THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 5 NO. 1 - APRIL 2024

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Ministry of National Development Planning/Bappenas Republic of Indonesia

Research Paper

Leveraging Waste Recycling as a Gateway to a Green Economy in Nigeria

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Abstract

The call for a transition to a green economy has been a recurring issue in Nigeria for over a decade. However, there was limited focus on the relationship between waste recycling and the green economy in previous studies. This study explores the nexus between waste recycling and the green economy, examining how waste recycling can be leveraged to foster a green economy in Nigeria. A descriptive qualitative approach was used, and relevant literature from secondary data sources and context were analyzed. The results indicate that waste recycling has not been fully embraced in Nigeria, especially at the household level. Therefore, waste recycling is primarily driven by the informal sector and entrepreneurs. Furthermore, the study reveals the diverse opportunities available through implementing a green economy. It recommends a green economy policy that promotes equity, economic incentives for household waste recycling, and support for entrepreneurs interested in partnering with the government.

Keywords: green economy; recycling; solid waste; sustainable development; waste management.

ARTICLE INFO
Received: August 04, 2023
Received in revised form: January 28, 2024
Accepted: April 25, 2024

doi: 10.46456/jisdep.v5i1.487

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren), Ministry of National Development Planning/National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70, Central Jakarta, Indonesia 10320
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Supported by Indonesian Development Planners Association (PPPI)

Please cite this article in APA Style as:
Ogunseye, N.O.,Ogunseye, O.D.,Ogunseye, A.O., Tongo, S.O.,Oladesu, J.O.,Oyinloye,M.A.,& Uzzi, F.O. (2024). Leveraging Waste Recycling as a Gateway to a Green Economy in Nigeria. *The Journal of Indonesia Sustainable Development Planning*, 5(1), 27-37. https://doi.org/10.46456/jisdep.v5i1.487

1. Introduction

Nigeria is in the western region of Africa, with a coverage area of about 924,000 square kilometers. The country is the most populous in the African continent. According to the World Population Review, (2023), Nigeria's population is about 226,000,000. Nigeria has six geopolitical zones: Northwest, Northcentral, Northeast, Southwest, South-south, and Southeast. These zones are divided into 36 States and the Federal Capital Territory Abuja.

The discussion surrounding the concept of a green economy has been present for a considerable duration, but it has recently garnered increased focus and interest(Al-Taai, 2021); McCormick & International Institute for Industrial Environmental Economics, 2015). The increased interest can be attributed to its being one of the ways to actualize sustainable development, particularly when it is considered that human activities are not without negative impacts, including global warming and climate change, environmental degradation, and resource depletion. Green Economy aims for sustainable development and improved human well-being without degrading the environment. There have been concerted efforts to project a green economy. This is witnessed through investments at various levels by government, regional bodies, and multilateral organizations to achieve its objectives.

Waste management is a global challenge linked to rapid urbanization, improved living standards, and changes in consumption patterns (Elagroudy et al., 2016). The generation of waste was not an issue in the earliest times due to the modest population and their nomadic way of life, but over time, rapid population growth, urbanization, the growth of large cities, and economic development culminated in greater waste volume generated (Ferronato & Torretta, 2019; Okedu et al., 2022). The global municipal solid waste generation is 1.3 billion tons annually and has been projected to almost double (about 2.2 billion tons) annually by 2025 (Elagroudy et al., 2016) (see Figure 1). There is also the problem of greenhouse gas (GHG) emissions causing global warming due to poor waste management. It has been established that the waste sector contributes 3-5% of the total GHG (Ilmas et al., 2018). Undoubtedly, this would increase if unsustainable approaches to waste management are sustained.

