SMES AND CIRCULAR ECONOMY BUSINESS MODELS' ADOPTION FOR SUSTAINABLE DEVELOPMENT IN NIGERIA: A CONCEPTUAL REVIEW

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Abstract
The circular economy (CE) represents one of the most progressive paradigms in contemporary business management, emphasizing the deliberate integration of environmentally responsible practices to achieve both present and future sustainability objectives. Despite its growing relevance, much of the academic and professional discourse has predominantly focused on large corporations, often overlooking the crucial contribution of Small and Medium-scale Enterprises (SMEs) in advancing sustainability transitions. Against this backdrop, the present article provides a comprehensive review of circular economy business models as instruments for sustainable development and explores the specific barriers constraining the adoption of CE practices within the Nigerian SME sector.

Keywords: Adoption, Circular Economy, Barriers, SMEs, Sustainable Development.

1. Introduction

Tracing the intellectual roots of the circular economy (CE) remains a complex endeavour, given its conceptual foundations in diverse theoretical traditions (Preston, 2012), that challenge the linear economic assumption of infinite resources (Allwood, 2014; Ellen MacArthur Foundation). Nonetheless, Boulding (1966) is often credited with pioneering the underlying philosophy of CE through his notion of a *"spaceman economy"*, characterized by the continuous regeneration of limited inputs and recycling of waste outputs. Since then, the CE framework has evolved substantially and has gained significant traction among scholars, policymakers, and practitioners advocating for an economic system where the energy and materials from discarded products are reintegrated into productive cycles (Lehmann et al., 2014; Ellen MacArthur Foundation, 2012; Rizos et al., 2015).

In the extant literature, CE is the industrial ecosystem that capitalizes on the restorative potential of earth's resources (Bastein et al., 2013), with an emphasis on waste

minimization, renewable energy utilization, and elimination of hazardous substances (Rizos et al., 2014). The framework distinguishes between two essential material flows within a closed-loop system:

(a) biological nutrients, which are renewable and can safely return to the biosphere (e.g., forest-based products), and
(b) technical nutrients, which are non-biodegradable (e.g., metals and plastics) but can be perpetually circulated through recovery and reuse (Bicket et al., 2014).

Unlike the end-of-pipe model prevalent in traditional linear economies, the CE approach advocates transformative systemic change across the entire value chain to maintain material utility and preserve value (Ellen MacArthur Foundation & WRAP, 2013; World Economic Forum & McKinsey & Company, 2014).

Transitioning to a circular economy therefore marks a paradigm shift from the conventional *"take–make–dispose"* model to one that emphasizes closed-loop resource cycles, waste minimization, and ecosystem regeneration. Adopting circular economy business models (CEBMs)—such as *product-as-a-service*, *remanufacturing*, *refurbishment*, *sharing platforms*, and *industrial symbiosis*—enhances sustainable development by reducing environmental degradation, promoting resource efficiency, stimulating innovation, and strengthening economic resilience (Assmann et al., 2023; Chakraborty et al., 2025). Indeed, CE has become a transformative paradigm redefining humanity's relationship with nature (Geissdoerfer et al., 2017).

Achieving CE objectives requires an environment that regenerates innovations in governance, production, and consumption processes. Its operational principles encompass four interrelated dimensions: resources and energy recirculation, resource demand reduction and recovery, diverse application framework, and sustainable development repositioning (Kristensen & Mosgaard, 2020).

When effectively implemented, CE outcomes manifest through closed-loop supply chain functions - design, procurement, production, distribution, use, and recovery (Stahel, 2016)—which collectively define the core fields of CE practice.

Despite the leadership of large corporations in CE adoption, SMEs encounter a distinct array of challenges due to finance limitations, technological, and informational resources. Given their dominance in the global business landscape, SMEs are indispensable for scaling sustainable development outcomes (D'Amato et al., 2017). Although CE research has expanded, it remains nascent, particularly concerning the SME context (Kristoffersen et al., Kirchherr et al., 2017; 2020; Singh et al., 2020). Prior studies have underscored the urgent necessity for firms to integrate CE business models to attain sustainability (Patwa et al., 2020). To achieve broad-based decarbonization, SMEs must be inclusively integrated into CE frameworks with adequate institutional and financial support from larger enterprises (Govindan & Hasanagic, 2018).

