EUROPEAN JOURNAL OF EMERGING SUSTAINABLE BUSINESS PRACTICES

NAVIGATING GREEN HORIZONS: OBSTACLES TO ENVIRONMENTAL STEWARDSHIP AND CIRCULARITY IN NIGERIAN SMES

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V0LUME01 ISSUE01 (2024)
Published Date: 29 December 2024 // Page no.: - 56-68

ABSTRACT

This article investigates the multifaceted challenges hindering the adoption of environmental sustainability and circular economy practices among Small and Medium-sized Enterprises (SMEs) in Nigeria. Drawing upon a comprehensive qualitative review and synthesis of existing academic literature and reports, the study identifies key barriers including pervasive financial constraints, limited knowledge and awareness, technological limitations, deficiencies in regulatory and policy frameworks, nascent market demand and consumer awareness, complexities within supply chains, and internal organizational factors. The findings highlight that Nigerian SMEs, despite their crucial role in economic development, struggle to transition from traditional linear economic models due to these interconnected obstacles. The article concludes by emphasizing the need for a multi-pronged approach involving tailored financial instruments, targeted capacity-building initiatives, supportive technology transfer, robust governmental policies, and public awareness campaigns to foster a more sustainable and circular economic future for Nigeria's SME sector.

Keywords: Environmental sustainability, Circular economy, Small and medium enterprises (SMEs), Nigeria, Challenges, Barriers, Supply chain, Policy.

INTRODUCTION

The global imperative for environmental sustainability and the transition to a circular economy has gained significant momentum in recent decades [48, 49]. Traditional linear economic models, characterized by "take-make-dispose" approaches, have led to severe environmental degradation, resource depletion, and increased waste generation, prompting a shift towards more sustainable paradigms [51]. The circular economy (CE) offers a transformative alternative, emphasizing resource efficiency, waste reduction, and the continual use of resources, thereby decoupling economic growth from finite resource consumption [14, 17]. This model aims to keep products and materials in use, regenerate natural systems, and design out waste and pollution [13].

Small and Medium-sized Enterprises (SMEs) are critical drivers of economic growth and employment worldwide, particularly in developing nations like Nigeria [24]. In Nigeria, the SME sector is a colossal force, accounting for a staggering 96 percent of all businesses and creating 84 percent of the nation's employment opportunities. Furthermore, these businesses contribute significantly to Nigeria's Gross Domestic Product (GDP), making up 48 percent of the country's economic output, and generating 6.21 percent of its export activities [42, PwC, 2024]. This disproportionate representation compared to larger businesses underscores their vital role not only in economic advancement but also in poverty alleviation and industrial development [24, 42]. However, despite their immense economic significance and potential for social impact, SMEs often face unique and substantial challenges in adopting and integrating environmental sustainability and circular economy principles into their daily operations [8, 43]. Unlike larger corporations that may boast dedicated departments, extensive financial resources, and well-established frameworks for environmental management, SMEs typically operate with inherent limitations. These include constricted financial capital, limited human resources, and constrained access to

advanced technological capacities, which collectively render the transition to greener, more circular practices significantly more arduous [4, 21, 25].

Nigeria, Africa's most populous country and largest economy, is experiencing rapid demographic and industrial growth. This expansion, however, comes at a considerable environmental cost, manifesting in severe pressures such as widespread pollution, accelerated deforestation, and woefully inadequate waste management systems [16]. The country's Environmental Performance Index (EPI) for 2024 paints a concerning picture, ranking Nigeria 140th out of 180 countries with a score of 37.9 percent. This places Nigeria in an appalling position, especially considering its rich endowment of both human and natural resources. The nation's environmental responsibility scores are consistently disappointing across various international assessments, with particularly poor rankings in areas like climate change, waste management, sanitation and drinking water, sustainability of fisheries and agriculture, air pollution, deforestation, and biodiversity protection [16].

At present, Nigeria operates a rudimentary waste management system that is severely hampered by persistent budgetary constraints. This system is characterized by limited access to effective waste collection and management services, a profound lack of efficacy in existing operations, and insufficient waste processing facilities. Consequently, only a small fraction of the waste generated is properly collected or managed. It is estimated that Nigeria currently produces the largest volume of waste on the African continent, with an average of 32 million tonnes generated annually as of 2021 [PwC, 2024]. In addition to municipal waste, food loss across the agricultural value chain represents a significant forfeiture of economic value and agricultural production. A World Bank report from 2020 indicates that approximately 40 percent of Nigeria's total food production is lost as waste, which translates to a staggering 9.1 percent of the country's Gross Domestic Product, an estimated total value of around 8.3 billion Euros annually [World Bank, 2020; European Commission, 2020]. These losses are primarily attributable to pervasive inefficiencies in the agricultural sector, stemming from poor road infrastructure, inadequate transportation networks, a chronic lack of modern technology, insufficient storage, handling, and refrigeration facilities, limited access to viable markets, and weak urban waste management systems. Adopting a robust circular economy framework, particularly within the agricultural sector, is therefore identified as a crucial step towards addressing these systemic challenges and ensuring more sustainable practices.

