

ASSESSMENT OF PLASTIC WASTE MANAGEMENT IN GWAFAN ESTATE KUNYI-KATSI, JOS NORTH LGA, PLATEAU STATE

¹Kasai, Itse Caleb ²Giwa, Saidat Olanipekun ³Abdulkadir, Isa Funtua

^{1,2,3} Environmental Standard Node
Sustainable Procurement, Environment and Social Standards Center of Excellence
Abubakar Tafawa Balewa University,
Bauchi, Nigeria

Corresponding Author's email: ckitse.pg@atbu.edu.ng

ABSTRACT

Plastic pollution is a global problem that harms habitats and disrupts natural processes, reducing ecosystems' ability to adapt to climate change and directly affecting the livelihoods, food security, and social well-being of millions. This study aimed to assess plastic waste management in Gwafan Estate, Kunyi-Katse, Jos, Plateau State. Using a mixed-method approach, data were collected through 136 survey questionnaires, focus group discussion, and field observation from the study area. The survey data were analyzed using descriptive statistics, while thematic analysis was applied to the FGD. Results show that most respondents are male and have a higher education, including postgraduate status. Most respondents have high knowledge of plastic waste management, and majority are unaware of local laws and regulations related to plastic waste management, while residents believe plastic waste is a very serious problem. The main waste disposal method is open dumpsites, with over eighty-three (83) open dumpsites identified. Focus group discussions revealed that the government has no record of plastic waste generated and no existing policies or regulations for plastic waste management in the state, despite their existence at the national level. The study concluded that plastic waste management in Gwafan Estate remains inadequate, with significant gaps in awareness, infrastructure, and sustainable disposal methods. It was recommended that plastic waste collection centers be established through public-private partnerships (PPP) to improve collection, transportation, and proper disposal of plastic waste in the estate. Evacuation of the open dumpsites, education and awareness programs on plastic waste management were also recommended.

Keywords: Plastic waste, waste management, recycling, awareness, Jos, Nigeria.

1. INTRODUCTION

Cities play a key role in global economic, social, and technological progress. However, they are also at the center of growing environmental challenges, especially the increasing volume and complexity of waste production. One of the most urgent issues facing urban areas today is managing Municipal Solid Waste (MSW), which is estimated at 1.7 to 1.9 billion metric tons each year (United Nation Environmental Program, 2023). The problem is particularly severe in developing countries, where waste management infrastructure and policies have struggled to keep up with urban growth and rising consumption. In low-income countries, waste collection

rates often fall below 70%, with over 50% of collected waste disposed of through uncontrolled landfilling, and about 15% handled by unsafe and informal recycling methods. Per capita solid waste generation varies by economic level: 0.6–1.0 kg/day in low-income countries, 0.8–1.5 kg/day in middle-income countries, and 1.1–4.5 kg/day in high-income countries (Kaza et al., 2018; Ritchie & Roser, 2018). Notably, plastics make up roughly 12% of total MSW (Kaza et al., 2018), a share that continues to grow as dependence on plastic products increases.

The widespread use of plastics dates back to World War II, when technological advancements in the petrochemical industry led to the creation of inexpensive, lightweight, and durable materials. Initially, plastics were used in military applications, including aircraft components, because of their strength, versatility, and affordability (Freinkel, 2011). After the war, the global economy experienced rapid industrialization, and plastic manufacturing shifted toward consumer goods. This shift caused a dramatic increase in plastic use, especially in packaging, construction, and household items. By 1950, global plastic production was about 2 million tonnes per year, but it surged exponentially to 438 million tonnes in 2017 (Geyer, 2020). Shockingly, over half of all plastics ever produced have been made since 2004. Despite a slight decline in plastic production during the COVID-19 pandemic, estimated at 0.3% in 2020 (Statista, 2021), demand for single-use plastics like personal protective equipment (PPE) and food packaging rose sharply. Predictions show that if current trends continue, worldwide plastic production could exceed 1,100 million tonnes annually by 2050 (Geyer, 2020).

