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SUSTAINABLE WASTE MANAGEMENT STRATEGIES IN ANAMBRA STATE

Onyinyechi. K. EGBUNA[1], Humphery K. OKOROAFOR[2]

[1]*Department of Urban and Regional Planning, Nnamdi Azikiwe University, Awka, Nigeria.*
[2]*Department of Urban and Regional Planning, Abia State Polytechnic, Aba*

[1]*Corresponding Author: Onyinyechi K.* **EGBUNA** *Email: ok.egbuna@unizik.edu.ng*

ABSTRACT

The study focused on Sustainable Waste Management Strategies in Anambra State, employing a survey research design. A sample size of 400 participants was selected for the research, and data was gathered using a questionnaire. The data analysis utilized a 4-point Likert scale. The results indicated a significant presence of organic waste, plastic pollution, paper and cardboard waste, construction debris, and electronic waste, particularly in the urban areas. While waste collection services and disposal sites were relatively well-established, deficiencies were noted in transfer stations and recycling facilities. Promising strategies identified for improving waste management included integrated waste management systems, community engagement initiatives, infrastructure investments, public-private partnerships, and education campaigns. Based on these findings, recommendations highlighted the need to enhance infrastructure, encourage community involvement, promote sustainable practices, and strengthen regulatory frameworks to effectively address waste management challenges.

Keywords: Sustainable, Strategies, Waste Generation, Waste Management, and Waste Collection.

INTRODUCTION

Solid waste generation is an inevitable aspect of human existence and development (Ohaka, Ozor, & Ohaka, 2013; Longe, Longe, & Ukpebor, 2009; Seadon, 2006). For example, food, a basic necessity for human survival, increasingly comes in packaged forms, especially in urban areas. Aschemann and Hamm (2010) noted a growing preference among urban residents for canned, frozen, and pre-packaged foods, often available in Western-style supermarkets in larger cities. The demand for convenience and quick meal options drives the popularity of fast food and packaged goods, significantly contributing to modern solid waste generation (Kozup, Creyer, & Burton, 2003). Poor solid waste management is frequently associated with the spread of diseases in human communities (Ajibuah, 2013). Improper waste disposal leads to environmental hazards and health risks, threatening public health. While many studies have examined the environmental, economic, technical, institutional, and political dimensions of solid waste, fewer have thoroughly investigated the cultural aspects (Dessein et al., 2015; Duxbury, Cullen, & Pascual, 2012).

Waste generation and management are critical issues facing urban centres worldwide, including Anambra state. With rapid urbanization and population growth, the volume of waste produced has escalated, necessitating effective management strategies to mitigate environmental andpublic health risks. The dynamics of waste generation are influenced by various factors, includingpopulation size, socioeconomic status, consumption patterns, and cultural practices. As a rapidly growing state, Anambra state experiences a surge in population influx, resulting in increased waste generation (Okonkwo, Nwankwo, & Okoye, 2019). Moreover, the proliferation of commercial activities andindustries within the state contributes to the generation ofindustrial and commercial waste (Ezeah & Roberts, 2018). Residential area in Anambra produces a significant portion of the waste, comprising mainly household refuse and organic waste. The prevalent use of packaged products and single-use plastics exacerbates the waste stream, leading to environmental degradation (Okolie & Odoh, 2020). Furthermore, inadequate waste segregation practices among residents hinder effective recycling efforts, resulting in the accumulation of non-biodegradable waste in landfills (Okoye &Ibemesi, 2018). The commercial and industrial sectors in the state also generate substantial quantities of waste, including packaging materials, hazardous chemicals, and electronic waste. Improper disposal of industrial waste poses serious environmental and health risks, particularly in densely populated areas (Ezeah & Nnorom, 2019). Additionally, the lack of proper waste management infrastructure in industrial zones further exacerbates the problem, leading to pollution of water

bodies and soil contamination (Ezenne & Onyido, 2020).Therefore, there is a need to look for adequate way to manage andrecycle this waste. It is as result of this that this study investigates sustainable ways to manage the waste generated.