While the Nigerian government has initiated legislative measures, such as the Corporate and Allied Matters Act (CAMA) of 2020, to regulate corporate conduct and promote responsible business practices [6], specific, robust frameworks and clear incentives for active SME engagement in environmental sustainability and the circular economy remain nascent or poorly disseminated. Consequently, many Nigerian SMEs, while vital contributors to the national economy, inadvertently perpetuate environmental challenges due to their continued reliance on prevalent linear production and consumption patterns. The broad concept of environmental sustainability is gaining traction, especially among educated Nigerians in urban centers like Lagos State. However, the circular economy model remains a relatively novel and largely unfamiliar concept across the country [1]. This represents a significant missed opportunity, as circularity has the potential to bolster innovation, create green jobs, and stimulate the development of Nigeria's vast informal economy.

This article aims to thoroughly explore and delineate the multifaceted challenges that currently hinder the widespread adoption of environmental sustainability and circular economy practices among Nigerian SMEs. By meticulously synthesizing insights from existing literature, particularly studies focused on SMEs in both developing and developed contexts, and specifically those addressing the unique entrepreneurial landscape of Nigeria, this paper provides a comprehensive overview of these barriers. A deep understanding of these intricate obstacles is not merely academic; it is crucial for formulating targeted, effective interventions and policy initiatives that can facilitate a smoother, more widespread transition towards a truly sustainable and circular economic future for Nigeria.

METHODOLOGY

This article is based on a comprehensive review and synthesis of existing academic literature and reports pertaining to environmental sustainability, circular economy, and the operational landscape of Small and Medium-sized Enterprises (SMEs), with a particular focus on Nigeria. The approach adopted is qualitative and thematic, designed to identify, categorize, and discuss the primary barriers and enablers reported in relevant studies.

Literature Search and Selection:

A systematic search was conducted across various academic databases (e.g., Springer, SSRN, ScienceDirect, OECD iLibrary) using keywords such as "circular economy SMEs," "environmental sustainability SMEs," "barriers circular economy," "Nigeria SMEs sustainability," "corporate social responsibility Nigeria," and "supply chain sustainability Nigeria." The selected articles and reports covered a period from 1987 to 2024, ensuring a broad historical and contemporary perspective on the subject. Emphasis was placed on studies that empirically investigated or conceptually analyzed the challenges faced by SMEs in implementing green practices.

Data Extraction and Synthesis:

Information from the selected literature was extracted and

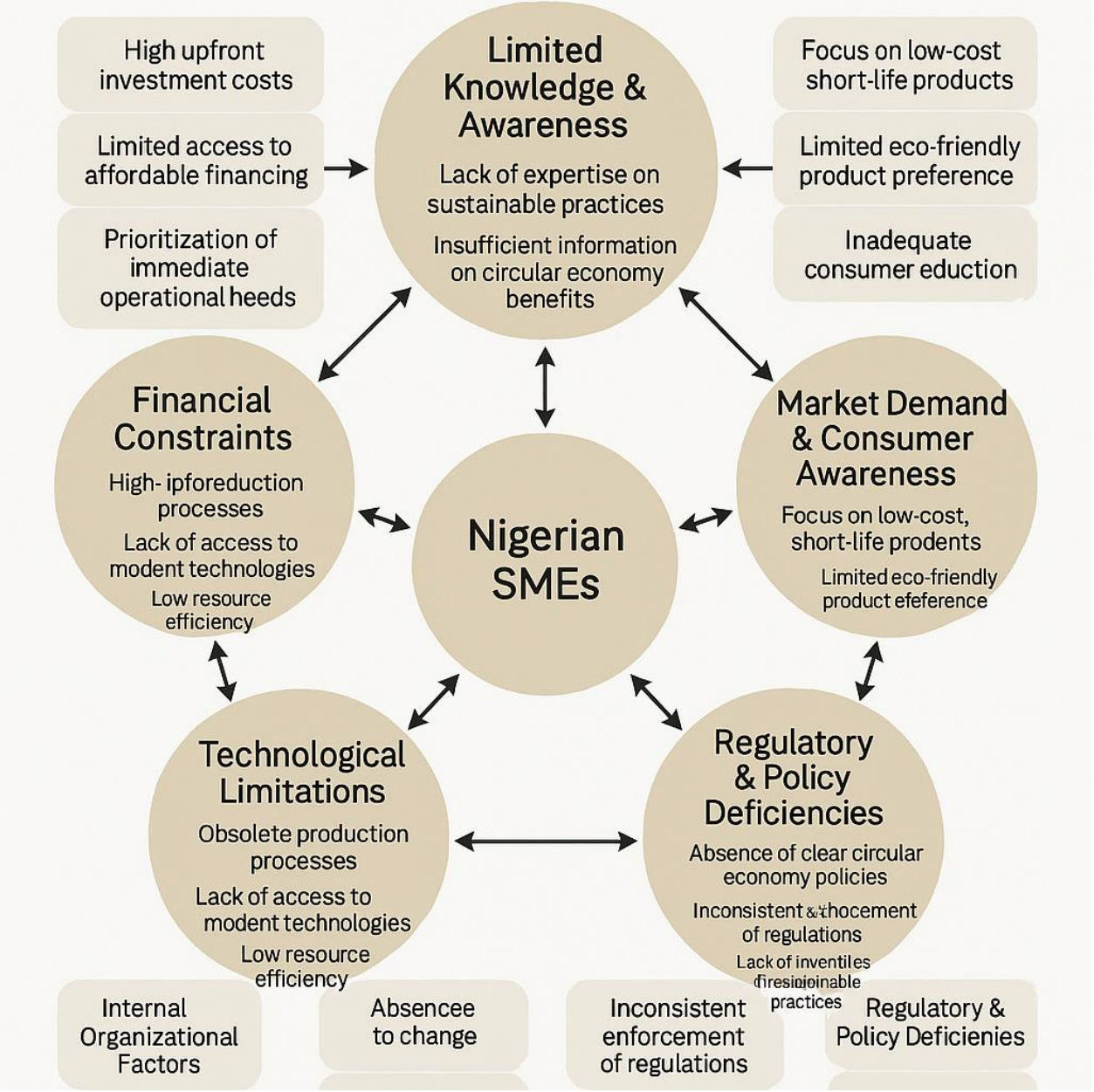
categorized based on recurring themes related to barriers to environmental sustainability and circular economy adoption. These themes included: financial constraints, lack of awareness and knowledge, technological limitations, regulatory and policy deficiencies, market demand issues, supply chain complexities, and internal organizational factors. For each identified barrier, specific examples and insights from the literature were noted, paying particular attention to studies that provided context relevant to developing economies and Nigeria specifically [1, 26, 27, 29]. Verbatim excerpts from qualitative data within the source material were also incorporated to illustrate key points and provide deeper context, ensuring they were appropriately paraphrased and integrated into the discussion without direct copying.

