et dévie l'écoulement des eaux de surface. Cela dégrade encore davantage la nature esthétique de l'environnement et le rend malsain. De plus, les paysages sont soumis à la pollution atmosphérique, ce qui entraîne souvent des problèmes de santé pour la population locale. Cette étude recommande un système de planification approprié, durable et moins risqué pour la communauté.

Mots-clés : Abattoir, risque sanitaire, risque environnemental, marché aux porcs, eaux usées, déchets.

Introduction

Way back in the colonial era, the town of Douala, as the economic capital of Cameroon, has always been in perpetual evolution on the social and economic plans. Its function as the economic capital of Cameroon is characterized by a socio-economic dynamic that attracts thousands of traders every year (Aristide M., *et al*; 2016). It is also a city that offers various opportunities for economic investment, particularly through its proximity to the ocean and the diversity of economic infrastructure and services found there. Nowadays, these economic dynamics favor its spatial sprawl more than ever before. In a context of divisional mutualization of economies, the city of Douala is therefore increasingly solicited for the sale of agro-pastoral products. Thus, for decades, there has been an emergence and anarchic proliferation of spaces for slaughtering and marketing pork, such as the slaughterhouse at the Ndokoti roundabout (Jean D., Andrea A. 2020).

The particularity of these pork marketing counters in the city of Douala, and particularly that of Ndokoti, lies in the fact that this pig market does not comply with hygiene and sanitation conditions (CODEX ALIMENTARIUS – FAO/OMS. 2003). A reality that is unfortunately in opposition to the terms of the Cameroon constitutional law of 18 January 1996, which stipulates that "Everyone has the right to a healthy environment. The protection of the environment is a duty for all. The State shall ensure the defense and protection of the environment".

In recent years, more and more importance has been attached to the problem of odor and/or odorous nuisances. Indeed, the lack of sensors as well as the subjective aspect of the pleasant or unpleasant smell, the tolerable concentration in the environment makes the problem of smell and odors a very complex approach. In addition, odors represent only a subjective reality insofar as they are inseparable from the olfactory apparatus, which adds to their complexity (Francis Pouliot et al., 1998).

1.Research methodology

1.1. Thematic delimitation

As part of this work, we will present the sanitary and environmental risk of the presence of

slaughterhouses in an urban space. We will limit ourselves to presenting the economic hub, which is the Ndokoti roundabout, on a human, strategic/ geographical, and economic level, then highlight the socio-economic threats likely to be generated by the anarchic management of the waste of this pork market from a health/environmental point of view, and lastly evaluate and analyze the environmental challenges of this slaughterhouse as well as propose prospects for sustainable management of this commercial space.

This topic, entitled: "Health and Environmental risks of slaughterhouses in the city of Douala: the case of Ndokoti slaughterhouse of pigs" is part of the central theme of the interrelations between environment and health of the countries in the South.

1.2. Presentation of sampling methods and techniques

To begin with, sampling is the process of selecting various aspects for conducting a study. The sample size was determined according to the main criterion of being a trader at the Ndokoti roundabout. The probabilistic method through which all individuals have the same chance of being sampled was applied in the data collection. With this in mind, a qualitative approach was adopted with a semi-directive guide administered to the various actors of this slaughterhouse (sellers, customers) and residents to collect their perceptions on the management of the waste generated, and then documentary research on previous studies in the field was carried out to better understand the problem (Ejuande E.W 2016).

1.3. Methods and techniques of data collection

Several techniques were used to collect primary and secondary data. The interviews, which lasted for 15 to 20 minutes, were recorded manually so as not to intimidate or frustrate the merchant who responded. As a result, the different interview techniques were equally used; a directive interview that was carried out from an interview guide was used. The non-directive interview, on the other hand, was carried out without an interview guide but targeted the objectives to be achieved. Also, semi-structured interpersonal interviews were of great importance since they were conducted on the basis of an interview guide on the thematic axes to be addressed. Moreover, semi-structured group interviews were on the rendezvous and these interviews were conducted with the various groups of traders in Ndokoti. This consisted of having qualitative information on the management of the slaughterhouse and the various physical impacts that could be generated. The questions were open-ended questions which granted liberty to the respondents to express themselves and let the mass effect act.

