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RESEARCH ARTICLE

STRATEGIC DEVELOPMENT INITIATIVES FOR ACHIEVING SUSTAINABLE ENVIRONMENTAL WASTE MANAGEMENT SYSTEM IN IMO STATE, NIGERIA

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ABSTRACT

Imo State, Nigeria, faces significant challenges in managing solid waste, which poses threats to public health and the environment. This paper explores the strategic development initiatives for achieving sustainable environmental waste management system in Imo state. The paper adopted secondary data which were collected from academic documents, abstracts, books, education resources and conference papers. The secondary sources of data were sourced from print and online publications. In the literature review, it adopted conceptual and theoretical frameworks. The study was anchored on extended Produce Responsibility (EPR) theory. It analyzed some legal policy frameworks on waste management and environmental protection in Nigeria. The study examined the methods of waste management adopted by the people of Imo State and it was found out and identified that landfilling, dumping sites and incineration are the major waste management adopted in the state. Despite the policy regulations on waste management in Imo state waste management has not improved therefore the study proposed some strategic development initiatives for achieving sustainable environmental waste management system in the state. The study concludes by stating that the waste management regulatory agencies should be empowered to ensure strict compliance by all proper management waste for a sustainable and eco-friendly environment.

Keywords: Strategic, Development, Initiatives, sustainable, environment, waste management

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1.0. INTRODUCTION

The geometric progression of the human population results in urbanization, marked by social dynamism, rapid growth, and civilization. This inevitably results in competition for resources and other life-sustaining systems. The UN DESA projected that by 2050, the global population will increase from 7.2 billion in 2011 to 9.6 billion (UN DESA, 2013). According to UNDESA, urban areas housed 54.5% of the world population. A UN agency projected that the urban population will increase from 52.1% in 2011 to 67.2% by 2050 (United Nations, 2016). Social and economic transformations resulting from urbanization influence living arrangements, resource use, land use and cover, housing, transportation, unemployment, urban crime, water and sanitation, and disease transmission (Chu et al., 2017; Rinkesh, 2017). More over half of humankind now lives in metropolitan settings. This proportion is anticipated to reach 70% by 2050, impacting future industrial development and consumer patterns. Socioeconomic, physical, environmental, and demographic aspects all experience beneficial transformations and enhancements due to development (Koop, Schinkel & Wilts, 2014).

Modern towns and metropolitan cities are witnessing large influx of people due to industrialization, commercial and business development. These human activities in no less order come with attendant environmental issues among which is waste generation. Wastes are generated from different aspects of the human activities ranging from industrial, agricultural and household. In Nigeria and Imo State with special reference to the state capital which is the commercial hub of the state records more waste generation due to high concentration of people and activities. The issue waste generation and management have come with lots of challenges. In order to tackle these challenges, the government must be very strategic. According to Fuller (2016), a strategy is a purposeful approach employed to achieve goals and objectives, guided by a vision and direction. One of such strategies is the formulation and implementation of legal frameworks that will ensure proper waste management.

In Nigeria today there are some legal and institutional frameworks that are guiding the issues of environmental waste generation and disposal systems which have been domestically in various states of the federation. The Imo state government has made frantic efforts through launching of various initiatives to ensure proper waste management but this issue keeps lingering. Many of the times it becomes an eye sore how huge deposit of wastes are littered in all the hooks and cranny of the beautiful city of Owerri, the state capita,l which continues to deface and contaminate the environment with the stanching odour oozing out from these waste. It becomes very worrisome to well-meaning Imolites and other people of high repute who have continued to inquire about the waste management plan of the state. However, studies on sustainable advocacy plans and strategies for waste management are grossly inadequacy.

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1.1. Aim and Objectives of the Study

The aim of this has study is to propose strategic development initiatives for achieving a sustainable environmental waste management system in Imo state. To achieve the aim, the following specific objectives were investigated.