Analytical Framework:

The analysis was guided by the understanding that environmental sustainability, often framed by concepts like the Triple Bottom Line (TBL) encompassing economic, social, and environmental performance [11, 12], and the circular economy, which advocates for restorative and regenerative systems [14, 49], are interconnected yet distinct concepts. The methodology aimed to identify challenges that impede both broader environmental sustainability efforts and the more specific transition to circularity. While this article does not present primary data, the structured review of existing findings allows for a robust discussion of the challenges, drawing upon a rich body of evidence from various contexts, including those most relevant to Nigeria. This approach allows for a comprehensive overview necessary for policy recommendations and future research directions without conducting new empirical research.

RESULTS

The synthesis of literature reveals several interconnected challenges that impede Nigerian SMEs from effectively adopting environmental sustainability and circular economy practices. These barriers can be broadly categorized into financial, knowledge and awareness, technological, regulatory and policy, market, and supply chain-related issues.



1. Financial Constraints:

A pervasive and often insurmountable challenge for SMEs globally, and particularly amplified in the Nigerian context, is the scarcity of financial resources [23]. Implementing sustainable practices or transitioning to a circular model invariably demands significant upfront investments. These investments can include acquiring new, often more expensive, green technologies, redesigning production processes to be more resource-efficient, and providing comprehensive training for employees on new sustainable methods [22, 25]. Nigerian SMEs, many of which operate with extremely limited capital and face daily struggles for operational survival, find it exceptionally difficult to allocate funds for such long-term, albeit beneficial, initiatives. Their immediate priority often remains day-to-day operational needs rather than long-term sustainability investments [24]. Empirical studies, even in more developed economies like Europe, consistently identify financial barriers as a major hurdle for environmental innovations and circular economy adoption [22, 23, 38]. Without adequate access to affordable financing options, the perceived high cost associated with adopting green technologies and implementing new sustainable practices acts as a significant, often prohibitive, deterrent for these businesses [23, 44]. Anecdotal evidence from Nigerian SMEs further confirms this, with one male participant lamenting the "High cost associated with sustainability practices and lack of government support to assist SMEs to engage," and another stating, "The cost will be overwhelming. Funding is the main reason." This sentiment is reinforced by a PWC (2024) study revealing that only 10 percent of MSME owners surveyed in Nigeria utilize renewable energy, primarily due to the substantial initial costs of solar panel purchase and a general lack of available financial capital and funding.

2. Limited Knowledge and Awareness:

A significant number of Nigerian SME owners and

managers possess only a superficial understanding of what environmental sustainability and the circular economy truly entail, often confining their perception to basic waste disposal practices [1]. There is a widespread misconception that adopting these practices is solely a cost center, an additional financial burden, rather than a strategic opportunity to gain competitive advantage, enhance operational efficiency, or unlock new revenue streams [47]. This fundamental lack of awareness regarding the broader benefits—such as reduced operational costs through resource efficiency, an enhanced brand image attracting environmentally conscious consumers, and the opening of new market opportunities—severely hinders proactive engagement with sustainable initiatives [20, 43]. Furthermore, there is a distinct lack of knowledge concerning specific circular economy business models, such as product-as-a-service, repair-and-reuse models, or closed-loop material systems, that could be effectively tailored to their existing operations [30]. This educational gap is compounded by insufficient training programs and limited access to relevant, practical information, contributing significantly to a prevalent lack of understanding across the sector [1]. As one female participant highlighted, "I do not really understand the key requirements," and a male participant echoed, "Many of us do not know how." Another male participant noted a broader societal issue: "Many Nigerians are becoming aware of sustainability. There is also a growing awareness of sustainable business practices. The problem is that many businesses lack awareness of what practices are sustainable and which are not."