Considering the geographical approach, it should be noted that observation occupies an important place in geographical reasoning. As such, the observation method allowed us to keenly see slaughtering activity unfolding in the Ndokoti slaughterhouse. From this, several techniques of observation were used: *In-situ* observation or direct observation was characterized by field trips and direct contact on the different pig treatment circuits. Indirect observation: This is all about immersing oneself in the subject without going into the field. In other words, distant contact was applied with some stakeholders involved in the pig business. Lastly, we made use of participant observation which was mainly based on the application of the object of study.

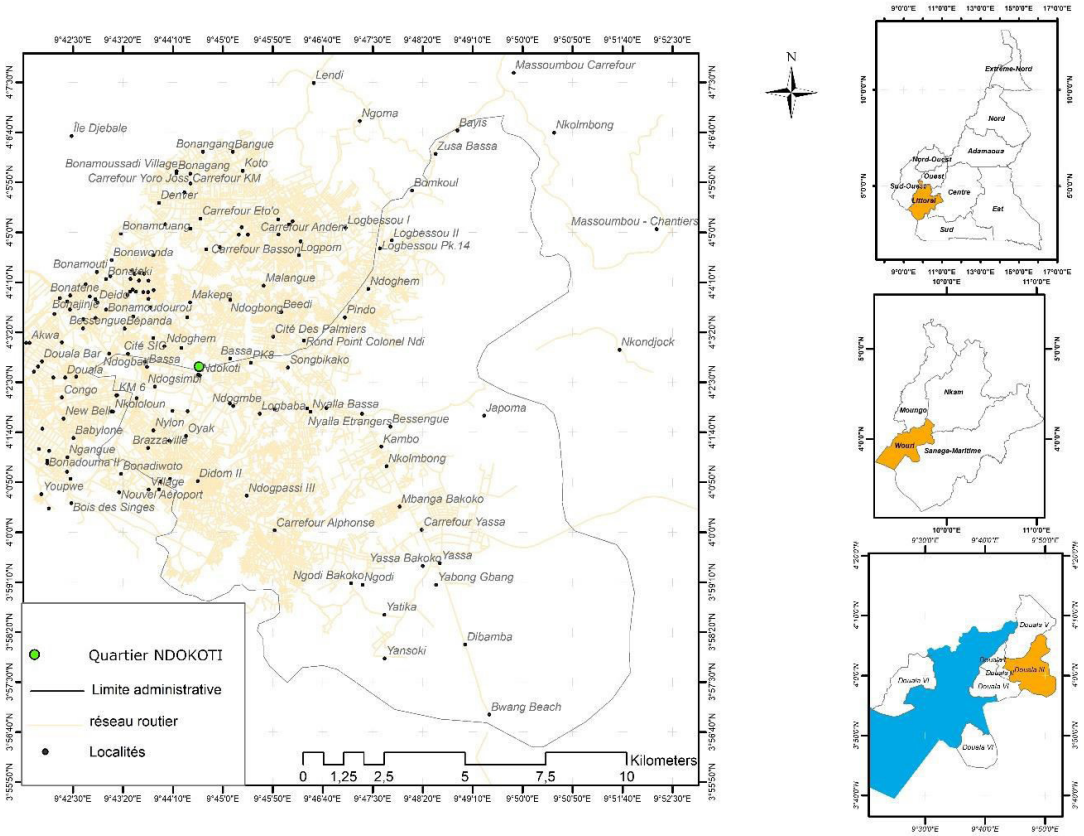
1.4. Method and technique of data analysis

The study used two types of questions and data in the questionnaires. The first set of questions were fixed-choice questions in which the informant had to choose an item amid several modalities; it was equally in the form of "yes" or "no" questions. On the other hand, the questionnaires had open-ended questions that granted the possibility to the informants to freely give their views on the health and environmental risks of slaughterhouse in the Ndokoti neighborhood. This exercise permitted the codification of responses from both question types and later expressed as a percentage for a better interpretation. In all, the data collected from various investigation methods and techniques were analyzed with two major software programs which are Sphinx and Argis 1.8. The software helped in the production of a location map of the study area.

