Circular Economy and Indian SMEs: Systematic Review of Practices, Progress, and Financial–Environmental Outcomes

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Abstract

The need to transition from linear to circular business models is becoming a necessity and a strategic value for India's small and medium enterprises (SMEs) because of limited resources, environmental conditions, and regulation. (Ellen MacArthur Foundation, 2016; Rizos et al., 2016; Rosa & Paula, 2023; Nemilentseva, Tariq, Tariq, Aghajani, & Torkkeli, 2024). This study presents a review of the present scenario of circular economy (CE) practices in manufacturing SMEs in India and the reported financial and environmental benefits of CE in the emerging economies (Fernando, 2024). Combinations of the words circular economy, SME(s)/MSME(s), financial performance and environmental performance were applied for the structured searches in the main academic databases (Wiley Online, Web of Science, Scopus, ScienceDirect, and SpringerLink) and selected policy portals from 2015 to 2025 were screened. Studies were chosen and coded into a final set of studies for evidence synthesis on CE practices, drivers and barriers, performance outcomes and policy frameworks based on pre-defined inclusion and exclusion criteria.

Indian SMEs are still in the initial phase of adopting CE and are progressing rapidly with most entities implementing basic initiatives like cutting waste and material recovery, along with relatively few in the country have applied more advanced practices like remanufacturing, product-service systems or fully circular supply networks (Mathivathanan et al., 2022; Rosa et al., 2023; (Trivedi et al., 2025)). The scholarly work, CE adoption is associated with cost savings, efficiency, and environmental performance; evidence has been found to be variable and the way rigour is measured has also been quite different. The review also highlights enablers and the ongoing financial, technological, and institutional hurdles and provides a set of suggestions for the empirical studies and policy design in Indian SME context in the future.

Keywords: circular economy, small and medium enterprises (SMEs), financial performance, environmental impact, sustainability

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How to cite this article: Maurya S., Viswakarma R., (2026). Circular Economy and Indian SMEs: Systematic Review of Practices, Progress, and Financial–Environmental Outcomes, Commerce Research Review 3(2) 18-34.
DOI:https://doi.org/10.21844/crr.v3i02.1148
Source of support: Nil
Conflict of Interest: None
Received: 02-04-2026 **Accepted:** 02-06-2026 **Published:** 20-06-2026

Introduction

The global economy is at a critical juncture where the prevailing traditional "linear production cycle" production paradigm is already environmentally and economically unsustainable in the face of increasing scarcity of resource, pollution, and climate change pressures (Geissdoerfer et al., 2017). In the framework of circular economy (CE) is now considered an alternative paradigm that emphasises optimised resource use, material recovery, product renewal, and waste reduction throughout product and resource life stages

(Kirchherr et al., 2017; Ahmadov, T. 2025) The transition to circularity in emerging economies like India, where natural resources and ecological systems are under unprecedented strain due to the country's rapid industrialisation, population growth and urbanisation, is not only a matter of environmental urgency, but also a vehicle for achieving sustainable development (Ellen MacArthur Foundation, 2016).

This bigger transformation is vital for India's economy with MSMEs playing a key role. On the basis of the recent estimates it is to be noted that the MSMEs are tens of millions in number and contribute a large share of jobs in the country and are also an important contributor to the country GDP, which signifies their role and importance in inclusive growth of the country and in the development of the region (Confederation of Indian Industry, 2024). Meanwhile, these companies have limited financial resources and technological ability and most lack structured environmental management systems, which means that they have a higher environmental exposure and are vulnerable to market and regulatory changes (Singh & Patel, 2025; Sharma et al., 2020; Rizos et al., 2016). Because of this fragility, MSMEs have become a crucial focus for circular economy initiatives as they are playing an important part in shaping the economic and economic and environmental challenges in India.

Policy makers are paying more attention, and international research on CE is expanding, Indian SMEs have significant challenges to overcome to shift from being traditional to circular. Empirical research has shown that CE continues to face financial constraints and outdated technologies, limited information on CE, and fragmented policy support that is rarely communicated effectively (Rizos et al., 2016; Madaan et al., 2024; ABNewswire, 2016). Others have implemented more basic steps in basic waste reduction and material recovery, advanced practices — such as remanufacturing, service-based product models, or circular supply chains — remain rare and poorly connected through industries and geographies (Mathivathanan et al., 2022; Sohal et al., 2022; Štreimikienė, 2025; Berniak-Woźny & Lewandowska, 2025). Researchers often describe SMEs as falling into three groups — leaders, followers, and laggards and different degrees of environmental responsibility and willingness to make circular transitions (Chowdhury et al., 2022).

