West Science Business and Management
Vol. 3, No. 01, March 2025, pp. 63~68

Application of Circular Economy in Sustainable Supply Chain Management in the Fashion Industry

Catur Sasi Kirono[1], Mohammad Gifari Sono[2]
[1]Universitas Pelita Bangsa
[2]Universitas Muhammadiyah Luwuk

Article Info

Article history:

Received March, 2025
Revised March, 2025
Accepted March, 2025

Keywords:

Circular Economy,
Sustainable Supply Chain Management,
Fashion Industry,
Recycling and Upcycling,
Green Manufacturing

ABSTRACT

This study examines the integration of circular economy (CE) principles within sustainable supply chain management (SSCM) in the fashion industry through a systematic review of 35 Scopus-indexed documents. The findings reveal that CE strategies, such as recycling, upcycling, and product life extension, are increasingly adopted to reduce waste and promote resource efficiency. Sustainable sourcing, green manufacturing, and efficient logistics are identified as critical SSCM activities supporting circular practices. However, challenges such as economic barriers, technological gaps, and consumer awareness hinder widespread adoption. The study highlights the importance of policy support, collaborative efforts, and technological advancements as enablers of CE implementation. Comparative insights from other industries further underscore the potential for scalable and innovative circular practices in fashion. These findings provide actionable recommendations for practitioners, policymakers, and researchers to enhance sustainability in the fashion industry's supply chains.

This is an open access article under the CC BY-SA license.

Corresponding Author:

Name: Catur Sasi Kirono, S.H. M.M.
Institution: Universitas Pelita Bangsa
e-mail: catur.kirono@pelitabangsa.ac.id

1. INTRODUCTION

The fashion industry, characterized by its rapid evolution and creativity, faces significant environmental and social challenges due to its traditional linear supply chain model, which exacerbates issues such as resource depletion, waste generation, and carbon emissions. The circular economy (CE) framework offers a transformative approach to address these challenges by promoting sustainability through principles like "reduce, reuse, and recycle," allowing the industry to mitigate environmental damage while fostering economic growth and aligning with sustainable development goals. However, several barriers hinder CE implementation, including manufacturing and design errors that limit product life cycle extension and contribute to environmental degradation [1], lack of supply chain collaboration [1], and challenges in transparent product tracking [1]. Despite these challenges, CE presents opportunities such as waste transformation into valuable resources like recycled yarn and biodegradable composites, reducing environmental impact (Das et al., 2025), as well as IoT integration to enhance supply chain transparency and support CE initiatives [2]. Additionally, sustainable marketing

strategies adopted by brands help raise awareness among producers and consumers about responsible practices [3]. From an environmental and economic perspective, CE promotes resource efficiency by reducing water and energy consumption [2], while driving economic growth by creating wealth from waste and aligning with UN sustainable development goals [2].

The integration of circular economy (CE) principles into sustainable supply chain management (SSCM) in the fashion industry offers a transformative solution to environmental challenges while enhancing economic and social value. By emphasizing resource efficiency, waste reduction, and lifecycle extension, CE redefines material sourcing, production, and logistics, aligning with sustainable development goals and fostering industry resilience. CE promotes "reduce, reuse, and recycle" to minimize waste and optimize resources [2], while green procurement and logistics improvements lower carbon footprints [4]. CE adoption transforms waste into valuable materials like recycled yarn and biodegradable composites [2], with IoT enhancing transparency and circularity [2], [4]. Extending product life through remanufacturing and resale mitigates environmental harm [1], [2], and stakeholder collaboration fosters accountability [1], [4]. Moreover, CE supports economic growth, reduces resource scarcity, and promotes responsible consumption, aligning with UN sustainable development goals while advancing social [2].

This paper systematically analyzes the integration of CE into SSCM in the fashion industry by reviewing 35 Scopus-indexed documents. The purpose of this study is to provide a comprehensive understanding of the current state of research on this topic, identify key strategies and challenges, and propose actionable insights for academics, practitioners, and policymakers. By synthesizing existing literature, this study aims to contribute to the growing body of knowledge on sustainable practices in the fashion supply chain and guide the industry in transitioning toward a circular and sustainable future.

