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Circular Economy and Sustainability in Fashion Products: A Bibliometric Review of the Literature

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Abstract: *The objective is to analyze the growth and evolution of research on circular economy practices in sustainable fashion across Asia, emphasizing descriptive trends and shifts over time. It aims to identify influential authors, journals, and collaborative networks shaping the field, while exploring conceptual and intellectual networks to uncover research gaps and emerging areas for future academic and industry advancements. The study employed bibliometric analysis using publications sourced from the Scopus database, covering 65 scholarly documents between 2016 and 2024. Data analysis was conducted using Biblioshiny (R), focusing on conceptual structures, research clusters, and emerging topics. The methodology included keyword-based searches and filtering by geographic relevance to Asian countries. This study emphasizes collaborative efforts among policymakers, industry leaders, and academia to integrate circular economy practices into fashion, fostering sustainable consumption, reducing waste, and driving eco-conscious choices to mitigate environmental harm effectively.*

Keywords: *Circular Economy, Sustainable Fashion Products, Bibliometric Analysis, Waste Management, Resource Efficiency*

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1. Introduction

The progression towards a sustainable and resource-efficient economy is urgent due to escalating environmental challenges. Central to this transformation is the framework of the Circular Economy (CE), which aims to substitute the conventional linear "take-make-dispose" model with regenerative, closed-loop systems. Unlike the linear approach—characterized by continuous production, consumption, and disposal, which leads to exhaustion of resources and environmental degradation—the CE focuses on maximizing energy and material utility through reuse, recycling, and sustainable design (Ghisellini et al., 2016; Korhonen et al., 2018). This model not only promotes environmental sustainability but also fosters economic innovation, job creation, and enhanced resource productivity.

The fashion and textile industry is among the most resource-intensive industries, contributing significantly to global environmental degradation. With over 100–150 billion

garments produced annually, the industry is a prominent source of water consumption, CO_2 emissions, and microplastic pollution (Gazzola et al., 2020; Quantis, 2018). These issues highlight an urgent need for circularity in the sector. In response, stakeholders are embracing eco-friendly product lines, transparent supply chains, and sustainable practices such as recycling, upcycling, and material innovation (Kim et al., 2021; Li et al., 2021). Innovations in textile design and business models are increasingly central to reducing the environmental impact of fashion.

The European Union has made notable progress in promoting CE through initiatives like the "Closing the Loop" action plan (European Commission, 2015), which advocates for enhanced recycling and reuse. Legislative frameworks and cross-sectoral partnerships further reinforce the continent's commitment to sustainable economic growth. Reports such as ETC/WMGE 6/2019 emphasize CE's potential to reduce environmental burdens while opening up new economic opportunities, particularly within the textile sector.

However, assimilating CE principles into the fashion industry presents several issues. Many garments are not designed with circularity in mind, often lacking durability, material homogeneity, or disassembly-friendly features (Durham et al., 2015). Moreover, consumer behavior plays a critical role; acceptance of secondhand or upcycled clothing is influenced by emotional attachment, hygiene concerns, and sustainability awareness (Yan et al., 2021; Kim et al., 2021). Educational initiatives, design innovation, and effective take-back schemes (Kant Hvass & Pedersen, 2019) are key strategies for overcoming these obstacles.

This study makes a significant contribution to the growing body of knowledge on circular economy practices in the context of sustainable fashion, with a particular focus on Asian countries. Through bibliometric, it uncovers underexplored research gaps and provides insights for advancing sustainability and resource efficiency in the region's fashion industry. It highlights the evolution of scholarly interest, identifies major research hotspots, and uncovers underexplored areas that warrant further investigation. Furthermore, the study identifies gaps and opportunities for further research in sustainable innovation.

The objective is to analyze the growth and evolution of research on circular economy practices in sustainable fashion across Asia, emphasizing descriptive trends and shifts over time. It aims to identify influential authors, journals, and collaborative networks shaping the field, while exploring conceptual and intellectual networks to uncover research gaps

and emerging areas for future academic and industry advancements.