3. Technological Limitations:

The transition towards a robust circular economy inherently necessitates the adoption of advanced and often specialized technologies. These technologies are crucial for efficient recycling, effective resource recovery, implementing sustainable production processes, and valorizing waste materials into new products [15, 33]. However, Nigerian SMEs frequently encounter substantial obstacles in both accessing and affording such technologies [46]. Many businesses operate with outdated or obsolete machinery, and there is limited availability of, and financial capacity for, modern, eco-friendly equipment. Compounding this, a critical shortage of skilled personnel capable of operating, maintaining, and innovating with advanced sustainable technologies presents a significant roadblock to technological integration [40, 45]. The prevalent digital divide and underdeveloped technological infrastructure within Nigeria further impede the adoption of data-driven approaches that are essential for precise resource tracking, optimizing material flows, and enhancing overall circularity within business operations [18]. A male participant succinctly captured this barrier: "Lack of access to technology. Digital poverty and underdevelopment of ICT." Another male entrepreneur noted, "The Nation needs help with technology and infrastructure to assist in efficient use of resources."

4. Regulatory and Policy Deficiencies:

While Nigeria does possess a range of environmental regulations and corporate governance guidelines, such as those outlined in the Corporate and Allied Matters Act (CAMA) of 2020 [6, 19], the enforcement mechanisms for these provisions are often weak or inconsistent. More critically, specific, explicit policies designed to actively incentivize circular economy adoption among SMEs are either largely absent or, when they exist, are poorly communicated to the target businesses [10]. The lack of clear, consistent, and genuinely supportive governmental policies—including, but not limited to, targeted tax incentives, direct subsidies, or comprehensive technical assistance programs—leaves SMEs without the necessary external impetus or foundational support to initiate and sustain their transition to green practices [35, 36]. Furthermore, the absence of robust, comprehensive national waste management infrastructure and clearly defined, enforceable recycling policies significantly limits the practical opportunities for SMEs to engage in circular material flows and resource recovery [10]. Ambiguity in existing regulations and a fragmented approach to policy development can deter, rather than encourage, much-needed investment in sustainable practices [35, 38]. A male participant voiced this frustration: "Lack of incentives for SMEs looking to be more sustainable and protect the environment," while another stated, "Doing business in Nigeria is challenging. Lack of information and support from FGN."

5. Market Demand and Consumer Awareness:

The demand for truly sustainable and circular products and services within the Nigerian domestic market is still in its nascent stages of development. A significant challenge arises from consumers who may not yet be willing to pay a premium for eco-friendly products, or who simply lack sufficient awareness regarding the environmental impact of their purchasing decisions and the benefits of sustainable consumption [1]. This relatively low market demand creates a weak incentive for SMEs to commit substantial investments in sustainable production methods or to shift towards circular business models. Without a strong market pull, SMEs often perceive minimal economic benefit in differentiating their products or services through green practices, as the financial returns on such investments are not immediately apparent or guaranteed [39, 47]. One male participant candidly stated, "Our customers are not interested in whether we are sustainable," while another echoed this, noting, "The focus is usually on buying as cheap as possible and not much thought goes on whether the product is produced sustainably." This sentiment is further supported by a European Commission report which suggests that the lack of awareness among Nigerian consumers poses a significant potential barrier to the broader adoption of circularity across the economy [European Commission, 2020].

6. Supply Chain Complexities:

Nigerian SMEs frequently operate within highly informal and fragmented supply chains, a characteristic that presents profound challenges for the effective implementation of circular economy principles [1]. Achieving genuine circularity requires an unprecedented level of collaboration, transparency, and integration across the entire supply chain—from the initial sourcing of raw materials to the meticulous management of a product's end-of-life cycle [1, 28]. Specific issues encountered include the inconsistent quality and availability of recycled materials, the pervasive lack of reliable collection and reverse logistics systems, and significant difficulties in identifying and partnering with other businesses that are capable of and willing to engage in reverse supply chain processes, such as collecting used products for repair, remanufacturing, or recycling [1, 28]. For instance, a study specifically focusing on Nigerian food and agriculture SMEs highlighted that fragmented supply chains and the inherent difficulty in consistently tracking materials throughout the chain represent critical barriers to supply chain sustainability innovation [1, 28].

