

Circular Economy and Sustainability in Nigeria: Opportunities and Challenges for Development

Isaac B Oluwatayo

University of Venda, South Africa

Ayodeji O Ojo

University of Ibadan, Nigeria

Abstract

The importance of developing the circular economy in Nigeria is increasingly recognized in literature. Nigeria, as the most populous black nation with over 240 million people and the 27th largest economy globally, possesses significant potential to explore and implement circular economy models, especially within the waste management sector. The market is buoyed by its large population and the growing demand for recycled materials, driven by economic incentives. Advancing the circular economy will aid in diversifying the national economy, promoting inclusive prosperity, and generating employment while creating safer environments to advance sustainable development goals..

However, the circular economy in Nigeria faces challenges such as low awareness, financial constraint, inadequate market integration, infrastructure deficiencies, policy inconsistencies, and high costs associated with equipment retrofitting. Recognizing the untapped potential of the circular economy as a transformative resource capable of creating employment opportunities for the burgeoning youth population and driving green growth amidst the threats posed by climate change, the study emphasizes the need for increased and monitored investments in infrastructure. Furthermore, it recommends providing grants and capacity -building support to current stakeholders within the circular economy sector to foster the development and scalability of innovative solutions, including ecosystem and equipment retrofitting/procurement. Consequently, it is imperative for the federal government to formulate and implement appropriate policies that support the circular economy framework.

The transition towards a circular economy model presents significant opportunities for development in Nigeria, a country grappling with various environmental and socio-economic challenges. By adopting this model, Nigeria can mitigate resource depletion, reduce waste generation, and foster economic growth while promoting sustainability. However, this transition also comes with its set of challenges that need to be addressed for effective implementation. This study addresses both the opportunities and challenges facing the Nigerian economy in developing a circular economy that is efficient, effective and sustainable.

Introduction

Post-pandemic economic development built on prudent resource management, inclusion, innovation, and sustainability is critical to the achievement of the Sustainable Development Goals (SDGs) (Ogunmakinde et al., 2022). However, the unregulated exploitation of natural resources by humans constrains the achievement of intergenerational equity. Intergenerational equity can be defined as the use of natural resources today without denying future generations physical and economic access to their use tomorrow (Law, 2019). Therefore, sustainability and circular economy are interrelated and interdependent (Okafor et al., 2020). The natural environment is being polluted by humans due to population increase and industrialization (Ogunmakinde et al., 2022). Therefore, the need to investigate a pathway to industrialization that is economically and environmentally sustainable is fast gaining relevance in literature (Velenturf and Purnell, 2021; Pieroni et al., 2019).

Circular economy and sustainability issues are multidimensional, involving connections with many disciplines and sectors of the economy (Lahti et al., 2018; Kirchherr et al., 2017). One school of thought defines the circular economy as an alternative economic model centered around sharing, renting, repairing, restoring, and recycling existing materials to extend the life of products or materials (EP, 2022; Reike et al., 2018). Other researchers conceptualize the circular economy as a four dimensional industrial structure focusing on reducing initial resource use through technology adoption, refurbishing resources for reuse, recycling waste, and incinerating materials with energy recovery (Purwanto and Prasetyo, 2021; Kirchherr et al., 2017).

The circular economy is an environmental strategy aimed at addressing global economic needs through proactive human activities aligned with the principles of "reduce, reuse, and recycle" (Lahti et al., 2018). It represents a planned departure from the linear economy concept, which is built around transforming inputs into products, creating form and place utility for products, and disposing of waste. The circular economy prioritizes production and consumption practices that protect the environment and promote sustainability (Purwanto and Prasetyo, 2021).

The concept of the circular economy is transformative; however, it has been criticized for lacking a universally acceptable definition and conceptual clarity (Lahti et al., 2018; Reike et al., 2018; Lieder and Rashid, 2016). Despite the multiple perspectives on the circular economy, commonalities exist around the efficient and responsible use of resources. Proponents of the circular economy aim to redefine the traditional business model to create and transmit values inherent in waste reduction and management across the entire value chain (Huovila et al., 2019).