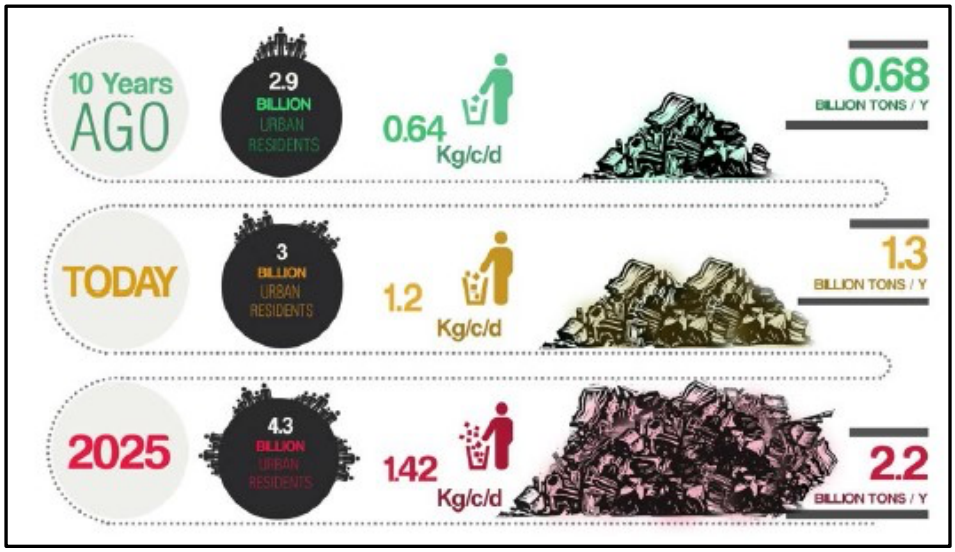

Figure 1. Municipal solid waste quantities
Source: Hoornweg and Bhada-Tata (2012) cited in Elagroudy et al. (2016)

While it is seen that developed countries have, to a great extent, addressed the waste problem, the same cannot be said of developing countries (Wilson et al., 2015). The socioeconomic conditions of developing countries constrain the conventional solutions developed countries use. In other words, variations exist in the nature and standards of waste management services within and between countries and different urban areas. For instance, globally, over half of the generated waste is dumped or disposed of in unsanitary landfills, whereas about 20% is recycled (See Figure 2). However, recycling is increasingly implemented as one of the waste management strategies to ensure resources from waste materials are

harnessed for attaining a green economy and, ultimately, sustainable development (Elagroudy et al., 2016).

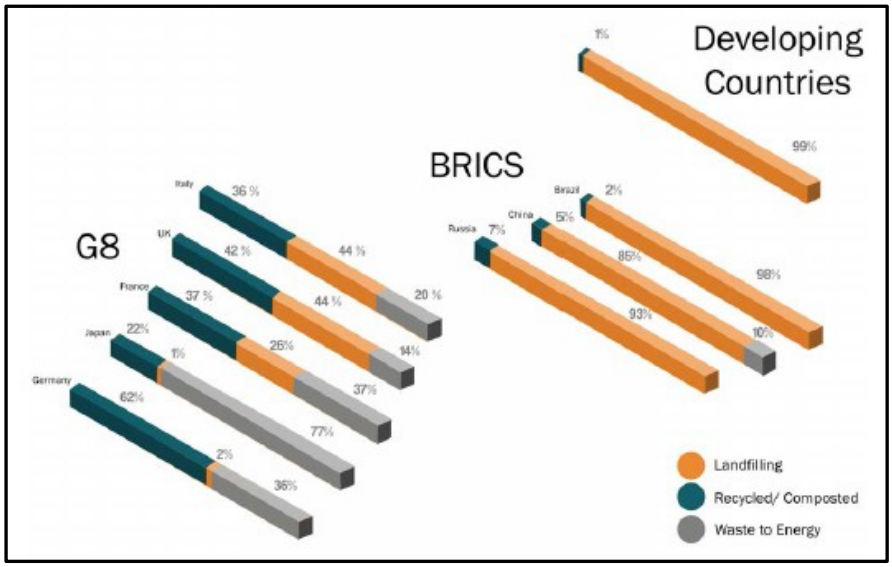

Figure 2. Management practices of municipal solid waste
Source: Fischedick et al. (2014) cited in Elagroudy et al. (2016)

Studies have been conducted on the green economy in Nigeria. The few studies conducted in Nigeria examined the green economy vis-à-vis agriculture (Tasie et al., 2015), planning regulations and horticulture practices (Olaleye et al., 2015); implication for economic growth (Okonkwo & Uwazie, 2015) and sustainable development and poverty reduction (Nwosu et al., 2015). Tasie et al. (2015) explored the nexus between green economy and agriculture in Nigeria. The study recognized the major constraints of agriculture and the challenges of Nigeria's transition to a green economy. While the researchers admitted to the absence of a policy framework on green deal initiatives, they put forward recommendations towards actualizing the transition to a green economy via agriculture. Another study by Olaleye et al. (2015) examined the influence of planning laws and regulations on the green economy in Lagos, Nigeria, and found that 38% of gardens were lost as a result of stringent enforcement of development control regulations. Additionally, ₦14,570,000 worth of investment and ₦11,070,000 annual profit were affected.