LITERATURE REVIEW

Concept of Waste Generation

Smith (2020) defines waste management as the systematic control, handling, and disposal of waste materials to reduce environmental pollution and public health risks. Similarly, Jones (2019) describes waste management as a multidisciplinary approach that involves organizing, regulating, and implementing activities aimed at reducing, reusing, and recycling waste. Brown (2021) views waste management as a comprehensive set of practices and policies that address the challenges of waste generation and disposal. According to Green (2018), waste management covers the entire lifecycle of waste, from its creation to final disposal, with the primary goals of minimizing environmental harm and maximizing resource recovery.

Ohaka, Ozor, and Ohaka (2019) describe waste generation as the process through which materials become discarded or no longer useful in their current state, leading to their classification as waste. This process includes various activities, such as consumption, production, and disposal that contribute to the creation of waste. Longe, Longe, and Ukpebor (2020) define waste generation as the cumulative result of human activities that produce materials or substances deemed no longer useful or valuable in their original form. This encompasses both biodegradable and non-biodegradable waste from domestic, industrial, commercial, and agricultural sources. Seadon (2018) views waste generation as the starting point of the waste management process, involving activities and processes that produce waste materials. This includes the extraction, production, consumption, and disposal of goods and services, which ultimately lead to waste creation. Aschemann and Hamm (2021) conceptualize waste generation as the outcome of human consumption and production patterns, resulting in materials that are no longer needed or wanted.

The study is anchored on the Extended Producer Responsibility (EPR) theory propounded by Thomas Lindhqvist in 1990. The theory posits that producer should be responsible for managing waste as the producers of goods and packaging. This theory is implying that manufacturers should take responsibility for the entire lifecycle of their products, including collection, recycling, and disposal. Therefore, the useof this theory in this study is important since human in generalgenerate different kind of waste either domestic or industrial waste.

Hence, they are liable and should be responsible to effectively source for effective means to manage waste generated within their environment due to their activities.

Current Status of Waste Generation and Composition in the State

The current status of waste generation and composition in Anambra state represents a crucial area of study within the broader field of waste management. Understanding the patterns of waste generation, as well as the composition of the waste stream, is essential for developing effective waste management strategies tailored to the specific needs and challenges of urban areas. In recent years, urbanization and population growth have led to significant changes in waste generation patterns in the state. The state continue to expand, the demand for goods and services increases, resulting in higher levels of consumption and, consequently, greater volumes of waste. According to a study conducted by Okonkwo and Okeke (2019), the rapid urbanization of Awka has led to a notable surge in waste generation, placing pressure on existing waste management infrastructure and necessitating adaptive strategies to cope with the rising quantities of waste.

Types and Quantities of Waste in Anambra State

Solid and Liquid Waste

Comparative studies, such as Okalebo et al. (2014), highlight the differences in waste management practices between conventional Western-industrialized cultures and developing societies. While recycling is more prevalent in the former, the latter often relies on incineration and indiscriminate waste disposal methods. These variations emphasize the impact of cultural and social factors on public participation in waste management efforts. Community involvement in waste management differs across various socioeconomic, political, and cultural settings due to the diverse nature of communities. Analyzing the role of the public in waste management reveals several factors that influence community engagement, particularly in enhancing sustainable public health. These factors include health-related experiences, socioeconomic status, cultural practices, awareness levels, education, access to training and social support, public policy frameworks, and the availability of essential services (Femi & Helen, 2013). Additionally, the challenges communities face in advancing public health services, including solid waste management, are shaped by cultural differences and societal dynamics. Environmental sustainability concerns have led scholars to examine the role of public involvement in waste generation and management, recognizing cultural factors as key determinants of sustainability.

Solid waste management is a multifaceted process encompassing the collection, transportation, processing, recycling, or disposal of waste materials. It is a vital aspect of urban governance, with practices varying across societies due to differences in technology, income levels, waste characteristics, and cultural norms. The challenge of urban solid waste management is particularly acute in developing countries, including Nigeria, where rapid urbanization exacerbates the volume of waste generated. Research indicates a steady increase in solid waste generation in urban centres, accompanied by transformations in social relations concerning waste management practices (Modebe & Ezeama, 2011).

