
ASSESSMENT OF SOCIO-ECONOMIC IMPACT OF RECYCLING PROGRAMS IN KADUNA METROPOLIS, KADUNA STATE, NIGERIA

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ABSTRACT

This study assesses the socio-economic impact of recycling programs on sustainable waste management in Kaduna Metropolis, Nigeria. The research employed a mixed-methods approach, combining qualitative and quantitative data collection techniques, including a structured questionnaire and interviews with 384 respondents. The findings reveal that 72.92% of respondents are aware of recycling programs, with 42.86% rating them as "Effective." However, 10.71% considered these programs "Ineffective" or "Very Ineffective," indicating room for improvement. The most commonly recycled materials were plastic (35%) and paper (25%), while glass (13%) and metal (10%) were less frequently recycled. Economically, 57.29% of respondents reported benefiting from recycling programs, primarily through income generation (40.46%) and employment opportunities (32.27%). The study concludes with recommendations to enhance recycling programs, including public awareness campaigns, provision of recycling infrastructure, and community engagement. These findings underscore the importance of recycling programs in fostering sustainable waste management and socio-economic development in Kaduna Metropolis.

Keywords: Qualitative, Recycling, Socio-economic, Sustainability, Waste

INTRODUCTION

Recycling programs have become a crucial component of sustainable waste management globally, addressing the growing challenges posed by increasing waste generation and environmental degradation. Recycling involves the collection, processing, and re-use of waste materials, thereby reducing the need for virgin resources, minimising pollution, and contributing to economic development. Globally, approximately 2.01 billion tonnes of municipal solid waste are generated annually, with only 19% being recycled (World Bank, 2018). Developed nations like Germany and Sweden have established robust recycling programs, achieving recycling rates of over 60%, thereby significantly reducing waste volumes and creating jobs (Eurostat, 2021). These examples highlight the potential of recycling to transform waste management into a sustainable and economically viable system.

In sub-Saharan Africa, rapid urbanisation and population growth exacerbate waste management challenges. The region generates approximately 125 million tonnes of municipal solid waste annually, of which only 4% is recycled (UNEP, 2018). The inefficiency of waste collection systems and limited recycling infrastructure have led to increasing environmental degradation. Despite these challenges, initiatives in countries like South Africa and Kenya highlight the potential of recycling



programs. In South Africa, over 70,000 informal workers are involved in waste recycling, contributing to both environmental conservation and poverty alleviation (Godfrey & Oelofse, 2017).

In Nigeria, municipal solid waste generation exceeds 32 million tonnes annually, with only 10-15% recycled (Nnaji, 2015). Urban centres like Lagos have piloted recycling programs, but their implementation remains uneven nationwide. The informal sector is responsible for the bulk of recycling activities, with waste pickers and small enterprises recovering valuable materials such as plastics, metals, and paper (Ogu, 2016). Recycling programs have demonstrated socio-economic benefits, including job creation and waste reduction, but inefficiencies in waste collection and limited public engagement pose significant challenges.

Kaduna State generates significant volumes of waste, particularly in its metropolitan areas. According to the Kaduna Environmental Protection Authority (KEPA), over 5,000 tonnes of waste are generated daily in the metropolis, with minimal recycling. The lack of formal recycling programs, coupled with inadequate waste collection infrastructure, exacerbates environmental issues such as illegal dumping and pollution. Nevertheless, emerging initiatives, including community-driven recycling projects and private-sector involvement, indicate growing recognition of the state's socio-economic and environmental benefits of recycling.

At the local level, neighbourhoods in Kaduna Metropolis face distinct challenges in managing waste. Informal waste pickers and recyclers play a critical role in recovering materials from dumpsites and households. However, these efforts remain largely uncoordinated and lack policy support. Addressing these challenges through organised recycling programs could significantly improve waste management, create employment opportunities, and enhance environmental sustainability.