At the same time, the capability advantages that can be obtained through the utilisation of CE by Indian SMEs are becoming increasingly recognised. The studies and scenario analyses show that a circular approach can contribute to lower costs (due to improved material and energy efficiency); to increased resilience to fluctuations in material and energy prices; and to new opportunities for creating value through innovative offerings and operational frameworks (Ellen MacArthur Foundation, 2016; Goyal et al., 2018). Further, compliance with new regulatory measures (like EPR and sustainability reporting) can help to improve the competitive standing and reputation of companies in both local and international value chains (Ministry of MSME, 2023). Yet the actual impact of these expected economic and environmental benefits is not well documented nor systematically understood from the empirical literature, especially for resource constrained SMEs (Dey et al., 2020; Rosa et al., 2023). There is a need for a structured synthesis of how the CE is being operationalized in the Indian SMEs, the most common CE practices and the monetary and environmental results reported up to now (Hoffmann, 2024).

Current research is scattered, conducted at different sectoral, regional and methodological levels and tends to be more on the identification of drivers and barriers than on the strict quantification of the implications for performance (Dey et al. 2020; European Proceedings 2023) (Wibisono, Juliarto, Tesselhof, & Gruben, 2025).

In addition, the methods of measuring and the criteria used to assess the circularity and its effects vary between studies and across countries and are not necessarily adapted to the specific challenges and data realities of SMEs, making comparisons across studies difficult (Rincón-Moreno et al., 2021). The design of evidence-based policies, managerial decision making and the overall implementation of national policies and programmes, including the National Circular Economy Framework (CII, 2024) and the European Commission's Circular Economy Framework (European Commission, 2020), will need to be addressed to fill these gaps.

In this regard this paper gives a a structured analysis of prior studies on the practice of CE in SMEs and in emerging economy in general and in India in particular. The purpose of the review is to map the variety of CE approaches taken by SMEs, to analyse and summarise the financial and environmental effects reported and to sketch the interaction between internal competences and external pressures, policy instruments and the decision-making process of CE in SMEs. This study aims to would be to collate and critically analyse the existing evidence-based facts and materials available with regards to CE in Indian SMEs and to indicate the areas which need more empirical research and policy interventions in the future.

Circular Economy Imperative

According to the recent reports, it is even possible to state that the full implementation of the practices of the circular economy will bring an annual ₹40 lakh crore (about USD 624 billion) to India by 2050 and at the same time decrease the quantity of greenhouse gas emissions by 44 percent (Ellen MacArthur Foundation, 2016). These forecasts emphasize the economic and sustainability-related opportunities of the CE adoption, and the concept of circularity extends beyond environmental project, but rather a strategic business goal that can result in increased competitiveness and lower costs and generate new revenues (Dalmia Cement, 2024; NEPRA, 2025).

Circular economy practices are particularly significant for Indian SMEs. First, by reducing material inputs and improving resource efficiency, CE initiatives can lower operating costs through leaner production processes and reduced waste generation, as suggested by scenario analyses for Indian industry (McKinsey and Company, 2021). Second, circular strategies can enhance supply-chain resilience by reducing dependence dependence on primary materials and exposure to cost fluctuations (Tonelli and Cristoni, 2019). Third, innovative circular strategies, like product-service systems and secondary-material markets, create opportunities for new revenue streams and differentiation in markets where customers increasingly value sustainability attributes (Goyal et al., 2018). Finally, early adoption of CE practices positions SMEs favourably for complying with emerging regulatory requirements, including extended producer responsibility and sustainability reporting obligations (Ministry of MSME, 2023).

Status of the adoption of circular economy in Indian SMEs.

Current empirical and theoretical studies indicate that Indian SMEs are in the initial yet evolving stage of CE transition, with practices varying by industry and geography. Even though familiarity with CE ideas has grown, many SMEs do not make clear differentiations between CE strategies and business models and identify circularity as part of their general environmental management (Kumar et al., 2020; European Proceedings, 2023). A general overview of literature published from 2019 to 2023 reveals that the majority

of the Indian SMEs have adopted relatively simpler straightforward energy-saving steps, while advanced approaches such as remanufacturing, service-based product models, industrial collaboration, and closed-cycle supply chains remain rare (Mathivathanan et al., 2022; Sohal et al., 2022).