Empirical evidence shows that CE principles are increasingly being applied by many manufacturing industries (Lieder & Rashid, 2016), energy (Wang et al., 2020), construction (Benachio et al., 2020; Dadhich et al., 2015), textiles (Saha et al., 2021; Jia et al., 2020), maritime (Milios et al., 2019), and services (Fernandes et al., 2020). Despite these advances, barriers to CE adoption persist, especially within resource-constrained SMEs. Consequently, this study aims to critically analyze the barriers and opportunities associated with CE adoption, focusing particularly on the Nigerian SME sector, where scholarly attention remains limited (Dey et al., 2019).

2.1 Overview of Sustainable Development (SD)

According to Mensah and Enu-Kwesi (2018), efforts to transcend the rhetorical appeal of sustainability's substantive issue necessitates a comprehensive understanding of its conceptual underpinnings, dimensions, and policy implications. Giovannoni and Fabietti (2014), also cite Gray (2010) as having called for greater conceptual clarity to guide action-oriented frameworks for SD. Despite a vast body of literature, ambiguities persist concerning the SD principles towards human progress. Hence, decision-makers require not only robust data on the interconnections among the economic, social, and environmental pillars of SD but also a nuanced understanding of their implications for policy and practice (Abubakar, 2017; Hylton, 2019).

In this regard, the present discussion seeks to enhance conceptual intelligibility by elucidating the meaning, evolution, key dimensions, and guiding principles of SD, while highlighting their relevance for global, national, and individual action**.**

2.2 Concept of Sustainable Development (SD)

SD has become a central theme in global discourses, widely interpreted as development that can continue indefinitely or over a defined temporal horizon (Lele, 1999; Dernbach, 2003; Stoddart, 2011). This integrates two interrelated terms—"sustainable" and "development"**—** each of which has been defined diversely, thereby contributing to the multiplicity of SD definitions.

Among these, the Brundtland Commission Report offers the most authoritative definition, that SD is a mindset focused on meeting present consumers' needs without denying future generations the chances of also meeting their own needs" (Schaefer & Crane, 2005; Cerin, 2006; Abubakar; 2017)**,** through enabling societies to pursue growth without jeopardising ecological integrity.

Conceptually, SD represents a process-oriented approach**,** while sustainability denotes the ultimate state or goal achieved through that process (Diesendorf, 2000; Benaim & Raftis, 2018; Browning & Rigolon, 2019; Hák et al., 2016; Stoddart, 2011).

2.3 The Concept of Development

The notion of development has been variously conceptualised as an evolutionary process marked by enhanced human capacity to innovate, solve problems, and adapt to continuous change (Peet, 1999, as cited in Du Pisani, 2006). Reyes (2001) describes it as a social condition wherein human needs are met through the rational and sustainable exploitation of natural resources. Similarly, Todaro and Smith (2006) define it as a multidimensional process encompassing structural, attitudinal, and institutional transformations that foster economic growth, reduce inequality, and eradicate poverty.

Several theoretical frameworks have sought to explain the diverse dynamics of SD. The Modernisation Theory (Tipps, 1976; Huntington, 1976) argues that traditional societies must emulate modern industrialised nations through capital accumulation and technological advancement to achieve progress. In contrast, the Dependency Theory**,** rooted in Marxist ideology, contends that the industrialisation of developed nations perpetuates underdevelopment in poorer regions through exploitative economic relations (Bodenheimer, 1970; Mensah et al., 2019).

The World Systems Theory (Petras, 1981; Reyes, 2001) extends this logic, positing that global economic hierarchies sustain peripheral dependence on core nations, while the Globalisation Theory highlights the increasing interconnectedness of political, economic, and cultural systems (Portes, 1992; Kaplan, 1993; Moore, 1993; Parjanadze, 2009). Despite their limitations, these frameworks collectively provided the intellectual foundation for the

emergence of sustainability and sustainable development paradigms as contemporary global objectives.

3.0 Methodology

This study adopts a conceptual literature review methodology, which synthesizes existing theoretical, empirical, and policy-oriented scholarship to develop an integrated understanding of SMEs' adoption of Circular Economy Business Models (CEBMs). The justification for the approach is because the circular economy (CE) discourse, particularly within the SME context in developing countries' stings like Nigeria, is still evolving, while sustainability studies, industrial ecology, environmental economics, and innovation management, is still low and fragmented in developing countries. Consequently, a conceptual review enables the identification, interpretation, and consolidation of key ideas, themes, and debates that inform CE adoption and its implications for sustainable development in the study area.

