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Effects of Industrial Emissions on Air Quality in Communities Surrounding International Breweries Limited, Ilesa Plant, Osun State.

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Abstract: Industrialisation is considered a cornerstone of development strategies. This popularity is due to the significant contribution that industries make to economic growth and human welfare. Industrial production provides goods, services and jobs. At the same time, it is a major source of pollution and waste. This scenario is evident in the long-standing presence of International Breweries Limited, the Ilesa plant, and the surrounding communities. It is against this background that this study investigates the effect of industrial activities, most especially emissions, on air quality in communities around International Breweries Limited, Ilesa, Osun State, Nigeria. Using a random systematic sampling technique, researchers conducted a survey of 500 residents within an area of one square kilometre of the industry. The parameters of interest include awareness of industrial activities, perceptions of air quality, health and environmental effects, community responses, and suggestions. Other primary data were collected through field observation and focus group discussions in the study area. The collected data were analysed using descriptive and inferential statistics for principal component analysis. Major findings from the study showed that 91% of the respondents are aware of the operations of the industry in the area, but only 46% are aware that industrial processes can emit substances into the air. 57.6% of the respondents also confirmed changes in the air quality around the industry. Although 12% and 23% of the respondents noticed cough and eye irritation, respectively, among the people around the industry, 75% confirmed that there was no noticeable health issue in the area. During the focus group discussion, the respondents identified noise pollution as the primary impact of the industry. Emissions of carbon monoxide, heaps of factory waste, and road congestion associated with factory noise were the major observations in the industry during the survey. The study concluded that there is air and noise pollution as a result of industrial activities, leading to obvious environmental degradation in the area. Therefore, there is a need for proper environmental control and management to ameliorate the adverse effects of industrial emissions, waste deposits, and noise pollution in the area.

Keywords: Industrial emissions, breweries industry, noise pollution and environmental degradation

I. Introduction

Industrialisation has long been recognised as a major driver of economic growth, but it is also one of the foremost contributors to environmental degradation and declining public health globally. Industrial emissions, in particular, pose a serious threat to air quality, especially in developing countries where environmental regulations are weakly enforced and community awareness remains low (World Health Organisation [WHO], 2021). Air pollution from industrial sources includes fine particulate matter (PM2.5 and PM10), sulphur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and heavy metals. These pollutants are known to contribute to respiratory illnesses, cardiovascular diseases, cancers, and premature deaths worldwide (Landrigan et al., 2018; Lelieveld et al., 2020).

Internationally, evidence underscores the severity of the problem. For example, Pope and Dockery (2006) established that long-term exposure to particulate matter from industrial sources is strongly associated with chronic obstructive pulmonary disease (COPD) and ischaemic heart disease. Similarly, Brauer et al. (2016) noted that industrial air pollution exacerbates health inequalities, as vulnerable populations living near industrial facilities are disproportionately exposed. Beyond human health, industrial emissions also harm ecosystems, contribute to acid rain, and accelerate climate change, with far-reaching socio-economic consequences (United Nations Environment Programme [UNEP], 2019).

In developing nations, particularly across Africa, the problem is compounded by weak institutional frameworks, poor waste management practices, and limited public awareness. The World Bank (2020) highlights that industries in Sub-Saharan Africa often operate with outdated technologies and inadequate pollution-control mechanisms, leading to indiscriminate release of hazardous substances into the air, water, and soil. A recent study by Owusu and Sarkodie (2020) revealed that industrialisation in West Africa significantly increases air pollutant concentrations, directly affecting respiratory health and agricultural productivity. Similarly, in South Asia, Gurjar et al. (2016) emphasised that unchecked industrial growth has led to some of the world's highest air pollution levels, reinforcing the global relevance of this issue.

In Nigeria, research has primarily centred on large industrial cities such as Lagos, Ibadan, Abeokuta, and Kaduna, where industrialisation is most intense (Adekunle, 2018; Ayeni, 2014; Ige et al., 2022). These studies confirm that industries contribute substantially to poor environmental quality and adverse health outcomes. Vagale's (1974) pioneering work on Ibadan demonstrated

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VIII, August 2025

the hazards of mixed industrial and residential land use, where communities were directly exposed to smoke, dust, noise, vibration, and toxic effluents. However, medium-sized cities like Ilesa, Ife, Ede, and Osogbo remain under-researched despite hosting industrial establishments that significantly influence environmental quality.