Empirical studies in selected states confirm this disjointed and selective picture of adoption. However, case and survey evidence from Tamil Nadu has shown that there is limited adoption of the core concepts of CE via a systematic approach among SMEs, and larger number of SMEs that practice some aspects of CE, but they are not linked to a systematic circular approach (Mathivathanan et al., 2022). Taking this into consideration, some researchers classified SMEs reflecting their ecological responsibility, orientation, and capacity for implementing CE as “leaders”, “followers” and “laggards”. (Chowdhury et al., 2022) Overall, the results indicate that the CE is being adopted as a 'low-intensity and low-order' practice across Indian SMEs and the higher-order CE practices are being adopted by a few firms that are better resourced in terms of their internal resources and external networks. Overall, the financial and environmental impact of CE in the SME sector might still be rather modest and research and policy attention is required to grasp the conditions to transition from incremental waste to more transformative circular models in the SME sector.

Removing obstacles to circular economy.

There are plenty of books available in the literature which discuss the problem of the adoption of CE across institutional, sectoral, and organisational tiers within Indian SMEs. Access to low cost credit to finance their businesses, investment in clean technology and product/process redesign and the perceived expected payback of the investments are often cited by SMEs as a significant constraint (Rsijwani et al., 2024). These are also closely related to the technological barriers including obsolete machines, lack of a digital system for handling materials, lack of infrastructure for reverse logistics and material recovery which are discussed by Rsijwanni et al. (2024).

In addition to the financial and technological issues, a few research projects have been conducted, revealing a lack of knowledge and skills among SME owners and managers.. The survey results show that many decision makers don't know much about the basic concepts of CE, for instance, waste-minimisation practices (reduce, reuse, recycle), eco-design, and reverse logistics and have few practical guidelines on how to implement these concepts in feasible interventions at the firm level (Raman et al., 2024). Firms' reluctance and risk-aversion make firms hesitant to abandon their traditional production routines, especially in the traditional manufacturing subsectors (Raman et al., 2024). Likewise, at the institutional level, weak policy execution, uneven enforcement, and complicated government schemes are some of the factors which cause uncertainty on long-term sustainability of CE related incentives (Sharma et al., 2020; Madaan et al., 2024; Kahuria & Waweru, 2015).

Taken together, CE challenges in Indian SMEs form a chain — financial, technological, knowledge, and institutional — rather than one isolated issue. Case studies provide descriptive, qualitative insights, but the evidence remains scattered. Quantitative comparisons of barriers across regions and sectors are still missing. This highlights the need for systematic, comparative analysis to design interventions that address the most pressing constraints in each SME context.

Enablers and drivers of circular economy.

"Alongside barriers, researchers point to several internal and external factors that support CE adoption in SMEs. Indian studies on the drivers for the adoption of renewable energy technologies show that demographic shifts, rapid urbanisation, growing demand for sustainable solutions, easier access to project finance, and rising resource consumption are key drivers (Mathivathanan et al., 2022). At the firm level, leadership commitment, an innovative culture, skilled employees, and a clear sustainability vision are linked to stronger CE practices and improved performance (Chowdhury et al., 2022; Fernando, 2024).

Access to green technologies, digital tools for tracking materials, and access to networks of industrial symbiosis, converting by-products into inputs for partner firms, significantly enhance circular practices (European Proceedings, 2023).

Another key set of drivers comes from external pressures. Some studies draw on stakeholder theory, showing how expectations from primary stakeholders (customers, suppliers) and secondary ones (government agencies, NGOs, community groups) shape incentives for SMEs to adopt CE practices (Circular Economy Journal 2024). Regulatory demands, new standards such as EPR, and consumer preferences for sustainable products push firms beyond compliance, encouraging more proactive circular strategies (Singh et al., 2018).

However, pressures vary: export-oriented firms and those in global value chains face stronger demands on environmental and circular performance than purely domestic SMEs.

Based on the evidence available, CE adoption in SMEs is complex, shaped by a mix of internal and external factors. Most studies list drivers but rarely analyse how they interact or when they lead to measurable financial and environmental outcomes. Because integrated multi-level models linking drivers, CE practices, and performance outcomes across SME contexts are missing, future research is clearly needed.

