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Driving Sustainability Through Renewable Energy: A Review Study of the Indian Apparel Industry

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ABSTRACT

The Indian apparel supply chain is increasingly recognizing the critical role of renewable energy in driving sustainable transitions. This research addresses three important objectives: (1) the identification of key enablers and barriers driving the renewable energy transition, (2) the analysis of notable government policy and incentives for adoption and (3) an evaluation of the quantifiable impacts of renewable energy adoption within the industry. Utilizing a descriptive research methodology, this study examines secondary data to achieve its objectives. The findings indicate that economic limitations are a key concern. In contrast, governmental incentives, increasing awareness and market competition serve as key enablers. The study also highlights several government policies and schemes that effectively reduce economic costs and attract investments in sustainable energy. Furthermore, renewable energy adoption is associated with notable benefits, including improved energy efficiency and significant reductions in carbon emissions across the apparel supply chain.

KEYWORDS: Apparel Supply Chain, Renewable Energy Adoption, Government Policy, Sustainable transition, Energy Efficiency

INTRODUCTION

The apparel industry is a significant contributor to global pollution and is also reported to be the world's second-largest polluting industry, after the paper industry, as it consumes immense quantities of energy and water across its supply chain, from fibre production to garment manufacturing and distribution. This concerning position is primarily attributed to the rise of "fast fashion," highlighting the inherent unsustainability of the current textile and apparel industries (Akter et al., 2019; Shen et al., 2017). The mass production of inexpensive, trend-driven garments with short life cycles has intensified the demand for raw materials and chemical inputs. Consequently, this has significantly increased water and air pollution, exacerbating environmental degradation (Akter et al., 2019).

According to the United Nations Environment Programme (UNEP, 2025), the fashion and textile industry accounts for 2-8% of global greenhouse gas emissions, consumes 215 trillion litres of water annually. UNEP calls for a shift towards circular economy models in the apparel industry, highlighting sustainable production, reuse and repair to mitigate environmental impacts. If this sector continues on its current pace, by 2050, it could use more than 26% of the carbon budget associated with a 2°C global warming limit

(Ellen MacArthur Foundation, 2017). This makes the sector a prime candidate for decarbonization through the adoption of renewable energy.

A supply chain is a coordinated network comprising organisations, individuals, resources, processes, information and technologies that collectively contribute to the production and efficient delivery of a finished product to the end consumer. It encompasses the entire flow of materials and goods, starting from the procurement of raw materials to the final distribution across various stages of the value chain (Islam, 2023). The new paradigm of supply chain revolves around the triple bottom approach, i.e., sustainability in three dimensions, namely social, economic and environmental(Majumdar & Sinha, 2019). As environmental concerns and ethical sourcing have gained prominence, the traditional efficiency-driven supply chains are being re-evaluated through the lens of sustainable development.

As the world's second-largest exporter of textiles and garments, India plays a pivotal role in this scenario. The Indian textile and apparel sector contributes approximately 2.3% to the nation's GDP, 13% to industrial production and 12% to its total export earnings, while employing more than 45 million people (Ministry of Textiles, 2024). The sector encompasses a diverse range of enterprises, from large, export-oriented manufacturers to a vast network of micro, small and medium-sized enterprises (MSMEs). However, the industry's high dependency on fossil fuels and grid electricity, often derived from coal-fired power, makes it an energy-intensive and carbon-intensive sector (International Energy Agency, 2022).

This research paper aims to analyze the current status of renewable energy adoption in the Indian apparel supply chain, identifying key enablers and barriers, evaluating the role of government policies and assessing the measurable environmental impacts such as improvements in energy efficiency and reductions in carbon emissions. The study is based on an extensive review of secondary data, including government portals, industry reports, academic publications and corporate sustainability disclosures.

By focusing on India's apparel sector—a major contributor to both employment and emissions—this paper contributes to the broader discourse on sustainable industrial transitions in emerging economies. In doing so, it aligns with national and global priorities for climate resilience, clean energy adoption and sustainable economic development.