This gap is especially concerning in Ilesa, Osun State, where the International Breweries Limited plant serves as a major industrial hub. Residents living around the facility report health challenges such as persistent coughing, eye irritation, and waterborne diseases, pointing to possible air and environmental pollution. Yet, empirical studies specifically addressing how industrial emissions from this brewery affect air quality are lacking. While Ige et al. (2022) linked industrial growth to environmental health risks in Nigeria, their work did not extend to medium cities such as Ilesa. This study, therefore, aims to fill this research gap by systematically examining the effects of industrial emissions on air quality in Ilesa.

By focusing on a medium-sized city, this study contributes to the broader environmental health discourse by bringing attention to overlooked contexts where communities may be equally, if not more, vulnerable. It also aligns with international calls for localised assessments of industrial impacts, which are critical for advancing both environmental justice and sustainable development (United Nations, 2015).

Justification

This study definitely provides useful information on the effects of industrial emissions on air quality in communities around the International Breweries Limited, Ilesa plant. This also guides the formation of a viable environmental strategy and implementation that can be of help to safeguard possible environmental degradation and atmospheric pollution in the study area and other areas of similar characteristics. In addition, the study provides information on industrial activities and their associated effects on residents' environmental health, which will guide the intervention of stakeholders in the implementation of relevant planning tools to mitigate the menace in the study area and other areas with similar characteristics.

II. Literature Review

Industrial emissions constitute one of the most pressing sources of environmental pollution, arising from diverse industrial activities that release toxic substances into the atmosphere. These emissions not only pose direct threats to human health but also cause significant ecological damage, altering the balance of natural systems and reducing the overall quality of life in affected communities (Ige, 2018). Beyond their physical and chemical toxicity, industrial emissions and their associated odours exert considerable influence on occupational safety and community well-being. Research has shown that residents living near industrial sites, as well as employees within those industries, often experience health challenges such as respiratory distress, eye irritation, and chronic illnesses linked to prolonged exposure (FEPA, 2021).

Air pollutants, particularly volatile organic and inorganic compounds, are notorious for their unpleasant odours, which cut across multiple industrial sectors such as breweries, petroleum refineries, latex processing plants, pharmaceutical industries, tanneries, waste treatment facilities, poultry farms, and fish processing industries (Webster et al., 1996; Gangagari Rao et al., 2012). These odours are more than a nuisance; they are often indicators of hazardous substances that can compromise air quality and public health.

Air, as a vital life-supporting medium, was naturally fresh and balanced prior to the advent of rapid industrialisation. However, with the accelerated growth of industrial activities, maintaining clean and breathable air has become increasingly challenging. The release of industrial toxins has transformed the atmosphere into a medium that is harmful, unstable, and, in many instances, unsuitable for sustaining both physical and biological systems. Industrial emissions typically consist of vapours, aerosols, solid particulates, toxic gases, and smoke, all of which contribute to environmental degradation and adverse health effects (WHO, 2022).

According to WHO (2022), six major “classic” air pollutants dominate industrial environments: nitrogen oxides (NOx), sulphur dioxide (SO_2), carbon monoxide (CO), suspended particulate matter, hydrocarbons, and ozone. These pollutants emanate from a wide range of sources, including fuel-fired boilers, internal combustion engines, industrial furnaces, and gas stoves. Exposure to these substances has been linked to multiple health complications, such as cardiovascular diseases, lung infections, and, in extreme cases, premature death.

Moreover, industrial activities emit high volumes of greenhouse gases (GHGs), including carbon dioxide, methane, and nitrous oxides, which significantly contribute to global warming and climate change. While the natural greenhouse effect is crucial for sustaining life on Earth by trapping heat, excessive accumulation of these gases has led to rising global temperatures and erratic climate patterns. Each GHG has a unique global warming potential, determined by its chemical and physical properties, with carbon dioxide being the most dominant due to its sheer concentration in the atmosphere.

