

Review

Transitioning to circular business models in developing countries: a systematic literature review of barriers, enablers, and future directions

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Abstract

The concept of the circular economy (CE) is gaining attention in developing countries as they cope with global challenges such as resource depletion, climate change, and environmental degradation. However, the adoption of CE principles at the business model level in these countries is constrained by various obstacles. This systematic literature review of 107 articles from Scopus and Web of Science (WoS) examines study results on circular business models within developing economies to establish a comprehensive framework for researchers, practitioners, and policymakers. We identify proof of obstacles such as financial constraints, regulatory and institutional challenges, technological limitations, market and supply chain issues, organizational hurdles, and cultural resistance. Among successful practices, drivers, and enablers that facilitate transition from linear to circular are highlighted: policy support, innovation, stakeholder engagement, and capacity building. A research gap is identified, especially in the health sector, food supply chains, and plastic packaging manufacturers. Due to the differences in terms of methodology, context, and topic of the reviewed research, the findings cannot be generalized. Nevertheless, by synthesizing current knowledge, our study aims to offer valuable insights to guide businesses in adopting circular models and policymakers in creating supportive environments, contributing to sustainable development in emerging economies.

Article highlights

- There is an expanding focus in circular economy literature from 2018 to 2024 to incorporate digital transformation, Industry 4.0, and supply chains related to plastic, food, and packaging.
- Brazil and India are the main contributors to circular economy research from developing countries.
- Main obstacles for circular economy practices in developing countries are related to finance, infrastructure, education, and cultural barriers.

Keywords Circular economy · Circular business models · Developing countries · Literature review

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1 Introduction

In its 2050 vision, the World Business Council for Sustainable Development (WBCSD) [1] calls for urgent action driven by the growing global material and waste footprint, declining material productivity, insufficient recycling rates, and rising economic inequality. Global population modernization and urbanization are trends that are expected to gradually increase energy demand, which in turn will increase greenhouse gas emissions and cause climate change [2]. According to World Bank projections, under business-as-usual scenarios, the overall amount of waste generated is expected to reach 3.88 billion tons by 2050 [3].

With these trends putting pressure on global resources, it is increasingly apparent that linear business models cannot continue for much longer [4]. The increased consumption by younger generations, urbanization, employment, stricter regulations, technological advances, and growing environmental pressures have accelerated the transition to a Circular Economy (CE) [5, 6], a viable strategy to assist in alleviating our global ecological pressures [7]. Circular Economy is defined by actions and behaviors such as eco-design, reuse, renovation, replication, repair, product sharing, and industrial symbiosis [8].

Although policies that support the transition to a more resource-efficient and circular economy are gaining attention [9–11], research on the Circular Economy has been mainly focused on developed countries [12], leaving a significant gap in the phenomenon from the perspective of emerging countries [13], partly due to the lack of adequate research information, data, and knowledge in the last few years [14]. Scholars and practitioners have only recently begun to pay attention to CE practices in developing countries [8]. Kirchherr and Santen [12] found that only 55% of the examined articles on CE practices are empirical, while 45% are conceptual, highlighting a significant knowledge gap [15]. The lack of scientific investigation on the implementation of CE in developing countries represents a critical research gap with important implications for global material flows [16]. No single CE model can be universally applied, given social, environmental, economic, and political differences [17].

This issue becomes more vital, considering that most people live in developing countries, and it is anticipated that by 2050, they will account for more than 90% of the world's total population [18]. Although the significant environmental crisis is largely caused by unsustainable consumption patterns in developed countries, while developing countries continue to experience growth, it is vital to prioritize sustainable growth to avoid a repeat of these unsustainable practices [19]. These countries are trying to utilize their resources by promoting industrialization that prioritizes economic growth. However, traditional approaches to economic development carry the burden of legacies that generate waste and exploit the environment [20, 21]. If the business environment lacks appropriate guidance, there is a risk of excessive exploitation of natural resources, environmental pollution, or significant waste production [22].

Notwithstanding the supposed economic, social, and environmental benefits advocated through various policies in different countries, the strengthening of overall resilience is contingent upon the private sector's capacity to adapt and innovatively develop new sustainable business models profitably [6]. Several publications have emphasized the need to rethink and reshape present production and consumption patterns, arguing for further study on CE-oriented creative practices such as the sharing economy, product-service systems, dematerialization, remanufacturing, and product lifecycles [23, 24]. Indeed, organizations have been striving to methodically apply circular supply chain models to their companies in recent years to extend the product life cycle, minimize waste, and promote economic sustainability by inclining client preferences toward secondary goods and products [18]. A circular economy system necessitates developing and implementing business models that focus on utilizing as few resources for as long as possible, while extracting as much value as possible [24, 25]. Furthermore, as emerging actors in development cooperation, businesses may play a crucial role as facilitators of CE practices in developing countries, promoting the transition to sustainable consumption and production patterns [8].

Current research has yet to explore how developing countries' companies develop their business models using circular economy principles [26]. The limited number of studies focused on a specific geographical setting constitutes an important perspective for further research [27]. Although several literature reviews have been conducted previously with a focus on the circular economy and business models in developed countries, [23, 26, 28, 29,30] none address developing countries, where implementation is slow and challenging due to unfavorable conditions [15, 31]. A particularly pronounced gap concerns the role, relevance, and specific characteristics of circular business models in developing countries. From both an academic and practical standpoint, the adoption of CE practices among micro, small, and medium-sized enterprises (MSMEs) in such regions appears to be in its nascent stages. Nevertheless, understanding how CE is adapted in developing countries is critical to advancing global sustainability

efforts. The effective integration of CE practices in these economies could significantly influence global resource flows, environmental impacts, and climate outcomes. Accordingly, this study addresses not only an academic gap but also a practical imperative: to understand how sustainable development can be advanced in emerging economies while simultaneously contributing to climate change mitigation and resource efficiency. To this end, we conduct a systematic literature review guided by the following research question: What are the barriers to applying CE practices in developing countries, and how do companies overcome them?

By investigating further, this study explores: What types of sustainable business models are currently being employed in developing countries, and what enabling factors support the promotion and implementation of circular economy practices in these contexts?

This research aims to contribute to the literature on Circular Economy (CE) principles in developing countries, which has received relatively little attention compared to industrialized economies. By examining 107 studies, we identify key challenges, opportunities, and sector-specific issues, thereby filling an important knowledge gap in understanding how Circular Business Models (CBMs) are implemented and what their specificities in developing countries are.

The study aims to provide valuable insights for practitioners by highlighting strategies and procedures that firms can use to overcome the financial, regulatory, operational, and other challenges of transitioning to circular models. Also, from a policy perspective, this assessment highlights the need for stronger institutional support, tailored incentives, and legal frameworks that promote circular business practices. This knowledge is essential for governments and policymakers seeking to incorporate CE concepts into national sustainability goals, thereby ensuring an inclusive and effective transition to circular economic systems. To guarantee the quality and relevance of the chosen studies, the systematic review adhered to an exacting procedure that included keyword searches, database selection (Scopus and Web of Science), and rigorous inclusion and exclusion criteria.

The structure of the paper is organized as follows: Sect. 2 provides an overview of the theoretical framework of the circular economy and business models in developing countries. Section 3, methodology, describes the entire systematic literature review process and data analysis approach. Section 4, results. Section 5 deals with the research gap and future studies. Section 6, Discussions, discusses the findings in the context of current literature in the field. Sections 7 and 8 discuss theoretical and practical implications, and Sect. 9 discusses conclusions and limitations.

2 Background of circular economy and business models in developing countries

2.1 Circular economy in developing countries

To capture leaders' attention in developing countries, CE supporters must demonstrate how circular approaches can accelerate industrialization and address critical development challenges such as energy access [32]. The growing awareness of resource constraints and the increasing demand from these nations for improved welfare and well-being underscore the need for new economic models that enhance resource use efficiency and effectiveness [33]. In light of the 2030 Agenda for Sustainable Development, adopted by all countries (developed and developing) in 2015, CE can be a tool, especially for developing countries, in their commitment to contribute to the SDGs' achievements, also because of their limited resources. CE and SDGs frameworks are interrelated in their approach to sustainability [34]. CE practices contribute mainly to: responsible consumption and production (SDG 12), through minimization of raw materials extraction, and reduction of waste; climate change (SDG13) by reduction of CO₂ emission; fostering inclusive economic growth (SDG 8), poverty reduction (SDG1) and zero hunger (SDG2) through minimizing food waste, enhancing resource efficiency, and creating value-added products from renewable biological resources [35]; sustainable infrastructure development (SDG 9); life on land (SDG 15) and SDG4 on education for awareness and lifestyle.

Extant research indicates that CE can provide considerable cost savings, foster innovation, create jobs, boost productivity, and improve resource efficiency in developed and developing countries [8]. Despite these potential benefits, circular economy adoption in developing countries remains in the early stages due to financial, regulatory, and other obstacles that businesses operating in these regions face [13, 18]. Furthermore, the lack of technology and innovation poses significant challenges, particularly in sectors like the food supply chain. This deficiency is exacerbated by limited financial capability, insufficient economic incentives, inadequate investments, and a lack of robust assessments of food waste and supply chain design [36]. Patwa et al. [37] emphasize the significant impact of factors such as customer behavior on the acceptance of remanufactured goods and using products as a service in encouraging the implementation of CE practices in emerging nations. Similarly, Khan and Haleem [38] identify critical strategies for successfully implementing the circular

economy in developing countries, including enhancing consumer awareness, enacting supportive laws and regulations, building a circular culture, raising awareness among supply chain partners, and designing products for circularity.

