



Circular Economy Practices in the Indian Textile Industry: A Review of Trends, Challenges and Future Directions

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Abstract

The textile industry is an important element in the process of economic development but is also considered to be one of the most resource-intensive and environmentally complex sectors. The rising level of resource depletion, waste generation, and environmental pollution has increased the rate of application of the practices of circular economy (CE) in order to create a sustainable alternative to the traditional linear production approach. This research conducts a review on the current trends, major barriers, and future perspectives of circular economy practices in the Indian textile industry by qualitative analysis of secondary data. Literature relevant to this study that was published in peer-reviewed academic journals, governmental reports, and industry publications was analysed using a thematic approach. The results show that the use of sustainable raw materials, textile recycling, resource-efficient production processes and digital technologies has helped improve sustainability at all stages of the textile value chain. However, some of the challenges associated with CE practices in the textile industry, including high cost of implementation, technology issues, lack of appropriate recycling facilities, fragmentation of supply chains, and poor consumer awareness remain as barriers to their widespread application. The findings show the significance of reinforcing policy, developing technologies, collaborating among stakeholders, and raising awareness among consumers as key means of fostering the transition into a circular economy within the textile industry. The review offers important lessons to policymakers, practitioners, and researchers in the field of sustainability in the Indian textile industry.

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Introduction

Textile industry is considered to be one of the largest industries in terms of contribution to the economy of the world through employment generation, industry growth, and international business. Textile and clothing industry is a critical sector for the economic development of India with high manufacturing, export, and employment generation. Although the sector is highly valued from an economic perspective, the textile industry is acknowledged to be one of the resource-consuming industries due to heavy use of water, energy, chemicals, and raw materials. The traditional linear manufacturing process, which operates through a take-make-dispose process, has led to growing textile waste, environmental pollution, and exhaustion of resources, posing serious concerns regarding environmental sustainability (Jia et al., 2020).

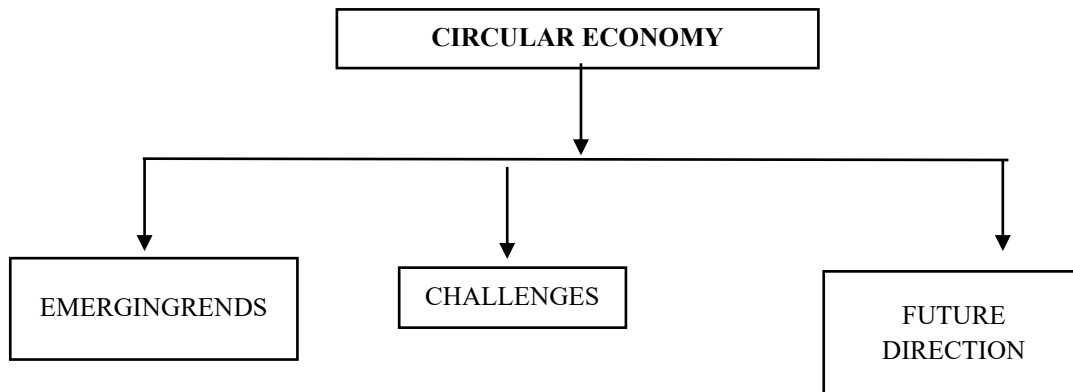
The emergence of environmental issues along with pressure for sustainable development has made the industry around the world think about changing the production and consumption process. In this regard, the idea of the circular economy has gained prominence as it seeks to reduce wastage and increase efficiency by extending the life cycle of the product by means of reuse, repairs, remanufacture, and recycling. Circular economy is quite different from the linear economy as it emphasizes on closing loops so as to retain the material values in the process of production (Dissanayake & Weerasinghe, 2022).

Circular economy practices have been gaining traction in the textile sector due to factors such as the rising level of consumers' awareness about environmental issues, increasing environmental regulations, and the increasing global demand for environmentally sustainable products. Various efforts such as the use of sustainable fibers, textile recycling, environmentally sustainable production methods, waste minimization, and technology solutions have been introduced with the intention of improving environmental performance in the textile value chain. Nevertheless, there are huge differences between nations and even organizations on the uptake of these practices, especially in smaller firms (Dohale et al., 2025; Sellappa, 2025).

