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# Environmental Impacts of Slaughter Houses with Special Reference to India: A Review

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## **Abstract**

*With the growing annual per capita meat consumption and high meat export, the estimated number of animals slaughtered has increased in India and in the same way; there has been an increase in the number of slaughter houses. Most of the slaughterhouses are creating massive hygienic and environmental complications as they are deprived of sufficient basic facilities like water supply, proper flooring, ventilation, transport etc. In addition to these, slaughter houses also suffer from very low sanitary standards posing major public health and environmental hazards due to the discrete dumping of waste and high contaminated waste discharge. Unauthorized slaughtering has also increased many folds, and thus the related problems like disposal of waste in hazardous manner, pollution of land, air and water, horrible smell and stench etc. which makes lives of those living in immediate vicinity and also those living farther away, deplorable. In the present paper an attempt is made to review the literature focussing on environmental impacts of the slaughter houses. The study concluded that major determinants of environmental problems in the slaughterhouses are the facilities available to them. However, a major research gap has been found in case of India, considering the size of meat production and export as well as total population in the country.*

**Keywords:** Pollution, Waste water, Health, Contamination, livestock

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## **Introduction**

Slaughtering of animals for public consumption is a preordained practice in majority of the nations in the world (Bello and Oyedemi, 2009). On a daily basis, millions of animals are slaughtered in various slaughterhouses and the meat is retailed for the civic consumption. However, the waste produced in slaughterhouses is major concern for the environmental and public health (Sangodoyin and Agbawhe, 1992; Quinn and Farlane, 1989; Al-Mutairi et al., 2003; and Al-Mutairi et al., 2004). Slaughterhouses due to their poor management and planning could badly affect the health and environment. The slaughterhouse industry produces very heavy amount of waste water. Though a certain amount of pollutants are disintegrated through natural degradation processes, this mechanism can be exhausted with the increasing amount of slaughterhouse wastewater, leading to the problem of contamination (Amorim et al., 2007) Slaughter house wastes are harmful as they comprise small amounts of

components which are potentially hazardous to people and environment. The waste can leach through the soil and pollute the ground water with nitrate and bacteria. Chukwu (2008) in his study suggested that wells that are situated near abattoir have performed very poorly in the physical, organic and chemical analysis of the water. The ecological impact of slaughterhouse waste is not only considered as contamination via surfactants, nitrate, and chloric anions but also microorganisms, which continue to thrive in the soil and keep reproducing. Microorganisms from slaughterhouse waste can also be transferred to humans who are exposed to the water body, making those water bodies unsuitable for drinking, swimming, or irrigation purposes (Cao and Mehrvar, 2011; Barrena et al., 2012).

India has the largest population of livestock and is the second largest exporter of beef after Brazil (Cook, 2020). The important purchasers of Indian meat are Vietnam, Malaysia, Thailand, Australia, UAE, Saudi Arabia and Egypt. India ranks fifth globally, in terms of beef production and seventh in domestic consumption (Wambugu, 2018). Due to country's increasing exports and per capita consumption number of slaughter houses in the country is increasing.

Among the meat producing states of India, Uttar Pradesh (UP) is the largest meat producer and exporter. Apart from having the country's largest buffalo population, UP also has the highest number of abattoirs in the country. U.P's meat processing industry manages about half of country's total export and about 25 lakh people are employed in it, directly or indirectly (Jeelani et al, 2017).

Attempts to meet the global demand as well as the local consumption has led to emergence of many waste from the activities of slaughterhouse which can further produce adverse impacts both on the environment and public. It is also important to note that meat from the major abattoirs of the country is being exported to global market. Therefore the local demand is met with smaller meat shops and slaughterhouses that are environmentally and hygienically inefficient. In the slaughterhouse industry, waste is generated from killing, dehairing, cutting, processing and clean-up activities. The waste often contains blood, fat, organic and inorganic solids, salts and chemicals added during processing (Ezeohaa and Ugwuishiwu 2011). Others wastes include discarded meat, bones, horns, hairs and liquid wastes consisting of dissolved solid, blood gut contents, urine and water (Adeyemo, 2002). Unscientific disposal of waste leads to soil, air and water pollution as well as leading to health concerns among residents in the vicinity. Effluent discharges from slaughterhouses can result in the depletion of oxygen from water bodies and the contamination of groundwater (Singh et al., 2016) It also generates breeding ground to pathogens producing infectious diseases (Adeyemo et al. 2009).