2. Literature Review

The shift to a circular economy (CE) in the fashion and textile industries has received a lot of interest because it has the potential to reduce environmental damage and enhance sustainability. An in-depth knowledge of the implementation of CE principles requires investigating various strategies, barriers, and institutional drivers that facilitate or hinder this transition. The (Ellen MacArthur Foundation, 2013) outlines the economic and business benefits of shifting to a circular economy, emphasizing resource efficiency, innovation, and long-term growth through regenerative design and closed-loop systems. (Goldsworthy and Earley, 2018) discuss how textile design plays a crucial role in enabling circular economy transitions, emphasizing innovative design practices, collaboration, and systemic thinking to reduce waste and enhance sustainability.

Several studies emphasize the significance of institutional incentives and policy support in driving CE practices within the fashion and textile sectors. (Fischer and Pascucci, 2017) explore the Dutch textile industry, highlighting that policy support, collaboration, and innovation are essential institutional incentives for promoting sustainability. They argue that without strong institutional backing, such as tax incentives or regulatory frameworks, the shift toward CE will face significant hurdles. Similarly, (Marques et al., 2020) discuss how new business models, incorporating CE principles, can help fashion companies reduce waste and enhance long-term value creation. These findings emphasize the essential role of institutional frameworks and stakeholder collaboration in driving circular transitions. (Lazarevic and Valve, 2017) examine various narratives surrounding the circular economy in Europe, highlighting common objectives and differing expectations that impact policies, stakeholder involvement, and transition strategies. (Hawley, 2009) examines textile recycling through a systems lens, stressing the need for collaboration, infrastructure, and innovation to improve recycling efficiency and sustainability. (Jacometti, 2019) analyzes legal frameworks supporting circular economy in fashion, emphasizing the need for stronger regulations, producer responsibility, and sustainable waste management to drive industry transformation. (Rathinamoorthy, 2019) discusses circular fashion principles, focusing on sustainable design, production, and consumption models that minimize waste, extend product life, and support recycling within the textile and apparel industry.

The role of design in implementing CE principles is also widely acknowledged.

(Vecchi, 2020) introduces the Circular Fashion Framework, emphasizing strategies like design for longevity, resource efficiency, and consumer engagement to embed circularity in fashion products. Moreover, (Karell, 2018) focuses on design for circularity, arguing that modularity, material transparency, and repairability are crucial to achieving sustainable outcomes in fashion. These design principles play a key role in decreasing the fashion industry's dependence on virgin materials and reducing waste.

Moreover, the adoption of innovative materials is an increasing trend in advancing the circular economy within the textile industry. (Provin and Dutra, 2021) investigate how food industry waste can be repurposed for biotextile production, showcasing its potential to be converted into valuable resources in the fashion industry. This study aligns with broader circular economy strategies, which promote waste reduction and resource efficiency. Similarly, (Ostermann et al., 2021) analyze business model innovation in fashion industry startups, highlighting sustainable practices like resource efficiency that are vital for promoting a circular economy.

However, the shift towards a circular economy faces various barriers. (Dissanayake and Weerasinghe, 2022) identify key barriers, including supply chain complexities and resistance to change, that impede the widespread adoption of CE in fashion. These barriers are echoed by (Kazancoglu et al., 2020), who argue that high initial costs and inefficiencies in resource management are significant challenges for the textile industry's circular supply chains. The requirement for technological advancements and enhanced collaboration between stakeholders is therefore vital for overcoming these barriers. (Franco, 2017) examines how incumbent firms in the textile industry struggle with adopting circular economy practices, facing barriers like internal resistance, rigid structures, and market constraints in dynamic environments. (Hartley et al., 2022) identify key barriers to circular economy adoption in Dutch technical and interior textiles, including regulatory hurdles, limited collaboration, high costs, and resistance to change.

Consumer perceptions are also vital in driving the implementation of circular economy practices. (Papamichael et al., 2023) explore how stakeholders in the fashion industry recognize the significance of CE for sustainability but are often deterred by factors such as cost and awareness. (Gazzola et al., 2021) further examine how gender and generational differences influence consumers' attitudes toward sustainability and circularity in fashion, which highlights the importance of

targeting specific consumer groups to foster eco-friendly practices.

Innovation in business models is another critical element driving the transition toward circularity. (Ostermann et al., 2019) and (Dziubaniuk et al., 2023) emphasize that innovative business frameworks, particularly those focusing on resource efficiency and collaboration, are key drivers of sustainable practices in fashion. These business frameworks not only promote the reuse of materials but also create new market opportunities that can accelerate the circular economy transition.