The brewery industry is a pertinent example of industrial activity with notable environmental implications. Beer, as the fifth most consumed beverage worldwide, demands large-scale production, with global output reaching approximately 1.96 billion hectolitres in 2016, accounting for more than three-quarters of global alcohol consumption (FEPA, 2021). The environmental footprint of this scale of production is considerable. Studies suggest that alcoholic beverages, including beer, contribute about 0.7% of total global GHG emissions when assessed across their life cycle from production and packaging to distribution and consumption. The brewery

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VIII, August 2025

sector's dependence on water, energy, and raw materials makes it a major contributor to environmental degradation, thereby affecting both ecosystems and the health of nearby communities.

III. Methodology

a) Study Area

International Breweries Plc, Ilesa Plant, was established in 1971 to brew both alcoholic and non-alcoholic malt beverages. It is in the Ilesa West Local Government Area of Osun State, Nigeria. The geographical coordinates are approximately latitude 7°1′ to 7°3′ North and longitude 4°8′ to 4°9′ East. The plant is located near the Asoro Stream. This location was strategically chosen due to the proximity to a water source, which serves both as a supply of water for industrial processes and a channel for disposing of industrial wastes and effluents. Production commenced in December 1978 with an installed capacity of 200,000 hectolitres per annum, which increased to 500,000 hectolitres annually by 1982. On April 26, 1994, International Breweries Plc, Ilesa, was officially listed as a public limited liability company.

b) Method of Data Collection

A total of 500 copies of a structured questionnaire were administered to both residents of surrounding communities and staff members of the brewery. A random systematic sampling technique was used among residents: the first household was selected using a random number table, followed by every 20th household within the estate. For the industry staff, purposive sampling was adopted to select respondents with relevant knowledge and experience to provide insightful information regarding the aim of the study. In addition, interviews and focus group discussions were conducted with community members to gather qualitative data on the perceived effects of industrial emissions on environmental health. Data collected were subjected to inferential statistical analysis to interpret and validate the findings.

IV. Results and Discussion

The socio-economic characteristics of the respondents are crucial to understanding the impact of industrial emissions on air quality in communities around the brewery. Key variables considered include age, gender, occupation, education level, and the number of years spent living in the area. Table 1 shows that the age distribution was fairly balanced, with 32.7% of respondents younger than 44 years, 27.3% between 45 and 54 years, 14.7% aged 55–64 years, and 25.3% aged 65 years and above. This indicates that both younger and older adults are represented in the study, suggesting that exposure to emissions spans across different age cohorts.

With regard to length of residency in the community, 34.0% had lived in the area for 11–20 years, 22.0% for 21–30 years, 11.3% for 31–40 years, 10.0% for 41–50 years, while 22.7% had resided in the area for 51 years or more. This long duration of residence suggests that a considerable proportion of respondents have had sustained exposure to the brewery's industrial activities. In terms of gender, 56.7% were male, while 43.3% were female. This distribution reflects a relatively higher male representation, which may be linked to the male-dominated nature of brewery-related occupations.

Occupationally, 62.0% of respondents were engaged in brewery-related jobs such as factory work, truck driving, labouring, and agency roles. Other occupational groups included civil servants (24.0%), professionals (4.7%), artisans (6.7%), and traders (2.7%). This distribution highlights the brewery's significance as a major source of employment in the area, while also pointing to the economic dependence of the community on the industry. Regarding education, 12.7% of respondents had primary education or below, 47.3% had completed secondary school, 30.0% attained OND/NCE level, and 10.0% possessed tertiary qualifications (HND, B.Sc., and above). This suggests that most respondents had at least some level of formal education, which may influence their awareness and perceptions of environmental issues.

Religiously, Christianity (50.6%) and Islam (46.7%) were the dominant affiliations, while 2.7% practised traditional religion. This reflects the religious diversity within the community. Overall, the demographic profile suggests a population that is relatively mature, largely dependent on the brewery for livelihood, and with a strong presence of long-term residents' factors that are critical in shaping perceptions and responses to industrial emissions and their impact on air quality.

