

Environmental and Public Health Impacts of Urbanization and Industrialization in Nigeria

ABSTRACT

Urbanization and industrialization are central to Nigeria's economic transformation, driving infrastructural development, job creation, and increased productivity. However, these processes have accelerated existing environmental and public health challenges rather than merely creating new ones. This paper examines the impacts of urban expansion and industrial activities on Nigeria's environment and public health. The rapid growth of cities, fueled by rural-urban migration and industrial development, has exacerbated issues such as deforestation, biodiversity loss, and pollution of air and water resources. Industrial operations, particularly in the oil and gas, manufacturing, and construction sectors, contribute to environmental degradation through emissions, hazardous waste disposal, and resource exploitation. These activities have resulted in worsening air quality, increased greenhouse gas emissions, and severe contamination of water bodies, posing major risks to human health. Additionally, inadequate infrastructure has led to poor waste management, compounding urban health challenges and contributing to the spread of vector-borne diseases and respiratory ailments. The study reveals the urgent need for targeted policy interventions to address these escalating issues. Sustainable urban and industrial policies must be implemented to balance economic progress with environmental conservation. This requires the active involvement of government agencies, industries, and local communities. Specifically, the study advocates for stringent environmental regulations, improved waste management systems, and the integration of green technologies to mitigate the adverse effects of urbanization and industrialization on public health and the ecosystem. Immediate action is critical to prevent further environmental degradation and health crises, particularly considering Nigeria's rapidly growing urban population. To ensure a healthier, more sustainable future, policymakers must prioritize collaborative efforts, enforce stricter environmental standards, and invest in sustainable infrastructure and green innovation.

Keywords: Environmental Degradation, Public Health Impact, Waste Management, Air and Water Pollution, Sustainable Development

1. INTRODUCTION

Urbanization and industrialization are pivotal drivers of economic growth and development in Nigeria, a nation experiencing rapid population expansion and urban sprawl. As Africa's most populous country, Nigeria has witnessed significant rural-urban migration, with cities such as Lagos, Abuja, and Port Harcourt emerging as centers of economic activity and industrial development (Adelekan, 2016). This rapid urban expansion, fueled by industrial growth, has transformed settlement patterns, economic structures, and environmental conditions. The proportion of urban dwellers has risen from 9% in 1950 to

over 50% in 2019 (Jemiluyi, 2021). Industrialization, marked by the exploration and utilization of natural resources, has driven economic growth. However, prioritizing industrial expansion over environmental quality has led to significant degradation. Industrial activities exert immense pressure on natural resources, leading to pollution, deforestation, and ecological depletion (Dubey & Narayanan, 2010). Urbanization exacerbates these effects through increased energy consumption, poor waste management, and deforestation (Mahmood et al., 2020). Since the 1960s, Nigeria has implemented policies to boost industrialization (Audi et al., 2014; Famade, 2007), yet weak environmental regulations have resulted in severe consequences for air quality, water resources, and public health.

While industrialization and urbanization have contributed to job creation, infrastructure development, and improved living standards, they have also introduced numerous environmental and public health challenges (Mehmood et al., 2024). The rapid pace of urbanization has outstripped infrastructure development, leading to overcrowding, poor waste disposal, and the proliferation of informal settlements, resulting in air and water pollution, deforestation, and soil contamination, all of which threaten human health (Eze et al., 2020). The environmental and public health impacts of these processes are profound. Industrial activities contribute to greenhouse gas emissions, land degradation, and pollution (Musa et al., 2021). Urbanization intensifies environmental stress through rising demands for housing, transportation, and waste management services (Ohwo&Abotutu, 2015). These conditions have led to increased cases of respiratory diseases, waterborne infections, and other health complications. Additionally, industrial expansion encroaches upon wetlands and forest reserves, exacerbating biodiversity loss and climate-related vulnerabilities. Given these challenges, this paper explores the environmental and public health consequences of urbanization and industrialization in Nigeria, emphasizing the anthropogenic activities that drive these processes. By examining the link between environmental degradation and human health, this study highlights the urgent need for sustainable urban and industrial policies to mitigate these adverse effects.

