InTex India

UN environment programme

Sustainable by Design, Competitive by Nature: Strengthening India's Position in Global Textile Value Chains

Value Chain Analysis, Sustainability Hotspots, and Transition Pathways



With the kind financial contribution of

Ministry of Environment and Gender Equality of Denmark

National Implementing Partner

CRB Centre for Responsible Business — Enabling Change for Impact

In collaboration with

CEE Centre for Environment Education

Table of Contents

Executive Summary **10**

Chapter 1: Introduction **13**

1.1 Purpose and Approach 15

Chapter 2: Overview of the Indian Textile & Apparel Sector **16**

2.1 India and the World 17

2.2 Domestic Market and Industrial Structure 19

2.3 India's Position Across the Textile Value Chain 20

2.4 Technical Textiles : An Emerging Growth Segment 22

2.5 Key Competitiveness Implications 24

Chapter 3: Industrial Clusters as Drivers of Transformation **25**

3.1 Why clusters matter 26

3.2 Selected Clusters Profiles 27

3.3 Karur (Tamil Nadu) 28

3.4 Surat (Gujarat) 30

3.5 Ludhiana (Punjab) 33

3.6 Panipat (Haryana) 35

3.7 Tirupur (Tamil Nadu) 37

3.8 Bhiwandi (Maharashtra) 39

3.9 Bengaluru (Karnataka) 41

3.10 Emerging Lessons from Indian Textile Clusters 42

Chapter 4: Strategic Positioning of India's Textile and Apparel Sector **43**

4.1 Sector Competitiveness and Strategic Positioning 44

4.2 Benchmarking: India's position in Regional Textile Markets 46

4.3 Emerging Market Drivers and Competitive Pressures 47

4.4 Opportunities for Sustainable Growth and Industrial Transformation 49

4.5 Risks and Constraints to Competitiveness 51

Chapter 5 : Policy and Regulatory Landscape **52**

Chapter 6: Sustainability Hotspots and Circular Transition Opportunities **58**

6.1 Life Cycle Hotspots Across the Textile Value Chain 59

6.2 Overview of the Indian Cotton Value Chain 61

6.3 Overview of the Synthetic Value Chain 64

Chapter 7: Transition Pathways for a Competitive and Circular Textile Sector **66**

7.1 Way Forward 67

7.2 Conclusion 72

List of Tables

Table 1: Major Government Schemes and Initiatives Supporting the Indian Textile and Apparel Sector

Table 2: India's Competitiveness Relative to Major Asia-Pacific Textile-Producing Countries

Table 3: Life Cycle Hotspots Across the Textile and Apparel Value Chain

Table 4: Sustainability Hotspots in the Cotton Value Chain

Table 5: Key Opportunities for Advancing Circularity Across the Indian Cotton Value Chain

Table 6: Life Cycle Hotspots of Polyester textile value chain

Table 7: Key Opportunities for Advancing Circularity Across the Indian Synthetic Textile Value Chain

Table 8: Short-, Medium-, and Long-Term Transition Priorities for India's Textile Sector

Table 9: Short-Term Priority Actions for Advancing a Competitive and Circular Textile Sector (1–3 Years)

Table 10: Medium -Term Priority Actions for Advancing a Competitive and Circular Textile Sector (3 - 5 Years)

Table 11: Long-Term Priority Actions for Advancing a Competitive and Circular Textile Sector (5+ Years)

List of Figures

Figure 1 : Indian textile Sector : Key Figures

Figure 2: India's top ten export market of textile & apparel products including handicraft in 2023-24

Figure 3 : India's textile & apparel export (principal commodity wise) in FY 2023 -24

Figure 4 : India's textile & apparel export product composition in FY 2023-24

Figure 5: Domestic T&A Market Size and Distribution in FY 2024-25

Figure 6: Average region wise share of India textile market from 2019 -24

Figure 7: India's Position Across the Textile Value Chain

Figure 8: Technical textile segments by Domestic production

Figure 9 : Export Value of technical textile (USD Billion) , FY2020 - FY 2025

Figure 10: Major Textile and Apparel Manufacturing Clusters in India

Figure 11: Snapshot of Sustainability Initiatives undertaken by the Ministry of Textiles

Figure 12: Linear Flow of Activities in the Textile and Apparel Value Chain

Acronyms & Abbreviations

Acronym	Full Form
A&T	Apparel and Textiles
ASTM	ASTM International (Former American Society for Testing and Materials)
BIS	Bureau of Indian Standards
BEE	Bureau of Energy Efficiency
BRSR	Business Responsibility and Sustainability Reporting
CETP	Common Effluent Treatment Plant
CEE	Centre for Environment Education
CMT	Cut, Make and Trim
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CSRD	Corporate Sustainability Reporting Directive
CEMS	Continuous Emissions Monitoring Systems
CEPA	Comprehensive Economic Partnership Agreement
CETA	Comprehensive Economic and Trade Agreement
CHCDS	Comprehensive Handicrafts Cluster Development Scheme
DPP	Digital Product Passport
EU	European Union
ECTA	Economic Cooperation and Trade Agreement
EOL	End-of-Life
EPR	Extended Producer Responsibility
ESG	Environmental, Social and Governance
ETP	Effluent Treatment Plant
ESPR	Ecodesign for Sustainable Products Regulation
ETS	Emission Trading Scheme
FTA	Free Trade Agreement
FEED	Financing Energy Efficiency Development
GeM	Government e-Marketplace
GST	Goods and Services Tax
GHG	Greenhouse Gas
GOTS	Global Organic Textile Standard
GPCB	Gujarat Pollution Control Board
H&M	Hennes & Mauritz
IKEA	Ingka/Inter IKEA (Global Home Furnishing Retailer)
IETP	Integrated Effluent Treatment Plant

Acronym	Full Form
IoT	Internet of Things
KTPA	Kilotonnes Per Annum
LCA	Life Cycle Assessment
MMF	Man-Made Fibre
MJ	Megajoule
MoT	Ministry of Textiles
MSMEs	Micro, Small and Medium Enterprises
MT	Metric Tonnes
NTTM	National Technical Textiles Mission
NHDP	National Handicrafts Development Programme
OHS	Occupational Health and Safety
PAT	Perform, Achieve and Trade
PFY	Polyester Filament Yarn
PMGSY	Pradhan Mantri Gram Sadak Yojna
PLI	Production Linked Incentive
PM MITRA	Prime Minister Mega Integrated Textile Region and Apparel Parks
PSF	Polyester Staple Fibre
QC	Quality Control
rPET	Recycled Polyethylene Terephthalate
RoDTEP	Remission of Duties and Taxes on Exported Products
RoSCTL	Rebate of State and Central Taxes and Levies
R&D	Research and Development
RE	Renewable Energy
SME	Small and Medium Enterprise
SDGs	Sustainable Development Goals
SITRA	South India Textile Research Association
SMC	Surat Municipal Corporation
T&A	Textiles and Apparel
TReDS	Trade Receivables Discounting System
UNEP	United Nations Environment Programme
USD	United States Dollar
WtE	Waste-to-Energy
ZDHC	Zero Discharge of Hazardous Chemicals
ZED	Zero Effect Zero Defect
ZLD	Zero Liquid Discharge

Disclaimer

This report has been prepared to support knowledge sharing, policy dialogue, and informed decision-making on sustainability and circularity in India's textile and apparel sector. The findings, analysis, and recommendations are based on secondary research, information available at the time of publication, and stakeholder consultations and expert inputs.

While every effort has been made to ensure the accuracy of the information presented, the authors and contributing organisations do not guarantee its completeness or absolute accuracy. Data, policies, and market conditions may change over time and should be interpreted in the context of the publication date.

The views expressed are those of the authors and do not necessarily reflect the views of the United Nations Environment Programme (UNEP), the Government of India, the Ministry of Textiles of India (MoT), or other organisations consulted during the preparation of this report. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory or city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

References to specific companies, products, technologies, organisations, or case studies are provided for illustrative purposes only and do not constitute endorsement or recommendation by the UNEP or the authors. Users are encouraged to independently verify information before making policy, investment, or commercial decisions based on this publication. Some cluster-level observations and qualitative insights, derived from stakeholder consultations and field interactions conducted by the Centre for Responsible Business (CRB), are intended as indicative perspectives and should not be considered statistically representative findings.

Acknowledgement

The InTex Programme in India is an initiative led by the UNEP in collaboration with the Ministry of Textiles in India. The project is implemented with the financial contribution of the Government of Denmark. The authors gratefully acknowledge the guidance, technical inputs and oversight of the UNEP throughout the development of this report.

The authors also extend their appreciation to colleagues at CRB for their support, valuable suggestions, and review, which helped strengthen the quality of this report.

Executive Summary

India's textile and apparel sector stands at a pivotal moment. As one of the few countries with an end-to-end textile value chain spanning fibre production, spinning, weaving, processing, garmenting, recycling and consumption, India possesses a unique foundation for global leadership in sustainable and circular textiles. The sector contributes approximately 2.3% of GDP, 13% of industrial production and 12% of exports, while providing direct employment to more than 45 million people and supporting the livelihoods of over 100 million people across associated activities.

However, the drivers of competitiveness in global textile markets are changing rapidly. Future success will increasingly be determined not only by cost and scale, but by resource efficiency, traceability, circularity, climate resilience and the ability to comply with evolving market requirements. ***Sustainability is no longer solely an environmental consideration; it is becoming a defining factor for export competitiveness, market access, investment attractiveness and long-term industrial resilience***. Emerging international requirements on product traceability, environmental performance, circularity and supply chain transparency are reshaping global textile value chains and creating both opportunities and risks for India's predominantly MSME-based industry.

This report applies a value-chain approach to identify where economic value is created, where environmental and social impacts are concentrated, and where interventions can generate the greatest economic and sustainability benefits. It highlights that India remains highly competitive in upstream segments such as fibre production, spinning and yarn manufacturing, supported by a large cotton base, significant man-made fibre production capacity and extensive manufacturing infrastructure. At the same time, **several midstream segments of the value chain, including weaving, knitting and wet processing, continue to face structural challenges relating to productivity, quality, resource efficiency, social compliance and technology adoption**. Addressing these bottlenecks represents one of the largest opportunities to strengthen India's competitiveness and increase value addition within the country.

A key finding of this study is that India's transition towards sustainability and circularity is expected to be achieved primarily through industrial cluster interventions rather than individual enterprises. Clusters such as Tiruppur, Surat, Panipat, Ludhiana, Bengaluru, along with others, concentrate production, employment, infrastructure and resource consumption, making them critical intervention points for sector-wide transformation. Successful examples of circular and sustainable interventions already exist within India. Surat has demonstrated the benefits of large-scale treated wastewater reuse, shared steam infrastructure and market-based environmental regulation. Tiruppur has established itself as a leader in wastewater treatment, water recycling and renewable energy deployment. Panipat has developed one of the world's largest textile recycling ecosystems. These examples demonstrate that **cluster-based approaches can simultaneously improve environmental performance, reduce operational costs and strengthen competitiveness**.

The report identifies key environmental hotspots across both cotton and synthetic textile value chains. Cotton cultivation faces challenges related to water consumption, pesticide use, low productivity and climate vulnerability, while manufacturing stages (particularly dyeing and wet processing) account for significant energy use, chemical consumption and wastewater generation. Synthetic textiles are associated with fossil-fuel dependence, high life-cycle emissions and microplastic pollution. Across both value chains, end-of-life management remains dominated by lower-value reuse, downcycling and informal recycling, resulting in significant losses of material value.

Despite these challenges, India is well positioned to lead the transition to a circular textile economy, supported by its strong manufacturing base, established recycling ecosystems, growing technical textile capabilities, extensive MSME networks and large domestic market. **India already possesses many of the foundations required for a circular textile economy**; however, unlocking the next phase of growth will require investment in product design, resource-efficient manufacturing, textile-to-textile recycling systems - including collection and sorting for stronger recycled-fibre markets, alternative fibres, and end-to-end traceability.

The policy environment is increasingly supportive of this transition. National initiatives including PM MITRA Parks, the Production Linked Incentive Scheme, the National Technical Textiles Mission, Samarth 2.0, the Tex-Eco Initiative and multiple state textile policies provide a strong platform for industrial modernisation and sustainability investments. At the same time, new trade agreements and evolving international regulations are creating incentives for higher sustainability performance and greater value addition. The challenge ahead is therefore less about policy intent and more about implementation, coordination and scaling solutions across India's industrial clusters and MSME ecosystem.

KEY POLICY INSIGHTS

- **Competitiveness and sustainability are increasingly interconnected**

Future competitiveness will increasingly depend on the ability of firms and clusters to improve resource efficiency, traceability, circularity and compliance with evolving market requirements.

- **Textile clusters are critical vehicles for sector transformation**

Given the predominance of MSMEs, cluster-based approaches offer significant opportunities to scale shared infrastructure, resource efficiency measures, recycling systems and sustainability solutions.

- **Data and traceability are becoming strategic capabilities**

Investments in life-cycle data, traceability systems and harmonised reporting frameworks can support market access, improve supply chain transparency and enhance compliance readiness.

- **Circular economy approaches can support value creation**

Opportunities exist to increase resource productivity and value retention through circular product design, recycled and alternative fibres, textile-to-textile recycling, and stronger collection and sorting systems.

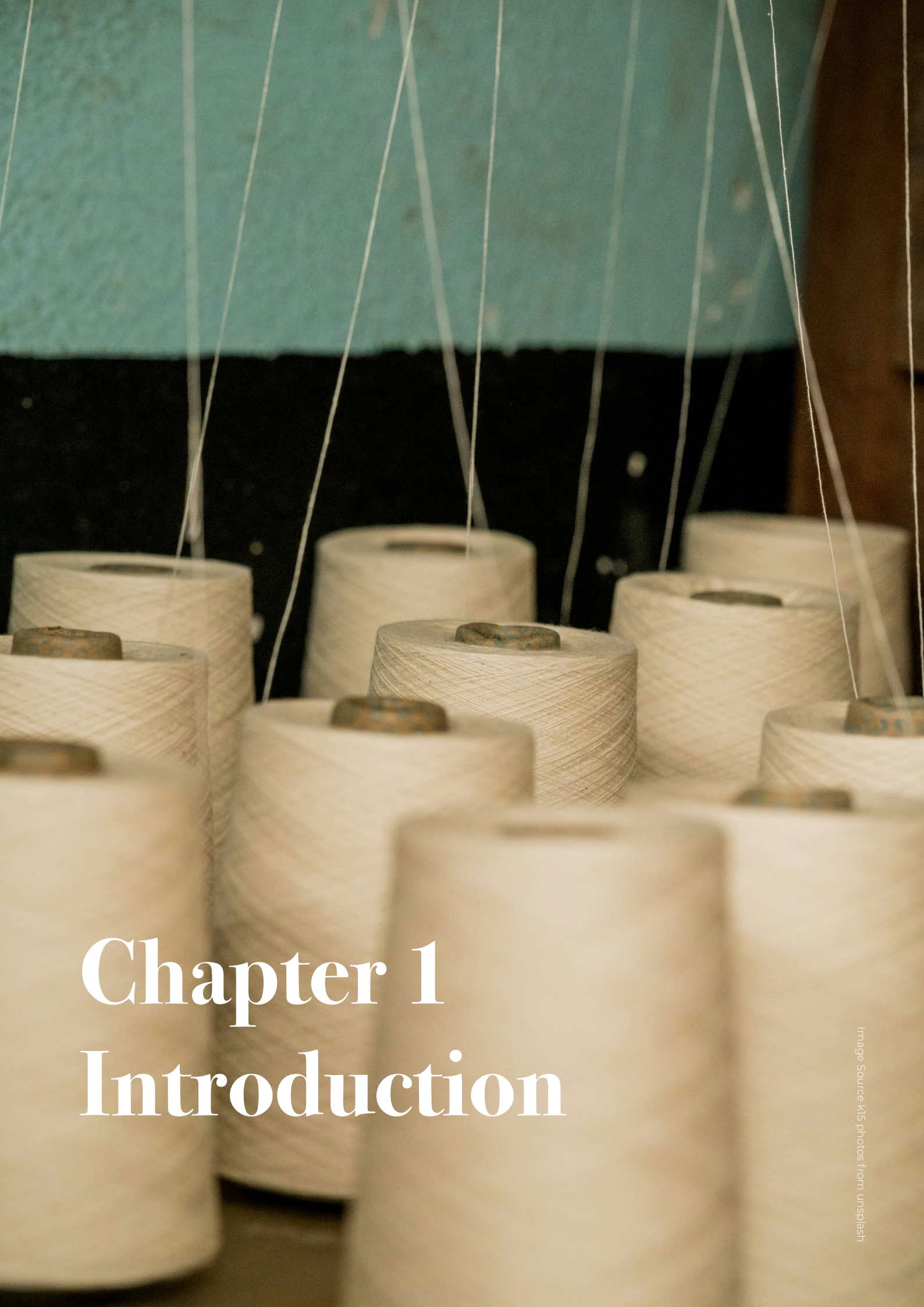
- **India is well positioned to lead the transition**

India's integrated value chain, industrial clusters, recycling ecosystem, manufacturing base and supportive policy environment provide strong foundations for developing a more sustainable, circular and resilient textile sector.

