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Waste-to-Energy Technologies: Sustainable Urban Development in Nigeria

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Abstract

Waste-to-Energy (WtE) technologies represent a strategic solution to Nigeria's dual challenges of poor waste management and unreliable energy supply. With urbanization and population growth accelerating, municipal solid waste (MSW) generation has increased, while more than 70% of waste remains improperly collected and less than 5% is formally recycled. WtE processes such as incineration, anaerobic digestion, gasification, and plasma-arc technology offer alternatives that reduce landfill use, cut greenhouse gas emissions, and generate renewable energy for sustainable urban development. Nigeria's adoption of WtE aligns with global efforts to diversify renewable energy sources and achieve climate mitigation goals. Pilot projects in Lagos, Imo, and Taraba States demonstrate both the opportunities and challenges of integrating WtE into national infrastructure. Barriers include high capital costs, inadequate regulation, limited public awareness, and weak financial incentives. Nevertheless, WtE technologies hold substantial potential to enhance energy security, stimulate economic growth, and promote environmental sustainability, provided policy frameworks, investment incentives, and stakeholder engagement are strengthened.

Keywords: Waste-to-Energy, Municipal Solid Waste, Nigeria, Renewable Energy, Sustainable Urban Development, Environmental Engineering

Introduction

Waste-to-Energy (WtE) technologies convert urban solid waste into usable forms of energy such as heat, electricity, steam, or fuel through a variety of processes (Onabanjo Somorin et al., 2017). The country's growing urban population, emerging middle class, increased urbanization, and low priority for investments in infrastructure have combined to place stress on the urban management system. Strict regulations coupled with economic instruments to enhance the sustainable application of WtE technologies in the country can be adopted from countries at the forefront of WtE technologies. The development and adoption of WtE technologies aligns well with the aspirations of sustainable development in the country.

Municipal Solid Waste (MSW) in Nigeria is often poorly managed and illegally dumped, leading to environmental consequences (Onabanjo Somorin et al., 2017). MSW comprises degradable materials like food scraps and paper, as well as plastics, glass, metals, and batteries. Recovering energy from potentially waste, known as Waste-to-Energy (WtE), involves processes such as incineration, gasification, and pyrolysis that thermally treat waste to produce electricity or heat. Thermal treatment methods are preferred because they reduce waste volume, recover minerals, destroy contaminants, and convert refuse into energy, thus minimizing environmental pollution and land degradation. WtE can also reduce fossil fuel consumption, lower greenhouse gas emissions, prevent health hazards from uncontrolled waste burning, and curtail the spread of diseases. It has emerged as a significant renewable energy source, particularly as Nigeria plans to generate 10% of its energy from renewables by 2025 to serve off-grid needs (Onabanjo Somorin et al., 2017).

Types of Waste-to-Energy Technologies

Waste-to-Energy (WtE) technologies utilize municipal solid waste to generate energy. Four methods dominate implementations worldwide. Each one, from incineration to plasma-arc gasification, is tried and tested around the globe. Incineration, the oldest and most common, combusts waste to generate heat for electricity or steam. Other thermal systems use oxygen-limited environments to produce combustible gases for power generation. Anaerobic digestion creates methane-rich biogas by breaking down organics in sealed tanks. Feedstocks are variable and typically include food and agriculture residues and paper. Technologies can process up to 15 tonnes daily; the product fuel can generate combined heat and power. Anaerobic digestion strongly aligns with the circular economy and enables green-certification programmes. Several types of Oxford Oxford Technologies offer waste management solutions. Gasification converts organic items into carbon monoxide, hydrogen, and other gases. Plasma Arc uses electric arcs in an oxygen-starved chamber to generate plasma at 5,500°C, efficiently producing syngas. (Onabanjo Somorin et al., 2017)