1. To comparatively assess of existing integrated waste management strategies in Imo State, Nigeria.

2. To identify and evaluate the key strategic waste management initiatives for sustainable economic transformation through conversion of waste to wealth.

2.0. CONCEPTUALIZATION AND THEORITICAL FRAMEWORK

2.1. Waste generation and Classification

An object is deemed trash when its intended function has been fulfilled and its owner, maker, or processor no longer finds it useful (Sutherland *et al*., 2013). Consequently, refuse comprises items that are no longer desired or useful due to the loss of their initial value. Wastes are materials or substances deemed useless by their producers or possessors, leading to their disposal. Food, groceries, electronics, plastics, agricultural products, and industrial items are prevalent sources of waste, defined as refuse or things rendered unsuitable for their intended use. The World Health Organization (WHO), as cited in Nnadozie (2022), defines solid waste as any object that is neither desired nor required and has insufficient liquid to flow freely. These include refuse from residences, neighborhoods, enterprises, and agricultural operations.

In a study, Ohaka, Ozor, and Ohaka (2019) assert that items are deemed waste when they are discarded or deemed devoid of value in their current state. The waste generation process has three stages: production, consumption, and disposal. Longe, Longe, and Ukpebor (2020) define waste as the final outcome of human activities that produce items or substances that are no longer appreciated or used for their original purpose. They include waste from residences, commercial establishments, and agricultural operations, in addition to non-biodegradable refuse. Seadon (2018) asserts that the first phase of trash management is waste production, including all activities and processes that result in the generation of refuse. Aschemann and Hamm (2021) assert that things deemed unnecessary or unwanted ultimately accumulate in landfills due to human consumption and production methods.

The three primary categories of garbage are gaseous, liquid, and solid. Household refuse, agricultural debris, biological waste, and industrial waste are all classified as solid waste. Rouf Ahmad Bhat et al. (2018) and Verma et al. (2016) identify food scraps, paper, plastic,

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metal, and glass as components of municipal solid waste. Agricultural waste includes livestock manure, crop residues, agro-industrial byproducts, and refuse from tourist sites (Bhat et al., 2012). Conversely, factories, mills, and mines generate industrial waste as a byproduct of their manufacturing or industrial activities. Industrial waste may be classified as either hazardous or non-hazardous; technologies such as composting, anaerobic digestion, and biogas production facilitate the repurposing and recycling of agricultural waste into nutrients and organic matter (Asokan et al., 2006). There are two primary categories of waste: organic and inorganic. Organic waste encompasses materials such as bovine excrement, agricultural byproducts, and residential refuse. Many cities in developing countries have experienced the accumulation of waste in numerous locations, such as streets, gutters, marketplaces, and rivers, as the volume of organic waste generated globally has increased due to human activity, surpassing the natural decomposition capacity of saprophytic microorganisms. Once again, several factors, such as industrialization, urbanization, population growth, and unsustainable economic development, are attributed to the increase in waste generation.

Lower-income countries are expected to have more growth (Sharma and Jain, 2019). Okenwa (2018) reports that more over 97.1% of household trash in Imo State comprises food remnants, whilst over 95.4% of organic waste consists of vegetable material. The World Bank estimates that Nigeria generates 32 million metric tons of solid trash annually, equating to a per capita rate of 0.79 kg per individual per day. A mere percentage of this garbage is collected and managed properly; by 2050, this figure is anticipated to escalate to 107 million metric tons. David et al. (2019) anticipate that worldwide waste generation will surpass 2.2 billion tons by 2025. Babatunde (2023) indicates that a substantial percentage of these trashes (33%) is not managed in an environmentally sustainable manner. Sub-Saharan Africa, South Asia, and the MENA area are recognized for their prevalent practice of open waste disposal.