Financial performance measure

The evidence of the financial implications of CE for SMEs is not always consistent and complete, but there are more and more studies that examine this issue. The positive financial effects of CE practices come from lower material and disposal costs, improved efficiency, and stronger brand reputation (European Proceedings, 2023; ASPD, 2023). For instance, Indian MSMEs show cost savings from waste reduction and recycling, with secondary material markets adding revenue. Profitability is also tied to improved brand image (ASPD, 2023).

Financial gains vary depending on CE experience, sector characteristics, and the wider policy environment. Studies on European SMEs suggest short-term financial benefits are limited, but medium- to long-term gains appear when economic conditions and environmental policies are supportive (Rosa et al., 2023). On the top of that, "SME evidence relied on few self-reported indicators, small samples, and single-case designs, limiting generalizability and causal interpretation, especially in the Indian context where a larger-scale quantitative study is limited (Dey et al., 2020).

"Overall, the literature offers weak but promising evidence that CE implementation influences SME

financial performance. While there is agreement on the directionality of the link, less is known about the strength of impact, the time needed for results, and how effects differ by sector, region, or business mode. Future research should use precise empirical designs (panel data, quasi-experiments) to identify the financial impacts of distinct CE practices and address existing research gaps.

Environmental performance metrics.

From the environmental perspective, CE is supposed to help to save resources, emissions and waste - but this is difficult to operationalise and measure in the context of the SME. Research shows that CE initiatives contribute to lowering material demand, optimising energy use, cutting waste, reducing emissions, and conserving water [FAO], 2020; Loizia et al. 2019; Kostic, Djokic, & Stojanovic, 2024; Zhang et al., 2024). Extensive rollout of CE in key sectors of India indicates that the carbon and material footprint can be notably lowered with the execution of CE, though exact estimates relies on the nature of sectors and modelling assumptions (ScienceDirect, 2024).

From a methodological point of view, there are various tools and indicators for the evaluation of environmental performance which are discussed in literature *(Yang, Jiang, & Nguyen, 2013)*. Life cycle assessment (LCA), as per ISO14040 and ISO14044, is a well-established method for assessing ecological footprint across the product's life cycle covering manufacturing, distribution, usage, and disposal treatment (HECS Consulting, 2025;Alzahrani & Zia, 2025).

However, the use of full LCA is not widespread among the SMEs in India because of the limitations of data availability, complexity of methodology, and resource availability (Kaizen, 2024). Alternative CE-specific indicators, such as the Material Circularity Indicator developed by the Ellen MacArthur Foundation, complemented by metrics like Circular economy performance indicator (CPI) and Recyclability benefits rate (RBR) and Product-level Circularity Metric (PCM), provide more targeted measures of circularity by combining information on recycled content, product utility, durability and end-of-life recovery (Ellen MacArthur Foundation, 2015; EFS Consulting, 2024).

However, their empirical applications in SMEs remain exploratory and are still limited. Such tools are mentioned and/or illustrated in a few examples but not systematically applied to large sample measurement of environmental performance of the SME population. The literature is therefore rich on the potential environmental benefits from CE practices, yet the scale of these benefits remains poorly understood, how distributed and comparable they are to other sectors and regions. Therefore, the development and testing of pragmatic and resource sensitive metrics which are implementable by SMEs is critical for future research.

Political climate and institutional support

Over the last few years, the policy and institutional landscape in India have undergone a dramatic transformation, and the perception of the strategic significance of CE for resource security and sustainable development has grown. The National Circular Economy Framework (NCEF) by the Confederation of Indian Industry (CII) offers a national framework for circular transformation to prioritize materials and adhere to the principles of prevention, upcycling, recycling and energy recovery (CII, 2024). To complement that, the Ministry of Micro, Small and Medium Enterprises has announced schemes such as

MSE-SPICE and other green-finance measures (including capital subsidies, interest subvention and credit-guarantee mechanisms) to encourage investments in resource efficient and cleaner production technologies among SMEs (Ministry of MSME, 2023; Press Information Bureau, 2024). The ZED (Zero Defect Zero Effect) certification is another initiative encouraging the production of better goods using a differential reimbursement scheme and graded certification for micro, small and medium enterprises (MSMEs) (Ministry of MSME, 2023).