Since the rise of mass plastic production, about 9.2 billion tons of plastics have been produced. However, only around 30% of these plastics are still in use, with the rest contributing to a troubling 6.9 billion tons of plastic waste worldwide (Geyer, 2020). This waste mainly consists of 81% polymer resin, 13% polymer fibers, and 32% additives. In 2018, over 343 million tons of plastic waste were generated globally, with post-consumer waste—including industrial, agricultural, commercial, and municipal plastic waste—making up 90% of the total (Geyer, 2020). The remaining 10% consisted of pre-consumer waste, such as offcuts and rejected materials from plastic manufacturing.

Nigeria has experienced significant growth in plastic consumption and waste generation, mainly driven by industrial expansion, urbanization, and changing consumer habits. From 1990 to 2017, Nigeria ranked second among selected African countries for plastic imports and usage (Babayemi et al., 2019). The widespread popularity of packaged goods has made the packaging industry the largest user of plastics, with approximately 30% of global plastic production dedicated to packaging (Patel & Shah, 2008). Consumers often favor plastic packaging due to its convenience and low cost, especially in food-related applications, where it is believed to provide better hygiene and protection from contaminants (Shah et al., 2008). However, the rapid rise in plastic consumption has surpassed the country's waste management capacity, leading to serious environmental and public health issues.

The aim of the study is to evaluate plastic waste management in Gwafan Estate, Kunyi-Katse in Jos North LGA by first analyzing the socio-economic parameters and characteristics of the respondents, then examining the current level of plastic waste generation and knowledge about plastic waste management. The study also reviews existing plastic waste handling practices, considers the government's role in environmental conservation, and offers recommendations to enhance plastic waste management in Gwafan Estate, Kunyi-Katse, Jos North.

2. MATERIALS AND METHOD

2.1 Study Area

Gwafan Estate, Kunyi-Katsi village, is located between latitudes $09^{\circ}52'0''$ and $09^{\circ}53'30''$ North, and longitudes $08^{\circ}56'0''$ and $08^{\circ}57'0''$ East in Gwafan district, Jos North LGA, Plateau State (Mindat, 2024). The estate is also called “Haske Quarters” due to its location opposite one of the oldest churches (Haske Baptist Church) beside the Lamingo Golf Club in Jos. The residents of the estate are made up of people from different ethnic groups (Afizere, Tarok, Berom, Ngas, Igbo, Yoruba, Igala, Idoma, Tiv, etc.) in Nigeria (Plateau State Government, 2023) Figure 1.

