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A Study on Circular Economy Implementation Barriers among MSMEs in Tamil Nadu

K. Murugan
Research Scholar,
Department of Management studies,
Manonmaniam Sundaranar University,
Tirunelveli, Tamil Nadu, India.

Dr K.N. Marimuthu
Assistant Professor,
Department of Management studies,
Manonmaniam Sundaranar University,
Tirunelveli, Tamil Nadu, India.

Abstract

This paper delves into the financial, technological, awareness, and policy, related factors that restrain MSMEs in Tamil Nadu from making the transition from a linear economy to a circular economy model that is environmentally, socially, and economically sustainable. It fills the research gap by pinpointing location, specific obstacles and offering in, depth knowledge and suggestions for sustainable development. Based on secondary data, the study utilizes materials such as journal articles, books, reports, and conference papers obtained via Google Scholar and analyzed through a systematic review of the literature. The goals are to comprehend the circular economy concept in MSMEs and to recognize the principal barriers to its implementation. The study, uncovering a slew of issues, mentions the main challenges as the shortage of finance, lack of proper technology, unawareness, poor policy support, unstable market, supply chain problems, and deficiency of skills. It puts forward the necessity of a more robust policy framework, easing of finance and technology acquisition, launching of awareness campaigns, and initiation of skill development programs, all aimed at equipping MSMEs with the ability to adopt circular economy measures and thus attain sustainable and inclusive growth

Keywords: Circular Economy, MSMEs, Implementation Barriers, Sustainable Development

I. INTRODUCTION

The circular economy (CE) has become very important lately as it provides a promising way to achieve sustainable economic development through resource efficiency, waste minimization, and environmental protection. A circular economy is different from the traditional linear economy model of take make dispose as it advocates for resource reuse, recycling, and renewal activities in this respect, Micro, Small, and Medium Enterprises (MSMEs) play a crucial role as they make a major contribution to the industrial output, job creation, and economic development of the region. In the case of India, especially Tamil Nadu, MSMEs make up a big part of the industrial system. However, the application of circular economy practices by MSMEs has not been widespread mainly due to several structural and operational hindrances. Among them are financial limitations, lack of technical facilities, unawareness, weak policy support, and shortage of skilled labor. As a result, these problems prevent MSMEs from going green effectively. Hence, the main thrust of this research is to assess the major obstacles of circular economy adoption by MSMEs in Tamil Nadu. The purpose of this paper is to offer a clear picture of the situation to policy designers, industrial players, and businesspeople so that they may come up with solutions and encourage green behavior in MSMEs after recognizing and understanding the problems.

Concept of Circular Economy

The idea of a circular economy has only been evolving for a while now and it has been changed by the earlier concepts of sustainability. If one decides to track back, it would be seen that the environmental economists of the 1960s and 1970s, such as Kenneth Boulding, with his metaphor of Spaceship Earth, were talking about a closed, loop system, a circular economy. The 1980s and 1990s saw the rise of concepts that were related to industrial ecology, cradle to cradle design, and eco, efficiency. These concepts can be considered as the stepping stones for the development of the circular economy, particularly with a focus on waste reduction and the reuse of resources in production systems. Eventually, the idea became increasingly tied with policy and business strategies in the 2000s and it was greatly influenced by the works of the Ellen MacArthur Foundation, which showcased the circular economy as an achievable model for sustainable development. Regional as well as international governments started incorporating CE principles into their environmental and industrial policies, mainly Europe and Asia. The circular economy has, in recent times, become a comprehensive sustainability framework that comprises of innovation, green technologies, and sustainable business models. It is now widely recognized as a vital instrument in achieving resource efficiency, reducing environmental degradation, and encouraging sustainable economic growth over time, especially among MSMEs of developing regions such as Tamil Nadu.