2. URBANIZATION IN NIGERIA: TRENDS AND ENVIRONMENTAL IMPACTS

Urbanization in Nigeria has been characterized by rapid population growth and the expansion of urban areas. According to the United Nations, Nigeria's urban population is projected to reach 60% of the total population by 2030, up from 50% in 2020 (UN-Habitat, 2020). This rapid urban growth has been driven by rural-urban migration, natural population increase, and the concentration of economic opportunities in cities (Adelekan, 2016). However, the infrastructure and services in many Nigerian cities have not kept pace with this growth, leading to significant environmental challenges. One of the most pressing issues associated with urbanization is the inadequate management of solid waste. This not only contributes to environmental pollution but also creates breeding grounds for disease vectors such as mosquitoes, which are responsible for the transmission of malaria and other vector-borne diseases (Eze et al., 2020, Omokaro et al., 2024b). Another major environmental impact of urbanization is the loss of green spaces and biodiversity. As cities expand, natural habitats are often destroyed to make way for housing, roads, and industrial facilities. This deforestation and habitat fragmentation have led to a decline in biodiversity

and the disruption of ecosystems, which are essential for maintaining environmental balance and providing ecosystem services such as air purification and climate regulation (Mafiana et al., 2022).

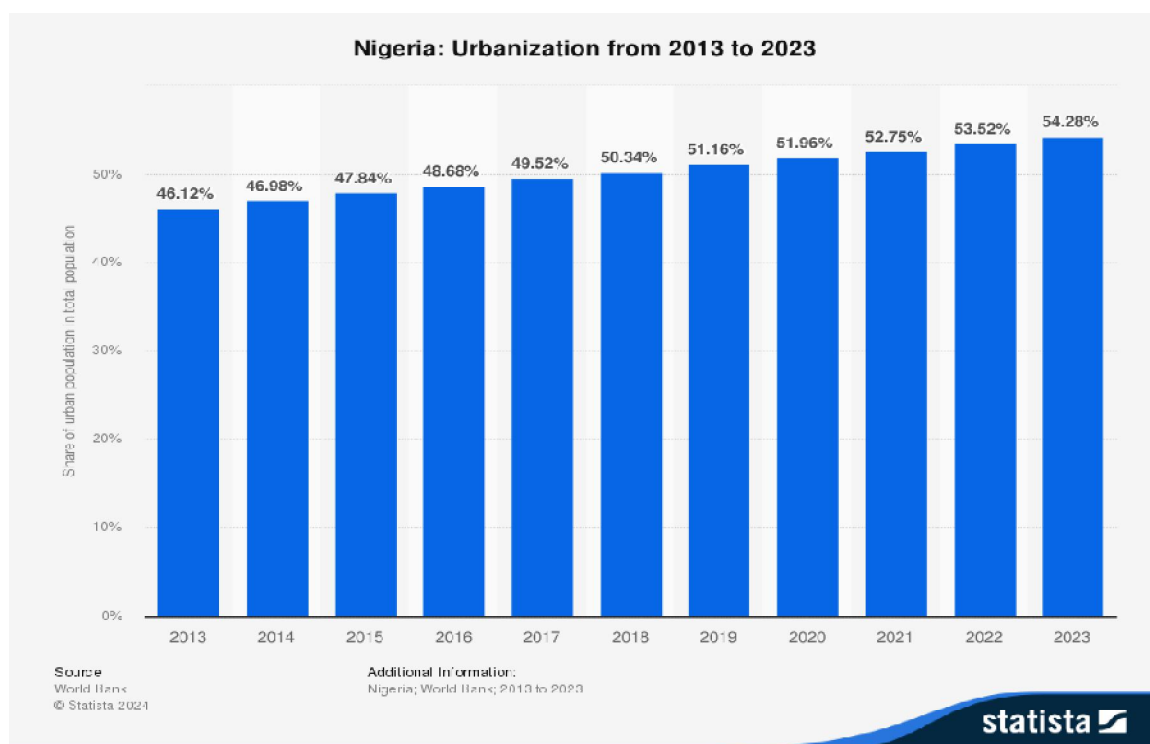


Figure 1: Nigeria Urban Growth

The data in Figure 1 shows that Nigeria's urban population remained steady at about 54.28% in 2023, showing no major change from the year 2022. However, this was the highest level recorded during the observed period.