The present paper is part of an ICSSR (Impress) project namely "Environmental and Health Consequences of Slaughter Houses: A study of slaughter houses located on the outskirts of Aligarh city". In this paper an attempt is made to review the possible impacts of slaughterhouse operations on the health of environment as well as public. A special emphasis is given to the studies conducted in India, especially Aligarh city, which is the largest meat producing hub of Uttar Pradesh.

### **Environmental impacts of slaughter houses: A review analysis outside India**

Environmental problems associated with slaughterhouses are a conspicuous concern both in the developing and developed countries and have been studied by authors from various times and regions. Studies have analysed the determinants of environmental problems in the form of mode of slaughterhouses waste handling and disposal. They have also examined water supply, hygiene practices and availability of facilities in the slaughterhouses. Contamination of water bodies and

deteriorating health of dwellers around slaughter houses have been major focus of studies (Olowoporoku, 2016).

Raymond (1977) while studying pollution control for agriculture reported that animal waste can affect water, land or air quality if proper practices of management are not followed. According to him animal waste can be valuable for crops but can cause water quality impairment. It also contains organic solids, trace heavy metals, salts, bacteria, viruses, other microorganisms and sediment. The waste from animals can also be washed into streams if not protected and reduces oxygen in water, thereby endangering aquatic life.

Merrington et al. (1984) examined the environmental problems caused by agriculture and found that there is high level of awareness on pollution from animal waste particularly from abattoir whether in the farm or in the city and over the years several measures have been put in place to protect the public health and the environment. Sangodoyin et al (1992) analysed the surface and groundwater pollutants from abattoir effluents and concluded that meat processing industries are major contributors of water pollution in Nigeria. Benka-coker et al (1995) examined the water quality of river Ikpoba and impact of slaughterhouses waste on it and maintained that constant discharge of untreated wastewater into surrounding water bodies is responsible for deteriorating water quality. Meadows (1995) while examining livestock legacy with environmental health perspective suggested that the slaughtering of animals result in meat supply and useful by-products like leather and skin, but livestock waste spills can introduce enteric pathogens and excess nutrients into surface waters and can also contaminate ground waters.

Wing and Wolf (2000) examined the health and quality of life of residents living in the vicinity of intensive livestock operations and hinted that respiratory and mucous membrane effects were common with neighbours of intensive swine operation. Moreover, S. Pina et al., 2000 have also reported the presence of hepatitis A and E viruses in animals associated with wastewater and suggested that slaughterhouse waste must be treated properly before releasing into water bodies to avoid contamination of water and associated human health threats. D. I. Masse and L. Masse (2000) studied the characterization of wastewater from hog slaughterhouses in Eastern Canada and found that the major composition of slaughter house wastes, contain rich organic contents, adequate alkalinity and enough organic biological nutrients.

Adelegan (2002) studied the policies regarding slaughterhouse waste in Nigeria and suggested that generators of pollutants need to be encouraged to put in pollution prevention and reduction technologies with the help of a sensible mix of regulatory policies to enjoy the benefits of clean environment.

Adeyemo (2002) studied the water quality and hygienic condition in a major abattoir in Ibadan, Nigeria and maintained that abattoir operations produce a characteristic highly organic waste with relatively high levels of suspended solids, liquid and fat. The liquid waste is usually composed of dissolved solids, blood, gut contents, urine and water. He suggested that more attention should be focused on the interactions between animal production and the environment, realizing environmental conditions and structures in animal production.

Abdul Gafar (2006) carried out the analysis of surface and ground water pollution from slaughterhouses waste and found that the significant problems associated with slaughterhouse waste are the large amount of suspended solids and liquid waste as well as pollution of the environment with bad odor.

Chukwu (2007) studied the climate and air quality associated with food processing industries and maintained that waste from food industries has the potential of polluting the environment in all the three possible states – solid, liquid and gas. Disposal of water effluent from the slaughter houses is a major source of pollution and can cause various health & environmental issues, if not disposed properly.

P. H. Nhat (2006) attempted to evaluate the environmental performances of small and medium sized abattoirs in Ho Chi Minh city of Vietnam and found that major environmental problems with abattoir are unrestrained use of ground water discharge of untreated liquid waste and effluents with high concentrations of animal faeces, urine and blood, pest eggs and bacteria that can easily pollute the environment and endanger the human health.