Definition and Classification of MSMEs

Micro, Small, and Medium Enterprises (MSMEs) play a critical role in India's economic growth, contributing significantly to GDP, exports, and job creation. Recognizing their importance, the government has periodically revised the MSME classification criteria to better reflect the changing business environment and help entrepreneurs access essential benefits such as loans, subsidies, and tax incentives. In the Union Budget 2025, Finance Minister Nirmala Sitharaman announced a major update to the New MSME classification, increasing the investment limit by 2.5 times and doubling the turnover limits. The revised MSME Definition came into effect from April 1, 2025. This move is aimed at fostering growth, encouraging innovation, and creating a more enabling ecosystem for MSMEs to flourish. In this article, we will look into the New MSME Definition.

Category	Investment Limit	Turnover Limit
Micro	Up to ₹2.5 crore	Up to ₹10 crore
Small	Up to ₹25 crore	Up to ₹100 crore
Medium	Up to ₹125 crore	Up to ₹500 crore

Review of Literature

1.Kuik (2023): The author investigates to examines how SMEs adopt circular economy practices based on reduce, reuse, and recycle principles. It finds that major barriers include high initial investment costs, lack of technical knowledge, weak government support, low customer awareness, and internal issues like short-term profit focus. However, adopting CE can improve brand image, stakeholder engagement, resource efficiency, and environmental performance. A case study of an Australian healthcare SME shows that CE helps create a market niche and sustainability benefits, though financial returns may take time. Overall, strong policy support, awareness, and top management commitment are key to successful CE implementation in SMEs.

2 Saini (2025): The Researcher concluded that the MSMEs in India have a major role in the economy, they are still at the infancy stage of adopting CE practices due to disbarring factors such as lack of awareness, financial issues, not having enough access to technology, and having poor policy support. On the other hand, the example of Reliance Industries is a proof that if one put into practice CE measures, like recycling, producing in a sustainable way, and managing waste, one can come out with better use of resources, less damage to the environment, and an increased competitive.

3. Jayasubramanian (2024): The Researcher concluded that the MSMEs as the backbone of Tirupur economy, which play a vital role in the GDP and employment generation of the city while the firms are facing difficulties in the operations. It is

found that the digital transformation and e, commerce could be the main growth source for the enterprises, however the enterprises are only being limited with the bank's requirement of high collateral and shortage of formal finance. The paper asserts that the biggest problems that the textile units have to deal with are the market competition and the regulatory compliance. Besides, adoption of technology is delayed due to the resistance of the employees and shortage of technical skills. Therefore, the city's growth cannot be sustainable unless there is a combined business and local government initiative to simplify the rules and offer

4 Rajeev Rathi (2023): The study highlights the importance of integrating circular economy principles into MSME manufacturing planning for sustainable and long-term growth. It shows that practices like waste reduction, resource efficiency, and closed-loop systems can improve performance, reduce costs, and enhance competitiveness. However, MSMEs face challenges such as financial constraints, low awareness, limited technology, and resistance to change. The study concludes that stakeholder collaboration, technological adoption, and strong policy support are essential for successful circular economy implementation and improved sustainability.

5 Sarmistha Mishra (2024): The study examines how innovation and sustainability practices improve MSME performance and competitiveness. It finds that sustainable production, efficient resource use, and new technologies enhance productivity and long-term growth. However, MSMEs face barriers such as limited finance, lack of technical knowledge, and low awareness. The study concludes that strategic planning, government support, and capacity-building are essential to promote sustainable innovation and strengthen MSME resilience and development.

6 Balaji (2024): The study examines the adoption of circular economy (CE) practices among SMEs in Visakhapatnam using case studies of six manufacturing firms. It highlights that while CE offers significant benefits such as resource efficiency, cost reduction, environmental protection, and improved organizational resilience, most SMEs still follow traditional linear models due to lack of awareness, limited technical knowledge, weak regulatory coordination, financial constraints, and cultural resistance. The findings reveal that many firms generate waste that could be reused or converted into value, but they lack the systems and partnerships needed to implement circular practices. The study concludes that stronger policy support, training, stakeholder collaboration, and process re-engineering are essential for promoting CE adoption and enabling SMEs to achieve sustainable growth and competitiveness.