This report proposes a phased transition pathway. In the short term, priority should be given to circular product design, resource efficiency, data and measurement systems, cleaner energy adoption, improved wastewater and chemical management, traceability, EPR and policy signals, and MSME capacity building. In the medium term, greater emphasis should be placed on recycled and alternative fibres, textile-to-textile recycling technologies, shared cluster infrastructure and sustainable finance mechanisms for market development. Over the longer term, India has the opportunity to become a global leader in sustainable textiles through innovation, scaling of fibre-to-fibre recycling, low-carbon materials and circular business models.

Ultimately, India's long-term competitiveness will depend not only on scale and cost, but on its ability to build resilient, resource-efficient and circular value chains. With coordinated action across government, industry and finance, India can strengthen its global competitiveness, create quality jobs and emerge as a leading hub for sustainable and circular textiles.





Chapter 1 Introduction

Image Source kl5 photos from unsplash

The Indian Textile and Apparel sector has been interwoven with the country's history and development over centuries and continues to play an important role in India's present progress. The sector represents a strategic pillar of the national economy, acting as a critical engine for employment, manufacturing output, and export earnings.

However, its long-term competitiveness is contingent upon addressing pressing sustainability challenges, from high resource consumption to significant pollution hotspots. The central hypothesis of this report is that these vulnerabilities, if addressed through a structured transition to a circular economy, can be transformed into a source of competitive advantage, resilience, and global leadership. This report provides some recommendations and considerations for policy actors to accelerate this vital transition.

The imperative for this strategic shift is underscored by several key factors:

- **Economic Significance**: The T&A[1] sector is a cornerstone of the Indian economy, providing direct employment to over 45 million people[2] and contributing substantially to industrial output and national exports.
- **Sustainability Pressures**: The industry's environmental footprint is significant, marked by high water and chemical intensity in cotton processing, considerable emissions from synthetic fibre production, and a rapidly expanding volume of textile waste. India's textile and apparel industry emits approximately 65 million tonnes of CO_2 equivalent (CO_2e) annually around 2% of the country's total greenhouse gas emissions while generating about 7.8 million tonnes of textile waste each year, highlighting the urgent need for circular economy interventions[3].
- **The Cluster-Based Opportunity**: India's geographically concentrated textile clusters possess unique strengths in scale, integration, and specialization that can be leveraged for a targeted circular transition, supported by policy interventions that are tailored to their specific capacities and needs.
- **A Strategic Policy Pathway**: An implementable pathway to circularity can be achieved through a combination of near-term policy measures—including targeted financing, infrastructure development, and regulatory clarity—and medium-term investments in advanced recycling, alternative fibres, and digital traceability.
- **The Role of Catalytic Support**: Strategic support from development partners, donors and financial institutions can be a powerful catalyst for change, particularly in co-financing essential public infrastructure, de-risking innovative technologies, and supporting the crucial upgradation of Micro, Small, and Medium Enterprises (MSMEs).

This document will now proceed with a detailed examination of the sector's current economic and structural context, providing the essential foundation for the proposed policy interventions.

[1] In this report, the term "textiles" refers to intermediate and non-apparel textile products such as fibres, yarns, fabrics, home textiles, and technical textiles, while "apparel" refers to finished wearable garments and clothing products. Together, the textile and apparel (T&A) sector encompasses the full value chain from raw material production to finished consumer products.
[2] https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2098770&reg=3&lang=2#:~:text=Over%2045%20million%20people%20employed%20directly%2C%20Textile,of%20the%20largest%20employment%20generators:%20Economic%20Survey.
[3]https://c4rb.org/IDRC_Synthesis_Report_fv.pdf

1.1 PURPOSE AND APPROACH

This report adopts a value-chain approach to examine India's textile and apparel sector, identifying where economic value is created, where environmental and social impacts are concentrated, and where interventions can deliver the greatest economic, environmental, and competitiveness benefits. By analysing the entire value chain from fibre production and raw material sourcing through manufacturing, processing, garment production, consumption, and end-of-life management—the report highlights key sustainability hotspots, resource-use patterns, and opportunities to improve circularity, resource efficiency, and value addition. It also examines the evolving policy, regulatory, and market landscape that is increasingly shaping the sector's future competitiveness.

The report places particular emphasis on the role of industrial clusters as key drivers of sustainability and circular economy transitions within India's predominantly MSME-based textile sector. Recognising that many environmental and competitiveness challenges are best addressed through cluster-level interventions, the report explores opportunities for shared infrastructure, technology adoption, resource efficiency, and collaborative approaches that can support sector-wide transformation. The analysis is based entirely on an extensive review of secondary literature, including government publications, policy documents, industry reports, academic research, and publications from national and international organisations, to provide an evidence-based assessment of the sector and identify practical pathways for a more sustainable, resilient, and globally competitive textile industry.





Chapter 2
Overview of the Indian Textile & Apparel Sector

The Indian textile and apparel (T&A) sector is one of the country's largest and most significant industries, contributing approximately 2.3% to GDP, 13% to industrial production, and 12% to exports. It is also one of the largest sources of employment, providing direct and indirect livelihoods to over 45 million people. With an estimated market size of USD 170–185 billion, the sector is a key driver of manufacturing, exports, and rural development, supported by a diverse value chain spanning natural and man-made fibres, yarns, fabrics, apparel, home textiles, and technical textiles[4].

Indian Textile Sector: Key Figures

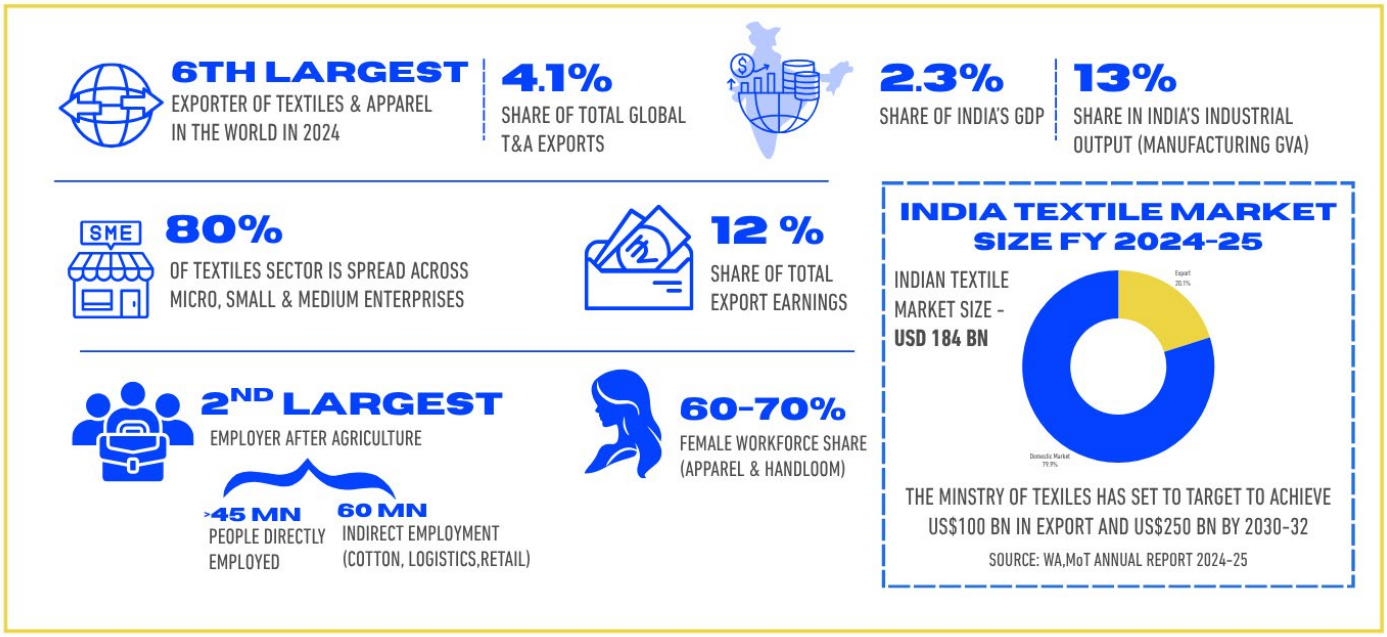


Figure 1 : Indian textile Sector : Key Figures

2.1 INDIA AND THE WORLD

India's T&A exports have remained around USD 40 billion over the past six years[5]. Major T&A export destinations for India are US and EU with 47% share in the figures, any change in these markets is likely to impact the T&A industry[6].

India's export patterns reveal strong presence in natural fibre based categories, particularly cotton. The country's textile exports are highly concentrated in a few product categories, - more than 52% of its exports come from just 134 items (it is to be noted that India has over 840 product categories in T&A exports), in which India holds a global export share of over 10%. This indicates strong competitiveness in selected segments but also absence of diversification.

[4]https://texmin.nic.in/documents/annual-reports
[5]https://niti.gov.in/sites/default/files/2025-03/Trade-Watch-Quarterly-%28July-September%5BQ2%5D-FY25%29_0.pdf
[6]https://www.pib.gov.in/PressReleasePage.aspx?PRID=2117470&reg=3&lang=2

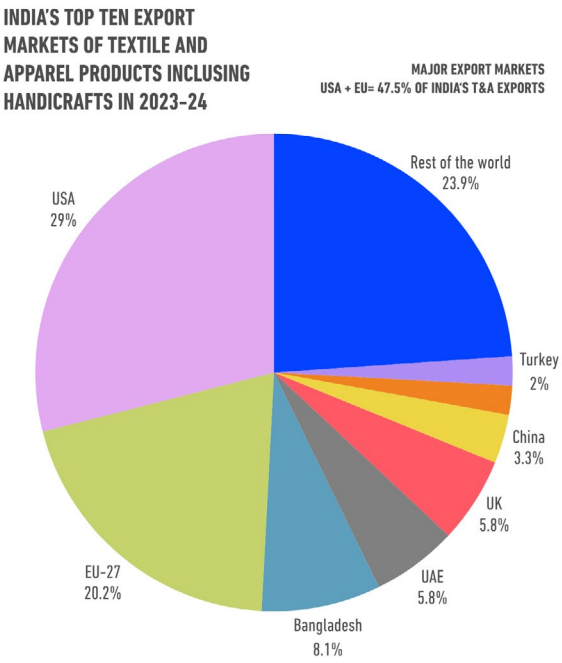


Figure 2: India's top ten export market of textile & apparel products including handicraft in 2023-24

Source: https://www.texmin.gov.in/documents/textile-data/foreign-tradeexports-QjMwQTMtQWa?pageTitle=Foreign-Trade(Exports)

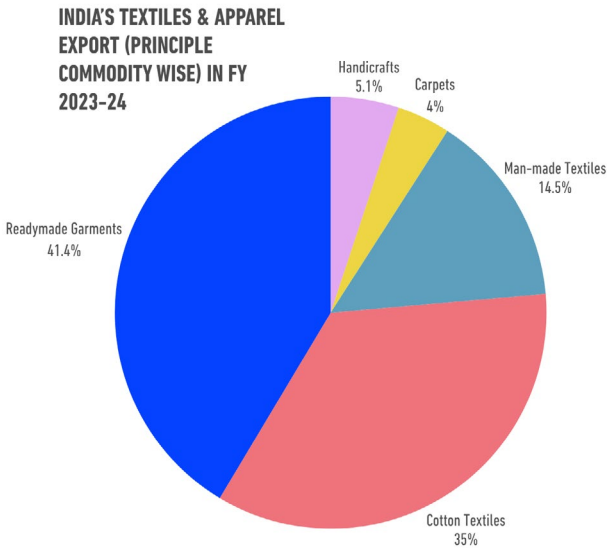


Figure 3 :India's textile & apparel export (principal commodity wise) in FY 2023 -24

Source:https://wazir.in/wp-content/uploads/2025/01/Wazir-Advisors-Annual-TA-Industry-Report-2025.pdf

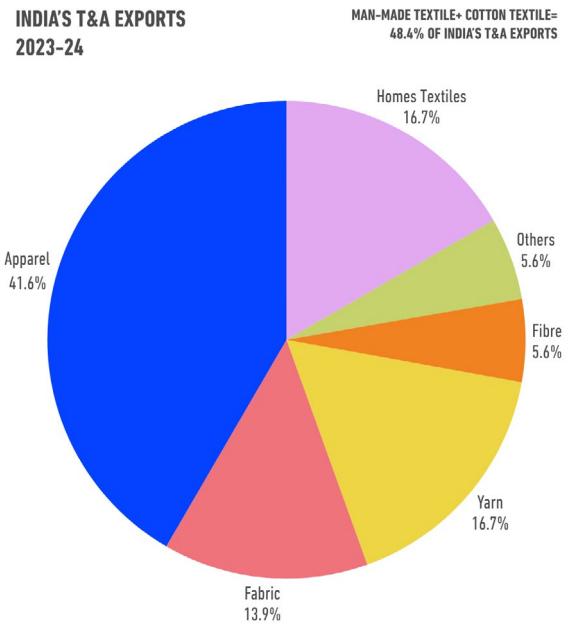


Figure 4 : India's textile & apparel export product composition in FY 2023-24

Source: https://www.texmin.gov.in/documents/textile-data/foreign-tradeexports-QjMwQTMtQWa?pageTitle=Foreign-Trade(Exports)

2.2 DOMESTIC MARKET AND INDUSTRIAL STRUCTURE

Alongside exports, India has a large, diverse, and rapidly growing domestic textile and apparel market. The domestic market, valued at approximately USD 147 billion, is significantly bigger than the export market (80% of total market size), is stable, generates employment, contributes to industrial production and provides a necessary cushion against volatility in international trade.

The contribution of the household sector to the domestic market is 58 % and Non Household consumption is 21% of the domestic market. Within the domestic market[7], the major segments include Apparel which accounts for ~75% share of the market, Technical Textiles (19%) and Home Textiles (7.5%), as indicated in the figure below.

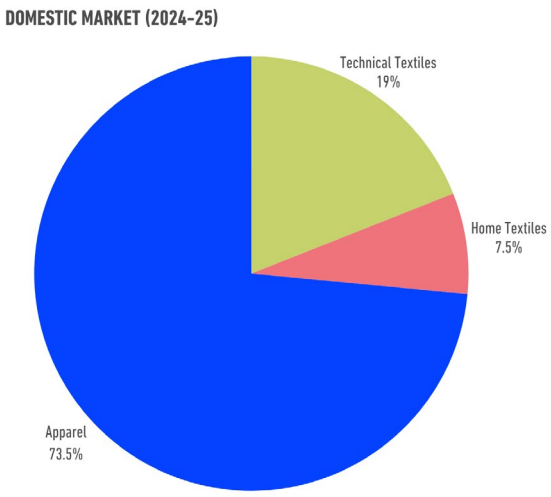


Figure 5: Domestic T&A Market Size and Distribution in FY 2024-25
Source: Wazir Advisors Annual Report

The Indian textile industry is geographically dispersed and is spread across clusters in India.

- South India dominates India's cotton textile value chain, with most cotton textile manufacturing concentrated in southern clusters.
- Gujarat, Maharashtra, and Telangana together account for nearly 65% of India's raw cotton production.
- The prominence of southern clusters is driven by the early development of cotton-based industries and favourable conditions for cotton cultivation in southern and western India.