(i) Incineration: Waste-to-energy (WtE) technologies have emerged as a dependable alternative that can address waste management problems while generating electricity for local consumption. Nigeria’s energy resources are unable to meet demand, resulting in an industry that cannot satisfy the appetite for power among its population, so energy generated from wastes can serve as a supplementary energy source (Onabanjo Somorin et al., 2017). WtE processes converts wastes into gas, steam, chemicals, fuels, or electricity that can be reintroduced to the economy. Apart from recovery of energy, several non-energy benefits are accrued to society when WtE is introduced (Onabanjo Somorin et al., 2017). One of the most important among them is reduction of wastes to landfill for vast portions of the municipal solid wastes (MSW). Filling of land requires space and sites suitable for hosting large quantities of MSWs. WtE processes can convert portions of the wastes to energy thereby reducing the volume that is used to fill the land. This aids in extending the life span of landfills but also frees up the wastes for use in other beneficial ways in the society since the portions sent for disposal at the landfills are greatly reduced. The use of WtE also aids in the reduction of greenhouse gases that are emitted following anaerobic degradation of wastes at the landfill. Analysis of MDs in different countries shows that the energy from MSW can be a significant contribution to Nigeria’s energy supply. Nigeria is ranked alongside South Africa and Egypt as one of the countries with the highest WtE potential based on waste generation rates. Hybrids of conventional combustion systems such as grate-fired incineration and fluidized bed incineration with gasification technology will be suitable for thermal treatment of MSW with options for energy recovery. Incinerators that integrate pre-process and hold-store (batch) treatment may also be feasible. Grate-fired incineration is dominant among the conventional thermal technologies due to minimal pre-processing required and the option for the treatment of waste en masse.

(ii) Anaerobic Digestion: Anaerobic digestion constitutes a waste-to-energy process that exploits the controlled breakdown of biodegradable materials within an oxygen-devoid environment to furnish a flammable biogas exploitable for heat and electricity generation (Onabanjo Somorin et al., 2017). The digestion period for organic waste varies between two and seven weeks. The process consists of four principal phases: hydrolysis, acidogenesis, acetogenesis, and methanogenesis, each effectuated by distinct bacterial populations. Initially, in the hydrolysis phase, insoluble organic compounds are enzymatically degraded into soluble molecules. Subsequently, during acidogenesis, these molecules undergo conversion into volatile fatty acids, alcohols, hydrogen, and carbon dioxide. In the acetogenesis stage, further transformation of acids and alcohols yields acetic acid, hydrogen, and carbon dioxide. Ultimately, the methanogenesis phase culminates in the production of methane and carbon dioxide from acetic acid, hydrogen, and carbon dioxide. An advancement of the conventional system is the dry fermentation approach, which accommodates substrates possessing a total solids content spanning 20 to 40%.

(iii) Gasification: Gasification represents a vital Waste-to-Energy (WtE) technology for sustainable urban development in Nigeria. This thermochemical conversion process transforms solid waste into a gaseous mixture mainly comprising carbon monoxide, hydrogen, carbon dioxide, methane, and water vapour, which can be combusted to generate heat and produce syngas. A gasification plant can produce a tenfold increase in energy output from approximately the same volume of municipal solid waste (Onabanjo Somorin et al., 2017).

(iv) Plasma Arc Technology: Unlike the thermal treatment of wastes by incineration, gasification, or pyrolysis, plasma arc technology refers to energy recovery processes that convert municipal solid waste into a gaseous fuel by means of heat and using an electric arc plasma torch (Magonagone Serage, 2017). Since July 2002, Japan has operated a number of municipal-scale waste disposal plasma arc facilities. The technology has spread to Europe and North America. Recent tests of the plasma technology in Japan showed that the plasma arc gasification system generates emissions far below the regulatory requirements. The cost-effectiveness of the plasma arc gasification technology, however, is still to be determined.

Current State of Waste-to-Energy in Nigeria

Waste-to-Energy (WtE) technologies extract usable energy and reduce the quantity of waste destined for landfills. They use both thermal and biological conversion processes to generate energy from waste, thereby helping to address environmental and health risks. Several WtE technologies are commercially available. Nigeria's strategic objectives include boosting renewable energy capacity, and pilot biomass energy projects have been proposed for Lagos and Imo States, where cogeneration is also used by some companies. As a signatory to the Paris Agreement, Nigeria views such projects as opportunities to mitigate pollution and reduce greenhouse gas emissions (Onabanjo Somorin et al., 2017). The sustainability of WtE initiatives depends on multiple factors: a sufficient supply of solid waste, access to appropriate technology, a supportive investment climate, and enabling legislation.

A few WtE projects have been proposed through the Strategic Environmental Assessment of the Power Sector and a World Bank-funded Renewable Energy Master Plan. These include a biomass energy conversion system at the Ikorodu Industrial Estate in Lagos State and a 12-MW gasification facility in Imo State. The power sector faces several challenges—low planning capacity, improper estimation methods, faulty infrastructure design, and poor transmission and distribution systems—that slow progress towards electrification goals. Efforts to integrate biomass plants into the national grid and establish minimum generation requirements to enhance system stability are underway (Onabanjo Somorin et al., 2017). Despite the uncertainties, the potential to implement waste recovery through suitable WtE technologies remains considerable, particularly in Lagos, Bauchi, Ogun, and Taraba States.