Several scholarly publications have recently focused on exploring how digital innovation intersects with sustainability and circular economy business models in SMS journals. Jaiswal and Pandey demonstrate the potential of generative AI to enhance sustainability by optimizing waste and energy usage and inform policies on the integration of AI in circular strategies (Jaiswal & Pandey, 2024). Research published in SMS Journal of Entrepreneurship and Innovation underscores the role of Industry 5.0 and green technologies in driving sustainable development and advancing the circular economy approach in emerging economies (Innovation and Sustainable Development in Entrepreneurship, 2023; Transition to a Greener Era with Industry 5.0 and Sustainability, 2025). The literature also suggests that when it comes to the MSMEs, positive environmental practices and better reporting on waste reduction, recycling and related activities can boost competitiveness and can also be the initial steps towards the integration of circular economy in business practices and reporting (Corporate social responsibly practices in MSMEs in India, 2016; Nature and Extent of ESG disclosure in India: A study of some selected companies, 2025).

Table 1: Summary of reviewed studies

Author & Year	Region / Sector	CE / Sustainability Focus	Methodology	Key Findings	Contribution to CE Adoption
Geissdoerfer et al. (2017)	Global / Conceptual	CE paradigm, reuse, recycling	Conceptual framework	CE as paradigm shift	Theoretical foundation for CE
Sharma et al. (2020)	India / Multi sector	Awareness & adoption barriers	Survey + case analysis	Finance & knowledge gaps	Identifies barriers in Indian SMEs
Mathivathanan et al. (2022)	Tamil Nadu / Textiles	Waste reduction, recycling, remanufacturing	Empirical survey	Basic recycling common, advanced CE rare	Sector specific adoption patterns
Sohal et al. (2022)	India / Manufacturing	Closed loop supply chains, product service	Case studies	New revenue streams	Demonstrates advanced CE potential
Chowdhury et al. (2022)	India / Multi sector	Drivers & enablers (leadership, innovation)	TISM modeling	Leadership & innovation key	Shows organizational enablers
Rosa et al. (2023)	Europe / SMEs	CE adoption vs. performance	Quantitative survey	Medium term financial gains	Links CE to firm performance
ASPD (2023)	India / MSMEs	Waste management, recycling	Case study	Cost reduction, brand gains	CE improves competitiveness
Madaan et al. (2024)	India / Textiles	Barriers (finance, tech, policy)	Qualitative interviews	High upfront costs	Policy gaps hinder CE
Circular Economy Journal (2024)	India / Multi sector	Stakeholder pressures	Literature synthesis	Market differentiation	External pressures drive CE
ScienceDirect (2024)	India / Multi sector	CE impact measurement (LCA, footprints)	Quantitative modeling	5.3% material footprint reduction	Empirical evidence of CE impact
Jaiswal & Pandey (2024)	India / Multi sector	Generative AI for CE	Conceptual + policy analysis	AI optimizes waste & energy	Digital innovation supports CE
Innovation & Sustainable Development in Entrepreneurship (2023)	Emerging economies	Industry 5.0, green tech	SMS entrepreneurship research	Innovation drives CE adoption	Positions SMEs as CE innovators
Transition to a Greener Era with Industry 5.0 (2025)	Emerging economies	Industry 5.0 & sustainability	Global Strategy Journal	Advanced tech accelerates CE	Strategic roadmap for SMEs
CSR Practices in MSMEs in India (2016)	India / MSMEs	CSR & environmental practices	Empirical study	Waste reduction boosts competitiveness	CSR as entry point to CE
ESG Disclosure in India (2025)	India / SMEs	ESG reporting & CE	Empirical study	Better disclosure improves competitiveness	Transparency drives CE integration

Study selection and screening.

The screened pool comprised publications from 2015 to 2025 located via systematic searches in premier scholarly databases including Web of Science, Scopus, and ScienceDirect, Wiley Online, SpringerLink) and selected policy and institutional portals. The initial records were screened based on evaluation of titles and abstracts, omitting research that failed to substantially cover circular economy practices in SMEs, or that lacked disaggregated SME-level insights, were excluded at this stage. Full-text screening of the remaining items, applying the predefined inclusion and exclusion criteria, resulted in a retained set of approximately twenty-five core articles, books and policy documents that met the SME–CE criteria and formed the evidential base for the review. The studies were then systematically coded and thematically synthesized to find: patterns about (1) CE practices, (2) financial outcomes, (3) environmental outcomes, (4) drivers and barriers, and (5) policy frameworks.

Lack of research and study aims.