The need for new economic models to increase resource use efficiency and effectiveness is evident, given the growing awareness of resource availability constraints and the increasing need from developing nations and social groups for access to welfare and well-being [33]. Regardless of the specifics, research indicates that CE techniques may provide considerable cost savings, innovation, job creation, productivity, and resource efficiency in developed and developing countries [8]. Nevertheless, many businesses in developing countries prioritize economic rather than environmental factors when selecting suppliers, and there is an urgent need to establish reverse logistics infrastructure to facilitate reuse, remanufacturing, and recycling to align with the circular business model [39]. Although the principles of the circular economy are pretty widespread in developed countries, adding value for the customer and effectively using resources, their adoption in developing countries is in the early stages due to some financial, regulatory, cultural norms, and behavioral aspects facing the businesses operating there [13, 18].

2.2 Circular economy and business models

Most research, especially in management journals, has recently focused on incorporating the circular economy into business models and defining taxonomies to understand the dynamics of value creation and capture in circular business models [26]. This is because circular production methods and the business models that support them are critical for transitioning to a more resource-efficient circular economy [40]. This transition helps to extend the product life cycle and to discover new business opportunities [41]. When possible, circular business models can facilitate the economically feasible reuse of materials and products, with a focus on renewable resources [28].

According to Geissdoerfer et al. [42], business models are simplified descriptions of value proposition, value creation, and delivery, value capture, and the relationships between these components within an organizational unit. They further define sustainable business models as business models that generate monetary and non-monetary value for a wide variety of stakeholders in the long term [42]. Meanwhile, Rosa et al. [23] says that circular business models are a new business model in which value creation is based on retaining the economic value embedded in products after their use and repurposing it for new market offerings. This value capture and storage mechanism provides benefits at both the micro and macro levels [43].

To close the loop in the value creation process, technology generation, certification, entrepreneurship stimulation, and financial resources are essential [42]. Closing material circles can also affect goods or services, relationships with customers and partners, and various production processes, revenue models, and business strategies. In the circular economy, business model innovation plays an essential role in fundamentally changing the way of doing business, going beyond the usual sustainability processes that focus on the supply chain's efficiency, productivity, and 'greening' [4]. Companies that shift their operations today exhibit environmental responsibility and establish a lasting competitive advantage by engaging in expanding market possibilities [44]. Other benefits of transitioning to the Circular Economy include innovation, new income sources, long-term contracts, customer loyalty and feedback, the numerous advantages of internal resource management, and advantageous collaborations across the value chain [31, 45]. The OECD [40] classifies the five main circular business models: circular supply chain, resource recovery, product life extension, sharing economy, and product service system models. While Lüdeke-Freund et al. [46] propose six major CEBM patterns: repair and maintenance, reuse and redistribution, recycling, refurbishment and remanufacturing, cascading and repurposing, and organic feedstock business model patterns that have the potential to support the closure of resource flows. However, it is essential to note that although the present business model frameworks may incorporate circular economy principles, little research has investigated how CE principles can be applied to all business model frameworks [45].

2.3 Theoretical framework

The focus on the environment can be broadened by including a variety of stakeholders in the investigation [25]. Stakeholder theory provides a lens through which to explore how these diverse groups, from suppliers and consumers to policymakers and local communities, interact and align their interests to adopt circular economy practices [47]. Schaltegger and Wagner [48] expand on the usual concept of a business model based on a customer value proposition, recognizing that no long-term value can be created for customers until value is created for a wider variety of stakeholders. Strengthening stakeholders' sustainability interests and enabling them to serve as mediators for sustainable development are two

issues facing the implementation of stakeholder theory in sustainability contexts [49]. Organizations can use strategies like legislation, education, and sustainability-based value creation to address these issues.

Another important theoretical framework for business models, specifically circular ones, is the resource-based view, which focuses on the concept of a company's attributes that are difficult to imitate as an important source of competitive advantage [50, 51]. According to the RBV, companies with distinct assets like organizational capabilities, strategic human capital, and specialized knowledge are more likely to beat rivals over the long haul [52]. Stakeholder theory has been incorporated into more recent RBV extensions, highlighting the part played by outside parties in forming and sustaining these resources [53, 54]. Additionally, because resource sustainability is becoming more and more crucial for long-term competitive advantage, researchers have expanded the RBV to incorporate environmental, social, and governance (ESG) factors [55, 54]. According to this new viewpoint, for businesses to stay ahead of the competition in ever-changing markets, they must not only amass strategic resources but also match them with wider environmental and societal standards. In some cases, resource-based theory can be combined with stakeholder theory to not only focus on resources and competitive advantages but also to include the social and regulatory context in which resource selection takes place [56].

The impact of external barriers can be explained from the perspective of contingency theory [57]. One of these external factors is the institutional theory, which describes how social, political, and cultural forces determine organizational behavior and decision-making [58]. It focuses on three key institutional pillars that influence firms' strategic responses: normative (social norms and professional standards), regulatory (laws and rules), and cultural-cognitive (shared beliefs and behaviors) [59]. According to this theory, government organizations can impact corporate sustainability initiatives through trade restrictions and fines, consumer expectations, the behavior of profitable rivals, and (d) parent company benchmarks [60]. This approach is critical as the world progresses toward sustainability and the circular economy, where enterprises must adapt to changing societal standards and environmental restrictions [61]. While cultural opposition and a lack of enforcement stifle growth, institutional forces such as consumer demand, financial incentives, and government restrictions encourage enterprises to adopt sustainable practices [62]. The adoption of circular economy models has been extensively studied using institutional theory, which shows how businesses adjust to outside forces to acquire credibility and a competitive edge [63]. Furthermore, the disruptive innovation theory suggests that startups can deliver more radical solutions with a greater circular economy impact [25]. This transition is further accelerated by the involvement of Industry 4.0, digital transformation, and technical developments in waste processing and material recovery [64]. The significance of big data analytics and the Internet of Things (IoT) in promoting circular innovation is highlighted in more recent contributions [65].

3 Methodology

A systematic literature review was employed as an appropriate approach to a detailed literature analysis to achieve the research purpose. The literature review helps researchers identify fields that need mapping and evaluation [66]. Scopus and Web of Science databases were utilized to retrieve a substantial and representative body of relevant material for the literature selection process. Early studies based on literature reviews in the field of circular economy have used the Scopus database [26, 67–69], and others have used both Scopus and the Web of Science [30, 70, 71] as databases that cover large and high-quality journals. According to Falagas [70, 71, 72], Scopus is a bibliographic database that indexes more journals, enormously assisting researchers with existing literature, especially with works published after 1995, and Web of Science covers the oldest publications. The PRISMA analysis approach was used as a systematic approach to ensure transparency and accuracy in the review process and reduce any potential biases [73]. A protocol has been designed to specify the carefully planned proceedings, eligibility requirements, and selection and identification of document data [74]. The Prisma flow diagram describes the flow of information through the different stages of a systematic review, including the number of records identified, included, and excluded, and the reasons for exclusions. It incorporates four key parts: defining eligibility criteria, picking articles, extracting data, assessing article quality to prevent bias, and synthesizing data [75].

To have a process as transparent as possible in the systematic review process, clear criteria were used for the exclusion of publications to make the systematic review process as transparent as feasible. Articles that did not concentrate on business models or practices of the circular economy (CE), had nothing to do with the context of developing nations, or had nothing to do with the study's geographic focus were disqualified. To maintain academic rigor, non-peer-reviewed

content like conference papers, opinion articles, or non-academic publications was also excluded. Moreover, publications without adequate methodological information to evaluate validity and reliability were not considered. This procedure is explained in the steps below:

- 1 Identification of keywords for searching documents.
- 2 Search in Scopus and Web of Science with keywords "circular economy" AND "business model" AND "developing countries" OR "Global South" OR "developing nations" OR "developing economies" OR "emerging Economies" OR "emerging nations" OR "emerging countries". This search resulted in 79 documents in Scopus and 28 in Web of Science.
- 3 The search was limited to:

Subject areas: Business, Management, and Accounting; Economics, Econometrics, and Finance.

Language: English

Document type: Article

Publication stage: Final

The number of articles after these limitations reached 44 in Scopus and 23 in Web of Science. The years of publication were not limited in the search. This approach was chosen to ensure the inclusion of basic studies and recent developments in the field of circular economy, and since publications according to the research specifications of this study started in 2018.

- 4 Duplicated articles were verified in both databases, 17 of which turned out to be the same articles. A total of 50 articles were selected and downloaded for further analysis.
- 5 The abstracts of the articles were read and analyzed to verify whether the articles fit the topic of the study, with particular attention to keeping in the study only the articles that have studied business models and the Circular Economy with a focus on developing countries. After this stage, 15 articles were removed from the analysis as unsuitable for the topic and two articles were because they were reports. In conclusion, 33 articles remain on which the literature review will be carried out.

All these steps and acceptable criteria for selecting articles are presented in Fig. 1 below, according to the scheme proposed by Page et al. [76] for the Prisma methodology.