Mbuligwe (2009) maintained that general public health can be affected with the interaction of the environment which is earlier affected by the inefficient management of wastewater, solid waste management and pungent odor from the slaughter houses. It has also been found that unhygienic conditions in slaughterhouses lead the propagation of microorganisms to the final meat product to be eaten. People in the underdeveloped countries of Africa, Asia, and South America have faced serious abdominal diseases, bloody diarrhoea, liver problems, and, in some cases, demises linked with the existence of viruses, microorganisms, and bacteria in slaughterhouse waste water.

Bello et al. (2009) in their work investigating impact of slaughterhouse activities and management in residential neighbourhood concluded that abattoir operation and management have direct and indirect effects on the built-up environment and health of people especially in the slaughterhouse vicinity. Worsening air and water quality was recorded especially near the slaughterhouses where proper disposal of waste water was not available. They have recommended that slaughter houses should be located far from residential neighbourhood. Government should enforce existing laws associated to slaughterhouse and new ones. Regulations regarding odour reduction plans and establishment of environmental impact assessment for slaughterhouses should be enforced. Licensing of slaughterhouses and proper training of workers involved in slaughterhouse operation should be made. Furthermore, public awareness on potential impact of pollution from slaughterhouse wastes should be embarked

E. E. Geldreich (2010) in his work “bacteriology of water” discussed food processing industries as one of the major sources of pathogens in the water namely salmonella (associated with typhoid fever), shigella (associated with diarrhea), *Vibrio cholera* (associated with cholera), *Escherichia coli* (associated with Cholecystitis, urinary tract infection and traveller’s diarrhoea), *Campylobacter* (associated with diarrhea) etc.

Nafarnda et al. in 2012 examined the biological characteristics of slaughter house wastewater and receiving water bodies. The study concluded that TC bacteria count in waste water and receiving water bodies exceeds the recommended limit with possible public and environmental health hazards.

Neboh et al. (2013) also examined the physic-chemical and micro-biological characteristics of the slaughter house effluents, effluent receiving soil and river and found that not only the all the parameters exceeded limitation guidelines. Bacteria namely *Escherichia coli*, *Klebsiella pneumonia*, *Staphylococcus aureus*, *Proteus mirabilis*, *Serratia sp.*, *Pseudomonas putida*, *Enterobacter aerogenes* while fungi including *Aspergillus niger*, *Torulopsis sp.*, *Aspergillus fumigatus*, *Candida sp.*, *Penicillium sp.* and *Saccharomyces cerevisiae* were prevalent in the contaminated soil, which could have a negative impact on microbial population in the soil and river.

Mulu et al (2013) examined impact of slaughterhouses waste on water quality and suggested that there should also be an intervention of appropriate regulatory bodies (EPA) to control environmental issues related to slaughter houses. A. Kayode (2014) studied conditions of two different slaughterhouses and stated that the soil dwelling pathogens were found in the soil around one slaughter house but not in other slaughter house. Reason was the difference in construction design of slaughter houses. In second slaughter house roads are properly tarred and proper drainage systems were constructed while in the first slaughter house this was not the case.

W. E. Tekenah et al. (2014) studied the impact of abattoir effluents on surface water quality and the interrelationship between examined physico-chemical properties. The study concluded that abattoir influence has a strong negative impact on health of the river water and as per Prati et al classification of surface water quality, river was categorized as polluted.

Sumayya et al. (2013) analysed the impact of abattoir effluents on the physico-chemical qualities of soil and groundwater in Gandu, Sokoto and found that *pH and amount of dissolved oxygen and nitrate in the well water were below the WHO standards for drinking water quality, suggesting that groundwater in the vicinity of abattoir vicinity was unfit for human consumption.*

Um et al. (2016) found that the conventional treatment processes have no major impact on the lessening of antibiotic-resistant *Escherichia coli* strains present in slaughter house waste, emphasizing the public health threats associated with ineffectively treated slaughterhouse waste.