In several regions, individuals publicly dispose of about 50% of the waste they generate. Ohaka, Ozor, & Ohaka (2013); Longe, Longe, & Ukpebor (2009); and Seadon (2006) concur that human progress and existence are fundamentally intertwined with the generation of solid waste. Residing in an urban environment considerably leads to waste buildup. Nearly all products nowadays are presented in some kind of packaging. These containers are either biodegradable or composed of environmentally harmful, non-biodegradable materials. In larger cities, one may see Western-style retailers offering canned, frozen, and pre-packaged goods, a trend identified by Aschemann and Hamm (2010) as more prevalent among metropolitan residents. The prevalence of fast food and packaged goods significantly influences contemporary solid waste generation, propelled by the need for convenient meal options (Kozup, Creyer, & Burton, 2003). The predominant trend is the increasing demand for bottled and sachet water in residences, businesses, and events. Another contributor to trash is the plastic containers often known as "takeaway" plates. The non-biodegradable characteristics of these packaged products in nylon and plastic constitute a significant

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environmental issue. The extensive use of packaged products and single-use plastics exacerbates the waste stream, thus leading to environmental degradation, as observed by Okolie & Odoh (2020). In 2016, the global production of plastic waste amounted to 242 million metric tons, as reported by Dastjerdi et al. (2019). The aforementioned factors clearly indicate that the increasing global population, industrialization, and urbanization are the primary contributors to the substantial quantities of waste seen daily.

Policy Regulatory Frameworks on waste management in Nigeria

Waste management in Nigeria is regulated by a fragmented array of legislation. Moreover, federal and state regulatory and enforcement agencies have been established to provide cooperation and foundational regulations for ecologically friendly practices. Section 20 of the modified 1999 Constitution stipulates that: "The State should preserve and improve the environment and protect Nigeria's water, air, land, forests, and wildlife." This aligns with the fundamental objectives and guiding principles of state policy. Section 21, sub-sections 1-2 of the Federal Environmental Protection Agency Act states that the release of hazardous substances in significant amounts into the air, land, or waters of Nigeria, including adjacent shorelines, is prohibited unless expressly permitted by existing laws in Nigeria. "Individuals convicted of violating the regulations specified in paragraph (1) of this section shall incur the following penalties: a fine not exceeding one hundred thousand naira (N100,000), imprisonment for a term of up to ten years, or both".

The National Environmental Standards and Regulations Enforcement Agency (NESREA) provides an additional framework. This specific agency is responsible for the enforcement of all environmental regulations in Nigeria. Regarding environmental issues, NESREA has a network of around 24 state offices distributed throughout Nigeria's six geopolitical zones. To mitigate pollution and promote environmentally sustainable practices, the federal government has enacted 35 environmental laws under NESREA. These laws will direct the country in establishing sustainable sanitation and waste management systems. Regulations for general cleanliness are outlined in Part II of the National Environmental (Sanitation and Wastes Control) Regulations 2009:

1) No person is to discard, throw or drop any litter or any similar refuse anywhere except in designated litter bins.
2. No owner, operator, occupant or person in care, management of control of premises is to allow the release of litter into the environment.
3. No occupant or passenger of any vehicle is to throw or drop any litter onto the streets, roads, highways, public spaces and other undesignated places.

Again, the law states that: It shall be an offence for an owner or occupant in care of premises or in control or management of a business to:

- release or causes litter to be released into the environment;

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- fails to contain and dispose litter at construction or demolition site regularly;
- fails to segregate waste for proper management.

Public waste sites and negligent waste management are prevalent throughout the state, although several laws and regulations addressing the issue. The issue with waste management in the country seems to stem from ineffective enforcement methods and tactics, rather than a deficiency in legislation or deterrents. According to the 2020 World Bank study, just 31% of Nigeria's anticipated population of 213 million employs safely managed sanitation. The World Bank indicates that the country's 68.6% mortality rate is attributable to contaminated water, inadequate sanitation, and a lack of personal hygiene habits, based on their latest figures.