4 Results

4.1 Descriptive overview of bibliographic analysis

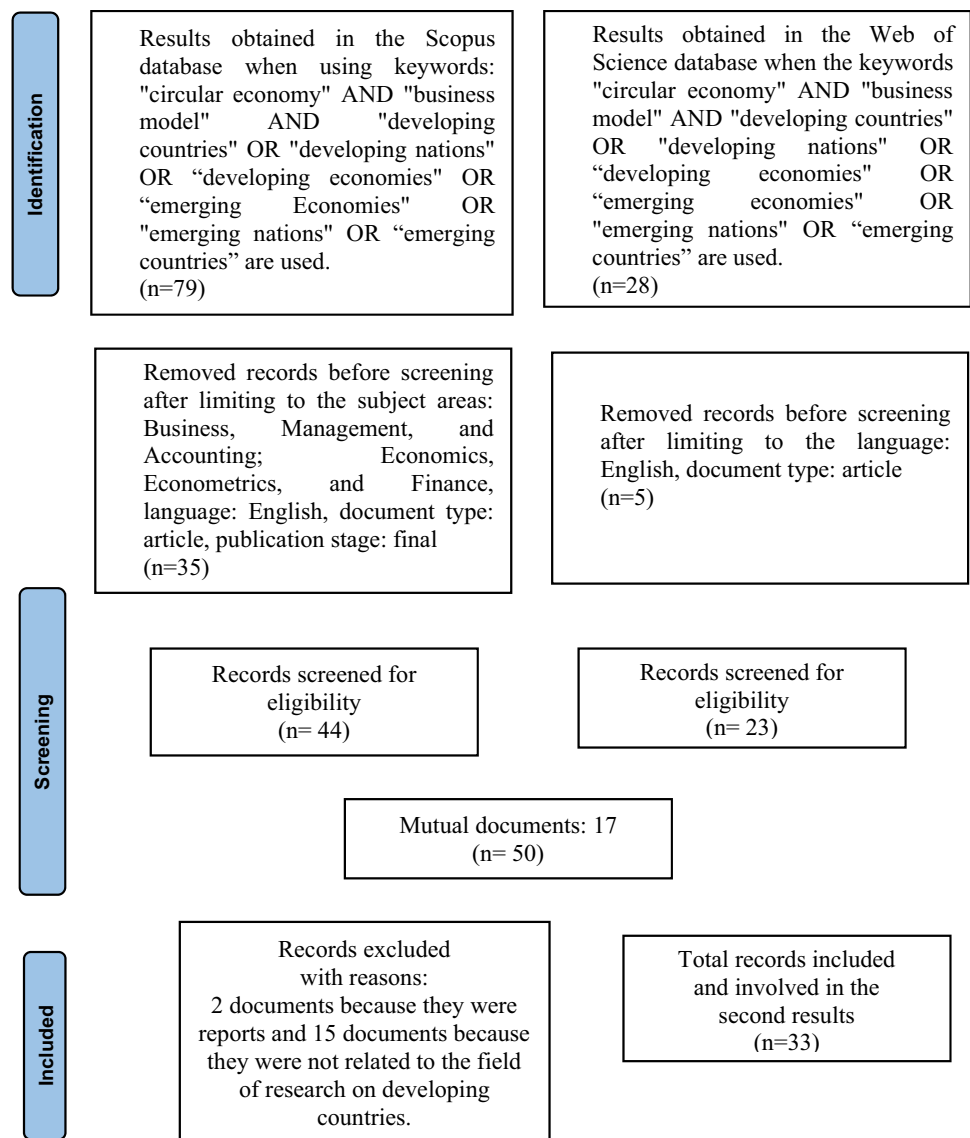
We use the VOSviewer program to visualize the occurrence and connection between keywords. VOSviewer is a program for building and viewing bibliometric maps. It can be used to build author, keywords, or journal maps based on attachment data or to build keyword maps [77]. Regarding the analysis of the keywords, it was possible to extract a summary of the keywords through VOSviewer software. We include the Excel data from Scopus and Web of Science following these steps:

1. Create;
2. create a map based on bibliographic data;
3. read data from the bibliographic database file, and choose Scopus (before this step, we fit all the data in Excel according to the Scopus database);
4. type of analyses: Co-occurrence, total counting, all keywords;
5. minimum number of occurrences: 2

After this procedure, synthesized keywords are shown in Table 1 and graphically in Fig. 2.

Keyword co-occurrence maps show groups of terms that commonly appear together in the evaluated literature. This allows for the identification of dominating areas of focus and developing trends, which are critical for defining the review's context and understanding where the field of study is oriented. Similarly, map areas with little or no connectivity

Fig. 1 Prisma flow map (data in the Scopus databases and Web of Science, December 20, 2024)



represent underexplored or unconnected themes, which can help identify potential study prospects. The Circular Economy is a unifying framework for discussion about sustainability, business practices, and innovation. Sustainability follows closely after, with fewer occurrences but a significant overall link strength of 50. Its inclusion in debates on corporate practices, legislative frameworks, and economic research highlights its significance as a cross-cutting issue. With 9 occurrences and a connection strength of 46, growing economies require equal attention. This reflects the increasing awareness that these areas are essential to the adoption and advancement of sustainable practices, especially in supply chains and industrial development. Additionally, prominent are business models and sustainable development, each of which appears six times with a link strength of 39. While some concepts, such as policy implementation and stakeholder theory, appear less frequently, their strong correlation underlines their importance in defining the overall picture of the context. Furthermore, the use of terminology like small and medium-sized enterprises (SMEs), innovation, and industry 4.0 indicates an emphasis on incorporating cutting-edge technologies and smaller corporate units into the sustainability journey. Although less frequently discussed, these subjects are critical components of the developing world's changing research environment.

According to the distribution over time, research in this field has been in recent years (see Fig. 3). Publications continued after 2018 and have a noticeable increase following the global trend of research on business models for a circular economy transition [20, 23].

Table 1 The list of keywords, occurrences, and total link strength [77]

Keyword	Occurrences	Total link strength
Circular economy	26	104
Sustainability	7	50
Emerging economies	9	46
Business models	6	39
Sustainable development	6	39
Business development	5	35
Brazil	4	24
Economic analysis	3	21
Industry	2	21
Policy implementation	2	21
Industrial development	2	20
Industry 4.0	4	20
Commerce	2	19
Stakeholder theory	2	19
Supply chains	4	18
Innovation	2	17
Manufacturing	3	17
Small and medium-sized enterprise	3	17
Decision making	3	15

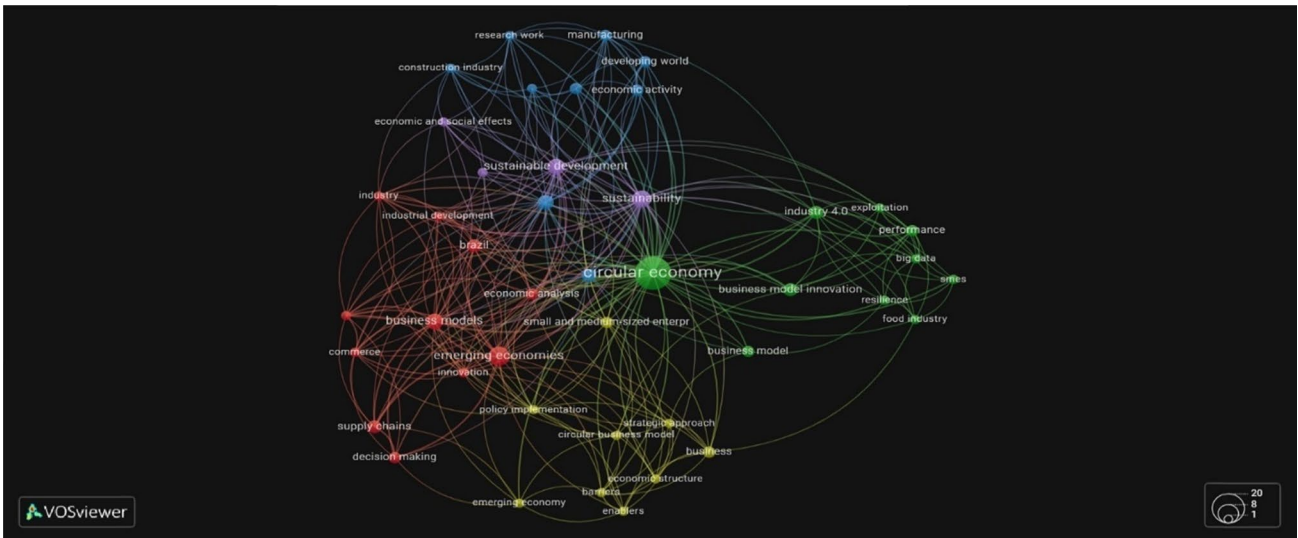


Fig. 2 Maps of the keywords processed in VOSviewer <https://tinyurl.com/28yku7jf>

Fig. 3 Number of articles by year (source: Scopus and Web of Science databases)