While the literature has played an important place in academic inquiry on CE adoption by SMEs around the world and in India specifically, there are several gaps in the literature. First, most studies are dedicated to determining the barriers and drivers of the CE adoption but offer a little empirical background on the real financial and environmental outcomes caused by implementation (Dey et al., 2020). The link between selected CE practices and firm performance indicators (financial, environmental) should be given more severe empirical research methodological frameworks.

Secondly, there is a limited studies addressing how the circular economy is measured in SME context. There are various circularity indicators and assessment schemes, however, the applicability of these indicators and the credibility and validity of the assessment in the context of the Indian SME has not been directly tested. (Rincon-Moreno et al., 2021). Guidance is missing on which metrics suit different SME categories, how to collect data with limited resources, and how to interpret circularity scores.

Thirdly, most CE studies in India are qualitative or conceptual, with few large-scale quantitative analyses to test hypotheses statistically (Rosa et al., 2023). However, mixed-methods designs combining qualitative insights and quantitative analysis are needed to capture CE nuances and measure organizational impacts.

Fourthly, sectoral and regional differences in CE practices and outcomes remain poorly understood. Though a few studies have been done with a specific State (such as Tamil Nadu) or with a specific manufacturing sub-sector (such as textiles), systematic comparative studies across manufacturing sub-sectors and states are entirely lacking (Mathivathanan et al, 2022). This heterogeneity must be understood to design evidence-based interventions and policy recommendations.

Finally, theory building and empirical support for CE adoption and impact in SMEs need to be expanded. While various theories such as resource-based view (RBV), stakeholder theory and institutional theory have been used to the case of CE, no integrated multi-theoretical approaches yet combine micro (organizational), sectoral, and institutional perspectives (Rosa et al., 2023). Such frameworks are useful for grasping the complexity of circular transitions and identifying leverage points for interventions.

Objective of this Study

Objectives of the present research, informed by the identified gaps, are as follows:

- Identification and categorization of the practices followed by SMEs for circular economy in the perspective of emerging economy like India systematically.
- To sum up the reported financial results of CE implementation in SME including cost savings, revenues impact etc. These tool can
- Synthesise reported environmental outcomes of CE in SMEs, focusing on resource use, waste generation, emissions, and impact measures.
- Understand factors that enable or block CE adoption in Indian SMEs, including internal capabilities, external pressures, and policy support.
- Review methodological approaches and measurement frameworks used in CE–SME studies, and suggest areas for future empirical research.

This review consolidates available empirical evidence, highlights gaps in Indian SME CE research, and estimates monetary and environmental costs and benefits of these practices.

Significance and Contributions of the studies.

This review brings together and compares all empirical evidence that is available and also highlights gaps with respect in relation to empirical studies on CE practices among Indian SMEs and estimates monetary and environmental costs/benefits of these practices. The research contributes to academic literature, policy formulation, and managerial practice.

First, It summarises and analyses prior empirical work on CE practices and dual outcomes (financial and environmental) in a developing-economy context. It supports theory development by applying frameworks such as RBV, NRBV, stakeholder theory, and institutional theory to Indian SMEs (Barney, 1991; Hart, 1995) (Barney, 1991; Hart, 1995).

Second, It advances measurement methodology by clarifying limits of circularity metrics and impact assessment schemes, making them more usable for resource-constrained SMEs (Bracquene et al., 2020).

Thirdly, It adopts a multi-level framework, analysing CE uptake and effects at firm, sectoral, and institutional levels (Khitous et al., 2020). This holistic view offers richer insights than single-level analyses and better reflects the complexity of CE implementation.

Policy Implications

The study provides evidence-based input to guide government initiatives promoting CE adoption among MSMEs. It helps prioritise interventions and allocate resources by identifying CE practices with the greatest financial and environmental benefits. (Ministry of MSME, 2023).

It reviews current policy tools such as MSE-SPICE, MSE-GIFT, and ZED certification, identifies implementation gaps, and suggests improvements. The insights are especially opportune since India is determined to become net -zero by 2070, and in this regard, MSMEs are at the centre of this change (Ministry of Environment, 2024).

Moreover, the research work has a function within the operationalization of the National Circular Economy Framework since it offers the sector-specific and practice-specific evidence in relation to circular economy performance. This helps the NCEF to achieve its goal of creating quantifiable targets and monitoring mechanisms of tracking the progress in CE initiatives in materials and sectors (CII, 2024).