Regulatory Framework

Legislative instruments serve both as frameworks for enforcement and as yardsticks to measure compliance and performance. The regulation of waste-to-energy consists of national policies and specific regulations enforced by state and local authorities. The National Renewable Energy and Energy Efficiency Policy (NREEEP) of 2014, the country's general policy guiding renewable energy initiatives, includes a waste-to-energy section addressing every relevant waste stream. Additionally, the National Energy Master Plan discusses opportunities for embedded generation from MSW across various Nigerian states (Onabanjo Somorin et al., 2017). The National Integrated Power Project's "embedded generation" pilot program exemplifies local regulation governing waste-to-energy technologies. However, a broad literature review suggests that Nigeria has yet to fully develop a waste-to-energy regulatory framework (Onabanjo Somorin et al., 2017).

(i) National Policies: For effective waste management, Nigerian policymakers have established the National Environmental Regulations and Standards Enforcement Agency (NESREA) to regulate environmental laws including Waste-to-Energy (WtE) initiatives and ensure the sustainability of natural resources. The Federal Ministry of Environment initiates and implements policies on environmental protection. Meanwhile, the Federal Ministry of Power coordinates and monitors electricity supply through wholly owned power generation companies, benefiting WtE projects by enabling the transfer of power back to the Nigerian Electricity Supply Company (NESCO) grid. Similarly, the Federal Ministry of Water Resources provides water to several WtE plants to facilitate their smooth operation. At the community level, local governments play a vital role in solid waste management, collection, and disposal. These agencies bear the responsibility to formulate adequate regulations that could assist in realizing WtE goals. Many of these agencies collaborate with the Federal Ministry of Environment in formulating and implementing policies that promote WtE projects (Onabanjo Somorin et al., 2017).

(ii) Local Government Regulations: In Nigeria's federal political system, waste management in urban areas falls under the jurisdiction of Local Government Authorities (LGA). LGAs independently operate within their territorial boundaries, guided by the Constitution. Consequently, various local rules and ordinances govern waste management activities at different levels. For example, the Lagos State Waste Management Authority (LAWMA) collaborates with private sector operators, providing waste management services for several LGAs in Lagos State and developing public awareness programmes within these LGAs. Nevertheless, several challenges related to waste management—particularly the provision of collection services, dumping of waste in undesignated areas, and the inadequate provision of internal drainage—remain.

Economic Implications

Waste-to-energy (WtE) technologies can stimulate economic growth because the collection, transportation, treatment, and disposal of municipal solid waste (MSW) involve activities that generate employment and income for various categories of workers. Nigeria's general energy uncertainly highlights the urgent need for efficient and reliable energy resources and conversion technologies that can meet the growing energy demand locally and at a large scale. WtE offers a promising alternative because it uses a readily available and affordable feedstock for energy conversion and recovery, mitigates pollution, and reduces dependence on fossil fuels. Considerable opportunities therefore exist for new power plants and treatment centres in many waste management authorities and local governments, even though the adoption of technologies like incineration can be limited by high investment, operation, and maintenance costs (Onabanjo Somorin et al., 2017).

(i) Cost-Benefit Analysis: Waste-to-Energy (WtE) technologies present a pathway for sustainable urban development in Nigeria by recovering value from municipal solid waste (MSW). These technologies generate electricity or products with a lower carbon footprint, whilst reducing demand for landfill. A cost-benefit analysis supports investment in WtE to enhance municipal revenues and move towards a circular economy.

The total economic value of by-products together with reduced use of landfills outweighs the cost of setting up WtE plants, larger plant capacities, and mixed waste feedstock. The average payback period ranges from four to nine years. This represents a promising investment opportunity since Nigeria currently lacks facilities for WtE from MSW. Investing in large-scale WtE at the national level benefits electricity generation, the environment, and the economy. Quantitatively accounting for the future increase of MSW from projected population growth and economic development adds value to the decision-making process and reflects the scale of the opportunity. Investing in WtE also helps to meet the United Nations Sustainable Development Goals. Investigations reveal that sampling and analysis typically involve manual collection and sorting of waste, which is labour intensive and may bias results towards heavier materials. Large-scale WtE schemes require improved waste collection and segregation. (Onabanjo Somorin et al., 2017) (Onabanjo Somorin et al., 2017)