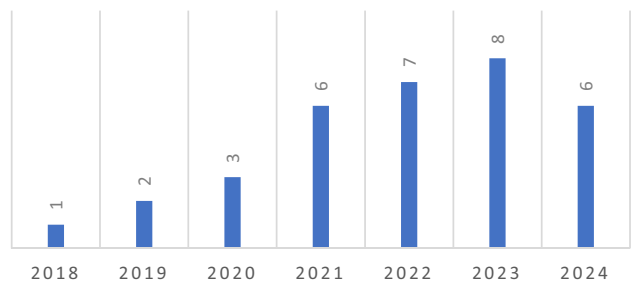
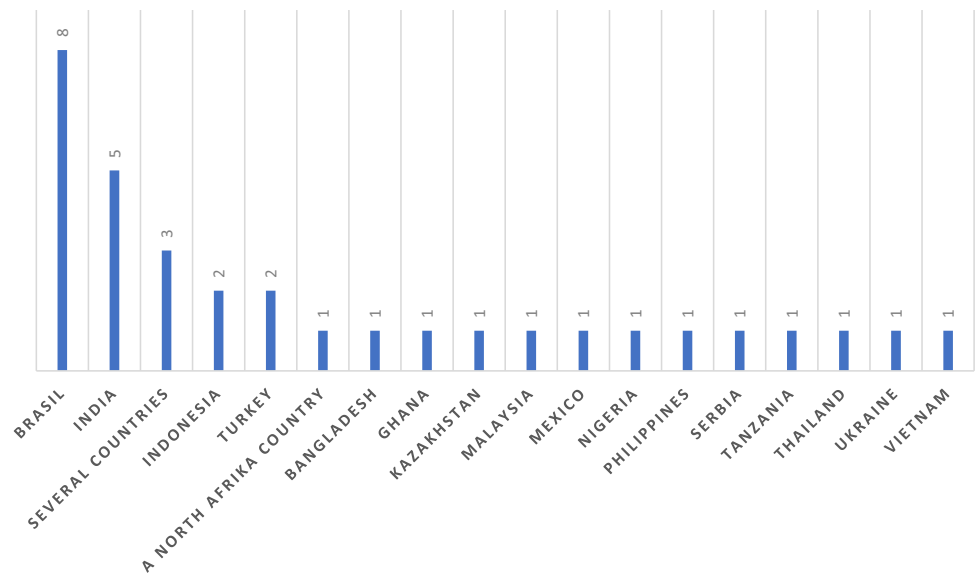
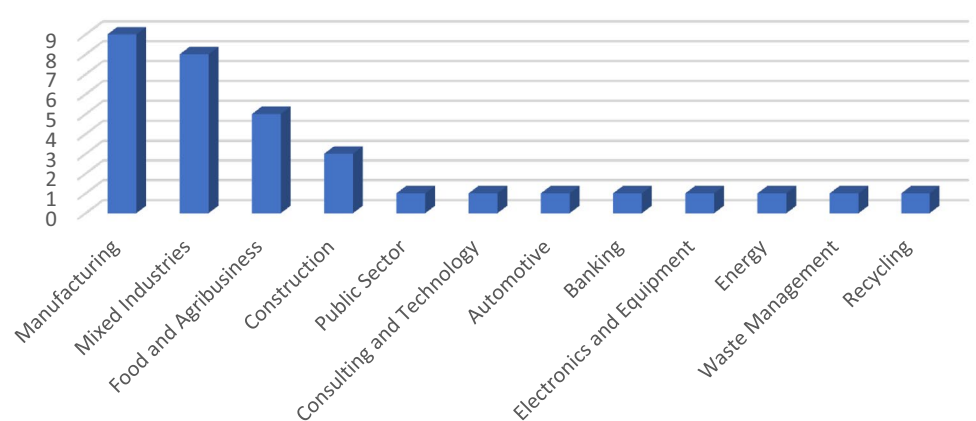


Fig. 4 Number of articles by countries

The distribution of research publications across nations demonstrates broad regional participation, with Brazil leading with eight publications (see Fig. 4). India follows with five publications, indicating a considerable engagement in the topic. Furthermore, three publications contain findings from several countries, suggesting an international collaborative study effort. Other studies, including Indonesia and Turkey, contributed two with two publications. The list also includes countries from several continents, including a North African country, Bangladesh, Ghana, Kazakhstan, Malaysia, Mexico, Nigeria, the Philippines, Serbia, Tanzania, Thailand, Ukraine, and Vietnam. This broad representation demonstrates the global interest and efforts in sustainability and environmental studies.

Regarding the methodologies used, it is noted that most of them have an empirical approach (90% of them), which is also prompted by the suggestions of some of the researchers in the field, which show a lack of empirical studies [12]. Empirical analyses usually focus on a few case studies, which is also evident in the literature reviews for business models carried out earlier by Bocken et al. [28] and Diaz Lopez et al. [29]. Therefore, the research mainly comes with adoption barriers derived from theory, primarily from research in developed countries, and then tested in the context of developing countries. Surveys are widely used for quantitative data collection, while secondary data analysis utilizes existing data for empirical research. Mixed methods include qualitative and quantitative data, using tools such as the Circulation Assessment Tool (CAT2022) and Gray-DEMATEL for multi-criteria decision-making. The case study method is the most widely used approach, providing detailed contextual analysis and practical application of theoretical models.

The manufacturing industry has received more attention from researchers regarding the studied sectors. Wine and coffee production, fresh markets, breweries, and beverage companies are also a focus of studies. Many studies have been carried out in several industries with a particular focus mainly on SMEs. The construction sector also has a visible presence, as shown by three articles. Energy, waste management, public sector, consultancy and technology, automobiles,

Fig. 5 Number of articles by sectors

banks and electronics, and equipment were not excluded from the study. The distribution of articles according to the studied sectors is shown in Fig. 5.

The distribution of articles in different journals highlights the importance and impact of research on sustainable and environmental topics, as shown in Table 2. Journal of Cleaner Production leads with six articles and 102 citations, followed by Sustainability, which follows with four articles and 148 citations. Other journals have one or two published articles.

4.2 Types of sustainable business models in use in developing countries

To address the first study question, "What kind of sustainable business models are in use?" this section examines critical business practices supporting circular transitions, resource recovery models, and circular supply chains.

4.2.1 Specific results related to circular supply chain

One of the most important components of circular business models is the reversed supply chain [45], which has proven to be one of the most successful ways for organizations to reduce costs and enhance economic performance in today's increasingly competitive marketplaces [78]. It stresses the utilization of reuse, recycling, and reproduction, promoting the transition from the linear model to the circle of product flow [18]. Increasing the sustainability of supply networks in developing countries offers great benefits, but companies in these countries face more obstacles to sustainability than those operating in developed countries [78]. Products manufactured in developing countries are exported to developed countries for mass consumption. Still, while the latter have regulatory rules, technology, and current expertise to implement the CSC model, developing countries lag in these areas [18]. One way to overcome these barriers is collaboration, which may assist in overcoming the lack of resources, modern technology, and logistics [15]. Articulating ecosystem agents would feed the market by giving knowledge, communication channels, and task implementation in a way that makes best practices simpler for dissemination across the production chain, including traditional industries, low technology, and SMEs [79]. In a supply chain, there may be substantial variety among focal enterprises, suppliers, and customers regarding expectations from the sharing economy [80]. The synergistic effect

Table 2 Number of articles by source

Source	Article numbers	Citations
Journal of Cleaner Production	6	102
Sustainability	4	148
Business Strategy and Development	2	9
Business Strategy and the Environment	2	1
Environment, Development and Sustainability	2	24
Management Decision	2	246
Resources Policy	2	139
Annals of Operations Research	1	5
Business Perspectives and Research	1	6
Circular Economy and Sustainability	1	8
Journal of Entrepreneurship in Emerging Economies	1	15
Journal of Environmental Management	1	222
Journal of Infrastructure, Policy and Development	1	0
Production Planning and Control	1	44
RAUSP Management Journal	1	4
Recycling	1	36
Renewable Energy Focus	1	2
Revista de Gestao Social e Ambiental	1	2
Smart and Sustainable Built Environment	1	15
Sustainability: Science, Practice, and Policy	1	4

between the circular economy and the sharing economy should be recognized because if a company has adopted the principles of the circular economy, the transition to the sharing economy would be easier [80].

4.2.2 Specific results related to resource recovery

According to trade data, developing nations account for a major percentage of the material recovery value chain (specifically, the reprocessing of sorted trash into secondary raw materials) [40]. Global resource costs are likely to rise, implying that the best-performing economies will become the most resource-efficient in 10–20 years [81]. Resource recovery business models entail generating supplementary raw materials from waste sources [40]. Several factors, including the use of recycled content in the subsequent production-consumption cycle, the percentage of savings reinvested into business growth, and the intricate interactions between cost savings through resource recovery, could still accelerate the extraction of natural resources and the associated negative environmental and social consequences. [81].

Managers may boost business opportunities by focusing on possibilities created by innovation and resource recovery initiatives [21]. The recovery of resources from their final destination process allows materials to be recycled back into the manufacturing chain while lowering negative externalities by preventing waste generation [82], by rearranging current enterprises rather than making new investments, and offering the attitude necessary to begin CE [21]. Small and medium-sized enterprises (SMEs), which account for most enterprises in developing nations, need to use the resource recovery business model [20, 81]. SMEs play an important role in industrial growth in emerging countries [84]. SMEs would find the move to a circular economy considerably more challenging than large firms [14]. Access to finance is one of the main obstacles SMEs face in growing their businesses in emerging markets [85]. These firms in developing countries struggle to implement sustainable manufacturing practices due to high costs, insufficient skills and training, lack of defined measurements, and lack of acceptance of emerging technology [86]. Nevertheless, MSMEs are usually more adaptable and sensitive to market demands than large companies [41, 87]. In their shift toward a circular economy, SMEs may encourage their staff to participate in environmentally friendly activities by offering green training and development regularly [41, 88].

At the same time, developing countries stand to gain the most from the global Industry 4.0 consolidation as it will enable them to collaborate more effectively in an international manufacturing network to provide vital goods, systems, and components while also increasing the efficiency of their horizontal value chain [79]. By reducing capital and operating expenses, automation speeds up and simplifies business procedures, while improving stakeholder and employee satisfaction [89]. Furthermore, the deployment of CE is made possible by Industry 4.0 technologies, which also enhance waste management and energy efficiency, process dependability and uptime, resilience, quality, infrastructure, and self-optimization [90]. However, there are some challenges to Industry 4.0 including a lack of investment capacity and knowledge in the industrial sector regarding smart production and new technologies, critical communication needed to promote and support innovation in a digital context, insufficient investment capacity and expertise for smart manufacturing and new technologies, and the alignment between new technological capabilities and the development of new business models [79]. Another successful practice in developing countries is vermicomposting applied in the agri-food sector, a process that offers environmental and financial advantages and is considered a form of recycling [91, 92]. Strategic visions that balance the company's interests with those of other stakeholders and key stakeholders' collaboration are essential to the strategic environmental CSR initiative, and ongoing support is a key enabler of the organic waste separation process for vermicomposting.