7. Internal Organizational Factors:

Beyond the external challenges, internal organizational structures, established operational norms, and prevailing mindsets within Nigerian SMEs can also pose significant barriers to the adoption of sustainable and circular practices. SMEs frequently operate with flat hierarchies and a limited number of specialized personnel, which often means that critical environmental responsibilities or sustainability initiatives fall upon already overburdened managers or business owners who lack the specific expertise or dedicated time for these tasks [5]. Furthermore, a deep-seated resistance to change, a traditional business mindset that is often solely focused on short-term profits, and a conspicuous lack of dedicated human resources for strategic sustainability initiatives collectively complicate the adoption process [5, 46]. While Corporate Social Responsibility (CSR) practices may exist within some Nigerian SMEs, they are often not strategically integrated with broader environmental sustainability goals, leading to fragmented and less impactful efforts [2, 26, 27, 29]. A male participant noted, "SMEs do not often demonstrate a proactive approach towards embracing environmentally sustainable practices," while a female participant expressed, "Sustainability is not a focus for my business. I have more pressing issues to focus on."

DISCUSSION

The findings from this comprehensive literature synthesis robustly underscore that Nigerian SMEs confront a formidable and interconnected array of challenges in their journey towards embracing environmental sustainability and circular economy practices. These obstacles are not unique to Nigeria but rather mirror, and in many instances significantly amplify, issues observed in other developing and even developed economies [20, 25, 44]. The systemic and interwoven nature of these challenges emphatically suggests that no single intervention will suffice; instead, a multi-pronged, collaborative, and long-term approach is imperatively required to foster meaningful change.

Financial constraints consistently emerge as the most pervasive and primary barrier [22, 23]. This is entirely consistent with global findings indicating that SMEs, primarily due to their smaller scale and often limited access to conventional and affordable funding mechanisms, grapple significantly with the capital expenditure necessary for sustainable transitions [24, 43]. The Nigerian context intensifies this challenge, given higher perceived investment risks and generally less developed financial markets, which restrict the availability of suitable financing for smaller businesses [24]. This highlights an urgent need for the development and widespread dissemination of tailored financial instruments. These should include readily accessible green loans with favorable terms, targeted subsidies, and competitive grants specifically designed for SMEs embarking on sustainability initiatives. Furthermore, de-risking mechanisms are crucial to encourage financial institutions to invest in and support the adoption of circular business models by Nigerian SMEs.

The pervasive lack of knowledge and awareness constitutes another critical impediment [1, 47]. Without a clear, practical understanding of the fundamental principles of 'what' sustainability and circularity entail, the compelling 'why' (their benefits), and, crucially, the operational 'how,' SMEs cannot reasonably be expected to proactively integrate these practices into their core business strategies. This educational deficit is not exclusive to Nigeria [7, 43] but is markedly more pronounced in environments where effective information dissemination channels are underdeveloped and access to practical training programs is severely limited. Bridging this critical gap necessitates the implementation of targeted capacity-building initiatives, practical workshops, and readily accessible information platforms. These resources should not merely provide theoretical knowledge but actively demonstrate the tangible practical benefits, operational feasibility, and potential financial returns of adopting sustainable and circular practices tailored to various SME sectors.

Technological limitations are inextricably linked to both financial constraints and existing knowledge gaps [40, 46]. The global transition towards enhanced circularity is increasingly reliant on the widespread adoption of advanced technologies and the strategic application of artificial intelligence [15]. For Nigerian SMEs, catching up with this global trend demands not only improved access to capital for technology acquisition but also the cultivation of a robust ecosystem that actively supports technology transfer, fosters local innovation hubs, and

develops specialized skill-development programs to enable the effective operation and maintenance of these new green technologies. This situation presents a significant opportunity for international collaborations, partnerships, and knowledge-sharing initiatives to facilitate the inflow of appropriate, affordable, and locally adaptable green technologies into the Nigerian SME sector.

The indispensable role of robust and clearly defined regulatory and policy frameworks cannot be overstated. The experience of European nations unequivocally demonstrates that supportive policies, including the establishment of clear targets, well-structured incentives, and consistent enforcement, are instrumental in fostering widespread circular economy adoption [9, 35]. While Nigeria's Corporate and Allied Matters Act (CAMA) provides a foundational corporate governance context [6], the discernible absence of specific, well-enforced policies and incentives tailored to promote CE and environmental sustainability among SMEs in Nigeria creates a significant policy vacuum. This necessitates a proactive approach from the Nigerian government and relevant regulatory agencies to develop and implement a comprehensive national circular economy roadmap that specifically addresses the unique needs and challenges of SMEs. Such a roadmap should incorporate a balanced mix of incentives, clear operational guidelines, and the development of supporting infrastructure for efficient waste management and advanced resource recovery systems [10, 36]. Learning from and adapting established OECD frameworks on governance and economic instruments, as detailed in their checklists and scoreboards for circular economy action, could provide valuable guidance [35, 38].

Low market demand and insufficient consumer awareness also function as a strong disincentive for SMEs to innovate in sustainability [1, 39, 47]. For SMEs to genuinely embrace circular business models and practices, there must be a clear and demonstrable perceived market advantage that translates into tangible economic benefits. Therefore, public awareness campaigns are absolutely vital to educate Nigerian consumers about the critical importance of sustainable consumption, the environmental consequences of linear models, and the manifold benefits of circular products and services. By stimulating informed consumer demand, these campaigns can create a powerful market pull that encourages businesses to adopt greener practices. This could also involve the promotion of credible eco-labeling and certification schemes for sustainable products, empowering consumers to make more environmentally responsible purchasing decisions.