Concerns about the applicability of the circular economy across different countries have been documented in the literature (Starke et al., 2022; Lahti et al., 2018). These concerns include the availability of production inputs, such as land, which is limited for locating large biorefineries, and the impact of recycling on trade. This is particularly relevant for countries that are net importers and whether they are well-positioned to export waste for recycling. Additionally, businesses are built to maximize profit, which can be achieved through cost minimization or revenue maximization. In a post-pandemic economy where purchasing power is weakened,

with several countries in recession and many companies struggling to keep their operations running, it becomes important to situate the circular economy within trade development and global economic advancement.

Purpose of the study

The study analyzed the intersection of circular economy and sustainability in Nigeria, with specific focus on opportunities and challenges for advancing developmental efforts using empirical review. Through a detailed analysis of the current state, trends and models of circular economy, the study aimed to achieve the following:

- Investigate the potential of a circular economy to spur innovation and foster economic growth in Nigeria.
- Analyze the key barriers preventing Nigeria from harnessing a circular economy for her development.
- Examine environmental and social benefits associated with transitioning to a circular economy model in Nigeria.
- Proffer actionable recommendations to relevant stakeholders to accelerate the adoption of a circular economy towards achieving sustainable development goals.

Current State and Models of Circular Economy in Nigeria

Nigeria is the most populous black nation with over 200 million people and the 27th largest economy in the world (Uduu, 2022). Therefore, the Nigerian economy has the potential to test and scale circular economy models, particularly in the waste management landscape. The market is built on the teeming population and high demand for recycled materials based on the attached economic incentives (Netherlands Enterprise Agency, 2021). Nigeria currently generates an average of 32 million tonnes of waste per annum, thus accounting for the bulk of the waste generated in Africa. (PWC, 2021). The Nigerian circular economy ecosystem is evolving with the participation of a few formal players in the last few years. The Nigerian entrepreneurs currently operating within the plastic waste, e-waste and biowaste value chains are solving critical societal problems. This is coming at a time when the country needs to urgently diversify its economy to mitigate the risk and shocks inherent in the current mono-product economy. Oil and gas account for 40 percent of the Nigerian GDP and 70 percent of the government revenue. However, the gains from oil proceeds are reversed by the heavy reliance and subsidy regime on imported petroleum products for domestic consumption due to the moribund status of the national refineries thus constraining national revenue (Omoregie, 2018; Asagunla and Agbede, 2018; Adamu, 2021).

Given that there is increased advocacy for environmental sustainability, many large organizations are creating environmental sustainability and governance departments to drive circular economy initiatives. However, most of the circular economy initiatives of such corporations have limited impacts. Therefore, development partners are currently providing catalytic funds and capacity-building support to entrepreneurs with innovative circular economy models to operate and scale.

Prospects of Circular economy in Nigeria

Developing the circular economy has significant economic, environmental, and health implications in Nigeria. Some of the prospects of the circular economy are explained below:

Shared prosperity: Poverty reduction and inclusive growth among the country's poorest and most vulnerable groups can be achieved through the circular economy. Specifically, the circular economy provides increased opportunities for women and youth across social groups that can be harnessed through the collection and sorting of recyclable household waste, often disposed of indiscriminately thus serving as a cheap income source for the vulnerable group bringing about an improvement in the quality of lives.

Employment creation: Circular economy has the potential to create new employment opportunities in society, these include waste collectors and aggregators who earn cash in return for their efforts. It is projected that the European Union would generate about \$630 billion per year of materials cost savings from circular business models by 2025 (Ellen MacArthur Foundation, 2022). This presents an opportunity for Africa to trade with the European Union by providing raw materials for recycling. The trade opportunity if harnessed will boost economies as private and public investors will be able to create new jobs because of resource recovery and cost savings from reuse and recycling of materials. There are a few organizations within the circular economy landscape in Nigeria with business models built around the facilitation of low-cost waste collection from households, hotels and communities, to aggregate and sell to recyclers who struggle to get enough waste to serve as feedstock in their recycling processes.