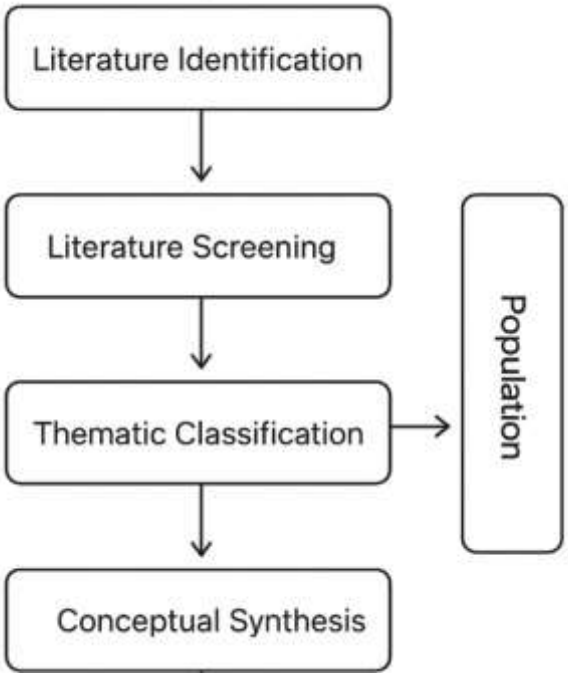

Fig. 1: The conceptual literature review flow chart.

The review followed a structured process consisting of literature identification, screening, thematic classification, and conceptual synthesis. First, relevant literature published between 2000 and 2025 was identified through major scholarly databases, including Google Scholar, Scopus, Web of Science, ResearchGate, and SpringerLink. Keywords used include: "circular economy," "CE business models," "SMEs," "sustainable development," "barriers," "resource efficiency," "innovation," and "Nigeria" guided the search. This ensured comprehensive coverage of foundational CE texts and contemporary empirical studies. See figure 1 for these.

Second, a screening process was applied to select literature that directly addresses CE business models, sustainability transitions, SME constraints, and national or sectoral CE adoption experiences. Both peer-reviewed journal articles and credible organizational reports (e.g., Ellen MacArthur Foundation, OECD, EU Commission) were included to strengthen conceptual depth.

Third, identified studies were grouped into major thematic categories such as environmental drivers, financial and institutional barriers, knowledge and capacity gaps, regulatory contexts, and opportunities for CE-enabled innovation. This categorization

supported the development of an integrated conceptual map linking SME characteristics, CE principles, and sustainability outcomes.

Finally, the review employed a qualitative synthesis approach to interpret interrelationships among emerging themes, highlight conceptual gaps, and propose future research directions relevant to the Nigerian SME ecosystem. Through this methodology, the article contributes a coherent analytical framework for understanding constraints and strategic pathways for enhancing CE adoption among SMEs for sustainable development.

4.0 Conceptual Literature Review

4.1 SMEs' CE Adoption Problems

The successful implementation of CE practices among SMEs is often impeded by a combination of institutional, financial, cultural, and informational constraints. These barriers may stem from the broader operational environment, including policy frameworks and cultural norms, as well as from internal organizational factors such as resource availability and managerial capability.

4.2 Environment-Related Issues

SMEs' managerial structures tend to be similar—often characterized by owner-managers who wield substantial decision-making power. As such, the adoption of *green innovations* and CE principles is heavily influenced by managerial attitudes and sectoral orientation. Studies suggest that the willingness of SMEs to adopt environmental measures largely depends on whether their industry perceives CE as a source of competitive advantage (Bradford & Fraser, 2007).

In the Nigerian context, certain sectors—such as banking and finance—demonstrate higher environmental awareness through digital transformation initiatives aimed at waste reduction. For example, the proliferation of Point-of-Sale (POS) systems has significantly reduced paper waste in banking operations. Thus, SMEs operating in environments that value sustainability are more likely to internalize CE practices, enhancing their contribution to sustainable development.

4.3 Financial Barriers

Financial constraints remain one of the most persistent challenges to CE adoption among SMEs (Lawrence et al., 2006; Vasilenko & Arbačiauskas, 2012; Trianni & Cango, 2012). High upfront investment costs, long payback periods, and limited access to external financing often deter small firms from pursuing sustainability-oriented innovations (Oakdene Hollins, 2011; Rademaekers et al., 2011).

Research indicates that many SMEs lack the financial muscles for recycling and resource recovery systems (Eunomia Research & Consulting, 2011). Similarly, waste collection and recycling are frequently unprofitable for smaller firms generating low waste volumes (WRAP, 2007; Rizos et al., 2015). In addition to direct costs, indirect expenses—including time, labor, and administrative resources devoted to environmental management—further constrain adoption (Revell & Blackburn, 2005; Yacob et al., 2013).