Recycling programs have become integral to sustainable waste management practices worldwide, addressing the dual challenges of environmental degradation and resource scarcity. These programs divert waste from landfills, reduce pollution, conserve natural resources, and create economic opportunities. In developing nations, where waste management systems are often inefficient, recycling programs offer potential solutions to waste-related challenges while generating socio-economic benefits. This study investigates the socio-economic impacts of recycling programs in Kaduna Metropolis, exploring their role in fostering sustainable waste management and addressing local environmental challenges.

MATERIALS AND METHODS

Study Area

Kaduna is the capital of Kaduna State. The state is in north-western Nigeria. The area is located between Latitudes 10°23' and 10° 43' North of the Equator and between Longitudes 7°17' and 7° 37' East of the Greenwich Meridian (See Figure 1). Kaduna metropolis comprises the Kaduna North Local Government Area (LGA), the Kaduna South LGA, the southern part of the Igabi LGA, and the Northern part of the Chikun LGA. Kaduna is 912km north of the Gulf of Guinea, about 390km from Nigeria's northern border, and 180km from Abuja, the country's capital city. It has an area of about 35 square kilometres (Ariko et al., 2018).

The city has a tropical continental climate, characterised by wet and dry seasons. The tropical continental climate is more pronounced in the dry season, particularly in December and January. The dry season is from October to April and is dominated by the north-east trade wind called Harmattan, which prevails between November and February. The dry season is also rainless from October to

April. The wet season is dominated by south-east winds, which occur from May/June to October (Ariko et al., 2025). The natural vegetation of the study area is Northern Guinea Savanna, with grasses dominating and scattered trees rarely exceeding 15ft. Meanwhile, the seasonal character of rainfall in the study area has influenced vegetation, which turns evergreen during the wet season and pale brown in the dry season (Ariko *et al.*, 2014).