LITERATURE REVIEW

(Vishwakarma et al., 2024) This study addresses the significant environmental impact of the apparel and textile sector and aims to identify key barriers hindering the adoption of sustainable practices. Using an integrated methodology combining Interpretive Structural Modeling (ISM), fuzzy MICMAC and DEMATEL, the research identifies critical barriers such as clothing disposal, technological adaptation, sector efficiency and fashion design issues. A cause-and-effect diagram provides deeper insight into these interrelated challenges. The findings offer a strategic framework for policymakers and industry stakeholders to overcome sustainability barriers and build a more eco-friendly and resilient apparel sector.

(Roy et al., 2020) This study investigates how stakeholder salience and organizational learning influence the adoption of Sustainable Supply Chain Management (SSCM) practices among apparel manufacturers in India. Using survey data from 156 firms, the research identifies two key pathways to SSCM implementation: reactive responses driven by external stakeholder pressure and proactive efforts driven by internal organizational learning. The findings reveal that proactive approaches are more effective in enhancing environmental and operational performance. The study contributes to SSCM literature by highlighting the dual role of stakeholders (internal and external) and emphasizing the importance of organizational learning and responsible management in fostering sustainable supply chains.

(Majumdar & Sinha, 2019) This study explores the key barriers to implementing green supply chain management in the textile and apparel industry of Southeast Asia, a major global production hub. Using literature review, surveys and Interpretive Structural Modeling (ISM), the study identifies 10 critical barriers. Among them, the complexity of the green process and system design emerged as the most influential root barrier. Other major barriers include a lack of consumer support, regulatory guidance and high implementation costs. The lack of green suppliers is the most affected or dependent barrier. The study emphasizes the need to address root causes through green technological innovation, consumer awareness and regulatory support, ensuring the successful adoption of sustainable practices in the industry.

(Akter et al., 2019) This paper focuses on environmental sustainability in the apparel supply chain by highlighting key trends, such as efficient energy use, reuse and recycling, green and life cycle design, life cycle assessment, reverse logistics, green suppliers, branding and marketing. It emphasizes clean manufacturing and Green Supply Chain Management (GSCM) practices as central to building a sustainable apparel industry. The study also outlines major challenges and proposes future research directions, offering valuable insights for both researchers and industry practitioners.

(Raut et al., 2019) This study aims to identify and rank the critical barriers to sustainable development in the Textile and Apparel (T&A) supply chain using a multi-criteria decision-making approach. Fourteen key challenges were identified through literature review and expert input. Using Interpretive Structural Modeling (ISM), the study revealed that lack of effective government policies, poor infrastructure, low integration, low foreign investment and demonetization are the most significant barriers. While the findings offer guidance for policymakers and industry leaders, the study acknowledges potential bias from expert input and suggests that including more factors could enhance model reliability.

(da Silva et al., 2019) This study addresses the growing need for companies to integrate economic, environmental and social considerations into their planning and design decisions. To manage complexity and market uncertainties, the authors propose a Mixed Integer Linear Programming (MILP) model that simultaneously evaluates economic performance and monetized environmental impacts, while incorporating risk management using Conditional Value at Risk (CVaR). The goal is to maximize the net present value minus environmental costs while minimizing risk. Using the augmented ε-constraint method, the model generates a Pareto-optimal trade-off curve to aid decision-making based on risk profiles. A European supply chain case study illustrates the model's practical application.

(Shen et al., 2017) This paper highlights the growing importance of sustainability in the textile and apparel supply chain, with companies like H&M, Patagonia and The North Face adopting various strategies such as sustainable product design, investment, performance evaluation, corporate social responsibility and environmental management systems. It provides an overview of fifteen articles featured in a special issue, summarizing their key findings and outlining future research directions in the field of sustainable supply chain management (SSCM) within the textile and apparel industry.

(Siddiq, I., & Shobana, M. D.) This study examines the relationship between government policies and the adoption of sustainable practices in India's Micro, Small and Medium Enterprises (MSME) sector, which plays a vital role in the nation's economy. It highlights the need to align economic growth with environmental conservation, recognizing sustainability as a key driver of long-term development. The research evaluates how current policy frameworks influence MSMEs' sustainability efforts and offers recommendations to improve policy effectiveness. Emphasizing the global importance of sustainability, the study underscores how policy-driven initiatives can enhance MSMEs' competitiveness, community wellbeing and resilience.