2. LITERATURE REVIEW

2.1 Circular Economy in the Fashion Industry

The circular economy in the fashion industry minimizes waste and maximizes resource efficiency through strategies like product-as-a-service, resale markets, and extended producer responsibility, fostering closed-loop systems that reduce reliance on virgin resources. The Ellen MacArthur Foundation promotes recycling and innovative design, supporting eco-design principles that emphasize durability, repairability, and recyclability, along with biodegradable materials. Product-as-a-service reduces waste by encouraging reuse [1], while resale markets extend garment lifecycles [2]. Extended producer responsibility pushes manufacturers to design for durability and recyclability [1]. Circular economy models enhance resource efficiency, as seen in the Netherlands and Japan, by cutting resource demand and waste [5], while waste transformation into recycled yarn and biodegradable composites supports sustainability [2]. However, challenges like high costs, weak legislation, and inadequate waste infrastructure remain obstacles [5], and rebound effects from increased production and consumption may offset environmental gains, requiring careful management [6].

2.2 Sustainable Supply Chain Management (SSCM)

Sustainable supply chain management (SSCM) in the fashion industry mitigates fast fashion's negative impacts by integrating circular economy principles that promote sustainable sourcing, energy-efficient manufacturing, and green logistics. Circular economy models focus on reuse, recycling, and recovery to reduce waste and resource depletion [4], while sustainable sourcing ensures responsible procurement [7]. Energy-efficient manufacturing minimizes carbon footprints [8], and technologies like blockchain and IoT enhance traceability and efficiency [4], [8]. Collaboration among stakeholders, supported by government policies, is crucial for fostering sustainability [8], [9]. However, challenges such as high costs and regulatory

complexities require policy incentives, innovation, and stakeholder engagement to overcome [4]. These strategies enhance efficiency, meet environmental expectations, and strengthen the fashion industry's resilience [4], [8].

3. METHODS

A systematic literature review was chosen as the research design to ensure a comprehensive and unbiased evaluation of existing studies on circular economy (CE) and sustainable supply chain management (SSCM) in the fashion industry. This method enables the identification of recurring themes, knowledge gaps, and opportunities for future research. The review adhered to established guidelines for systematic reviews, including clear inclusion and exclusion criteria, rigorous data extraction, and thematic analysis. The data for this study was sourced exclusively from Scopus, one of the largest and most reliable abstract and citation databases for peer-reviewed literature. A specific search strategy was employed using keywords and Boolean operators to retrieve relevant documents, including terms such as "Circular Economy" AND "Sustainable Supply Chain Management", "Circular Economy" AND "Fashion Industry", "Sustainable Supply Chain Management" AND "Fashion", and "Circular Economy" AND "Textiles". The search was limited to journal articles, conference proceedings, and review papers published in English, with no restrictions on publication year to capture the evolution of the research topic.

To ensure the relevance and quality of the literature, inclusion criteria were applied to focus on articles discussing CE principles within SSCM, particularly in the fashion or textile industry, and published in peer-reviewed journals or conference proceedings indexed in Scopus. Exclusion criteria removed articles that did not address CE or SSCM in the fashion industry, non-peer-reviewed publications, and studies unavailable in full text or written in languages other than English. After applying these criteria, 35 documents were selected for analysis. The selected studies were reviewed and analyzed using a thematic analysis approach, with key information extracted, including study objectives, research methods, findings, and conclusions. The extracted data were categorized into themes such as CE strategies, challenges, enabling factors, and technological innovations. To ensure consistency and minimize bias, each document was independently reviewed by the researchers, and discrepancies were resolved through discussion. The findings were synthesized into a comprehensive framework to highlight the relationships between CE and SSCM in the fashion industry.