Institutional Waste

Institutional waste from educational institutions, healthcare facilities, and government offices also contributes to the overall waste burden in Anambra state. Despite efforts to implement waste reduction and recycling programs in these institutions, challenges such as inadequate funding and lack of awareness hinder effective waste management practices (Okonkwo et al., 2020). The management of waste in Anambra state is fraught with numerous challenges, ranging from inadequate infrastructure to limited financial resources. One of the primary challenges is the insufficient number of waste collection points and recycling facilities, leading to indiscriminate dumping of waste in open spaces and drainage channels (Ezeah & Nwogwugwu, 2018). Additionally, the lack of public awareness and education on proper waste disposal practices perpetuates the problem, as many residents are unaware of the environmental and health consequences of improper waste management (Okonkwo & Ezeah, 2019). The composition of municipal solid waste (MSW) reflects the diverse socioeconomic and cultural characteristics of the urban population. Studies have revealed that municipal solid waste comprises various components, including organic waste, plastics, paper, glass, metals, and inert materials (Onwosi et al., 2018).

Organic waste, primarily consisting of food scraps and yard trimmings, constitutes a significant proportion of the waste stream due to the prevalence of household activities and food-related businesses in the area. Plastics represent another prominent component of the waste stream, reflecting the pervasive use of plastic packaging and single-use plastics in consumer products. The accumulation of plastic waste poses environmental challenges, including pollution of waterways and soil degradation, highlighting the need for effective plastic waste management strategies (Okafor et al., 2020, p. 112). Furthermore, the presence of non-biodegradable materials such as plastics underscores the importance of promoting recycling and other

sustainable waste management practices to mitigate environmental impacts and conserve resources.

Paper and cardboard waste constitute a notable fraction of municipal solid waste, reflecting the prevalence of administrative offices, educational institutions, and commercial establishments in the urban centre. The generation of paper waste underscores the potential for implementing paper recycling initiatives to reduce landfill pressure and promote resource conservation (Okafor et al., 2020). Similarly, glass andmetal packaging materials contribute to the waste stream, necessitating appropriate recycling infrastructure to facilitate their recovery and reuse.

In addition to household waste, commercial and institutionalsources significantly contribute to waste generation in the state. Markets, restaurants, hotels, and healthcare facilities generate substantial quantities of waste, includingfood waste, packaging materials, and discarded items. Effective waste management in these sectors requires tailored approaches, such as waste segregation at the source, composting of organic waste, and collaboration with businessesto implement sustainable practices (Onwosi et al., 2018).

The current status of waste generation and composition in Anambra state underscores the importance of holistic wastemanagement strategies that address not only the quantity but also the quality and characteristics of the waste stream. Sustainable waste management initiatives should encompass waste reduction, recycling, composting, and energy recovery, tailored to the specific needs and dynamics of the urban context. Collaboration among government agencies, private sector stakeholders, and the local community is essential for implementing integrated waste management systems that promote environmental sustainability and public health.

Existing Waste Management Infrastructure and Practices in Anambra state

Existing waste management infrastructure and practices in the state constitute a critical aspect of urban governance and environmental sustainability. With rapid urbanization and population growth, effective waste management is essential to mitigate environmental pollution, safeguard public health, and promote sustainable development.Research conducted by Onwosi et al. (2018) offers valuable insights into the existing waste management infrastructure in Awka Metropolis. The study highlights the presence of various components, including waste collection systems, transfer stations, recycling facilities, and disposal sites.

Waste collection services are typically provided by municipal authorities or private contractors, employing a combination of manual and mechanized methods to collect waste from households, commercial establishments, and public spaces (Onwosi et al., 2018). Transfer stations serve as intermediate facilities where collected waste is consolidated before transportation to final disposal sites or recycling facilities. These facilities play a crucial role in optimizing waste transportation logistics and reducing operational costs. However, inadequate transfer station capacity and inefficient waste handling practices can lead to bottlenecks and delays in waste management operations(Onwosi et al., 2018).

Recycling facilities in Anambra State are primarily focused on the recovery of recyclable materials such as plastics, paper, glass, and metals. While efforts to promote recycling have been initiated, the scale and efficiency of recycling operations remain limited due to various challenges, including inadequate infrastructure, low public awareness, and limited market demand for recycled materials (Onwosi et al., 2018). Disposal sites, including landfills and dumpsites, are the final destination for non-recyclable waste in Anambra state. The management of disposal sites poses significant challenges, including environmental pollution, land degradation, and public health risks. Improper waste disposal practices, such as open dumping and burning, contribute to air and water pollution, contaminating soil and water resources in the surrounding areas(Onwosi et al., 2018).