(Kunci et al., n.d.) This study examines how fast fashion brands are shifting toward sustainability in response to criticism over their environmentally harmful practices. It presents a structured review of annual reports to assess energy efficiency and environmental sustainability within supply chain management (SSCM). By comparing the sustainability efforts of leading brands, the study identifies key factors influencing sustainable supply chain performance. It also explores how these initiatives impact customer perceptions, based on five years of sustainability data from top fashion brands. The findings highlight the growing role of SSCM in transforming fast fashion toward more sustainable operations.

RESEARCH OBJECTIVES

Based on available literature, this study focuses on the following research objectives-

1. The key barriers and enablers affecting the renewable energy transition in the apparel supply chain.
2. The major government policies and incentives that promote the adoption of renewable energy in the Indian apparel industry.
3. The measurable impacts of renewable energy adoption by Indian apparel supply chains.

RESEARCH METHODOLOGY

Research Design

The research employs a Descriptive Research Design to analyze and achieve the study's objectives systematically. The descriptive approach is suitable for providing an accurate depiction of the phenomenon by relying on existing information rather than experimental manipulation (Kumar, 2018).

Data Collection

To develop a holistic understanding of the topic, data for this study were collected from secondary sources, including a review of existing national and international literature, research papers, articles, government reports & publications and academic journals available on various e-databases. Using secondary data is a cost-effective and reliable method to gather relevant information and gain insights into sustainability practices without direct data collection from primary sources (Johnston, 2014).

ANALYSIS AND DISCUSSION

OBJECTIVE 1. The key barriers and enablers affecting the renewable energy transition in the apparel industry

The transition to renewable energy in the apparel industry is a complex process shaped by a variety of barriers and enabling factors that collectively determine the pace and success of adoption. To fulfill this objective, the available literature is considered from various sources, including journals and research papers. The information is presented in a tabular format for easier understanding.

Table 1: Studies regarding barriers and enablers that affect renewable energy transition in the apparel industry

Studies	Authors	Country	Statistical Technique	Barriers	Enablers
The Role of Renewable Energy in Confronting Climate Change	(Mostafa & Mohamed, 2025)	Egypt	Descriptive methodology using	-	Economic and environmental benefits

and Reducing the Environmental Impact of the Apparel Industry			analytical techniques		
A triple helix framework for strategy development in circular textile and clothing supply chain: an Indian perspective	(Majumdar et al., 2022)	India	Grey-DEMATEL analysis	-	Consumer awareness, circular clothing design, automated sorting technology, upscaling chemical recycling, enacting incentives and making recycled fibre economically - competitive
Analysis of enablers for implementation of sustainable supply chain management – A textile case	(Diabat et al., 2014)	India	Interpretative Structural Modelling (ISM)	-	Adoption of safety standards, green practices, Community economic welfare, Health and safety issues, Employment stability
Strategies to mitigate barriers to supply chain sustainability: an apparel manufacturing case study	(Chowdhury et al., 2023)	-	Both qualitative and quantitative methods	-	Incentives, awareness and supplier development
Analyzing the barriers of green textile supply chain management in Southeast Asia	(Majumdar & Sinha, 2019)	Southeast Asian countries	Literature review, surveys and Interpretive Structural	Complexity of the green process, system design, lack of consumer	-

using interpretive structural modeling			Modeling (ISM)	support, regulatory guidance, high implementation costs and lack of green suppliers	
Critical barriers to adopt sustainable manufacturing practices in medium-sized ready-made garment manufacturing enterprises and their mitigation strategies	(Muhshin Aziz Khan et al., 2024)	-	Delphi Method and expert consensus	Higher prices of sustainable products, limited supplier commitment and lack of access to information	-
Ranking the barriers of sustainable textile and apparel supply chains: An interpretive structural modelling methodology	(Raut et al., 2019)	-	Interpretive Structural Modelling (ISM)	Poor infrastructure, lack of effective governmental policies, level of integration, low foreign investment and demonetization	-
Breaking barriers: paving the path to sustainable fashion – insights for a greener apparel and textile sector	(Vishwakarma et al., 2024)	-	Interpretive Structural Modelling (ISM), fuzzy MICMAC and DEMATEL	Clothing disposal, technology adaptation, sector efficiency and fashion design issues	-
Exploring the barriers to implement industrial symbiosis in the apparel	(Hossain et al., 2024)	Bangladesh	Survey	Lack of technology and infrastructure, inter-company cooperation,	Sector's resilience, resource efficiency and environmental performance

