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EXPLORING BARRIERS TO EFFECTIVE GARBAGE SORTING FOR RECYCLING IN KANO STATE METROPOLIS

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ABSTRACT

The aim of this study was to examine the Barriers to Effective Garbage Sorting for Recycling in Kano State Metropolis and to identify Possible Solution towards the Barriers. The study was conducted from June, 2023 to March, 2024. Descriptive survey research design was employed for this study. The population of the study area are four million four hundred and ninety one (4,491,000) as per 2023 growth index of .85% (NPC). Three hundred and fifty seven (357) participants were randomly selected using research advisor (2006) out of which two hundred and fourteen (214) were male and one hundred and forty three (143) were female. Simple random sampling technique was used to select the sample size of the study. The instrument used to collect data was self-developed questionnaire. The questionnaire was validated by experts in environmental waste management and statisticians. The reliability index of 0.78 was obtained using Pearson Moment Correlation Coefficient (PPMC) after the questionnaire was subjected to test re-test. Frequency count and descriptive statistics was used to analysed the data. The result of the survey obtained revealed that people in Kano State Metropolis are facing challenges towards sorting out garbage for recycling. Various factors have also been identified to provide solution against barriers hindering sorting out garbage in the study area. It is recommended that government should invest in waste sorting and recycling machines for metals, plastics/nylons, bottles for further usage of new products and safe and hygienic environment. Governments and Non-governmental organisations should promote public awareness and education on the importance of garbage sorting, develop and implement effective waste management policies and regulations among others.

Key Point: *Barriers, Ecology, Garbage Sorting, Recycling*

Introduction

West African sub-continent is being faced by many ecological disasters, some of these disasters are natural while others are being caused by human activities. The greatest challenge of ecological disaster in west Africa are single used Poly bags/Nylons, Papers, bottles, metals and steels waste among others which we are not able to recycle. In most advance countries such communities were used to sorting home base garbage which makes the work of refuse disposal companies easier and processing of the waste most convenient. The rapid urbanization and industrialization of modern society have led to an unprecedented increase in waste generation, posing significant environmental and health challenges. In response, the concept of ecological civilization has emerged as a promising solution (Zhang, et al., 2020). Ecological civilization is a concept that emphasizes the need for a fundamental transformation of human society to achieve a harmonious relationship between humans and nature through environmental sustainability to prioritize environmental protection and conservation, Social Equity to promote social justice and equality and economic viability to ensure economic development while minimizing environmental degradation. Despite these challenges, garbage sorting presents several opportunities for achieving ecological civilization,

including: Reduced waste disposal costs: effective sorting can minimize waste disposal costs. Increased recycling rates: sorting can facilitate the recovery of valuable materials. Job creation and economic benefits: a well-organized waste management system can create employment opportunities and stimulate local economies. The poor state of solid waste management in cities of developing countries is fast assuming the scale of a major social/environmental challenge. The main drivers of the waste problem in Nigeria, for instance, are poverty, high population and urbanization growth rates, compounded by a weak and underfunded infrastructure. The gravity of this problem is perhaps best reflected in the level of attention given to it in the United Nations Millennium Declaration in September, 2000. Three of the eight Millennium Development Goals (MDGs) in the declaration have waste or resource efficiency implications. In response to the waste challenge many developed countries have embarked upon ambitious environmental reforms, recording remarkable advances in best practices and sustainable management of their Municipal Solid Waste (MSW). The same cannot be said for most countries in Sub-Sahara Africa, however, as a result of several barriers militating against (Ezeah & Nnoram, 2019). Increasing municipal solid waste (MSW) generation is a major concern worldwide, with least developed African economies such as South Africa, Egypt, and Nigeria are particularly affected due to ineffective waste management practices (Muzenda, 2015; Sango et al, 2015). These practices include littering, illegal dumping, poor waste management, outdated measures, escalating management costs, decreasing landfill space, and limited land availability for new landfills (Muzenda, 2015; Sango et al, 2015). It is anticipated that Africa is headed for a major social and economic transformation in this century, with its population expected to reach 2.4 billion by 2050 (Hall, et al. 2017). Urbanisation and changing consumer purchasing habits will lead to exponential growth in waste generation. Africa generated 125 million tons of MSW in 2012, with 81 million tons coming from sub-Saharan Africa (Debrah, et al., 2022). This is expected to increase to 244 million tons per year by 2025 (Godfrey, et al., 2019). In 2011, South Africa generated approximately 108 million tons of waste, which increased to 121 million tons in 2017 (Godfrey & Dambuza, 2019; Nyuka, et al, 2020). Like other developing countries, South Africa faces significant challenges due to poor waste management practices, primarily driven by issues at the local government level (Fakoye, 2015). Contributing factors include poor organisational structures, lack of capacity and appropriate skills, inadequate budgeting, ineffective legislation and enforcement, low public awareness, conflicts, and corruption (Godfrey, et al., 2019, Tsheleza, et al., 2019).