7 Roy (2018): The study analyses circular economy (CE) readiness among manufacturing MSMEs in India using an extended Theory of Planned Behavior model. It finds that attitude, social pressure, environmental commitment, and green economic incentives positively influence CE readiness, while perceived behavioral control has no significant effect. Social pressure and financial incentives also

indirectly enhance readiness by shaping attitudes and internal capabilities. The study concludes that stronger institutional support, financial incentives, and environmental awareness are crucial for promoting CE adoption, and the extended TPB model better explains MSME readiness than the traditional model.

8 Mishra (2024): The study examines circular economy (CE) adoption among MSMEs, highlighting its role in improving sustainability, resource efficiency, and competitiveness. It finds that MSMEs face barriers such as low awareness, financial constraints, technological limitations, and weak regulatory support. However, adopting practices like recycling, reuse, and waste-to-value can enhance efficiency and reduce environmental impact. The study concludes that stronger policy support, access to finance, and improved technical knowledge are essential to boost MSME readiness and achieve sustainable growth.

9 Sarmistha Mishra (2025): The researcher examines the barriers to adopting circular economy (CE) practices among MSMEs in developing economies using the WINGS analytical approach. The research identifies and prioritizes sixteen critical barriers, highlighting financial constraints, lack of investment support, inadequate infrastructure, and limited knowledge as the most influential challenges. The findings emphasize that these barriers are not isolated but interrelated, with financial and informational limitations exerting the strongest systemic influence. The study contributes significantly by offering a structured ranking and causal classification of barriers, enabling policymakers and practitioners to identify key leverage points. It concludes that targeted policy interventions, improved financial access, and knowledge dissemination are essential to facilitate CE adoption in MSMEs. Overall, the research provides practical and policy-relevant insights for promoting sustainable industrial transformation in developing economies.

10 Doğuş (2021): The study highlights that MSMEs are critical actors in resource efficiency, waste reduction, and eco-innovation, but they face constraints such as limited financial resources, technological capability, and policy support. It emphasizes that adopting CE principles—such as recycling, reuse, and sustainable production—can improve competitiveness and environmental performance of SMEs. The research also points out that collaboration, innovation, and supportive institutional frameworks are essential to enable SMEs to transition toward circular business models. The findings suggest that policy incentives, awareness programs, and access to green technologies can significantly enhance CE adoption among SMEs.

11 Prasanta Kumar Dey (2025): This review explores how Small and Medium-Sized Enterprises (SMEs) can adopt Circular Economy (CE) principles to achieve Net Zero targets, identifying key drivers like technological advancement and barriers such as high investment costs. Based on a content analysis of 188 articles, the researchers propose a conceptual framework for implementation that balances "push" factors (stakeholders/technology) with "pull" factors (market/economic

considerations). The study highlights that while SMEs contribute significantly to global pollution, they often lack the integrated strategies needed for successful green transitions

12 Rizos (2015): The researcher concludes that Small and medium-sized enterprises (SMEs) are essential for global decarbonization because they represent over 90% of the world's businesses and employ 60% of the workforce, yet they contribute to approximately 70% of global pollution. This research identifies that the adoption of Circular Economy (CE) principles in SMEs is currently in a nascent stage, primarily driven by qualitative exploration of enablers such as technological advancement and market demand. The authors propose a "Push and Pull" framework where technology, stakeholders, and organizational commitment "push" enterprises toward green practices, while market perspectives and economic considerations "pull" them into adoption. Ultimately, the study emphasizes that bridging the knowledge gap through a consolidated framework of design, planning, and implementation strategies is vital for SMEs to improve their environmental, social, and economic performance

Research Gap

Existing literature identifies financial, technological, awareness, and policy, related issues as the main obstacles for MSMEs to implement a circular economy. However, most research is done at the global or national levels and does not consider regional aspects. Very few studies provide concrete evidence regarding the problems faced by MSMEs in Tamil Nadu, especially from the point of view of entrepreneurs who are at the ground, level. Thus, the present research intends to fill in the gap by identifying the major hurdles for MSMEs in Tamil Nadu to shift towards a circular economy and offering local insights and suggestions for sustainable development.