4. RESULTS AND DISCUSSION

4.1 Adoption of Circular Economy Strategies

The findings reveal a growing trend of integrating CE principles into the fashion supply chain. The adoption of strategies such as recycling, upcycling, and product life extension is crucial for reducing waste and enhancing resource efficiency in the fashion industry, forming the foundation of closed-loop systems where post-consumer waste is reintegrated into production, promoting sustainability. Companies increasingly implement take-back schemes and collaborate with recycling firms to transform old garments into raw materials, while technologies like chemical recycling and fiber regeneration enable the creation of high-quality materials from waste textiles. Additionally, circular economy-driven business models, such as clothing rental and resale platforms, reshape consumer behavior and reduce fashion’s environmental impact by aligning economic incentives with sustainability goals. Recycling plays a pivotal role in the industry's shift toward sustainability, with upcycling extending garment life and promoting reuse, though balancing upcycling and downcycling is essential to minimize environmental impact while preserving design integrity [10]. Novel waste recycling technologies contribute to transforming waste into valuable resources, closing the loop in production and

consumption cycles [11]. Circular economy principles advocate designing out waste, keeping materials in use, and regenerating natural systems, while green marketing fosters eco-friendly practices that align with consumer values (Moorthy et al., 2025). Successful strategies, including eco-design, product lifecycle extension, and closed-loop supply chains, enhance brand loyalty and contribute to global sustainability goals (Moorthy et al., 2025). However, the fast fashion phenomenon significantly contributes to environmental degradation, necessitating sustainable interventions such as reuse, recycling, repair, and reduction, assessed through environmental, social, and economic lenses [12]. Sustainable product design integrates advanced materials and processes to enhance longevity and reduce environmental

4.2 Role of SSCM in Supporting Circular Practices

Sustainable supply chain management plays a pivotal role in enabling the implementation of circular practices. The review highlights several key SSCM activities that align with CE objectives.

The transition to sustainable practices in the fashion industry involves sustainable sourcing, green manufacturing, and efficient logistics, with companies increasingly adopting eco-friendly raw materials like organic cotton and recycled polyester to mitigate environmental impacts and meet consumer demands [13]. Certifications and standards enhance transparency and accountability in sourcing, ensuring responsible procurement [13]. Green manufacturing practices, including energy-efficient production and non-toxic dyeing, are becoming standard as the industry moves toward circular economy models [4]. These efforts contribute to waste reduction and resource efficiency, further promoting sustainability [4]. Additionally, efficient logistics, such as the use of electric vehicles and optimized transportation routes, help reduce carbon emissions, while digital technologies like blockchain and IoT enhance supply chain transparency and traceability, enabling stakeholders to

4.3 Challenges in Implementing CE in SSCM

Despite the promising advancements, several challenges hinder the widespread adoption of CE in SSCM. Key challenges identified in the literature include, the transition to a Circular Economy (CE) presents challenges for small and medium-sized enterprises (SMEs) and the fashion industry, including high costs, technological gaps, consumer awareness issues, and complex supply chains. SMEs, which constitute over 90% of global businesses, often lack the financial resources to invest in circular technologies, with the absence of economic incentives further hindering CE adoption [14], [15]. Limited access to advanced recycling technologies and the lack of standardization in material recovery processes create additional barriers, particularly in the fashion industry, where technological upgrades remain costly and scarce [1], [16]. Consumer awareness also plays a critical role, as many buyers are unaware of the environmental impact of their purchasing habits, slowing the demand for sustainable products, highlighting the need for educational initiatives to promote CE adoption [1], [17]. Additionally, the global nature of fashion supply chains complicates coordination efforts, requiring effective collaboration among stakeholders to ensure the success of circular initiatives [1], [17]. These challenges underscore the need for strategic actions, policy support, and technological advancements to facilitate CE implementation across industries.