Besides these innovations, some research has focused on the role of second-hand markets in promoting CE within the fashion industry. (D'Adamo et al., 2022) argue that second-hand markets serve as an essential sustainable practice, reducing waste and fostering responsible consumption. This practice, they suggest, is an example of a best practice in sustainable business models that can drive circularity by extending the lifecycle of products. **(**Han et al., 2017) compare standard and upcycled fashion, highlighting upcycling's sustainability benefits and creative challenges in design, production, and scaling within the fashion industry.

3. Research Methodology

The research draws on publications sourced from Scopus database because it provides enhanced metadata, detailed author and institution profiles, and maintains stringent content selection standards (Baas et al., 2020). It has been widely applied in research evaluations, such as science policy reviews and the formulation of university rankings (Baas et al., 2020). It is essential to highlight that the initial search utilized the following combinations of keywords: *"circular economy*" and "sustainable fashion* product*"*. However, this search produced only 3 results. To address this limitation, the search was expanded and finally, the combinations of keywords and booleans employed for the search were: *"Circular economy*" and "Fashion* industry*" or "fashion* product*" or "sustainable fashion* product*"*. We have utilized the asterisk (*) to account for various derivatives of the words.

The data was restricted to the English language and covers the period from 2016 to 2024, a period marked by the growing worldwide focus on sustainability and regulatory developments, for instance the Paris Agreement in 2015. Documents in the final stage of publication were selected, as the publication stage is a critical factor in bibliometric studies. Typically, most analyses prioritize finalized publications (Sofyan et al., 2022).

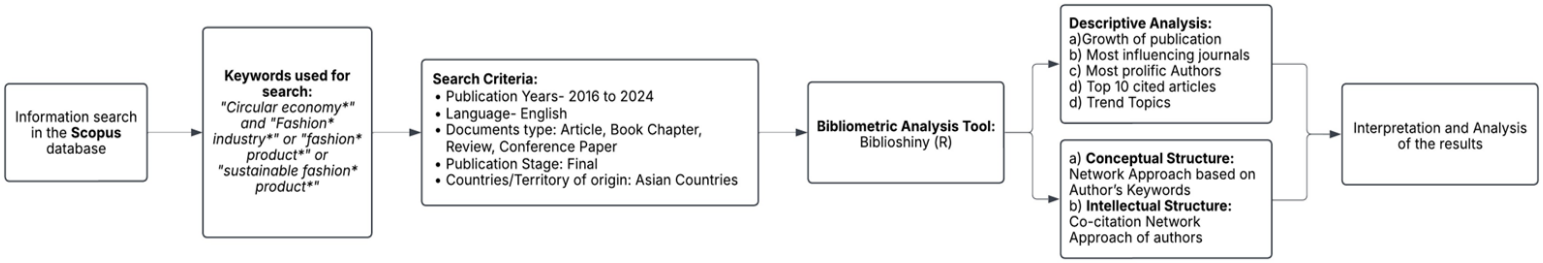

Fig. 1: Execution process. Source: Authors' own elaboration.

This research further narrowed its scope by including only publications originating from Asian countries or territories, focusing on geographical relevance. After applying appropriate and suitable filters, the final count of the results was 65. The kinds of documents composed mainly of articles (46), then book chapters (10), review (7) and conference papers (2). **Fig.1** depicts the execution process followed for the bibliometric analysis. For the analysis and to create the conceptual maps, Biblioshiny (R), a tool designed for constructing and analyzing bibliometric networks (Martínez-Infante et al., 2023), has been utilized.

4. Data Analysis

The dataset (**Fig. 2**), centered on Asia, provides a valuable basis for understanding research trends in the region. It includes 39 sources and 65 documents with a robust annual growth rate of 46.31%, reflecting a growing interest in this field within Asian countries. The focus on publications from this region underscores the importance of localized perspectives on global issues. Collaboration is a notable aspect, with an average of 3.86 co-authors per document and substantial international partnerships, signifying Asia's active engagement in the global research landscape. An average age of 2.68 years signifies that the publications are relatively recent, indicating an active and evolving research field. It reflects the timeliness of the studies and highlights ongoing academic interest in the topic.