Okonkwo and Uwazie (2015) studied the green economy framework and its implication for sustainable growth and development of the Nigerian economy. The researchers analyzed sectors such as agriculture, fisheries, forestry, manufacturing, and renewable energy, as well as highlighted the various challenges confronting these sectors and probable solutions addressing identified challenges. They concluded that a green economy in Nigeria is desirable and attainable if the country pays attention to building institutional capacity and how green economy and environmental regulation are perceived. On the part of Nwosu et al. (2015), who investigated the importance of the green economy as a tool for achieving sustainable development, findings showed that the green economy is central to poverty reduction, creates jobs, enhances social welfare, and promotes enhanced resource and energy efficiency. To achieve sustainable development via a green economy, the authors recommended specific enabling conditions such as a well-designed regulatory framework, subsidies with public good characteristics or positive externalities, stimulation of investment through taxes and market-based instruments, and the creation of agricultural zones in urban and rural areas. In the current discourse, a noticeable research gap exists in understanding the interconnectedness of waste recycling and the green economy, particularly adopting waste recycling as a leverage to attain a green economy in Nigeria. Compared to developed nations with a growing body of research examining the green economic system, many developing nations like Nigeria have given limited attention to opportunities that can aid the transition to a green economy. Investigating the socioeconomic factors influencing the adoption of waste recycling practices and assessing issues faced by households and communities are fundamental aspects that remain underexplored. Exploring this research gap can uncover valuable insights to inform policy measures and

strategies that can facilitate the adoption of waste recycling as a vehicle towards a green economy in Nigeria.

Given the above, this paper explores waste recycling and the green economy nexus and how waste recycling could be leveraged to achieve a green economy in Nigeria. It will address the following research questions: What is the green economy? What is the situation of waste recycling in Nigeria? How can waste recycling be leveraged toward achieving a green economy in Nigeria?

2. Methods

This paper is concerned with the nexus between waste recycling and a green economy and, more importantly, how waste recycling can be leveraged towards the attainment of a green economy in Nigeria. A qualitative descriptive approach (QDA) was employed to achieve the study objectives. According to Lambert & Lambert (2012), qualitative descriptive study entails "a comprehensive summarization, in everyday terms, of specific events experienced by individuals or groups of individuals", and is "the least theoretical of all the qualitative approaches to research". Additionally, QDA is regarded as less encumbered since it does not involve "pre-selection of study variables, no manipulation of variables, and no prior commitment to any one theoretical view of target phenomenon" (Lambert & Lambert, 2012), hence the choice of the QDA for this study. More importantly, its merits over other qualitative approaches are that the technique applied for data analysis is categorical, less conceptual, and straightforward, which thus allows it to be conducted in shorter timeframes than other qualitative research designs (Ayton, 2023). This approach has been adopted by previous studies (Ogunseye et al., 2022; Ogunseye et al., 2023). Notably, the paper relied solely on secondary data sources comprising journal articles, dissertations, specialized books, conference proceedings, and international organization reports. These documents were carefully selected, and their selections were based on keywords such as green economy, waste recycling, waste management, and sustainable development. Context analyses of the secondary data were conducted to gain insight into the subject matter. First, an effort was made to explore the concept of green economy. Second, we examined waste recycling by gleaning its definitions and consequences if poorly implemented and reviewed waste recycling studies that span the six geopolitical zones of Nigeria. Third, we discussed based on the review conducted and drew conclusions based on the findings.

3. Results and Discussion

3.1 Waste Recycling in Nigeria

Recycling is "the process of extracting resources of value from waste". It could also involve "solid waste reuse of waste items recovered to be used again after cleaning and refurbishing have taken place" (Agbaeze et al., 2021). Recycling is a waste management option that transforms waste into a new product. It is a viable option because it creates employment opportunities, reduces pollution, contributes to energy saving, and enhances resource efficiency. For instance, the United States recycling industry alone generated an estimated US$ 236 billion in revenue in 2007, employed over a million people, and contributed about 2% of the Gross Domestic Product (EPN cited in Rozenberg, 2014). Likewise, in the European Union Countries, between 2004 and 2008, recycling produced a turnover of EUR 32 billion, which increased to a minimum of EUR 60 billion. This is besides recycling's contribution to employment growth, which increased by 7% annually between 2000 and 2008 (EEA 2011 cited in Rozenberg, 2014).