Table 1: Socio–Economic and Demographic Characteristics of the Respondents

Variables	Options	Frequency	Percentage (%)
Age group (yrs)	<44	392	32.7
	45 – 54	328	27.3
	55 – 64	176	14.7
	65 and above	304	25.3
Years spent in the community	11 – 20	408	34.0
	21 – 30	264	22.0

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VIII, August 2025

	31 – 40	136	11.3
	41 – 50	120	10.0
	51 and above	272	22.7
Gender	Male	680	56.7
	Female	520	43.3
Marital status	Single	88	7.3
	Married	1,040	86.7
	Divorced	72	6.0
Level of education	Primary and below	152	12.7
	Secondary	568	47.3
	OND/NCE	360	30.0
	Tertiary (HND/B.Sc. & above)	120	10.0
Religion	Christianity	607	50.6
	Islam	560	46.7
	Traditional	33	2.7
Occupation	Civil servant	288	24.0
	Brewery-related	744	62.0
	Professional	56	4.7
	Trading	32	2.7
	Artisan	80	6.7
Total		1200	100

Source: Author's Fieldwork, 2024

Health Challenges of Industrial Emission in The Study Area

The implications of industrial emissions and related activities on human health are evident in the study area. Table 2 shows that 41% of respondents reported experiencing persistent coughing, while 40% indicated cases of eye irritation within the past year. These symptoms are likely due to exposure to polluted air, as inhalation of airborne contaminants and irritation caused by airborne particles can lead to respiratory and ocular health issues.

Furthermore, 13% of respondents reported cases of diarrhoea, and 2% mentioned cholera outbreaks—both of which are common in environments with poor sanitation and water pollution. These health conditions may be linked to the presence of brewery waste dumps in the vicinity, which could contaminate local water sources and promote the spread of disease.

Exposure to harmful substances such as carbon monoxide, bioaerosols, smoke, and emissions from industrial engines can result in a variety of health issues. Additionally, airborne bacteria originating from industrial waste and effluents pose infectious threats to nearby residents (Akinloye, 2017).

Industrial emissions are a significant component of air pollution and contribute substantially to environmental degradation. Not only do they release a considerable volume of toxic gases into the atmosphere, but they also have a direct negative impact on public health and the overall quality of the environment.

Table 2: Health Challenges of Population

Diseases	Population	Percentage
Cough	225	45
Eye irritation	200	40

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VIII, August 2025

Malaria	65	13
Cholera	10	2
Total	500	100

Source: Author's Field work 2024.

Principal Component Analysis of Environmental Health Factors

The Principal Component Analysis (PCA) extracted key factors explaining 84.7% of the variance in environmental health conditions in the study area. The first principal component, which explained 22% of the variance, had strong loadings on two variables: residents' nonchalant attitudes toward industrial emissions (loading = 0.711) and the ineffectiveness of environmental sanitary inspections (loading = 0.683). In practical terms, this suggests that weak community responsiveness, combined with lapses in institutional enforcement, are the most critical drivers of environmental health risks. Policies should therefore prioritise community sensitisation campaigns and strengthening routine environmental monitoring systems to address this gap.

The second component, which explained 18.5% of the variance, was most strongly associated with the level of awareness of health risks from prolonged exposure to carbon monoxide (loading = 0.642) and industrial dust (loading = 0.605). These loadings highlight a deficit in health risk knowledge among residents. Interventions here should emphasize public health education, incorporating both formal health systems and community-based approaches to ensure residents understand the long-term risks of toxic emissions.

The third component accounted for 13.3% of the variance and was dominated by the industrial emission methods used in the factory (loading = 0.529). This indicates that the technologies and processes employed in production have a direct bearing on community health outcomes. From a policy standpoint, enforcing compliance with emission standards and encouraging cleaner production technologies within the brewery would substantially mitigate risks.

Other components contributed smaller proportions of the variance but still highlight relevant dynamics. For instance, proximity of residences to the factory (loading = 0.488) loaded on Factor 4 (10.0% variance), suggesting that urban planning and zoning regulations could play an important preventive role.

Taken together, the PCA findings show that (1) weak enforcement and community apathy, (2) low health-risk awareness, and (3) unsustainable industrial practices are the strongest determinants of environmental health vulnerabilities. These insights underscore the need for a multi-pronged policy approach combining stricter regulatory enforcement, targeted awareness campaigns, and promotion of cleaner technologies.