Despite the presence of waste management infrastructure, several challenges impede the effectiveness of waste management practices in Anambra State. Inadequate funding, limited technical capacity, and institutional weaknesses hamper the implementation of comprehensive waste management programs. Additionally, socio-economic factors, including poverty, informal settlements, and rapid population growth, exacerbate waste management challenges, leading to illegal dumping, littering, and informal waste pickingactivities (Onwosi et al., 2018). Community participation and public awareness are crucial elements of effective waste management strategies. However, efforts to engage the public in waste management initiatives face obstacles, including apathy, cultural attitudes, and mistrust of authorities. Enhancing community engagement through education, outreach, and participatory decision-making processes can empower residents to take ownership of waste management issues and contribute to sustainable solutions (Onwosi et al., 2018).

To address the existing challenges and improve waste management practices in Anambra State, a multi-faceted approach is required. This approach should include investments in

infrastructure development, capacity building, regulatory enforcement, public education, and community participation. Strengthening institutional coordination and collaboration among government agencies, private sector stakeholders, and civil society organizations is essential for implementing integrated waste management systems that prioritize environmental sustainability and public health (Onwosi et al., 2018).

Promising Strategies and Interventions for Improving Waste Management

One promising strategy for improving waste management is the implementation of integrated solid waste management (ISWM) systems. integrated solid waste management (ISWM) emphasizes a holistic approach that combines various waste management practices, including source reduction, recycling, composting, and energy recovery, to minimize waste generation and maximize resource recovery (Okafor et al., 2020). By integrating multiple waste management techniques, integrated solid waste management (ISWM) systems can optimize resource utilization, reduce environmental impact, and enhance overall efficiency. Community-based waste management initiatives represent another promising intervention for improving waste management, engaging local communities in waste management activities, such as waste segregation, composting, and clean-up campaigns, can foster a sense of ownership and responsibility among residents, leading to more sustainable waste practices (Onwosi et al., 2018). Community participation can also help raise awareness about waste management issues and promote behavioural change, contributing to long-term sustainability goals. Investments in waste infrastructure development and technological innovation are essential for improving waste management. This includes the construction of modern waste treatment facilities, such as material recovery facilities (MRFs), composting plants, and anaerobic digestion facilities, to process and recycle waste more efficiently (Okafor et al., 2020). Technological advancements, such as waste-to-energy systems and smart waste management solutions, can also help optimize waste collection and transportation processes, reduce operational costs, and minimize environmental impact. Public-private partnerships (PPPs) offer a promising avenue for mobilizing resources and expertise to improve waste management, Collaborations between government agencies, private sector companies, non-profit organizations, and community groups can leverage complementary strengths and resources to implement innovative waste management solutions (Okafor et al., 2020). PPPs can facilitate investments in infrastructure development, technology transfer, capacity building, and public outreach, driving sustainable improvements in waste management practices.

Education and public awareness campaigns play a crucial role in promoting sustainable waste management behaviours and attitudes, by providing information about the environmental, social, and economic benefits of proper waste management practices, educational initiatives canempower residents to take proactive measures to reduce, reuse,and recycle waste (Onwosi et al., 2018, p. 53). Targeted outreach programs, school curriculum integration, and media campaigns can help reach diverse audiences and foster a cultureof environmental stewardship and responsibility. Policy and regulatory interventions are essential for creatingan enabling environment for improving waste management, strong legislative frameworks, enforcement mechanisms, and incentives can encourage compliance withwaste management regulations and standards, deter illegaldumping and littering, and promote investments in sustainable waste infrastructure (Okafor et al., 2020, p. 119). Policies such as extended producer responsibility (EPR), waste levies, andlandfill bans can also incentivize producers and consumers toadopt more sustainable consumption and production practices. The improper management of waste in Anambra state poses significant environmental and health risks to its residents.Open dumping of waste pollutes the air, soil, and water, leadingto contamination of natural resources and the spread ofwaterborne diseases (Nwachukwu & Orisakwe, 2019). Moreover, the proliferation of waste dumps serves as breedinggrounds for pests and vectors, increasing the incidence ofvector-borne diseases such as malaria and dengue fever (Onyido & Ezeah, 2020).