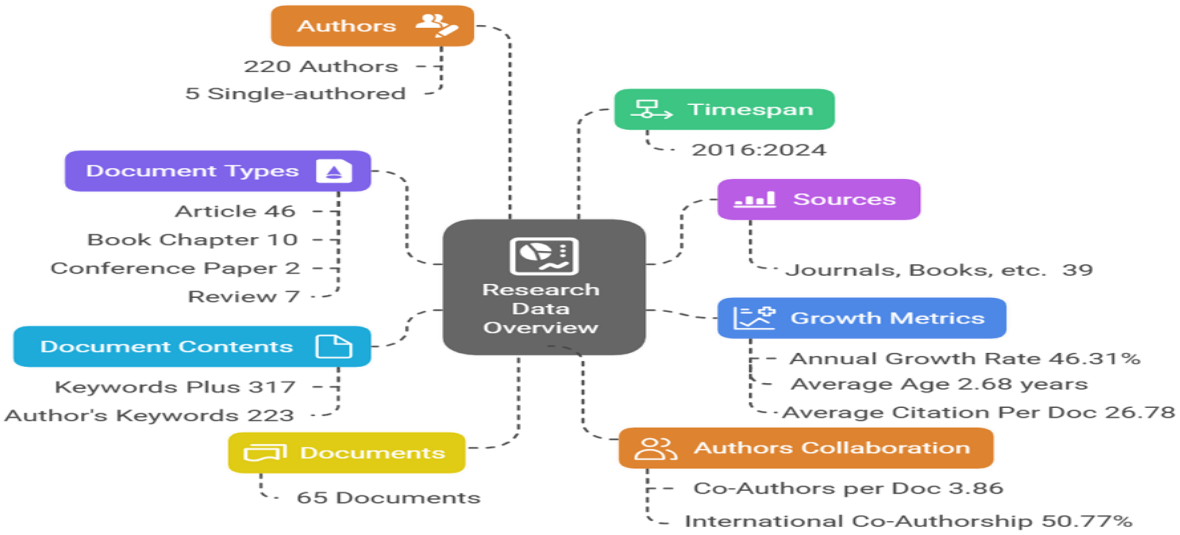

Fig. 2: Overview of Research Data Metrics. Source: Authors' own elaboration derived from Scopus database

4.1 Growth of publication

The data, in **Fig. 3**, shows steady growth from 2016 to 2024. The early years, 2016 to 2018, show relatively limited output, reflecting the initial stages of academic interest in this area. However, from 2020 onwards, there is a significant surge, likely driven by increased regional awareness, policies, and initiatives focused on sustainability and the circular economy. The growth reaches its peak in 2024, showcasing heightened engagement and robust contributions from the region.

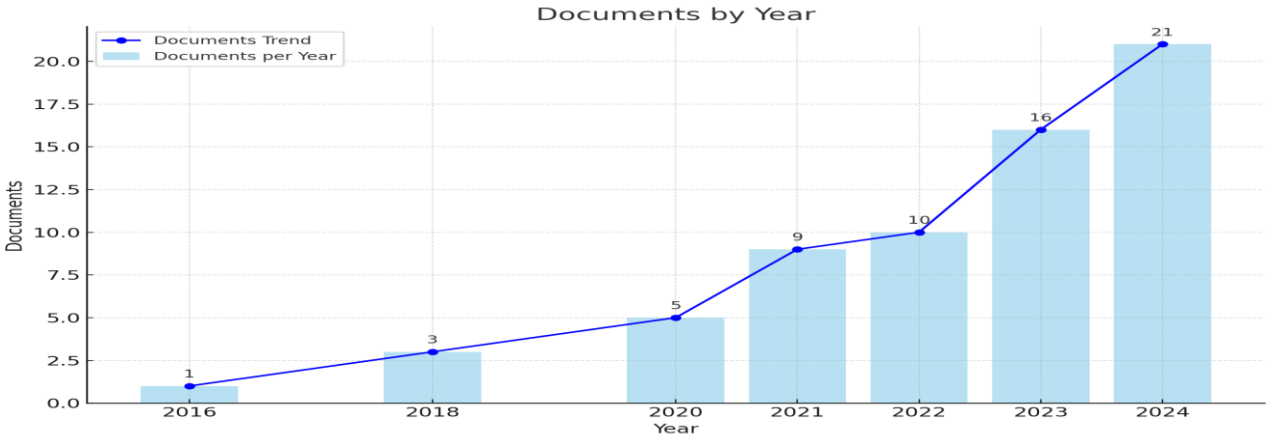

Fig. 3: Annual Production and trend of Documents. Source: Authors' own elaboration derived from Scopus database