(iii) Investment Opportunities: Municipal solid waste (MSW) treatment and disposal are a constant challenge in Nigeria. Uncollected MSW contributes to flood disasters and waterborne diseases such as cholera, especially in low- income communities. The quest for appropriate treatment and disposal technologies suitable to Nigeria's current socio-economic state and techno-economic infrastructure has resulted in increased application of waste-to- energy (WtE) systems. WtE conversion technologies reduce GHG emissions, decrease heavy metal content in ash and wastewater, and mitigate the hazards of polluted surface and groundwater without compromising technological and economic viability. The National Renewable Energy and Energy Efficiency Policy proposes WtE pilot projects in Lagos and Imo States. The sustainability of such projects depends on sufficient solid waste supply, suitable technology, investment risk, financial returns, and a supportive legal framework (Onabanjo Somorin et al., 2017). Nigeria's WtE industry is yet to attract significant private- sector investment, due to lack of support measures such as feed-in tariffs and initial capital, despite having the required combinations of available waste, suitable technologies, investment incentives and a large number of engineering firms and contractors (Onabanjo Somorin et al., 2017).

Environmental Impact

The implementation of Waste-to-Energy (WtE) technologies has considerable capacity to alleviate the environmental burden of municipal solid waste in Nigerian cities. Many densely populated cities in Nigeria fill thousands of hectares of land with MSW in urban open dumpsites (Onabanjo Somorin et al., 2017). Unlike landfills, open dumpsites and burning of waste emit enormous quantities of methane, a greenhouse gas with an estimated global warming potential at least 20 times greater than that of carbon dioxide. WtE could therefore offset the methane emissions from such sites. The controlled combustion in an incinerator could also prevent the uncontrolled spread of infectious diseases caused by exposure to the activities in open dumpsites and burning of waste. Exposure to methane (CH) is also dangerous to human health because of its toxicity at higher concentrations. Accordingly, while converting the waste to useful energy such as electricity, the WtE technologies address the ghastly effect of the combustion and visible discharge of smoke to the environment with the accompanying eco-burdens of climate change and global warming that affect social growth. The complexities associated with social acceptance nevertheless remain a major impediment to a successful implementation of these technologies (Onabanjo Somorin et al., 2017).

(i) Reduction of Landfill Waste: Waste-to-energy (WtE) converts municipal solid waste (MSW) into energy, supporting urban sustainability in Nigeria. Plastic and biodegradables constitute approximately 60% of MSW, yielding an average calorific value of 7.32 MJ/kg and daily waste generation of 0.8–1.0 kg/capita in Lagos, Kano, and Rivers states. Energy recovery depends on waste composition, conversion efficiency, and process technology, influencing the choice of WtE options.

Incineration involves controlled combustion of combustibles, reducing waste volume and generating electricity and heat. Plastic content above 10% by weight is crucial to sustain the combustion of MSW. Gasification applies elevated heat and limited oxygen to produce a low-Btu gaseous fuel from MSW. Combined with MSW composting, it can fully process urban waste and harness a useful energy form without incineration problems. Plasma arc gasification uses extreme temperatures produced by electric arcs to convert waste into synthesis gas and vitrified slag, yielding high-quality fuels with typically fewer environmental concerns than other thermal methods. (Onabanjo Somorin et al., 2017)

(ii) Greenhouse Gas Emissions: Waste-to-energy technologies produce a renewable energy source that enables cities to meet a zero-waste goal more effectively. They contribute to sustainable urban development by ensuring a consistent supply of energy. To achieve this, cities must capture the energy that remains within municipal solid waste (MSW) to efficiently convert MSW into end-use fuels such as methane, ethanol, biodiesel, and solid fuels. This conversion involves determining which waste treatment process satisfies the energy requirements for a given fuel production pathway. Energy recovery also necessitates the removal of moisture from wet wastes through the addition of dry wastes or by subjecting wet wastes to a drying process before energy conversion. Detailed assessments—such as those reported for Nigeria—highlight the importance of securing a continuous supply of solid waste, selecting appropriate technologies, ensuring investment security, addressing legal matters, and demonstrating the ability to consistently deliver recovered energy and recyclable materials to the market (Onabanjo Somorin et al., 2017).