Objectives of the Study

1. To understand the concept of circular economy in MSMEs.
2. To identify the key barriers to Circular Economy Implementation.

Methodology

This study uses secondary data and a methodical literature review technique. Using scholarly resources like Google Scholar, pertinent data is gathered from books, conference proceedings, journal articles, and reports on MSMEs and the circular economy. The chosen studies are vetted for applicability and subjected to a theme analysis to pinpoint significant obstacles and patterns that support the development of the study's conceptual framework.

Methods of Data Collection

The study is based on secondary data collected from journal articles, books, reports, and conference papers related to circular economy and MSMEs. The sources are identified using academic databases such as Google Scholar and are selected based on their relevance and reliability.

Discussion

To understand the concept of Circular Economy

A restorative and regenerative economic system, the circular economy seeks to disentangle economic development from the depletion of natural resources. It emphasizes creating long-lasting, repairable, and reusable items as well as recycling materials using closed-loop technologies to turn trash into a resource. Its guiding concepts include reducing pollution and waste, reusing and recycling resources and products to their fullest potential, and regenerating natural systems. The circular economy reduces environmental impact while generating social and economic advantages by prolonging product life cycles and increasing resource efficiency.

The circular economy is a major concept of environmental economics and is even a central pillar of the European Union's Horizon 2020 program. It is an industrial system that is, in principle, restorative and regenerative and is intended to 'decouple' economic growth from the use of constrained natural resources. The global extraction of natural resources since the start of the century has tripled and, therefore, the circular economy has been drawing more and more attention from the business world and policymakers as a sustainable solution.

Circular Economy and Closed-Loop Systems

Moving from a linear to a circular economy means creating closed, loop production systems that enable the reintroduction of waste materials into the production cycle as raw materials. In these types of systems, products are seen as temporary resource containers, and their parts are taken back and used again in subsequent production cycles.

Global Significance of Circular Economy

Even though the global food system produces enough food to feed the world's population, nearly one-third of food is lost across supply chains (Ellen MacArthur Foundation & Google, 2019). The circular economy addresses such inefficiencies by promoting reuse, redistribution, and recycling of resources within the system.

Principles of Circular Economy

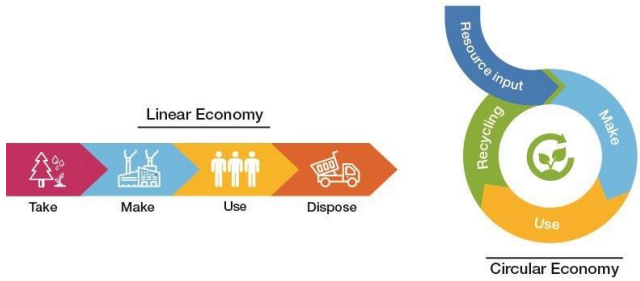
The circular economy is guided by three core principles

- Eliminate waste and pollution
- Circulate products and materials at their highest value
- Regenerate natural systems

3R's of Circular Economy

- Reduce – Minimizing the use of non-renewable resources and reducing emissions during production and consumption
- Reuse – Extending the life cycle of products by reintroducing them into the economy through reuse and redistribution.
- Recycle – Processing used materials to recover valuable resources and convert them into new products.