Objectives of the Study

i. To find out the challenges hindering sorting out garbage for recycling in Kano State Metropolis.
ii. To ascertain possible ways to overcome the challenges hindering the sorting out of garbage for recycling in Kano State Metropolis.

Research Questions

i. What are the challenges hindering sorting out garbage for recycling in Kano State Metropolis?
ii. What are the possible ways to overcome the challenges hindering the sorting out of garbage for recycling in the study area?

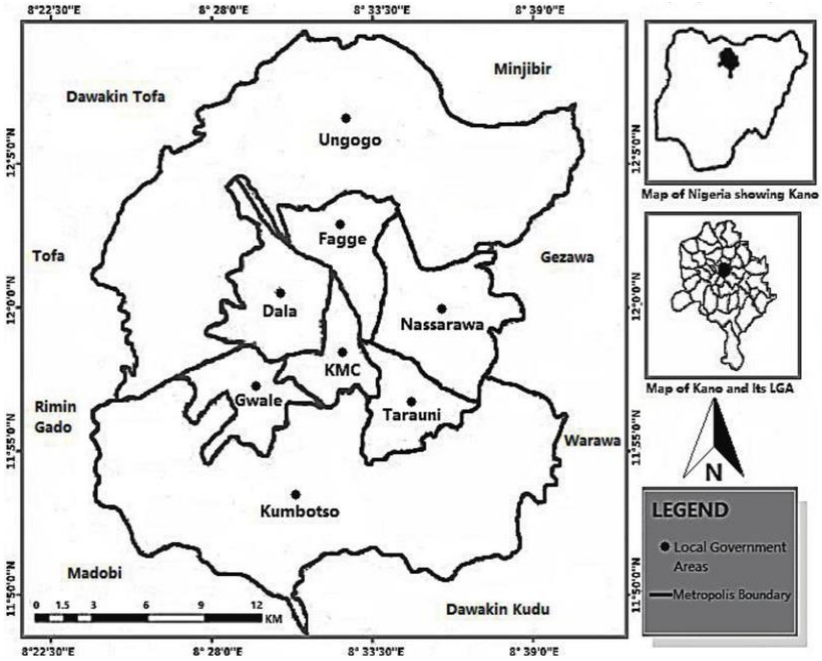
Statement of the Problem

Solid waste management poses a significant challenge globally, especially in developing economies, where increasing waste generation and ineffective management measures are common. Municipalities, responsible for managing waste, often struggle to provide efficient services (Mukwevho, et al., 2024). The rapid urbanization and industrialization of modern society have led to an unprecedented increase in waste generation, posing significant environmental and health challenges (Onyinyechi, et al., 2014). Many developed countries have embarked upon ambitious environmental reforms, recording remarkable advances in best practices and sustainable management of their Municipal Solid Waste (MSW). Sustainable

MSW should aim to continually improve the environment, provide direct health benefits, support economic productivity, and provide safe, dignified and secure employment. Many developing countries such as Nigeria are reported to have fared less well in implementing sustainable SMW management as a result of several barriers militating against municipal solid waste management (Ezeah & Nnoram, 2019). In response, the concept of ecological civilization has emerged as a promising solution. Garbage sorting is a critical component of waste management, and its implementation is essential for achieving ecological civilization.