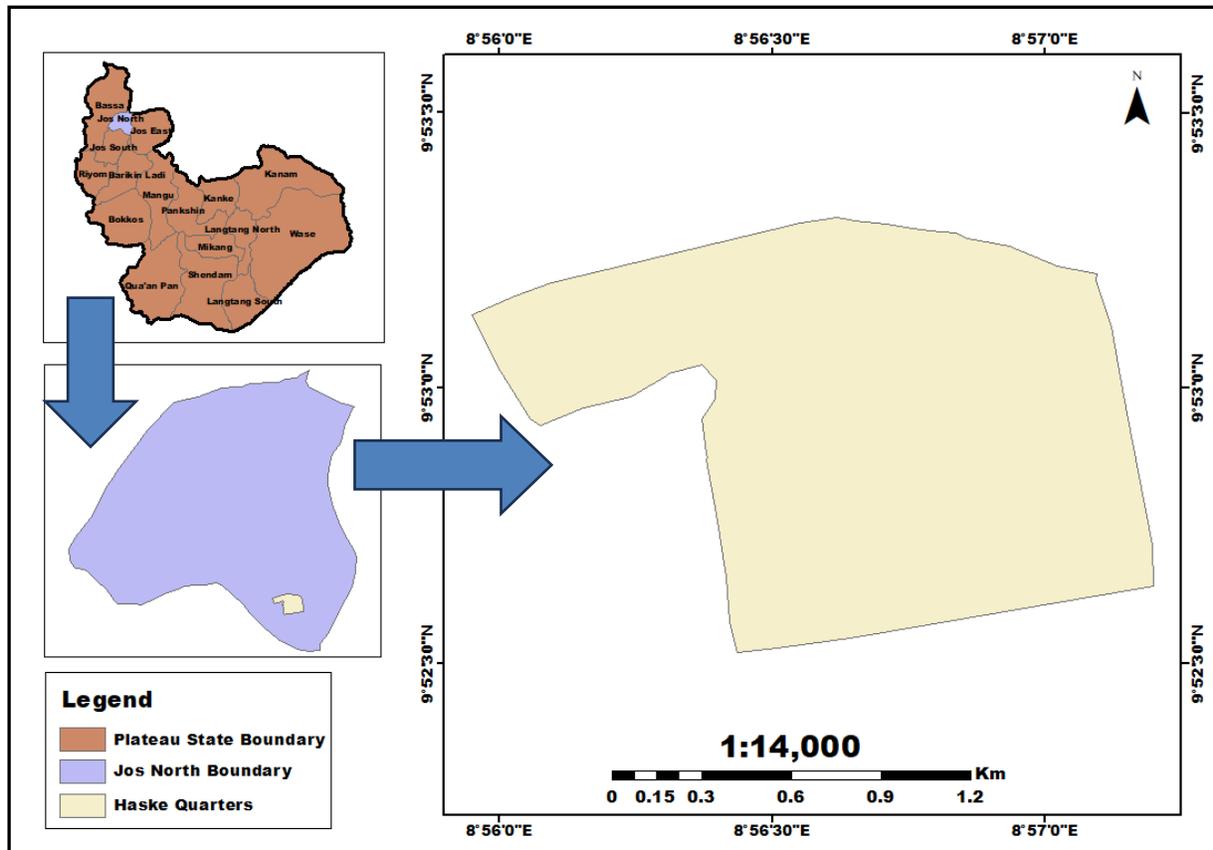


Figure 1: Map of Plateau State showing Jos North LGA and the study area.
Source: National Center for Remote Sensing, Jos.



Figure 2: Google Earth Map of Gwafan Estate
Source: Google Earth App

2.2 Research Design

This study used a Mixed-Method research design to gain a more comprehensive understanding of plastic waste management in Gwafan Quarters, Jos North Local Government Area. This design was chosen because it enables a detailed examination of waste disposal practices, recycling behaviors, government interventions, and public awareness levels without manipulating any variables. By using this approach, the study identified knowledge gaps, challenges, and opportunities in plastic waste management while providing insights into potential solutions to enhance sustainability efforts within the community.

2.3 Participants and Sampling Technique

The study focused on residents of Gwafan Quarters, a community facing serious waste management issues caused by population growth and increased plastic use. To ensure fair representation, simple random sampling was employed to select participants from 206 inhabited households within the estate. Besides household representatives, the study also involved key stakeholders, including policymakers from the Plateau State Environmental Protection and Sanitation Agency (PEPSA).

2.4 Research Instruments

A structured questionnaire was created and distributed online to household representatives to gather information on their waste disposal practices, recycling knowledge, awareness of plastic waste management, and perceived challenges in waste disposal. The questionnaire included closed-ended questions for statistical analysis and open-ended questions to collect personal viewpoints and suggestions. In addition to the survey data, field observation was conducted to gain direct insights into waste disposal behaviors within the estate. The researcher observed and

recorded these behaviors weekly over six months to identify patterns in plastic waste buildup and management. Observation started in March 2024 and concluded in August 2024. The researcher had access to the estate with help from a resident research assistant. We toured the estate for six months to observe waste management behaviors, assess the physical characteristics of waste, and perform other evaluations related to waste management.

A Focus Group Discussion (FGD) was held with policymakers from PEPSA. Participants included the Director of Waste Management, Director of Sanitation and Enforcement, Director of Administration, Assistant Director of Audit, two mid-level officers, and a National Youth Service Corps (NYSC) member, all sharing their expertise on waste management policies and enforcement mechanisms.

2.5 Data Collection Procedure

A structured questionnaire was distributed online through the estate WhatsApp platform to household representatives, enabling convenient and efficient data collection. Respondents had one week to complete the survey, with follow-up reminders sent to boost response rates. The responses were automatically stored.