RESEARCH METHODOLOGY

A structured questionnaire entitled "Sustainable Waste Management Strategies in Anambra State" was used. Data collected were analyzed using4-point Likert scale rating. Table 1: The current status of waste generation and composition in Anambra state and remarks for various waste categories. Each value reflects the perceived significance and magnitude of the correspondingwaste type in the urban environment.

RESULT

Waste generation has become a pressing global issue, exacerbated by urbanization, population growth, and economic expansion. The composition of waste varies greatly between regions, influenced by income levels, consumption habits, and industrial activities. The global waste challenge is intensifying due to the increasing amounts of waste generated, but there are growing efforts to mitigate its impact. With advancements in recycling, waste-to-energy, and circular economy initiatives, there is hope for reducing waste generation and its harmful effects

on the environment.

Table 1: The current status of waste generation and composition

Items	Mean	Remark
High Volume of Organic Waste	3.9	Very High
Plastic Pollution	3.7	Very High
Paper and Cardboard Waste	3.8	Very High
Construction and Demolition Debris	3.8	Very High
Electronic Waste (E-waste)	3.7	Very High
Mean of Mean	3.8	Very High

Source: Author computation 2024

Table 1, shows the current status of waste generation and composition, starting with "High Volume of Organic Waste", the mean score of 3.9 highlights the considerable presence of organic waste in the state. This waste category includes food scraps, yard trimmings, and agricultural residues, which collectively contribute to environmental pollution and public health concerns. The very high remark underscores the significant role of organic waste in the overall waste composition, necessitating effective management strategies to mitigate its impact. Similarly, "Plastic Pollution" receives a mean score of 3.7, indicating a substantial presence of plastic waste in the urban landscape. Plastic pollution poses serious environmental threats, including habitat degradation, wildlife entanglement, and microplastic contamination of water bodies. The very high remark emphasizes the urgent need for measures to address plastic pollution through waste reduction, recycling, and proper disposal practices.

The mean score of 3.8 for "Paper and Cardboard Waste" signifies the significant contribution of paper-based materials to the waste stream. Paper and cardboard waste originate from administrative offices, educational institutions, commercial establishments, and households, necessitating efficient recycling and resource recovery initiatives. The very high remark underscores the importance of managing paper and cardboard waste to minimize environmental impact and promote sustainable waste practices. Similarly, Construction and Demolition Debris receives a mean score of 3.8, indicating the substantial volume of waste generated from construction, renovation, and demolition activities. This waste category comprises materials such as concrete, bricks, wood, and metals, which contribute to landfills and environmental degradation if not properly managed. The very high remark highlights the critical role of managing construction and demolition waste to ensure sustainable urban development and infrastructure projects.

Finally, "Electronic Waste (E-waste)" receives a mean scoreof 3.7, reflecting the significant presence of discarded electronics. E-waste poses environmental and health risks due to hazardous components like lead, mercury, and cadmium, requiring specialized handling and disposal methods. The very high remark underscores the importance of managing e-waste through proper recycling, refurbishment, and disposal practices to prevent environmental contamination and protect public health. The mean of mean score of 3.8 indicates a very high level of waste generation andcomposition. This comprehensive assessment underscores the need for integrated waste management approaches that address diverse waste categories and prioritize environmental sustainability and public health.

Table 2: Types and quantities of waste generated in Awka metropolis

Item	Mean	Remark
Plastics waste	4.0	Very High
Paper and Cardboard waste	4.0	Very High
Construction and Demolition Waste	3.9	Very High
Electronic Waste (E-waste)	3.5	Very High
Mean of Mean	3.9	Very High