Imo state government have domesticated most of these laws by the establishment Imo State Environment Protection Agency (ISEPA) and through other initiatives of various state administrations like the Clean and Green initiative and ENTRACO have extended the provisions of these frameworks toward ensuring a clean and healthy Imo state. It is however very unfortunate to notice that indiscriminate dumping of waste have continued unabated in the state. This is one of the reasons for this study to propose strategic development initiatives for tackling the challenges of environmental waste disposal system in the state.

2.2. Theoretical Framework

The study is based on Lindhqvist's 1990 thesis about Extended Producer Responsibility (EPR). Upon consumers deeming a product obsolete, makers are responsible for its management and disposal, in accordance with this practice and principle. An extended producer responsibility policy aims to motivate manufacturers to make environmentally benign items by requiring them to bear the costs of their own disposal. This strategy transfers the responsibility for generating environmentally sustainable products to producers, aiming to promote more conscientious product design and disposal. Extended producer responsibility solutions are founded on a triad of social, environmental, and economic factors. Consequently, the producer, rather than the government, will have the financial responsibility for disposal costs. It dissuades the incorporation of detrimental materials in production and advocates for recyclable design, since products in an ecological context must be recyclable. Reduced garbage is sent to landfills or incinerators due to the ecologically favorable nature of products manufactured from recycled materials. A "cradle-to-grave" or life-cycle methodology for product regulation is proposed here, as an alternative to traditional end-of-pipe command-and-control systems. The objective of extended producer responsibility legislation is to alter product disposal behaviors by changing the manufacturing process, or the "cradle" (Surak, nd). This theory should empower many nations of the world to regulate manufacturing and use of products for a sustainable environment. But thing one herein is the political will to implement the provisions of this theory in actual fact. All manufacturing

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companies should be held responsible for the products they manufacture for societal consumption. The application of this theory is the solution to the issue of waste management starting the point of production to the last stage of the life value of the product.

3.0. METHODOLOGY

This study employ a qualitative method is evaluating the strategic development initiatives for achieving sustainable environmental waste management system in Imo State. The authors draw contemporary literature and presents logical arguments on place-centered approaches for wastes management using discourse analysis.

4.0. DIMENSIONAL DISCOURSES

4.1. Comparative Evaluation of Integrated Methods in Wastes Management Strategies

According to Rasmeni and Madyira (2019), solid waste management include the collection, transportation, processing, disposal, and monitoring of waste materials. Strategies such as eco-design and closed-loop manufacturing systems may aid in industrial waste management by minimizing waste and contamination (Winkler, 2011). Brown (2021) asserts that waste management is a comprehensive framework of regulations and protocols aimed at addressing issues related to waste generation and disposal. Waste management is a systematic strategy to the collection, sorting, and disposal of refuse to mitigate adverse impacts on the environment and human health. Jones (2019) asserts that waste management involves several disciplines collaborating to strategize, regulate, and implement efforts to minimize, repurpose, and recycle garbage. To reduce environmental effect and enhance resource recovery, waste management includes the whole waste lifecycle, from creation to final disposal (Green, 2018). Minimizing waste is a crucial aspect of solid waste management, including the formulation of strategies to address waste management challenges and the dissemination of knowledge on environmental problems to the public. Nonetheless, solid waste and waste management have emerged as prominent issues at the municipal level, impacting the formulation and implementation of several governmental initiatives.

The empirical evidences have shown that three metric were used to evaluate the waste management variable: recycling rates, regulated solid waste, and oceanic plastic pollution. Another method to quantify oceanic plastic pollution is by assessing the overall volume of plastics that nations discharge into the ocean annually, expressed in millions of metric tons. Nigeria generates 32 million metric tons of waste annually, of which 2.5 million tons is plastic. Waste generation in Nigeria is anticipated to increase in the next years, with an annual growth rate of 2.4 percent (Babatunde, 2023). Open dumping and landfilling are the primary methods used for waste disposal in Nigeria. Besides their inefficiency, these methods adversely impact both the environment and human health. Ogwueleka and Naveen (2021) indicate that the predominant form of waste disposal in metropolitan Nigeria is open burning,

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followed by open dumping. Composting and open incineration are viable alternatives. The primary technique of waste disposal is incinerating refuse rather than discarding it.

