



Tropentag 2023 Berlin, Germany

September 19-22, 2023

Conference on International Research on Food Security, Natural Resource
Management and Rural Development
organised by Humboldt University of Berlin & ATSAF e. V, Germany

Evaluating Waste Management Challenges, Practices and Habits for Circular Economy and Green Growth in Nigeria

Opeyemi Amusan^{a,b,c,d}, Sola Amusan^d, Oladeji Yusuf^d, Israel Afolayan^d, Paul Akinbode^d

a University of Ibadan, Center for Petroleum, Energy Economics & Law, Nigeria Email: amusanope@gmail.com

b Development Impact West Africa, ECG, Safisana, GIMPA - Ghana; Hewlett Foundation & CEGA - USA

c Amiesol Resources Konsult, P.O. Box 23039 University of Ibadan Post-office Agbowo, Ibadan, Nigeria

d Waste And Bio Recycling Alliance League (WABRAL); ARK Foundation; MUST Energy; BOG Intercontinental

Abstract

The importance of waste management in developing countries like Nigeria cannot be over-emphasized because of its attendant health, safety, environment, land use and socioeconomic challenges. Nigeria is the most populous black country globally with an ever increasing population of over 200 million, limited land area of 923,768 kilometer square at about 150 people per square kilometer, and urban -to- rural population of 48.3 -to- 52.7% across the six geopolitical zones. These increasing population, urbanization and scarce resources call for a study to evaluate the waste management challenges, practices and habits for circular economy development and green growth in Nigeria. Consumption and development theories formed the theoretical framework of this study. Descriptive statistics and secondary sources of information were utilized through books, journal articles and web pages of specific organizations. In addition, personal-expert knowledge of these field and study area was also used in the evaluation of waste management challenges, practices and habits for circular economy development and green growth in the country. It was found that, wastes are often burned or disposed of on landfills, open dumps and water bodies without prior treatment. Thus, waste management is a bottleneck in Nigeria because of weak or lack of enforcement of environmental regulatory policies and legislation. This may be connected with challenges like inadequate environmental awareness, poor land-use, missing recycling, producers' irresponsibility, corruption, inadequate- funding, technology and development. Established waste habits of Nigerians in hierarchy were Organic/food waste 57.0%, Plastics 27.0%, Glass 5% and Others 4%, mostly dumped on landfills. Since organic/food waste is the highest, moving the country from linear to circular economy would improve agri-food systems, foster green growth and clean environment. Circular economy conserve resources, enhance food security, and generate new products for agri-food transformation. This study led to the establishment of Waste And Bio Recycling Associates League (WABRAL) in Nigeria for the promotion of global circular economy best practices in Nigeria and Africa.

Keywords: Agri-food systems, Circular economy, Land use, WABRAL, Waste management

1.0 Introduction

It has been established by researchers that poor municipal solid waste (MSW) management is one of the major problems confronting Nigerian or African towns and cities with no remarkable headway by the