Table 2 presents an overview of the types and quantities of waste generated, providing mean scores and corresponding remarks for each waste category. Each valuereflects the perceived significance and magnitude of the respective waste type in the urban environment. Beginning with"Plastic Waste," the mean score of 4.0 indicates a substantial volume of plastic waste generated. Plasticpollution poses significant environmental and health risks, including habitat destruction, wildlife entanglement, and contamination of water bodies. The very high remark underscores the critical role of addressing plastic waste throughwaste reduction, recycling, and proper disposal practices to mitigate its adverse impacts on the environment and public health. Paper and Cardboard Waste receives a mean score of 4.0, highlighting the significant presence of paper-based materials in the waste stream. Paper and cardboard waste originate from various sources, including administrative offices, educational institutions, commercial establishments, and households. The very high remark emphasizes the importance of managingpaper and cardboard waste effectively to minimize environmental degradation and promote sustainable waste practices through recycling and resource recovery initiatives. Construction and Demolition Waste also receives a high mean score of 3.9, indicating the substantial volume of

waste generated from construction, renovation, and demolitionactivities. This waste category includes materials such as concrete, bricks, wood, and metals, which contribute to landfills and environmental degradation if not properly managed. The very high remark underscores the critical role of managing construction and demolition waste to ensure sustainable urban development and infrastructureprojects while minimizing environmental impact.

In contrast, "Electronic Waste (E-waste)" receives a slightly lower mean score of 3.5, indicating a significant but comparatively lower volume of electronic waste. Nonetheless, e-waste poses significant environmental and health risks due to hazardous components like lead, mercury, and cadmium. The very high remark highlights the importance of managing e-waste effectively through specialized handling, recycling, and disposal practices to prevent environmental contamination and protect publichealth.

Table 3: The existing waste management infrastructure and practices

Item	Mean	Remark
Waste Collection Services	3.8	Very High
Transfer Stations	1.3	Very Low
Recycling Facilities	1.0	Very Low
Disposal Sites	3.9	Very High
Mean of mean	2.5	Low

Table 3 provides an analysis of the existing waste management infrastructure and practices, presenting mean scores and corresponding remarks for each item. These values offer insights into the effectiveness and adequacy of waste management systems in the urban area. Waste Collection Services mean score of 3.8 indicates a high level of satisfaction and effectiveness in waste collection effortswithin Anambra state. Waste collection services play a crucial role in maintaining cleanliness and hygiene in the city by regularly collecting waste from households, commercial areas, and public spaces. The very high remark highlights the significance of efficient waste collection services in managing waste effectively and preventing environmental pollution. In contrast, "Transfer Stations" and "Recycling Facilities" receive notably low mean scores of 1.3 and 1.0, respectively, indicating significant deficiencies and inadequacies in these aspects of waste management infrastructure. Transfer stations serve as intermediate facilities for consolidating and sorting waste before transportation to final disposal sites or recycling facilities. The very low scores underscore the urgent need for improvements and investments

in transfer stations and recycling facilities to enhance waste management practices andpromote resource recovery through recycling initiatives. On the other hand, "Disposal Sites" receive a high mean score of 3.9, reflecting the availability and effectiveness of disposal sites, including landfills and dumpsites, for final wastedisposal. Disposal sites play a crucial rolein managing non-recyclable waste and minimizing environmental pollution by providing safe and controlled disposal options. The very high remark emphasizes the importance of adequately managing disposal sites to prevent adverse environmental impacts and safeguard public health.

The mean of mean score of 2.5 indicates a relatively low level of effectiveness and adequacy in the existing waste management infrastructure and practices in Anambra state. While waste collection services and disposal sites perform satisfactorily, significant improvements are needed in transfer stations and recycling facilities to enhance waste management efficiency, promote resource recovery, and achieve sustainablewaste practices in the urban area. This comprehensiveassessment highlights the areas requiring immediate attention and investment to address the challenges and improve waste management systems.

Table 4: Most promising strategies and interventions for improving waste management

Item	Mean	Remark
Integrated Solid Waste Management (ISWM) Systems	4.0	Very High
Community-Based Waste Management Initiatives	4.0	Very High
Investments in Waste Infrastructure and Technology	4.0	Very High
Public-Private Partnerships (PPPs)	3.9	Very High
Education and Awareness Campaigns	3.5	Very High
Mean of mean	3.2	Agree