2. Results

2.1. The Ndokoti roundabout: a real hub of economic development to capitalize on

The Ndokoti roundabout is located between the Brasseries du Cameroun and the Eneo office, in the Wouri Division and the littoral region of Cameroon. It overlaps between two sub-divisions, namely the Douala III and the Douala V. It is an important transit point for goods across the country and the Central African sub-region. It is therefore an important showcase of Cameroon, which has economic, socio-cultural, strategic, geopolitical and symbolic stakes. Figure 1 presents the Ndokoti pork market.



Source : UTM 33N-WGS84 @ Ndewe A.A, Ejuande E.W. 2024

Figure 1: Presentation of the Ndokoti pork market

The Ndokoti pork market is a market that came into existence spontaneously, around some drinking spots. Initially, the site was occupied by eateries and restaurants. With time, attention shifted towards satisfying the needs of alcohol consumers and later the emergence of the first sellers of pork as well as fresh food. Gradually, several counters agglomerated the area, thereby transforming it into what is now known as the slaughterhouse of Ndokoti and today it has about 22 counters.

Plate 1 shows the physical view of the slaughterhouse

Plate 1: glimpses of the Ndokoti pork market

2.1.1. Logic and practice of traders

The marketing of pork meat in the Ndokoti junction has permitted several households to have access to this meat, which is, of course, very popular. For more than six years now, an economic circuit has been built around this trade. The pigs are transported from the outskirts of the city to be marketed at the Ndokoti junction. Once on site, these animals are slaughtered without any form of health inspection and in a precarious and unsanitary environment. In some instances, the pigs are slaughtered before arriving at the sale point at Ndokoti. Such cases usually raise questioning and even a sense of doubt on the health situation of the pig before slaughter and on the prevailing sanitary conditions of the sites of slaughter (CODEX ALIMENTARIUS – FAO/OMS. 2005). Pigs are slaughtered and transported mostly on motorcycles from the outskirts and precarious quarters to the sale point in Ndokoti. Transportation on motorcycles is done in a primitive manner where blood

oozing from the slaughtered pigs will wash and bathe the transporter as well as the trajectory from departure to arrival.

Unfortunately, the site does not have closed tanks where intestinal waste and blood from slaughtered pigs are stored. Some butchers only dispose of small reservoirs to collect animal blood and later pour it into the environment and in the tiny water channel. The absence of a well-planned drainage system and good reservoirs is considered an excuse by the butchers who prefer to litter the environment with wastewater and other by-products from the pigs. It is commonplace to see dogs battling over bones around the slaughterhouse, flies and other insects are not left out in such an unsanitary environment. It should be noted that these latter are excellent vectors of disease transmission and so, this explains why the proliferation of malaria and other diseases is constantly increasing in the town of Douala. Plate 2 illustrates the uncontrolled management of blood and other by-products in the Ndokoti slaughterhouse (Organisation des Nations Unies pour l'Alimentation et l'Agriculture. 2009).

Plate 2: illustration of anarchic and unhealthy slaughterhouse practices at the Ndokoti pig market.

Plate 2 illustrates poor management of by-products such as blood from the slaughterhouse at Ndokoti. The butchers, sellers and buyers are seen trampling on blood and other waste products from one end of the slaughterhouse to the other. Some of them do not put on productive equipment such as security shoes, some go to the extent of putting on flip-flop and start parading the site. During the helter-skelter movements some of the stakeholders sustain injuries, which usually predispose them to infections.