4.2 Most influencing journals

The **Fig. 4** shows top-10 prolific journals and their respective contributions to the research field, reflecting trends in academic

dissemination related to circular economy and fashion products. With 13 articles, *Sustainability (Switzerland)* journal is the most significant contributor, underlining its focus on sustainability topics. Its dominance indicates that it is a primary platform for research in areas related to the circular economy in Asia. *Business Strategy and the Environment*, with 4 articles, demonstrates the growing incorporation of circular economy practices into business strategies, including the fashion industry. *Journal of Cleaner Production* follows with 3 articles, reflecting its emphasis on sustainability practices and eco-friendly production methods. This reflects both the maturity and evolving nature of research on the circular economy and sustainable fashion. The presence of specialized journals highlights interdisciplinary efforts, with a notable focus on practical applications in textiles and apparel.

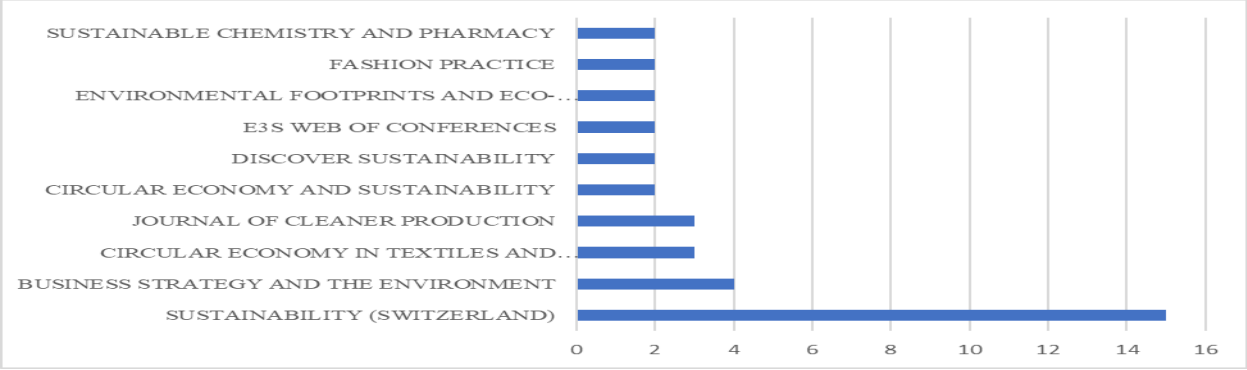

Fig. 4: Number of articles per source. Source: Authors' own elaboration derived from Scopus database

4.3 Most prolific Authors

Table 1 presents the contribution of authors to the research on the circular economy, potentially with relevance to fashion products in Asia. It shows their total articles and a fractionalized count. The fractionalized approach distributes authorship credit when articles are co-authored, giving insights into individual contributions. Leading contributors, such as PAPAMICHAEL I, VOUKKALI I, and ZORPAS AA, each with six articles and a highest fractionalized count of 0.89, demonstrate a strong and consistent engagement in advancing this research field. PAPAMICHAEL I advocated the critical role of transitioning the fashion industry toward a circular economy to mitigate its environmental impact. By replacing synthetic materials with natural alternatives and encouraging a shift from disposable consumption to mindful purchasing, the study identifies economic opportunities within the waste management framework (Papamichael et al., 2022). Emerging contributors, such as CHANDRAVELU P and KARUPPIAH K,

KARUPPIAH K, though contributing fewer articles, bring valuable perspectives and specialized insights to the field.

Table 1: Key Contributors in shaping the research area (Top- 10)

Author's Name	No. of Articles	Articles Fractionalized	Author's Name	No. of Articles	Articles Fractionalized
Papamichael I	6	0.89	Naddeo V	3	0.39
Voukkali I	6	0.89	Chandravelu P	2	0.37
Zorpas AA	6	0.89	Chatziparaskeva G	2	0.33
Economou F	3	0.39	Karuppiah K	2	0.37
Loizia P	3	0.41	Liscio MC	2	0.24

Source: Authors' own elaboration derived from Scopus database

This collective effort underlines the importance of teamwork and interdisciplinary approaches in addressing the challenges posed by integrating circular economy principles into industries like fashion, particularly within Asia.