Economic Opportunities: Making circularity an important policy imperative can create new economic opportunities especially for the teeming population of unemployed people. This is because the circular economy fosters innovation in product design, manufacturing processes, and business models. For example, industries can explore revenue streams through product-as-a-service models, remanufacturing, and recycling. The circular economy can also create jobs in different sectors of the economy, including green technologies, service industries and waste management

Safer environment: Sustainable circular economy would help manufacturers maximize the use of raw materials in the system for a longer time due to re-use and recycling thereby generating less waste and reducing the chances of pollutants getting into the soil and water. In addition, the circular economy can potentially reduce the amount of emissions released during each production, global greenhouse gas emissions (excluding those from land use and forestry) released during the extraction, processing and manufacturing of goods to serve society's needs which are estimated to be 62% relative to 38% emitted in the delivery and use of products and services (Circle Economy, 2018). The adoption of the circular economy will provide a pathway for the achievement of net-zero.

Resource Efficiency: The circular economy targets waste reduction through resource use maximisation. Efficient use of resources leads to cost reduction and the resource savings from energy, raw materials, water and other key production inputs. The use of materials and other products for an extended period through

strategies such as reuse, remoulding, reprocessing and recycling reduces overexploitation of resources and makes circular economy a cost-effective strategy in this era of declining income and climate change threats.

Resilience to Supply Chain Disruptions: The circular economy prioritises local production and promotes decentralized systems thereby minimising dependency on global supply chains. This is particularly important in times of unforeseen global disruption especially in cases of global disasters and pandemics like Covid-19 as there would be minimal impact to supply chains making the circular economy a more resilient approach to ensuring sustainability.

In general, the circular economy presents a more comprehensive and holistic approach to sustainability, offering economic, environmental, and social benefits. While challenges remain, such as overcoming inertia in linear economic models and addressing infrastructure limitations, the momentum towards circularity continues to grow, driven by the urgency of global environmental and social challenges.

Challenges of Circular Economy

Low awareness and weak market linkage: There is a need to improve awareness of the benefits of the circular economy in the Nigerian context. Waste management and recycling are still in the emerging phase. Most of the waste management services are provided by waste pickers who aggregate all kinds of waste which are then disposed of in refuse dumps with harmful effects on the society and environment (PWC, 2021). The waste recycling outfits in Nigeria include Chanjaa Datti, De Star Metals, Ecofuture Nigeria, Greenhill recycling, Metal Recycling Industries limited and Recycle Points among others. However, the value chain is underdeveloped as there is a missing link around aggregation and logistics for raw materials or waste across the country (Oyebode, 2022; Duru et al., 2019; Nwigwe, 2008). Most of the entrepreneurs that are creating value from waste are concentrated in a few states such as Lagos, Abuja, Edo and Oyo states. In addition, most of the entrepreneurs with small and medium-sized enterprises playing in the circular economy space are not structured. This makes it difficult to attract industrial customers sustainably.

High cost of retrofitting equipment: Most production lines have been built around new materials such as plastics, bottles and metals. Therefore, there is a need to retrofit existing equipment to allow recycling within the production process. This implies that manufacturing organizations would invest in training, recruiting and management of staff towards integrating circular economy into their current practices. This is particularly challenging as the cost of procuring and importing highly efficient capital equipment for waste recycling is high. While some organizations currently outsource their product packages and waste recycling, only a few have access to entrepreneurs playing in the circular economy landscape. In addition, the investment required and the potential returns to scale are not well defined. This situation makes it difficult for potential investors to consider the Nigerian circular economy space despite the huge opportunities within the landscape.

Financial constraints: Embracing circular business models requires significant upfront investments in innovation, infrastructure, skill acquisition, and workforce training. However, businesses may face financial constraints or short-term profitability concerns that hinder investment in circular initiatives. Access to financing, innovative funding mechanisms, and demonstrating the long-term economic benefits of circularity are critical for overcoming financial barriers.

Infrastructure deficit: The Nigerian economic landscape is constrained by infrastructure deficits. Electricity and road infrastructure continue to constrain the activities of entrepreneurs in the circular economy space. For instance, the incessant collapse of the national grid continues to force businesses to invest in expensive and polluting fossil-driven power equipment. The investment in alternative sources of power and poor roads significantly increases production costs thereby rendering local businesses uncompetitive.