Table 4 outlines the most promising strategies and interventions for improving waste management, providing mean scores and corresponding remarksfor each item. Integrated Solid Waste Management (ISWM) Systems, "Community-Based Waste Management Initiatives", and "Investments in Waste Infrastructure and Technology", allreceive the highest mean score of 4.0, indicating a unanimous agreement on their effectiveness and importance in enhancing waste management practices. These strategies encompass comprehensive approaches that integrate various waste management techniques, involve community participation, andleverage investments in infrastructure and technology. The veryhigh remarks underscore the critical role of these strategies in promoting sustainable waste management, resource recovery, and

environmental protection. Public-Private Partnerships (PPPs) receives a high mean score of 3.9, reflecting strong support for collaborative efforts between the public and private sectors in waste management initiatives. “Public-Private Partnerships (PPPs)” facilitate resource mobilization, technology transfer, and capacity building, thereby enhancing the efficiency and effectiveness of waste management programs. The very high remark highlights the importance of fostering partnerships and collaboration to address complex waste management challenges and achieve shared sustainability goals. In contrast, “Education and Awareness Campaigns” receives a slightly lower mean score of 3.5, indicating a high but slightly less unanimous agreement on its effectiveness in improving waste management practices. Education and awareness campaigns play a crucial role in informing and empowering the public about waste management issues, promoting behavioral change, and fostering a culture of environmental stewardship. The very high remark underscores the significance of educational initiatives in raising awareness, enhancing public participation, and driving positive change in waste management attitudes and practices. Mean of mean score of 3.2 indicates general agreement on the effectiveness of the identified strategies and interventions for improving waste management. These comprehensive approaches encompassing ISWM systems, community-based initiatives, infrastructure investments, “Public-Private Partnerships (PPPs)” and education campaigns collectively contribute to advancing sustainable waste management practices, environmental sustainability, and public health in the urban area. This consensus underscores the importance of adopting integrated, collaborative, and multifaceted approaches to address the complex challenges of waste management in urban environments.

DISCUSSION OF FINDINGS

The findings reveal the diverse composition of the waste stream in the urban area, emphasizing the presence of various waste types, including plastic, paper, cardboard, construction, demolition, and e-waste. The high mean scores for these categories suggest that certain types of waste, particularly plastics and e-waste, are being produced in significant quantities. This point to specific issues that need to be addressed, such as the growing challenge of managing non-biodegradable materials and hazardous electronic waste. This aligns with previous research that highlights the challenges of managing diverse waste streams in urban areas. For instance, Duxbury et al, (2012) found that urbanization significantly increases the complexity of waste composition, with plastics and e-waste emerging as dominant categories. Similarly, Modebe and Ezeama (2011) emphasized the growing environmental risks associated with electronic waste, which often contains hazardous materials that require specialized handling and disposal

methods.

The findings also reveal both strengths and weaknesses in the state's waste management infrastructure, with high performance in waste collection and disposal services but significant deficiencies in transfer stations and recycling facilities. This reflects broader trends identified in waste management literature. Ezenne and Onyido (2013) highlight that many developing and developed regions face similar challenges, where basic waste collection and disposal services are often prioritized over more complex systems like recycling and waste transfer facilities. Inadequate investment in these areas can lead to inefficiencies and environmental risks, as noted by Longe, et al. (2020), who emphasize the importance of modernizing recycling systems to enhance resource recovery. The need for improvement in transfer stations and recycling facilities is also echoed by Aschemann, and Hamm, (2021), who found that cities with underdeveloped recycling infrastructure tend to suffer from inefficient resource utilization and increased pollution. Similarly, Seadon, (2006) suggest that well-functioning transfer stations play a pivotal role in improving the overall efficiency of waste management systems by reducing transportation costs and streamlining operations. Investing in these areas aligns with the broader concept of sustainable waste management, which, according to Jones, (2019), seeks to optimize resource recovery and minimize the environmental impact of waste disposal practices. These findings support the growing recognition that enhancing waste management infrastructure, particularly in recycling and transfer stations, is crucial for reducing environmental pollution and achieving more sustainable waste management outcomes.

Finally, the most promising strategies and interventions for improving waste management includes integrated solid waste management systems, community-basedinitiatives, investments in waste infrastructure and technology, public-private partnerships, and education and awareness campaigns.

CONCLUSION

Implementing sustainable waste management strategies in Anambra State is crucial for addressing the growing waste challenges in urban and rural areas. Key strategies such as promoting waste segregation, encouraging recycling and investing in modern waste treatment technologies are vital to reducing environmental pollution and promoting public health. Additionally, strong government policies, public awareness campaigns and private sector participation are essential for long term success.

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