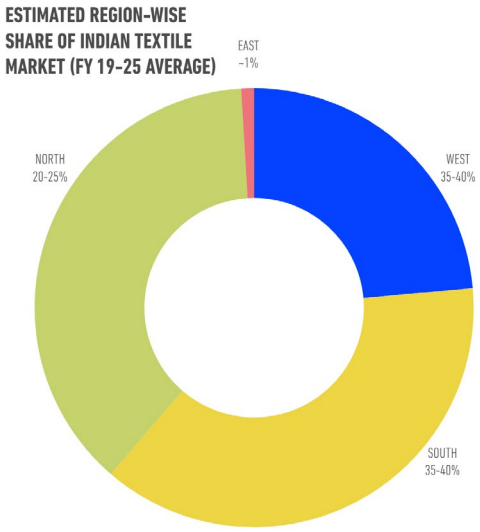


Figure 6: Average region wise share of India textile market from 2019 -24
Source: https://www.sanathan.com/static/media/CRISIL_Report_on_Yarn_Manufacturing_in_India.1ee0ade5.pdf

[7]https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=2174864&reg=3&lang=2

2.3 INDIA'S POSITION ACROSS THE TEXTILE VALUE CHAIN

India occupies a unique position within the global textile economy as one of the few countries with capabilities spanning nearly every stage of the textile value chain. This integrated ecosystem provides significant opportunities for value addition, employment generation, resilience, and the advancement of a circular economy.

The textile value chain can be broadly divided into five major stages: fibre production, yarn and fabric production, textile manufacturing, consumption, and end-of-life management. India has a significant presence across each of these stages, supported by a diverse manufacturing base, abundant raw material availability, specialised industrial clusters, and a large domestic market. This end-to-end value chain is a key competitive advantage, enabling greater value retention within the country while creating opportunities to strengthen sustainability, traceability, and circularity across the sector. Figure 7 illustrates India's presence across the different stages of the textile value chain.



Figure 7: India's Position Across the Textile Value Chain

2.3.1 Fibre Production

India is better positioned in natural fibre production and is significantly placed in man-made fibre production as well. The country contributes ~22–24% of global cotton production and has the largest cotton cultivation area globally (36% of world acreage) around 113.60 lakh hectares. In value terms, raw cotton exports from India stood at USD 809 mn. Cotton farming sustains the livelihood of 6 million farmers and 40-50 million people engaged in related activities (Ministry of Textiles, 2025).

Despite its scale, India's cotton productivity (435 kg/ha) remains relatively low when compared to China (1,945 kg/ha) and Brazil (1,839 kg/ha) highlighting a huge productivity gap[8]. Beyond cotton, India is also the world's largest producer of raw jute, second largest producer and largest consumer of silk. India accounts for approximately 9.2% of global Man-Made Fibre (MMF) production and is among the world's largest MMF producers. India's export of MMF textiles and apparel stood at USD 8.19 billion in FY 2023–24. The country is also the world's second-largest producer of viscose fibre, with major domestic manufacturers including Aditya Birla Fashion and Retail Limited (ABFRL).

[8]https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/apr/doc202541530401.pdf

Cotton produced in India is largely consumed domestically across the country's extensive spinning, weaving, and apparel manufacturing industry, although a significant share of raw cotton and cotton yarn is also exported to countries such as Bangladesh, China, Vietnam, Egypt, Turkey, and Portugal. Bangladesh and China remain among the largest export destinations for Indian cotton and cotton yarn. Similarly, a large share of India's Man-Made Fibre (MMF) production supports domestic textile manufacturing, particularly in apparel, home textiles, and technical textiles, while MMF textiles are exported to nearly 140 countries. In contrast, fibres such as raw jute and silk are both domestically processed and exported in raw or semi-processed forms depending on market demand and value-chain integration.

2.3.2 Yarn and fabric production

India is the second largest producer of cotton and man-made fibre yarn after China, it is also the leading exporter of cotton yarn with exports of cotton yarn exports in 2024–25 were USD 3.5 billion and cotton fabric stood at USD 2.4 bn. In 2023-24, India exported USD 0.9 billion man-made filament yarn and imported USD 14 billion, being a net importer of man-made filament yarn. India has the second largest spinning capacity with 52 mn spindles and had a total spun yarn production of 5.2 bn kg in 2022-23, of which cotton yarn accounts for approximately 65% of production and rest is blended or non-cotton yarn. India exported USD 4.6 bn worth of spun yarn and imported USD 0.6 bn worth of spun yarn (Wazir Advisory, 2025).

2.3.3 Textile Production

India's textile processing capabilities are spread across the country. Major processing hubs include Tirupur, Bangalore, Surat, Ahmedabad, Panipat, Delhi-NCR and Ludhiana, in addition there are over 125 small textile clusters across India[9]. Clusters have heterogeneous capacities and capabilities. 80 percent of the manufacturing sector operates in a decentralised manner and contributes 97.3 per cent of the total fabric production. The country has approximately 100,000 garment factories and an estimated annual garment production of 22 billion pieces, and made-up articles such as bed linen, towels, curtains, and furnishing products stood at 2.4 billion kg (Annual Textile & Apparel Report 2019-20).

2.3.4 Consumption

India's textile consumption is huge and is growing, driven by a large population, rising incomes, dominant use of technology and a large internal market. There is also a presence of a large mix of brands comprising global, domestic, premium and budget fashion (H&M, Puma, Adidas, Zara, Fab India, Allen Solly, Levi's etc.) in both retail and e-commerce. Circular business models which include rental and reuse are present, but form a miniscule segment of the market.

2.3.5 End-of-Life

In figures, India generates (domestically) approximately 7.8 million tonnes/year of textile waste annually[10]. Of this, 42% originates from pre-consumer sources such as manufacturing waste, while 58% arises from post-consumer disposal and imported waste at 7% [11]. More than 70%[12] textile waste in India is estimated to be recovered and routed into reuse, recycling, upcycling, or downcycling streams, although recovery rates vary significantly between pre-

[9]https://icrier.org/pdf/pb-39_A-Stitch-in-Time.pdf
[10]https://www.texmin.gov.in/static/uploads/2026/03/407c2f186a2044a4497c9c9803d16a2c.pdf
[11]https://www.pib.gov.in/PressReleasePage.aspx?PRID=2237779&reg=3&lang=2
[12]https://www.pib.gov.in/PressReleasePage.aspx?PRID=2237779&reg=3&lang=2

consumer and post-consumer waste. Nearly 95% of pre-consumer textile waste generated during manufacturing is recovered due to relatively well-established industrial and informal recovery networks across the value chain. Recovery of post-consumer textile waste is comparatively lower and is primarily driven by informal collection, resale, repair, donation, and reuse systems rather than formal segregated textile waste collection mechanisms[13]. India has a very rich culture for resource efficiency and most individuals engage in reuse, repurpose, recycling or downcycling without actually knowing about it. Textile waste is often reused in donation (depending on quality) or handed over in family, repurposed as cleaning rags, upcycled as different items or downcycled and used in industries such as pulp and paper, automobile, home textiles and other industries. India has also established itself as one of the leaders in mechanical recycling with clusters of Panipat and Tirupur taking the lead. There are entrepreneurship opportunities in upcycling, recycling, and repurposing of textiles, but it is a niche market at the moment and is evolving as solutions to textile waste. Examples include Dwij, Aadi Sustainability Solutions, Twirl Store, Rimagined, Bunko Junko.

2.4 TECHNICAL TEXTILES : AN EMERGING GROWTH SEGMENT

As a country progresses, the demand for technical textiles increases significantly as they are crucial for industrial advancement, infrastructure development, healthcare, and national defense. These materials are engineered for function rather than aesthetics and replace traditional materials in a wide array of specialized applications. Technical textiles are an emerging high-growth segment within the Indian textile sector and are steadily gaining strategic importance due to their applications across infrastructure, healthcare, agriculture, mobility, defense, and environmental management. The Indian technical textiles market is the fifth largest in the world and stood at USD 29 billion in 2024; projected growth - USD 123 billion by 2035[14] and with current exports at USD 2.6 billion[15].

Technical Textile demand has been fuelled by the following growth factors -

- **Rising demand from new application areas**

Technical textile products are finding application in new functional areas such as in smart textile wear for sports, advanced medical tech, agricultural technology and environmental solutions.

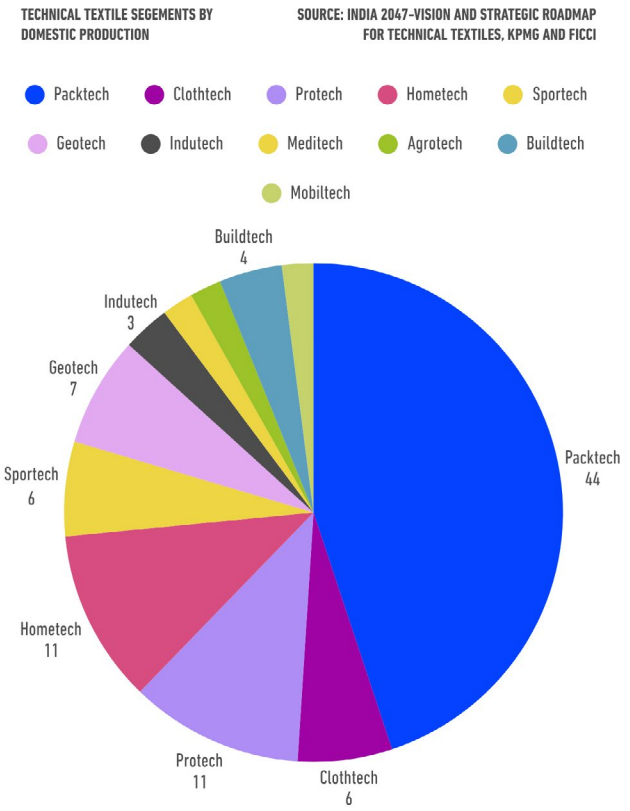


Figure 8: Technical textile segments by Domestic production

- **Standards and guidelines**

13 https://www.pib.gov.in/PressReleasePage.aspx?PRID=2237779&reg=3&lang=2
14 https://www.ibef.org/industry/indian-textiles-and-apparel-industry-analysis-presentation
15 https://www.pib.gov.in/PressReleasePage.aspx?PRID=2052570&reg=3&lang=2

The development and harmonisation of standards and guidelines at both national and international levels are supporting the growth of India's technical textiles sector by improving product quality, safety, and export competitiveness. In India, the Bureau of Indian Standards (BIS) has developed a comprehensive portfolio of standards for technical textile products, many of which are aligned with internationally recognised ISO and ASTM standards. This alignment facilitates market access and enhances acceptance of Indian products in global value chains. In addition, technical textile manufacturers increasingly rely on internationally recognised certification and testing frameworks such as ISO standards, CE marking requirements in the European Union, OEKO-TEX® certification for textile safety, and sector-specific standards for geotextiles, medical textiles, protective textiles, and automotive applications.

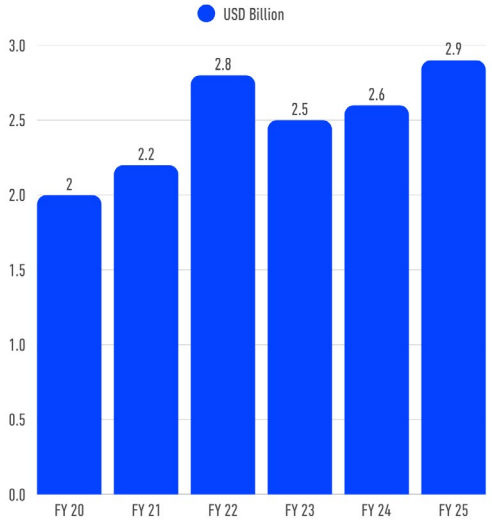


Figure 9: Export Value of technical textile (USD Billion) , FY2020 - FY 2025

- **Government regulations**

Government policy has played an important role in promoting the adoption of technical textiles in India. Examples include the use of geotextiles in rural road construction under Pradhan Mantri Gram Sadak Yojna (PMGSY), the integration of geosynthetics into infrastructure applications under PM Gati Shakti and the National Infrastructure Pipeline, and the introduction of mandatory Quality Control Orders (QCOs) for geotextiles, protective textiles, agro-textiles, and medical textiles. Together, these measures have strengthened product quality, expanded institutional demand, and supported the growth and competitiveness of the technical textiles sector.

- **Innovation and R&D**

The government has funded research projects under the National Technical Textiles Mission (NTTM), which has been able to create an ecosystem for manufacturing of technical textiles in India and reducing the dependency on imports.

- **Useful physical properties of technical textiles and Climate Change**

The physical properties of technical textile have benefits over conventional material use and can be used for both adaptation and mitigation of climate change. For example, Geotextiles offers benefits by replacing aggregates which can help in reduction of carbon emissions, agrotech can help enhance production, Geo membrane usage for flood protection, slope stabilization and various other uses in construction and infrastructure development.

Some common examples of technical textile include use in sportswear, bullet proof jackets, fireproof material, high altitude combat gear, space applications and various uses in automobile and civil engineering.

2.5 KEY COMPETITIVENESS IMPLICATIONS

The analysis highlights four important implications for India's future competitiveness.

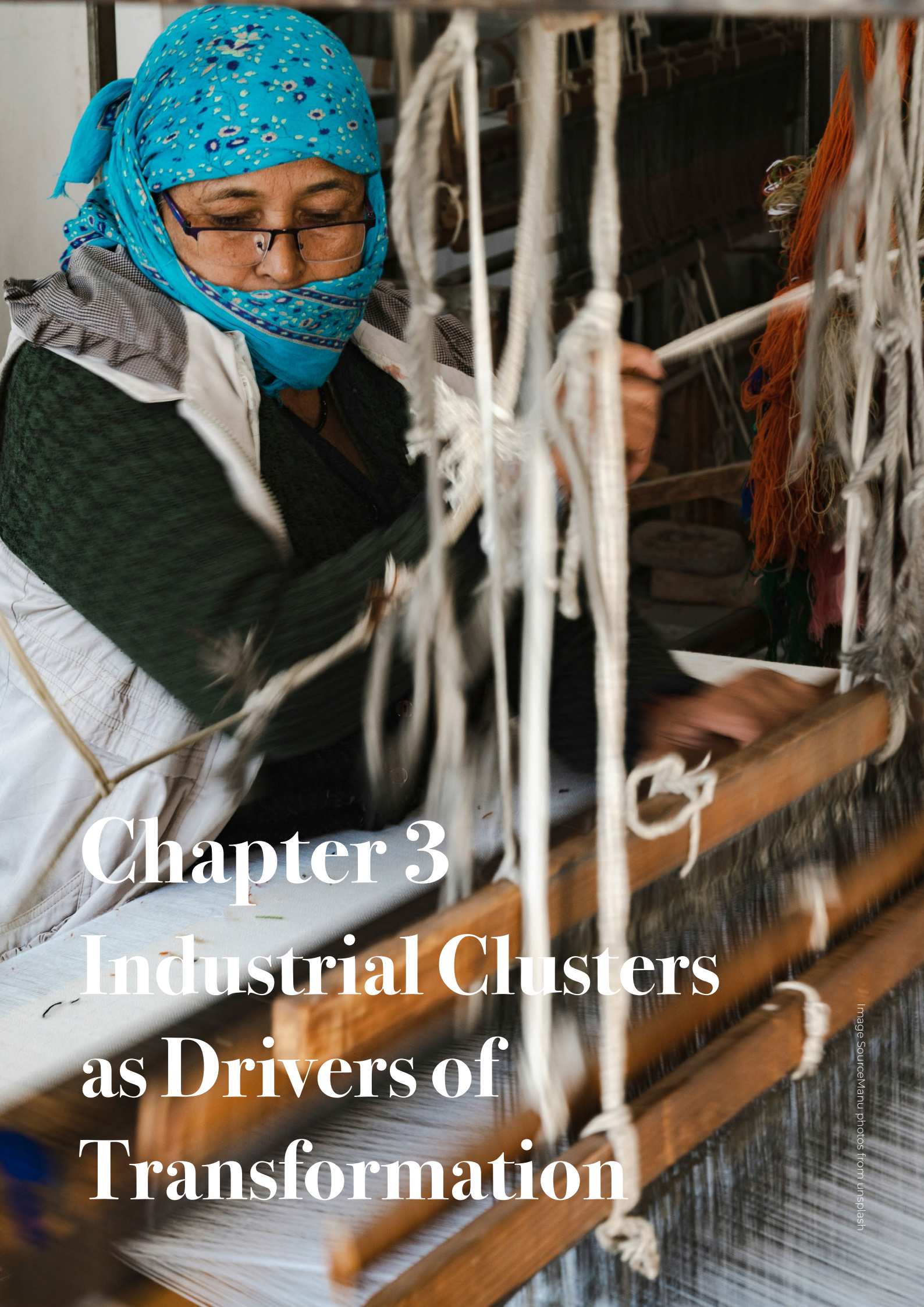
First, India's greatest advantage lies in its integrated textile ecosystem. Few countries combine large-scale fibre production, spinning, manufacturing, recycling, domestic demand and specialised industrial clusters within a single economy. Second, competitiveness remains uneven across the value chain. India performs strongly in upstream segments such as fibre production and spinning, but less strongly in several midstream segments, particularly weaving, knitting and wet processing. Addressing these gaps represents one of the largest opportunities to increase value addition and export competitiveness.