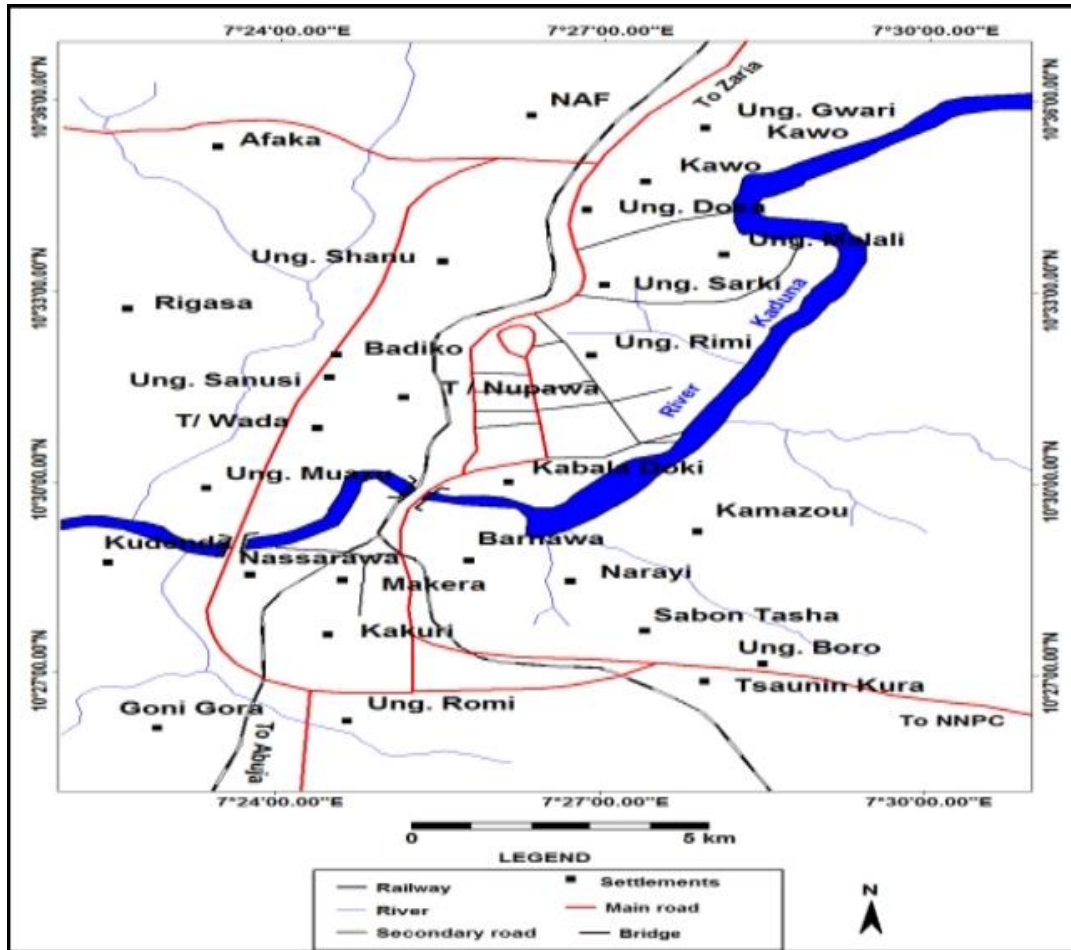


Figure 1: Map of the Study Area

Source: Adapted from the Administrative Map of Kaduna State, 2025

Data Collection

A multi-stage sampling technique was employed to acquire the data. Kaduna Metropolis was stratified into four key local government areas: Kaduna North, Kaduna South, Chikun, and Igabi. Random sampling technique was then used to select households, waste collectors, and recycling firms within each LGA. Purposive sampling was used to select key informants, including government officials, environmental agencies, and recycling program managers. Krejcie and Morgan's (1970) method for determining sample size was employed; a total of 384 respondents were sampled for questionnaire administration.

Data Analysis

To evaluate the current state and effectiveness of recycling programs in the study area, descriptive statistics were used to assess respondents' perceptions. Regression analysis was employed to examine the impact of recycling programs on employment, income levels, and community well-being.

RESULT AND DISCUSSION

Socio-Economic Characteristics of the Respondents

Figure 2 presents the distribution of the respondents by Gender. The results show that the majority of respondents were male (55%), while females constituted 45%. The largest age group among the respondents, as shown in Figure 3, is those aged 26–35 years (39%), followed by those aged 18–25 years (31%). This suggests that the majority of respondents were young and middle-aged adults, which may reflect a higher level of awareness and participation in recycling programs among these age groups. Younger and middle-aged adults were more likely to adopt sustainable practices due to higher levels of awareness and education.