The FGD session was held with PEPSA officials and key stakeholders, lasting approximately 90 minutes. The discussions addressed topics such as the effectiveness of current waste management policies, enforcement challenges, recycling initiatives, and potential public-private partnerships (PPP) in plastic waste management. These FGDs offered valuable institutional insights that complemented the survey and field observational findings, providing a comprehensive understanding of the challenges and opportunities in plastic waste management within the estate community.

3. RESULTS AND DISCUSSION

3.1 Demographic Characteristics of Respondents

As shown in Table 1, the majority of respondents (38.2%) are in the 25–34 age range, followed by those aged 35–44 (35.3%). This suggests that most participants are young to middle-aged adults, which may influence waste management behaviors and awareness levels. The sample is mostly male (69.1%), indicating that gender-related perspectives on waste management could be an important factor in policy and awareness strategies. A large portion of respondents have tertiary (49.3%) or postgraduate (47.8%) education, which could positively affect their knowledge and attitudes toward waste management initiatives.

Table 1: Distribution of demographic characteristics of respondents

Age Group	Frequency (F) n= 136	Percentage (%)
18-24	3	2.2
25-34	52	38.2
35-44	48	35.3
45-54	21	15.4
55-64	9	6.6
65 and over	3	2.2
Gender		
Male	94	69.1
Female	42	30.9
Education		
Postgraduate	65	47.8
Tertiary	67	49.3
Secondary	4	2.9

3.2 Knowledge and awareness on plastic waste management

As shown in Table 2, the majority (39.7%) of respondents have moderate knowledge of plastic waste management, while 33.1% report high knowledge, and 15.4%, 9.6%, and 2.2% have very high, low, and very low knowledge, respectively. However, a combined 11.8% have low or very low knowledge, indicating a need for increased awareness campaigns. Fakunle et al. (2022) reported that residents' attitudes, economic conditions and activities, level of knowledge, beliefs, perceptions, customs, and traditions are specific sociocultural factors influencing plastic bottle waste management. The findings indicate that while a significant proportion of respondents rate their knowledge as moderate or high, a notable percentage still consider their understanding to be low. Studies show that there is substantial high and moderate public awareness of the negative impacts of plastic pollution, yet this awareness does not always lead to effective behavioral changes or compliance with laws and regulations, especially regarding illegal waste disposal and single-use plastic consumption (Chilote & Dhakal, 2025; Rahman et al., 2025). According to Ogundele et al. (2021), awareness should extend beyond general understanding to include practical knowledge of sustainable disposal practices, recycling opportunities, and the environmental consequences of improper waste disposal. The findings reinforce the need to increase public awareness through targeted education and community engagement programs to promote responsible waste management behaviors.

Table 2: Distribution of Knowledge and Awareness on Plastic Waste Management

Knowledge level	Frequency (F)	Percentage (%)
Very high	21	15.4
High	45	33.1
Moderate	54	39.7
Low	13	9.6
Very low	3	2.2
Total	136	100

3.3 Perspective of respondents on plastic waste

From Table 3, 22.8% of respondents believe that plastic waste is not a serious issue in the community, 24.3% believe it is a serious issue, 17.6% are unsure if it is a serious problem, while 35.3% think plastic waste is a very serious issue. This indicates that most respondents view plastic waste as a significant problem, possibly due to their high level of education. However, there remain substantial percentages that see plastic waste as not serious, highlighting the need for further education. Public perception of environmental problems greatly influences how actively individuals participate in waste management. This difference in views suggests that, although awareness exists, there are still gaps in understanding the full environmental, health, and socio-economic impacts of plastic pollution. Studies (Kousar et al., 2022; Abbasi & Abbasi, 2024; Efendi & Ismail, 2025) show that environmental awareness, personal concerns, and perceptions of how environmental issues affect health and safety are key factors driving pro-environmental behaviors and intentions. Therefore, public education campaigns should focus on demonstrating the tangible effects of plastic pollution, such as health risks, flooding, and biodiversity loss, to increase public engagement.