Third, the MSME-dominated structure of the industry is both a strength and a challenge. While it enables flexibility and employment creation, it can also constrain access to finance, technology, sustainability expertise and traceability systems. This reinforces the importance of cluster-based approaches to industrial transformation.

Finally, competitiveness is increasingly linked to sustainability. Resource efficiency, traceability, circularity and resilience are becoming important determinants of market access, investment attractiveness and participation in global value chains. Strengthening these capabilities can therefore support both sustainability outcomes and long-term industrial competitiveness.

KEY MESSAGE

India's future competitiveness will depend not only on its strengths in fibre production and manufacturing scale, but increasingly on its ability to improve value addition, strengthen midstream capabilities and build more traceable, resource-efficient and circular textile value chains.



Chapter 3
Industrial Clusters as Drivers of Transformation

Image SourceManu photos from unsplash

India's textile production is geographically concentrated in specialised clusters that have evolved around specific fibres, products, and processing capabilities. These clusters form the backbone of the textile industry and are responsible for the sector's manufacturing competitiveness and employment generation.

They also represent the most practical entry point for scaling sustainability and circular economy interventions, particularly given the dominance of MSMEs across the sector. The transition towards more sustainable and circular textile value chains is therefore likely to occur primarily through cluster-level transformation. Shared infrastructure, collective action, common services and coordinated investments can help address sustainability challenges that individual enterprises, particularly MSMEs, often struggle to tackle independently. This chapter examines selected textile clusters and identifies both existing sustainability initiatives and opportunities for future transformation.

3.1 WHY CLUSTERS MATTER

Clusters such as Tiruppur (knitwear), Surat (man-made fibres), Panipat (recycling and home textiles), Ludhiana (woollens), Karur (home textiles), Bhiwandi (powerlooms) and Bengaluru (garments) illustrate the diversity of India's textile ecosystem and collectively account for a substantial proportion of production and employment. The cluster model provides several important economic advantages and from a sustainability perspective, clusters are equally important because they allow environmental challenges to be addressed collectively. Common infrastructure for wastewater treatment, renewable energy, resource recovery, logistics and recycling can reduce compliance costs and improve environmental performance at scale. This is particularly important in an industry dominated by MSMEs that often lack the resources to implement such measures independently. Several Indian clusters already demonstrate successful examples of resource efficiency, circularity and environmental management. These examples provide valuable lessons that can be adapted and replicated across the wider sector.

KEY MESSAGE

Industrial clusters are not only centres of production; they are the primary vehicles through which sustainability and circularity can be scaled across India's textile sector.

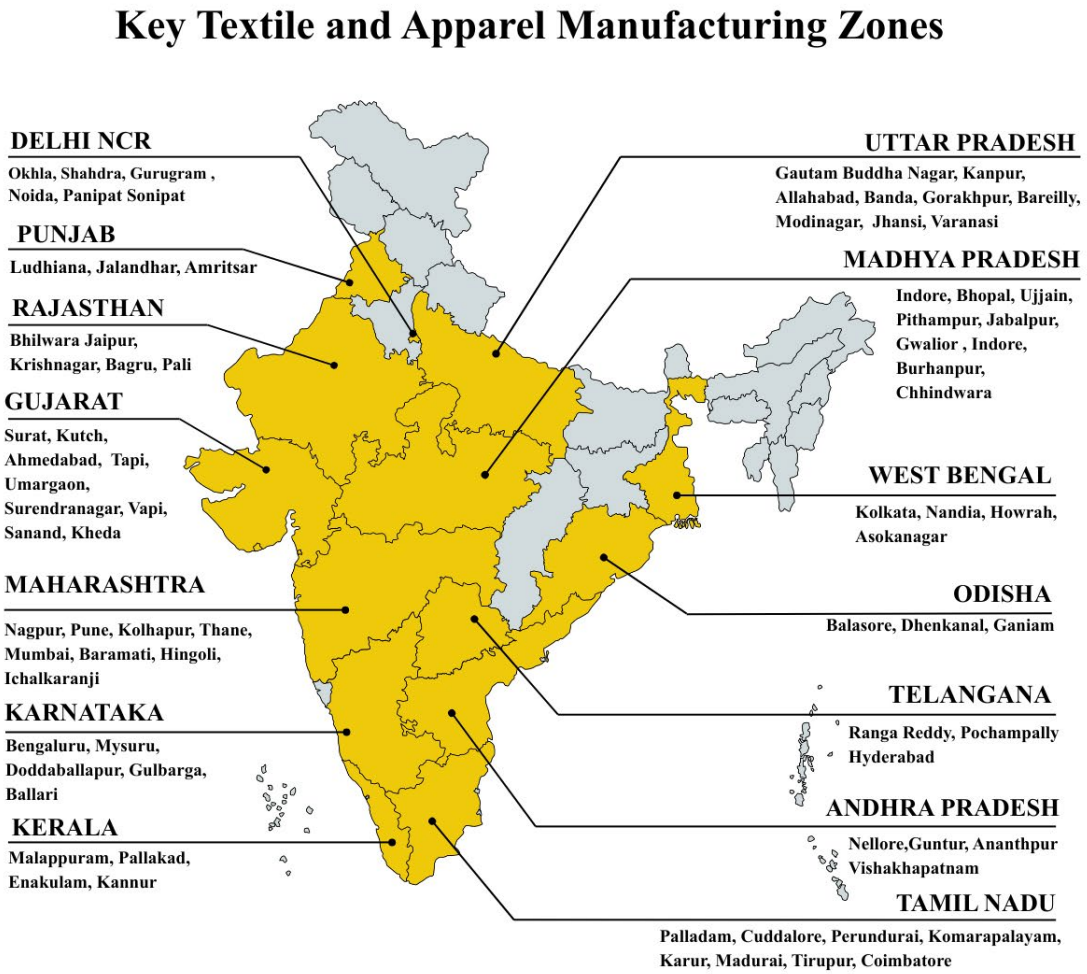


Figure 10: Major Textile and Apparel Manufacturing Clusters in India

3.2 SELECTED CLUSTERS PROFILES

These clusters have been selected to capture the diversity of India's textile sector in terms of fibre types, manufacturing processes, and their significance in both domestic and export markets, while collectively representing different stages of the textile value chain. The selected clusters also vary considerably in their scale of operations, industrial structure, technology adoption, resource efficiency, sustainability practices, and awareness levels. This diversity enables the assessment to reflect the varying opportunities, challenges, and intervention priorities required to accelerate the transition towards a more competitive, sustainable, and circular textile sector.

3.3 KARUR (TAMIL NADU)

CLUSTER OVERVIEW

Karur (Tamil Nadu)

Key Home Textile Cluster



ANNUAL TURNOVER OF APPROXIMATELY

$ 1.05 BN

₹9 K CR

OF WHICH

₹6,000 CRORES (USD 0.7 BILLION)

IS FROM EXPORTS LARGELY TO EU AND US MARKETS.
OTHER EXPORT MARKETS INCLUDE SOUTH KOREA, JAPAN, AND SCANDINAVIAN COUNTRIES.

THE CLUSTER CURRENTLY HAS AROUND

400 EXPORTERS AND 250

DOMESTIC FOCUSSED UNITS.
MORE THAN 80% OF THE UNITS ARE MICRO OR SMALL UNITS, ALSO RESEMBLING THE PERCENTAGE OF MICRO OR SMALL UNITS IN THE INDIAN TEXTILE INDUSTRY.

THERE ARE AROUND

69

PROCESSING UNITS IN KARUR.
MOST OF THE UNITS IN THE KARUR CLUSTER ARE "**CMT**" (CUT, MAKE & TRIM) WITH A FEW INTEGRATED UNITS.

CMT IS WHERE AN APPAREL FACTORY TAKES A BUYER'S DESIGNS AND PRODUCES THEM FOLLOWING THREE STAGES:

- '**CUT**', WHERE THE MATERIAL IS CUT TO A REQUIRED PATTERN AND MADE READY TO SEW.
- '**MAKE**', WHERE THE GARMENT IS STITCHED TOGETHER.
- '**TRIM**', WHERE THE GARMENT IS FINISHED, SMALL IMPERFECTIONS ARE REMOVED, AND FINAL QC AND PACKING OCCURS.

BUYERS TRY TO BE INVOLVED IN DEVELOPMENT AND PURCHASING.

YARN IS OUTSOURCED FROM SPINNING MILLS IN TAMIL NADU WHILE PROCESSING IS LARGELY UNDERTAKEN AT **ERODE** AND A SMALL PERCENTAGE FROM **PERUNDURAI** AND IN **KARUR**.

2LAKH

INDIVIDUALS DIRECTLY EMPLOYED

ANOTHER 2LAKH EMPLOYED INDIRECTLY



70%

WOMEN WORKFORCE

KEY INTERNATIONAL CLIENTS

H&M **IKEA**

DOMESTIC BRANDS

DMART

RELIANCE AT HOME

MAJOR PRODUCTS

- BED LINEN
- TABLE LINEN
- BATH LINEN
- TABLE LINEN
- FLOOR COVERINGS
- DRAPES

KEY RAW MATERIALS

COTTON | ORGANIC COTTON | LINEN | JUTE | POLYESTER | BLENDED FABRIC | HEMP | BAMBOO | LYOCELL | RECYCLED FABRICS | COIR

COTTON IS SOURCED FROM NORTH INDIA, ANDHRA PRADESH, GUJARAT AND MAHARASHTRA

POLYSTER FROM SURAT AND VISCOSE BOTH DOMESTICALLY AND THROUGH IMPORTS

Sources: https://www.thehindu.com/news/cities/Tiruchirapalli/karur-textile-exporters-heave-sigh-of-relief-over-india-usa-trade-deal/article70591192.ece

Current Circular Practices:

- Use of sustainable fibres – organic cotton, alternate fibres such as bamboo, lyocell, coir etc.
- Textile waste is reused as cushion fillings and cut wastes are repurposed as new products.
- Renewable Energy (through the grid).
- Large integrated units have captive renewable energy solution installations which include wind energy and solar photovoltaic plants, wastewater treatment plants, hostel facilities etc.

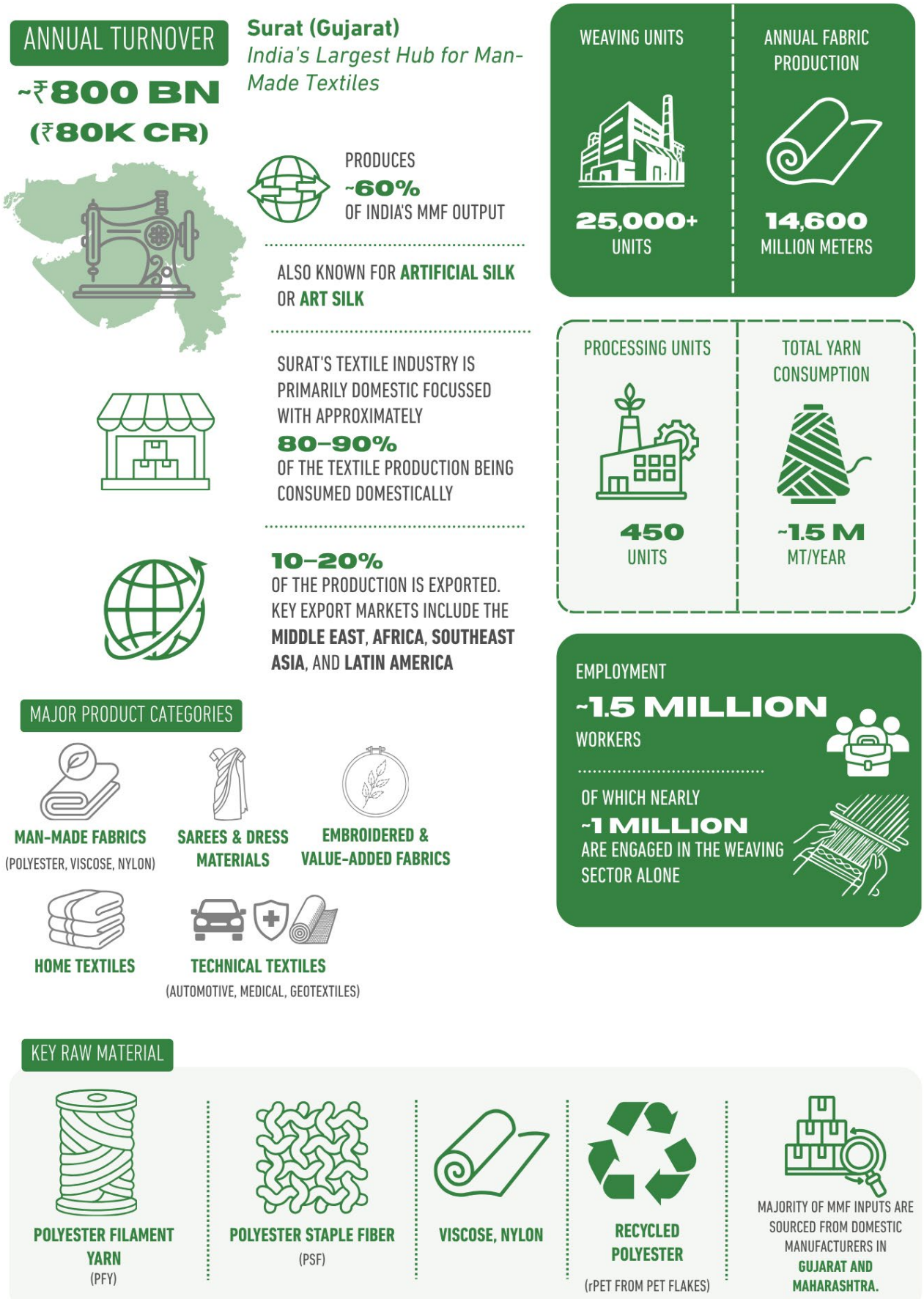
Potential Opportunities for Circular Practices and Sustainability Initiatives:

There is a strong case for identifying and reducing environmental hotspots using life cycle assessments (LCA) and establishing better traceability mechanisms. There is also a higher possibility of usage of recycled post-consumer waste and alternative sustainable fibres in home textiles. There are opportunities for circular supply chain interventions especially with the processing sector. The cluster can also diversify into sustainable technical textiles and other value-added products to increase product and market diversification.

There is significant potential to strengthen circularity within the Karur cluster by adopting life cycle thinking and improving traceability across the value chain to identify and address environmental hotspots. The cluster can enhance material circularity through the increased use of recycled fibres, and alternative sustainable fibres in home textiles. Some specific interventions can include:

- Investments in integrated cluster-level infrastructure, especially shared wastewater treatment, textile waste management and recycling and common testing facilities, can enhance environmental performance and competitiveness. A local centre of excellence on sustainability and circularity should also be established in the cluster. The cluster has received sanction for both a trade centre and a testing facility and the same should be implemented through KTMEA and the relevant government departments
- Diversification into sustainable technical textiles and other value-added products.This will require closer collaboration and handholding from research institutions such as South India Textile Research Association (SITRA) and knowledge sharing with other clusters such as Surat which has significant technical textiles activity.
- Adding local capacity on sustainability and circularity. Industry associations should invest in shared manpower resources to provide support to SMEs on the evolving sustainability landscape, identify opportunities for sustainable interventions and explore implementation pathways. The InTex India project is supporting KTMEA with the recruitment of a sustainability anchor as a pilot. The anchor will be responsible for driving sustainability related interventions, baselines and conversations in the cluster.
- Design and development of supply chain awareness programmes on data, traceability and life cycle assessments to ensure readiness of supply chains for upcoming regulations such as the ESPR and associated DPPs.
- Explore collaborations with financial institutions for alternate and green/sustainable financing.
- Strengthen industry - academia linkages with a focus to promote uptake of LCA and circular practices. The InTex India Programme will deliver training on LCA and circular textiles to 3-4 relevant academic institutions (to both students and faculty) in and around Karur with the long-term objective that these concepts are integrated into the curriculum.