2.2 Environmental Impact

The dumping of organic waste from the pork slaughterhouse is at the origin of several forms of pollution, ranging from visual pollution (urban eco-landscape aesthetics), the spread of pungent odors and more especially the obstruction of urban drainage systems which is one of the fundamental causes of floods observed regularly (Revue systémique des écrits. 2009).

2.2.1. Eyesore

Every day traders spill about a hundred liters of blood from the slaughtering of pigs, the act of spilling blood in the open renders the environment very ugly and it makes the environment unlivable. The majority of the urban population as well as those in the rural areas and nonmedical personnel feel very uncomfortable seeing blood whatever be the origin. The exposure of blood and its spilling on the environment contributes to social stress and fragilises the health of some viewers. This is justified by the fact that the spilling of blood has left its context which is the slaughterhouses, it has gone beyond limits and is now spotted everywhere.

In fact, the pork market of Ndokoti is now seen as a hotbed of putrefaction, the gullies (gutter intended for the flow of rainwater) are filled with bloody water infested by germs and producing toxic odors. Given the fact that the drainage systems are poorly maintained, these urban channels which also serve as spillways for various garbage, form small fetid pools, carrying sewage and garbage mixed with various organic waste from pigs. According to Damien Baldin (2014), however, it is in the field of moral hygiene that the success of slaughterhouses must be greatest through the disappearance of the "*disgusting spectacle of blood*". Plate 3 presents the spilling of blood on the environment.

Plate 3 : Illustration of pig's blood flowing in the drains of Ndokoti

Plate 3 presents spilled animal blood in the water channels and on the surface. Such a practice has become the order of the day as the populations are ignorantly acquainting to the situation thereby minimizing the risk factor. A person can slips and falls or wounds the body with a knife, animal bones, or a cutlass and the blood gently oozes out of the body and mixes-up with the animal blood unnoticed. Such a mixture can be dangerous to the general public especially if the victim's blood is contaminated with diseases such as STDs (Louis-Sébastien Mercier, 1783).

Added to this is the fact that despite the presence of public toilets, many city dwellers prefer to urinate or dump their commercial wastewater into urban drains. The odor from urine and other liquid and solid wastes renders the Ndokoti junction unhealthy; the pungent odor is a threat to the health of passersby. Photo 1 shows one of the usual scenes where the users prefer to urinate in the open rather than making use of the toilets designed for that purpose.