3. INDUSTRIALIZATION AND ITS ENVIRONMENTAL FOOTPRINT

Industrialization has been a key driver of economic growth in Nigeria, particularly in sectors such as oil and gas, manufacturing, and construction. However, the environmental costs of industrial activities have been substantial. The oil and gas industry, which is the backbone of Nigeria's economy, has been particularly notorious for its environmental impacts. Oil spills, gas flaring, and the discharge of untreated effluents have caused widespread contamination of land, water, and air in the Niger Delta region (Lindén & Pålsson, 2013; Iloabuchi et al., 2024). Gas flaring, a common practice in Nigeria's oil fields, releases large quantities of greenhouse gases and toxic pollutants such as carbon monoxide, sulfur dioxide, and volatile organic compounds into the atmosphere. These emissions contribute to climate change and pose serious health risks to local communities, including respiratory diseases, cardiovascular disorders, and cancer (Eze et al., 2020). Similarly, oil spills have devastated aquatic ecosystems, destroyed farmland, and contaminated drinking water sources, leading to food insecurity and waterborne diseases (Omokaro et al., 2024a). The manufacturing sector also contributes significantly to environmental degradation in Nigeria. Many industries operate without adequate pollution control measures, releasing untreated

wastewater, hazardous chemicals, and particulate matter into the environment. For example, the textile and tannery industries are known to discharge heavy metals and dyes into water bodies, contaminating aquatic ecosystems and posing risks to human health (Oladimeji et al., 2024).

4. URBANIZATION AND ENVIRONMENTAL DEGRADATION IN NIGERIA

Urbanization in Nigeria has significantly altered the natural environment, leading to land-use changes, pollution, and resource depletion. The expansion of cities, driven by population growth and infrastructural development, has resulted in the encroachment of wetlands, deforestation, and soil degradation. There is an ongoing debate that as nations advance, the migration of people to urban areas weakens environmental quality. Newman (2006) argues that urbanization often leads to environmental negativity due to population growth and ecological footprint expansion. However, Dodman (2009) found that greenhouse gas emissions per capita in many cities are lower than the national average, suggesting that urbanization does not always equate to higher emissions. Ejaro and Abubakar (2013) caution that unchecked rapid urbanization in developing nations often leads to increased poverty, crime, and unsustainable development. Similarly, Iroye (2015) observed that urbanization-driven construction activities have led to illegal mining practices, which degrade water quality and deplete groundwater resources.

Industrialization, while essential for economic growth, has also been a significant driver of environmental degradation. Mahmood et al. (2020) highlight that industrialization has deteriorated air, water, and soil quality, making it a primary cause of environmental degradation. In Nigeria, industrialization efforts since the 1960s have been accompanied by environmental challenges, including greenhouse gas emissions from gas flaring in the oil sector (Audi et al., 2014). Despite numerous policies aimed at curbing these issues, enforcement has been weak, leading to continued environmental degradation. According to Ohwo and Abotutu (2015), the environmental impacts of urbanization in Nigeria include air pollution, deforestation, water pollution, and biodiversity loss.