Perhaps, many researchers conducted study on challenges associated with sorting out garbage and the findings obtained from the studies shows various obstacles faced when sorting out and recycling garbage. But none of the researches have been found to be conducted in Metropolis areas of Kano State. In light of the above findings, this research study was intended to explore barriers to effective garbage sorting for recycling in Metropolis area of Kano State as findings shows.

Study Sites



The figure above showed a map of the study area which consist eight metropolises local government although six (6) composed cosmopolitan due to their high population density and two (2) peri urban which are low density. Kano is the commercial hub of Northern Nigeria, the spatial distribution of population in Kano metropolis is nearly 50 percent of the entire population of Kano state this contributed to overall population density of the study area. All the eight local government stretched between 8^0 22'' 30' to 8^0 39'' 0' east of meridian and 11^0 50'' 0' to 2^0 5'' 0' north of equator.

Methodology

Descriptive survey research design was used to conduct the study. The population of the study area are four million four hundred and ninety one thousand (4,491,000) as per 2023 at growth index of .85% (NPC). Three hundred and fifty seven (357) participants were randomly selected using research advisor (2006) out of which two hundred and fourteen (214) were male and one hundred and forty three (143) were female. Simple random sampling technique was used to select the sample size of the study area. The instrument used to collect data was a self-developed questionnaire consisted of nineteen (19) items. The questionnaire was designed in three different sections. Section A on demographic characteristics of the respondent, section B is a close items response on sorting home based garbage and section C which designed in a four Likert Scale (Strongly Agree (4), Agree (30, Disagree(2), Strongly Disagree(1) comprises of items on challenges and solutions to barriers hindering sorting home based garbage for recycling. The questionnaire was validated by experts in environmental waste management and statisticians. The Cronbach's alpha

reliability index of 0.78 was obtained. Frequency count and descriptive statistics were used to analysed the data. The entire populations are distributed across the eight local government areas that make up the Kano Metropolis namely; Dala, Minicipal, Gwale, Fagge, Tarauni, Nassarawa, Kumbotso and Ungogo.

Informed consent was obtained from all respondents before administering the questionnaire. The respondents' identities were kept confidential. A questionnaire was administered to 357 respondents, selected through simple random sampling technique. Ten (10) research assistants were trained to administer the questionnaires. They were responsible for ensuring that the questionnaires were completed correctly and that the respondents understood the questions. All the questionnaires were filled and returned.

Results

Table 1: Demographic Characteristics of the Participants (n = 357)

Items	Number of Participants	Percentage%
Gender		
Male	214	60%
Female	143	40%
Total	**357**	**100.0%**
Occupation		
Civil Servants	114	32%
Business Men	118	33%
Petty traders/Farmers	125	35%
Total	**357**	**100.0**

Field Data 2024

Table 1 above presents demographic variables of the sample understudy. The table showed distribution of respondents by gender 214(60%) of the respondents were male while 143(40%) respondents were female. A total of 357 respondents were studied across Kano metropolis. Distribution of respondents by occupation was recorded as civil servant who form the sample of the study were 114(32%), those who indicate they are business men were 118 (33%) while respondents who showed they are petty traders and farmers were 125(35%).

Research question 1: What are the challenges hindering sorting out garbage for recycling in Kano State Metropolis?

Table 2: Challenges hindering sorting out garbage for recycling in Kano Metropolis (n =357)

Field Data 2024

Items	N	Mean	Std. Dev.	Decision
Lack of knowledge and awareness on what can and cannot be sorted and recycled	357	3.58	1.376	Strongly Agree
Inadequate knowledge and training for waste management workers and public	357	3.96	1.981	Strongly Agree
Lack of access to recycling facilities and limited access to recycling programs, composting facilities and proper waste disposal services	357	3.35	1.249	Strongly Agree
Perceived lack of impact that recycling is not an effective way to address environmental issue	357	2.26	1.032	Disagree
Time consuming making it hard for people to participate and physical disabilities that make sorting and handling garbage challenging	357	3.63	1.371	Strongly Agree
Cultural and social barriers which do not prioritized waste sorting, recycling and concerns about unpleasant odors and mess associated with sorting garbage	357	2.98	1.547	Strongly Agree

