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

Evaluation of Waste Management in Southwestern Nigeria for Clean Environment, Circular Economy and Agri-food Systems Development

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Abstract

Poor waste management results in environmental, ecological and socioeconomic problems in Southwestern-Nigeria. Attempts at managing waste through burning can lead to climate change while landfill leachate reduces soil and ground water quality. Hence, the need to look for better alternative. This research looks at the current challenges in the waste management system in Southwestern-Nigeria and proposes a more contemporary system that will move the region towards attaining a circular economy. Environmental Kuznets Curve hypothesis provided 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 (30). Data were analysed using descriptive and inferential statistics. Waste Habits of Nigerians were 57.0% organic/food-waste, 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 ($p=0.048$). From the current linear economy 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 agri-food systems development. 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. The government has a role in creating an enabling environment and stimulating demand.

Keywords: Agri-food system, Circular economy, Clean environment, Waste habits, Waste management challenges

1.0 Background: Introduction and Literature Review

One of the main effects that the population is beginning to suffer is the lack of government attention to urban cities centers. In other words, they are forming makeshift urban centers, and do not receive timely intervention by the government (local, state and federal) as multiple situations that result in the degradation of the populace appears. One of these absences is the proper waste management, sanitation (lack of urban toilet services) and drinking water supply in these urban centers, causing a lack in adequate personal hygiene in the areas in which they live, as well as excessive accumulation of waste because in these areas of new urban centres there is no planning for the provision of waste disposal and collection services. It has been established by previous researchers that poor municipal solid waste (MSW) management is one of the major problems confronting Nigerian towns and cities with no remarkable headway by the government in solving the problem (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 (Kelly, 2009). Especially in Nigeria with a destiny 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. 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 discharges 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. The challenges in waste management service delivery include lack of comprehensive legal framework and enforcement of the existing regulations, low investment (private) in infrastructure, inadequate human capacity for administrative and technical issues, wrong attitude of the public towards solid waste disposal, cost recovery is low in most States and no funding, low data management and uncontrolled urbanization, uncoordinated institutional functions, low academic research and industry linkages and lack of the needed political will. Since waste is a basic part of any developing or industrial nation, proper waste management by waste-to-energy system would deal with a large increase in waste as population increases and help to ensure a good environmental quality, socio-economic growth and generate electricity to argument alleviate energy poverty. 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 (Oladele, 2011).

2.0 Material and Methods

2.1 Survey Methods

Environmental Kuznets Curve (EKC) hypothesis provided theoretical framework. Purposive sampling of major landfills and dumpsites in Southwestern Nigeria with their waste generation pattern using structured questionnaires (210) on spatial variation, challenges and prospect of waste management practices were done. The results were validated at expert workshops for key officials within the waste management industry both in Nigeria. The data generated were analyzed using descriptive and inferential statistics.

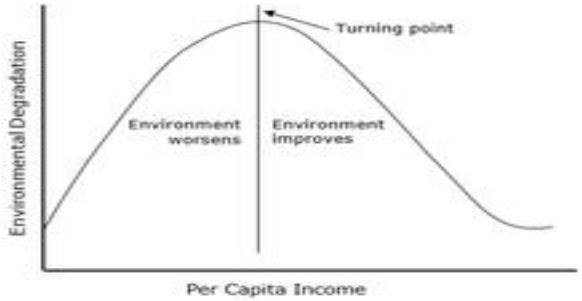


Fig 1: Environmental Kuznets Curve (Amusan, 2019)

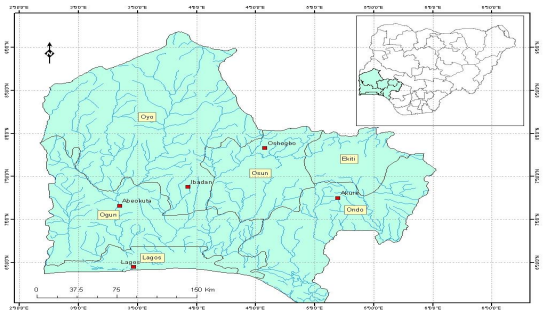


Fig 2: Southwestern Nigeria Map (Amusan, 2016)

3.0 Results and Discussion

Currently in Southwestern (SW) Nigeria, residential waste is collected from door-to-door and transported to various dumpsites across the state by the waste managers popularly known as Private Sector Participants (PSP). Public waste is collected by the government regulators across the six (6) States in SW-Nigeria. There is currently an increased number of residential wastes on the highways and medians, this emanated from the policy somersault by some past administration in some States when communal waste collection was introduced, when bins were placed on highways and medians and Residents were invited to dump their waste in these communal bins. Although this policy was reverted to door-to-door collection in some SW-Nigeria States, however, as a way to avoid paying their waste disposal bills, some residents have continued with open and illegal dumping of waste in unauthorized places. Waste when dumped by the roadside, in abandoned buildings, in gutters and drainages make us prone to diseases, it causes traffic congestion, insecurity, unsightliness, unpleasantness and blockage of drainages, this practice is an environmental nuisance in SW-Nigeria, defacing the States in this region and unsustainable as a recurring expenditure for the state government. Commercial, waste including market waste are also evacuated by the Waste Managers and transported to the dumpsites or landfills, however, this co-exists with Government Regulators also evacuating this waste from the markets, thereby causing some degree of confusion among the Waste managers. Currently over 90% of the evacuated waste are taken to the dumpsites, where the informal sector, also known as Scavengers or Waste Pickers recover the recyclables. The Scavengers or Waste Pickers sell to “Aggregators” who bag them and in turn, sell to the “Buyers” who transport them to their various factories across the Country. This is a very hazardous working condition (shown in figures 3 & 4), resulting in many accidents, often leading to death. It is also a security risk as the dumpsites are home to many criminals, this influx of criminals is responsible for a high rate of crimes reported in the surrounding areas. In summary, the waste that is co-mingled by generators, are evacuated by the PSP who dump the waste at dumpsites, only for the informal sector to harvest and sell off to factories. This model is not sustainable; the Government is needlessly spending a lot of money on maintaining the landfills and/or dumpsites that is a major pollutant of environment. These landfills or dumpsites have limited lifespans and some of the Southwestern Nigeria States do not exactly have an abundance of land to be used superfluously.