4.4 Top 10 cited articles

Table 2 offers a snapshot of various academic papers, highlighting their impact across 3 metrics: total citations, annual citations (TC per Year), and normalized citations (Normalized TC). The paper by (*Shirvanimoghaddam et al., 2020)* published in *Science of the Total Environment* leads in total citations (348) and annual citations (58.00), making it the most impactful in absolute terms. Recent entries such as (*Papamichael et al., 2022)* and (*Dissanayake DGK, 2022)* demonstrate impressive annual citations (17.75 and 20.50, respectively), indicating their growing relevance. (*Shirvanimoghaddam et al., 2020)* and (*Papamichael et al.,2022)* emphasized collaborative efforts among policymakers, businesses, and consumers to overcome recycling challenges and drive sustainable transformation in the fashion industry, aligning economic opportunities with environmental preservation. Journals like *Science of the Total Environment* and *Sustainability* appear consistently in the analysis, underscoring their roles as key platforms for impactful research. However, certain works, like (*Mishra et al., 2020)* in the *Social Responsibility Journal*, despite having a decent citation count, display lower normalized citations, hinting at a more niche audience.

Table 2: Most Cited Documents

Title of the Article	Author's Name	Total Citations	Per Year TC	TC Normalized
Death by waste: Fashion and textile circular economy case	Shirvanimoghaddam et al., 2020	348	58.00	2.77
Blockchain-enabled circular supply chain management: A system architecture for fast fashion	Wang et al., 2020	161	26.83	1.28
Consumers' value and risk perceptions of circular fashion: Comparison between secondhand, upcycled, and recycled clothing	Kim et al., 2021	105	21.00	2.44
Possibility routes for textile recycling technology	Damayanti et al., 2021	90	18.00	2.09
The anatomy of circular economy transition in the fashion industry	Mishra et al., 2020	85	14.17	0.68
Consumer attitudes towards new circular models in the fashion industry	Musova et al., 2021	82	16.40	1.90
Towards Circular Economy in Fashion: Review of Strategies, Barriers and Enablers	Dissanayake & Weerasinghe, 2022	82	20.50	2.57
Building a new mind set in tomorrow fashion development through circular strategy models in the framework of waste management	Papamichael et al., 2022	71	17.75	2.23
Toward a circular economy: Understanding consumers' moral stance on corporations' and individuals' responsibilities in creating a circular fashion economy	Ki et al., 2020	62	12.40	1.44
Implementation of Digitalized Technologies for Fashion Industry 4.0: Opportunities and Challenges	Akram et al., 2022	52	13.00	1.63

Source: Authors' own elaboration derived from Scopus database

4.5 Trend Topics

An analysis was undertaken to ascertain the trending topics over the past four years (2021–2024) based on Keywords. The threshold for minimum word frequency was set at two occurrences. This ensures that only terms appearing at least twice are included in the analysis, allowing for more focused insights. The findings, as shown in **Table 3**, revealed that the prominence and frequency of key research subjects have varied over time. Between 2021 and 2024, emerging trends reveal a shift toward sustainable practices and circular methodologies. High-frequency topics include the textile industry (16) and fashion industry (13), reflecting heightened environmental concerns in production and consumer behavior.

Central themes such as sustainability (15), circular economy (13), waste management (12), and recycling (11) emphasize the commitment to eco-friendly practices and efficient resource use. Additional topics — manufacturing (5), public attitude (4), and supply chain management (4) — highlight operational challenges and societal perceptions. Although landfill (2) and business circular model (2) are less frequent, they represent niche areas ripe for exploration and innovation.