An examination of Imo's collection systems, transfer stations, disposal sites, and recycling facilities would elucidate their waste management protocols. Government entities and private enterprises in Imo State often collaborate to gather refuse. It employs a combination of residential zones where individuals manually dispose of rubbish and regions where agencies or waste management companies use machinery for collection. Certain individuals use specified locations, like as market squares or major thoroughfares in Owerri city, for the disposal of their waste. Before transportation to final disposal or recycling facilities, larger collected waste is consolidated in transfer stations, which serve as intermediary facilities. A transfer station may be necessary if the eventual disposal site is far from the generating location. Waste is moved from many collection vehicles to a larger vehicle, such as a tractor-trailer unit, at a transfer station. Open-top trucks may transport about 76 cubic meters (100 cubic yards) of uncompacted waste to a regional processing or disposal facility.

Moreover, closed compactor trailers may be supplied, but they must be equipped with ejector systems. Numerous collection trucks unload their goods directly onto the transport vehicle at a designated discharge location. Once the refuse is put in a holding pit or on a platform at a storage discharge station, the solid waste is conveyed to the transport truck using technology that elevates or propels it. Large transfer stations may manage over 500 tons of garbage daily (Cited from Encyclopedia Britannica by Nathanson, 2025). These facilities are crucial for reducing operational costs and enhancing waste transportation logistics. Nonetheless, challenges and delays in waste management operations may arise from inadequate waste handling protocols and limited capacity of transfer stations (Onwosi *et al.*, 2018). The state's non-recyclable waste ultimately culminates in disposal facilities, which may include landfills or dumpsites.

Land filling method: The most municipal solid waste management solutions include land disposal. A sanitary landfill is a kind of landfill that is deliberately selected, designed, constructed, and administered to mitigate adverse effects on human and environmental health. Globally, landfills account for the disposal of almost 75% of all waste (Zuberi and Ali, 2015). Leachate is a landfill waste and a recognized water pollutant (Kinobe, 2015). Methane and other greenhouse gases are emitted into the atmosphere during the breakdown of solid waste, representing about 5% of total greenhouse gas emissions (Rodic-Wiersma, 2013). The entombed waste remains isolated from surface water and groundwater; this is a fundamental element of sanitary landfilling, which has undergone enhancements and innovations. According to Bhat et al. (2019), every component of solid waste may be effectively used if it is converted into a valuable product using a suitable scientific method. Engineering requirements dictate that a certain distance must be maintained between the landfill's base and the fluctuating groundwater table. Most new landfills need a system of

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groundwater-monitoring wells and an impermeable liner or barrier at the base. An impermeable cover must be installed over completed landfill sections to redirect surface runoff and precipitation away from the buried waste. Flexible plastic membranes, clay soil layers, or a combination of both may serve as bottom and cap liners (Nathanson, 2025). Landfills are often the most economical option for non-recyclable garbage disposal. However, identifying places with appropriate capacity, accessibility, and environmental conditions is becoming difficult. Nonetheless, landfills will continue to be essential in solid waste management. Due to the residuals generated by incineration and other treatment methods that need burial for disposal, recycling solid waste is an unfeasible alternative.

Incineration: Incineration is a waste management technique that involves the combustion of materials constituting refuse. The phrase "waste-to-energy facility" refers to a conventional industrial incineration plant. "Thermal treatment" denotes incineration and other high-temperature waste management techniques. The regulated combustion of waste materials is referred to as incineration. Incineration, unlike conventional burning techniques, occurs inside a furnace. When waste is incinerated in a furnace, the hazardous gases are extracted. The three main types of incinerators are the rotary kiln, controlled air, and excess air. The objective of these facilities is to incinerate substantial quantities of waste to reduce their volume (Nathanson, 2025).