Managerial Implications

The research might be meaningful for SME managers and entrepreneurs to inform them on the most desirable circular economy practice to achieve a better return on investment and reduce the impact on the environment. Recording case experience, recognition of success factors, and the measurement of performance results make the study less ambiguous and risky to some perceived risk of circular transitions (Rizos et al., 2016).

The study also develops feasible models and tools that could contribute to the evaluation of the extent of their circularity within SMEs, the circularity gaps, and their previous achievements in terms of gains. the deficiency of knowledge and skills in current scenario can be addressed through these tools to prevent the small businesses from adopting CE (Sharma et al., 2020).
At the end, study assist managers in building linkages amongst drivers of the CE practices and financial performance, emphasizing the intermediate function of the brand's reputation, operational efficiency and innovation, and designing strategies to improve the linkages (ASPD, 2023).

The approach and planning of the research project

The article follows a systematic narrative review (SNR) methodology and interrogates the literature with regard to circular practices within SMEs particularly in India and other emerging economies. Its first aim was to help clarify how CE has been implemented in SMEs; to list the financial and environmental outcomes and effects reported; and to trace the evolution of the literature on the depth, thematic focus and methodological rigour of CE. It is a review article and is not a generating of new data, rather a compilation of empirical and conceptual research advances, contributions and gaps in research still remaining.

It is not a primary empirical study that collects new survey or interview data, estimates the structural models, but rather a systematic narrative review of literature to deliver an evidence synthesis and critical assessment of: The practice of CE in SMEs and the financial and environmental impacts of CE.

The authors have focused the review on articles published in 2015-2025, though, with special emphasis on papers published since 2019, when the interest in CE and SMEs has rapidly increased in the context of emerging economies, and along with the rise in the salience of impact assessment. Systematic search was conducted on databases (including Web of Science, Scopus, ScienceDirect, Wiley and SpringerLink) and additional search was done on institutional and policy portals (i.e., Ellen MacArthur Foundation, CII and

Government of India portals).. The following method was used to combine the key words circular economy, SME(s) / MSME(s), India, financial performance, environmental performance and impact.

One criterion that was applied to include and exclude studies was that they covered the philosophy of the circular economy or the related resource-efficiency/closed-loop practice in a substantive manner, (ii) covered SMEs/MSMEs of focused on disaggregated results, (iii) discussed one of the following dimensions: types of CE practices, financial or environmental impact, drivers/enablers, barriers, or policy frameworks. This was because conceptual and review studies were only retained where they provided pertinent frameworks or syntheses that will contribute towards an understanding of CE in SMEs. Articles, that discussed only superficially the general issue of sustainability or focused only on big companies and not on the disaggregated SME results, were not considered.

Data from the selected articles was summarised in a review table, including author(s) and the year of the publication, country/region of origin, sector, type of company, CE strategies studied (waste reduction, recycling, remanufacturing, eco-design, circular supply chains), the methods adopted, and other reported finance (cost savings, ROI, revenues) and environment (emissions, waste, resource/energy use) outcomes. Other areas of interest that were captured included the drivers, barriers and policy instruments to enable the cross contextual comparison.

The material was then analysed using the thematic coding, which is the latest method in systematic reviews in CE. The first codes were lumped together as higher-level themes, including: (1) the maturity and diversity of CE practices; (2) the nature and scale of financial and environmental effects; (3) the contribution of internal capabilities, external pressures and policy support (3) and the development of the methodology and evidence gaps (4).

Then, the results were synthesised in two complementary layers. First, descriptive synthesis traces the changes in the development of research output, geographic focus, sectoral coverage and methodological discovery showing a shift of mostly conceptual, Europe based literature towards more impactful analysis with location in the emerging economies.

In addition, a thematic and evaluative synthesis is built to combine findings on progress and impact, compare reported amounts of cost savings or impact reductions where practicable, and point to areas where evidence remains partial or mostly qualitative - especially in the case of Indian SMEs. Thus, the twin research design and methodological rigour allow the paper to summarise available scholarship and critically evaluate to what degree the analysis of CE engagement by SMEs has progressed and thus unveil the available knowledge on the financial and environmental performance.

This review has some restrictions.