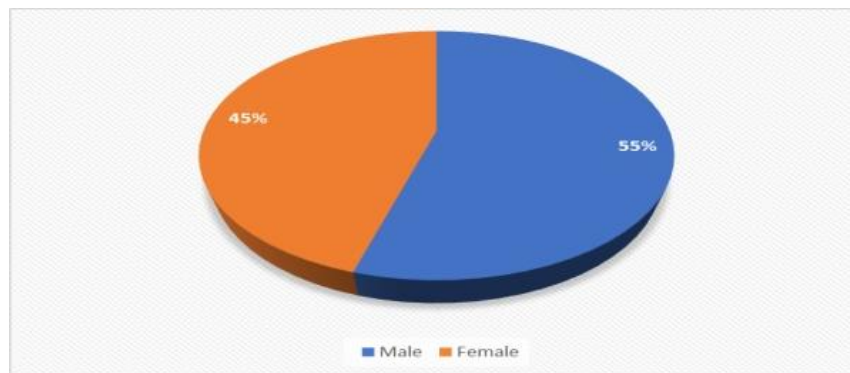


Figure 2: Distribution of the Respondents by Gender

Source: Field Analysis, 2025

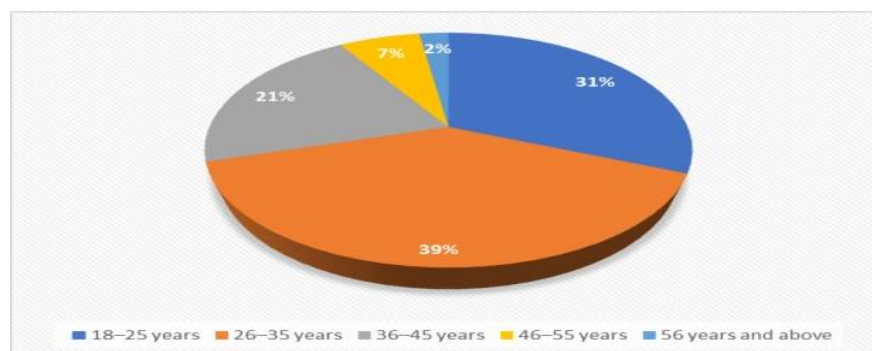


Figure 3: Distribution of Respondents by Age

Source: Field Survey, 2025

As presented in Figure 4, over half of the respondents (52.08%) had a tertiary education, indicating a relatively educated sample. This may influence their awareness and participation in recycling programs. A smaller percentage (3.65%) has no formal education, suggesting a need for targeted outreach to less educated groups. Education plays a critical role in fostering awareness and participation in recycling programs. The high percentage of educated respondents suggests a greater potential for behavioural change and adoption of sustainable practices. Studies by Akinbami &

Adedoyin (2020) and Yusuf *et al.* (2019) emphasised that education level influences participation in recycling and the socio-economic benefits derived from such programs.

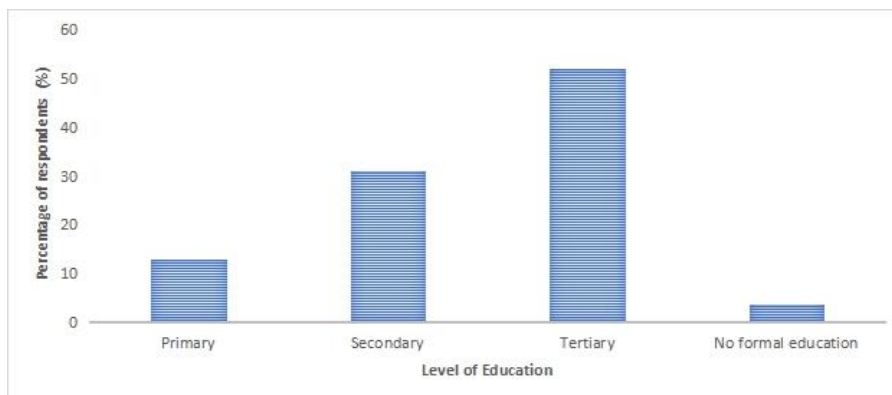


Figure 4: Distribution of Respondents by Level of Education
Source: Field Survey, 2025