Dumping and drop off sites: Dumping refers to indiscriminate discarding and dumping waste materials and garbage in an uncontrolled manner, often in low-lying areas or open spaces. Open dumping- In this type of dumping, garbage is dumped in deep depressions or trench. They are not covered by soil. This is a common waste management practices in less developed places. It is harmful practice that leads to environmental pollution, health risks and climate change. Dumping is not the best method for disposal of waste because the chemicals present in them can seep underground which can pollute the soil and can reach the underground water table thus polluting water resources. Despite high awareness (90 percent) and positive attitudes (97.5 percent) towards waste management among residents, practices such as open dumping (66.3 percent) and burning (62.4 percent) remain prevalent Okenwa (2018). Onwosi et al. (2018) assert that open dumping and incineration pollute soil and water resources in adjacent areas, resulting in air and water pollution.

Environmental pollution, soil and groundwater degradation, and public health issues are but a few of the drawbacks associated with these waste management practices among Imolites. A comprehensive waste management strategy is being developed to mitigate negative environmental consequences and to foster economic growth and resource conservation by recycling, reusing, and other eco-friendly technological advancements. Agarwal et al. (2015) and Kumar (2015) assert that these are efficient waste management techniques that mitigate the detrimental impacts of refuse on the ecosystem. Consequently, we assert that enhancing public awareness and executing efficient waste management techniques are crucial for

attaining environmental protection and sustainable development objectives. Failure to do this will result in the decline of waste management and an escalation of environmental hazards. Mitigating environmental contamination necessitates the implementation of effective and validated strategies to diminish waste generation, enhance recycling rates, and deter alternative waste reduction methods. Effective waste management is essential for conserving natural resources, safeguarding the environment, and ensuring a sustainable future for subsequent generations. Improper waste disposal leads in environmental degradation, threats to human health, and a diminished ability of the earth to sustain life.

4.2. Strategic Solution Initiatives for Sustainable Waste Management in Imo State

Imo state's waste management must be comprehensive and integrated to address the many challenges associated with rubbish collection, transportation, processing, and disposal. Energy recovery, composting, recycling, and waste reduction must constitute the foundational elements of any sustainable waste management strategy. Collaboration across public and private sectors, including technical innovations and community initiatives, should underpin an integrated waste management plan aimed at enhancing environmental sustainability. Strategically planning, creating, optimizing, and executing waste management systems in a smart city is crucial for achieving long-term sustainability. Establishing a comprehensive waste management system requires collaboration in the domains of planning, infrastructure development, capacity enhancement, database management, and implementation (Cheela, Ranjan, John Goel, and Dubey, 2021). A comprehensive solid waste management plan for many urban areas throughout the state may be established using the policy and legal framework, which will provide answers and insights. Below are few potential strategies:

Short- term strategies (0-5years): Policy implementation plan and Public Education:

This is the first step in the application of the strategies for proper waste management in the state. This is bringing the issue of waste management policies to people's knowledge through public education, the policy directives on effective and efficient waste management. Public education will be in the form of advocacy and awareness campaign through the social, print media and social mobilization. In public education all media platforms will effectively be deployed in form of advertisement or public service announcement with the purpose of capturing the attention of the masses on the issues of waste management. It entails collaborating with local communities, organizations, and government agencies to promote sustainable waste management practices and educate the public about the importance of proper waste disposal. The following strategies have been suggested.

1. Strengthening Waste Management Policies and Regulations: Develop and implement policies and regulations that support sustainable waste management practices.