4.1 Air Pollution and Greenhouse Gas Emissions

One of the most critical environmental consequences of urbanization and industrialization in Nigeria is air pollution. Industrial emissions, vehicular exhaust, and the burning of fossil fuels contribute significantly to air quality deterioration. Musa et al. (2021) found a direct link between industrialization and CO₂ emissions in Nigeria. The researchers employed the Toda and Yamamoto approach to examine the causality between industrial growth and environmental degradation, concluding that rapid industrialization has exacerbated air pollution. Similarly, urban transportation systems, characterized by outdated and poorly maintained vehicles, contribute to high levels of nitrogen oxides, carbon monoxide, and particulate matter in the air (Ohwo&Abotutu, 2015). These pollutants have been associated with respiratory diseases, cardiovascular conditions, and premature deaths. Chindo (2014) further revealed that higher

economic growth and energy consumption are linked to increased CO₂ emissions, emphasizing the negative impact of industrialization on air quality.

4.2 Water Pollution and Industrial Waste Disposal

Industrial activities contribute significantly to water pollution in Nigeria. The indiscriminate discharge of untreated industrial effluents into water bodies has led to the contamination of rivers and underground water sources. Jemiluyi (2021) observed that industrialization in Nigeria is largely unregulated, with industries failing to adhere to environmental guidelines. The Niger Delta region, which hosts a significant proportion of Nigeria's industrial activities, suffers from frequent oil spills, heavy metal contamination, and chemical waste disposal. Studies have shown that rainwater in heavily industrialized cities such as Warri contains high levels of acidity, making it unsafe for consumption (Ohwo&Abotutu, 2015). According to Omokaro et al. (2025), elevated levels of nickel (Ni), mercury (Hg), lead (Pb) and cadmium (Cd) at a dumpsite near Ughelli North, which further finds its way into nearby river pose a serious risk to environmental safety. Iroye (2015) observed that urbanization has encouraged illegal mining practices, leading to the contamination of riverbeds and depletion of groundwater reserves. Contaminated water sources pose severe health risks, including cholera outbreaks, typhoid fever, and heavy metal poisoning.

Omokaro et al. (2024a) highlight that Nigeria's water resources, though abundant, face significant threats from urbanization and industrialization, particularly due to water pollution and improper industrial waste disposal. The country's water landscape, characterized by extensive surface and groundwater reserves, including four major river drainage systems, numerous dams, and large aquifer formations, is increasingly compromised by anthropogenic activities. Despite the presence of River Basin Development Authorities, which have contributed to water resource development, inadequate catchment management and the indiscriminate disposal of hazardous industrial waste remain pressing challenges. Urbanization and industrialization have exacerbated water pollution, particularly in regions such as the Niger Delta, where oil spills and chemical discharges from industrial activities have severely contaminated water bodies. Similarly, in urban centers, untreated industrial effluents and municipal waste are often discharged into rivers and streams, leading to the degradation of water quality and posing serious public health risks. Flooding in the Middle Belt and inadequate water distribution systems further compound these issues, leaving rural and urban populations vulnerable to waterborne diseases and environmental hazards.

4.3 Deforestation and Land Degradation

Urban expansion and industrial development have led to large-scale deforestation in Nigeria. The demand for land for housing, agriculture, and infrastructure has resulted in the destruction of forests and green spaces. According to Ohwo and Abotutu (2015), Nigeria's forest cover has declined drastically over the years, with urban sprawl being a major contributor. Deforestation has severe ecological consequences, including habitat loss, reduced carbon sequestration, and increased vulnerability to climate change. Furthermore, the loss of vegetation cover has led to increased soil erosion, desertification, and declining agricultural productivity. Maijama'a, et al. (2020) found that foreign direct

investment and agricultural expansion have also contributed to deforestation, further degrading the environment.