Table 3: Trend Topics

2021	2022	2023	2024
Landfill (2)	Textile (6)	Textile Industry (16)	Manufacturing (5)
Gross Domestic Product (2)	Supply Chain management (4)	Sustainability (15)	Public Attitude (4)
	Business (3)	Fashion Industry (13)	Carbon Footprint (4)
	Business Circular Model (2)	Circular Economy (13)	Footwear Industry (3)
		Waste Management (12)	
		Recycling (11)	

Source: Authors' own elaboration derived from Scopus database

4.6 Conceptual Structure through Network Approach

Analyzing the conceptual structure based on Author's Keywords (shown in the Table 4), revealed distinct themes of research topics in sustainable fashion, classified by their development and relevance. Motor themes, such as fashion waste, textile recycling, and customer behavior, are both highly relevant and well-developed, indicating their central role in the field. The presence of terms like *barriers* suggests ongoing challenges in implementation, highlighting potential research gaps in policy interventions and consumer psychology. Basic themes, including circular fashion and the circular economy, serve as foundational concepts but remain less developed in terms of in-depth analysis. The high frequency of "Circular Economy" (40) shows its dominance in discussions, yet the lower density indicates a need for practical applications, transparency in supply chains, and strategies to combat greenwashing.

Table 4: Themes of research topics classified by their development and relevance

Nature of Themes	Research Themes	Leading terms	Terms with high occurrence
Motor themes (High centrality and density)	Fashion Waste, Textile Recycling, Customer Behavior and Clothing	Fashion Waste, Textile, Barriers, Clothing, Customer Behavior	Fashion Waste- 3 Textile- 2
Basic themes (High centrality but low density)	Circular Fashion and Circular Economy	Circular Economy, Sustainability, Sustainable Fashion, Fashion Industry, Strategy, Circular Fashion, Greenwashing, India, Supply Chain, Sustainable Development Goals	Circular Economy- 40 Fashion Industry- 15 Sustainability- 14 Circular Fashion- 10
Niche themes (Low centrality but high density)	Perceived Value, Social Innovation, Zero Waste, and Business Circular Model	Business Circular Model, Plastic Pollution, Fashion Development,Waste Strategies, perceived value, perceived risk, recycled clothing	Perceived Value- 3 Recycled clothing- 2 Business Circular Model- 2
Emerging or Declining themes (Low centrality and density)	Sustainable Development and Fast Fashion	Fast Fashion, Sustainable development	Sustainable Development- 5 Fast Fashion- 4

Source: Authors' own elaboration derived from Scopus database

Meanwhile, niche themes, such as perceived value, social innovation, and business circular models, are well-developed but not widely connected to mainstream research. These areas focus on consumer psychology and innovative waste strategies but require stronger links to broader circular economy discussions. The emerging or declining themes, including sustainable development and fast fashion, suggest either an evolving research focus or a decline in interest. Despite the persistent debate over fast fashion's impact, its lower centrality could indicate a shift toward alternative sustainability narratives like slow fashion or ethical consumption.

4.7 Intellectual Structure through Co-citation Network Approach

The image (Fig. 5) represents a co-citation network of authors, where nodes (authors) are connected based on how frequently they are cited together. The different colors indicate distinct research clusters, suggesting thematic groupings within the area of circular economy and fashion sustainability. Larger nodes signify influential entities or individuals with higher connectivity within their respective clusters. The connecting lines between clusters highlight interdisciplinary collaborations or overlapping areas of research/work (Negrete-Cardoso et al., 2022). *Niinimäki K* appears as the most central and influential author (largest node in blue), indicating his foundational contributions to sustainable fashion, consumer behavior, and circular economy

principles. Other highly cited authors, such as *Geissdoerfer, Kirchherr, and Shirvanimoghaddam*, indicate strong contributions to sustainability, recycling, and circular business models. It should be noted that the study conducted by (Negrete-Cardoso et al., 2022) has also shown similar results: "*Geissdoerfer and Kircherr, who are interpreted as the most influential authors"*. (Geissdoerfer et al., 2017) clarifies Circular Economy and sustainability, uncovering eight relationship types, similarities, and differences through comprehensive literature analysis.