manufacturing industry: Implications for sustainable development				management support	
The challenges to circular economy in the Indian apparel industry: a qualitative study	(Zaidi & Chandra, 2024)	India	Delphi and Survey Method	Standards and regulatory barriers, strategic barriers, supply chain management and technology barriers	Top management support, coordinating supply chain components, training and employee motivation.
Barriers to adopting circular economy practices in Indian textile industries	(R. Sharma et al., 2025)	India	DEMATEL	Lack of economic feasibility	Financial support, effective reverse logistic system, awareness program, policies and regulations
What motivates and inhibits Indian textile firms to embrace sustainability?	(A. Sharma & Narula, 2020)	India	Survey	Initial cost of compliance	Regulatory, market and economic factors
Exploring current enablers and barriers for sustainable proximity manufacturing	(Sirilertsuwan et al., 2019)	Europe	Semi-structured interviews	Expensive production cost and lack of industrial set-up	High-quality suppliers, short lead-time and fast replenishment
Developing a framework to analyse the effect of sustainable manufacturing adoption in Indian textile industries	(Chourasiya et al., 2022)	India	SPSS 18.0	Lack of top management attitude, green practices, high quality, lack of acceptance and lack of CE awareness	Government policies, internal auditing system, society's awareness, joint learning process and knowledge exchange

(*Source: Researcher's compilation*)

Based on the studies mentioned in Table 1, factors that act as enablers are Economic and Environmental wellness, Consumer Awareness, Competition, Technology, Employment Stability, Government Incentives and Health & Safety, whereas the factors acting like barriers are Complex Technology and Process, lack of Customer Support, Regulatory Guidance, Cost of implementation, suppliers' support, high prices of products, lack of information access, poor infrastructure.

OBJECTIVE 2. The major government policies and incentives that promote the adoption of renewable energy in the Indian apparel industry.

Governmental policies and industry standards play a pivotal role in shaping the adoption of sustainable practices by providing incentives, regulations and certification schemes that encourage responsible production practices (Chourasiya et al., 2023). The key policies and incentives of the Indian Government to promote and facilitate the adoption of renewable energy in the apparel industry are-

a. MSE-Green Initiative for Future Transformation (MSE-GIFT)

SIDBI launched this initiative in 2023 to accelerate the adoption of clean energy among micro and small enterprises to reduce carbon footprints and improve energy use metrics. It provides finance to MSEs at a concessional rate for the incremental cost of green technologies, clean transportation and energy-efficient projects, waste management, etc. (Small Industries Development Bank of India).

b. Green Finance Scheme by SIDBI

This scheme aims to promote the adoption of renewable energy and energy-efficient technologies in micro, small and medium industrial units. It offers loans at flexible terms. MSMEs on either the supply side or the demand side of the green value chain are eligible under this scheme (Small Industries Development Bank of India).

c. PM-Mega Integrated Textiles Region and Apparel Park (PM-MITRA)

Announced in 2021, PM-MITRA Parks are designed to support India in achieving Sustainable Development Goal 9, which focuses on building resilient infrastructure, promoting sustainable industrialization and encouraging innovation. The objective of this scheme is to establish 7 integrated textile parks across India. These parks promote sustainable practices by integrating the entire textile value chain in a single location, resulting in reduced logistics costs and motivating the adoption of renewable energy sources (Ministry of Textiles, 2024).

d. Sustainable Resolution (SU.RE Project)