Challenges and Barriers to Implementation

The implementation of waste-to-energy (WTE) technologies in Nigeria is confronted by myriad challenges, which must be surmounted to pave the way for widespread adoption. Lesson-learning from currently operational WTE plants (worldwide) is instrumental in establishing the requisite conditions to foster successful local deployment. Crucial prerequisites include robust technical know-how, economic viability, and broad-based political support. However, in Nigeria, the potential of WTE remains largely untapped, thus impeding the materialisation of WTE-concomitant benefits noted in previous analyses. The successful inception of WTE projects first necessitates a strong initial capital outlay, which poses a substantial barrier in local contexts. Notwithstanding the abundance of residual waste suitable for energy conversion affordably, concerns regarding technological maturity and general implementation costs remain dominant. Access to finance and funding streams is therefore imperative to underpin such schemes. The contemporary WTE industry does not enjoy widespread commercial deployment, as evidenced by the limited number of extant projects to constitute industrial-scale reference points. Plants that have operationalised beyond immaturity in the initial years of service-despite prevailing volatile market dynamics and general macroeconomic uncertainty are yet rare exceptions, rather than the norm (Onabanjo Somorin et al., 2017). Additionally, local perceptions towards both innovation and the specific novelty of WTE often harbour scepticism (Onabanjo Somorin et al., 2017).

(i) Technological Challenges: The right technology for the conversion of Nigeria's urban waste to energy will be determined by an in-depth analysis of the quantities of waste generated in each state and city. It must accommodate the possibility of urban growth in each town, and the forward planning horizon of every urban policy development or waste management plan in every state and local government area. Systematic investments in electricity and natural gas distribution infrastructure are also needed to support the full commercial adoption of waste-to-energy in all Nigerian cities (Onabanjo Somorin et al., 2017). Governments at the state and local levels must lead the development of these facilities, with financial structures put in place to improve the cash flow models of both existing and planned these operations. This is especially necessary given the prevalent market belief that these projects are investment heavy and the limited success experienced by most previous private sector-led doom-and-gloom initiatives and community-based collection modalities. A dedicated PPP framework encompassing a dedicated policy, a robust regulatory and legal framework, and clearly articulated standards and rules of operation and conduct will be key to achieving the projected waste-to-energy outcomes in Nigerian cities (Onabanjo Somorin et al., 2017).

(ii) Financial Constraints: Waste-to-Energy (WtE) technologies represent an emerging solution for the sustainable development of Nigerian cities, where increasing population and urbanization have aggravated waste management problems (Onabanjo Somorin et al., 2017). The WtE potential of municipal solid waste (MSW) in Nigerian states is huge. Nevertheless, MSW as an alternative energy source is faced with a number of challenges, foremost of which is the financial constraint.

Efficient and sustainable waste management is an important aspect of sustainable urban development. A lack of funding for the development and implementation of WtE technologies accounts for the generally poor state of waste management practice in Nigeria. The high cost of setting up waste management infrastructure and equipment makes it impossible for local councils and private stakeholders to acquire them. Many Nigerian cities still rely heavily on crude waste management practices and open-dumping methods due to the lack of finance. Closing this financing gap requires the identification of viable investment opportunities in the Nigerian waste management and renewable energy sectors, and the appropriate channelling of capital into them.

(iii) Cultural Barriers: Nigeria continues to struggle with collection and segregation of municipal solid waste (MSW) for recycling, reuse, and waste-to-energy (WTE) conversion due to cultural and technological constraints (Onabanjo Somorin et al., 2017). The low level of awareness of the benefits of enhanced modern waste management practices and waste recycle and reuse is a major barrier to the successful implementation of solid waste management (SWM) plans, especially with respect to WTE technology SMEs. Typically, the adoption of WTE waste technologies is not encouraged by society because of the widespread belief that energy generation from waste is linked to complex technology and is expensive to execute on a small scale. The importance attached to WTE generation is further compromised by the frequent monetary incentives offered by third parties to individuals and SMEs to encourage them to sort waste for recycling and reuse. However, unsegregated waste that contains a greater number of organic materials is still dumped in the general waste stream that is eventually conveyed to landfill sites (Onabanjo Somorin et al., 2017). There is unsatisfactory involvement of the public and community members in SWM initiatives. This is primarily due to a lack of adequate communication, engagement, and relationships with the relevant governmental agencies. Adopting a sustainable SWM method depends largely on the support and involvement of local communities. Public participation and community involvement are the key to sustainable growth in the WTE sector.