government in solving the problem (Amusan, 2018-2023; Anekwe, 2016). This tripling generation of waste (MSW) may not be unconnected with some noticeable economic and social progress linked with urbanization and population growth (Hoorweg, et.al., 2012). Especially in Nigeria with a density of over 122 people per square kilometer and among the large economy in Africa where urban population growth was >6% in most countries (Iwayemi, 2011). This rapid urbanization rate was to a large extent caused by the perceived higher income earning potentials that characterized the urban aided with alarming resource inflows from the rural which have left the area impoverished in the post-independent period. Waste have become a common feature of Nigeria's urban landscape due to poor waste management with growing heap of solid waste often found along our major roads and streets (Amusan, 2020; Oberai, 1987). This notable feature of most Nigerian urban areas is described as "Refuse Mountains" which breeding ground for pathogenic agents and foul odour. This menace of waste has posed great environmental problems in most urban and rural areas in Nigeria with MSW management agencies battling with the challenges of indiscriminate disposal of refuse on streets, drainages and water bodies in many Nigerian cities. The MSW management problem triggered by the process of urban development and/or urbanization is a major pervasive problem globally in cities especially in developing countries like Nigeria. They pointed out the need of research that helps sensitize all relevant stakeholder and enable them to agreeably adopt a realistic action plan for implementation. They, solicit for attitudinal changes of Nigerians through re-orientation, sound education and technological innovations in the development of a new sustainable approach for MSW management in Nigeria. Many Nigerian cities are confronting untold challenges of sharp increase in MSW and poor disposal. Pointing out the alarming rate at which plastic waste littering the public premises and streets are increasing in volume and environmental sanitation violated. There is no remarkable improvement in many states' waste management despite government involvement. Thus, recommending a community-private sector participation policy for MSW management. (Ubani, 2003). From Okpala (1986) studies of waste management in Nigeria aimed at solving the resultant problems, they note that the sanitary condition in many Nigerian cities are not satisfactory in spite of measures taken to address the waste problem. High volume of waste in Nigerian cities as majorly influenced by poor evacuation of central refuse dumpsite. The grave consequences of indiscriminate waste disposal is flooding and unsanitary conditions resulting from blockages of drainages with uncollected waste that often end up in them. The consequences are health hazards, poor environmental quality, pollution and low scenic value of neighbourhood, and the causes as lack of environmental awareness, absence of dumpsites, carefree attitude and population explosion thus, recommending the upgrade of MSW system as a way out. The contributory factors to the challenge include inadequate regulatory framework that has manifested in lack of interest of private sector investment in service delivery (infrastructure); uncoordinated institutional functions; low political will, low capacity to discharge duties, poor data information for planning, wrong attitude of waste generator among others. Yet on the increase is the demand for good waste management service for public health and environmental protection. However, above the generality of solid waste management (SWM) in Nigeria, the commitment of the Lagos State Government towards sustainable waste management has made Lagos state a model for other states in the country. In Nigeria, established legislation relating to waste management include the Harmful Waste Act, 1988, the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, 2007, Environmental Impact Assessment Act Of 1992. Also, relevant regulations are National Environmental (Sanitation and Wastes Control) Regulations, 2009 and the National Environmental Protection (pollution abatement in industries and facilities generating waste) regulations. Furthermore, legislation at the state level among other include; Lagos State Waste Management Authority, Oyo State Solid Waste Management, among others. Generally, all waste streams are stored together in either bags or containers (such as used buckets) and plastics waste bins. From findings, the Lagos Waste Management Agency (LAWMA) provides 240 liters bins for households after annual payment of the Land Use charge through the Land Records Company. Also, waste collection service is offered mainly by the public sector though some State Governments operate some level of formal public-private participation (PPP). It is not, however, uncommon to see informal waste collector using local vehicles (push carts) for collection services from door to door in some parts of Nigerian cities. The Lagos State Government through LAWMA engages, coordinates and evaluates the activities of its private sector participant (they are over 300) into Municipal Solid Waste Collection. Collection frequency is either once or twice a week and usually on door-to-door basis. This is usually difficult in densely-populated areas and it not uncommon that collection frequency is elongated. Sadly, there is no National Waste Management Plan in Nigeria and if any is available in any of the States it is likely it will not be substantial. In August, 2012, a draft Policy on Municipal and

Agricultural Wastes was reviewed. It is hoped that the Policy in time will lead to development of a comprehensive legislation and possibly a plan that will address the issue of waste management in the Country. One major challenge in Nigeria is the enforcement and implementation of policy (Oladele, 2011; Amusan, 2023). Waste as a valuable energy resource will support energy recovery from waste which can solve two problems at once: treating non-recyclable and non-reusable amounts of waste; and generating a significant amount of energy which can be included in the energy production mix in order to satisfy the consumers' needs (Ogwueleka, 2009; Amusan, 2018 & 2019).