It should be noted that recycling is not limited to recyclables (dry waste); instead, it involves the conversion of the organic content of the waste stream to compost via a process called composting (organic recycling). In developed countries, there are numerous cases of successful composting projects. Composting is becoming common in developing countries, though not without challenges (Wei et al., 2017).

Recycling poses health and environmental risks in the form of high concentrations of dust, bioaerosols, and metal. Consequently, waste and recycling workers are usually subjected to itching eyes, sore throats, and respiratory diseases (Poole & Basu, 2017). It was reported that waste pickers at Mexico City dumpsite have a life expectancy of 39 years as against 67 years for the whole population (Webster, 2020). These health, safety, and environmental risks associated with recycling, especially in areas where waste is poorly managed, constitute concerns to waste managers and policymakers, and efforts towards reducing it to the bare minimum, if unavoidable, should be encouraged.

Several studies have been conducted addressing waste recycling in Nigeria. Few considered relevant and that provide insight into the state-of-the-art regarding waste recycling in Nigeria were explored. The findings in this section revolve around stakeholders' perceptions, attitudes, and roles in waste recycling, initiatives, and waste materials recycled by the stakeholders.

Households' perception of financial incentives in endorsing sustainable recycling for municipal solid waste in Lagos, southwestern Nigeria, was studied, coupled with the specific objectives to understand the factors of environmental risk, behavioral economics, resource value, economic benefits, convenience, knowledge, legislation, and belief. Findings revealed that financial incentives for recycling are essential for sustainably reducing and managing municipal solid waste. A detrimental environmental impact was the most important driver for the households willing to recycle municipal solid waste. It was also established that a moderate to positive relationship exists between households' perception of financial incentives and drivers for household willingness to recycle municipal solid waste (Abila, 2018). In the Nigerian construction industry, recycling is adopted as one of the waste disposal methods in Lagos. Recycling is next to landfilling and reusing as backfill in terms of the commonest waste disposal methods among construction firms. Other important disposal methods identified are open dumping, incineration, onsite dig and bury, and burning (Ogunmakinde et al., 2019). The activities of a social enterprise called Wecyclers have not gone unnoticed in Lagos. In partnership with LAWMA, Wecyclers collect plastic bottles, plastic bags, and aluminium cans from households and garner points for every kilogram for which they redeem electronics, household items, training classes, and money. Subsequently, wecyclers sort and aggregate the collected recyclables before selling high-quality recyclables to recyclers (The World Bank, 2017). An elaborate study of the urban dwellers' attitudes to waste management and control in four local government areas in Ogun State in southwest Nigeria revealed that households displayed weak attitudes to waste management practices such as recycling (28.1%) and composting (25.8%). This is a huge challenge for these cities, with the majority of households (64.7%) not paying for waste collection services. However, they were willing to pay for waste collection services (Adetola & Omonijo, 2019).

The characterization and types of waste generated in Ota indicated that about 64% of household waste is recyclables. The recyclables that dominated the waste stream were cartons, plastic, textiles, glass, nylon, rubber, tin, and sacks. The recovered recyclables are bought by local vendors who pack them for sale to recycling plants and companies in Lagos (Olukanni et al., 2014). An estimate to determine the potential revenue per day of the materials based on waste quantity generation per day and cost per kilogram of each waste material is summarized in Table 1. From Table 1, the total value of the recyclables (paper, cartons, plastics, glass, tin/can, and nylon) recovered daily by the vendors amounts to ₦7,271,617.60 ($45,447.60). This revenue is huge if it is calculated weekly and annually for a medium-sized city. Then, one can imagine the revenue that will accrue to the country if the waste recycling potential is fully harnessed. With the increasing population coupled with the unpredictable consumption habits of citizens, waste recycling will not only contribute revenue to the states but create job opportunities for citizens willing to participate in recycling. The figures on potential revenues, as presented in Table 1, lay credence to the contributions of recycling as an industry to the economy if strategically implemented.