3.4 SURAT (GUJARAT)



Sources: https://sitasurat.in/?surat-south-gujarat

Current Circular Practices:

The Surat textile cluster demonstrates a strong commitment to environmental sustainability through close collaboration with government agencies. One of its most significant circular resource initiatives is the large-scale reuse of treated municipal wastewater. Surat Municipal Corporation (SMC) has developed one of India's largest urban wastewater recycling systems, supported by over 2,032 km of sewer network and 11 sewage treatment plants with a combined treatment capacity of approximately 1,018 MLD. The city currently recycles around 320–330 MLD of treated wastewater annually, generating nearly ₹140 crore in revenue through industrial water sales[16].

The initiative originated in 2014, when SMC, with support from the Asian Development Bank (ADB), implemented a wastewater recycling project worth approximately INR 2.8 billion (USD 40 million). The project established advanced tertiary treatment facilities incorporating sand filtration, ultrafiltration, reverse osmosis, and activated carbon technologies to supply high-quality reclaimed water to the Pandesara and Sachin industrial estates, which together host more than 400 textile dyeing and printing units[17]. Complementing this, the cluster relies on Common Effluent Treatment Plants (CETPs) to manage industrial wastewater at scale, with the main facilities serving the textile sector located at Pandesara GIDC, Sachin GIDC, Palsana GIDC, Kadodara GIDC and the Gujarat Eco Textile Park at Palsana[18].

The cluster has similarly adopted shared utility infrastructure to improve energy efficiency. Several textile processing units in the Sachin and Pandesara industrial estates have transitioned from individually operated boilers to centralised steam generation systems. Steam House, for example, supplies 'steam as a utility' to more than 50 industrial units in Sachin GIDC through an 8 km insulated steam distribution network, with steam generated and monitored at a central facility. This model improves fuel efficiency, enhances operational safety, reduces maintenance requirements, and strengthens regulatory compliance compared to decentralised boiler operations[19].

Surat has also emerged as a national leader in market-based environmental regulation through the introduction of India's first pilot Emission Trading Scheme (ETS) for particulate matter. Launched in 2019 by the Gujarat Pollution Control Board (GPCB) in collaboration with researchers from Yale University, the Energy Policy Institute at the University of Chicago (EPIC India), and the Abdul Latif Jameel Poverty Action Lab (J-PAL), the scheme introduced a cap-and-trade mechanism supported by Continuous Emissions Monitoring Systems (CEMS). Among the 317 participating industrial units, 162 units were included in the emissions trading market, while the remainder continued under conventional regulatory oversight. When compared to units in the control group, which continued to operate under the status quo, it was discovered that pollution in units in the treatment group decreased by 24 percent[20].

[16]Centre for Science and Environment, "Reuse of Treated Used Water: A Successful Model, Surat Municipal Corporation," https://cdn.cseindia.org/attachments/0.84371800_1709877539_surat-municipal-corporation.pdf
[17]World Bank Group PPP Knowledge Lab, "Industrial Water Supply, Surat Municipal Corporation, India," https://ppp.worldbank.org/public-private-partnership/water-and-sanitation/industrial-water-supply-surat-municipal-corporation-india
[18]Textile Insights, "Surat's Textile Hub Gears Up For Deep Sea Cluster Project," https://textileinsights.in/surats-textile-hub-gears-up-for-deep-sea-cluster-project/
[19]Centre for Environment Education & UNEP, Roadmap for a Sustainable Textile Hub (2022), p. 23–24, Case Study: Steam House
[20]Centre for Environment Education & UNEP, Roadmap for a Sustainable Textile Hub (2022), p. 16–17, Case Study: Emission Trading Scheme

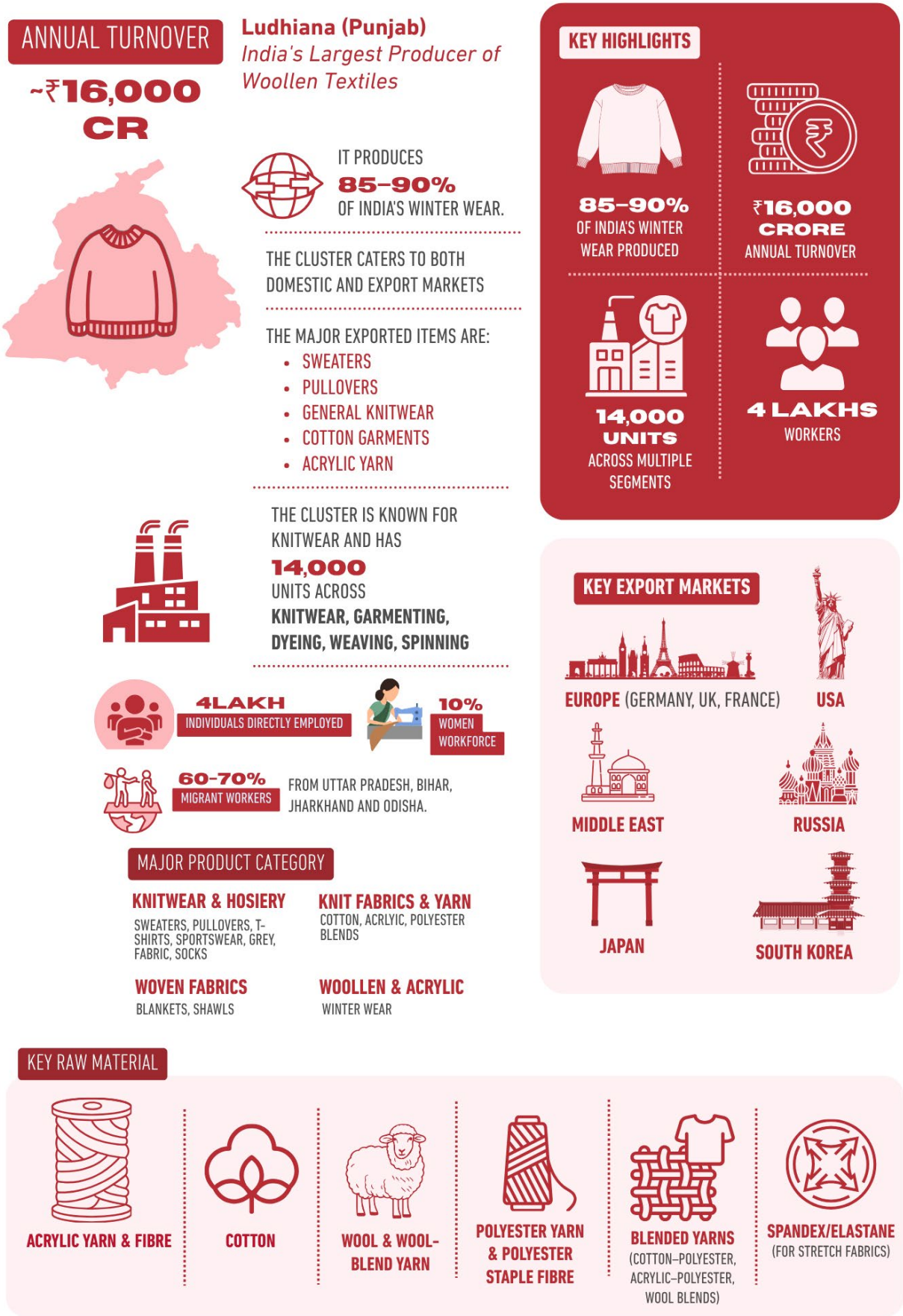
Potential Opportunities for Circular Practices and Sustainability Initiatives:

Surat has significant potential to strengthen sustainability and circularity while building on its dominance in the man-made fibre (MMF) sector. As the cluster diversifies into apparel manufacturing and higher value-added products, integrating circular economy principles, resource-efficient manufacturing, and digital traceability will be critical to enhancing competitiveness and meeting evolving global market requirements. The Roadmap for a Sustainable Textile Hub, developed by the Centre for Environment Education (CEE) in collaboration with UNEP under the guidance of the Ministry of Textiles, provides a strong foundation for this transition through a collaborative framework involving industry, government, and common infrastructure providers.

Some specific interventions include:

- Enhance wastewater management, particularly among smaller processing units, and promote wider adoption of GPCB-recommended Best Available Technologies (BATs), lean manufacturing, and Industry 4.0 solutions to improve water, energy, and resource efficiency.
- Increase the use of recycled and alternative sustainable fibres while strengthening Life Cycle Assessment (LCA)-based decision-making and digital traceability systems to identify environmental hotspots, support credible sustainability claims, and improve export readiness. The Roadmap for a Sustainable Textile Hub highlights that over 98% of polyester's water footprint is generated during wet processing, underscoring the need to improve processing efficiency alongside recycled fibre adoption.
- Support the cluster's diversification into apparel manufacturing and other higher value-added products by embedding sustainability and circularity into product design, manufacturing processes, and supply chains.
- Develop targeted capacity-building programmes for MSMEs and other industry stakeholders on circular manufacturing, resource efficiency, ESG reporting, Life Cycle Assessment (LCA), and emerging global sustainability regulations.
- Position Surat as a leading sustainable and circular textile hub through credible sustainability reporting, third-party verification, and promotion of best practices to strengthen buyer confidence and market access.
- Strengthen partnerships among industry, research institutions, technology providers, and government agencies to accelerate innovation, technology adoption, and implementation of circular economy solutions across the cluster.

3.5 LUDHIANA (PUNJAB)



Sources: https://www.sameeeksha.org/pdf/clusterprofile/Ludhiana_knitwear_cluster.pdf
https://sameeeksha.org/index.php?option=com_content&view=article&id=139&Itemid=502

Current Circular Practices

The cluster has shown growing interest in use of recycled fibres including wool. Presently, there are 3 Common Effluent Treatment Plants (CETPs), for over a 100 processing units. Several units have implemented wastewater reuse practices, especially for polyester products driven by restrictions on ground water use.

Potential Opportunities for Circular Practices and Sustainability Initiatives

The Ludhiana Cluster has significant scope to deepen circularity and sustainability outcomes. Key opportunities for the cluster include:

- Accelerated deployment of rooftop solar PV, solar thermal systems for process heating, and crop residue-based biomass solutions to substantially reduce dependence on fossil fuels, particularly in processing.
- Development of shared cluster-level infrastructure for heat and steam generation and promotion of energy service models.
- Strengthening decentralized pre-treatment facilities for smaller units to complement existing wastewater reuse practices.
- Improving process optimisation, including enhanced chemical use efficiency, to improve water circularity.
- Promoting product diversification through the use of recycled textile waste, alternate fibres, and technical textiles.
- Investing in skill development and capacity building to mainstream sustainable and circular practices across the cluster.



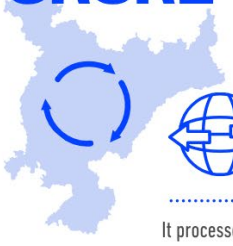
3.6 PANIPAT (HARYANA)

ANNUAL TURNOVER

₹50,000 CRORE

Panipat (Haryana)

The World's Leading "Cast-off Capital"



PANIPAT IS WIDELY RECOGNISED AS ONE OF THE WORLD'S LARGEST TEXTILE RECYCLING HUBS AND HAS BEEN REFERRED TO AS THE **"CAST-OFF CAPITAL"** OF THE WORLD.

It processes both imported and domestically generated textile waste streams, including:

- Post-consumer textile waste sourced primarily from **Europe, the UK, the USA, Canada** and other developed markets
- Predominantly domestically generated pre-consumer industrial textile waste arising from manufacturing processes within India.

The cluster annually processes around **1 million tonnes** of textile waste from domestic and imported post-consumer sources. Through mechanical recycling, this waste is converted into recycled yarn, which is then largely downcycled into products such as:

Blankets | Floor coverings | Mats | Cleaning clothes

In terms of revenue, the cluster has an annual turnover of approximately **₹50,000 CRORE** of which **20–25%** comes from exports.

There are around **4,600 UNITS ACROSS**:

- Textile waste processing
- Recycling
- Yarn manufacturing
- Blanket manufacturing

2.5 LAKH WORKERS

85-90% MIGRANT WORKERS

FROM UTTAR PRADESH, BIHAR, RAJASTHAN, JHARKHAND

KEY RAW MATERIALS

IMPORTED POST-CONSUMER TEXTILE WASTE
EUROPE, UK, USA, CANADA, KOREA

DOMESTIC TEXTILE WASTE (≈64%)

COTTON, WOOL, JUTE, MMF

COLOUR-SORTED WASTE

SHODDY WOOL

REGENERATED FIBERS

It is to be noted that there is an effort to increase the proportion of domestic post-consumer textile waste. However, the poor quality of domestic post-consumer waste poses challenges for textile-to-textile recycling and is often downcycled into coarse yarn

KEY EXPORT MARKETS



EUROPEAN UNION



USA



MIDDLE EAST



UK



HONG KONG



BANGLADESH



NEPAL



AFRICA

The cluster exports not only end products such as blankets and home textiles, but also recycled fibres and yarns, with several export-oriented units supplying international brands such as IKEA and H&M Home.

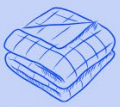
MAJOR PRODUCT CATEGORIES



SHODDY YARN
RECYCLED AND BLENDED YARN



HOME TEXTILES
MATS, FLOOR COVERINGS



WOOLLEN & SYNTHETIC BLANKETS
SHODDY BLANKETS, MINK BLANKETS, FLANNEL BLANKETS, 3D BEDSHEETS



RECYCLING
POST-CONSUMER AND PRE-CONSUMER TEXTILE WASTE

Sources:https://www.sameeeksha.org/pdf/clusterprofile/Ludhiana_knitwear_cluster.pdf
https://www.pib.gov.in/PressReleaseDetail.aspx?PRID=2260895&reg=6&lang=1
https://apparelresources.com/business-news/sustainability/textile-waste-panipat-answer
https://fmc.org.in/wp-content/uploads/2026/02/Panipat-Textile-Recycling-DSR-Final_Draft-12-02-2026.pdf
https://sameeeksha.org/index.php?option=com_content&view=article&id=190&Itemid=502#:~:text=Panipat%2C%20a%20city%20in%20Haryana,://www.hcma.in/
Note : some information and insights presented in this document regarding the clusters are based on primary data collected through field-level surveys and direct interactions with stakeholders. All cluster-specific data has been compiled from CRB's primary engagements and on-ground interactions.

Current Circular Practices

The cluster is known for recycling capabilities and has been able to set up a sustaining ecosystem, with capacity of annual processing of 1 million tonnes of waste. The cluster plays an important role in diverting textile waste from landfill disposal by creating an industrial ecosystem for collection, sorting, recycling, and reuse of textile materials. These activities contribute to material recovery, reduced landfill burden, and associated emissions savings, while also generating employment and economic value for the cluster. The use of coal is not permitted in the cluster, encouraging a transition towards biomass fuels, moving the industry towards usage of biomass - which is a carbon neutral fuel.

Potential Opportunities for Circular Practices and Sustainability Initiatives

There is still a massive opportunity to strengthen circularity and sustainability within the Panipat cluster. Key opportunities include:

- Expanding post-consumer textile waste recycling and progressing towards textile-to-textile recycling and chemical recycling for man-made fibres (MMF).
- Transitioning towards cleaner energy through the installation of rooftop solar systems. While the cluster currently uses biomass as boiler fuel, which is considered carbon neutral, it is not free of air pollutants.
- Strengthening integrated cluster-level infrastructure, including shared facilities for wastewater treatment, textile waste collection and recycling, renewable energy, and testing, to improve resource efficiency, reduce operational costs, and enhance competitiveness.
- Improving wastewater management and exploring opportunities for common Zero Liquid Discharge (ZLD) plants.
- Supporting technology upgradation to improve operational efficiency, productivity, and global competitiveness.
- Investing in targeted skill development and capacity building for both shop-floor workers and management personnel to facilitate the adoption of sustainable production practices, resource efficiency measures, circular business models, and compliance with emerging market requirements.