India has made considerable advancements in sustainable manufacturing policies and processes through various means including policy interventions, cooperation between the government and industries, and innovation. However, issues such as the absence of proper recycling facilities, lack of integration of the supply chain process, insufficient consumer knowledge, and high costs of implementation have been among some of the obstacles facing the wide adoption of circular economy principles within the textiles industry (Ajwani-Ramchandani et al., 2023; Sharma et al., 2024).

While there have been several attempts made at analyzing circular economy practices in the textile and clothing industry, the extant literature is fragmented and mainly deals with specific elements of the circular economy such as recycling processes, sustainable manufacturing, consumer behavior, or intervention from the policy side. There seems to be little consolidation of the existing literature in terms of recent findings related to trends, problems, and prospects of the adoption of the circular economy in the Indian textile industry. It is for this reason that the present study attempts to review and synthesize existing literature.

Figure 1. Conceptual Framework of Circular Economy Practices in the Indian Textile Industry



Literature Review

The idea of circular economy has been widely discussed recently due to its capability to promote sustainable production and consumption. In contrast to the conventional linear economy, where the process is conducted according to "take-make-dispose" principles, in the circular economy, there is constant utilization of resources using approaches such as reducing material usage, reuse of products, recycling of waste, and resource recovery. Transition to this approach not only helps avoid environmental degradation but also increases the efficiency of resource use and ensures economic sustainability (Jia et al., 2020; Dissanayake & Weerasinghe, 2022).

The textile industry is one of those industries that are given priority in applying principles of circular economy due to its heavy environmental impact. There are many practices identified by researchers to make the application of circular economy possible in the textile industry, which include the application of sustainable fibers, eco-design, textile recycling, closed loop production, product life extension, and waste valorization. All these methods help in achieving lower raw material consumption, reduction in waste generation, emission of greenhouse gases, and improve environmental performance as well. The importance of Industry 4.0, such as artificial intelligence, IoT, and blockchain, is discussed by Saha et al. (2021) and Dohale et al. (2025).

A number of studies have analyzed the application of the circular economy approach in the Indian textile industry. The current literature suggests that there has been an increase in the awareness levels related to sustainability among textile manufacturers because of strict environmental laws, international sustainability norms, and increasing demands from consumers of sustainable products. Government efforts to promote sustainable manufacturing processes, textile recycling, and efficient resource use have also helped industries to embrace the circular approach. However, the adoption of such business models is far from being evenly implemented, especially among SMEs owing to financial, technological, and infrastructural barriers (Sellappa, 2025; Ajwani-Ramchandani et al., 2023).

Although there is an increasing number of studies in the area, there are certain obstacles that impede the application of circular economy practices in reality. They can be related to large upfront costs of adopting circular practices, technological inadequacy, fragmented supply chains, poor recycling facilities, lack of consumer awareness, and ineffective cooperation between stakeholders. There is also organizational resistance to changes and the lack of performance metrics for circular business practices (Sharma et al., 2024; Zaidi & Chandra, 2023; Dohale et al., 2025).



Though earlier researches have added immensely to the understanding of circular economy practices in the textile industry, most of the literature available has been limited to some specific areas such as recycling technology, sustainable production processes, consumer behavior, and barriers to implementation. On the contrary, there are comparatively few research papers that have tried to draw upon the knowledge from all these sources and provided a holistic view of the trends, challenges, and future directions of circular economy practices in the Indian textile industry. It is for this reason that the current study is made an attempt to fill this gap.

Objectives of the Study

- To examine the current trends in circular economy practices within the Indian textile industry.
- To identify the major challenges influencing the adoption of circular economy practices.
- To suggest practical strategies and future directions for promoting circular economy implementation in the Indian textile sector.

Research Methodology

The current research study involves the use of a qualitative literature review approach with secondary data to analyze the practices of circular economy in the Indian textile industry. It is believed that the use of secondary data will be appropriate in this research because this study attempts to compile secondary data on emerging trends and issues.

Data for the research have been sourced from various reliable sources, such as peer reviewed journal articles, government documents, industry journals, and reports published by international organizations in relation to sustainability and circular economy. The literature review has been compiled by sourcing from different sources, such as academic databases like Google Scholar, Scopus Indexed Journals, Springer, Elsevier, Wiley, Taylor & Francis and MDPI. Reports from other organizations such as Ministry of Textiles (Government of India), NITI Aayog, Textile Exchange, and Ellen MacArthur Foundation have also been referred to wherever necessary.