4.3 Specific results related to barriers to circular economy implementation

Of the 33 studies analyzed, only 14 mention the barriers businesses face to adapting to the circular economy in developing countries. These barriers are summarized and categorized in Table 3. Developing countries' most serious challenges are a need for more political will to address environmental issues, the absence of national solid waste management plans, insufficient laws and regulations, and a lack of training programs [93]. Relevant contextual elements, such as governments and international institutions, influence companies' willingness to transition toward a circular economy [26]. Poor regulations, awful institutional structures, and a lack of cutting-edge infrastructure are prevalent features of these countries, where the political will to enact and enforce laws and provide strong governance is often lacking [14]. Especially in the building sector, institutional and regulatory barriers are the most pressing circular economy barriers, slowing and preventing the transition to a circular economy in developing countries [94].

Table 3 The barriers encountered by business models in developing countries to adapt to the circular economy

Major barrier category	Specific barriers	Authors
Financial barriers	Difficulties in accessing suitable financing and investment capacity; lack of financial resources; perception of high business risk; low virgin material prices and industry trends; high initial investment costs; reluctance to provide funding and subsidies for circular business models; lack of financial infrastructure, and lack of access to financial services	[14, 15, 79, 83, 90, 94, 96, 101]
Regulatory and institutional barriers	Lack of a regulatory framework; lack of effective legislature; dysfunction of institutions; delays in issuing permits; public policies and other social development practices that are not always compatible with the development and implementation of circular solutions; lack of global consensus; limited circular procurement; lack of circular economy incentives; inconsistent policy messages and weak institutional infrastructure	[31, 90, 94, 96, 102]
Technological barriers	Lack of innovation and technological integration and readiness; processing waste products; limited circular design; no large-scale demonstration project; lack of data on environmental footprints, technical performance, tracking, and reuse planning, and material characteristics	[14, 31, 79, 80, 90, 94, 101]
Market barriers	The dominance of the main market players; low market affordability; stable product options available in the market low ability of users to pay and consumer skepticism	[14, 15, 80, 90, 96]
Supply chain problems	Global secondary material supply chain problems; limited interest and engagement across the value chain	[83, 94, 97, 102]
Organizational and operational barriers	Lack of skills and qualifications; lack of experience and knowledge for transitioning to a Product-Service System business model, issues of collaboration, scalability, and adoption rate; the lack of adequate infrastructure and the lack of the concept of prioritizing sustainability in the vision statement; difficulties in extending the life cycle of the product; the lack and difficulty of introducing sustainable alternatives into production; environmental cost and competition; structural issues; unclear responsibilities of different departments regarding CE;	[14, 15, 31, 79, 80, 83, 94, 96, 98, 101–103]
Consumer and cultural barriers	Lack of awareness and knowledge; reluctance to adopt new habits; lack of consumer awareness, quality problems of recovered resources; uncertain organizational culture; operation in a linear economic system; negative consumer perception and reluctance to pay a reasonable price or buy used materials and products; customer preferences for traditional products; lack of consumer awareness regarding the transition to a Product-Service System approach and the benefits of sustainable products; the emergence of large retail stores operating in a disruptive business model and sectoral barriers	[15, 31, 41, 80, 83, 90, 94, 97, 101, 102]

Financial problems are also evident in developing countries, as results by research in developed countries [18, 84, 95]. The difficulty in accessing suitable financing and the perception of high business risk make this challenge even more present in developing countries [95, 96]. Also, low virgin material prices are considered a significant barrier to a circular economy in numerous sectors, notably in the built environment, because of concerns regarding value in the distant future [94].

Organizational and operational obstacles have caused many companies not to have sustainability as part of their culture, policy, and strategy [94]. Chiappetta Jabbour, Seuring, et al. [97] point out that the main factors that determine the movement of a company towards a CE are the internal factors of the company, especially structural issues related to communication difficulties and ambiguities about the different responsibilities related to CE, as well as the difficulties to adapt technology advanced. Inadequate willingness and lack of knowledge, interest, and participation throughout the value chain is a wide term, yet it may be seen as the root of the problem and a major barrier [94]. Developing countries are characterized by limitations related to formal education, the availability of skilled labor, and a large potential consumer market [79]. Businesses are likewise concerned about component recovery to maintain a consistent supply of recycled materials and reused parts to potential buyers [98]. Furthermore, the lack of articulation between the stakeholders of the innovation ecosystem is worse in developing countries than in developed countries, and this is partly because there is a low level of communication between public and private organizations [79]. A culture used to linear economic systems may resist the fundamental adjustments necessary to transition to the circular economy, frequently accompanied by a lack of desire and commitment throughout the value chain [94].

Furthermore, solutions that promote circular features such as durability, multifunctionality, and modularity might clash with customers' preferences for traditional product use and ownership [31]. When faced with a high customer desire for product ownership, businesses opt to shift their business model from "rental" to "sale" with innovative payment mechanisms to meet consumer demand [31]. Furthermore, consumer recycling behavior is critical for preserving the value of parts, modules, and materials in the economy for as long as possible [99]. Post-consumer waste availability in both quality and quantity might be inadequate because of a lack of regulation or infrastructure, hindering many CE activities [15]. The circular design of the product is one of the most important barriers for SMEs because it prevents other possible obstacles, but circular design practices still depend on SMEs' nature, the field of activity, leadership, and resources [83]. Product designers may design multiple manufacturing cycles using secondary raw materials and components as a new source of value creation, provided the institution creates a business environment for secondary product sellers, and the opportunity to join the primary supply chain [100].

Despite these obstacles related to the context of developing countries, there are some specifics related to firm size. Pacheco et al. [41] studied the challenges faced by MSMEs in developing economies when it comes to implementing CE practices, with a particular focus on transparency and product optimization. The main obstacles include the lack of information regarding product issues and sustainable resource management, the lack of effective communication, billing procedures, and maximizing end-user value, training, understanding, recycling, and financial constraints. The obstacles identified by Hashemkhani Zolfani et al. [83], are also along the same lines. In addition to financial shortcomings, collaboration problems, and supply chain issues, they highlight quality concerns with recovered resources and product design. Another important obstacle to the adoption of circular practices by SMEs is consumer behavior, including their low ability to pay and their skepticism toward green products [15]. As for the barriers SMEs face in adapting to Industry 4.0, Despoudi et al. [90] mention interconnectedness, collaboration, financial affordability issues, and lack of infrastructure.

While barriers for large companies are often operational and systemic. Global corporations find it difficult to integrate their operations with various local regulatory constraints, and fragmented supply chains make it difficult to implement circular models at scale. Heterogeneity in policies between countries, lack of consensus around supportive policies, and hindering laws are other significant barriers to CE adoption in large firms, as many supply chains are highly integrated internationally [94].

For a large company aiming to adopt circular practices with glass bottles, a significant problem is the lack of proper channels for the return of materials, activities of informal actors, the proliferation of imitation products, and the absence of information on the emergence of large retail stores [14]. In another case study of a large hermetic refrigeration compressor company, a significant barrier is seen as the uncertainty surrounding parts recovery to ensure a stable supply for buyers of recycled materials and reused parts [98].

The implementation of CBM can mean different things in different industries [14], and therefore, the interpretation of the above obstacles should be adapted to the sector and the context where the business operates. Table 4 shows the barriers according to the industries studied. What is noticed is that even within the same sector, under the

Table 4 The barriers according to the authors and industries

Authors	Industry	Financial barriers	Regulatory and institutional Barriers	Technological barriers	Market barriers	Supply chain	Organizational and operational barriers	Consumer and cultural barriers
[94]	Construction	✓	✓	✓		✓	✓	
[102]	Environmental consulting, technology solutions		✓		✓	✓	✓	✓
[14]	Breweries and beverage companies	✓	✓	✓	✓			
[98]	Commercial refrigeration and electronic equipment					✓		
[31]	Mix	✓		✓				✓
[90]	Food sector	✓	✓	✓	✓			✓
[96]	Manufacturing	✓			✓			
[80]	Manufacturing			✓	✓	✓	✓	✓
[15]	Manufacturing and services	✓			✓		✓	✓
[79]	Mix	✓		✓			✓	
[101]	Mix	✓		✓			✓	✓
[41]	MSMEs							
[83]	Not defined	✓				✓	✓	✓
[103]	Recycling						✓	

conditions of developing countries, the results are not always the same from different authors. In the study carried out in the production sector, Chiappetta Jabbour et al. [80] emphasize consumer and organizational barriers, Cantú et al. [15] and Ting et al. [96] highlight the importance of financial barriers. This may be related to the fact that the studies were carried out in different countries, and contextual factors impact the results.

4.4 Specific results related to opportunities and enablers of circular economy implementation

Chiappetta Jabbour, De Camargo Fiorini, et al. [80] discuss some of the challenges that enterprises in developing countries face while adopting circular practices; increasing the quality of service provided by the organization; integrating cutting-edge technology and software; introducing the use of recycled materials in the manufacturing process; developing new abilities and resources to support the business and development and integration of new technologies, R&D, supply chain, manufacturing, finance, and legal departments. Effective legislation and stakeholder participation are essential for improving and reformulating public policies related to the circular economy, significantly increasing the adoption and effectiveness of the circular economy [14]. For example, in the case of returnable glass bottles in Nigeria, collaboration between value chain actors to pull the end-of-life bottle into reverse logistics through both formal and informal engagement, even in the absence of regulatory policies, has enabled the successful operation of this circular business. Another study of Indian automobile companies emphasizes the necessity of collaborating with the government and business organizations to raise awareness and encourage the construction of infrastructure for reverse logistics [100]. For instance, material recovery and recycling rates have increased dramatically as a result of pilot projects involving authorized product recovery workshops. Adopting modern economic instruments such as the increase of producer responsibility, the creation of waste management and elimination rules, and the shift of factory policies towards green economy reforms are other necessary policies that would further encourage companies towards environmental initiatives [104]. Industrial symbiosis can considerably improve the operational productivity of the industrial system, assisting cities and countries in increasing job opportunities and reducing environmental pollution [101].