Table 3: Environmental Challenges Emanating from Waste Disposed

Component	Initial	Eigen Values		Extraction Of Sums Of Squared Loadings		
	Total	%Variance	Cumulative %	Total	%Variance	Cumulative %
1	3.728	21.931	21.931	3.728	21.931	24.931
2	2.899	17.053	38.984	2.899	17.053	38.984
3	2.260	13.295	52.279	2.260	13.295	52.279
4	1.858	10.205	63.208	1.858	10.929	63.208
5	1.451	8.535	71.743	1.451	8.535	71.743
6	1.217	7.160	78.903	1.217	7.160	78.902
7	1.018	5.991	84.893	1.018	5.991	84.893
8	.735	4.322	89.215			
9	.521	3.064	92.279			
10	.482	2.836	95.115			
11	.298	1.755	96.870			
12	.227	1.353	98.205			
13	.141	.830	98.035			
14	.093	.546	99.581			
15	.054	.316	99.987			

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VIII, August 2025

16	.014	.083	99.980			
17	.003	.020	100.000			

Source: Author's Field work 2024.

Perception of Air Quality

Table 4 presents the distribution of respondents based on their perception of air quality in the study area. The results indicate that a significant majority approximately 75% of the respondents reported noticeable changes in air quality, while 25% reported no changes.

In terms of how residents rated the air quality in their community, those who acknowledged changes provided further explanations that supported their claims. Their responses suggest a decline in air freshness, increased dustiness, and more frequent odour emissions, all likely resulting from ongoing industrial activities in the area.

Table 4: Distribution of Respondent responses by Air Quality

Changes in air	Frequency	Percentage
Air changed	373	74.7
Air didn't change	127	25.3
Total	500	100

Source: Author's Field work 2024

Air Quality Rating by Respondents

According to the data presented in Table 5, only 7.2% of the respondents rated the air quality in their community as very good, while 9% described it as good. A majority 55.2% rated the air quality as just fair, and the remaining 28.6% reported that the air quality was poor.

These findings suggest that while a small proportion of residents view the air quality positively, the majority perceive it as either average or poor, indicating widespread concern about air pollution in the area.

Table 5: Distribution of Respondents According to Change

Changes noticed	Frequency	Percentage
Very good air	36	7.2
Good air	45	9.0
Fair	276	55.2
Poor	143	28.6
Total	500	100

Source: Author's Field work 2024

Distribution of Respondents by Community Response

Table 6 presents the distribution of respondents based on their community's response to industrial air pollution and related environmental actions.

Regarding visits by government or environmental agencies for air quality inspection, only 14% of the respondents reported regular or noticeable visits. In contrast, 66% stated that no such visits have occurred, while 20% were unsure.

When asked whether residents had ever raised complaints or concerns about air pollution in the area, only 4% responded yes, indicating that they had made such complaints. A significant majority 81.3% reported that they had never made any complaints, while 14% were unsure.

Furthermore, when evaluating the efforts of International Breweries Plc in protecting the environment, only 5.3% of respondents believed the company was doing enough. On the other hand, 49% stated that the company was not doing enough, and 46% were not sure whether adequate environmental protection measures were being taken.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VIII, August 2025

Table 6: Distribution of Respondents by Community Response

Response	Yes	No	Not Sure	
Has any government agency ever visited your community for air quality inspection	70(14%)	330(66%)	100(20%)	500(100.0)
Have you ever made complaints or raised concerns about air pollution in your area	20(4%)	406(81.3%)	73(14%)	500(100.0)
Do you think International Breweries is doing enough to protect the environment	8(5.3)	247(49%)	267(46%)	500(100.0)

Source: Author's Field work 2024

V. Discussion

The relative inactivity of environmental agencies in the study area can be understood through the lens of legal, logistical, and political challenges, which are widely discussed in the literature on environmental governance. From a legal standpoint, several scholars argue that Nigeria's regulatory frameworks remain weak, outdated, or poorly enforced (Adekunle, 2018; FEPA, 2021). For instance, fines for environmental violations are often minimal, allowing industries to treat them as part of routine operating costs rather than deterrents (Ayeni, 2014). Similarly, Vagale (1974) earlier observed that weak enforcement of environmental laws in industrial towns like Ibadan enabled industries to disregard regulatory standards, with adverse implications for surrounding communities. This legal fragility persists today, as regulatory bodies often lack prosecutorial powers and must rely on slow judicial processes, which rarely result in meaningful sanctions (World Bank, 2020).