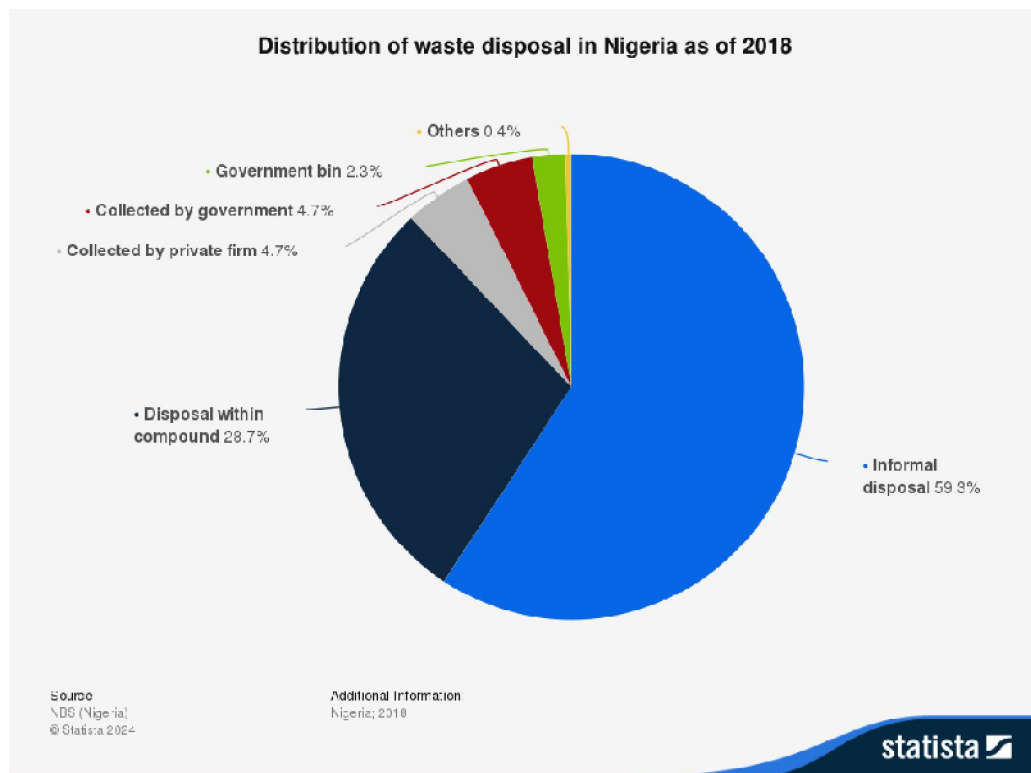


Figure 2: Nigeria 2018 Waste Disposal Pattern

4.4 Waste Management Challenges

The rapid rate of urbanization has overwhelmed Nigeria's waste management systems. Poor waste disposal practices, including open dumping and burning of solid waste, have led to significant environmental pollution. Jemiluyi (2021) noted that many urban areas lack adequate waste collection and recycling facilities, leading to the accumulation of refuse in streets and water channels. The improper disposal of industrial waste, including hazardous chemicals and non-biodegradable materials, further exacerbates the problem. The proliferation of plastic waste, in particular, has clogged drainage systems, contributing to frequent urban flooding and health hazards. According to the National Emergency Management Agency (NEMA), the 2022 floods affected 4.47 million people across all 36 states and the FCT. The disaster, considered Nigeria's worst flooding event, was linked to poor infrastructure and unsustainable environmental practices, with improper waste disposal also playing a role. Over 2 million people were displaced, and 665 lives were lost.

According to Omokaro et al. (2024b), the exploration of dumpsites across Africa underscores the severe waste management challenges exacerbated by rapid urbanization and industrialization. In Nigeria, large dumpsites such as Olusosun in Lagos serve as stark examples of the environmental and public health risks associated with inadequate waste disposal practices. These sites, characterized by massive

accumulations of industrial, municipal, and hazardous waste, not only degrade surrounding ecosystems but also pose significant threats to human health, particularly for communities living in close proximity. The release of toxic substances, greenhouse gases, and leachates from these dumpsites contaminates air, soil, and water resources, contributing to respiratory illnesses, waterborne diseases, and other public health crises.