The SU.RE Project (short for Sustainable Resolution) is a notable sustainability initiative in India's textile and apparel industry. It was launched in 2019 to promote sustainable fashion practices across the country. The 5 core commitments under the SU.RE Project are understanding environmental impact, sustainable raw material sourcing policy, effective communication of sustainability initiatives, choosing sustainable and renewable materials and processes while ensuring traceability throughout the value chain and supporting the United Nations Sustainable Development Goals.

e. End-to-End Energy Efficiency (4E Scheme)

With the aim of creating a streamlined process from energy auditing to implementing the energy-efficient solutions, this scheme is implemented. It benefits MSMEs in the manufacturing and service sectors by providing energy audit support, a loan for implementing solutions based on audit recommendations and eligible upgradation (Small Industries Development Bank of India).

f. Integrated Processing Development Scheme (IPDS)

The Integrated Processing Development Scheme (IPDS) was initiated by the Ministry of Textiles, Government of India. The primary objective of IPDS is to make the textile industry globally competitive by facilitating the use of environmentally friendly processing standards and technologies. The IPDS supports both the creation of new processing parks and the upgradation of existing clusters, mainly related to water and wastewater management and also promotes R&D for clean and green technologies in the processing sector (Ministry of Textiles).

g. BEE-SME Program

The BEE-SME program refers to an initiative by the Bureau of Energy Efficiency (BEE) targeting Small and Medium Enterprises (SMEs) in India. The program aims to enhance energy efficiency and foster sustainable development within the SME sector, which, despite its significant contribution to the Indian economy, often lacks access to modern energy-efficient technologies. This is pursued through targeted interventions, including knowledge dissemination, capacity building and the development of appropriate financial mechanisms (Bureau of Energy Efficiency).

h. Scheme for Integrated Textile Parks (SITP)

The SITP is a government initiative in India, launched in 2005, intending to provide world-class, state-of-the-art infrastructure facilities for setting up textile industry units that meet international environmental and social standards. SITP will develop new parks of international standards at key potential growth centres (Ministry of Textiles).

Table 2: The major incentives and policies of the Indian government for the adoption of renewable energy in the apparel industry

Initiative/Scheme	Launched in	Implementing body	Objective	Key Feature/Benefit
MSE-Green Initiative for Future Transformation (MSE-GIFT)	2023	SIDBI	Accelerate the adoption of clean energy by MSEs	Concessional finance for green tech, clean transport, energy-efficient projects and waste management
Green Finance Scheme	2022	SIDBI	Promote renewable energy and energy efficiency in MSMEs	Loans with flexible terms for MSMEs in green value chains (supply/demand side)
PM-MITRA (Mega Integrated Textiles Region & Apparel Parks)	2021	Ministry of Textiles	Support SDG 9 through integrated textile parks	7 parks to reduce logistics costs and promote renewable energy integration
SU.RE Project (Sustainable Resolution)	2019	Clothing Manufacturers Association of India (CMAI)	Promote sustainable fashion practices	5 core commitments: sustainable materials, traceability, environmental impact awareness, effective

				communication of sustainability initiatives and SDG alignment
4E Scheme (End-to-End Energy Efficiency)	2014	SIDBI	Streamline energy audits to implementation	Energy audit support, concessional loans for implementation and technology upgradation support
Integrated Processing Development Scheme (IPDS)	2014	Ministry of Textiles	Make Indian textiles globally competitive with eco-friendly processing	Supports eco-friendly tech, water/wastewater management and green R&D
BEE-SME Program	2009	Bureau of Energy Efficiency (BEE)	Enhance energy efficiency in SMEs	Capacity building, awareness and financial access to modern energy-efficient technologies
Scheme for Integrated Textile Parks (SITP)	2005	Ministry of Textiles	Provide modern infrastructure for the textile industry	State-of-the-art parks with a focus on international environmental and social standards

(Source: Researcher's Compilation)

OBJECTIVE 3. The measurable impacts of renewable energy adoption by Indian apparel supply chains. Renewable energy adoption in India's apparel supply chains delivers significant measurable benefits, notably by enhancing energy efficiency and reducing carbon emissions, while also improving economic viability compared to conventional electricity. The government's policy support and efforts to raise sustainability awareness among apparel units underscore the critical importance of this transition.

