Impact of Circular Economy on Sustainable Development in Lagos Mega City

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Abstract

The circular economy is a concept that has gained considerable attention in recent years due to its potentials to contribute to sustainable development. Lagos, the largest city in Nigeria, is faced with numerous environmental and social challenges that require innovative solutions. This research aims to assess the impact of circular economy on sustainable development in Lagos megacity. A cross-sectional survey was conducted using a set of structured questionnaire randomly administered, 121 responses were returned the data collected was analyzed using statistical analysis techniques. The result revealed that 42.1% of the respondent are not aware of circular economy at all and 32.2% have heard of it but not familiar only 25.7% are aware of what circular economy it all about. Also, 43.8% of the respondent have a clear insight of the challenges/drawbacks of implementing circular economy principles in Lagos megacity development; while 46.3% are clear on the possible impacts of circular economy of sustainable development in Lagos megacity. The study concludes that the level of awareness is very low and its potentials to impact in sustainable development of Lagos megacity. The challenges and drawbacks are visible. It is recommended that the level of awareness of circular economy be intensified among students and all stakeholders as a whole.

Keywords: Circular Economy, Lagos Megacity, Stakeholders, Sustainable Development

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Introduction

Circular economy as an emerging global phenomenon has gained significant attention in the recent years due to the growing recognition of the environmental and social challenges associated with the traditional linear economic model. If in a linear economy, resources are extracted, processed into products, used and then disposed of as waste; then a circular economy emphasizes the importance of resource conversation and efficiency by promoting the reuse,

recycling, and regeneration of materials (Bocken et al., 2016). Moreover, if the linear approach has led to resource depletion, pollution and the accumulation of waste, contributing to environmental degradation and social inequality; then the circular economy reduces the reliance on raw materials, minimizes waste generation and lower environmental impacts (Bocken et al., 2016).

Therefore, the emerging circular economy approach aligns with the principles of sustainable development by ensuring the responsible and efficient use of resources to meet the needs of the present and future generations (United Nations, 2015).

The aim of this study is to examine the impact of the circular economy on the sustainable development of the Lagos megacity. The study's main goal is therefore to explore the potential benefits, challenges, and opportunities associated with the adoption and implementation of circular economy practices in the megacity. The research seeks to contribute to the existing knowledge by providing a comprehensive analysis of the roles of circular economy in addressing sustainability challenges in Lagos megacity. The specific objectives of this research include the following: firstly, to measure the level of circular economy awareness among the Lagos megacity residents; secondly, to analyze the impacts (social, environmental, and economic) of circular economy practices on Lagos megacity development, and finally to identify the challenges/drawbacks of circular economy in the achievement of sustainable development in Lagos megacity.

The current state of sustainable development in Lagos megacity is a complex and multifaceted issue. The megacity is faced with numerous challenges including rapid urbanization, population growth and environmental pressures including inadequate access to clean waters and air pollution with traffic congestion (Adelekan, 2010; Bello et al., 2019; Balogun et al., 2018).

The real strength of circular economy practices lies in its target to eliminate waste and reduce pollution by designing products for durability, reparability and recyclability (Geissdoerfer, et al., 2017) through strategies such as product life extension, manufacturing and waste-to-resource conversion. Moreover, a circular economy seeks to divert waste from landfills and minimize environmental pollution (Ghiselleni, et al., 2016). This focus on waste management

and pollution reduction aligns with the environmental pillar of sustainable development, which emphasizes the protection and conversation of the ecosystem (United Nations, 2015).

Also, the economic dimension of the circular economy aligns with the goal of sustainable development to promote inclusive and sustainable economic growth (United Nations, 2015). This can also contribute to social equity and inclusion by addressing inequalities and improving access to resources and services. It also encourages collaborative consumption models such as sharing platforms, which can provide affordable access to goods and services for marginalized communities (Tukker, et al., 2015). Circular economy practices can create employment opportunities across diverse sectors and promote the development of skills for a more sustainable future (Kirchherre et al., 2017). This social dimension aligns with the goal of sustainable development to ensure inclusive and equitable societies (United Nations, 2015).

Literature Review

Lagos Megacity and its Sustainability Challenges

The Lagos megacity, located in Nigeria, is one of the fastest-growing cities in the world and serves as the economic and financial hub of the country. Currently, the population of this megacity has exceeded 20 million people. Therefore, Lagos faces numerous sustainability challenges due to rapid urbanization, inadequate infrastructure and high demand for resources (World Bank, 2020). Lagos experiences rapid population growth and urbanization (Onamade et al., 2022), leading to increased pressure on resources and infrastructure. The current megacity's population growth surpasses the capacity of existing services, such as housing, waste, sanitation and transportation, resulting in overcrowding and strained urban systems (Mabogunje, 2012).