Linear Economy and Circular Economy Models



Source: Synthesis (2021)

Linear Economy (Take–Make–Use–Dispose)

- **Take** – Extraction of raw materials from natural resources
- **Make** – Manufacturing of products using these materials
- **Use** – Consumption of products by individuals or industries
- **Dispose** – Disposal of products as waste after use

Circular Economy

- **Resource Input** – Efficient and reduced use of raw materials
- **Make** – Eco-friendly and sustainable production processes
- **Use** – Maximum utilization and longer product life
- **Recycling** – Reuse, repair, remanufacture, and recycling of materials back into the

Circular Economy and Indian MSMEs

Micro, Small and Medium Enterprises (MSMEs) significantly impact the Indian economy through various ways such as creation of job opportunities, upholding the spirit of innovation, backing export through their production and thus leading to growth which is inclusive of all sections of the society. Economically, they form the primary structure supporting the country's development and contribute to nearly 30% of India's GDP. India's exports include a wide range of products such as textiles, garments, footwear, rice, and castor oil in which the MSMEs are directly involved. The idea of a circular economy is quite novel in India. However, its implementation has led to significant investments in recent times especially in the areas of renewable energy and sustainable mobility. India is expected to be the third,

largest economy globally by 2030, and the circular economy alone provides a potential benefit of approximately US$45 billion in the country. Therefore, the role of MSMEs is indispensable in a green growth transition scenario. Policymaking, mentoring frameworks, research and innovation hubs as well as skill development programmers are necessary to help this sector grow stronger thus enabling it to resolve the issues of financial, technological and informational inadequacies and also foster the embrace of circular business practices.

To Identify the key barriers to Circular Economy Implementation.

Financial Barriers

Small and medium enterprises have limited financial resources which is one of the biggest issues when it comes to implementing circular economy practices. Small businesses have a hard time justifying the high upfront investments in recycling equipment, waste management systems, and environmentally friendly technologies. Besides that, limited access to bank loans, lack of subsidies, and the risk of not getting the return on investment also limit the adoption of these practices.

Technological and Infrastructure Barriers

Most of the MSMEs rely on traditional methods and old machines, so they cannot easily implement the modern circular methods such as remanufacturing, reuse, and resource recovery. The absence of proper infrastructure such as recycling plants, collection methods, and reverse logistics also creates challenges.

Knowledge and Awareness Barriers

The lack of knowledge about circular economy among the owners and managers is one of the greatest obstacles. Following the trend of many MSMEs that are unaware of sustainable production methods, environmental standards, or the benefits they can get from circular business models issues could not be solved quickly

Policy and Regulatory Barriers

Although governments may be encouraging the idea of sustainability, small and medium enterprises may have to deal with unclarified policies, complicated procedures, and poor enforcement of environmental regulations on the ground. The absence of a regulatory coordination mechanism and a lack of enough incentives make it difficult for circular economy initiatives to thrive.

Market and Demand Barrier

There is a challenge for MSMEs when it comes to selling circular or environmentally friendly products due to the uncertain demand. Consumers, on the other hand, may simply not be willing to pay more for sustainable goods, and the availability of marketing channels and branding opportunities for such products is quite limited.

Supply Chain and Network Barriers

Going circular would mean that suppliers, manufacturers, recyclers, and distributors are working very well together. Unfortunately, MSMEs, in most cases, do not have integrated supply chains and collaboration networks, which results in difficulties when they try to set up reuse and recycling systems.

Skill and Human Resource Barriers

Switching to circular methods means workers have to be trained and there is a need for technical knows, how. A lot of MSMEs do not have the skilled labour necessary to operate advanced machinery, manage waste systems, and comply with environmental standards.

II. CONCLUSION

The circular economy is a sustainable model that primarily focuses on resource efficiency, waste minimization, and the regeneration of the environment. Its great economic and environmental advantages are widely acknowledged, yet the transition to circular economy by MSMEs is still at a very nascent stage. Since MSMEs are the engine of economic growth, their commitment to circular practices is indispensable for sustainable development. The research points out the main barriers that include financial difficulties, inadequate technology, unawareness, insufficient policy support, market unpredictability, supply chain problems, and skills shortage. All these obstacles make it hard for businesses to change from a linear to a circular model. In order to get rid of these hurdles, strong policy intervention, provision of financial resources, easy technology access, and awareness raising and skill development should be in place. Given the right backing and coordination, MSMEs can be able to implement circular economy practices and thus sustain, as well as, make inclusive growth possible.

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