5. PUBLIC HEALTH CONSEQUENCES OF URBANIZATION AND INDUSTRIALIZATION

The environmental challenges associated with urbanization and industrialization in Nigeria have direct implications for public health. Pollution, inadequate sanitation, and poor housing conditions have contributed to a rise in disease prevalence, particularly in urban areas. The environmental impacts of urbanization and industrialization have direct and indirect consequences for public health in Nigeria. Air pollution, for instance, is a major health risk associated with both urban and industrial activities. In cities like Lagos and Port Harcourt, the combination of vehicular emissions, industrial discharges, and the burning of waste has led to dangerously high levels of air pollution (Adelekan, 2016). Exposure to air pollutants such as particulate matter (PM_{2.5} and PM₁₀), nitrogen oxides, and sulfur dioxide has been linked to respiratory and cardiovascular diseases, as well as increased mortality rates (Eze et al., 2020). Water pollution is another critical public health issue. The contamination of water sources by industrial effluents, oil spills, and untreated sewage has resulted in the spread of waterborne diseases such as cholera, typhoid, and dysentery. In rural and urban areas alike, access to clean and safe drinking water remains a significant challenge, exacerbating the burden of disease and undermining efforts to improve public health outcomes (Lindén & Pålsson 2013). The degradation of soil and agricultural land due to industrial activities and improper waste disposal also has implications for food security and nutrition. Contaminated soil can lead to the uptake of toxic substances by crops, which may then enter the food chain and pose health risks to consumers.

5.1 Respiratory Diseases and Airborne Pollutants

Exposure to air pollutants from industrial emissions, vehicular exhaust, and biomass burning has been strongly linked to a rise in respiratory illnesses in Nigeria. Musa et al. (2021) found that CO₂ emissions from industrial activities, particularly in urban areas such as Lagos and Port Harcourt, correlate with increased cases of asthma, bronchitis, and chronic obstructive pulmonary disease (COPD). The study also highlighted that particulate matter (PM_{2.5} and PM₁₀) from vehicle emissions and industrial processes exacerbates these conditions, particularly among vulnerable populations such as children and the elderly. Similarly, Jemiluyi (2021) reported that urban children are disproportionately affected by air pollution, with high rates of pneumonia and other lung infections. This is attributed to their developing respiratory systems and higher exposure to polluted environments, especially in low-income neighborhoods near industrial zones. Komolafe et al. (2014) also emphasized that the burning of fossil fuels and waste in urban areas releases harmful pollutants such as sulfur dioxide (SO₂) and nitrogen oxides (NO_x), which contribute to respiratory and cardiovascular diseases. These findings underscore the

urgent need for stricter air quality regulations and public health interventions to mitigate the impact of airborne pollutants on respiratory health.

5.2 Waterborne Diseases and Poor Sanitation

The contamination of water sources due to inadequate sanitation infrastructure and industrial pollution has led to a rise in waterborne diseases such as cholera, dysentery, and hepatitis. Ohwo and Abotutu (2015) highlighted that many urban slums in Nigeria lack access to clean drinking water, exposing residents to severe health risks. For instance, in cities like Lagos and Kano, open defecation and improper waste disposal practices contaminate surface water, which is often used for drinking and domestic purposes. This has resulted in recurrent cholera outbreaks, particularly during the rainy season when flooding spreads contaminated water. Industrial pollutants, including heavy metals like lead and mercury, as well as chemical waste from manufacturing processes, further compound the problem by infiltrating groundwater supplies. A study by Ezeabasili et al. (2015) found that groundwater in industrial areas such as Aba and Onitsha is heavily contaminated with toxic substances, posing long-term health risks such as kidney damage and cancer. Additionally, the lack of proper wastewater treatment facilities in urban centers exacerbates the problem, as untreated sewage is often discharged into rivers and streams. According to UNICEF (2021), only 10% of Nigeria's population has access to basic sanitation services, highlighting the urgent need for improved water and sanitation infrastructure to reduce the burden of waterborne diseases.

5.3 Mental Health and Socioeconomic Stress

Urbanization has also been linked to mental health challenges due to overcrowding, unemployment, and socio-economic inequalities. The rapid expansion of urban areas without corresponding economic opportunities has led to increased poverty and crime rates (Jemiluyi, 2021). High-stress levels, depression, and anxiety disorders have become prevalent in densely populated urban centers, where residents face daily struggles such as inadequate housing, traffic congestion, and limited access to healthcare. A study by Adewuya et al. (2007) found that the prevalence of depression in Nigerian women in urban areas is significantly higher than in rural areas, with unemployment and financial instability being major contributing factors. Furthermore, the lack of green spaces and recreational facilities in cities exacerbates mental health issues, as urban dwellers have limited opportunities for relaxation and stress relief.