Moreover, Lagos faces significant challenges in waste management. The city generates an enormous amount of solid waste, estimated at around 13,000 metric tons per day, overwhelming the existing waste management infrastructure (Oyedepo et al., 2018; Onamade et al., 2022). Inadequate collection, recycling facilities and disposal sites contribute to environmental pollution and health hazards (Adebola et al., 2020).

Moreover, sanitation remains a pressing challenge with a substantial portion of the population lacking access to safe drinking water and proper sanitation facilities (Nwankwoala et al., 2016).

Inadequate water supply infrastructure and inadequate wastewater management contribute to waterborne diseases and environmental degradation (Oyedepo et al., 2018).

Also, Lagos faces severe air pollution and traffic congestion due to a high number of vehicles, outdated transportation systems and inadequate emission control measures. The megacity's air pollution is negatively impacted by vehicular emissions, industrial activities and open burning of waste (Efe et al., 2019). These factors contribute to respiratory problems and environmental degradation.

The megacity is also vulnerable to the impacts of climate change, including sea level rise, coastal erosion and increased frequency of extreme weather events. The megacity's coastal location exposes it to the risks of flooding and erosion, which can lead to displacement, infrastructure drainage and loss of livelihood (Jimoh et al., 2020)

The principles of circular economy.

The circular economy is an economic model that aims to maximize resources, and efficiency, reduce waste, and promote sustainability by keeping resources in use for as long as possible and extracting the maximum value possible from them (Geissdoerfer et al., 2018; Stahel, 2016). It seeks to decouple economic growth from resource consumption and environmental degradation by shifting from the traditional linear "take–make–dispose" model to a more regenerative and restorative approach (Ellen MacArthur Foundation., 2013). The principles of circular economy can vary slightly depending on different frameworks and perspectives, but they generally include the following:

Firstly, (design out waste and pollution) the circular economy emphasizes the importance of designing products and systems with the goal of minimizing waste generation and pollution. This involves using sustainable material, designing for durability, reparability and recyclability, and considering the entire lifecycle of the products from production to disposal (Geissdoerfer et al., 2018, Stahel, 2016).

Secondly (keep products and materials in use) the circular economy promotes the idea of extending the lifespan of products and materials by encouraging reuse, repair and remanufacturing. By keeping products and materials in use for longer periods, the need for extracting new resources and producing new goods is reduced (Geissdoerfer et al., 2018, Stahel, 2016).

Thirdly(regenerate natural systems)the circular economy principles emphasize the importance of restoring and regenerating natural systems. This involves promoting sustainable agricultural practices, reforestation and conservation efforts to enhance ecosystem, health and resilience (Geissdoerfer et al., 2018).

Fourthly (foster collaboration and sharing) collaboration and sharing are integral to the circular economy. Sharing platforms, collaborative consumption models, and resource-sharing initiatives help optimize resource utilization and reduce the need for individual ownership of goods (Geissdoerfer et al., 2018; Stahel, 2016).

Fifthly and lastly (value–added recycling and waste–to–resource conversion)in addition to the promotion of clean energy alternatives and sustainable sourcing practices, the circular economy aims to maximize the value obtained from waste materials to promote advanced recycling technologies and waste–to–waste resources conversion processes. This involves recovering valuable materials from waste streams and transforming waste into new resources or energy (Geissdoerfer et al., 2018).

The linkage between circular economy and sustainable development.

Generally, circular economy and sustainable development are an interconnected concept that aims to address environmental, social and economic challenges. While the circular economy focuses on minimizing waste and maximizing resource efficiency by promoting the reuse, recycling and regeneration of products and materials; then sustainable development, on the other hand, seeks to meet present needs without compromising the ability of future generations to meet their own needs. However, the meeting points of both are outlined as follows:

Firstly, (resource conservation) the circular economy reduces the extraction of raw materials and minimizes waste generation, contributing to sustainable resource management. It promotes strategies such as remanufacturing, recycling and waste–to–energy which aligns with the principles of sustainable development (Ellen MacArthur Foundation, 2015; Mont, 2017).

Secondly, (environmental protection) the circular economy aims to decouple economic growth from environmental degradation by reducing pollution and greenhouse gas emissions. It promotes the use of renewable energy sources, sustainable production processes, and the development of eco-friendly products and services, all of which support the goals of sustainable development (Stahel, 2016; Bocken et al., 2017).

Thirdly (social equity)the circular economy emphasizes inclusive economic growth, job creation, and the well-being of the communities. Promoting the repair, refurbishment, and sharing of products, can enhance accessibility and affordability, reducing social inequalities. This social dimension aligns with the principles of sustainable development which emphasize the need for equitable and fair outcomes (Ghisellini et al., 2016, Geissdoerfer et al ., 2017).