In addition to legal weaknesses, logistical and institutional constraints are a recurring theme. Scholars have noted that Nigerian environmental agencies are chronically underfunded and understaffed, limiting their ability to carry out regular inspections or invest in modern monitoring technologies (Ige, 2018; Akinloye, 2017). Field officers often lack basic equipment to test air and water quality, and in some cases, they cannot even reach affected communities due to transportation challenges (Omofonmwan & Eseigbe, 2009). This resonates with findings by the UNEP (2019), which reported that many African countries lack adequate capacity to measure and regulate industrial emissions effectively. Without adequate institutional resources, agencies tend to adopt reactive measures rather than preventive approaches, leaving communities vulnerable to persistent environmental health risks.

Political interference further exacerbates these structural weaknesses. Industries that contribute significantly to local employment or generate substantial tax revenues are often shielded from strict regulation by political elites, who prioritize economic gains over environmental protection (Owusu & Sarkodie, 2020). This aligns with the observation by Landrigan et al. (2018) that in low- and middle-income countries, pollution control is often undermined by political capture, where powerful interests compromise environmental accountability. The problem is further compounded by overlapping mandates of agencies, resulting in poor coordination, bureaucratic inefficiencies, and a diffusion of responsibility (FEPA, 2021; UNEP, 2019).

The literature also provides pathways for reform. Strengthening the legal framework by updating environmental laws, closing loopholes, and raising penalties to levels that act as real deterrents is widely recommended (Adekunle & Eniola, 2018; World Bank, 2020). In addition, agencies should be empowered with direct enforcement powers and mandated to publish data on emissions to ensure transparency (WHO, 2021). Institutional reforms are equally important: increasing budgetary allocations, equipping field officers with modern monitoring tools, and providing continuous training are necessary to enhance effectiveness (Ukpebor et al., 2006; Brauer et al., 2016). Furthermore, insulating agencies from political interference through independent oversight mechanisms and community-based monitoring initiatives could help reduce regulatory capture (Lelieveld et al., 2020; UNEP, 2019).

In essence, the observed negligence of environmental agencies is not simply a matter of unwillingness but reflects deep structural constraints across the legal, institutional, and political landscape. As Owusu and Sarkodie (2020) and Pope & Dockery (2006) emphasize, addressing industrial emissions requires holistic governance reforms that combine legal empowerment, institutional strengthening, and active citizen participation. Only through such integrated reforms can environmental agencies effectively safeguard air quality and protect community health in industrial towns like Ilesa.

VI. Conclusion

In conclusion, the findings of this study underscore that industrial emissions from the brewery exert clear and measurable impacts on the environmental health of nearby residents. However, the persistence of these problems cannot be separated from the broader structural weaknesses of environmental governance in Nigeria, which include outdated legal frameworks, under-resourced regulatory agencies, and political interference that undermines enforcement. Addressing these challenges requires not only stronger regulatory enforcement and regular environmental monitoring but also institutional reforms that enhance agency capacity, transparency, and independence. Equally, fostering public awareness and empowering local communities to participate in environmental governance are essential to bridging gaps in accountability. Importantly, International Breweries Plc must take

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VIII, August 2025

proactive responsibility by adopting sustainable technologies and minimising its ecological footprint, thereby setting a precedent for corporate environmental responsibility. By highlighting these multi-dimensional issues, this study contributes to the growing literature on industrial pollution in developing contexts and provides evidence that can inform both policy reform and future research on sustainable industrial practices.