Given SMEs' limited human capital and management bandwidth (Iraldo et al., 2010; Seidel et al., 2008), these indirect costs can become prohibitive. Moreover, the smaller the enterprise, the greater its difficulty in navigating available funding opportunities, such as government grants and financial incentives (Hoevenagel et al., 2007; Müller & Tunçer, 2013). In the Nigerian context, banks often perceive SMEs as high-risk borrowers due to inadequate collateral and unstable cash flows (Hyz, 2011), further exacerbating their financial exclusion. Hence, improving SMEs' access to green financing mechanisms is pivotal for advancing CE adoption and sustainable development in Nigeria.

4.4 Lack of Government Support and Regulatory Frameworks

Insufficient governmental support, weak institutional incentives, and inadequate legislative frameworks constitute major impediments to CE adoption among SMEs (Calogirou et al., 2010; Studer et al., 2006). SMEs often depend on favorable tax regimes, training programs, and financial incentives to implement sustainability initiatives. In the absence of such policies, the motivation to pursue CE-aligned innovations declines.

Smaller enterprises are also more susceptible to local regulatory influence compared to large corporations (Hillary, 2004). When enforcement mechanisms are weak, environmental improvements rely primarily on the discretionary commitment of firm managers (Rutherfoord et al., 2000; Parker et al., 2009). Furthermore, most environmental management tools are designed for large firms, leaving SMEs without tailored guidance (Calogirou et al., 2010).

In Nigeria, sustainability regulations and government incentives largely target major corporations, neglecting the SME segment despite its vast economic potential. To foster wider CE adoption, governments must strengthen policy enforcement, expand financial support systems, and establish SME-specific sustainability frameworks.

4.5 Lack of Information and Knowledge Gaps

A pervasive information deficit represents another formidable obstacle to CE adoption. Many SMEs remain unaware of the potential economic benefits of resource efficiency and often perceive CE initiatives as cost-intensive rather than value-generating (Rademaekers et al., 2011; AMEC & Bio Intelligence Service, 2013). This misconception perpetuates traditional compliance-based approaches—such as the *"polluter pays"* principle—where waste is viewed solely as a liability rather than a resource (Ellen MacArthur Foundation, 2013). Consequently, addressing informational and cognitive barriers through targeted awareness programs, training, and technical assistance is essential for fostering a cultural shift toward CE within the SME ecosystem.

To further illustrate, FUSION Project (2014), conducted an extensive survey to generate empirical insights into SMEs' imbibing the CE concept. The study located in Belgium, France, and England encompassed 300 enterprises. All of participating SMEs had previous interest in sustainable initiatives. A noteworthy finding from the project revealed that a significant proportion of respondents know a little about CE, or possessed only a superficial understanding of its principles. However, a positive dimension of the study emerged when the participants were furnished with more information about CE—emphasizing principles such as waste recovery, reuse, and material regeneration. Upon clarification, most respondents reported active efforts in recycling and repair practices, suggesting that awareness and conceptual clarity can significantly influence behavioural change among SMEs. Moreover, the surveyed firms collectively identified waste management as a strategic area with considerable potential for generating new business opportunities within the CE framework.

4.6 Administrative Burden

Transitioning to environmentally sustainable business operations often imposes substantial administrative burdens on SMEs, primarily emanating from the existing legislative and regulatory frameworks**.** Consequently, administrative overheads constitute a critical impediment to SMEs' successful transition toward green business models, as compliance frequently demands substantial financial expenditure and time investment (OECD, 2010).

Empirical findings from a European Commission study indicate that, while SMEs generally exhibit awareness of national environmental legislations, they frequently lack the requisite institutional capacity and technical expertise to meet compliance requirements (Calogirou et

al., 2010). As a result, they tend to depend on external consultancy services to fulfil statutory obligations, thereby incurring additional financial costs that may be burdensome for smaller enterprises. Furthermore, the monitoring, documentation, and submission of environmental data present additional complexities, given that SMEs are often compelled to report similar data to multiple authorities in diverse formats. Compounding this, discrepancies between ex ante cost estimates and actual expenditures arising from procedural inefficiencies generate uncertainty**,** thereby undermining business competitiveness (Oosterhuis et al., 2006).

In the Nigerian context, similar administrative barriers persist and significantly influence SMEs' adoption of green business practices. Most Nigerian SMEs operate with lean management structures, where owners often double as managers, limiting their administrative competence to navigate regulatory procedures. Consequently, the lack of administrative and institutional capacity discourages the comprehensive adoption of environmentally sustainable practices, as SMEs are either ill-equipped **or** unwilling to absorb the compliance-related burdens imposed by the prevailing legislative environment.