In addition, environmental taxes play an important role in establishing a circular economy policy, significantly increasing the adoption and effectiveness of CE in developing countries. Companies that want to thrive in this environment and become competitive over time must reconsider their policies and procedures since stakeholders and customers are concerned about protecting the environment [89]. A company that has activity in recycling household appliances, for example, has innovation as a pillar of growth and sustainability for its entire business strategy, so it focuses on recovering all the potential value of waste from electrical and electronic equipment, to maximize the usefulness of end-of-life products. Improving business processes through higher efficiency, cleaner production, a skilled workforce, and sustainable profit is essential to the long-term success of CE [96]. Understanding strategic pathways for private and public managers, combining creation, partnerships, investments, and debureaucratization, is critical for the successful adoption of CE [79]. The SME sector must include green practices in its strategic agenda to secure a competitive advantage when reacting to government or market demands [88]. Leadership commitment and training are critical for influencing the adoption of CE in MSMEs, particularly in emerging economies [41]. Only environmentally conscious management that understands the implications and long-term benefits of the circular economy will take risks as eco-entrepreneurs [96]. Green training and development are essential for building environmental awareness and achieving organizational environmental performance. It guides organizations toward better environmental practices [88]. SME management should design for loyalty and trust, dependability and durability, product longevity, simplicity of maintenance and repair, and upgradeability [83]. In this process, it is critical to build links with local and international organizations while providing continuous training and education in designing and upgrading business models [105]. This includes digitizing accounting processes to ensure timely and accurate data, implementing infrastructure and technology to facilitate cross-industry interactions, allocating appropriate budgets and advanced technologies, and increasing accounting staff involvement in digital transformations [105]. Businesses can preserve assets to benefit from CE practices by designing components that can be recycled and reused to produce new products, which, in turn, can help adopt socially responsible manufacturing [101]. An example is the case of using coffee by-products in Tanzania, such as husks and pulp, as substrates for the cultivation of edible mushrooms. This approach not only reduces waste but also transforms by-products that would normally contribute to environmental pollution into valuable inputs for mushroom cultivation [91]. Another good practice in circulating in the food supply chain is provided by the study by Thongplew [92], which mentions how the production of vermicompost offers financial advantages over traditional compost because it can be sold at higher prices. The design of a green business model must address issues such as value proposition, alignment of sector activities with

value proposition to promote sustainability, and identification of potential market segments and locations with target customers who require green design and services [106].

CE practices, especially in businesses, are influenced by factors related to human resources, including training, information exchange, employee involvement in building strategies, management, and leadership [41]. Green training and development are essential for building environmental awareness and achieving organizational environmental performance. It guides organizations toward better environmental practices [88]. Similarly, Toker and Görener [21] stress the importance of training employees on CE and resource recovery models while providing opportunities for skill development. They also highlight managers' need to actively mentor employees and increase participation in CE initiatives in developing countries. SME managers can leverage employee engagement in green activities through periodic green training and development. Recognizing sector-specific circular economy approaches allows SMEs to incorporate green practices into their strategic agenda, achieving a competitive advantage and meeting government or market demands [88].

Furthermore, companies should broaden their view of the CE paradigm, including different related dimensions to guide the development of circular economy-driven roadmaps [107]. Circular activities should consider the specific characteristics of the local operational environment to ensure acceptance and the inclusion of solutions [31]. Ahmed et al. [103] discuss the importance of deepening local policies to stimulate business growth and create sustainable businesses that meet consumer expectations. They discuss how an inventive approach to resource recovery is at the heart of an Indian paper recycling company's success. The business turns post-consumer plastics into raw materials for a variety of industries, such as cement and apparel manufacture, by using contemporary recycling techniques like secondary recycling. Most significantly, the group started school programs in the area to teach kids the value of recycling and garbage separation because it recognized how vital behavior modification is to attaining circularity. Also, a way to facilitate the transition to the circular economy in businesses in developing countries is to select and train local suppliers to ensure the recycling and reuse of products and materials [13]. The drivers and enablers of the circular economy for companies operating in developing countries are summarized in Table 5.

4.5 Research gap and recommendations for future studies

It is noteworthy that the existing literature on this topic is relatively nascent, commencing in 2018. Proposed areas for future research from 2018 to 2024 illustrate the evolution of themes within circular economy (CE) studies. Earlier investigations primarily focused on foundational inquiries, such as assessing the significance of relationships between constructs and evaluating frameworks in specific contexts (e.g., SMEs or particular low-income countries). Gradually, the emphasis has shifted towards more diverse and sophisticated domains, including the integration of digital transformation in circular economy practices, exploring applications of Industry 4.0, and investigating the nuances of specific industries (such as food supply chains, plastics packaging, and start-ups). This narrative highlights how research topics are becoming increasingly complex, transitioning from the development of fundamental knowledge to addressing real-world applications and industry-specific challenges in various international contexts. Future studies focusing on the integration of digitization have been identified as critical, especially in understanding how these developments may alter CE practices within local and global value chains [96]. It is essential to comprehend the competing needs and interests of different stakeholders to successfully implement digital strategies within the CE framework, as these could significantly impact circular initiatives. In this vein, Sharma et al. [89] suggest that future research utilize longitudinal data to investigate the potentials of Industry 4.0 across other industries and fields. Specifically, Despoudi et al. [90] recommend examining the intersection of Industry 4.0 and CE at the food supply chain level, particularly within SMEs, to assess whether the resources and competencies identified are sustainable across various sectors and nations. Furthermore, future research might explore the role of Industry 4.0 and CE principles in unlocking the full potential of the sharing economy, especially within the manufacturing sector [80]. Conversely, Thongplew et al. [92] advocate for investigating the influence of traditional technologies on enabling firms to implement CE strategies, particularly in developing countries with limited access to advanced technologies.

Additional research in other sectors is necessary to establish a more robust theoretical framework and validate the proposed models [14, 88]. Research could focus on less-explored sectors, such as healthcare, food supply chains, or urban mining, utilizing case studies and longitudinal studies. Gue et al. [16] suggest future inquiry should assess the intensities of each sector for reliable and accurate modeling, potentially incorporating factors like capital costs and carbon footprints. They also recommend replicating models in other developing countries with similar CE objectives and updating them with recently available data. Enhancing the explanatory power of existing models can be achieved by

Table 5 Drivers that promote business models towards a circular economy in developing countries

Enablers and opportunities	Description	Authors
Market and consumer demand	New sensitivity of consumers to environmental and social sustainability transition; adapting core business to sustainability trends; exploring services and compliance with standards	[80, 108]
Product design	Durable product design, circular product, and service design	[14, 106]
Waste management	Development of a national recycling strategy and waste management	[14, 83]
Financial	Cost reduction, financial support	[14, 83]
Awareness and education	Building awareness with stakeholders, impact on behavioral change, organizational learning, partnerships with research centers, and universities; providing the necessary information on known product issues, such as environmental and health risks, and access to relevant information for sustainable resource management	[13, 43, 98]
New technologies and innovation	Sustainable technology innovation centers; Introducing new technologies; sustainable technology innovation centers; technology and innovation partnerships, and technology transfer, industrial digitalization	[13, 80, 89, 90, 97, 98, 104]
Strategic visions and cooperation	Aligning business strategies with stakeholders' interests and cooperation from key stakeholders; Influence of organizational culture on CE practices, the importance of stakeholder support, and industry alliances	[92, 109]
Marketing	Focus on circular value marketing and incentives in the secondary market	[100]
Transparency and trust	Tackling users' skepticism and lack of trust through transparency, added-value business models, and the use of guarantees	[15]
improved energy efficiency	energy and waste recovery	[90]

replicating studies across different countries and large enterprises [13, 83, 94]. Despite a considerable amount of practice in emerging economies regarding the repair and reuse of materials to extend product lifecycles, future research could investigate consumer acceptance of circularity and the existence of a potential gap in circularity-related business models [103]. Given the significant role of small and medium-sized enterprises (SMEs) in ecological conservation, future studies should examine how SMEs manage waste to mitigate production impacts and adopt new technologies to address these challenges [88]. Demko-Rihter et al. [107] have noted the absence of a generic model applicable for evaluating organizational maturity and readiness for transition in both developed and developing countries. A comparison of data from emerging and developing countries could provide a more comprehensive perspective on CE trends [80].

Furthermore, it is recommended that additional studies be conducted within the plastic packaging manufacturing sector, considering the importance of promoting CE in the packaging industry. Future research could explore additional moderating and mediating mechanisms, such as green teams, green innovation, top management support, and organizational ecological culture, which may influence the relationships between green human resource management, the circular economy, and sustainable business performance [88].