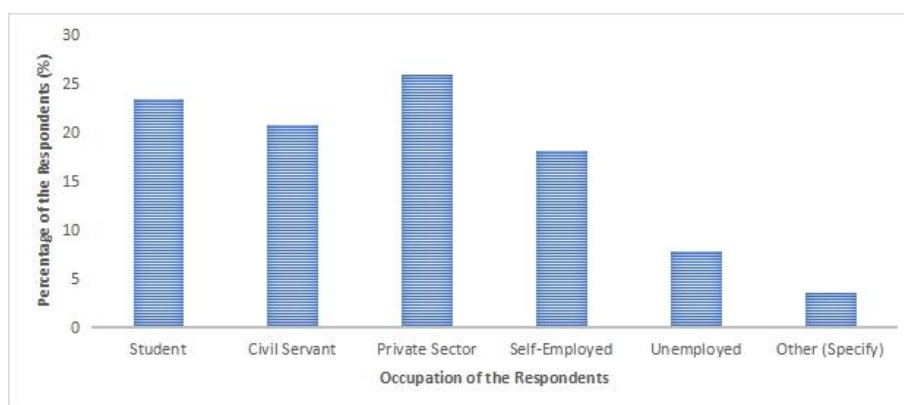


Figure 5: Distribution of Respondents by Occupation
Source: Field Survey, 2025

The largest occupational group was the Private Sector Employees (26.04%), followed by Students (23.44%) and Civil Servants (20.83%). This distribution reflects a mix of employed and student respondents, which may influence their perspectives on recycling programs based on their work or study environments. Recycling programs provided economic opportunities for diverse occupational groups, including students, private sector employees, and civil servants. This aligns with the findings that recycling creates jobs and income-generating opportunities. Research by Yusuf *et al.* (2019) highlights the role of recycling in supporting small-scale entrepreneurs and informal workers, contributing to poverty alleviation and economic empowerment.

Assessment of Socio-Economic Benefits of Recycling Programs

Figure 6: Types of materials commonly recycled in the study area. From the result, it was observed that the most commonly recycled materials were Plastic (35%) and Paper (25%). Glass (13%) and Organic Waste (14%) were less frequently recycled, while Metal (10%) and other materials (3%) were the least recycled. This suggests a focus on plastic and paper recycling in the area. Recycling plastics and paper aligns with the principles of a circular economy, where materials are reused and

repurposed to minimise waste. Studies by Alabi *et al.* (2020) and Adekunle (2020) emphasise the environmental and economic benefits of recycling plastics and paper, which are widely available and easily recyclable.

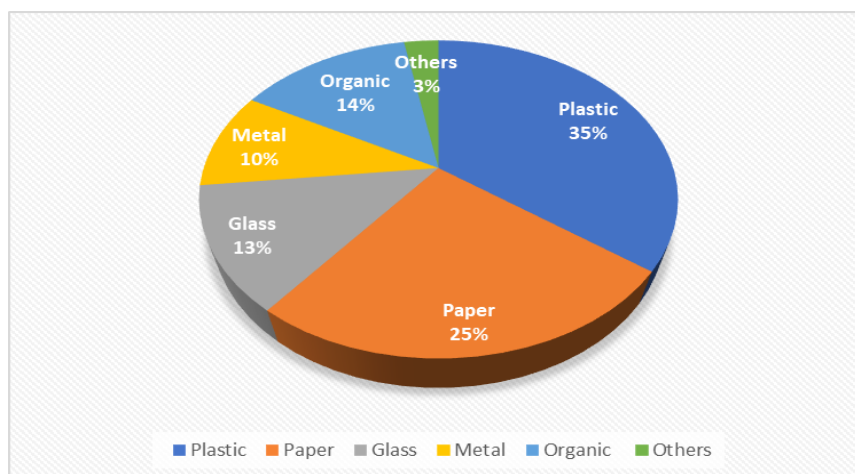


Figure 6. Types of Materials Commonly Recycled
Source: Field Survey, 2025

As revealed in Table 1, primary sources of information about recycling programs were Government Agencies (31.25%) and social media (26.04%). NGOs (20.83%) and Community Leaders (15.63%) also played significant roles, while a small percentage (6.25%) relied on other sources. This highlighted the importance of government and digital platforms in disseminating information. Effective communication channels, such as social media and government agencies, are critical for raising awareness and encouraging participation in recycling programs (Zaman & Lehmann, 2017). Research by Akpan and Williams (2020) highlights the role of government-led initiatives and digital platforms in promoting recycling and sustainable waste management.