Fourthly (economic resilience) the circular economy can foster economic resilience by diversifying supply chains, reducing dependency on finite resources, and stimulating innovation and entrepreneurship. These aspects align with the goal of sustainable development which seeks to create robust and sustainable economies (European Commission, 2020; D'Amato et al., 2017).

Fifthly, (long–term perspective)both the circular economy and sustainable development embrace a long-term perspective, considering the intergeneration impact of current actions. They promote a shift from a linear "take–make–dispose' model to a more generative and sustainable approach ensuring the well-being of future generations (World Economic Forum, 2019. United Nations, 2015). Therefore, the interconnectivity of this two evolving phenomenon in all the principal platforms of 21st-century global development cannot be overemphasized. This linkage can be seen to cover all the major sectors – economic, social and environmental, having a clear impact on political–and cultural development in the short, medium and long-term periods of global development.

Key Stakeholders and their roles in implementing circular economy practices.

In order to implement circular economy practices in Lagos megacity, their various stakeholders are involved among which are:

Firstly, Governmentsat all levels (global, regional, national, sub-national and local) play a crucial role in shaping policies, regulations, and incentives that promote and support circular economy practices (Ellen MacArthur Foundation, 2015).

Secondly, businesses and industries have a significant role to play in implementing circular economy practices, especially in the design of their products and services to minimize waste, increase durability, and promote repair, reuse and recycling (World Business Council for Sustainable Development WBCSD, 2017).

Thirdly, Consumershave the power to drive the demand for circular products and services by making informed choices and opting for sustainable and eco-friendly products (Stahel, 2016). Fourthly, academia and research institutionscontribute to a circular economy by conducting research, developing innovative technologies and providing guidance-based insights (Geissdoerfer et al., 2017).

Fifthly, Non- Non-governmental organisations (NGOs) and Civil Society play a vital role in advocating for a circular economy by raising awareness about its benefits (Geng et al., 2012). These stakeholders, along with others such as financial institutions, industry associations and international organizations have their unique role in driving the adoption of circular economy practices. Collaborations and collective actions among these stakeholders are essential for the successful transition to a circular economy.

Case Studies of Successful Circular Economy Projects in Lagos Megacity.

The circular economy landscape is constantly evolving and Lagos megacity had witnessed very few completed projects with some ongoing and others at the drawing board. Examples of completed successful circular economy projects in Lagos Megacity are Wecylers and Backbit Books.

Wecylers is a Lagos-based social enterprise that focuses on recycling household waste. They provide door-to-door waste collection services using customized cargo bikes. The collected waste is sorted and sent for recycling, contributing to waste reduction and resource recovery (Wecylers, n.d.). Its target audience is low-income communities as it operates low-cost recyclable waste management infrastructure including recyclable pick-up, recyclable drop-off and so on.

Blackbit Books is an innovative project that focuses on the circular economy in the publishing industry. They have implemented a model that utilizes recycled materials to produce notebooks and other stationary items. The project collects waste paper from various sources and transforms it into high-quality, environmentally friendly products. It contributes to the circular economy principles by diverting wastes from landfills and promoting sustainable production.

Other circular economy initiatives ongoing in Lagos Megacity that are and will help its sustainable development are the Lagos State Management Authority (LAWMA), Eko Innovation Center, Recycle Points, and Lagos State Green Bond (Moody's Investors Service, 2019).

Lagos is in the fifth stage of its development and hasn't gone through a settlement (group of villages), to a township, into a city, a metropolitan city and now to a megacity within the 500 years of its existence. The demand for sustainable development in 21st-century Lagos urbanism calls for the usage of all available tools including the circular economy which is gradually replacing the linear economy.

The existing numerous challenges and drawbacks of Lagos urban development like waste management issues, transport-related issues, optimization of natural resources and so on that have fallen out linear economy model need one stone to kill many birds at once. The circular economy seems to be the answer, but this has not been put into maximum usage as a result of inadequate awareness of its potential.

Methodology

A cross-sectional survey was conducted using a set of structured questionnaire randomly administered. 121 responses were returned and analyzed using statistical techniques for Social Sciences (SPSS). All responses were free of any manipulation as the total number received was analyzed and interpreted. The animosity of all respondents was kept as there were none that were forced to answer without their consent.

Findings

Firstly, from the demographic analysis of the result, majority of the respondent are male (76.03%) while the female 23.97%. Also, majority lives in Lagos mainland division (58.68%) and have lived for more than 15 years, which put them in position to know Lagos well enough to be able to answer these questions and this is shown on Table 1.