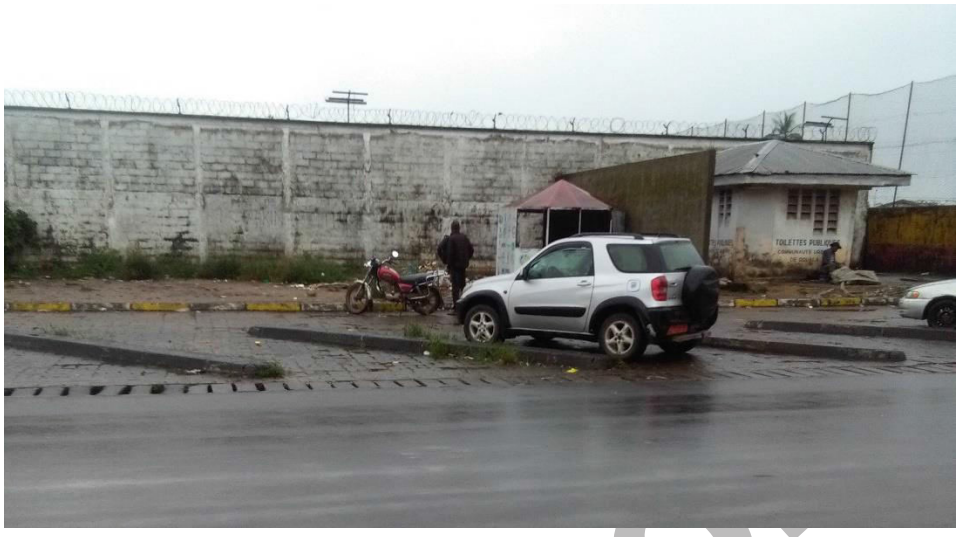


Photo 1: illustration of a user urinating in the open

2.2.2. Diffusion of pungent odors

Pungent odor is very subjective, and as such; this makes it difficult to measure. An odor can be defined by its specific nature (quality of odor), the pleasant or unpleasant sensation it causes (hedonic character or acceptability) and by its intensity (Francis Pouliot et al, 1998). The spillage of blood and other organic waste from pork is often followed by a period of putrefaction, since most of these urban channels are not deep and large enough. Most of the channels do not have good inclination to permit the easy flow of liquid waste to the main water channel. Consequently, this favors the stagnation of bloody water. The stagnation of water further creates chambers for the settlement of flies and other insects. The clustering of insects around this slaughterhouse can be seen even at 300 meters. Figure 2 represents the extent to which the odor can attain as well as the clustering of insects.