Table 2 presents responses from the sample at the study area based on the challenges being faced in sorting out garbage for recycling in Kano State Metropolis. The survey results reveal significant barriers to effective waste sorting and recycling practices among respondents in Kano State metropolis. The top barriers identified are:

1. **Inadequate knowledge and training**: Respondents strongly agree (mean score: 3.96) that waste management workers and the public lack adequate knowledge and training on waste management.
2. **Lack of knowledge and awareness**: Respondents strongly agree (mean score: 3.58) that they lack knowledge on what can and cannot be sorted and recycled.
3. **Limited access to recycling facilities**: Respondents strongly agree (mean score: 3.35) that they have limited access to recycling facilities, composting facilities, and proper waste disposal services.
4. **Time-consuming and physical challenges**: Respondents strongly agree (mean score: 3.63) that sorting and recycling is time-consuming and physically challenging, particularly for those with disabilities.

5. **Cultural and social barriers**: Respondents strongly agree (mean score: 2.98) that cultural and social norms do not prioritize waste sorting and recycling, and that concerns about unpleasant odors and mess associated with sorting are significant.

On the other hand, respondents they disagree showed a mean score of 2.26 that recycling is not an effective way to address environmental issues, indicating that they recognize the importance of recycling. Overall, the results suggest that addressing these barriers through education, training, and infrastructure development is crucial to promoting effective waste sorting and recycling practices in Kano State metropolis. The scores conclude there are Challenges faced towards sorting out garbage for recycling in Kano Metropolis.

Research question 2: What are the possible ways to overcome the challenges hindering the sorting out of garbage for recycling in the study area?

Table 3: Ways to overcome challenges hindering sorting out garbage for recycling (n =357)

Items	N	Mean	Std.Dev.	Decision
Education and awareness on how to sort out waste and the importance of recycling and its benefits	357	3.84	1.765	Strongly Agree
Provision of accessible recycling facilities (sorting centres, clear labeled and signage recycling bins and composting facilities to minimize confusion and ensures correct sorting.	357	3.17	1.691	Strongly Agree
Developing and enforcing effective waste management policies, laws and regulations that support recycling and reduce waste disposal	357	3.54	1.732	Strongly Agree
Technology integration using sorting machines to Stream line the recycling process, improve efficiencys and reduce contamination	357	3.62	1.804	Strongly Agree
Fostering community involvement through volunteer Programs and collaborative projects to promote Ownership and responsibility for recycling	357	3.25	1.530	Strongly Agree
Continuous monitoring through regular assessment and refining recycling programs to address challenges, identify areas for improvement and adapt to evolving waste management	357	3.76	1.972	Strongly Agree

Field Data 2024

Table 3 presents responses from the sample of the study area based on the possible ways to overcome the challenges hindering the sorting out of garbage for recycling in the Kano Metropolis. The results revealed the most effective strategies to promote waste sorting and recycling practices among respondents in Kano State metropolis. Education and awareness with a mean score 3.84 shows respondents strongly agree that education and awareness on how to sort out waste and the importance of recycling and its benefits are crucial. Continuous monitoring and refinement with a mean score of 3.76 reveals respondents' agreement that continuous monitoring through regular assessment and refining recycling programs is essential to address challenges and identify areas for improvement. Respondents with a mean score of 3.17 strongly

agree that providing accessible recycling facilities, such as sorting centers, clear labeled and signage recycling bins, and composting facilities, are vital to minimize confusion and ensure correct sorting. Technology integration with a mean score 3.62 shows that respondents strongly agree that integrating technology, such as sorting machines, can streamline the recycling process, improve efficiency, and reduce contamination. Fostering community involvement with a mean score of 3.25 indicates that respondents strongly agree that fostering community involvement through volunteer programs and collaborative projects can promote ownership and responsibility for recycling. Continuous monitoring through regular assessment and refining recycling programs to address challenges, identify areas for improvement and adapt to evolving waste management with a mean score of 3.76 has also been agreed by the respondents as a way of proving solutions to the challenges associated with sorting out home based garbage in Kano State Metropolis. Developing and enforcing effective waste management policies has a mean score of 3.54 meaning that respondents strongly agree that developing and enforcing effective waste management policies, laws, and regulations that support recycling and reduce waste disposal is essential.