Table 1. Estimated recyclables and their economic values in Ota

Materials	Average Percent of each item in the waste stream (%)	Quantity of Waste generation per day (kg/day)	Cost/kg for sale of each recyclable material (₦/kg)	Potential Revenue/day of the materials from the waste stream (₦/day)	Potential Revenue/day of the materials from the waste stream ($/day)
Paper	3.94	12048.28	35	421,689.80	2635.56
Carton	11.78	36023.28	35	1,260,814.80	7880.09
Plastics	11.48	35105.88	30	1,053,176.40	6582.35
Glass	14.19	43393.07	30	1,301,792.10	8136.20
Tin Can	9.32	28500.59	30	855,017.70	5343.86
Nylon	19.45	59478.17	40	2,379,126.80	14869.54

Source: Olukanni et al. (2014)

In the southeastern region of Nigeria, specifically in Owerri, the modes of waste management showed that a marginal proportion of the households (1.6%) engaged in recycling, 2.2% compost the waste, and 2.3% sorted their waste, which thus suggests poor participation in sustainable waste management practices of recycling, composting and waste sorting (Uwakwe, 2013). In another city in the

southeast region (Awka), waste management was coordinated by various agencies, but with no positive results to show for the efforts. The food residue, leaves, and garden waste constitute over 70% of the generated waste, whereas nylon/plastics, metal, and paper accounted for over 22%. Unfortunately, the waste management strategies of reducing, reusing, recycling, and recovering are not practiced in Awka because the waste disposed of was found commingled and dumped at an illegal dumpsite (Okonkwo, 2014). Azuike et al. (2015) reported poor knowledge about recycling among the residents in the Anaocha local government area of Anambra State. However, residents demonstrate superior knowledge about other waste disposal methods, including open burning (77.8%), burying (68.1%), open dumping (65.2%), and animal feeding (51.1%) (Azuike et al., 2015).

In Yenogoa, south-south of Nigeria, residents' attitude toward solid waste were good, but the waste collection was carried out without sorting or recycling (Stanley et al., 2018). According to Egun et al.,2012), the waste market operation is informally driven primarily by small enterprises and waste pickers who are motivated by poverty and need to earn a living. Scavenging activities are also pervasive at dumpsites and other locations like the neighborhood streets where waste pickers negotiate for the purchase of valuable waste from households and establishments. There are also middlemen identified as waste traders in the waste market. The waste traders own a scrap shop where waste is sorted, weighed, and bought from the waste pickers. Subsequently, the recyclables are transmitted to the industries that utilize them as raw materials. While the purchase of and use of recycled waste indicated that a majority (78%) were supportive of waste recycled products, especially plastic/polythene products, 11% were not supportive as they were unsure of the durability of recycled products. Another 85% responded positively regarding using compost fertilizers, but 15% were uncertain. Concerning waste segregation before disposal, 17% displayed a positive attitude about it, but 83% were negative, which thus implies a lack of sensitization and enlightenment about the need for proper segregation before disposal. On the issue of participation in waste market operation, 87% of the respondents were positive in their response, whereas 5% were negative, as the latter perceived waste market operation as a demeaning job.

In an examination of solid waste management in northcentral Nigeria, for instance, a formal recycling program was absent in Abuja FCT. However, quite a few Material Recovery Facilities were under construction. However, material reuse and recycling activities were found to be restricted to household reuse and scavenging activities of the poor (Ezeah & Roberts, 2014). Furthermore, entrepreneurial activities in solid waste recycling were evident in Abuja FCT and can be leveraged to enhance sustainable solid waste management competencies. This was unconnected to the private sector involvement in solid waste management in Abuja, as it was argued that entrepreneurs possessed the capacity to bring innovation into waste recycling (Agbaeze et al., 2021). In Minna, the capital of Niger State in northcentral Nigeria, recycling is at a zero level despite increasing environmental awareness. The investigation of reuse of construction and demolition waste (CDW) in the Ilorin metropolis in northcentral Nigeria revealed that CDW such as asphalt, wood, wooden door frames/window frames, louvers, asbestos, metals, and concrete were salvaged and reused. These waste materials from the construction sites were given away and offered for sale by contractors. Reusing these waste materials helps avoid storage and transportation costs that eat into contractors' profits. Additionally, salvage markets exist in Ilorin, where these materials were given in exchange for a price below the selling prices of new materials (Mudashiru et al., 2016).