2.0 Material and Methods

Nigeria, a developing nation with population of approximately 200 million people and land area of 923,768 km square is the most populous country in Africa and 9th most populous in the world. Whereas about 50% of its population live in urban areas (48.3%), 52.7% live in rural areas and population density at 139 people per square km. The GDP per capita is about \$1,800 with above 60% living below poverty line. Nigeria is located in Western Africa on the Gulf of Guinea. The country land borders with the Republic of Benin in the West, Chad and Cameroon in the East, and Niger in the North and has a coastline of at least 853km. Nigeria has a varied landscape, from the Obudu Hills in the Southeast through the beaches in the South, the rainforest, the Lagos estuary and savannah in the middle and Southwest of the country and the Sahel to the encroaching Sahara in the extreme North. River Niger and River Benue are the country's two main rivers. These two rivers converge and drain (empty) into the Niger Delta, the world's largest river delta. The South-western Nigeria is the most developed out of the six geo – political regions commercially and the cocoa belt of the nation with lots of agriculture as well as (renewable) energy potentials. Nigeria comprises 36 States and one Federal Capital Territory, subdivided into 774 Local Government Areas. Life expectancy is 47 years (average male / female). The climate is equatorial in south, tropical in center and arid in north. 33.02% of the land is arable. Consumption and development theories provided the theoretical framework. Purposive sampling of major landfills in Lagos, Ogun, Oyo, Osun, Ondo, Ekiti States and waste generation pattern using structured questionnaires (210) on spatial variation, challenges and prospect of waste management practices. The results were validated at expert workshop for key officials within the waste management industry. Data were analysed using descriptive and inferential statistics.

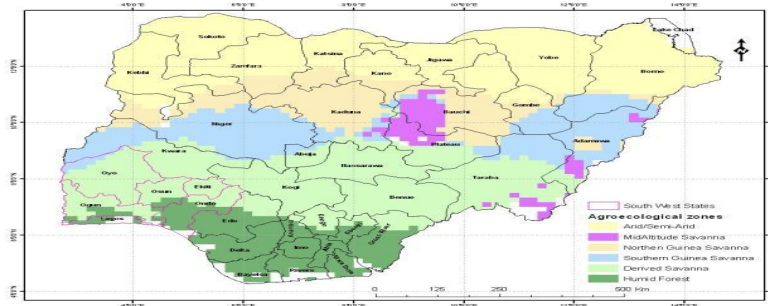


Figure 1: The Map of Nigeria (Amusan, 2016)

3.0 Results and Discussion

3.1 Waste Management Practices Habits, Challenges & Willingness for Circular Economy

Waste Habits of Nigerians (shown in figure 4) were 57.0% organic, 27.0% plastics, 5.0% glass, 5.0% metal and 4.0% others, ending up mostly on landfills/dumpsites. Only 28.1% separated waste at source and 46.2% used private collection services. The major waste management challenges were pollution and health risks (69.1%), limited resources (44.8%), lack of technical skill (23.8%) and inadequate management skill (18.1%). As part of waste management practices, 95.2% were willing to participate in circular economy, 94.3% supported polluter pays principle and 96.2% supported dissemination of public information on Waste-to-Energy. Waste management challenges significantly influenced health issues and pollution ($p=0.048$).

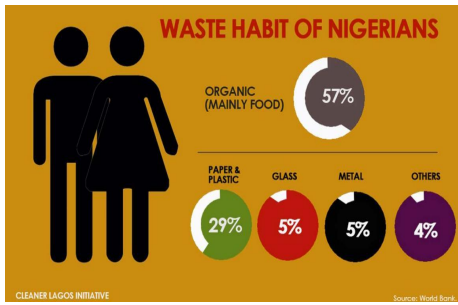


Figure 2: Waste Habit of Nigerians



Figures 3 & 4: Field Survey Pictures (Amusan, 2018, 2023)

Table 1: Location Distribution of the Respondents in Nigeria Landfills / Dumpsites

SW-Nigeria Locations	Frequency	Percentage (%)
Lagos	64	25.60
Ogun	30	12.00
Oyo	30	12.00
Osun	30	12.00
Ondo	26	10.40
Ekiti	30	12.00
Total	210	100.0
Gender	Frequency	Percent (%)
Male	112	53.3
Female	98	46.7
Total	210	100.0

Table 2: Waste Management (MGT) Challenges in Nigeria

Waste MGT Challenges	Frequency	Percentage (%)
Pollution and Health Risks	166	69.1
Limited Resources	108	44.8
Lack of Technical Skill	57	23.8
Inadequate Management Skill	43	18.1