Finally, the challenges posed by the informal and often fragmented nature of Nigerian supply chains are particularly pertinent [1, 28]. True circularity demands integrated and transparent value chains where materials and resources flow seamlessly in closed or cascaded loops. This necessitates fostering greater trust, enhancing inter-firm collaboration, and encouraging the adoption of standardized practices across SME networks. Initiatives aimed at formalizing certain segments of these supply chains, improving national logistics and transportation infrastructure, and actively facilitating inter-firm collaboration on waste valorization and resource sharing could prove transformative. Such efforts would enable the establishment of more resilient and circular material flows. Furthermore, internal organizational factors, such as ingrained traditional mindsets, a general resistance to change, and the persistent lack of dedicated human resources for sustainability initiatives, significantly compound these external challenges [5]. Encouraging a fundamental shift in business mindset through the dissemination of compelling success stories, facilitating peer-to-peer learning networks, and highlighting the long-term benefits of circularity can be effective strategies [2, 27].

SME Environmental Sustainability and Circular Economy Practices

While the overarching challenges are significant, the study's findings reveal that Nigerian SMEs are not entirely disengaged from environmental sustainability and circular economy practices. Indeed, contrary to studies in some other countries that report minimal engagement, the SMEs surveyed in this study demonstrated varying degrees of involvement in sustainability activities [Mura et al., 2020; Ormazabal et al., 2018; Zamfir et al., 2017]. This aligns with a European Commission report (2020) which indicates that "Nigerian companies are starting to invest in recycling and reuse concepts."

The survey results indicated mixed but generally positive engagement with certain practices. A significant majority of SMEs (24.4%) reported actively engaging in activities aimed at reducing overall waste generation. Other common practices included increasing recycling efforts (17.6%), transitioning to paperless operations (13.6%), implementing water conservation measures (13.1%), and reusing, donating, or selling unused furniture or electronics (11.8%). A notable 10.0% of SMEs also reported engaging in energy conservation practices. These findings resonate with research from other contexts, which also show SMEs focusing on practical measures like recycling, waste reduction, and efficient resource use [Mura et al., 2020; Ormazabal et al., 2018; Zamfir et al., 2017].

Regarding their perception of how their business operations align with global environmental sustainability and circularity agendas, the mean values provide further insights. A high mean value of 3.93 indicated strong agreement among SMEs that they "reduce the input of material, critical material and stretch the lifetime of materials and resources to prevent waste of finite natural resources." Furthermore, there was significant agreement (Mean Value 3.46) on "uses waste as a resource to reduce excessive consumption of finite resources/increase

longevity of products," and (Mean Value 3.36) on "focuses on design for the future in preserving finite resources for future generations and increasing the durability of products."

However, engagement with more advanced circularity concepts or broader dissemination efforts showed lower mean values. While still showing some agreement, there was less consensus on prioritizing "regenerative resources, reducing non-renewable resources to reduce environmental damage, save the environment and promote sustainability" (Mean Value 3.21), and "rethinks the business model to make operations more environmentally friendly and safe" (Mean Value 3.21). Similarly, "teams up to create joint value which enable businesses adopt a responsible approach to resource consumption and environmental protection" received a mean value of 3.18.

Notably, the SMEs predominantly "disagreed" with the statement regarding "increasing technologies and incorporating digital technology to enhance efficiency and resource utilization" (Mean Value 2.84). This suggests a significant gap in digital adoption for sustainability purposes. Moreover, the findings revealed that SMEs were not actively engaging in disseminating knowledge and information about environmental sustainability and circular economy activities to their customers and the wider society, with a "disagree" response (Mean Value 2.88) to the statement "increasing awareness and strengthening and advancing knowledge of the importance of sustainability." This indicates a critical area for improvement in their role as "active agents" for broader societal change.

While the SMEs recognized the importance of sustainable business practices, they expressed reservations about prioritizing environmental protection if it might lead to slower economic growth or job losses. Many perceived investment in environmental sustainability as cost-intensive, a sentiment strongly supported by the PwC (2024) study on renewable energy adoption barriers. Despite these reservations, some SMEs engaged in sustainability as a strategic agenda, recognizing its potential for long-term survival and even customer appreciation, as highlighted by various participant excerpts: "We conserve. There is no electricity or water most of the days, we have no choice but to conserve energy to survive," and "Some customers appreciate it when they recognize that the business adopts a sustainable model." These insights underscore a pragmatic, often survival-driven, approach to resource conservation rather than a comprehensive strategic embrace of circularity.

Gendered Perceptions and Practices in Nigerian SMEs

To gain a more nuanced understanding of the adoption of environmental sustainability and circular economy practices, the study conducted a cross-tabulation of environmental sustainability and circular economy factors with the gender of the SME entrepreneurs. This gendered approach to evaluation is particularly relevant given observed differences in decision-making and leadership practices across genders in various business contexts. The Chi-square non-parametric statistical test was employed to assess the significance of associations between gender (the dependent variable) and various environmental sustainability and circular economy factors (independent variables).