a) Energy Efficiency

Renewable energy initiatives in the supply chain of India's apparel industry have led to significant improvements in energy efficiency. The following are some of the notable examples to prove the above statement-

- The Pali Textile Cluster made significant strides in energy efficiency by implementing energy-efficient upgrades and optimizing industrial processes. These initiatives resulted in a remarkable saving of 309 tonnes of oil equivalent (toe), (BEE-UDIT Portal).
- Three Small and Medium Enterprises (SMEs) operating jet dyeing units under the BEE demonstration projects reported a combined savings of 593 toe in FY 2019–20 (BEE Final Impact Report).
- Ambika Cotton Mills installed a rooftop solar power system with a capacity of 8.3 MW, generating approximately 11.57 million kWh of electricity annually, contributing significantly to power savings and environmental sustainability(Indian Textile Companies Harnessing Solar Power for Sustainable Growth - The Textile Magazine, 2023).

a) Carbon Emissions Reduction

The Indian textile industry is increasingly integrating renewable energy sources to reduce carbon emissions. Some of the measurable impacts are-

- One of the country's largest garment manufacturers, the Shahi Exports has offset over 600,000 metric tons of CO_2 equivalent by transitioning to renewable electricity, achieving a 65% reliance on clean power (*Shahi's Journey to Achieving 100% Renewable Electricity - Shahi*, n.d.)
- Arvind Ltd., a leading textile conglomerate, reported the avoidance of 82,191 metric tons of CO_2e emissions through the use of renewable electricity and the sourcing of 87% of its cotton sustainably(*Sustainability | Arvind Ltd.*, n.d.).
- At the MSME level, general apparel manufacturing units that have adopted rooftop solar under SIDBI's green financing initiatives experienced an estimated 30–40% reduction in carbon emissions over a 25-year lifecycle (Small Industries Development Bank of India)

b) Economic Feasibility

The economic viability of renewable energy adoption in the textile sector is becoming increasingly apparent. As per Industry Solar Feasibility Studies, the on-grid solar systems in apparel manufacturing units, the cost parity with conventional electricity is attained in just five years, after which solar becomes significantly more affordable. Over 30 years, solar power can cost around ₹3.72 million, compared to ₹9.88 million from grid electricity. Off-grid solar systems, although requiring a higher initial investment, offer complete energy independence and long-term operational savings.

c) Impact of Policy Support

Policy interventions have played a crucial role in accelerating renewable energy and sustainable infrastructure in textiles. During FY2024, under the 4E Scheme and the Green Finance Scheme, SIDBI provided green loans to nearly 4,400 MSMEs, resulting in electricity savings of more than 1.3 billion units annually (Business Performance, SIDBI) . Several government-backed infrastructure programs also support sustainable practices. Schemes like PM-MITRA, Scheme for Integrated Textile Parks (SITP) and the Integrated Processing Development Scheme (IPDS) promote the establishment of shared facilities such as solar power systems, common effluent treatment plants and other environment-friendly infrastructure in textile clusters (Ministry of Textiles).

d) Sustainability Awareness

Capacity building and knowledge dissemination form the backbone of long-term sustainability. The BEE-SME Programme has been instrumental in providing more than 5,000 Small and Medium Enterprises (SMEs) with technical assistance, training and awareness programs on energy auditing and best practices in renewable energy adoption. (BEE SME Programme).

CONCLUSION

The shift towards renewable energy in the apparel industry is a sophisticated process influenced by multiple crucial barriers and facilitating forces combined to shape the adoption pace and the level of success. Among the barriers, financial issues are a key challenge. Adopting renewable energy requires high investment and infrastructure. On the other hand, government incentives, awareness and market competition are the major factors facilitating the adoption.

Subsidies and concessional loans by government policies have been found to be very useful in reducing economic costs and attracting investments in clean energy. The significant government schemes are PM-

MITRA, MSE-GIFT, Green Finance Scheme, 4E, IPDS, SITP, BEE-SME, SU.RE offers focused support addressed to the apparel industry's needs, enhancing access to finance.