Table 3: Distribution of the perspective of residents on plastic waste

Variables	Frequency (F)	Percentage (%)
Not serious	31	22.8
Somewhat serious	24	17.6
Serious	33	24.3
Very Serious	48	35.3
Total	136	100

3.4 Awareness on local plastic waste regulation

Table 4 shows that a significant majority (85.3%) of respondents are unaware of local regulations on plastic waste management, while 14.7% are aware. This highlights the need to expand government and community-driven educational programs. A key aspect of plastic waste management is the legal and policy framework that governs waste disposal practices. The study reveals that most respondents lack awareness of local laws or policies regulating plastic waste management in Plateau State. In 2021, the Federal Government of Nigeria launched the National Policy on Plastic Waste Management (NPPWM). The policy recognizes the twin challenges of increased per capita plastic consumption and the lack of capacity to address the resulting waste. It aims to reduce plastic waste generation and pollution in line with Nigeria's commitments as a signatory of the Basel Convention, the MARPOL Convention, the SDGs, and the UN Climate Change Convention, among others (Federal Ministry of Environment, 2024). This lack of awareness of the legal framework on plastic waste management presents a major obstacle, as individuals are unlikely to comply with regulations they do not know about. Ogunkan (2022) and Olaoti (2024) report that Nigeria's environmental system suffers from inefficiency, low public awareness and participation, unenforceable and non-implementable laws and policies, and a weak, uncoordinated institutional framework. The findings emphasize the need for the Plateau State Government and relevant environmental agencies to intensify efforts in publicizing waste management policies, ensuring that citizens are well-informed about their responsibilities and the legal consequences of non-compliance.

Table 4: Distribution of Awareness on Local Plastic Waste Regulations

Awareness	Frequency (F)	Percentage (%)
Yes	20	14.7
No	116	85.3
Total	136	100

3.5 Causes of plastic waste in households

As shown in Table 5, the main cause of plastic waste buildup in households was lack of recycling options (49.3%), followed by lack of awareness about plastic waste management (32.4%), and convenience of single-use plastics (18.4%). Ekanem et al., (2024) reported high consumption of cheap, single-use plastic items like water sachets and packaging, a lack of effective waste management infrastructure and recycling systems, poor waste disposal habits such as open dumping or burning, and insufficient public awareness about the impacts of plastic pollution. The Nature Conservancy (2024) reported that effective plastic waste management requires using reusable items, proper recycling of materials, and proper disposal of plastic waste. These findings suggest that improving recycling infrastructure and launching educational campaigns could significantly reduce household plastic waste.

Table 5: Distribution of Causes of Plastic Waste in Households

Cause	Frequency (F)	Percentage (%)
Convenience of single-use plastic	25	18.4
Lack of awareness	44	32.4
Lack of recycling options	67	49.3
Total	136	100

3.6 Methods of plastic waste disposal

As shown in Table 6, the most common disposal methods were open dumping (24.3%) and general waste bins (22.1%). However, a significant portion (47.1%) used mixed methods, highlighting inconsistencies in waste disposal practices. This suggests that many residents lack access to organized waste management services, emphasizing the need for formalized waste collection and recycling programs. According to Omole et al. (2016), landfilling, open-air burning, and open dumping are ineffective and widely used waste disposal methods in Nigeria, and they harm public health and the environment. Wuyep et al. (2024) reported insufficient awareness and education about waste disposal among residents in Jos urban area; distance to disposal sites and inadequate facilities are major factors affecting proper waste disposal.