3.2 Waste Management System in Nigeria: Current Linear & Proposed Circular Economy

From linear to circular economy, there is a need for a paradigm shift in the product economy regarding the curtailing of environmental impact and waste of resources through increased efficiency at all stages. With a circular economy, waste is seen as a viable resource and not an undesirable end product of society. Waste is seen as input material for the creation of valuable products as new outputs. For this to be successful, all hands must be on deck and all stakeholders actively involved. There must be seamless synergy in the products development, infrastructure, equipment and services sector with the conventional waste managers rightly supported to take the driver's seat. There is a pressing need for a market driven solution to unlock the potential in the waste management industry. The government has a role in creating an enabling environment and stimulate demand. The weakest link in achieving circular economy in Southwestern Nigeria is the

current collection method where waste is co-mingled and transport to the dumpsites for mining. A closed loop system where waste is segregated at source using three-bin system (1. organic waste, 2. other recyclable waste and 3. non-recyclable waste). These three categories of waste will be evacuated by the Waste Operators and transported to sorting centers for sorting, then transported to off-takers for recycling in circular economy process for agri-food system development and green growth. The non-recyclables are transported to landfills or dumpsites as viable resource for waste-to-energy development, thus making waste move in a circular path.

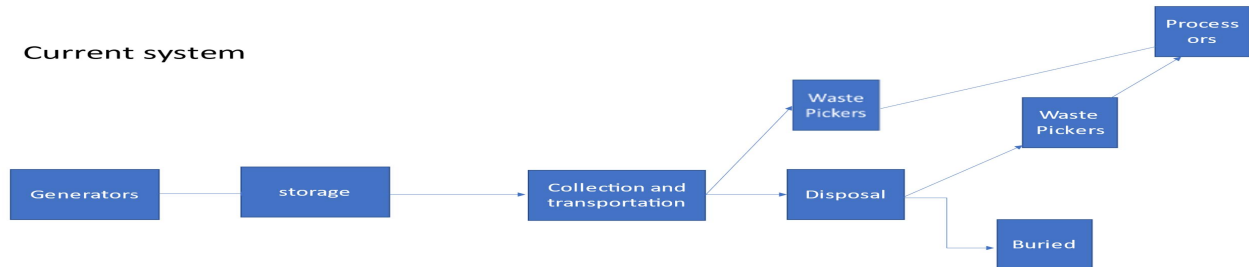


Figure 5: Current Waste Management System in Nigeria (Amusan, 2023)

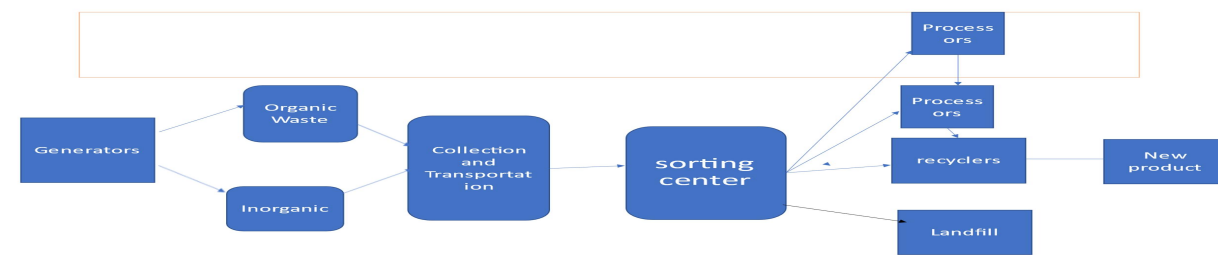


Figure 6: The Proposed Process Model for Circular Economy Adoption (Amusan, 2023)



Fig 7: Linear to Circular Economy Fig 8: Circular Economy Enablers for SDGs Achievement (Amusan, 2019, 2023)

4.0 Conclusion and Recommendation

Waste habits of Nigerians are 57.0% Organic / Food waste, 27.0% Plastics waste, 5.0% Glass waste and 4.0% Others, mostly un-separated and dumped on landfills. Since Organic / Food waste is the largest, moving the Country from linear to circular economy would improve the agri-food systems, foster green growth and clean environment. Circular economy conserve resources, enhance food security and generate new products for agri-food transformation. This study led to the establishment of Waste And Bio Recycling Associates League (WABRAL) for the promotion of global circular economy best practices in Nigeria and Africa. While the Government is encouraged to create enabling environment and effective regulation of environmental policies / legislation, WABRAL is supporting all Stakeholders to make these happen-with capacity building, partnerships, business training trips, conference, research and development.