Ogbomida et al. (2016) examined that bacterial profile and biodegradation probabilities of slaughterhouse waste water and suggested appropriate wastewater treatment procedures for slaughterhouse in order to prevent the contamination of the environment including surface and ground water. According to them, cost effective implementation of technology & management approaches i.e. separation by screening (solids), protein recovery (blood separation), primary settling etc. should be carried out to lessen the period of late degradation.

Olowoporoku(2016) investigated the environmental sanitation practices in slaughterhouses in Osogbo, Nigeria and found that slaughterhouses were situated near water bodies or regions with high water table. Slaughter house's solid waste was dumped into in the premises while waste water, liquid waste and effluents were released into nearby rivulets and drainages. The adverse effects of slaughter house waste were not considered while disposing.

Bustillo-Lecompte and Mehrvar (2017) discussed the regulatory parameters associated with slaughterhouse waste management, environmental impacts, health impacts and treatment methods. They have suggested that on-site treatment of the slaughter house waste using combined processes would be best option to treat and disinfect the wastewater and discharge it into receiving bodies.

Dada et al. (2017) studied the groundwater quality in the neighbourhood of a medium-sized abattoir in Lagos, Nigeria and examined the physico-chemical and microbiological qualities of samples from abattoir effluent, borehole water and effluent water. The study found that values of most of the parameters of abattoir effluent were far above the standards suggesting that these are discharged in the environment without treatment. The ground water quality was also found poor with a significant proportion of coliform in it. Therefore, regulatory agencies and public health authorities are recommended to take proper action to prevent any outbreak of epidemic.

Daramola et al. (2017) in their study measured the impact of abattoir operation on the health of neighbouring residents in Osogbo, Nigeria. They randomly selected fifteen slaughterhouses out of thirty and examined environmental and public health in the buffer of 1-250 m, 250-500 and above 500

meters. The result revealed that abattoir activities contaminate the environment and this unavoidably had adversely impacts on the health of the neighbouring residents. The study also added that distance from the slaughter house has important impact on the quality of environment. Vector borne diseases like malaria and diarrhoea were prevalent among the residents, closer to slaughterhouses.

Istifanus and Bwala (2017) have reviewed the environmental and health effects of slaughter house activities in Nigeria with special emphasis on infrastructure availability and found that slaughter house operations have direct and indirect implications on the environment and health of humans especially inhabitants within abattoir's neighbourhood. It was specified that there are adverse impacts of slaughter house operations on air, land and water quality in the neighbourhood. Pollution of water bodies and abundance of diseases in the slaughter house vicinity necessitates the attention of health professional in this area.

Cook et al. (2017) investigated working conditions and public health risks in slaughterhouses in western Kenya and found that most of the slaughterhouse have very poor infrastructure. Working conditions in the slaughter houses was found not in line with the standard which may enhance the risk of occupational exposure to infections or injury and infested meat may enter the consumer market.

Bandaw and Herago (2019) have also reviewed the effects of abattoir wastes on the environment and public health, suitable abattoir waste management practices, liquid waste/effluent/ management, solid waste management practices, safe disposal, treatment and processing methods of the waste and concluded that appropriate solid, liquid and gaseous waste management practices are necessary to minimize the potential threats to environment and public health.

### **Slaughter houses polluting the environment: Indian scenario**

The Central Pollution Control Board (CPCB) in India is a legal organisation under the Ministry of Environment, Forest and Climate Change. It carries out environmental assessments and researches and responsible for keeping national standards under various environmental laws. It is also responsible to monitor air and water quality and advise the governments to control and prevent pollution. Central Pollution Control Board (2017) documented a report on characterization, waste management practices and best available pollution control technologies in slaughter houses and maintained that majority of the slaughterhouses in the country are quite old and still in primitive condition. These units function without adequate basic facilities like proper flooring, water supply etc. Many slaughter houses are much smaller and widely scattered and their waste disposal has become a major problem due to this. The report has pointed out the need to advance old slaughterhouses on modern ways for overall enhancement in sanitation and hygiene and overall meat production.

Vijayan et al (2012) analysed the environmental management of slaughterhouses in India and maintained that majority of the slaughter houses in the country are very old, without satisfactory basic facilities viz. adequate flooring, air circulation, water supply, conveyance etc. Over and above these insufficiencies, slaughter houses possess very low sanitation standard posing a major community health and environmental threats due to unsatisfactory disposal of waste and exceedingly contaminated effluent discharge. These are increased manifold with increasing illegal and illicit slaughtering.