Table 6: Distribution of Methods of Plastic Waste Disposal

Disposal method	Frequency (F)	Percentage (%)
General waste bin	30	22.1
Open dumpsite	33	24.3
Recycle bin	6	4.4
Plastic waste collection services	3	2.2
Mixed methods (General waste bin& Open dumpsite)	64	47.1
Total	136	100

3.7 Challenges in plastic waste disposal

Table 7 shows common challenges residents face with waste disposal, including 57.3% citing multiple issues, 22.1% lacking recycling facilities, 13.2% lacking waste disposal services, and 7.4% lacking information. These problems emphasize the need for improved waste management infrastructure and public education. Solving these barriers will require cooperation between the government and the community to enhance recycling facilities and waste collection services. Wuyep et al. (2024) reported that many residents in Jos have low awareness and education about waste disposal. Distance to disposal points and inadequate disposal facilities are major factors affecting proper waste management. Kabiru (2017, as cited in Wuyep et al., 2024) said that the distance to disposal sites is a main challenge for residents in Kano city. He also noted that proper health education and community outreach can improve people’s understanding of correct solid waste management.

The finding highlights the importance of creative and accessible communication methods, such as social media campaigns, community forums, and educational programs, to raise awareness and encourage participation in plastic waste management efforts.

Table 7: Distribution of the Challenges in Plastic Waste Disposal

Challenges	Frequency (F)	Percentage (%)
Lack of recycling facilities	30	22.1
No waste disposal services	18	13.2
Lack of information	10	7.4
Multiple challenges combined	78	57.3
Total	136	100

3.8 Focus Group Discussion (FGD)

The FGD confirmed that Plateau Environmental Protection Sanitation Agency (PEPSA) is mandated to manage waste and oversee waste managers in Plateau State. The agency has been actively educating the public on waste segregation, particularly on distinguishing biodegradable waste from non-biodegradable waste (such as plastics). PEPSA is also responsible for formulating policies and enforcing regulations that promote waste segregation, recycling, and responsible disposal of waste materials. The discussion revealed a significant gap in record-keeping for plastic waste. While PEPSA has records of Municipal Solid Waste (MSW) generated since 2000, it does not currently track plastic waste separately. However, there are plans to

improve record-keeping for plastic waste. The FGD highlighted economic opportunities in waste management, especially through Public-Private Partnerships (PPPs), which could create income for individuals and the government. This aligns with research conducted on solid waste generation in Jos (Ombugadu 2016; Alubo et al., 2023; Yakubu et al., 2023), which includes plastic waste in the overall solid waste composition, and identifies proper data, limitations on solid waste generation, and collection.

The FGD recognized the effectiveness of government waste management programs. In 2023, the government declared a sanitation emergency in Plateau State, resulting in funds allocated for waste management efforts. Currently, Plateau State ranks as the seventh cleanest state in Nigeria. Moreover, solid waste has been repurposed to reclaim mining ponds in the Jos-Bukuru metropolis. Nevertheless, several challenges were identified, including: insufficient waste management infrastructure, open burning and illegal dumping, limited recycling opportunities, low public awareness and education about environmental protection, and inadequate policies with weak enforcement mechanisms.

The FGD found that although laws prohibit burning household waste and require centralized collection and disposal, there are no specific policies for managing plastic waste in Plateau State. However, PEPSA is actively working with an NGO to review and create regulations to tackle plastic waste issues. This finding contradicts the Lagos State Government's announcement of a ban on single-use plastics in January 2024. According to Omotere (2025), Lagos State clarified that the ban on single-use plastics—such as styrofoam food containers and all types of polystyrene cups, including disposable cups—will not cover PET bottles, water sachets, or nylon bags thicker than 40 microns. The Lagos State Government confirmed that the ban would be enforced starting on July 1, 2025, after an 18-month moratorium granted following the initial announcement in January 2024. Shortly after Lagos State's ban, the Abia State government also banned single-use plastics in 2024 (Rumble, 2024).

3.9 FIELD OBSERVATION

It was observed that some households have waste management facilities in the form of waste bins. The waste storage containers are mostly plastic containers, usually buckets. It was also observed that some households dispose of their waste by open burning within their compounds, and some dump the waste within the estate indiscriminately. A few households collect plastic bottles for their relatives to be reused for making zobo and kunu. Members of most households are not aware of the impact plastic waste poses to the environment.