Table 1: Primary Source of Information on Recycling Programs

| Source of Information | Frequency | Percentage |
|---------------------------------------|------------|------------|
| Government Agencies | 120 | 31.25 |
| Non-Governmental Organisations (NGOs) | 80 | 20.83 |
| Social media | 100 | 26.04 |
| Community Leaders | 60 | 15.63 |
| Other | 24 | 6.25 |
| Total | 384 | 100 |

Source: Field Survey, 2025

Tables 2, 3, and 4 present respondents' perceptions of economic benefits, the nature of the benefit, and the impact of the recycling program on the community. The result indicates that the majority of respondents (57.29%) report that they or someone in their household has benefited economically from recycling programs. However, 42.71% had not experienced such benefits, indicating that economic gains are not evenly distributed. Among those who reported having benefited economically from the recycling programs, the most common benefits are Income Generation (40.46%) and Employment Opportunities (32.27%). Skill Acquisition (21.82%) was also notable, while a smaller

percentage (5.45%) mentioned other benefits. This highlights the role of recycling programs in creating jobs and generating income. This aligns with Yusuf et al. (2019) and Okonkwo et al. (2020), whose work emphasises the role of recycling in supporting small-scale enterprises and creating jobs in waste collection and processing.

Table 2: Economic Benefits from Recycling Programs

| Economic Benefits | Frequency | Percentage |
|-------------------|------------|------------|
| Yes | 220 | 57.29 |
| No | 164 | 42.71 |
| Total | 384 | 100 |

Source: Field Survey, 2025

Table 3: Respondents' Perceptions on the Economic Benefits of the Recycling Program

| Economic Benefit Type | Frequency | Percentage |
|--------------------------|------------|------------|
| Employment Opportunities | 71 | 32.27 |
| Income Generation | 89 | 40.46 |
| Skill Acquisition | 48 | 21.82 |
| Other | 12 | 5.45 |
| Total | 220 | 100 |

Source: Field Survey, 2025

As revealed in Table 4, the most significant impacts of recycling programs on the community were Reduced Environmental Pollution (35.46%) and Improved Sanitation (31.92%). Increased Community Engagement (21.28%) was also notable, while 8.87% reported No Significant Impact, suggesting that some communities may not yet feel the benefits. Recycling aligns with the Sustainable Development Goals by reducing pollution and improving environmental health. Studies by Ogunyemi *et al.* (2021) and Alhassan and Danmusa (2019) highlight the environmental benefits of recycling, including reduced pollution and improved sanitation.

Table 4: Respondents' Perceptions on the Impact of Recycling on Community Well-being

| Impact on Community Well-being | Frequency | Percentage |
|---------------------------------|------------|------------|
| Improved Sanitation | 123 | 31.92 |
| Reduced Environmental Pollution | 136 | 35.46 |
| Increased Community Engagement | 82 | 21.28 |
| No Significant Impact | 34 | 8.87 |
| Others | 9 | 2.47 |
| Total | 384 | 100 |

Source: Field Survey, 2025

The Result in Table 5 shows that 59.89% of respondents agreed or Strongly Agreed that recycling programs had improved the standard of living in their community. However, 26.04% were Neutral, and 14.07% Disagreed or Strongly Disagreed, indicating mixed perceptions about the impact of recycling programs on living standards. Recycling programs improve livelihoods by creating economic opportunities and enhancing community well-being. Research by Yusuf *et al.* (2019) and

Akinbami and Adedoyin (2020) highlighted the socio-economic benefits of recycling, including poverty alleviation and improved living standards.

Table 5: Perception of Recycling Programs on Standard of Living

| Perception of Standard of Living | Frequency | Percentage |
|----------------------------------|------------|------------|
| Strongly Agree | 80 | 20.83 |
| Agree | 150 | 39.06 |
| Neutral | 100 | 26.04 |
| Disagree | 40 | 10.42 |
| Strongly Disagree | 14 | 3.65 |
| Total | 384 | 100 |

Source: Field Survey, 2025

CONCLUSION AND RECOMMENDATIONS

The study analysed recycling programs and their socio-economic impact in Kaduna Metropolis. The results show that recycling programs have created employment opportunities, generated income, and improved community well-being. However, economic benefits are not evenly distributed, and some communities still do not feel the impact. Recycling programs reduce environmental pollution, improve sanitation, and conserve resources. However, challenges such as inadequate infrastructure and low awareness hinder their effectiveness. Participation in recycling activities, community engagement, and infrastructure are the most critical factors for the success of recycling programs. Government support and awareness also play important roles, but are less impactful compared to participation and infrastructure. The findings align with the Circular Economy Theory and the Sustainable Livelihoods Framework, which emphasise the importance of resource efficiency, community empowerment, and economic opportunities for achieving sustainable waste management.