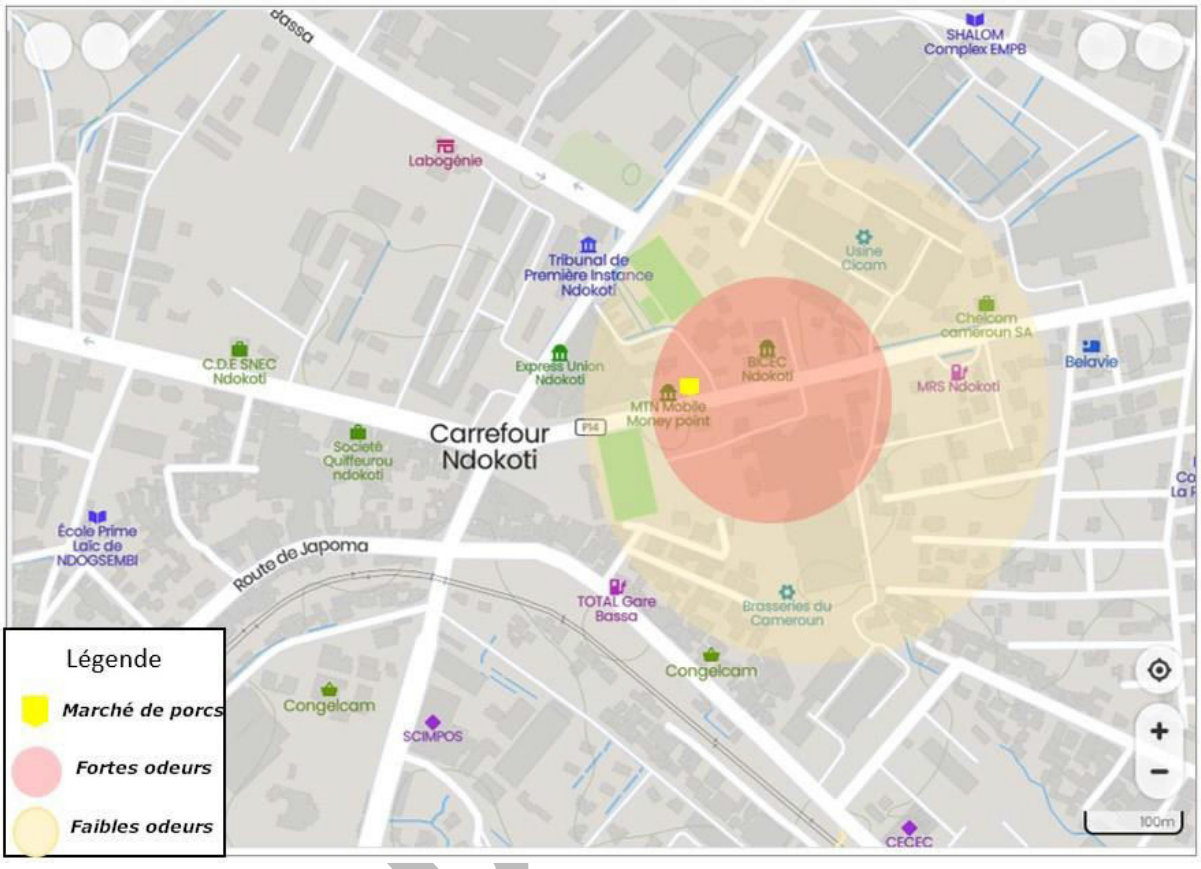


Figure 2 : Rays of the diffusion of pungent odors felt by the users

In a more practical manner, a fairly rough scale of five levels is defined:

- 0 - Imperceptible smell (or absence of odor)
- 1 - Just detectable smell (perception threshold)
- 2 - Distinct and clear odor (identification threshold)
- 3 - Strong smell that we try to escape
- 4 - Unbearable smell

In the context of this research, the intensity of the pungent odor was based on susceptible analyses,

by taking into account the respondents' view and especially the empirical field data observed.

On the ground, 37% of city dwellers assign a value of 3 while 63% of city dwellers attribute a value of 4 to the intensity of odors generated by the Ndokoti pork market. On the overall, the spread of the pungent odor is not only felt within the Ndokoti junction but it goes beyond.

2.2.3. Obstruction of urban drains

The dumping of sewage from the slaughterhouse of pig is often accompanied by other types of garbage into the water channels. Concerning the sewage (solid waste resulting from the slaughtering of livestock), they are also often found in the street because most butchers do not respect the obligation to install an iron grate at the point of exit of the water to retain solid waste inside the slaughterhouse. This ends up obstructing the urban water channels leading to flooding notably in the rainy season. Floods frequently occur due to this obstruction of drains, the saturation of the aquifer layer and the fairly permeability nature of the sub soils. The floods transport solid and liquid wastes from the point of production to different destinations in the town. Once the flooded waters become subsided, they deposit pills of garbage on various spots in the town. A case in point is a regular deposit point of garbage in front of the BICEC bank of Ndokoti. The plate 4 shows deposits of garbage after an episode of flood has occurred.

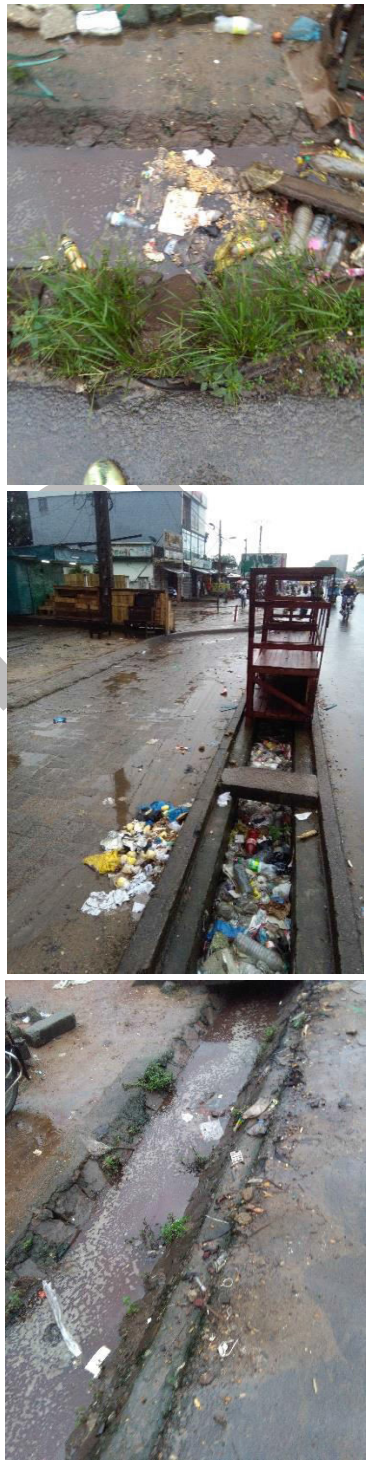


Plate 4: saturation of drains at Ndokoti by various waste from the pig market

Plate 4 present the ugly situation of sewage and garbage disposal on the environment by the butchers at the Ndokoti roundabout. When it rains, the waste are transported to about 1km and more from the site, thereby creating a form of spatial diffusion of contaminated water. Thus, the negative externalities of the slaughterhouse are not only felt within the perimeters but are equally felt out of the site in question.