Taking up renewable energy use in India's apparel value chains brings considerable measurable gains, particularly by improving energy efficiency and lowering carbon footprints and emissions and contributing to better economic viability than traditional electricity. The policy efforts of the government and the efforts to sensitise apparel units for sustainability reflect the importance of this shift**.**

REFERENCES

1. Akter, S., Ji, X., Sarker, Md. M., Cai, L., Shao, Y., Hasan, Md. K., Abir, S. A., Quan, V., Akter, S., Ji, X., Sarker, Md. M., Cai, L., Shao, Y., Hasan, Md. K., Abir, S. A., & Quan, V. (2019). Clean Manufacturing and Green Practices in the Apparel Supply Chain. *Open Journal of Business and Management*, *8*(1), 104–113. https://doi.org/10.4236/OJBM.2020.81007
2. *Business Performance*. (n.d.). Retrieved June 2, 2025, from https://www.sidbi.in/annualreport/AnnualReport202324/business-performance.php
3. Chourasiya, R., Pandey, S., & Kumar Malviya, R. (2022). Developing a framework to analyse the effect of sustainable manufacturing adoption in Indian textile industries. *Cleaner Logistics and Supply Chain*, *4*, 100045. https://doi.org/10.1016/J.CLSCN.2022.100045
4. Chourasiya, R., Pandey, S., & Malviya, R. K. (2023). Sustainable manufacturing adoption in textile industries: A systematic state-of-art literature review and future research outline. *Sustainable Development*, *31*(2), 612–638. https://doi.org/10.1002/SD.2434
5. Chowdhury, M. M. H., Rahman, S., Quaddus, M. A., & Shi, Y. (2023). Strategies to mitigate barriers to supply chain sustainability: an apparel manufacturing case study. *Journal of Business and Industrial Marketing*, *38*(4), 869–885. https://doi.org/10.1108/JBIM-04-2021-0233/FULL/XML
6. da Silva, C., Barbosa-Póvoa, A. P., & Carvalho, A. (2019). Green Supply Chain: Integrating Financial Risk Measures while Monetizing Environmental Impacts. *Computer Aided Chemical Engineering*, *46*, 1549–1554. https://doi.org/10.1016/B978-0-12-818634-3.50259-9
7. Hossain, M., Aziz, R. Al, Karmaker, C. L., Debnath, B., Bari, A. B. M. M., & Islam, A. R. M. T. (2024). Exploring the barriers to implement industrial symbiosis in the apparel manufacturing industry: Implications for sustainable development. *Heliyon*, *10*(13). https://doi.org/10.1016/J.HELIYON.2024.E34156/ATTACHMENT/A20FCC60-51C5-4C49-B62E-13807530B30A/MMC1.DOCX
8. *Indian Textile Companies harnessing solar power for Sustainable Growth - The Textile Magazine*. (n.d.). Retrieved June 2, 2025, from https://www.indiantextilemagazine.in/indian-textile-companies-harnessing-solar-power-for-sustainable-growth/
9. Islam, M. D. (2023). A survey on the use of blockchains to achieve supply chain security. *Information Systems*, *117*. https://doi.org/10.1016/j.is.2023.102232
10. Johnston, M. P. (2014). Secondary Data Analysis: A Method of which the Time Has Come. *Qualitative and Quantitative Methods in Libraries*, *3*(3), 619–626. https://www.qqml-journal.net/index.php/qqml/article/view/169
11. Kumar, R. (2018). Research Methodology : A Step-by-Step Guide for Beginners. *SAGE*, 1–528.