Discussion of the Result

Based on the above this study has unfolded problems associated with different facets affecting sorting out and garbage recycling in Kano metropolis. Recycling is the only option for numerous types of waste being spilled across the metropolis. The daily tons brought out of household markets, hospitals and schools continue to litter our streets and extends to farms which the non-degradable part of waste do affect the farm productions in crops and animal rearing practices.

This study has found lack of awareness among the entire sample on matters affecting recycling and its benefit to the community with a X = 3.58. Inadequate knowledge and training for waste with X= 3.96. Time consuming making it hard for people to participate and physical disabilities that make sorting and handling garbage challenging with X =3.63. Lack of access to recycling facilities and limited access to recycling programs, composting facilities and proper waste disposal services with X 3.35.
The findings was similar to the findings of (Godfrey, et al., 2019, Tsheleza, et al., 2019), who opined contributing factors include lack of capacity and appropriate skills, inadequate budgeting, ineffective legislation and enforcement, low public awareness, conflicts, and corruption. The findings of this study have shown technology integration using machine to recycle waste is lacking in Kano metropolis with a X of 3.35 which agrees with increasing municipal solid waste (MSW) generation is a major concern worldwide, with least developed African economies such as South Africa, Egypt, and Nigeria particularly affected due to ineffective waste management practices (Muzenda, 2014; Sango et al, 2014). This study has found developing and enforcing effective waste management policies, laws and regulations that support recycling and reduce waste disposal with a X of 3.54 which has direct bearing with United Nations Millenium development goals which states, waste challenge many developed countries have embarked upon ambitious environmental reforms, recording remarkable advances in best practices and sustainable management of their Municipal Solid Waste (MSW).

Conclusion

Ecological civilization offers a promising framework for addressing the environmental challenges posed by waste generation. Garbage sorting is a critical component of waste management, and its implementation is essential for achieving ecological civilization. While several challenges hinder the effective sorting of garbage, best practices and case studies demonstrate the potential for garbage sorting to contribute to a more sustainable and equitable society. On the issues of best practices we need to reflect on the effort by some east African countries for their effort to ban use of single use nylons in the area of production, buying, selling and using. These single use nylons contributed to the major environmental waste pollutions as well as odors affecting health related problems in Kano Metropolis local governments in Kano state.

Recommendations

Policy makers and all the stakeholders concerned should:

1. Organize community awareness campaigns to educate residents/people on the importance of waste separation, proper waste disposal practices, and the use of color-coded bins.
2. Provide education and training programs for residents, particularly in schools and community centers, to promote proper waste management practices and environmental sustainability.
3. Provide separate bins for different types of waste and ensure that they are easily accessible to all households.
4. Collaboration with Waste Collection Companies for guidelines to separate waste and adopt better waste management practices.
5. Regularly monitor and evaluate the effectiveness of waste management practices and awareness campaigns to identify areas for improvement.

Implication of the study

Policy Implications

- The results obtained from the study highlighted a significant knowledge gap among residents regarding proper waste management practices. Policy makers should invest in public education and awareness campaigns to promote better waste management practices.
- The lack of awareness about color-coded bins highlights the need for policy makers to implement and promote this system, which can help to streamline waste separation and disposal practices.
- Policy makers should invest in the development of waste management infrastructure, including the provision of adequate waste collection facilities and recycling facilities.
- Policy makers should encourage private sector participation in waste management, including the provision of waste collection services and recycling facilities.
- Policy makers should develop and implement effective waste management policies and regulations, including those related to waste separation, disposal, and recycling.
- **Environmental Implications**

i. Increased Pollution: The lack of sorting home garbage can lead to increased pollution, as waste is not properly separated and disposed of. This can result in the contamination of soil, water, and air.

ii. Loss of Natural Resources: The failure to recycle and reuse waste can lead to the loss of natural resources, as raw materials are extracted and processed to produce new products.

iii. Climate Change: The decomposition of organic waste in landfills produces methane, a potent greenhouse gas that contributes to climate change.

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