The literature search was concentrated on literature pertaining to circular economy, textile & apparel industry, sustainability, waste management in textiles, recycling, and circular business practices. Priority was accorded to literature from the recent period of 2020 to 2025. Nevertheless, some foundational literature was used as well when needed for conceptual purposes.

The selected literature was analysed using a thematic analysis approach. The literature findings were categorized into three main themes, namely: (i) current trends in circular economy practices, (ii) problems associated with the use of circular economy practices, and (iii) future directions to promote circular economy in Indian textile industry. Such thematic categories helped in integrating fragmented literature from previous studies and forming an understanding of the current situation of circular economy implementation in the textile industry.

Emerging Trends in Circular Economy Practices

It can be seen that there has been an increase in the implementation of circular economy (CE) principles within the textile industry in recent years. Increased environmental awareness, stricter sustainability policies, and consumers' rising preference for green products have forced manufacturers to move from traditional linear production models to



more sustainable CE models. The rationale for making this transition is to decrease resource usage, waste production, and ensure sustainable textile production processes (Jia et al., 2020).

There is one major trend that is prevalent in the literature that stands out. One such trend is the increase in the usage of sustainable raw materials in the manufacture of textile goods. Organic cotton, recycled polyester, regenerated cellulose fibers, and other sustainable materials are being used to reduce the reliance on virgin materials. This has led to decreased carbon emission levels, decreased water consumption, and sustainable usage of resources.

Recycling of textiles and waste management is another major trend being observed. Many companies have been working on recycling, upcycling, and remanufacturing processes that will enable recovery of value from pre-consumer and post-consumer textile waste. This trend aids in developing closed loop production systems through extended life cycle of products and reduction in disposal of textile waste in the landfill (Ajwani-Ramchandani et al., 2023).

Further, the literature also reveals how Industry 4.0 technologies are increasingly being integrated into circular economy trends. Use of technology like artificial intelligence (AI), internet of things (IoT), blockchain, and big data analytics is making supply chains more transparent and efficient in terms of inventory management and product traceability and resource optimization. These technologies help in efficient resource monitoring of the manufacturing industry and promote sustainable production processes (Dohale et al., 2025).

Government policies and industry initiatives have also contributed significantly to the promotion of circular economy practices in the Indian textile industry. The presence of government programs related to sustainable manufacturing, waste management, use of renewable energy, and recycling of textiles has facilitated industries in adopting environmentally sound business practices. The collaboration between the government, research organizations, and the industrial sector has helped implement circular economy practices in the textile industry (Sellappa, 2025).

On the whole, the literature reveals that the Indian textile industry is moving gradually towards circular economy practices. While there may be differences in terms of speed of implementation among different industries, the focus on sustainability in terms of material, recycling technologies, digital practices, and governmental support signifies a positive change.

Table 1. Emerging Trends in Circular Economy Practices in the Indian Textile Industry

Emerging Trend	Description	Expected Benefits
Sustainable Raw Materials	Increased use of organic cotton, recycled polyester, regenerated cellulose fibres, and eco-friendly materials.	Reduced consumption of virgin resources, lower carbon emissions, and improved environmental sustainability.
Textile Recycling and Upcycling	Recovery, recycling, and remanufacturing of pre-consumer and post-consumer textile waste.	Waste reduction, resource conservation, and development of closed-loop production systems.



Resource-Efficient Manufacturing	Adoption of cleaner production methods, energy-efficient technologies, and water-saving manufacturing processes.	Improved operational efficiency and reduced environmental impact.
Industry 4.0 Technologies	Application of Artificial Intelligence (AI), Internet of Things (IoT), Blockchain, and Big Data Analytics in textile production and supply chain management.	Better traceability, resource optimization, improved transparency, and enhanced supply chain efficiency.
Government Policies and Industry Initiatives	Promotion of sustainable manufacturing through government regulations, financial incentives, recycling programmes, and collaborative initiatives.	Increased adoption of circular economy practices and support for sustainable industrial development.

Source: Developed by the author based on the reviewed literature.

Challenges in Circular Economy Adoption

Though the adoption of circular economy practices has become popular nowadays, there are still various problems faced by the Indian textile industry which have been noted in the literature. These problems are interconnected and influence companies of different sizes, including small and medium-size businesses (SMEs) that often encounter more difficulties compared to large enterprises due to their limitations in terms of finance and technologies.