In the Kastina metropolis (northwest Nigeria), households adopted waste disposal methods such as waste disposal on vacant plots, roadside, open dumps, gullies, burning, and drains. Despite these methods being unsatisfactory, households supported waste sorting before disposal, a strategy that enhances recycling within the Katsina metropolis (Olajide, 2014). Electronic waste management in Kaduna metropolis in northwest Nigeria indicated the prevalence of electronic waste in the metropolis, which either exists in reusable or non-reusable forms. The management approach to electronic waste includes recycling, refurbishment, processing for parts recovery, collection, and sales of scrap; however, the city has no policy on electronic waste (Nyam et al., 2015). Moreover, in the Kaduna metropolis, the majority of the households (85%) store and dispose of solid waste in its commingled form. There are cases of waste segregation by households but only for items considered valuable, which they offer in exchange for other goods by itinerant buyers. The wheelbarrow boys (cart pushers) constitute another active group involved in segregation within the metropolis. Still, waste segregation is rare among formal waste collectors or contractors as they get subsidized by the government (Rigasa et al., 2016).

An assessment of waste management activities of the Borno State Environmental Protection Agency (BOSEPA) provided insight into waste management practices in Borno (northeast Nigeria). The informal

sector dominates recycling activities in the State, waste pickers scavenge metallic waste and PET bottles from dumpsites and offer them for sale to scrapyards and junkshops, before onward sale to companies from the cities of Abuja, Kano, and Lagos. BOSEPA's recycling pilot project for the production of interlocking paving blocks from plastics is noteworthy (Wunubo et al., 2017). However, in Jalingo (capital of Taraba State, northeast Nigeria), the agency responsible for waste collection faced various challenges as waste sorting is non-existent in the city. Thus waste collected is commingled, which makes recycling difficult to achieve. The problem experienced was linked to the rural lifestyle of the populace, whereby wastes are dumped indiscriminately (Abd'razack et al., 2013).

3.2 Green Economy

Although the idea is familiar, the concept of the green economy is rapidly gaining attention globally. According to Williams et al. (2013), the term 'green economy' was first coined in a report entitled "Blueprint for a Green Economy" by a group of renowned environmental economists for the United Kingdom Government. The increased interest can be linked to the 2008 crisis when governments and industries worldwide needed to respond to economic recessions while furthering environmental and climate protection goals (McCormick & International Institute for Industrial Environmental Economics, 2015). In 2008, the United Nations Environmental Programme (UNEP) resuscitated the term when the idea of a 'green stimulus package' was developed. The concept was built on the platform of the pro-growth model developed to justify the need for the type of development that is low-income-friendly and ensures poverty eradication. The concept is also believed to have originated from the works of Simon Kuznets, who 1995, found an inverted U-pattern between per capita income and inequality based on a cross-section of countries (Olaleye et al., 2015). However, Georgeson et al. (2017) stated that the green economy emerged as an essential policy framework for sustainable development in both developed and developing countries and further observed tensions exist between competing green economy discourses and several different definitions.

There is no internationally agreed definition of a green economy, but the UNEP gives the common and widely adopted. UNEP describes a green economy "as one that results in improved human well-being and social equity while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low-carbon, resource-efficient, and socially inclusive" (Aoyi et al., 2016); ten Brink P. et al., 2014). From an economic perspective, the green economy is defined as using taxes, subsidies, and fees strategically and systematically. In other words, it involves using tough economic policy tools to clean and protect the environment. For instance, Sweden has some of the world's highest taxes on carbon dioxide (CO_2) and an "ambitious program for deposit-refund of old cans and bottles, which is engrained in the national psyche". Similarly, in Denmark, vital subsidies are available for wind energy (Eklund, cited in McCormick & International Institute for Industrial Environmental Economics, 2015). It has also been defined as the economy driven by investments in six critical sectors: renewable energy, transportation, water management, waste management, land management, and green buildings (Burkart, 2012 cited in Omuta, 2014).