Qualitative findings from field observations and focus group discussions add depth to the quantitative data. The study shows that the main plastic waste management method in Gwafan Estate is open dumping, with over eighty-three (83) open dump sites identified within the estate. This uncontrolled disposal of plastic waste greatly contributes to environmental pollution and poses serious health and sanitation risks to residents. Additionally, findings reveal that most residents are unaware of proper plastic waste management practices and the harmful effects of plastic waste on the environment.

A major challenge in plastic waste management in Gwafan Estate is the lack of proper waste infrastructure. The estate does not have designated waste collection points, recycling facilities, or organized waste disposal systems. This is clear from the abundance of polyethylene bags, plastic

bottles, and other plastic debris scattered throughout the environment. Without a structured waste collection system, illegal dumping increases, causing environmental harm.

4. CONCLUSION

The study highlights the important role of the Plateau State Government in waste management. However, findings show that the government has failed to fulfill its duties related to plastic waste collection, transportation, and disposal in Gwafan Estate. Despite the presence of the Plateau Environmental Protection and Sanitation Agency (PEPSA), there is little to no enforcement of waste management rules within the estate. This lack of government intervention has led residents to manage plastic waste themselves, often resulting in improper disposal. The study concludes that plastic waste is poorly handled in Gwafan Estate.

5. RECOMMENDATION

A key recommendation is to establish a plastic waste collection and sorting center within the estate where individuals can bring plastic waste in exchange for incentives. This initiative could encourage responsible plastic waste disposal while creating economic opportunities for waste collectors and recyclers. Additionally, education and awareness programs on plastic waste management were launched in Gwafan Estate. Residents also stressed the need for government collaboration with private stakeholders to improve waste management efforts, including policy enforcement, infrastructure development, and community awareness programs.

Reference

- Abbasi, I.S., & Abbasi, M. S. (2024). People's perceptions of environmental risks influence their pro-environmental behaviors and mental well-being: a qualitative study, *Sarhad Journal of Management Science (SJMS)*, 10 (1), 163-182.
- Alubo, O.I., Isma'il, M., & Arigbede, Y.A. (2023). Site Suitability Analysis for Waste to Energy Facility in Jos Metropolis, Plateau State, Nigeria. *Dutse Journal of Pure and Applied Sciences (DUJOPAS)*, 9(2), 311-321.
- Babayemi, J.O., Ogundiran, M.B., Weber, R., & Osibanjo, O. (2018). Initial inventory of plastics imports in Nigeria as a basis for more sustainable management policies. *Journal of Health & Pollution*. 8 (18), 620.
- Chilote, M. O., & Dhakal, H. N. (2025). Plastic Pollution and Framework Towards Sustainable Plastic Waste Management in Nigeria: Case Study. *Environments*, 12(6), 209. <https://doi.org/10.3390/environments12060209>
- Effendi, M.H.A.M., & Ismail, W.N.A.T. (2025). The impact of environmental responsibility on the wellbeing of university students, *Journal of the Malaysian Institute of Planners*, 23 (1) 415 – 427.
- Ekanem, I. I., Ikpe, A. E., & Ikpe, E. O. (2024). The menace of plastic waste in Nigeria and its management techniques in the 21st century. *System Analytics*, 2 (2), 200-217.
- Freinkel, S. (2011). A Brief History of Plastic's Conquest of the World Cheap plastic has unleashed a flood of consumer goods. *Scientific American*. Retrieved from <https://www.scientificamerican.com/article/a-briefhistory-of-plastic-world-conquest/>.
- Federal Ministry of Environment (2024). Implementation guidelines on collection, diversion,