Therefore, many local firms must contend with dumping given the level of infrastructure of external competitors coupled with the price elasticity of industries towards profit maximization.

Policy inconsistencies: There is a need for a national circular economy framework that will highlight the policy direction of the government. Nigerian state governments typically formulate and implement different waste management policies within a waste management authority or department. However, the approach should be holistic and national in approach to mitigate the risk of investors prioritizing the states with less stringent policies. Therefore, the limited regulations have contributed to the structural issues currently preventing waste management and recycling firms from having national coverage.

Addressing these challenges requires a coordinated effort from all stakeholders including individuals, governments, businesses, academia, and civil society organizations. By tackling these challenges collectively, the transition to a circular economy can accelerate, unlocking its full potential to create a more sustainable and prosperous future.

Conclusion and Recommendations

The need to prioritize a circular economy is critical to achieving economic diversification and sustainability in Nigeria. This is particularly relevant as the nation continues to address some of its developmental challenges, including unemployment, poverty, and inequality. This study found that infrastructure deficits, policy inconsistencies, high costs of retrofitting equipment, and low awareness and market linkage are significant constraints to the development of the circular economy in Nigeria. The study recommends increased and monitored investments in infrastructure to support the development of the circular economy. Additionally, there is a need to provide grants and capacity-building support to current players within the circular economy space to develop and scale innovative solutions within the ecosystem and for equipment retrofitting/procurement. The federal government should also formulate and implement appropriate circular economy policies.

Isaac B Oluwatayo, < isaacoluwatayo@yahoo.com > Department of Agricultural Economics and Agribusiness, University of Venda, South Africa.

Ayodeji O Ojo, < ayodejiojo7591@gmail.com > Department of Agricultural Economics, University of Ibadan, Nigeria.

References

- Adamu, I. M. (2020). Oil Price and Real Exchange Rate Appreciation: Is there Dutch Disease in Nigeria? <http://ir.lib.seu.ac.lk/handle/123456789/5281>
- Asagunla, T. M. & Agbede, M. O. (2018). Oil revenue and output growth in Nigeria. *Oil Revenue and Output Growth in Nigeria* (iiajournals.org)
- Circle Economy, 2018. The circularity gap report. (2018). <https://www.legacy.circularity-gap.world/2018>
- Duru, R. U., Ikpeama, E. E. & Ibekwe, J. A. (2019). Challenges and prospects of plastic waste management in Nigeria. *Waste Disposal & Sustainable Energy*, 1(2), 117–126. <https://doi.org/10.1007/s42768-019-00010-2>
- Ellen MacArthur Foundation (2022). Towards the circular economy Vol. 1: an economic and business rationale for an accelerated transit. <https://ellenmacarthurfoundation.org/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an>
- European Parliament (EP) 2022. Circular economy: definition, importance and benefits <https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits>
- Huovila P., Iyer-Raniga U. & S. Maity (2019). Circular Economy in the Built Environment: Supporting Emerging Concepts. *IOP Conference Series Earth Environ. Sci.*, 297(1), 1-8.
- Circular Economy in the Built Environment: Supporting Emerging Concepts - IOPscience
- Kirchherr J., M. Hekkert, R. Bour, A. Huijbrechtse-Trujiens, E. Kostense-Smit & Muller, J. (2017). Breaking the Barriers to the Circular Economy, pp1-16. [171106 white paper breaking the barriers to the circular economy white paper vweb-14021.pdf \(europa.eu\)](https://www.europecircularwhitepaper.eu/white-paper-breaking-the-barriers-to-the-circular-economy-white-paper-vweb-14021.pdf)
- Lahti, T., Wincent, J. & Parida, V. (2018). A Definition and Theoretical Review of the Circular Economy, Value Creation and Sustainable Business Models: Where are we now and where should research move in the future? *Sustainability*, 10(8), 1-19. <https://doi.org/10.3390/su10082799>
- Law, V.T. (2019). Intergenerational and Sustainable Development. In: Leal Filho, W. (eds) *Encyclopedia of Sustainability in Higher Education*. Springer, Cham. https://doi.org/10.1007/978-3-030-11352-0_89
- Lieder, M. & Rashid, A. (2016). Towards circular economy implementation: a comprehensive review in the context of the manufacturing industry. *Journal of Clean. Prod.* 115(2015), 36-51. <https://doi.org/10.1016/j.jclepro.2015.12.042>
- Netherlands Enterprise Agency (2021). Business opportunities in Nigeria's waste and the circular economy sector. , pp1-42. Publication RVO-107-2021/RP-INT <https://www.rvo.nl/sites/default/files/2021/03/Business-Opportunities-in-Nigerias-Circular.pdf>.
- Nwigwe, N. (2008). Problems and prospects of refuse disposal in Nigerian urban centres. *International Journal of Natural and Applied Sciences*, 4(3): <https://doi.org/10.4314/ijonas.v4i3.49880>
- Ogunmakinde, E. O., Egbelakin, T. & Sher, W. (2022). Contributions of the circular economy to the UN sustainable development goals through sustainable construction. *Resources, Conservation and Recycling*, 178(2022), 1-13. <https://doi.org/10.1016/j.resconrec.2021.106023>