The green economy concept connects with several other concepts, such as 'sustainable development, 'ecological modernization, and 'green jobs,' but sustainable development is the most prominent of the concepts (McCormick & International Institute for Industrial Environmental Economics, 2015). ten Brink et al. (2014) also opined that a critical look at the concept requires more than just "greening" the economic sectors; it is a means of achieving the sustainable development imperatives of: **i. Improving human well-being:** securing better healthcare, education, and job security; **ii. Increasing social equity:** ending persistent poverty and ensuring social, economic, and financial inclusion; **iii. Reducing environmental risks:** addressing climate change, ocean acidification, the release of hazardous chemicals and pollutants, and excessive or mismanaged waste; and **iv. Reducing ecological scarcities:** securing access to fresh water natural resources and improving soil fertility.

The preceding has shown that understanding and implementing the concept of a green economy is fundamental for any nation to achieve sustainable development. Many countries worldwide are taking steps toward transitioning to a green economy, and Nigeria should not be an exception.

3.3 Discussions

This study is concerned with the nexus between waste recycling and a green economy and how waste recycling can be leveraged to attain a green economy in Nigeria. It has shown that the green economy is a phenomenon that is being pursued globally to achieve low carbon, resource efficiency, and inclusiveness. These objectives of a green economy could be best achieved by deliberate policies in sectors comprising renewable energy, green buildings, clean transportation, waste management, water management, and land management. It was also established that waste recycling, as a waste management option, is beneficial because it provides job opportunities for the unemployed, reduces pollution, alleviates poverty, reduces energy consumption, and makes for resource efficiency and management (Elagroudy et al., 2016). However, waste recycling has not been fully embraced, although many households are willing to participate in recycling, whereas the informal sector has been playing a laudable role. Low participation and awareness in waste recycling in Nigeria indicate that if carefully designed and managed, it can accelerate the transition to a green economy. Therefore, to encourage citizens' active and sustained participation in recycling, efforts should be made to understand which factors influence people's decision to cooperate with a recycling programme as a way of life and to augment people's involvement in recycling.

Conclusion

This study has shown that waste recycling activities in Nigeria involve multiple stakeholders. Although households contribute substantially to waste generated in Nigerian cities, their involvement in waste recycling has been largely dominated by the informal sector and entrepreneurs. This knowledge is relevant in the development of an effective framework that encompasses environmental, economic, technological, and social dimensions for leveraging waste recycling as a medium to realize a green economy in Nigeria. It has also been shown that implementing a green economy policy is worthwhile in any nation as it offers diverse opportunities and possibilities.

To leverage waste recycling to attain a green economy in Nigeria, the government, through waste management authorities or agencies, needs to collaborate with identified stakeholders in crafting inclusive green economy policies. Such collaboration should aim to deepen stakeholders' understanding of health, safety, and environmental risks. Addressing social issues like child labor, social protection, and freedom of association within the green policy document is crucial for a comprehensive approach. Households must be motivated to participate in the State's recycling program by initiating public campaigns and raising awareness about recycling's role in achieving a green economy as necessary. These campaigns should emphasize the importance of adopting measures to prevent air, land, and water pollution to maintain environmental sustainability. Implementing economic incentives, such as taxes to promote recycling, needs to be clearly defined in the green economy policy, eliminating ambiguity to facilitate stakeholders' understanding of their roles.

Furthermore, supporting and partnering with entrepreneurs for recycling ventures through bank loans is vital for acquiring necessary recycling equipment, thereby enabling waste recycling on a larger scale than is feasible at the household level. This support generates employment opportunities and allows for the diversification of recycling activities. Also, recognizing the significant yet overlooked contribution of the informal sector, including itinerant buyers, scavengers, and recyclers, to Nigeria's waste management system is another step forward. Their formal integration into the waste sector and encouragement to form cooperative societies, mirroring practices in countries like Egypt and Brazil, would enable them to undertake larger projects and contribute more effectively to a green economy. The successful implementation of these recommendations is anticipated to enhance waste recycling efforts in Nigeria, steering the country closer to realizing a green economy.

Finally, this study utilized a qualitative descriptive research methodology. Although this is a fundamental precursor, its limitation is the lack of broad applicability often found in quantitative research approaches, which may be considered in future studies to quantitatively examine the nexus between waste recycling and the green economy in Nigeria.

Acknowledgments

The authors thank individuals and organizations whose work aided this study.

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