Discussion

Commercial activities especially the informal activity as the case of the Ndokoti slaughterhouse of pigs are often the breathing ground of pathogens and disease vectors when proper sanitary measures are not implemented. Stakeholders engage in a sort of survival of the fittest, prioritizing profit making to the detriment of human welfare. As presented in the results, a critical analysis outline the following points:

Impacts on human health

Beside noise pollution, odor nuisance is the second leading cause of environmental related complaints of the populations; this is so because it causes a significant decline in the quality of life and thus, should be addressed urgently (Capelli *et al.* 2013). Effluents generated by slaughterhouses have high organic loads, which pose a threat to ecosystems and pose a microbiological and toxicological risk to human health. To assess the thresholds of odor nuisance related to odors from the pig market, a maintenance guide was carried out with the following stakeholders (FAO. 1998):

Customers

Odor emanating from slaughterhouses often leads to complaints from the population residing close to the slaughterhouses. The problem is often exacerbated by the heavy ventilation that blows across the Ndokoti junction, especially between 2 p.m. and 5 p.m., when volatile organic compounds (VOCs) become more odorous and more people are exposed. Some customers who have been regularly exposed to these odors reported that they suffer more of breathing difficulties, migraine, and vomiting.

Passers-by

Majority of the passers-by confirmed that the odors coming from this pig market are unbearable, and it can easily suffocate. Many questions have been raised as to anxiously know why the government through the decentralized authority such as the Mayor of the Douala municipality is yet to react or why are they paying deaf ears to the series of complaints from the population, why should the municipal authorities allow such unhealthy practice in the heart of business activities of the tertiary sector? According to Dr. Max Fandong, an orthopedic- traumatologist doctor, air pollution can have various short- and long-term health effects. Urban air pollution increases the risk of acute

respiratory diseases (lung diseases, bronchopulmonary cancer, blood diseases, asthma, thrombocytopenia, leukemia also called blood cancer) and chronic (bronchopulmonary cancer).

Asthmatic patients who aware of the polluted atmosphere around the slaughterhouse prefer not to travel by that road irrespective of the extra cost they will incur by passing through a different road. Howbeit, those who are not aware or do not dispose enough financial resources to go by other roads, are eventually cutup in the nest of polluted air.

Conclusion and Perspectives

In a nutshell, this study has raised a major worry on the urban health situation by targeting sanitary and environmental risks resulting from the presence of slaughterhouses in an urban setup such as Douala. The objective has been to show beyond reasonable doubt that the slaughterhouse of Ndokoti constitutes a major point of multiform discharges of solid and liquid wastes. The slaughtering of pigs by butchers usually results in the spilling of blood and dumping of other animal's by-products on the environment thereby rendering it unhealthy. This paper therefore formulates perspectives to ameliorate the health situation of this slaughterhouse as well as protect the health of the entire population of Douala. Some of the important measures include:

Implement a project on slaughterhouse management which entails: the site should have closed tanks where intestinal waste and blood will be stored before being transformed into fertilizer or destroyed, with vents to release gases from the decomposition process. The site should also have bins for the recovery of all types of waste produced at market level.

The municipality should accompany the traders by subcontracting with an approved service provider for the treatment of wastewater;

The slaughterhouse of Ndokoti should benefit from regular inspection by the services of

the State and the municipality to ensure the sanitary safety of the meat marketed, through the verification of the state of health of the animals before slaughter (ante-mortem inspection)

The municipality should develop the pork market for good food hygiene

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