Subsequent investigations utilizing systematic sampling techniques across different national and cultural contexts, accompanied by longitudinal studies offering greater depth, could yield additional theoretical insights [104]. Levänen et al. [31] emphasize the importance of investigating the long-term effects of sustainability tensions on business operations. Toker and Görener [21] argue that replicating research designs across different countries could elucidate the parameters that determine the viability of selected business models. Other researchers advocate for more empirical studies aimed at better understanding the barriers and opportunities for implementing the circular economy in developing countries [15, 79, 80], particularly during the start-up phase [101], employing methodologies such as rough DEMATEL or interpretive structural modeling to clarify the interrelationships among these challenges [101]. In developing countries, it is also imperative to explore supply network characteristics for functional and innovative products, especially within the context of CE and Product-Service Systems [100]. Additionally, investigating counterintuitive smart e-waste systems, including cost–benefit analyses to quantify their benefits for stakeholders and the environment, would add significant value [99]. A summarized and categorized overview of pathways for future research is presented in Table 6

5 Discussion

The Industrial Revolution and the subsequent adoption of the linear economy over the past 150 years have disrupted the social and cultural alignment that developing nations once had towards environmental stewardship and respect for nature [37]. In most developing countries, more than 90% of waste generated is disposed of untreated, either in open dumps or landfills [110]. While both developing and developed economies face challenges in implementing circular economy (CE) practices, emerging economies are uniquely burdened by contextual factors that can complicate the transition further [15].

Researchers have identified a lack of government support and infrastructure as significant barriers to the adoption of circular business models, even in developed countries [111–115]. These nations typically possess robust environmental policies and established waste management systems [107]. In contrast, governments in developing countries often lack the capability and effectiveness to promote the shift towards circular business models, as they struggle to provide basic facilities essential for supporting any sustainable business operations, such as reliable roads and rail networks [14]. The theoretical integration of circular business principles with innovation to create value is constrained by the bureaucratic and structural deficiencies present in emerging markets [82]. Additional obstacles identified through literature analysis include supply chain inconsistencies and cultural barriers, where the business environment in developing countries is often populated by informal actors, further limiting the flow of information and knowledge [14]. However, Ahmed et al. [116] demonstrate that these challenges could be transformed into significant opportunities for establishing circular business models in these regions.

Aligned with the findings of this study, several authors have recognized consumer awareness and perception barriers as critical challenges in many developed countries [68, 114, 117, 118]. In the context of developing nations, it's crucial to emphasize the direct impact that perceived uncertainty has on consumers' intentions to adopt new products [119]. Moreover, a substantial segment of the consumer base in developing economies, particularly those with lower middle incomes, may find sustainable products financially inaccessible, leading to the purchase of less sustainable alternatives [15]. This issue is exacerbated in developing countries due to the difficulties in establishing a direct connection between education and economic prosperity [37]. Additionally, while this barrier exists in developed countries, the lack

Table 6 Promising topics for future research

	References
<i>Comparative studies</i>	
<ul style="list-style-type: none"> • The proposed methodologies should be reproduced in many developing nations and major companies for comparative study • Increasing the number of responding specialists from different nations can help to establish a decision-making framework • Creating a general approach to evaluate firms' circularity readiness and maturity in both developed and developing nations • In a single research, compare sample enterprises from developing and developed economies • Investigate the sustainability of circular models in economies with comparable socioeconomic situations, such as China, Bangladesh, and African countries 	[80, 83, 103, 107]
<i>Research design and model testing</i>	
<ul style="list-style-type: none"> • Repeat the research design in other developing and developed nations • Include parameters that affect the chosen business model's capacity as well as the time required to move to the next business model • A clear definition of indicators will assist in determining appropriate measurements for the research context • More research on the long-term effects of sustainability tensions on company activity is needed • Longitudinal research in more depth can help generate insights into the transition problem 	[21, 31, 79]
<i>Expansion in other contexts</i>	
<ul style="list-style-type: none"> • Test the research approach in rising markets, new businesses, and various sectors such as pet food, animal care, and veterinary services • Examine the intensities of each sector, as well as additional consequences such as carbon footprint and capital cost, using models such as the Environmentally Extended Input–Output • Create criteria for evaluating the circularity tool dimensions in construction and cross-industry research • Determine if the highlighted resources and competencies exist in other industries and countries by collecting broader data • Investigate large corporations utilizing circular concepts and undertake comparative analyses in different countries • Explore industrial symbiosis in different social or geographical contexts using techniques like DEMATEL and interpretive structural modeling • Evaluate the research model by focusing on other industries and expanding the sample to additional nations • Investigate research potential in mature and established economies • Validate models in developing nations and different industries, such as perishable products • Use longitudinal data to investigate various industries and areas and generalize the conclusions • Investigate future research opportunities for comparable frameworks in developing-country environments • Investigations should focus on varied national and cultural situations to give more theoretical data • The suggested framework may be extended to plastic packaging manufacturers to encourage CE adoption 	[13, 16, 80, 82, 89, 90, 97, 101, 104, 107]
<i>More empirical validation</i>	
<ul style="list-style-type: none"> • Empirical validation of qualitative aspects developed throughout the investigation • Include many startup case studies and use additional tools from the literature on business models for sustainability • Focus on empirical research into emerging countries' sustainability performance • Additional resources and studies are required for testing and cost–benefit evaluations • Examine further circular instances to have a fair perspective on the barriers and enablers of CE adoption • Develop quantitative research to test connections using multivariate analytic techniques • Gather primary data through in-depth conversations with industry experts • Investigate how businesses may effectively implement BS 8001:2017 standards • Consider surveying with a multi-informant strategy to improve empirical analysis 	[15, 43, 79, 91, 109]
<i>The role of technologies</i>	
<ul style="list-style-type: none"> • Investigate the role of conventional technologies in increasing the ability of enterprises to implement CE strategies • Conduct smart e-waste reverse system studies to measure the benefits to stakeholders and the environment • Create scales to quantify the 'transition to the shared economy' and comprehend the significance of circular economy concepts and Industry 4.0 • Examine Industry 4.0 and CE across the whole food supply chain • Research into how digitization is being integrated into circular economy practices, as well as how digital transformation might redefine these practices globally • Understanding diverse stakeholders' competing needs and interests while adopting digital strategies in the circular economy 	[80, 90, 92, 99]
<i>Other suggestions</i>	

Table 6 (continued)

	References
<ul style="list-style-type: none"> • Discuss the characteristics of the supply network for functional and innovative products, as well as the influence on circular value creation and delivery • Conduct extensive case studies on ecosystems, concentrating on collaboration and the strategic goals of the participating parties • Investigate moderator mechanisms and mediators such as green teams, green innovation, top management support, and organizational ecological culture • Focus on how SMEs manage waste to mitigate the consequences of production and technology adoption • Investigate customer acceptability of circularity as well as the institutional gap in circularity-related businesses 	[88, 100, 103]

of coordination among stakeholders in the innovation ecosystem is markedly worse in developing nations [79]. Poor communication among governmental and private entities contributes to this issue. Enhancing stakeholder engagement can be achieved by educating consumers about the benefits of circular practices and involving local communities in resource recovery initiatives.

Financial barriers, such as difficulties in accessing appropriate financing and investment capacity, are also prevalent in developed economies [111–114, 120, 121]. However, compared to industrialized nations, developing countries face heightened susceptibility to additional costs incurred from environmentally sustainable initiatives. The inconsistencies and deficiencies in the financial ecosystem within developing nations exert pressure on the processes of adopting circular business models [83]. While the organizational and operational barriers to CE adoption in developing countries are quite similar to those in developed countries, they tend to be more pronounced. Although companies in developed nations often possess a stronger awareness of sustainability and corporate responsibility—integrating environmental values into their strategies—phenomena like greenwashing also occur in these contexts [74, 122], with company leadership frequently prioritizing short-term profits.

Leadership commitment to sustainability in developing countries is often constrained by competing priorities, and a lack of knowledge and understanding of circular economy concepts further exacerbates the lack of strategic direction. Consequently, organizations are generally more reluctant to adopt proactive, environmentally friendly practices [18].

Based on the findings of this study, we propose several research suggestions aimed at understanding the implications of circular business models and advancing the theoretical framework. A notable observation in the research on the circular economy and business models in developing countries is the difficulty in generalizing findings due to a lack of coherence across studies. Different contexts make it challenging to assert that a successful practice in one nation can be applied untested in another. Nonetheless, similar to global research efforts in the circular economy, the growth of studies in developing countries contributes to an empirical foundation supporting the conceptual framework and presents a compelling area for future inquiry. Based on the identified barriers and drivers associated with circular business models in developing nations, we propose the following research proposals:

RP1: Strengthening collaboration among key ecosystem agents—such as businesses, suppliers, and regulatory agencies—enhances knowledge sharing, access to contemporary technology, and logistical efficiency in developing countries, resulting in more effective circular supply chain implementation.

RP2: The capacity of businesses to adopt circular economy principles in developing countries is significantly hampered by ambiguous legislation and lax enforcement of environmental laws.

RP3: Consumer skepticism towards green products and a preference for ownership over circular business models (e.g., renting or shared use) hinder the transition to a circular economy.

RP4: Enhancing collaboration among businesses, government institutions, and research organizations fosters innovation and improves the implementation of circular economy practices by advancing resource recovery and industrial symbiosis.

RP5: The effectiveness of circular economy practices is significantly enhanced by integrating digital transformation and Industry 4.0 technologies, particularly in supply chain management and resource recovery within developing countries.