4.7 Lack of Technical Skills

Technical expertise constitutes a fundamental determinant of organisational capacity to innovate and implement environmentally sustainable practices. Several studies have established that the absence of requisite technical competence represents a major barrier constraining SMEs from leveraging opportunities within the green and circular economy sectors (Trianni & Cango, 2012; Rademaekers et al., 2011; Iraldo et al., 2010). Empirical evidence indicates that many SMEs lack the technical knowledge and analytical capacity necessary to identify, evaluate, and deploy advanced technologies that could reduce environmental impact while simultaneously improving cost efficiency.

Consequently, SMEs frequently prioritise familiar technologies and depend heavily on the recommendations of suppliers when considering the adoption of new technical solutions. However, meaningful evaluation of such innovations requires a baseline level of technical proficiency, which many SMEs do not possess. This skill gap often compels them to rely excessively on external consultants and actors for decision-making (Hoevenagel et al., 2007; Calogirou et al., 2010; Trianni & Cango, 2012).

In the Nigerian SME sector**,** this constraint is particularly pronounced. Most enterprises operate primarily in survival mode**,** focusing on immediate operational continuity rather than capacity building. Consequently, SMEs often lack both the resources and motivation to invest in acquiring new skills due to financial and time limitations. This dual deficiency—of both skills and willingness to learn—significantly inhibits their ability to adopt green technologies and circular economy practices, thereby perpetuating traditional, resource-intensive business models.

4.8 Supply and Demand Network Problems

Another widely recognised obstacle to the diffusion of sustainable business models among SMEs is the limited environmental awareness among customers and suppliers (Wooi & Zailani; 2010; Meqdadi, 2012). Although sustainability considerations occasionally influence consumer purchasing behaviour, such factors rarely constitute decisive determinants of market choices (Wycherley, 1999). When sustainable supply chain initiatives necessitate collaboration with external stakeholders—such as in green procurement or supplier engagement—SMEs' adoption rates tend to be low.

Due to their modest market size and limited bargaining power, SMEs wield minimal influence over the environmental policies and practices of their suppliers (Zhu, 2008; Eltayeb & Zailani, 2009). Suppliers' reluctance to engage in green supply chain collaborations is

often driven by the perception that such commitments entail additional costs, which could compromise their competitive advantage (Wycherley, 1999).

This challenge mirrors the situation in Nigeria, where SMEs exert negligible influence on both suppliers and customers. Their limited capacity to shape upstream and downstream practices constrains the formation of sustainable supply and demand networks, leading to fragmented and ineffective implementation of circular economy initiatives. Consequently, even when individual SMEs attempt to integrate green innovations, the absence of reciprocal commitment from their business partners undermines the overall impact of their sustainability efforts.

5.0 Conclusion

The foregoing analyses affirm that the circular economy represents a transformative pathway toward sustainability and resource efficiency, necessitating deliberate integration into business operations. Nonetheless, for SMEs in Nigeria, multiple impediments—such as environmental culture, financial limitations, weak government support, information asymmetry, administrative burdens, inadequate technical skills, and fragmented supply-demand networks—continue to hinder adoption. Addressing these barriers through targeted policy interventions, financial incentives, and capacity-building initiatives is imperative to enhance SMEs' participation in the circular economy and advance sustainable development objectives within the Nigerian context.

6. Recommendations

1. Governments should develop SME-specific circular economy (CE) policies, including tax incentives, grants, soft loans, and simplified environmental compliance procedures.
2. There should be a stronger enforcement of sustainability regulations, combined with clear guidelines in the country, to help SMEs transition effectively into CE practices.
3. Financial institutions in the country should design low-interest green financing programmes tailored to SMEs' peculiarities.
4. Since many SMEs lack knowledge about CE benefits and opportunities in the country, national and state governments should partner with universities, NGOs, and industry associations to deliver training, workshops, and extension services. These programs should focus on practical skills, such as waste valorization, eco-design, material recovery, and CE business model innovation.
5. SMEs should also be given access to technical expertise essential for CE adoption. Establishing CE technology hubs or advisory centers can help the SMEs in doing this.
6. Regulatory agencies in the country should bureaucratic bottle necks like repetitive reporting demands, and harmonize environmental data submissions for the SMEs. Digitized portals for CE compliance, certification, and monitoring would help SMEs save time and reduce administrative stress, enabling greater focus on innovation.
7. Governments and industry bodies should also facilitate CE industrial clusters where SMEs can share resources, infrastructure, and waste-to-resource exchanges. Creating markets for recycled materials, refurbished goods, repair services, and product-as-a-service models will generate new business opportunities and enhance SME return-on-investments.

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