References

- Akhator, E.P., Obanor, AI; Igbinomwanhia. D.I. 2016. Thermal Analysis of a Small-Scale Solid Waste-fired Steam Boiler for Power Penetration in Benin City, Nigeria. *Nigeria Journal of Technology*, 35 (3): 551-61.
- Amusan, O.A. 2023. Evaluation of Waste Management in Southwestern Nigeria for Food-Energy-Water Nexus and Circular Economy Development. *Circularity Africa Conference 2023 Publication*, IITA Ibadan, Nigeria.
- Amusan, O.A. 2020. Evaluating the Relationship between Solid-Food Waste, Environment and Economic Security among Malnutrition in Nigeria. *Tropentag Hohenheim 2020, Germany*. Open Access ID - 184.
- Amusan, O.A. 2019. Unlocking the Potential in Waste through Circular Economy. *Association of Waste Managers of Nigeria (AWAMN) Award Paper*. AWAMN Waste Management Industry Publication 1: 31-37.
- Amusan, O.A., Dinkler, K., and Peterseim, J. 2018. Renewable Energy Recovery Generation for Security and Safety in Global Agriculture and Production: Justification & Outlook. *Tropentag Ghent 2018, Belgium*. Open Access ID-56.
- Amusan, O.A. 2018. Sustainable Agri-Value Chain and Production: Interplay of Efficient Resource Use and Energy Systems in World's Remote Areas. *FOOD2030 Hohenheim, Germany*. Online Paper ID - A159.
- Amusan, O.A, (2016). Benefits of Irrigation among Smallholder Farmers in SW-Nigeria –ISBN 978-3-8473-3564-
- Anekwe, Rita (2016). Waste Management and Sustainable Development in Nigeria: A Study of Anambra State Waste Management Agency. *European Journal of Business and Management*. ISSN 2222 –1905. Vol. 8. No. 17
- Hornweg D & Bhada-Tata P. (2012) What a Waste - A Review of Solid Waste Management, World Bank Urban Development Series, No. 15 Knowledge Papers.
- Iwayemi, A. (1983). Energy in West Africa, *Energy Policy*, September, 235-249
- Iwayemi, Akin (2011). Energy Sector Development in Africa. *Research-Gate*. <https://www.researchgate.net/publication/2289017>
- Modebe, I.A., Onyeonoro, U.U., Ezeama, N.N, Ogbuagu, C.N.O and Agam, N.E. 2008. Public Health Implication of Household Solid Waste Management in Akwa Southeast Nigeria. *The Internet Journal of Public Health*; 1(1); 78-91.
- Oberai, A.S. (1987). *Migration, Urbanization and Development*. ILO. Geneva
- Ogwueleka T.C., (2009). Municipal Solid Waste Characteristics and Management in Nigeria. *Iran Journal of Environmental Health Science and Engineering*. Vol. 6, No. 3, pp. 173 – 180
- Okpala, D.C. 1986. *Institutional Problems in the Management of Nigerian Environment*. NISER Monograph, Ibadan.
- Oladele, M.B. (2011). Impact of recycling on environmental quality & revenue generation in University of Lagos (UNILAG).
- Ubani, O.J. (2003). Municipal Waste Generation and Management in Nigeria. *Sustainable Options*. *Environmental Studies and Research Journal*, Vol. 3 Pp. 57-65
- Omojolaibi, J.A. (2010). Environmental Quality and Economic Growth in Some Selected West African Countries: A Panel Data Assessment of the Environmental Kuznets Curve. *Journal of Sustainable Development in Africa* (Vol. 12, No. 8, 2010) ISSN: 1520-5509.