12. Future Prospects of Waste-to-Energy Technologies in Nigeria

The prospects for Waste-to-Energy (WtE) technologies in Nigeria are promising due to continued urbanization that fuels waste generation, a power sector troubled by frequent outages, and increasing political support. The recent launch of the Sokoto Bio-Energy Plant is a key milestone demonstrating feasibility at scale, and the ongoing evaluation of new projects suggests that the pace of adoption will increase. Successful adoption of WtE is expected to have a long-term impact on resource efficiency, sustainable production and consumption, and climate change (Onabanjo Somorin et al., 2017).

13. Policy Recommendations

For the accelerated deployment of WtE technologies in Nigeria, particularly for municipal solid waste generated in urban areas, the countrywide implementation of a waste-to-energy development policy is proposed. Incorporating public-private partnerships (PPP) will create an enabling environment for service delivery within and between states, while also attracting private capital. PPP establishment must therefore include clear deployment boundaries and defined states' operation areas to avoid institutional overlaps and voids (Onabanjo Somorin et al., 2017). The provision of fiscal instruments will support effective policy implementation and market development. A related measure involves the creation of a national competitive, transparent investment framework and the removal of regulatory hurdles. Urban solid waste delivery services should also be explicitly addressed by a revised policy document. To overcome the current structural, institutional, and financial barriers, where both the private sector and local authorities fail to deliver, legislation could boost local authorities' active participation and encourage PPPs. Similarly, explicit regulation of the service provider sector, which currently lacks any form of oversight and control, is required to enhance quality and support (Onabanjo Somorin et al., 2017).

Waste-to-energy technologies offer opportunities to curb the proliferation of landfills and capture energy benefits from the increasingly high volume of municipal solid wastes in Nigeria's rapidly growing cities. Even though the federal government of Nigeria has enacted a legal and policy framework on waste management, local governments are at the forefront of waste management operations but often have weak enforcement and limited inversion capacity. Local governments should therefore embark on an urgent review and reform of existing environmental regulations to build an enabling environment for private sector involvement, which has the finance and technical know-how to develop and operate waste-to-energy plants in Nigerian cities. Public–private partnership (PPP) offers a viable option to create an enabling environment for service delivery within and between states, as well as where the private sector could raise investment capital for both operational and construction costs of major infrastructure and machinery (Onabanjo Somorin et al., 2017). It is however suggested that where PPP is adopted, clear boundaries of operation and roles should be designed within the partnership, preventing institutional overlap and voids.

Conclusion

Waste management continues to be a major challenge in Nigeria, contributing significantly to pollution and affecting health. The quantity of waste generated has consistently increased with urbanization and economic growth, and it is a common assumption that countries with growing populations and increased development have higher quantities of waste generation. Energy security has been a major element in economic development in Nigeria since the early 1980s. Conventional sources are becoming increasingly expensive due to shortage, and various methods of energy conversion have received significant attention in recent times (Onabanjo Somorin et al., 2017). Furthermore, the Nigerian government introduced a legislative framework within the National Renewable Energy and Energy Efficiency Policy to increase the use of renewable energy sources in the power and transport sectors. Pilot projects include a waste-to-energy plant in Lagos State and a 12 MW gasification facility in Imo State. Waste-to-energy projects are part of climate change mitigation strategies that contribute to environmental sustainability through the transmission of clean energy and reduction in pollution and greenhouse emissions. Waste-to-energy technology has been adopted in many countries to recover energy from the combustible fraction of waste. To successfully implement such projects, a sufficient, continuous and readily available waste supply for the adopted waste-to-energy technology is required. Investment security is ensured when the technology is appropriate, the financial return is satisfactory, and the legal environment is supportive. Challenges facing the power industry in Nigeria include poor planning, inadequate estimation, improper forecasting, poor coordination of gas infrastructure, irregular gas supply, bad operation and maintenance culture, epileptic power supply, and inadequate transmission and distribution of electricity. Biomass plants for electricity generation have not been considered; even when constructed, such plants are not connected to the national grid. Studies have been carried out to evaluate waste-to-energy potentials at the community and state levels in Nigeria. Lagos, Bauchi, and Ogun States have been assessed at the state level. Lagos Waste Management Authority has also estimated waste-to-energy potential at the local government level. At the community level, refuse dumps of four cities in Taraba State have been assessed for waste-to-energy potential using a small scale incinerator. Waste components, along with physicochemical analysis, have been carried out for the dumpsites.

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