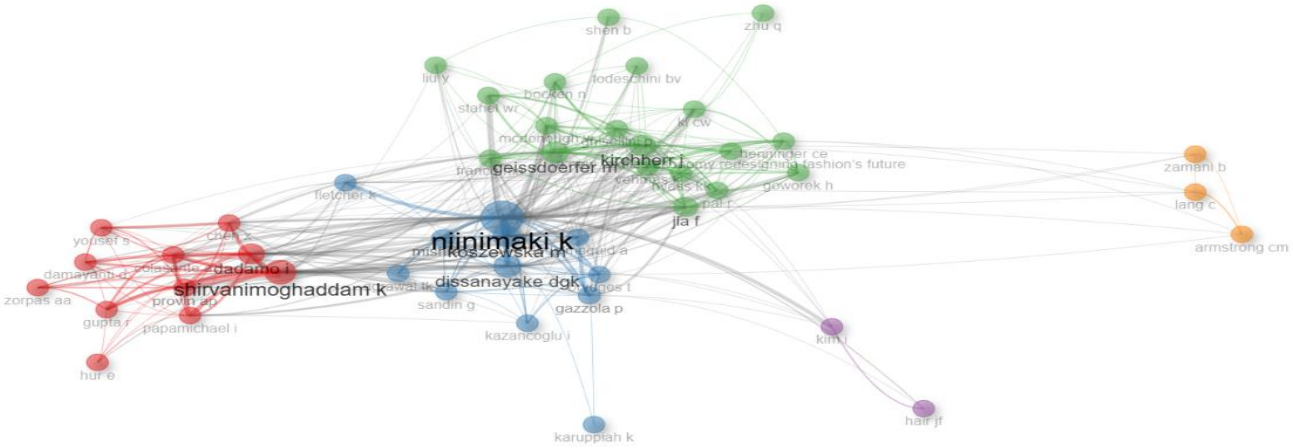

Fig. 5: Co-citation network of authors. Source: Authors' own elaboration derived from Scopus database.

The dense interconnections between major clusters indicate a strong interdisciplinary approach, with sustainability research integrating business strategies, material science, policy frameworks, and consumer studies. **Table 5** shows the different research clusters and their focus areas. The presence of weaker connections to isolated nodes suggests emerging or specialized topics that are not yet fully integrated into mainstream discussions.

Table 5: Different research clusters and their focus areas

Cluster Color	Key Authors	Theme / Focus of Research
Blue	Niinimäki K, Dissanayake DGK	Sustainability in fashion, consumer behavior, circular economy principles
Red	Shirvanimoghaddam, Zorpas AA	Textile recycling, waste management, material innovations
Green	Geissdoerfer M, Kirchherr J	Circular economy frameworks, policy implications, systemic change
Purple	Kim I, Hair JF	Niche research areas, possibly statistical modeling
Orange	Zamani B, Lang C, Armstrong CM	Regional studies on sustainable fashion

Source: Authors' own elaboration derived from Scopus database

5. Limitations and potential avenues for further research

Three limitations of this bibliometric need to be mentioned. Firstly, data was retrieved from the Scopus database only. Even if it is the biggest and most reliable database, adding some additional databases, such as Emerald, Web of Science, or Google Scholar, might enhance the data set for the study. Second, grey literature, which might be useful in obtaining other viewpoints, is not included in the dataset. And lastly, its scope is limited to publications originating from Asian countries or territories. Future research can be done by including data from other databases, without focusing on any particular region. Further research can examine diverse fashion categories (such as apparel, footwear, and accessories), age-specific consumer preferences (like Gen Z and Millennials), and the environmental and behavioral impact of adopting sustainable and green fashion products.

6. Conclusion

This study employed bibliometric analysis, using Biblioshiny (R), to investigate 65 scholarly publications, having Asian origin country/territory, related to circular economy (CE) practices in sustainable fashion. The research offers valuable insights on the growing importance of Circular Economy (CE) principles in sustainable fashion within Asia. The bibliometric approach, centered on publications sourced from the Scopus database, revealed significant growth in academic interest from 2016 to 2024, particularly in topics like textile recycling, consumer behavior, and circular business models. Key contributions from authors, such as Niinimäki K and Papamichael I, highlight the central role of interdisciplinary collaboration in advancing CE practices.

The analysis uncovered notable trends, including the dominance of topics like sustainability, waste management, and recycling, reflecting heightened regional and global awareness of environmental challenges. Journals such as *Sustainability* (Switzerland) emerged as influential platforms for disseminating research, emphasizing CE's role in fostering systemic change. Conceptual and intellectual structures indicated a strong focus on foundational themes, such as circular economy frameworks, but also revealed emerging niche areas like perceived value and social innovation.

Despite advancements, challenges like consumer misconceptions, supply chain complexities, and barriers in recycling infrastructure persist. The study underscores the need for collaborative efforts among

policymakers, industry stakeholders, and academia to bridge gaps and implement effective CE strategies, fostering sustainability in the fashion sector and beyond.

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