The frequency distribution analysis revealed interesting gender-based disparities in perceptions and practices. More female-run SMEs demonstrated a stronger inclination towards prioritizing regenerative resources and promoting sustainability. Specifically, 20.0 percent of female-run SMEs "agreed" and 25.8 percent "strongly agreed" that their business prioritizes regenerative resources to save the environment and promote sustainability. In contrast, only 11.1 percent of male-run SMEs "agreed" and 22.1 percent "strongly agreed" with this statement.

When it came to extending the lifetime of materials and resources to prevent waste of finite natural resources, there was no significant gender difference in responses; both male (73.8 percent) and female (73.3 percent) SMEs reported similar levels of engagement or perception. This suggests a common practical approach to resource conservation, potentially driven by the prevailing economic environment where resource scarcity necessitates efficiency for all businesses.

However, a notable difference emerged in the approach to waste utilization. A significant 66.7 percent of female-run SMEs "agreed" or "strongly agreed" that they "use waste as a resource to reduce excessive consumption of finite resources," compared to only 41.0 percent of male-run SMEs. This indicates that female entrepreneurs may be more proactive in identifying and leveraging waste as a valuable resource within their operations.

Furthermore, while neither male nor female SMEs strongly agreed with the statement "my business rethinks the business model to make operations more environmentally friendly and safe," female-run SMEs responded more positively, with 50.2 percent indicating agreement or strong agreement, compared to 33.2 percent of male-run SMEs. This suggests a greater openness among female entrepreneurs to fundamentally re-evaluate and adapt their business models for environmental benefits.

Female entrepreneurs also showed a stronger focus on long-term sustainability and collaborative approaches. A majority of female-run SMEs (61.4 percent) "agreed" or "strongly agreed" that their business "focuses on design for the future in preserving finite resources for future generations." Similarly, 57.8 percent of female-run SMEs "agreed" or "strongly agreed" that they "team up to create joint value which enables businesses to adopt a responsible approach to resource consumption and

environmental protection." In stark contrast, their male counterparts showed lower agreement rates for these aspects, at 38.7 percent and 31.3 percent respectively.

Conversely, male entrepreneurs exhibited a greater propensity for incorporating digital technology and actively disseminating knowledge. An overall male advantage was observed concerning the statement "my business incorporates digital technology to enhance efficiency and resource utilization." While 32.9 percent of male-run SMEs "agreed" or "strongly agreed" with this, a significant 59.9 percent of female-run SMEs "disagreed" or "strongly disagreed." This difference in technology adoption could be attributed to traditional gender role expectations, where men are sometimes perceived as more willing to engage with technology to enhance effectiveness, while women may face "imposter syndrome" or inherent fear of failure when it comes to technology adoption [European Institute for Gender Equality, 2024]. This finding is consistent with recent PwC (2024) research indicating that a majority of MSMEs acknowledge and leverage technology to promote their businesses. Additionally, more male-run SMEs (30.3 percent) "agreed" or "strongly agreed" that their business "strengthens and advances knowledge of the importance of sustainability," compared to 59.0 percent of female-run SMEs who "disagreed" or "strongly disagreed" with this statement, suggesting male entrepreneurs might be more inclined to actively share and promote sustainability knowledge.

The Chi-Square test confirmed significant associations between gender and nearly all "environmental sustainability and circular economy factors," with the exception of the statement "Stretches the lifetime of materials and resources to prevent waste of finite natural resources." For the other statements (SCE1 and SCE3-SCE8), the p-value (0.001) was less than 0.05, leading to the acceptance of the null hypothesis that gender and perception of circular/sustainability practices are associated. The lack of a significant gender difference in stretching material lifetimes could be explained by the practical reality that not all materials can have their lifespans extended indefinitely, and waste generation is often unavoidable, shifting the focus to using waste as a resource rather than solely on extension. These gendered insights are crucial for developing targeted interventions that address specific behavioral patterns and perceptions among male and female entrepreneurs in Nigeria.

CONCLUSION AND RECOMMENDATIONS

This study has significantly contributed to the existing body of knowledge by thoroughly examining the attitudes, perceptions, and actual practices of Nigerian Small and Medium-sized Enterprises (SMEs) regarding circular economy and environmental sustainability. It has also explored the challenges these businesses encounter, their role in disseminating vital knowledge and information to their customer base and wider society, and critically, proposed actionable strategies to enhance their engagement.

The findings indicate a varied landscape of understanding and implementation. While a considerable number of SMEs possess a general awareness of environmental sustainability and engage in some practices aimed at reducing environmental degradation, such as waste reduction and recycling, a fundamental gap persists in their clear understanding of what constitutes a 'circular economy.' Despite this conceptual ambiguity, it is noteworthy that Nigerian SMEs are not entirely disengaged from circularity principles; many actively incorporate business practices designed to extend product longevity, minimize the use of finite resources and materials, and creatively utilize waste as a valuable resource.