12. Kunci, K., Mode-Cepat, :, Soni, S., Baldawa, S., & I P A T I -12 -, S. A. R. (n.d.). Analyzing Sustainable Practices in Fashion Supply Chain. *Research Journal of Business Studies |*, *16*(1International), 11. https://doi.org/10.21632/irjbs
13. Majumdar, A., Ali, S. M., Agrawal, R., & Srivastava, S. (2022). A triple helix framework for strategy development in circular textile and clothing supply chain: an Indian perspective. *Journal of Cleaner Production*, *367*, 132954. https://doi.org/10.1016/J.JCLEPRO.2022.132954
14. Majumdar, A., & Sinha, S. K. (2019). Analyzing the barriers of green textile supply chain management in Southeast Asia using interpretive structural modeling. *Sustainable Production and Consumption*, *17*, 176–187. https://doi.org/10.1016/J.SPC.2018.10.005
15. Mostafa, S., & Mohamed, A. (2025). The Role of Renewable Energy in Confronting Climate Change and Reducing the Environmental Impact of the Apparel Industry. *International Design Journal*, *15*(1), 327–345. https://doi.org/10.21608/IDJ.2025.395719
16. Muhshin Aziz Khan, M., Jahedul Alam, M., Saha, S., & Sayem, A. (2024). *Critical barriers to adopt sustainable manufacturing practices in medium-sized ready-made garment manufacturing enterprises and their mitigation strategies*. https://doi.org/10.1016/j.heliyon.2024.e39195
17. *Publications & Reports - Small Industries Development Bank of India*. (n.d.). Retrieved June 2, 2025, from https://www.sidbi.in/publication-and-reports
18. Raut, R., Gardas, B. B., & Narkhede, B. (2019). Ranking the barriers of sustainable textile and apparel supply chains: An interpretive structural modelling methodology. *Benchmarking*, *26*(2), 371–394. https://doi.org/10.1108/BIJ-12-2017-0340/FULL/XML
19. Roy, V., Silvestre, B. S., & Singh, S. (2020). Reactive and proactive pathways to sustainable apparel supply chains: Manufacturer's perspective on stakeholder salience and organizational learning toward responsible management. *International Journal of Production Economics*, *227*, 107672. https://doi.org/10.1016/J.IJPE.2020.107672
20. *Shahi's Journey to Achieving 100% Renewable Electricity - Shahi*. (n.d.). Retrieved June 2, 2025, from https://www.shahi.co.in/blog/shahis-journey-to-achieving-100-renewable-electricity/
21. Sharma, A., & Narula, S. A. (2020). What motivates and inhibits Indian textile firms to embrace sustainability? *Asian Journal of Sustainability and Social Responsibility 2020 5:1*, *5*(1), 1–23. https://doi.org/10.1186/S41180-020-0032-8
22. Sharma, R., Yadav, V., & Gaur, T. S. (2025). Barriers to adopting circular economy practices in Indian textile industries. *Discover Sustainability*, *6*(1), 1–16. https://doi.org/10.1007/S43621-025-01173-1/METRICS
23. Shen, B., Li, Q., Dong, C., & Perry, P. (2017). Sustainability Issues in Textile and Apparel Supply Chains. *Sustainability 2017, Vol. 9, Page 1592*, *9*(9), 1592. https://doi.org/10.3390/SU9091592
24. Sirilertsuwan, P., Hjelmgren, D., & Ekwall, D. (2019). Exploring current enablers and barriers for sustainable proximity manufacturing. *Journal of Fashion Marketing and Management*, *23*(4), 551–571. https://doi.org/10.1108/JFMM-09-2018-0114/FULL/XML
25. *Sustainability | Arvind Ltd.* (n.d.). Retrieved June 2, 2025, from https://www.arvind.com/environment
26. Zaidi, A. A., & Chandra, R. (2024). The challenges to circular economy in the Indian apparel industry: a qualitative study. *Research Journal of Textile and Apparel*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/RJTA-09-2023-0105/FULL/XML

27. UNEP. (2025). *Sustainable fashion to take centre stage on Zero Waste Day.* *https://www.unep.org/technical-highlight/sustainable-fashion-take-centre-stage-zero-waste-day*
28. Ellen MacArthur Foundation. (2017). *A New Textiles Economy: Redesigning Fashion's Future*. https://ellenmacarthurfoundation.org/
29. Ministry of Textiles. (2024). *Annual Report 2023–24*. https://texmin.nic.in/
30. International Energy Agency. (2022). *Energy Efficiency 2022*. https://www.iea.org/
31. Small Industries Development Bank of India. https://www.sidbi.in/en/green-finance
32. Small Industries Development Bank of India. https://www.sidbi.in/
33. Ministry of Textiles. https://www.texmin.nic.in/
34. Bureau of Energy Efficiency. https://beeindia.gov.in/