Jayathilakan et al (2012) while considering the problems associated with disposal of waste have reviewed the status of use of by-products and waste from meat industry and suggested that this

industry has potential for recycling raw materials, or alteration into valuable products of higher value, as raw material for other manufacturing, or utilization as food or feed after some organic treatments. Kharat and Abolkar (2014) in their work "Performance evaluation of treatment plants installed in a typical slaughter house" examined effluent characteristics, effluent treatment scheme and performance of the treatment plant consisting of two stages activated sludge process and activated absorption filter. They found that treatment plant achieved TDS, BOD and COD removal efficiencies of 98.62%, 99.48% and 99.08% respectively. The treated effluent is used by slaughter house for irrigation of eucalyptus plants.

Singh et al (2016) examined a large scale slaughter house in Meerut, Uttar Pradesh and found that all the waste generated from the slaughter house were treated efficiently and Fluoride, Nitrate and Sulphate concentration in surrounding groundwater were much below the desirable limit as per BIS. They found that complex was compliance and followed very high hygiene standards of public health and environmental hazards due to recycling of effluent and manufacturing the nutrition and protein supplement in the formulation of feed for fish and poultry within the premises from solid waste. The final treated effluent was utilized for horticulture and other washing purposes. And it was a partially zero liquid discharge unit.

#### **In Aligarh City**

Aligarh, an agriculturally rich district and an industrial town well known for its Locks and Hardware is located in the western part of the state of Uttar Pradesh, spreads over an area of about 40 square kilometers and has population of more than 0.8 million (census of India 2011). Aligarh, once known for its lock industries has now, become famous for its meat processing and production units. The number of slaughter houses has increased tremendously. Aligarh houses some major meat processing industries like Frigifco Conserva Allana, Hind Agro Industries Limited, Al Hamd Agro Food Products Pvt. Ltd. etc. Aligarh contributes about 25 per cent of the total state's total meat production (Amar Ujala, 2013). Besides, numerous illegal abattoirs are also located in the city. The studies that have examined Aligarh slaughter houses are as follows.

Down to Earth has analysed the environmental problems associated with slaughterhouses and analysed some major slaughterhouses of the country. It has been found that slaughterhouses in Aligarh are in bad shape. Government Slaughterhouses are poorly ventilated with no arrangement of drinking water. Environmental problem with the slaughterhouses waste of the major Private slaughter houses were also reported by people from nearby villages.

Singh et al (2014) conducted a study of slaughterhouses located in Aligarh city. They have examined the working condition of slaughterhouse as well interviewed the nearby residents as well with help of a well-established questionnaire. The study revealed that all the slaughterhouses are suffering from very poor sanitation facilities resulting in both environment and health issues due to disposal of solid waste, extremely contaminated effluent discharge, burning of bones, hooves, fat, etc. The residents living in the vicinity have also reported occurrence of various diseases like diarrhoea, malaria, typhoid, respiratory diseases, cholera and jaundice etc. associated with environmental pollution. The authors have thus suggested that there should be a controlled system of liquid waste collection in the premises of slaughter house. The municipality and local government should properly plan for location of slaughter houses because any wrong location can cause various problems in the vicinity. The policies of government regarding zoning should be strictly followed. People that are consuming meat

must have awareness regarding the quality of meat available in market. Also the slaughterer should maintain the quality of meat by maintaining hygienic conditions (EESD 2016) at slaughter houses.

### Conclusion

The study thus concludes that major determinants of environmental problems in the slaughterhouses are the facilities available to them. These include water supply, sanitation practices, mode of waste handling and disposal as well as availability of waste treatment facilities. The major environmental problem associated with slaughter houses has been found as disposal of untreated liquid and solid waste leading to contamination of shallow water table and nearby water bodies. This can result in waterborne diseases among nearby residents. Therefore, in the recent years environmental problems associated with slaughterhouses have emerged as a major field of concern among researchers. However a major research gap has been found in case of India, considering the size of meat production and export in the country. Existing researches in the country have shown that apart from some major abattoirs, slaughterhouses in the country are still in the primitive condition with inefficient facilities and amenities for waste handling and disposal. Similar is the situation with slaughterhouses in Aligarh city. Hence, further researches are required to explore the problem, increase the awareness and suggest suitable measures to minimize the issue.

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