3.7 TIRUPUR (TAMIL NADU)

CLUSTER OVERVIEW

Tirupur (Tamil Nadu)
The Knitwear Capital of India



EXPORTS FROM THE CLUSTER ACCOUNT FOR NEARLY
₹40,000 CRORE

MAJOR EXPORT MARKETS INCLUDE
EU, USA, UK, CANADA, JAPAN, AUSTRALIA

THE CLUSTER HAS A LARGE DOMESTIC MARKET, CONTRIBUTING AROUND
₹30,000 CRORE

THE CLUSTER COMPRISES MORE THAN
20,000 UNITS
ACROSS THE VALUE CHAIN.

IT CONTRIBUTES APPROXIMATELY
55%
OF INDIA'S TOTAL KNITWEAR EXPORTS.

6 LAKH
INDIVIDUALS DIRECTLY EMPLOYED

65%
WOMEN WORKERS

SEMI LITERATE WOMEN WORKERS FROM RURAL AREAS

2 LAKH
ADDITIONAL WORKERS

EMPLOYED INDIRECTLY IN ANCILLARY ACTIVITIES

KEY RAW MATERIAL

- **COTTON YARN**
- **BLENDED YARNS** (POLY-COTTON, VISCOSE)
- **ECO-FRIENDLY DYES**

MAJOR PRODUCTS

- T-SHIRT
- KNITWEAR APPAREL
- INNERWEAR
- INFANT WEAR
- SPORTS WEAR
- ATHLEISURE
- VALUE-ADDED KNITTED GARMENTS

THE ECOSYSTEM INCLUDES:
KNITTING
DYEING
COMPACTING
PRINTING
EMBROIDERY
STITCHING
FINISHING
FORMING ONE OF INDIA'S MOST INTEGRATED APPAREL CLUSTERS.

Current Circular Practices

Early adopter of Zero Liquid Discharge (ZLD) technologies-18 CETPs (300 units connected, out of approximately 430 dyeing units operating in the cluster units); leader in water recycling and effluent treatment (130 million liters treated on a daily basis – 96% recycled); high use of clean energy (installed capacity of 1950 MW – 1600 W and 350 MW solar; cluster level plantation drive – 2 million tree saplings planted, Textile waste recycled into yarn; rPET facilities

Potential Opportunities for Circular Practices and Sustainability Initiatives

The Tiruppur cluster has achieved significant progress on wastewater management and reuse, clean energy and tree plantations. Building on these achievements, some achievements for the cluster can consider:

- Use of renewable energy for CETP operations.
- Diversification into alternate fibres including man made fibres.
- Exploring new technologies/innovations such as waterless dyeing or processes requiring low chemical applications.
- End-to-end traceability on textile waste generated from manufacturing units.
- Dedicated portals/platforms for all industry actors including MSMEs to report in a uniform and a timely manner.



3.8 BHIWANDI (MAHARASHTRA)

CLUSTER OVERVIEW

Bhiwandi (Maharashtra)
One of India's Largest Powerloom Clusters



₹10,000 CRORE
ESTIMATED ANNUAL TURNOVER

THE CLUSTER PRIMARILY CATERS TO THE DOMESTIC MARKET, INCLUDING:

- **MUMBAI**
- **JAIPUR**
- **SURAT**
- **ICHALKARANJI**
- **AHMEDABAD**

EXPORT ACTIVITY IS LIMITED, WITH ONLY
~9%
OF UNITS PRODUCING EXPORT-QUALITY GREY FABRIC, **MOSTLY ROUTED INDIRECTLY THROUGH AGENTS** AND **EXPORTERS**

CONTRIBUTING NEARLY
33%
OF INDIA'S TOTAL POWERLOOM PRODUCTION.

THE CLUSTER COMPRISES AROUND
12 LAKH (1.2 MILLION)
POWERLOOMS

THE CLUSTER SUPPORTS AROUND
20 LAKH (2 MILLION)
WORKERS, PREDOMINANTLY MIGRANTS FROM **UTTAR PRADESH AND BIHAR, WITH ADDITIONAL LABOUR FROM WEST BENGAL, ODISHA, AND ASSAM**

DAILY FABRIC PRODUCTION IS APPROXIMATELY
420 LAKH METRES
SOURCED FROM AROUND **7 LAKH ACTIVE LOOMS**

MAJOR PRODUCTS

MAINLY GREY FABRIC
SHIRTING, DRESS MATERIALS

DYED FABRICS
LUNGIS, SAREE, RUNNING FABRICS

JACQUARD FABRICS

CHECK FABRICS

LIMITED MADE-UPS
CURTAINS, BED SHEETS, HOME FURNISHINGS

KEY RAW MATERIAL

- **COTTON YARN**
- **POLY COTTON & POLY VISCOSE BLENDS**
- **VISCOSE YARN**
- **POLYESTER YARN**

Potential opportunities for Circular Practices and Sustainability Initiatives

The Bhiwandi cluster has significant potential to strengthen circularity and sustainability outcomes. Key opportunities for the cluster include:

- Promoting the adoption of structured circularity and sustainability practices, particularly among MSME-operated units that continue to rely on conventional and energy-intensive production systems.
- Accelerating the uptake of renewable energy systems, cleaner production technologies, and digital monitoring mechanisms across the broader cluster.
- Implementing data-driven resource efficiency programmes focused on energy optimisation, machine productivity, emissions reduction, and traceability systems.
- Developing cluster-wide interventions for cleaner energy transitions, shared infrastructure models, and improved wastewater management.
- Strengthening sustainability awareness, skill development, and capacity building to support the adoption of circular economy practices and enhance the cluster's long-term environmental performance and competitiveness.



3.9 BENGALURU (KARNATAKA)

CLUSTER OVERVIEW

Bengaluru (Karnataka)

A Key Organized Hub for Readymade Garments and Fashion Apparel



AN ESTIMATED ANNUAL TURNOVER OF APPROXIMATELY

$ 7.87 BN

₹75 K CR

CONTRIBUTING AROUND **11%** OF INDIA'S GARMENT EXPORTS.

EXPORTS ARE DIRECTED TO **THE USA, EU, UK,** AND MIDDLE EAST MARKETS, WHILE THE DOMESTIC MARKET ALSO REMAINS SIGNIFICANT.

THE CLUSTER COMPRISES **~400+ ORGANIZED UNITS** AND THOUSANDS OF ANCILLARY/JOB-WORKING UNITS.

THE CLUSTER EMPLOYS AROUND **500,000 WORKERS,** WITH APPROXIMATELY **90% WOMEN,** REPRESENTING ONE OF INDIA'S HIGHEST FEMALE WORKFORCE SHARES IN THE INDIAN TEXTILE SECTOR.

KEY HIGHLIGHTS

ANNUAL TURNOVER **₹75,000 CRORE**

11% OF INDIA'S GARMENT EXPORTS

KEY HUB FOR **READYMADE GARMENTS** AND FASHION APPAREL, INCLUDING UNIFORMS AND SILK PRODUCTS

EXPORT MARKETS **USA, EU, UK, AND MIDDLE EAST**

~400+ ORGANIZED UNITS AND THOUSANDS OF ANCILLARY/JOB WORKING UNITS

~500,000 WORKERS EMPLOYED **~90%** WOMEN

MAJOR PRODUCTS

READYMADE GARMENTS

FASHION APPAREL

UNIFORMS

SILK PRODUCTS

KEY RAW MATERIALS

COTTON FABRICS (SOURCED FROM TAMIL NADU, GUJARAT)

SILK (LOCAL PRODUCTION)

MANMADE FIBERS (POLYSTER, VISCOSE BLENDS)

ECO CERTIFIED DYES AND CHEMICALS

Potential opportunities for Circular Practices and Sustainability Initiatives

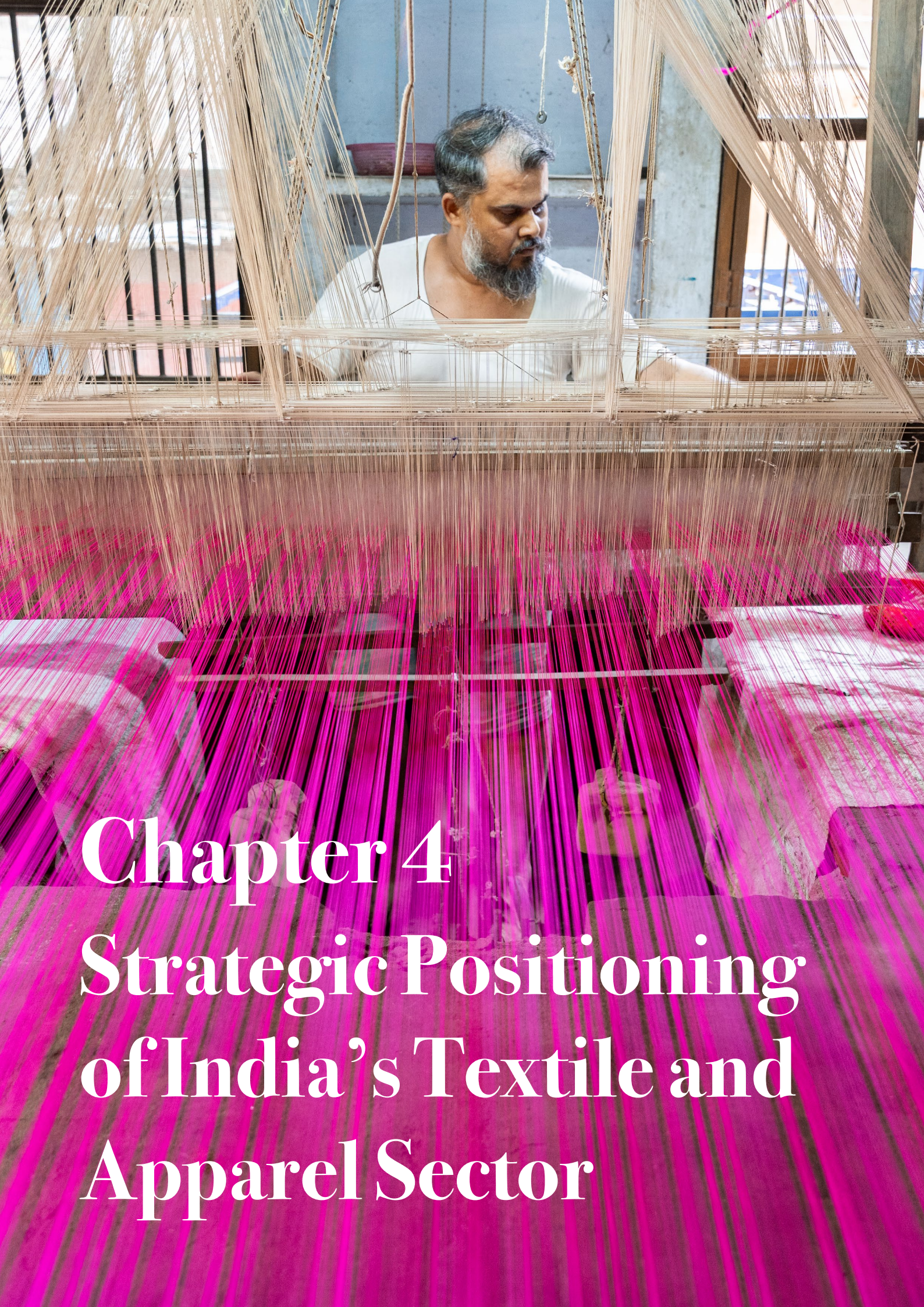
The Bengaluru cluster is well positioned to strengthen its leadership in sustainable and circular apparel manufacturing. Key opportunities for the cluster include:

- Expanding the adoption of compliance and traceability systems across the broader garment value chain.
- Promoting sustainable material sourcing and responsible procurement practices.
- Scaling the use of digital supply-chain tools, including Enterprise Resource Planning (ERP) systems, Product Lifecycle Management (PLM) software, RFID-based inventory tracking, and QR code-enabled traceability platforms.
- Piloting and scaling innovations related to circular fashion, Digital Product Passports (DPPs), and end-to-end product traceability systems.
- Strengthening sustainable design practices and encouraging collaboration among export-oriented manufacturers, global sourcing offices, design institutes, technology start-ups, and sustainability-focused brands to accelerate the transition towards a more circular textile ecosystem.

3.10 EMERGING LESSONS FROM INDIAN TEXTILE CLUSTERS

The analysis of selected textile clusters demonstrates that many solutions required for a sustainable and circular textile transition already exist within India. While clusters differ in terms of products, technologies and market orientation, several common lessons emerge:

- **Shared infrastructure delivers scale**: Examples from Surat and Tiruppur demonstrate that investments in shared wastewater treatment, water recycling and common utilities can help reduce environmental impacts while improving operational efficiency and competitiveness. Such infrastructure can be significantly more affordable for MSMEs when deployed at cluster level.
- **Circular business ecosystems can emerge organically:** Panipat illustrates how industrial ecosystems can develop around material recovery and recycling. The cluster has established one of the world's largest textile recycling systems and demonstrates the potential for circular business models to generate both economic value and employment.
- **Sustainability can improve competitiveness**: Several clusters show that sustainability investments can reduce resource costs, improve operational performance and strengthen market positioning. Water efficiency, renewable energy and resource recovery can produce both environmental and economic benefits.
- **MSMEs require collective support**: Most sustainability challenges identified across clusters relate not to a lack of willingness, but to limited access to finance, technical expertise, data systems and infrastructure. Cluster-level approaches can reduce these barriers and accelerate adoption of sustainable practices.
- **Data, traceability and skills will become increasingly important**: As international buyer expectations and regulatory requirements evolve, clusters will require stronger capabilities related to traceability, lifecycle data, sustainability reporting and compliance management. Capacity-building and knowledge-sharing platforms will therefore become increasingly important.



Chapter 4
Strategic Positioning of India's Textile and Apparel Sector

The Indian A&T sector is at a crossroads. While the sector has inherent strengths, it is also facing stiff competition from other emerging economies, has to account for climate related supply chain disruptions and has to invest in capacities and know how to respond to market demands on circularity and sustainability. This necessitates undertaking a critical strategic positioning analysis of the sector and to also benchmark the sector against other competing economies.

The section below explains the strengths, weaknesses, opportunities and threats of the Indian textile industry based on the primary and secondary research conducted by the authors with a specific focus on environmental and economic sustainability dimensions.

4.1 SECTOR COMPETITIVENESS AND STRATEGIC POSITIONING

This section answers the questions where does India stand today and what are its structural advantages and weaknesses.

- **Strong competitiveness in selected segments** - India's textile exports are highly concentrated in a few product categories, while the country exports 840 textile products, more than 52% of its exports come from just 134 items, in which India holds a global export share of over 10%[21]. This includes a rich, GI tagged handloom heritage that provides Indian textiles a strong branding in traditional, high value textiles.
- **Value chain available inside the country** - India is one of the few countries which has the advantage of having the entire value chain inside the country, even though it is fragmented. India also experiences all kinds of climates from harsh winters to monsoons, generating demand for different kinds of materials.
- **Flexibility from small scale manufacturing** - The textile & Apparel industry is dominated by small scale manufacturing units, which are agglomerated in clusters, which provide flexibility in handling specific and small orders. Each of these clusters are specialized textile hubs in themselves with different specialization and advantages.
- **Government Support for Textile Sector** - The government has been taking many policy measures and supporting several schemes to support the textile sector including infrastructure development and support for identifying new export markets.In addition to central government initiatives, several state governments have also introduced textile policies to attract investments and provide continued support to existing textile units.
- **E-commerce as an efficient distribution channel** - E-commerce in India had a propelled growth with presence of various platforms and tech-savviness among consumers. E-commerce platforms are also moving to AI based shopping and solutions, opening up whole new opportunities and markets.
- **Increasing focus on sustainable and circular practices** - The last few years have witnessed a marked shift towards sustainable and circular practices. This is evident in various developments such as integration of sustainability and circularity aspects in curricula for leading fashion and apparel institutes, formation of industry alliances such as SU.RE, large-scale recycling capacities in clusters like Panipat, the introduction of initiatives such as the "Upcycling Mark" to promote products made from upcycled materials, and the emergence of several start-ups focusing on circular business models including alternative fibres, upcycling, recycling, and repurposing.