3.1 Survey Pictures

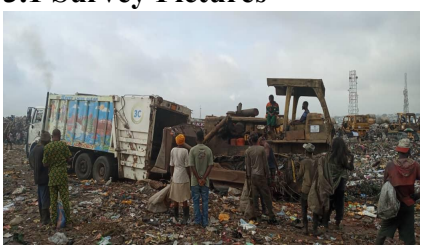


Fig3:Waste Pickers on Landfill


Fig4:Aggregators Transporting Waste

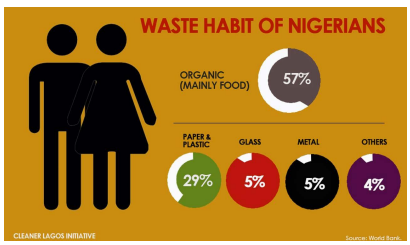
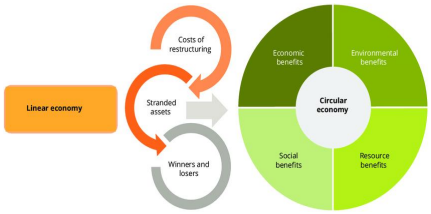


Fig5:Waste Habits in Nigeria (Amusan, 2023)



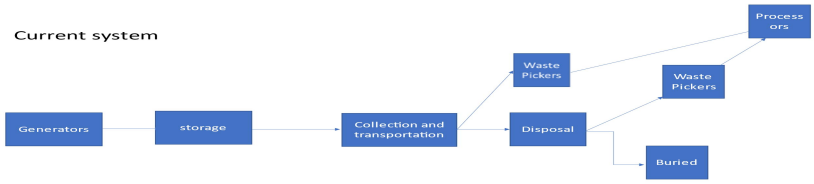
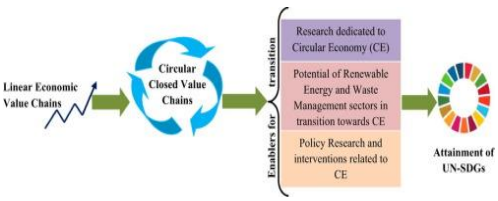


Fig 6: Linear to Circular Economy Fig 7: Current Waste Management System in SW-Nigeria (Amusan, 2023)

3.2 Developing Circular Economy for Agri-food System & Green Growth in SW-Nigeria

The current waste management is one of the major contributing factors to climate change, the emissions from the waste compactor trucks and the methane emanating from the dumpsites. This should not be allowed to continue, and all hands must be on deck to achieve waste minimization, reuse and recycling of waste into other products. Waste is a product of our society and understanding how to manage it collectively and sustainably has always been a major challenge. The existing waste management system is linear, where waste is evacuated and dumped or buried to be harvested by the informal sector. The quest for sustainable development, clean environment and resources recovery has led to the emergence of a circular economy as a viable and better choice as opposed to our current linear 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.



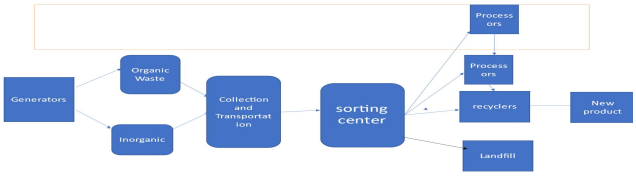


Fig8: Circular Economy SDGs Enablers Fig9: SW-Nigeria Proposed Model Circular Economy (Amusan, 2019, 2023)

Waste MGT Challenges	Frequency	%	Lagos	64	25.60
Pollution and Health Risks	166	69.1	Ogun	30	12.00
Ltd. Resources	108	44.8	Oyo	30	12.00
Lack of Tech Skill	57	23.8	Osun	30	12.00
Inadequate Managemnt Skill	43	18.1	Ondo	26	10.40
Table 1: SW - Nigeria Survey			Ekiti	30	12.00

4.0 Conclusion and Recommendation

From the current linear economy 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. That the Government introduces an affordable three (3) waste bin system for all waste generators, the first bin for organic wastes, the second for other recyclables waste, and the third for non-recyclables waste. That the waste compactor be used to carry the non-recyclables while open trucks will be used for recyclables. The Government has a role to play in fashioning out an enabling environment and stimulate demands, for example, a change in policy to use plastic as part of the materials to be used in roads construction and building of houses, will place an intrinsic value on plastic. The Government needs to look into making Extended Producers Responsibility ("EPR") into law, where producers take responsibility for the disposal of the waste, they injected into the environment. Presently, this is done voluntarily on a "best efforts basis" with little results. Government should also provide support to the private sector for accessing grants targeted at achieving the United Nations Sustainable Development Goals (UN SDGs).

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