- Okafor, C., Ajaero, C., Madu, C., Agomuo, K. & Abu, E. (2020). Implementation of circular economy principles in management of end-of-life tyres in a developing country (Nigeria). *AIMS Environmental Science*, 7(5), 406-433. <https://doi.org/doi: 10.3934/environsci.2020027>
- Omoregie, U. (2018). Nigeria's Petroleum Sector and GDP: The Missing Oil Refining Link, pp1-9. <https://doi.org/10.22606/jaef.2019.41001>
- Oyebode, O. J. (2022). Sustainable Waste Management Towards Circular Economy in Nigerian Context: Challenges, Prospects and Way Forward. In: Ayeni, A.O., Oladokun, O., Orodu, O.D. (eds) *Advanced Manufacturing in Biological, Petroleum, and Nanotechnology Processing. Green Energy and Technology*. Springer, Cham. https://doi.org/10.1007/978-3-030-95820-6_20
- Pieroni, M. P., McAlone, T. C., & Pigosso, D. C. (2019). Business model innovation for circular economy and sustainability: A review of approaches. *Journal of Cleaner Production*, 215, 198-216. <https://doi.org/10.1016/j.jclepro.2019.01.036>
- Purwanto, E. & Prasetyo, T. (2021). Changing the Paradigm of a Linear Economy into A Circular Economy in Residential Waste Management. *IOP Conference Series: Earth and Environmental Science*, 945, 1-8. <https://doi.org/10.1088/1755-1315/945/1/012054>
- PWC 2021. (2021) Nigeria Sustainability Outlook, pp 17-18 <https://www.pwc.com/ng/en/assets/pdf/nigeria-sustainability-outlook-2021.pdf>
- Reike, D., Vermeulen, W.J.V. & Witjes, S. (2018). The circular economy: New or Refurbished as CE 3.0?- Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options. *Resources, Conservation and Recycling*, 135, 246-264. <https://doi.org/10.1016/j.resconrec.2017.08.027>
- Starke, J.R., Tamara, A., Metzger, P., Jeroen, J., Candel, L., Catrien, J.A. & Termeer, M. (2022). Conceptualizing controversies in the EU circular bioeconomy transition. *Ambio*, 51 (2022), 1-12. <https://doi.org/10.1007/s13280-022-01730-2>
- Uduu, O. (2022). Nigeria's IMF GDP ranking improves but grave socioeconomic challenges overshadow growth. https://www.dataphyte.com/latest-reports/nigerias-imf-gdp-ranking-has-improved-but-grave-socio-economic-challenges-overshadows-growth/?amp_markup=1
- Velenturf, A. P. & Purnell, P. (2021). Principles for a sustainable circular economy. *Sustainable Production and Consumption*, 27(2021), 1437-1457. <https://doi.org/10.1016/j.spc.2021.02.018>