4.4 Enablers and Opportunities

The literature identifies several enablers that can accelerate the integration of CE into SSCM:

Government regulations, subsidies, and tax incentives play a crucial role in encouraging businesses to adopt sustainable practices and embrace circular economy (CE) models, with extended producer responsibility (EPR) policies effectively promoting waste reduction and recycling. Government regulations enhance corporate compliance and support CE integration into business operations, while tax incentives reduce liabilities for firms with strong

sustainability practices, encouraging broader adoption [18], [19]. Collaborative efforts among stakeholders, including brands, suppliers, recyclers, and consumers, are essential for resource sharing and innovation, fostering sustainable supply chain practices [4]. Multi-stakeholder cooperation, including policymakers, industries, and communities, helps overcome barriers like poor standardization and technological limitations in CE implementation [20]. Technological advancements such as AI-driven predictive analytics, digital twins, and IoT enhance resource efficiency and improve manufacturing processes, supporting CE transitions [20]. Additionally, digital tools and data analytics enable real-time monitoring of resource flows and emissions, increasing transparency and accountability in energy supply chains [21]. These combined efforts contribute to the successful implementation of CE models across industries, ensuring long-term sustainability.

Emerging trends in consumer behavior, such as the increasing demand for sustainable fashion and the popularity of eco-labels, also present opportunities for businesses to align their practices with market expectations.

4.5 Comparative Analysis with Other Industries

The review indicates that while the fashion industry faces unique challenges, it can draw valuable lessons from other industries that have successfully implemented circular economy (CE) practices. The electronics industry, for example, has demonstrated effective take-back schemes and modular product designs that enhance repairability and recyclability, while the automotive sector's circular initiatives, such as remanufacturing and component reuse, provide insights into scaling up CE practices within complex supply chains. By adopting similar strategies and tailoring them to the fashion context, the industry can overcome many of its existing challenges and advance toward a more sustainable future.

4.6 Implications for Research and Practice

The integration of CE into SSCM requires a multi-faceted approach involving technological, organizational, and policy interventions. For practitioners, the findings emphasize the need to invest in digital infrastructure and foster collaborative partnerships to achieve sustainable outcomes. Policymakers are encouraged to establish supportive regulatory frameworks and provide incentives for innovation in sustainable practices.

For researchers, the results highlight gaps in the literature, particularly in areas such as consumer behavior, life-cycle assessment, and the long-term economic impacts of CE adoption. Future studies should explore these dimensions to provide a more holistic understanding of CE in the fashion industry.

5. CONCLUSION

This study underscores the critical role of circular economy principles in transforming the fashion industry's supply chains toward sustainability. By adopting strategies such as recycling, upcycling, and product life extension, the industry can significantly reduce its environmental footprint. SSCM practices, including sustainable sourcing, green manufacturing, and efficient logistics, are pivotal in supporting these circular initiatives. Despite promising advancements, challenges such as high costs, limited access to technology, and complex supply chain coordination persist.

Enablers such as supportive policies, stakeholder collaboration, and technological innovations present opportunities for overcoming these obstacles. Additionally, lessons from other industries, like electronics and automotive, offer valuable insights into implementing scalable circular solutions. Future research should focus on addressing knowledge gaps related to consumer behavior, life-cycle assessments, and the long-term economic impacts of CE adoption. By leveraging these findings, the fashion industry can make significant strides toward

achieving sustainability while meeting evolving consumer and market demands.

REFERENCES

[1] K. Saha, P. K. Dey, and E. Papagiannaki, "Implementing circular economy in the textile and clothing industry," in *Supply chain sustainability in small and medium sized enterprises*, Routledge, 2022, pp. 239–276.

[2] A. K. Das, M. F. Hossain, B. U. Khan, M. M. Rahman, M. A. Z. Asad, and M. Akter, "Circular economy: A sustainable model for waste reduction and wealth creation in the textile supply chain," *SPE Polym.*, vol. 6, no. 1, p. e10171, 2025.

[3] M. Diktaş, S. Arı, and V. Ö. Akgün, "A Theoretical Research on Sustainability in the Fashion Industry," *Selçuk Üniversitesi Sos. ve Tek. Araştırmalar Derg.*, no. 24, pp. 34–45, 2024.

[4] K. Govindan and M. Hasanagic, "A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective," *Int. J. Prod. Res.*, vol. 56, no. 1–2, pp. 278–311, 2018.

[5] N. C. Obiuto, N. Ninduwezuor-Ehiobu, E. C. Ani, and K. Andrew, "Implementing circular economy principles to enhance safety and environmental sustainability in manufacturing," *Int J Adv Multidiscip Res Stud*, vol. 4, no. 2, pp. 22–29, 2024.