This review has many constraints to consider prior to interpreting the findings. First, the screened pool was limited to publications from 2015 to 2025—work published prior to this period or future work that have not yet come out may not have been captured. Second, the final evidence base is a small number of around twenty-five key articles, books, and policy documents, many of which rely on case studies, small samples, or self-reported indicators, limiting the generalisability of the results, especially for the diverse Indian SME

sector. possible barriers to achieving publication and database subjectivity, since the review relied on predetermined databases. Even with backward and forward reference checks, some grey literature and unindexed reports may have been missed. Financial and environmental performance were compared descriptively rather than through meta-analysis, due to varied definitions and methods across studies.

Policy documents, consultancy reports, and institutional papers from multilateral bodies, national agencies, industry groups, and research consultancies were also reviewed. In India's SME context, grey literature often reports evidence first, before it appears in academic journals or formal publications. Excluding grey literature risks losing valuable on-the-ground evidence of CE initiatives and emerging best practices. Only documents with clear scope, methods, SME-level evaluation, and substantive CE discussion were retained. Their findings were triangulated with academic studies during coding and synthesis to ensure rigour.

Future research directions

Based on the gaps identified, several opportunities for CE adoption in Indian SMEs and other emerging economies can be outlined. the link between particular CE practices and Sectoral/regional specific dual performance outcomes (Dey et al., 2020; Rosa et al., 2023) should shift from qualitative case evidence to statistical testing of indicators and controls for sector- and region-specific dual outcomes. Second, mixed-methods designs could combine firm-level performance measures with case studies to examine how CE practices create financial and environmental value, and how SMEs experience internal strengths and external pressures (Madaan et al., 2024; Chowdhury et al., 2022). Third, Practical circularity and impact indicators should be designed for SME data and resource limits, and tested across subsectors and regions (Rincón-Moreno et al., 2021;Li & Tang, 2009). Lastly, cross-state comparisons within India and between India and other emerging economies can separate contextual drivers and barriers from general patterns, guiding more targeted policy and support.

Conclusion

Traditional business models remain a strategic option for many Indian SMEs, given resource pressures, environmental concerns, and regulatory demands (Rizos et al., 2016; Ellen MacArthur Foundation, 2016). The findings of this review indicate that practices of circular economy (CE) in SMEs of emerging economies, like India, are at an early but gradually growing level of adoption, with many of the complex CE initiatives like remanufacturing, product-service integration or closed-loop supply chains (Rosa et al., 2023; Mathivathanan et al., 2022), documented in few cases. Although the integration of CE is linked to enhanced operational efficiency, cost savings, and environmental outcomes, the strength of these relationships remains inconsistent across various studies and can differ significantly based on the methodology used, indicators measured, and industry sectors (Dey et al., 2020; European Proceedings, 2023).

Simultaneously, the potential of CE in Indian SMEs is yet to be realised owing to the persistent configuration of financial barriers, technological limitations, knowledge gaps, and institutional gaps in implementation (Madaan et al., 2024; Rizos et al., 2016). Internal capacities (like leadership commitment, innovation culture and employee skills) and external pressures (from stakeholders and enabling policy frameworks) are identified as important drivers that can help a firm move from incremental efficiency improvements to more systemic circular business models (Chowdhury et al., 2022; Circular Economy Journal, 2024; Ahmadov,

2025). Existing circularity and impact measures, however, are often not easily applicable to the realities of resource constrained SMEs and the use of more sophisticated tools, like life cycle assessment and circularity indices, is limited in practice (Ellen MacArthur Foundation, 2015; Rincón-Moreno et al., 2021).

The mapping of CE practices, the financial and environmental impacts reported by the SMEs, and the wider ecosystem of drivers, barriers and policy instruments brings a more complex view of the nature of circular transitions in Indian SMEs, and highlights gaps in the evidence base. The results highlight the importance of the need for methodologically rigorous, large-scale empirical studies so as to quantitatively test the effect of the specific CE practices on the firm's performance, in addition to systematic review designs that will unravel the mechanisms through which the circular strategies bring value to different sectors and regions (Khitous et al., 2020; Rosa et al., 2023). The synthesis suggests streamlining access to programmes like NCEF, MSE-SPICE, and ZED certification, with added support for SME-focused measurement and capacity-building (CII, 2024; Ministry of MSME, 2023; Press Information Bureau, 2024). The review offers a data-driven assessment of practices most likely to deliver economic and environmental gains, reducing perceived risks and aligning with India's sustainability goals, including Viksit Bharat 2047 and national CE commitments. (Ministry of Environment, 2024). It highlights evidence-based practices that promise financial and environmental benefits, help mitigate risk, and align with India's broader sustainability and CE commitments.

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