Table1: Showing Demographic Characteristics of the respondents

Gender	Badagry Division	Epe Division	Ikorodu Division	Lagos Island Division	Lagos Mainland Division	Total
Female	1	0	9	3	16	29
Male	1	1	22	13	55	92
Total	2	1	31	16	71	121

Gender/Duration ion Lagos	Under 5years	5-6years	6-10years	11-15years	Above 15years	Total
Female	3	0	0	3	12	29
Male	4	2	11	9	50	92
Total	7	2	11	12	62	121

Divisions of Lagos versus Occupation

Occupation /Division of Lagos	Badagry Division	Epe Division	IkoroduDivision	Lagos Island Division	Lagos Mainland Division	Total
Employed (private sector)	1	0	5	3	11	20
Employed (public sector)	0	0	2	0	3	5
Self-employed	0	1	6	2	9	18
Student	1	0	18	10	48	77
Unemployed	0	0	0	1	0	1
Total	2	1	31	16	71	121

Secondly, about 42.1% of the respondent are not aware of circular economy at all. This shows that the level of awareness is very low and perhaps it's potential to impact in sustainable development of Lagos megacity this is shown in Table 2.

Table 2: Showing awareness with Circular Economy

Familiarity/Awareness	Frequency	Percent	Valid Percent	Cumulative Percent
No, I haven't heard about it	51	42.1	42.1	42.1

Yes, I am familiar with it	31	25.6	25.6	67.8
Yes, I have heard of it but not familiar with it	39	32.2	32.2	100.0
Total	121	100.	100.0	

Understanding of Circular Economy Concept

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Neutral	27	22.3	22.3	22.3
Not knowledgeable at all	30	24.8	24.8	47.1
Slightly knowledgeable	29	24.0	24.0	95.5
Very knowledgeable	5	4.1	4.1	100.0
Total	121	100.0	100.0	

Definition of Circular Economy

	Frequency	**Percent**	**Cumulative Percent**
All of the above	47	38.8	38.8
An economic model centered on sustainable production and consumption	10	8.3	47.1
An economic model focused on reducing waste and maximizing resource efficiency	16	13.2	60.3
An economic model that promotes recycling and reuse	23	19.0	79.3
None of the above	1	0.8	80.2
Not sure	24	19.8	100.0
Total	121	100.0	

Thirdly, the bulk of respondent are post graduate student (63.64%) who are also working class in the megacity. They have a comprehensive understanding of circular economic model and therefore should be able to influence its impact on sustainable development of Lagos megacity. Fourthly, 43.8% of the respondent have a clear insight of the challenges/drawbacks of implementing circular economy principles in Lagos megacity development; while 46.3% are clear on the possible impacts of circular economy of sustainable development in Lagos megacity. Lastly, Table 3 shows that circular economy principle had impact on Lagos megacity development in many sectors especially waste management by recycling, reuse and remanufacturing to achieve Lagos megacity economic resilience and resource efficiency.

Table 3: Challenges/ Drawbacks of Implementing Circular Economy in Lagos

	Frequency	Percent	Cumulative Percent
All of the above	53	43.8	43.8
High implementation cost	8	6.6	50.4
Insufficient government and regulations	9	7.4	57.9
Lack of awareness and education about the circular economy	29	24.0	81.8
Limited infrastructure and technology for circular economy practices	14	11.6	93.4
None of the above	5	4.1	97.5
Not sure	1	0.8	98.3
Resistance from stakeholders	2	1.7	100.0
Total	121	100.0	

The Circular Economy Contribution to Sustainable Development in Lagos

	Frequency	Percent	Cumulative Percent
All of the above	56	46.3	46.3
Enhanced resources efficiency	14	11.6	57.9

I don't know	1	0.8	58.7
Improved local economic resilience	9	7.4	66.1
Increased recycling and reuse	19	15.7	81.8
None of the above	4	3.3	85.1
Reduced environmental impact	8	6.6	91.7
Reduced waste generation	10	8.3	100.0
Total	121	100.0	

Conclusion

The key findings on the impact of circular economy on sustainable development indicate several implications for Lagos megacity. The circular economy has the potential to drive sustainable development by addressing environmental challenges, promoting economic growth and improving social well-being. Therefore, the level of awareness in schools of architecture and the general public be intensified. Also, adopting circular economy principles can enhance the resilience of Lagos megacity to environmental and economic shocks by diversifying resources inputs, reducing dependence on finite resources and promoting local self-sufficiency however the challenges and draw backs mitigate it. It is therefore recommended that the all stakeholders should work together to overcome the challenges so that benefits of circular economy can be maximized.

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