- recycling and single-use plastics for national policy on plastic waste management. Retrieved from <https://powerlibrary.theelectricityhub.com/2025/06/30/national-policy-on-plastic-waste-management>
- Fakunle, S. O., Okunola, J. L., Adeoye, A. O. (2022). Knowledge of plastic bottle waste management and sociocultural factors in Ile-Ife city: A rapid qualitative study. *Journal of Arts and Social Science Education (JASSE)*, 1(1), 9-20. Department of Arts and Social Science Education, Lead City University, Ibadan Nigeria.
- Geyer, R. (2020). Production, Chapter 2- Production, Use and Fate of Synthetic Polymers in Plastic Waste and Recycling. Letcher, T.M. (ed.). Cambridge, MA: *Academic Press*, 13-22.
- Kabiru, M.Y. (2017). Environmental and public health impact of poor solid waste disposal in Kano Metropolis Nigeria. *Texila International Journal of Public Health*, 5(4), 1-11.
- Kaza, S., Yao, L.C., Bhada-Tata, P., Van Woerden, F. (2018). What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. *Urban Development*; Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/30317>.
- Kousar, S., Afzal, M., Ahmed, F., & Bojnec, Š. (2022). Environmental Awareness and Air Quality: The Mediating Role of Environmental Protective Behaviors. *Sustainability*, 14(6), 3138. <https://doi.org/10.3390/su14063138>.
- Ogunkan, D.V. (2022). Achieving sustainable environmental governance in Nigeria: A review for policy consideration, *Urban Governance*, 2(1), 212-220, <https://doi.org/10.1016/j.ugj.2022.04.004>.
- Olaoti, S.O (2024). Plastic pollution in Lagos state, Nigeria: challenges and sustainable solutions. *Open Journals of Environmental Research (OJER)* 5 (2) 01-15, DOI: 10.52417/ojer.v5i2.667
- Omotere, S. (2025, May 25). Lagos to enforce single-use ban of plastic July 1. *Punch Newspaper*. <https://punchng.com/lagos-to-enforce-single-use-plastic-ban-from-july-1/>.
- Omole, D.O., Isiorho, S.A., & Ndambuki, J.M. (2016). Waste management practices in Nigeria: Impacts and mitigation, *The Geological Society of America Special Paper 520*, https://www.researchgate.net/publication/301529654_Waste_management_practices_in_Nigeria_Impacts_and_mitigation
- Ombugadu, A. (2016). *Waste Generation, Collection and Management Pattern in Jos City of Plateau State, Nigeria*. https://www.researchgate.net/publication/337002106_Waste_Generation_Collection_and_Management_Pattern_in_Jos_City_of_Plateau_State_Nigeria.
- Plateau State Government (2023). *Investors Guide*. Retrieved from <https://www.plateaustate.gov.ng/uploads/Investing-in-Plateau-State-OSS-booklet.pdf>
- Rahman, M.M., Jahan, I., U-Shah, F., Shahide, A.M.S., Shobuj, I.A., Hossain, M.T., Alam, E., & Islam M.K (2025). Public perception on plastic pollution: a web-based study in Dhaka City, Bangladesh. *BMC Public Health* 25, 710. <https://doi.org/10.1186/s12889-025-21959-2>
- Rumble, O. (2024). *Nigeria Expands its Climate Repertoire by Banning Certain Plastics*. <https://africanclimatewire.org/2024/02/nigeria-expands-its-climate-repertoire-by-banning-certain-plastics/>
- Shah A.A., Hasan, F., Hameed, A. & Ahmed, S. (2008). Biological degradation of plastics: A comprehensive review. *Biotechnology Advance*. 2, 246-65.
- Statista (2021). *Global plastic production 1950-2020*.

- <https://www.statista.com/statistics/282732/global-production-of-plasticssince-1950>. Accessed 6 October 2021.
- The Nature Conservancy (2024). *Eight ways to reduce waste*. Retrieved from <https://www.nature.org/en-us/about-us/where-we-work/united-states/delaware/stories-in-delaware/delaware-eight-ways-to-reduce-waste>
- Wuyep, S.Z., Musa, S.P., Bioltif, E. Y., & Beka, L. (2024). Assessment of the Environmental Impact and Awareness of Solid Waste Disposal in Jos Urban Area, Plateau State, Nigeria. *Journal of Environment Sciences (JOES)* 23, (2), 1-11.
<https://journals.unijos.edu.ng/ojs/index.php/joes>
- Yakubu, J.A., Woodard, R., & Aboagye-Nimo, E. (2023). Generation and composition of solid waste in low-income areas of Jos, Plateau State, Nigeria. *World Journal of Advanced Research and Reviews*, 18(02), 906–918.