[6] P. Ghisellini, C. Cialani, and S. Ulgiati, "A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems," *J. Clean. Prod.*, vol. 114, pp. 11–32, 2016.

[7] M. Khan, M. Hussain, and M. M. Ajmal, *Green supply chain management for sustainable business practice*. IGI Global, 2016.

[8] U. Nweje and M. Taiwo, "Supply chain management: Balancing efficiency and environmental responsibility," *World J. Adv. Res. Rev.*, vol. 25, no. 1, pp. 1547–1564, 2025.

[9] M. T. I. Imran, C. L. Karmaker, R. Karim, S. M. Misbauddin, A. B. M. M. Bari, and A. Raihan, "Modeling the supply chain sustainability imperatives in the fashion retail industry: Implications for sustainable development," *PLoS One*, vol. 19, no. 12, p. e0312671, 2024.

[10] S. Tiwari and P. Patel, "Redefining Fashion Sustainability for Industry 5.0: Sustainability," in *The Synergy of Sustainable Entrepreneurship*, IGI Global Scientific Publishing, 2025, pp. 139–166.

[11] K. Baziene, J. Gargasas, S. Rajendran, and J. N. Solomon, "TOWARDS CIRCULAR ECONOMY THROUGH NOVEL WASTE RECYCLING TECHNOLOGIES.," *J. Entrep. Sustain. Issues*, vol. 12, no. 2, 2024.

[12] H. G. Ramírez-Escamilla, M. C. Martínez-Rodríguez, A. Padilla-Rivera, D. Domínguez-Solís, and L. E. Campos-Villegas, "Advancing toward sustainability: a systematic review of circular economy strategies in the textile industry," *Recycling*, vol. 9, no. 5, p. 95, 2024.

[13] R. Nayak, M. Akbari, and S. M. Far, "Recent sustainable trends in Vietnam's fashion supply chain," *J. Clean. Prod.*, vol. 225, pp. 291–303, 2019.

[14] A. Chakraborty, D. De, and P. K. Dey, "Circular Economy in Small and Medium Sized Enterprises—Current Trends, Practical Challenges and Future Research Agenda," 2025.

[15] D. G. da Fontoura, S. V. Bonato, V. de C. Junges, G. de O. Rodrigues, and C. S. Salomão, "Barriers and opportunities of the circular economy in small and medium enterprises: a systematic review of the literature," *Rev. Adm. da UFSM*, vol. 17, no. 3, p. e5, 2024.

[16] S. Mishra, D. Sahoo, and S. Mohapatra, "Circular economy adoption in MSMEs: unveiling enablers and barriers," *Int. J. Dev. Issues*, 2024.

[17] M. S. Dennison, M. B. Kumar, and S. K. Jebabalan, "Realization of circular economy principles in manufacturing: obstacles, advancements, and routes to achieve a sustainable industry transformation," *Discov. Sustain.*, vol. 5, no. 1, p. 438, 2024.

[18] A. N. Maharani and E. Sisdianto, "Analisis Pengaruh Regulasi Pemerintah Terhadap Penerapan Akuntansi Lingkungan," *J. Ilm. Ekon. MANAJEMEN, BISNIS DAN Akunt.*, vol. 2, no. 1, pp. 208–218, 2025.

[19] V. Siagian and N. D. P. Sinaga, "SUSTAINABILITY AND TAX INCENTIVES," *EKUITAS (Jurnal Ekon. dan Keuangan)*, vol. 8, no. 4, pp. 687–701, 2024.

[20] M. D. Rai, T. Sahu, F. Khatoon, S. Singh, and B. Saikia, "Circular Economy Strategies for Resource Efficiency and Sustainable Development in Manufacturing Industries".

[21] N. L. Eyo-Udo, M. O. Agho, E. C. Onukwulu, A. K. Sule, and C. Azubuike, "Advances in circular economy models for sustainable energy supply chains," *Gulf J. Adv. Bus. Res.*, vol. 2, no. 6, pp. 300–337, 2024.