[21]https://niti.gov.in/whats-new/trade-watch-quarterly-july-september-q2-fy25

While the Indian A&T sector is strongly placed, there are certain weaknesses that need to be addressed for the sector to capitalise its strategic advantage. These are:

- **Stagnant apparel exports** - India's textile and apparel exports have remained stagnant at approximately $40 billion for the past six years, growing at just 0.8% annually, which is significantly lower than the global growth rate of 3.5%.
- **Uncompetitive in the global value chain** - While India has the advantage of presence across the entire textile value chain, not all segments of the value chain are globally competitive. India has a relatively strong presence in raw materials, fibres, and yarn production, making these segments more competitive compared to downstream value-added segments.
- **Supply Chain Bottlenecks** - India's textile supply chain faces challenges in logistics with gaps in connectivity between manufacturing hubs and ports. Exports are delayed due to container shortages, high freight charges and complex custom procedures[22], and discounted prices[23]. Lack of integrated infrastructure at the cluster level adds to costs and reduces competitiveness and productivity. India's textile industry suffers due to these bottlenecks in the supply chain, making it difficult to secure or complete orders for export markets.
- **Inconsistent Quality** - Indian exporters often fail to meet quality expectations, this can harm long-term partnerships, even if the prices are low. Inconsistent product quality remains a major barrier to market diversification and global competitiveness. For example, the yarn industry faces challenges related to the quality of raw cotton, as contamination and inconsistent fibre length are common issues in Indian cotton. India is reported to have among the highest cotton contamination rates globally, which affects yarn quality, increases processing costs, and reduces competitiveness in premium international markets.
- **High environmental footprint** - The A&T sector accounts for roughly 2% of India's total greenhouse gas (GHG) emission[24] , generates and receives over 7.8 million tonnes per annum of textile waste annually[25] and causes high water pollution especially in the dyeing and finishing processes. The A&T sector will need large resources to address this adverse impact and invest in resource efficiency, circularity and climate change combating measures.
- **Sustainability and Circularity remain niche** and adoption is particularly low for goods manufactured for the domestic market.
- **Limited collaboration and knowledge sharing** amongst different clusters and stakeholders - The A&T sector across the country remains silo based and collaborations are missing across i) different clusters, ii) between industry and academia, and iii) between public and private sector stakeholders.

[22]https://in.apparelresources.com/business-news/trade/complex-dgft-customs-procedures-impede-garment-sectors-growth-says-gtri/
[23]https://texprocil.org/informationcorner/44a57be390577d2d559bf6cefab795aa.pdf
[24]https://www.eai.in/ref/analytics/ghg/india/industry/textiles
[25]https://www.texmin.gov.in/static/uploads/2026/03/407c2f186a2044a4497c9c9803d16a2c.pdf

4.2 BENCHMARKING: INDIA'S POSITION IN REGIONAL TEXTILE MARKETS

The following section assesses how India compares with competing textile-producing countries in the region.

Table 1 below compares key industry competitiveness indicators across five textile and apparel producing countries in Asia-Pacific. These indicators shape global export competitiveness for each country in the global value chain. Key takeaways are:

- India's advantage lies in scale, fibre availability and value-chain depth.
- India's challenge lies in productivity, quality and resource efficiency.

Table 1: India's Competitiveness Relative to Major Asia-Pacific Textile-Producing Countries

Industry Indicators	India	China	Vietnam	Bangladesh	Sri Lanka
Labour Cost	Low; only Bangladesh lower.	Increasing labour costs, hourly labour costs more than double of Vietnam.	Medium; higher than India & Bangladesh, but lower than China.	Lowest in the region (USD 68/ month)	Low but higher than India and Bangladesh
Labour Productivity (Output per hour worked)	10.7	19.8	12.4	8.7	18
Adherence to Quality (% of products failed / outside acceptable limits	22% – Highest failure rate (poorest quality adherence among listed countries)	14% – Moderate failure rate	12% – Lowest failure rate (best quality adherence, tied with Indonesia)	13% – Low failure rate, better than China and India	Not available
Commercial Electricity Cost (kW/h)- 2025 (in USD)	0.12	0.08	0.07	0.1	0.09
Fibre Cost Advantage	Cotton cheaper than world price; synthetics costly due to policy bias	Balanced structure	Cotton import dependent; competitive in synthetics due to regional integration and FTAs	Cotton import dependent (14% imports); cost advantage in low-value garments.	Highly import dependent (54% imports) for fabric and inputs.
Logistics Performance Rank	38 - Moderate logistics efficiency	19 - Strong, highly efficient logistics	43 - Improving, but average efficiency	88 - Weak logistics infrastructure and processes	73 - Below average logistics performance
Statutory Corporate Tax Rates	30%	25%	20%	27.5%	30%

4.3 EMERGING MARKET DRIVERS AND COMPETITIVE PRESSURES

Sustainability in the textile industry has moved from being a peripheral concern, which was voluntary to what determines now the market access, competitiveness and resilience. There are several drivers for the change in how sustainability is adopted by the textile industry. What external trends are reshaping competitiveness and what are the key drivers for sustainability are discussed here.

Trade and Geopolitical Developments

Global trade realignments and geopolitical uncertainties are influencing sourcing decisions and market access for Indian textiles. The India–US interim trade framework, announced in February 2026, marked a significant step forward in bilateral trade relations. Under the framework, the United States reduced tariffs on Indian goods including textiles, apparel, leather, and footwear from a previous high of 50% to 18%, while revoking the additional 25% duty previously imposed on Indian crude oil imports from Russia.This reduction provides immediate relief to exporters and restores India's competitiveness in its largest overseas market, giving it a marginal tariff advantage over competitors such as Vietnam and Bangladesh. The framework also establishes a clear pathway toward a comprehensive bilateral trade agreement, with commitments to cooperate on export controls, mutually recognize safety and licensing standards, and address non-market policies of third countries. Indian exporters, particularly micro, small, and medium enterprises (MSMEs), are expected to gain improved access to the US market, while the broader value chain including rural farmers and women workers stands to benefit from increased trade and employment opportunities[26].

Disruptions arising from tariff measures, particularly in the United States , are prompting exporters to diversify markets and explore expansion into non-traditional markets with the Government's policy focus on export diversification, value addition, and global market integration. At the same time, new and ongoing trade negotiations present opportunities for India to position itself as a reliable supplier of sustainable textiles. India has signed six Free Trade Agreements (FTA) in the last five years and recently concluded one with UK and New Zealand[27].

The EU-India FTA negotiations have concluded in 2026 and it is expected to be operational in 2027. Both India and the European Union aim to strengthen trade and investment ties, and the T&A sector is a key area of focus. Once concluded, the agreement is expected to improve market access and reduce tariff barriers for Indian textile exports to the EU. However, negotiations are taking place in the context of the EU's evolving sustainability framework, which emphasizes circular economy practices, supply chain traceability, environmental compliance, and corporate due diligence. As a result, Indian textile exporters will need to align with stricter environmental and social standards to fully benefit from the agreement once it comes into force[28]. In particular, the European Commission Strategy for Sustainable and Circular Textiles has introduced several legislative measures, including ecodesign requirements for sustainable products, revisions to the Waste Framework Directive, and deforestation-free supply chain regulations. These developments in key export markets are compelling manufacturers to improve transparency, traceability, durability, resource efficiency, and environmental performance across their value chains.

[26]https://www.india-briefing.com/news/us-india-interim-trade-agreement-18-percent-tariff-42514.html/
[27]https://www.pib.gov.in/PressNoteDetails.aspx?id=156654&NoteId=156654&ModuleId=3&reg=3&lang=1
[28]https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/india_en

Domestic Regulatory Changes

Domestically, India's climate commitments, including reducing emissions intensity of GDP by 45% by 2030, achieving Net Zero by 2070, and the broader "Viksit Bharat 2047" vision, signal a long-term policy direction aligned with sustainable industrial development. More recently, the Union Budget 2026–27 introduced the Tex-Eco initiative and other sustainability-focused measures for the textile sector, reflecting a growing policy emphasis on resource efficiency, circularity, cleaner production, and global competitiveness. The emergence of national initiatives on sustainable and circular textiles, along with the National Guidelines on Responsible Business Conduct (NGRBC), further reinforces expectations for responsible production and business practices.

Shift in Investor/Financier Focus

Capital markets are increasingly integrating environmental, social, and governance (ESG) considerations into investment decisions. Large international brands and corporations are leveraging sustainable and green bonds to finance low-carbon and resource-efficient operations, influencing their suppliers to align with similar practices. In India, financing products and incentives offered by institutions such as the Small Industries Development Bank of India and energy efficiency focused schemes supported by public agencies are encouraging adoption of cleaner technologies.

In parallel, the development of a framework of climate finance taxonomy[29] in India is expected to bring greater clarity and scale to green and transition finance, benefiting sustainability-oriented textile investments.

Evolving Consumer Demand

Consumer preferences in key markets are shifting steadily towards sustainable fashion. The global sustainable fashion market size was valued at USD 11.36 billion in 2025. The market is projected to grow from USD 12.44 billion in 2026 to USD 27.96 billion by 2034[30], indicating strong long-term demand[31]. Research further indicates that India accounted for 6.44% of sustainable fashion in 2025 and the size of the sustainable fashion market in India is estimated at USD 4.4 billion by 2034[32]. Consumers are showing increased preference for eco-friendly materials such as organic cotton, recycled fibres, and alternative materials. A niche but growing segment of buyers is willing to pay a premium for sustainable and circular products. There is also rising demand for product traceability, transparency, and credible evidence of ethical and environmentally responsible value chains.

New Risks and Climate-related Disruptions

Climate change is emerging as a material business risk for the textile sector. Supply chain disruptions caused by extreme weather events such as floods, heatwaves, and erratic rainfall are affecting raw material availability, logistics, and production continuity. Depleting natural resources, particularly freshwater, are posing serious challenges for water-intensive textile processing units, necessitating the adoption of water-efficient and circular solutions. Heat stress is also gaining attention as a critical issue, with direct implications for labour health, safety, and productivity, especially in manufacturing clusters exposed to rising temperatures.

[29] https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/may/doc202557551101.pdf
[30] https://www.fortunebusinessinsights.com/sustainable-fashion-market-110575
[31] https://www.coherentmarketinsights.com/industry-reports/global-sustainable-fashion-market
[32] https://deepmarketinsights.com/vista/insights/sustainable-fashion-market/india

Innovations and Technology Developments

Technological innovation is enabling the sector to respond to sustainability pressures while improving efficiency and competitiveness. Advances are being made in alternative and plant-based fibres that reduce dependence on conventional, resource-intensive raw materials. Modern machinery and process upgrades are helping improve water, energy, and chemical use efficiency across spinning, weaving, processing, and garmenting stages. In addition, emerging techniques for water-less or low-water dyeing are gaining traction, offering pathways to significantly reduce environmental footprints while meeting buyer and regulatory expectations.

4.4 OPPORTUNITIES FOR SUSTAINABLE GROWTH AND INDUSTRIAL TRANSFORMATION

Following the evidence identified in the strategic positioning analysis, this section presents India's biggest opportunities:

New Markets through Free Trade Agreements

Recent FTAs, including the India–UK Comprehensive Economic and Trade Agreement (CETA), India–UAE CEPA, Australia ECTA, and the proposed India–EU FTA, offer significant opportunities for the Indian textile and apparel sector by improving market access and reducing tariff barriers in key export destinations. For instance, the India–UK agreement provides duty-free access for most Indian textile and apparel products in a market where tariffs previously ranged from 8–12%, enhancing India's competitiveness against suppliers such as Bangladesh, Vietnam, and China. Together, these agreements can boost exports of garments, home textiles, technical textiles, and sustainable textile products, attract investment across the value chain, support diversification into higher-value markets, and strengthen India's position as a global sourcing hub amid ongoing supply-chain diversification and resilience efforts. Further, some of these FTAs especially with EU and the UK prioritise and prefer sustainable and circular manufacturing which will provide a distinct advantage to industry actors that are able to demonstrate positive social and environmental action.

Potential in technical textiles and alternative fibre

India currently ranks 5th in technical textiles market and has a projection to grow to USD 123 billion by 2035[33]. Technical textile's demand rises directly in proportion with a country's level of industrialization and economic development, supporting critical applications across infrastructure, agriculture, healthcare, defense, automobiles, aerospace, sports, protective equipment, and packaging.

Technology upgradation and innovation

India has currently FTAs in negotiations which can facilitate technology transfer and deployment of climate smart technologies. There are opportunities to enhance competitiveness and profitability by increased usage of resource efficient technologies especially regulating energy, water and chemical consumption. Competitiveness and profitability can also be boosted by early adoption of advanced automation, AI and IOT.

[33] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2117470&reg=3&lang=2

Leverage green/sustainable financing

Climate finance taxonomy is under discussion in India. The sector has schemes related to sustainable financing from Small Industries Development Bank of India and Bureau of Energy Efficiency. The textile sector can benefit from sustainable financing initiatives such as **SIDBI Green Finance Scheme**[34], which supports MSMEs in adopting energy-efficient and cleaner production technologies, and the **SIDBI End-to-End Energy Efficiency (4E) Financing Scheme**[35], which provides financial assistance for energy-efficient equipment and technologies.In addition, the **Bureau of Energy Efficiency (BEE)** promotes investments in energy efficiency through schemes such as the initiatives under its Assistance in Deploying Energy Efficient Technologies in Industries & Establishments (ADEETIE) designed to accelerate the adoption of energy-efficient technologies across India's MSME sector. **Financing Energy Efficiency Development (FEEED) framework. Circular economy jobs and livelihood opportunities** – Circular textiles in India could create 100,000 jobs over the next 5 years[36]. There are nearly 4 million informal workers engaged in handling textile waste (sorting and segregation). Circular economy in textiles has entrepreneurship opportunities in recycling/upcycling/repurpose circular business models and innovations in sustainable materials.

New customer segments

There is an increasing preference for eco-friendly and sustainable fashion materials, the current sustainable fashion market is valued at USD 9.2 billion in 2025 and projected to grow to USD 17.8 bn by 2032[37] . The market is projected to expand on innovations in textile production, such as the introduction of eco-friendly materials and recycling technologies, awareness and demand creation from younger people, further facilitating market expansion.

Policy Shift and Government Support

Government support for the sector has been growing with measures in restriction of garment imports from Bangladesh, PLI Schemes, expanding infrastructure through Textile Parks, improving MMF capacity, tax reforms[38] for the industry. In addition, trade agreements that are already in force, such as the India–UAE Comprehensive Economic Partnership Agreement (CEPA) and the India–Australia Economic Cooperation and Trade Agreement (ECTA), as well as recently concluded agreements with key markets such as the EU and the UK, present opportunities for improved market access, reduced tariffs, increased investment, and stronger integration into global value chains. These agreements can also facilitate technology transfer and support alignment with emerging international sustainability, traceability, and due diligence requirements.

Increased disposable income and purchasing power of domestic customers

The Indian middle class has been growing alongside economic development and is expected to reach approximately 800 million people by 2030. This rising middle-class population is likely to drive higher demand for textiles and apparel. However, it will also be important to encourage sustainable consumption patterns, including greater adoption of durable, resource-efficient, and circular textile products, to reduce potential environmental impacts associated with increased consumption.

[34]https://www.sidbi.in/en/green-finance
[35]https://www.sidbi.in/head/uploads/other_loans_document/3.%20Financing%20Schemes%20for%20Sustainable%20Development.pdf
[36]https://www.primuspartners.in/news/adoption-of-circular-economy-can-create-1l-jobs-in-india-says-report
[37]https://www.imarcgroup.com/sustainable-fashion-market
[38]https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/sep/doc2025917639401.pdf

4.5 RISKS AND CONSTRAINTS TO COMPETITIVENESS

To effectively transition to circularity, the following risks and constraints to competitiveness would need to be addressed:

High dependence on few markets

Exports to the USA and the EU accounted for more than 47% of India's total textile exports in 2024. This dependence became particularly evident following the imposition of 50% tariffs, which contributed to a decline in trade. The slowdown also resulted in significant employment impacts, including an estimated loss of up to 200,000 jobs, with migrant and women workers being among the most affected groups due to their high representation in the textile workforce.