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2. Conduct Waste Audits: Assess current waste management practices and identify areas for improvement.
3. Develop Waste management plans: Create plans that outline goals, objectives, and strategies for sustainable waste management.
4. Implement recycling programs: Establish recycling programs for paper, plastic, glass, and other materials.
5. Promote waste reduction and minimization: Educate residents, businesses, and institutions on the importance of reducing waste generation.
6. Develop partnerships and collaboration patterns: Foster partnerships among stakeholders, including government agencies, private sector companies, and community organizations.
7. Promote sustainable consumption patterns: Educate consumers on sustainable consumption patterns, including reducing, reusing, and recycling

Medium-Term Strategies (5-10 years): Technology and Infrastructural Development

At this stage the strategy will be focusing on technology driven and infrastructural development for waste management. Most developed countries of the world today are thinking of investing and transforming their waste management strategy. In this context, vermi-transformation technology has emerged as a sustainable and eco-friendly alternative for waste management. Here government has moved steps ahead in recycling and developing waste management where waste is converted to energy. This requires man power development and partnership with some experts in terms of capacity building and management. This strategy will bring about a turnaround in the economy of the state. This may be capital intensive but when managed very well the return on investment will be worthy it. The following step by step strategies have been suggested to achieve this.

1. Invest in Waste Management Infrastructure: Develop and upgrade waste management infrastructure, including recycling facilities, composting plants, and waste-to-energy facilities.
2. Implement Waste-to-Energy Technologies: Explore waste-to-energy technologies, such as anaerobic digestion, gasification, and incineration.
3. Develop Extended Producer Responsibility (EPR) Programs: Implement EPR programs that require manufacturers to take responsibility for the waste generated by their products.
4. Develop Green Economy Initiatives: Foster green economy initiatives, including green jobs, green entrepreneurship, and green infrastructure.
5. Develop Circular Economy Models: Implement circular economy models that promote the reuse and recycling of materials.

Long Term (above 10yrs) Strategic Innovation and International Cooperation

The focus is on the higher institutions and other professional bodies that produce higher human capacity workforce in the country through teaching, learning, research and trainings. Educational institutions engage in research and innovation activities that aim to generate and disseminate new and useful knowledge and solutions for the challenges and opportunities in waste management. Higher education institutions are expected to play a more active role in developing human resources that can contribute to the achievement of the eco-friendly environment in waste management. Anynawu, Defeli and Okoroafor (2024) opine that by creating and disseminating knowledge, universities contribute to economic growth, social well-being, and global innovations. To address pressing global issues effectively, collaboration among academics and researchers from diverse fields—such as natural sciences, social sciences, and humanities—is essential. This emphasizes the growing need for innovative collaborative models beyond traditional industry-academia partnerships. Private companies and universities are increasingly engaging in joint research, product development, and public-private initiatives, incorporating international best practices and collaborating with experts from other countries in waste management initiatives. Human society is dynamic resulting to rapid urbanization and waste generation, therefore the state needs to very strategic and futuristic in term of confronting waste management for a sustainable environment. The following operational strategies are suggested.

1. Invest in Research and Development: Invest in research and development of new waste management technologies and strategies.
2. Promote International Cooperation and Knowledge Sharing: Foster international cooperation and knowledge sharing on sustainable waste management practices.
3. Develop Education and Training Programs: Develop education and training programs that promote sustainable waste management practices and provide skills training for waste management professionals.

5.0. CONCLUSION

Environmental waste management has remained a big challenge towards a sustainable and protective environment. A contributory factor to this is the dynamic nature of the human society which has resulted into urbanization. Urban development plan is very important in order to capture all the basic necessities of man. One important indices of urban development is sustainable waste management systems. Therefore implementing sustainable waste management strategies in Imo State is crucial for addressing the growing waste management challenges in the state. Key initiatives are promoting waste reduction, recycling, reuse, and investing in modern waste treatment technologies are vital to reducing pollution and

promoting eco-friendly environment. This can only be possibly by ensuring strict implementation of the policy and legal frameworks on waste management through public awareness campaigns and private sector participation, technology, infrastructural development and research innovation and international cooperation. The regulatory agencies should be empowered to ensure strict compliance of the all in proper waste management in the state. These are the strategic development initiatives that will enable a sustainable environment waste management.

Competing Interest

The authors have declared that no conflicting interest exist in this manuscript.

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