One of the most common issues that are often mentioned is the expensive implementation process. It means that a company should make substantial investments into technologies, sustainable materials, recycling process and training of employees when moving from a traditional production system to a circular business model (Dohale et al., 2025). Another key difficulty is that of the lack of technological infrastructure. Many textile producers still use traditional methods of manufacturing textiles because there is not enough technological innovation, such as recycling technologies, digital manufacturing systems, and waste management infrastructures. This leads to the inefficiency of the utilization of many resources (Saha et al., 2023).

In the literature, another significant barrier to implementing circular economy principles is considered to be the fragmentation of supply chains. To make circular business models effective, it is necessary to cooperate between producers of raw materials, manufacturers, distributors, retailers, consumers, and recycling organizations. However, cooperation is ineffective due to the fragmentation of supply chains. One other important obstacle is the absence of consumer awareness and demand for sustainable textile products. While environmental consciousness has increased over the years, consumers still prefer price rather than sustainability when buying textile products. This minimizes the market motivation for firms to implement production processes that are environmentally sustainable.

Implementation barriers of the policy also affect the adoption of a circular economy approach. While various governmental policies promote sustainable manufacturing, the failure to effectively enforce such policies, as well as



lack of financing and monitoring strategies, decrease the efficiency of these policies. In general, it can be argued that all these obstacles are critical and require joint effort from different parties involved.

The Way Forward

The results of the literature review show that promoting the adoption of circular economy in the Indian textile industry involves a mixture of innovations, government policies, cooperation between companies in the textile sector, and consumer involvement. Increasing efforts in all of these spheres can contribute to overcoming the existing obstacles and achieving sustainable growth in the textile sector.

Government initiatives should include financial stimuli, tax breaks, grants for green technologies, and more rigid environmental regulation enforcement. These actions will stimulate textile producers, especially SMEs, to implement sustainable production facilities and recycling infrastructure.

The use of investments into research, innovations, and digitalization can become one of the effective solutions as well. The introduction of technologies such as artificial intelligence, blockchain, and Internet of Things can contribute to increasing product traceability, optimizing resources utilization, and increasing transparency in textile supply chains.

Another strategy that could enhance the uptake of the circular economy model is investment in research and development of new technology. Application of artificial intelligence, blockchain technology, and Internet of Things technology could improve traceability and optimize resource usage, thereby increasing transparency in the textile supply chain.

Collaboration within the industry is just as important as collaboration in the above areas. Collaboration between the various parties in the industry, including manufacturers, recycling companies, research institutions, consumers, and policymakers would lead to greater knowledge, technological advancements, and efficient waste management systems. It is essential that consumer awareness be improved. Initiatives that seek to educate consumers, such as eco-labelling and sustainability certification schemes, can contribute to sustainable consumption and purchasing behavior among consumers.

Lastly, it is necessary to consider the integration of concepts of a circular economy in corporate strategy, product design, and supply chain management. The comprehensive approach that would include policy support, technological progress, stakeholder involvement, and consumers' responsibility would play an important role in the creation of the sustainable and competitive textile industry in India.

Conclusion

The shift from the linear economy towards the circular economy is becoming increasingly important in attaining sustainability and resource efficiency in the textile industry. This review analyzed the current trends, challenges, and future perspectives related to the use of circular economy in the Indian textile industry based on recent literature. It was found that the textile industry is increasingly embracing sustainability by using sustainable raw materials, textile recycling, resource-efficient production, and advanced technology.



However, despite such positive developments in the industry, there are a number of challenges in the adoption of circular economy practices in the industry. Challenges like high implementation cost, lack of adequate recycling facilities, low technological capability, supply chain fragmentation, and low consumer awareness have been identified. Despite favorable government policies and sustainability initiatives, there is a need for enhanced implementation and collaboration among the stakeholders.

Furthermore, it is made clear that the adoption of the concept of circular economy entails the need for collaboration between various actors like governmental bodies, industry players, academic institutions, and consumers. Investments in green technology, improvements in recycling infrastructure, encouragement of sustainable product design, digitalization, and educational campaigns can help boost the adoption of circular business models. This will not only increase the environmental efficiency but also ensure the competitive advantage of the Indian textile industry in the future.

In conclusion, it is important to mention that circular economy provides numerous opportunities to transform the textile industry into a more sustainable and environmentally responsible sector. This research provides relevant information for stakeholders who are interested in promoting sustainable development in the textile industry. Future studies may be based on empirical research in order to analyze the effectiveness of particular circular economy practices in different segments of the textile value chain.

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