References

1. Adekunle, A. (2018). Industrial pollution and its impact on Nigerian cities. Journal of Environmental Studies, 22(4), 45–59.
2. Adekunle, A. S. (2018). Impacts of industrial effluents on quality of well water within Asa Dam Industrial Estate, Ilorin. New York Science Journal, 1(6), 1–5.
3. Adekunle, A. S., & Eniola, I. I. (2018). Impact of industrial effluents on quality of a segment of Asa River within industrial estate in Ilorin, Nigeria. New York Science Journal, 1(6), 1–5.
4. Akinloye, F. Y. (2017). Environmental impacts of waste generation and management in Ilesa, Osun State, Nigeria (Unpublished master's thesis). Ekiti State University, Ado-Ekiti.
5. Ayeni, T. (2014). Environmental degradation in urban industrial centers of Nigeria. Nigerian Journal of Geography, 7(1), 33–48.
6. Brauer, M., Freedman, G., Frostad, J., van Donkelaar, A., Martin, R. V., Dentener, F., … Cohen, A. (2016). Ambient air pollution exposure estimation for the Global Burden of Disease 2013. Environmental Science & Technology, 50(1), 79–88.
7. Federal Environmental Protection Agency (FEPA). (2021). Guidelines and standards for environmental pollution control in Nigeria (pp. 1–238). FG Press.
8. Gangagari Rao, V. V., Muralikrishna, I. V., & Murthy, V. R. (2012). Environmental management and assessment of odour pollution in industries. Journal of Environmental Research and Development, 6(4), 889–894.
9. Gurjar, B. R., Ravindra, K., & Nagpure, A. S. (2016). Air pollution trends over Indian megacities and their local-to-global implications. Atmospheric Environment, 142, 475–495.
10. Ige, O. O. (2018). Air pollution and industrial emissions: Implications for health and environment in Nigerian urban centers. African Journal of Environmental Science, 12(3), 102–110.
11. Ige, O., Aluko, O., & Ajayi, T. (2022). Industrial activities and residents' environmental health in Nigeria. African Journal of Environmental Research, 16(2), 89–103.
12. International Organization for Standardization. (1999). ISO 14644-1: Cleanrooms and associated controlled environments – Part 1: Classification of air cleanliness. https://www.iso.org/standard/25089.html
13. Landrigan, P. J., Fuller, R., Acosta, N. J. R., Adeyi, O., Arnold, R., Basu, N., … Zhong, M. (2018). The Lancet Commission on pollution and health. The Lancet, 391(10119), 462–512.
14. Lelieveld, J., Klingmüller, K., Pozzer, A., Burnett, R. T., Haines, A., & Ramanathan, V. (2020). Effects of fossil fuel and total anthropogenic emission removal on public health and climate. Proceedings of the National Academy of Sciences, 116(15), 7192–7197.
15. Omofonmwan, S. I., & Eseigbe, J. O. (2009). Effect of solid waste on the quality of underground water in Benin Metropolis, Nigeria. Journal of Human Ecology, 26(2), 99–105.
16. Owusu, P. A., & Sarkodie, S. A. (2020). Global perspective on air pollution and health: A review. Energy Reports, 6, 361–372.
17. Pope, C. A., & Dockery, D. W. (2006). Health effects of fine particulate air pollution: Lines that connect. Journal of the Air & Waste Management Association, 56(6), 709–742.
18. United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. UN General Assembly.
19. United Nations Environment Programme (UNEP). (2019). Air pollution in Africa: Policy, science and capacity to address the growing threat. UNEP.
20. Ukpebor, E. E., Ukpebor, J. E., Oviasogie, P. O., Odiase, J. I., & Egbeme, M. A. (2006). Field comparison of total suspended particulates (TSP) samplers to assess spatial variation. International Journal of Environmental Studies, 63(5), 567–577. https://doi.org/10.1080/00207230600963866
21. Vagale, L. R. (1974). Urban environment and industrial pollution in Ibadan. Ibadan University Press.
22. Webster, R., Halvorsen, K. E., & Brown, B. (1996). Industrial air emissions and the problem of odour: Case studies and management strategies. Environmental Management, 20(4), 547–555.
23. World Bank. (2020). Pollution management and environmental health program. World Bank.
24. World Health Organization (WHO). (2021). Air pollution. World Health Organization. https://www.who.int/health-topics/air-pollution
25. World Health Organization (WHO). (2022). Air pollution and health: The evidence. WHO Publications. https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health