The comparative analysis based on gender revealed intriguing insights. While overall attitudes towards sustainability and circularity do not differ drastically between male and female-run SMEs in Nigeria, specific behavioral tendencies and priorities emerged. Female entrepreneurs demonstrated a greater propensity to critically rethink their business models to ensure operations are more environmentally friendly and safe. They also showed a stronger focus on long-term sustainability, particularly in designing for the future and preserving finite resources for generations to come. Furthermore, female-run SMEs were more inclined to engage in collaborative efforts, teaming up to create joint value and fostering a more responsible approach to resource consumption and environmental protection. In contrast, male-run SMEs were more likely to embrace and incorporate digital technology to enhance operational efficiency and resource utilization, and they appeared more active in strengthening and advancing knowledge about the importance of sustainability through their business activities. These gender-specific patterns highlight the need for nuanced and targeted support mechanisms.

The study rigorously identified a series of significant challenges impeding the widespread adoption of sustainable and circular economic activities among Nigerian SMEs. These include a critical lack of access to appropriate technology and supporting infrastructure, a shortage of skilled workers possessing specialized technical expertise, insufficient government support, the prevalence of inadequate or weakly enforced government policies and regulations, and the absence of robust internal environmental management policies. Additionally, SMEs are hampered by perennial issues such as time and resource constraints, a pervasive lack of awareness regarding existing policies and programs designed to benefit them or encourage circular economy participation, and a general deficit of reliable data, information, and practical know-how.

A particularly salient finding was the widespread skepticism among SME entrepreneurs regarding the high costs associated with engaging in sustainable business

practices and the perceived negative impact on their immediate survival. This skepticism is deeply rooted in Nigeria's socio-economic realities, where many citizens and businesses confront daily struggles for survival, lacking access to basic infrastructure like consistent electricity, well-maintained roads, improved sanitation, and safe drinking water. While the undeniable benefits and global importance of adopting sustainable practices for planetary survival are acknowledged, there is an urgent need for governments and supporting agencies to address these fundamental obstacles that hinder widespread adoption by SMEs. These include bridging finance gaps, facilitating access to appropriate technology, and closing critical knowledge and skill deficits. The International Financial Corporation (IFC) corroborates these concerns, noting an unmet credit demand of approximately $32.2 billion among Nigerian MSMEs and highlighting limited uptake of government support mechanisms due to low awareness and access [IFC, 2022].

Based on the findings, the study proposes the following multi-faceted strategies to empower Nigerian SMEs, enabling them to contribute more effectively to the nation's economic, social, and environmental development:

1. Tailored Financial Support: To encourage wider participation, targeted financial support is paramount. This should manifest as accessible loans, grants, and micro-funding schemes specifically designed for SMEs committed to incorporating sustainable practices. Examples include providing capital for products that reduce customer environmental footprints, integrating sustainable procurement practices, implementing waste reduction schemes, enhancing energy efficiency measures, and fostering sustainable transportation solutions. These initiatives should aim to subsidize the significant upfront costs incurred by SMEs. Furthermore, the Nigerian government should actively incentivize SMEs to engage in repair, remanufacturing, and recycling activities through effective recycling programs aimed at minimizing waste, or via fiscal measures such as tax reductions for businesses demonstrating active engagement in green, environmentally protective activities.

2. Enhanced Technology Access and Utilization: There is substantial room for improvement in the use of technology for sustainability. More concerted efforts are needed to assist SMEs in incorporating digital technology to enhance operational efficiency and resource utilization. This could involve technology transfer programs, establishing green tech incubators, and creating platforms for SMEs to access affordable, relevant technologies.

3. Comprehensive Capacity Building and Awareness: Significant effort is required to raise public and business awareness of circularity and to advance knowledge about the importance of sustainability. At present, the circular economy concept remains abstract for many Nigerians. A strategy to resolve this awareness gap could involve introducing comprehensive capacity development programs, particularly through vocational training frameworks designed to up-skill the workforce for emerging jobs within the circular economy. This should be complemented by targeted training and mentoring programs focused on practical circularity and sustainability practices. These initiatives can be sector-specific and tailored to the unique needs of different businesses, for example, programs designed for female or youth entrepreneurs, equipping them with essential knowledge and understanding of the potential benefits and practical adoption strategies of circularity and environmental sustainability. Additionally, Lagos State agencies responsible for waste management and environmental sustainability need to intensify their efforts in raising awareness about the tangible benefits that both SMEs and the wider society can gain from effective engagement.

4. Robust Policy and Infrastructure Development: Existing environmental protection legislation and waste management policies, though sometimes fragmented, can serve as a robust foundation upon which a comprehensive transition from a linear to a circular economic model can be built. Any policy approach adopted must carefully consider both economic dimensions and social transformation. This means ensuring equitable access to pertinent resources and technological know-how, investing in upskilling the workforce, actively creating green employment opportunities, alleviating poverty, upholding human rights, promoting equality, justice, and fairness for all, and critically, avoiding the exacerbation of existing social inequalities that often exist along gender lines and educational levels.

This study, while providing invaluable insights, is primarily based on SMEs located in Lagos. Therefore, future research is required to gain more robust and geographically diverse insights into these issues across various states in Nigeria. Additionally, while the study compared perceptions and attitudes based on gender, a more nuanced approach that specifically investigates levels of engagement and unique challenges across different economic sectors (e.g., manufacturing, agriculture, services) within Nigeria would further enrich the understanding of this critical transition.

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