Based on the above findings, the study therefore came up with the following recommendations:

- Integrate recycling education into school curricula to foster a culture of recycling from a young age.
- Establish more recycling centres in both urban and rural areas to make recycling more accessible.
- Increase funding for recycling programs to improve infrastructure, provide incentives, and support awareness campaigns.
- Incentivise private companies to invest in recycling initiatives through public-private partnerships.
- Establish a monitoring and evaluation framework to assess the effectiveness of recycling programs and identify areas for improvement.

REFERENCES

- Adekunle, A. (2020). Strategic approaches to waste management and recycling in urban areas. *Nigerian Environmental Studies*, 6(1), 17–29.
- Akinbami, J., & Adedoyin, R. (2020). Recycling programs and their socio-economic impact in urban Nigeria. *African Journal of Sustainable Development*, 10(3), 67–84.



- Alabi, S., Adeyemi, T., & Onwuka, K. (2020). Energy savings from plastic recycling: A case study from Lagos. *Energy Efficiency Journal*, 9(2), 34–45.
- Alhassan, S., & Danmusa, K. (2018). Exploring the role of recycling in sustainable urban waste management. *International Journal of Environmental Studies*, 26(1), 45–62.
- Ariko, J. D., Sawa, B. A., & Abdulhamed, I. A. (2014). Variability in carbon monoxide concentration in Kaduna Metropolis, Nigeria. *Research Journal of Environment and Science*, 6(4), 189–194.
- Ariko, J. D., Sawa, B. A., Abdulhamed, I. A., Aruya, E. I., & Abdulsalam, J. A. (2018). An assessment of the variability of bioclimatic conditions within Kaduna Metropolis, Kaduna State, Nigeria. *Zaria Geographer*, 25(1), 28–38.
- Ariko, J. D., Ikpe, E., Yerima, N. D., & Abdulsalam, A. J. (2025). Analysis of thermal comfort trend of Kaduna Metropolis, Kaduna State, Nigeria. *Kaduna Journal of Geography*, 6(1), 1–13.
- Eurostat. (2021). Recycling rates in the EU. <https://ec.europa.eu/eurostat>
- Godfrey, L., & Oelofse, S. (2017). Historical trends in waste management in South Africa: Achievements and challenges. *Waste Management*, 32(11), 1–12.
- Nnaji, C. C. (2015). Waste management and recycling in Nigeria: Opportunities and challenges. *Journal of Environmental Research*, 12(3), 101–115.
- Ogu, V. I. (2016). Waste management challenges in Nigeria: A case study of Lagos. *Waste Management Journal*, 17(4), 23–35.
- Ogunyemi, J., Adekunle, L., & Alabi, S. (2021). Waste management practices and community participation in Nigerian cities. *Journal of Environmental Management*, 23(4), 278–295.
- Okonkwo, P. (2020). The economic value of waste recycling programs in urban settings. *Economic Review of Waste Management*, 5(1), 38–51.
- United Nations Environment Programme. (2018). *Africa Waste Management Outlook*. Nairobi: UNEP.
- World Bank. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. Washington, DC: World Bank.
- Yusuf, A., Lawal, T., & Okoye, P. (2019). Economic implications of recycling in Kaduna Metropolis. *Nigerian Journal of Urban Studies*, 14(2), 89–102.
- Zaman, A., & Lehmann, S. (2017). Urban waste management: A global perspective. *Waste Management Journal*, 33(4), 988–1000.