5.4 Impact on Child Health and Mortality Rates

The health effects of urbanization are particularly pronounced among children, who are more vulnerable to environmental and socio-economic challenges. According to Jemiluyi (2021), child mortality rates remain high in Nigerian urban areas due to poor sanitation, malnutrition, and limited healthcare access.

The study found that while urbanization provides some health benefits, such as improved immunization coverage and proximity to healthcare facilities, it also exacerbates health risks due to environmental degradation and inadequate health infrastructure. For instance, overcrowded living conditions in urban slums increase the risk of infectious diseases such as measles and tuberculosis, which disproportionately affect children. A report by Save the Children (2023) revealed that Nigeria has one of the highest under-five mortality rates globally, with urban areas accounting for a significant proportion of these deaths. Malnutrition, driven by poverty and food insecurity, further weakens children's immune systems, making them more susceptible to diseases. Additionally, the lack of access to clean water and sanitation in urban slums contributes to diarrheal diseases, which are a leading cause of child mortality (Vivian et al., 2024).

6. SOCIOECONOMIC AND POLICY IMPLICATIONS

The environmental and public health challenges associated with urbanization and industrialization in Nigeria are deeply intertwined with socioeconomic factors. Poverty, inequality, and weak governance structures exacerbate the impacts of environmental degradation, particularly for vulnerable populations such as women, children, and the elderly (Ajayi & Otuya, 2020). For example, low-income communities are often disproportionately affected by pollution and environmental hazards due to their proximity to industrial sites and lack of access to basic services. Addressing these challenges requires a multifaceted approach that integrates environmental, health, and socioeconomic considerations. Strengthening regulatory frameworks and enforcement mechanisms is essential to ensure that industries comply with environmental standards and adopt sustainable practices (Eze et al., 2020). Additionally, investments in infrastructure, such as waste management systems, clean water supply, and public transportation, are critical to mitigating the environmental impacts of urbanization and improving public health outcomes. Omokaro et al. (2024a), suggested that collaborative action among governments, industries, and communities is a necessity; indicating that key measures include enforcing stricter regulations on industrial waste disposal, investing in modern waste treatment facilities, and promoting public awareness campaigns on waste segregation and recycling. Public awareness and community engagement are also key components of any strategy to address the environmental and health consequences of urbanization and industrialization.

7. CONCLUSION AND RECOMMENDATIONS

The findings of urbanization and industrialization in Nigeria reveals that while these processes drive economic growth and development, they also pose significant environmental and public health challenges. Uncontrolled urban expansion has led to overcrowding, inadequate waste management, and environmental degradation, while industrial activities contribute to air and water pollution, biodiversity loss, and climate change. The consequences of these challenges are evident in rising cases of respiratory illnesses, waterborne diseases, and poor living conditions, particularly in low-income urban communities. To mitigate these adverse effects, a multi-pronged approach is necessary. Firstly, the Nigerian government must strengthen its environmental policies and enforcement mechanisms to ensure industrial compliance with pollution control measures. Industries should be mandated to adopt cleaner

production technologies and implement sustainable waste disposal systems. Secondly, investments in urban infrastructure are crucial to addressing sanitation, housing, and waste management deficiencies. Expanding access to clean water, improving public transportation, and integrating renewable energy sources will enhance urban resilience and reduce environmental degradation. Additionally, community engagement and public awareness campaigns should be promoted to encourage responsible waste disposal and conservation practices. Collaborative efforts among government agencies, private industries, and international organizations are essential to implementing sustainable urban development initiatives. By prioritizing environmental sustainability alongside economic growth, Nigeria can foster a healthier, more livable urban environment while preserving its natural resources for future generations.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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