6 Theoretical implications

Through this systematic literature review, from a theoretical point of view, we improve the understanding of the circular business models operating in a developing country, the research gap, and the direction of future studies. First, this study addresses an unexplored connection in developing countries, such as that of business models and the circular economy. This may be an invitation for further research on the specifics that these countries have in this transition of business models from a linear to a circular model. Second, we bring a broad picture of the enabling and hindering factors that constitute an important basis for comparison with developed countries, as dictated above. Several systematic literature review studies have been conducted to examine the circular economy in developing countries [8, 122, 123]. The findings of this study are consistent with those of some previous studies, particularly because they highlight the obstacles and drivers behind the circular economy in developing countries. For instance, Schroeder et al. [8] demonstrate that while circular economy principles are associated with multiple SDG targets, their implementation is hindered in developing nations by a lack of laws that support them. The strengths, weaknesses, possibilities, and risks of waste management systems are also listed by Wikurendra et al. [124], who stress the importance of financial investment and political will for success. However, this manuscript offers a cross-sectional analysis of circular business models, unlike earlier studies that focused on specific sectors such as construction, management approaches, etc. Additionally, this study distinctly identifies CE implementation options that are frequently missed in the evaluated articles, like innovation, stakeholder collaboration, and company-level capacity building. Schroeder et al. [8], for instance, talk about how CE practices can improve resource efficiency, although they mostly concentrate on high-level policy implications rather than firm-level tactics. Another contribution of this study is also the application of stakeholder theory to understand how the interaction between different actors, such as businesses, consumers, governments, and civil society, can promote the effective implementation of circular economy practices, as well as in the context of developing countries.

By connecting theoretical frameworks with useful and applicable knowledge for enterprises in developing countries, this study addresses a significant gap in the literature.

7 Practical implications

In this section, some policy recommendations and implications for promoting the Circular Economy in the context of developing countries are provided. Our findings aim to provide recommendations to practitioners who want to reorganize or develop their organizations as circular business models.

Legislation and policymakers: The circular products and services must be complemented by circularity awareness development programs that favorably impact behavior change in the community [43]. The drafting of effective legislation and the engagement of stakeholders are essential for reformulating public policies, which include increasing producer responsibility, implementing waste management regulations, and shifting factory policies towards green economy reforms. Likewise, environmental taxes to support companies that adopt circular practices and the debureaucratization of tendering procedures would encourage business even more. The categorization of various barriers between MSMEs and large firms also emphasizes the necessity for policymakers to adopt distinct approaches, such as infrastructure investments and regulatory harmonization for large firms and targeted financial incentives and capacity-building programs for MSMEs. Policymakers can encourage a more inclusive adoption of CE practices by attending to these particular needs. In addition, since financial barriers are a major problem for circular business models in developing countries, banks, in synergy with the public sector, need to promote the financing of green initiatives. Furthermore, the introduction of innovative alternative funding mechanisms in developing nations, such as green bonds, could contribute to solving financing issues [96].

Practitioners and business: The business needs a clear long-term environmental strategy that also matches customer expectations, the creation of partnerships and the involvement of stakeholders, the integration of advanced technologies, continuous staff training, and good supply chain management. The findings of this study help companies address the entire product life cycle and get the right incentives to encourage consumer participation [15]. Some of developing countries' main successful business strategies include circular supply chains, resource recovery, and Industry 4.0. The authors also mention the sharing economy, industrial symbiosis, and vermicomposting in the food industry.

Managers can promote business opportunities by focusing on opportunities created by resource recovery that allow materials to be recycled back into the production chain, reducing negative externalities by preventing generational

waste [82]. Developing countries also benefit from Industry 4.0 technologies that improve waste management, energy efficiency, and business process automation. Despite constraints like limited investment capacity and experience, these technologies can facilitate CE progress. Only when management is environmentally conscious does it tend to adopt the circular economy, taking risks as eco-entrepreneurs, as they understand the long-term implications and benefits of this initiative [96]. Leadership commitment and training are critical for influencing CE adoption in MSMEs, particularly in developing economies, highlighting the significance of proactive leadership [41]. To gain a competitive edge in responding to government or market demands, small and medium-sized enterprises (SMEs) must incorporate green practices into their strategic agenda. By providing green training and development regularly, managers can encourage their employees to participate in green activities [88]. Managers need to be aware that the difficulties in setting prices for circular solutions may lead to conflicts that impede daily operations, long-term planning, and the accomplishment of social objectives of circulation [31]. To benefit from CE practices, such as developing components that can be recycled and reused to create new goods, businesses might employ more raw materials and expedite asset preservation. This could help businesses adopt socially responsible manufacturing [101]. Given the literature's indicated drivers, specific emphasis should be placed on building links with local and international organizations, as well as offering continual education and training in business model design and updating [105]. This involves evaluating ways used by countries at the vanguard of modern business model development, as well as automating accounting operations to offer timely and accurate data.

8 Conclusions

This paper provides a systematic review of the literature on business models and the circular economy in developing countries to provide a framework for the current state, the challenges that these businesses face, and the drivers that push them in their transition towards circularity. Following a tight protocol, the literature selection process used Scopus and Web of Science databases to identify 33 relevant publications on business models and the circular economy in developing countries. By focusing on developing countries, an area that has not been addressed in systematic reviews before, this study significantly adds to the body of knowledge on the circular economy. The integration of three theoretical approaches, stakeholder, internal resources, and institutional theory, is a unique innovation that makes it possible to fully comprehend the potential and challenges of implementing circular practices in environments with limited resources and fragile institutional frameworks. It also increases theoretical understanding by proposing a comprehensive framework that incorporates multiple views and sector-specific insights, laying the groundwork for comparative studies across areas.

This systematic literature review has an important practical and theoretical contribution. By highlighting the circular business models that have functioned in developing countries, their specificities, and the context in which they are created and operate, this study constitutes an important value that can serve scientific researchers. In addition, a critical summary of the barriers and drivers comparing them between developed and developing countries, according to industries and company sizes, constitutes a practical value for all stakeholders who aim to have as many incentives for circular business models as possible. The findings show that the will and vision of businesses serve as an important catalyst to move towards a circular economy even when all other contextual factors are unfavorable. But on the other hand, they also show how all these elements of the external environment, especially those of policymakers, enable businesses to overcome the numerous barriers identified and undertake green initiatives. Of course, this requires the cooperation of all parties and must be accompanied by awareness, education, training, financial and technical assistance, redesign, etc.

Following stakeholder theory, the important influence that different interest groups have in promoting or hindering the adoption of circular practices is noted. Cooperation throughout the value chain, from the producer to the final customer, plays an important role in enabling reverse logistics. This also raises the need for cooperation between government and business organizations to raise awareness and encourage the construction of appropriate infrastructure to enable the return cycle of materials to the producer. To further facilitate the circular initiative in developing countries, an important role is played by the digitalization of accounting processes, the implementation of infrastructure and technology to facilitate cross-industry interactions, the allocation of appropriate budgets, and the use of advanced technologies, as well as increasing staff involvement in digital transformations.

Our research offers valuable insights for academics, businesses, and policymakers. Businesses will be able to generate sustainable changes in all sectors only if they are supported by regulators, investors, and consumers in this journey towards closing resource circles, WBCSD [125]. This study provides insights for existing and emerging firms to review their business models, strategies, and policies, to find ways to renew waste-based business models so they contribute to economic, environmental, and developmental benefits [43]. For governments, creating favorable conditions for

businesses and other initiatives to implement the circular economy is essential, and the results of this study can lead to the development of infrastructure and the design of policies that support the spread of these practices [15]. It is the responsibility of governments to create business-friendly environments for companies.

One crucial point to make in light of the study's findings is that, essentially, the evaluated research does not sufficiently differentiate between the contextual realities of developed and developing countries when examining the adoption of the circular economy (CE). In the discussion session, we tried to draw out some important contextual elements. By relying on frameworks and barriers derived mostly from developed country contexts, these studies risk disregarding the distinct socioeconomic, institutional, and cultural elements that define CE implementation in developing economies. This study raises a key question: Should developing countries copy affluent countries' CE policies or construct pathways tailored to their challenges? While developed countries prioritize reducing consumption and adhering to global boundaries, developing countries must reconcile environmental sustainability with pressing socioeconomic requirements such as poverty alleviation and industrialization. Future studies should look beyond one-sided solutions and consider context-specific CE models that take into consideration structural and economic disparities between different countries.

9 Limitations and future studies

A limitation of this study is that the research reviewed differs significantly in terms of methodology, context, and topic, making it difficult to make consistent and generalizable findings. This variability may make it difficult to adequately combine data from several investigations. For this reason, the depth of analysis across different sectors can be an important focus for further research. It may happen that some industries with potentially higher adoption of circular economies in these countries, such as technology and manufacturing, may be underrepresented. Furthermore, while the study focuses broadly on developing countries, it does not address regional variations or country-specific challenges affecting CE implementation, such as policy frameworks or cultural barriers. This study is based on secondary data and literature reviews, which limits direct empirical validation of the proposed frameworks. This limits the capacity to assess actual applications in real-world commercial settings in developing countries. Similarly, informal economic activities, which have been highlighted as both inhibitors but also boosters of the circular economy, have not received much attention. As Morsetto [126] suggests, future research should focus on ways to better identify, refine, or supplement a CE's guiding principles so that they are well-stated, consistent, and accomplished. Future research might also include qualitative techniques like focus groups and interviews with community people, business leaders, and legislators to gain a detailed understanding of the factors that encourage and hinder the adoption of the circular economy. Furthermore, the study exclusively considered business models in developing countries; as a result, there is a shortage of research on these topics in China, even though China has one of the most widespread implementations of the circular economy. Future research may also focus on building study models unique to developing countries, knowing that simply following the tools used in developing countries will not ensure these countries the desired success. Together, researchers, policymakers, and businesses can create their path to a sustainable future even in a developing country, overcoming obstacles or turning them into growth opportunities that are both inclusive and resilient.

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Declarations

Ethics approval and consent to participate Not applicable.

Consent for publication Not applicable.

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