Geopolitical factors

India has a competition from other textile producing nations such as China, Bangladesh and Vietnam, the current geopolitical factors impact India's textile exports defined by tariffs, sanctions and changing alliances. Exports are now also affected by logistics and supply chain bottlenecks. With tariffs in action, global trade is reshaping as costs push up across the value chain forced to shift sourcing or improve efficiency to counteract the impact.

Tightening international regulations for sustainability

Internationally, for India's export markets, the regulations are becoming stricter on sustainability with examples of the EU's Corporate Supply Chain Due Diligence, Ecodesign for Sustainable Products Regulation[39] and EU Deforestation Free Regulation. These stricter regulations increase compliance costs for Indian business and decrease profitability, particularly for exporting SMEs that stand at the risk of being excluded from the supply chain, if they are not able to demonstrate required sustainable and circular practices.

Consumers shift to man-made fibre

India holds a comparative advantage in cotton and cotton-based fibres, the global textile market has moved to man-made fibre (77 per cent global consumption). It is also anticipated that the increase in global fibre consumption will be in favour of man-made fibres as there is a limitation to growth of cotton on account of limited availability of land for cotton cultivation[40].

Climate-related supply chain disruptions

Increasing climate-related risks such as heat stress, water scarcity, floods, and extreme weather events pose significant threats to India's textile sector. These disruptions can affect cotton production, water availability for processing, energy reliability, worker productivity, and logistics infrastructure, particularly in climate-vulnerable textile clusters, thereby impacting production continuity and export competitiveness.

[39]https://www.aepcindia.com/system/files/Key%20Sustainability%20legislations.pdf
[40]https://www.nitiforstates.gov.in/public-assets/Policy/policy_files/RNC504C000105.pdf



Chapter 5
Policy and Regulatory Landscape

Currently, the Indian textile and apparel sector is estimated at approximately USD 165–170 billion, including both domestic market and export contributions. MoT has set a target for the sector to reach USD 350 billion by 2030 (USD 250 billion from the domestic market and USD 100 billion from exports). Further, it is inevitable that the Indian A&T sector has to grow in a sustainable and circular fashion to ensure its resilience and relevance in markets that are increasingly demanding sustainability.This shift is being driven by emerging international regulations and market requirements such as the European Union's Ecodesign for Sustainable Products Regulation (ESPR)[41], Digital Product Passports (DPPs)[42], Corporate Sustainability Reporting Directive (CSRD)[43], the revised Waste Shipment Regulation[44], and the proposed Green Claims Directive[45] which are placing greater emphasis on product traceability, transparency, circularity, and environmental performance across global value chains.

It is then imperative to have a conducive and supportive policy ecosystem both at the national and state levels. An analysis of the existing policy landscape in India clearly highlights that there are several policies and schematic interventions that propel the sector forward in a sustainable and inclusive manner. This section provides an overview of these policies and also lays out the current context that guides policy actors for the sector.

Vision of Viksit Bharat : Transform India into a developed entity characterized by economic prosperity, social advancement, environmental sustainability and effective governance by 2047.

The Indian Government's vision of a Developed India by 2047 (aligned to 100 years of independence) provides an overall direction to the sustainability outlook in the country and remains an important consideration for policy making.

Union Budget 2026–27: Strengthening India's Textile Value Chain

The Union Budget 2026–27 places the textile sector at the centre of India's manufacturing, employment and export growth strategy. Key announcements include the launch of an Integrated Programme for the Textile Sector covering fibre diversification (National Fibre Scheme), cluster modernisation and employment generation, strengthening of handloom and handicrafts, sustainability through the Tex-Eco Initiative, Textile Expansion and Employment Scheme (TEEM) to modernise traditional clusters and expansion of skilling under Samarth 2.0. The Budget also proposes the development of Mega Textile Parks to promote integrated infrastructure and scale efficiencies, alongside continued support for Man-Made Fibre (MMF), technical textiles, and value-added manufacturing through Production Linked Incentive (PLI) and PM Mega Integrated Textile Region and Apparel (PM MITRA) Parks.

In addition, liquidity and competitiveness of MSMEs are being strengthened through enhanced Trade Receivables Discounting System (TReDS)[46] mechanisms, credit guarantee support for invoice discounting, linking Government e-Marketplace (GeM) with Trade Receivables Discounting System (TReDS), and the creation of a ₹10,000 crore SME Growth Fund. Export facilitation measures, including extension of export obligation timelines, further aim to improve operational flexibility and global competitiveness.

[41]https://environment.ec.europa.eu/topics/circular-economy/ecodesign-sustainable-products-regulation_en
[42]https://environment.ec.europa.eu/topics/circular-economy/digital-product-passport_en
[43]https://finance.ec.europa.eu/financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en
[44]https://eur-lex.europa.eu/eli/reg/2024/1157/oj
[45]https://www.europarl.europa.eu/topics/en/article/20240111STO16722/stopping-greenwashing-how-the-eu-regulates-green-claims
[46]https://www.pib.gov.in/PressReleasePage.aspx?PRID=2221486&reg=48&lang=2

MoT is currently in the process of developing detailed operational guidelines, implementation roadmaps, and coordination frameworks with State Governments and industry stakeholders to operationalise these Budget announcements. The focus will be on time-bound execution, convergence with existing schemes, and alignment with sustainability and export objectives to ensure effective on-ground impact across the textile value chain.

MoT, responsible for a balanced and sustainable development of the sector, has identified the following principles for the Indian A&T sector

- Prioritize resource efficiency, innovation and ethical practices
- Product longevity, recyclability and safety
- Localized circular ecosystems
- Textile to textile recycling
- Value chain transparency

Figure 11 below is a snapshot of the steps taken by MoT to promote sustainable and circular textiles



Figure 11: Snapshot of Sustainability Initiatives undertaken by the Ministry of Textiles

The Government is implementing various schemes/initiatives to strengthen the Indian Textile and Apparel sector and increase its competitiveness. Table 2 provides an overview of the major schemes and initiatives[47]

Table 2: Major Government Schemes and Initiatives Supporting the Indian Textile and Apparel Sector

Scheme	Key Objective
PM MITRA Parks	Establishes integrated textile parks to establish integrated, enabling end-to-end manufacturing, improving industrial infrastructure, generating employment, and enhancing sector competitiveness.
PLI Scheme for Textiles	Incentivizes increased production and competitiveness in the man-made fibre and technical textiles segments, by encouraging fresh investments and value-added manufacturing.
National Technical Textiles Mission	Promotes innovation, R&D, and high-value product development in technical textiles, supporting indigenous manufacturing, market development, and institutional strengthening across emerging technical textile segments.
Samarth Scheme	Enhance workforce skills through industry-oriented training

[47]Based on Ministry of Textiles scheme guidelines and notifications

Scheme	Key Objective
Silk Samagra-2	Supports the entire sericulture value chain from seed production to post-cocoon processing to improve productivity, quality, infrastructure, and farmer incomes.
National Handloom Development Programme (NHDP)	Supports handloom weavers through raw material assistance, technology upgradation, skill development, marketing support, and welfare measures.
National Handicrafts Development Programme (NHDP)	Promotes the handicrafts sector through design and technology development, skill enhancement, infrastructure support, and marketing assistance.
Comprehensive Handicrafts Cluster Development Scheme (CHCDS)	Facilitates integrated development of handicrafts clusters through interventions in infrastructure, technology, design, skill development, and market access.
Rebate of State and Central Taxes and Levies (RoSCTL)	Provides rebate of embedded state and central taxes on exports of apparel and made-ups to improve export competitiveness.
Remission of Duties and Taxes on Exported Products (RoDTEP)	Refunds duties and taxes incurred during production and distribution that are not reimbursed under any other export promotion scheme.

Several measures have also been adopted to strengthen the textile sector, including extension of export obligation period for exemption of mandatory compliance of Quality Control Order (QCO) related cases, revision of PLI schemes to ease entry and investment norms and rationalisation of GST across value chain.

In addition to national-level schemes and budgetary measures, regulatory and policy interventions have also been introduced to improve ease of doing business, enhance export competitiveness, and support sectoral growth. These include extension of export obligation periods for exemption from mandatory compliance under Quality Control Orders (QCOs), revisions to Production Linked Incentive (PLI) schemes to ease entry and investment norms, and efforts toward rationalisation of Goods and Services Tax (GST) across different stages of the textile value chain.

Furthermore, several states have notified dedicated textile policies to promote sector-specific industrial development within their jurisdictions. Key state-level textile policies include:

Maharashtra:

Integrated & Sustainable Textile Policy 2023-28[48] : Following are the key incentives included in the policy -



- Capital investment subsidy for clean machinery (MSMEs 25–45%)
- ETP: 50% up to ₹5 Cr
- ZLD: 50% up to ₹10 Cr
- Solar subsidy (max 4 MW; ₹4.8 Cr cap)
- Recycling projects: 50% up to ₹2 Cr
- R&D fund: ₹50 Cr/year
- Green branding support

Tamil Nadu :

Tamil Nadu New Integrated Textile Policy 2025–26 (Released: 29 Jan 2026)[49]

5-Year Targets: Modernise 19 lakh spindles & 8 lakh rotors; install 1,000 Rapier looms + 3,000 shuttleless looms; set up 10 dyeing/printing units with IETPs; modernise 50 processing units; 100 CAD/CAM machines; 10 non-conventional fibre units; support 24 technical textile startups; 10 R&D projects in MMF/Technical Textiles.

Fiscal Incentives:

- 6% interest subvention (spinning)
- 25% subsidy for non-conventional fibres (banana, bamboo, hemp, etc.)
- 25% subsidy for new/modernised processing units
- 50% subsidies for CAD/CAM, non-conventional fibres
- Handloom support programme (₹40 Cr), mini parks, free electricity;
- CFC supports up to ₹60 lakh
- **Regional Incentives**: Extra 10% subsidy in 22 “C” category districts



Sustainability: 50% subsidy for environmental audits; 25% subsidy for conservation equipment; compliance certification compendium.

Market & Institutional Support:

- TN Pavilion in 4 international fairs, 50% stall reimbursement
- Annual International Textile Exhibition
- TTFC digital platform, Exporter Awards, skill development

Tamil Nadu Technical Textile Mission[50]

Following are the key sustainability incentives included in the policy:.

- ₹15 Cr fund for 5 years (2025-2026 to 2030-2031)
- Promotes high-value technical textiles (Meditech, Protech, Indutech , Hometech, Sportech etc.)
- Innovation & diversification support
- Empanelment of national and international consultants; 50% reimbursement of consultancy fees (up to ₹50 lakh per firm).
- Target: 24 new units, ₹480 Cr investment

[48] https://oldpolicy-mahatextile.maharashtra.gov.in/GR/English_2023_28.pdf
[49] https://static.fibre2fashion.com/Newsresource/images/308/308099.pdf
[50] https://tntextilesschemes.tn.gov.in/t3m#:~:text=Promoting%20the%20production%20of%20Technical,Protech

Karnataka:

Karnataka Industrial Policy[51]



Following are the key sustainability incentives -

- ETP/CETP: 50% cost support (₹50 L – ₹5 Cr)
- ZLD: 50% support (up to ₹1 Cr)
- Air pollution control: 50% cost
- Energy efficiency: 50% certification cost
- Recycling & WtE: 50% up to ₹5 Cr
- Eco/Export certification: 50% up to ₹5 L/unit

Rajasthan:

Rajasthan Textile & Apparel Policy 2025-29[52]



Following are key sustainability incentives -

- Water recycling/ZLD: 50% up to ₹12.5 Cr
- 100% electricity duty exemption for 7 years on captive RE
- 5% interest subvention for green machinery
- Consent fee waiver for Green Rated units
- R&D for sustainability: 50% up to ₹1 Cr.

Punjab:

Punjab Industrial & Business Development Policy 2022-27[53]



Following are the key sustainability incentives included in the policy :

- Audit incentives: 75% (₹1.5 L/audit) - Energy/Water/Safety/ Environment/Steam
- ETP/ZLD: 50% up to ₹25 L
- Eco-certifications (incl. ZED): 100% up to ₹10 L
- Clean fuel & renewable energy incentives

Haryana:

Aatma Nirbhar Textile Policy[54]



Following are the key sustainability incentives included in the policy:

- ETP: 70–75% up to ₹1 Cr
- ZLD: 40–75% up to ₹10 Cr
- Energy audit: 75% up to ₹2 L + 20–50% machinery subsidy up to ₹20 L
- Water audit: 75% up to ₹1 L
- Solar rooftop: 30–50% up to ₹20–50 L

[51]https://investkarnataka.co.in/wp-content/uploads/2025/02/IndustrialPolicy2025_PrintPagesSingle_.pdf
[52]https://rising.rajasthan.gov.in/storage/app/public/files/pdf/rajasthan-textile-and-apparel-policy-2025.pdf
[53]https://punjabinfotech.in/assets/pdf/Industrial_Policy_2022.pdf
[54]https://cdnbbsr.s3waas.gov.in/s3f48c04ffab49ff0e5d1176244fdfb65c/uploads/2022/12/2022122747.pdf



Chapter 6 Sustainability Hotspots and Circular Transition Opportunities

The textile and apparel sector creates significant economic value but also generates environmental and social impacts across its lifecycle. Understanding where these impacts occur is essential for identifying opportunities to improve resource efficiency, reduce environmental pressures, strengthen competitiveness and accelerate the transition towards a circular economy. The current textile economic model is a linear one based on "take, make and dispose", where it takes or extracts from the environment, makes a product and then disposes of it, where all material loses value. Circularity in the textile value chain means that materials should be kept at the highest possible value, when they move in the value chain and that it is retained as long as possible in the value chain. Circular economy, in principle is the decoupling of economic growth from material consumption and thereby the environmental impacts associated while continuing to improve human well-being.

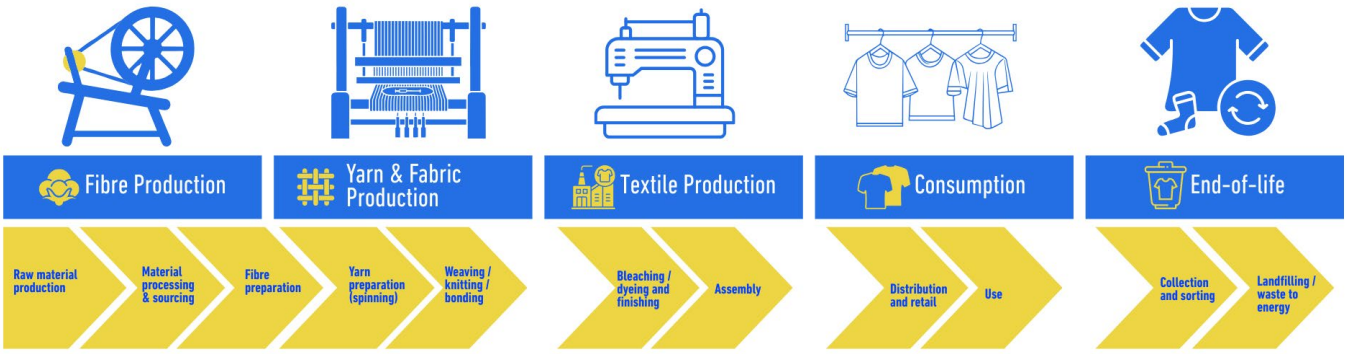


Figure 12: Linear Flow of Activities in the Textile and Apparel Value Chain

UNEP's Value-Chain Approach identifies intervention points within economic systems where actions can reduce resource use and environmental impacts while supporting sustainable consumption and production. It provides the analytical framework used in this report.

Using UNEP's value-chain approach, this chapter examines key sustainability hotspots across the Indian textile value chain and identifies priority intervention areas for cotton and synthetic textile systems. It highlights opportunities to improve value retention, reduce resource consumption, support circularity and strengthen long-term sector competitiveness.

6.1 LIFE CYCLE HOTSPOTS ACROSS THE TEXTILE VALUE CHAIN

A life-cycle perspective highlights that environmental and social impacts are concentrated at specific stages of the textile value chain. Textile production is the largest contributor to lifecycle greenhouse gas emissions (approximately 36%), followed by the use phase (24%), while raw material production and material processing each account for around 12%. Freshwater consumption is highest during fibre production (35%), followed by the use phase (24%), raw material production (21%), and wet processing activities such as bleaching, dyeing, and finishing (18%)[55]. These wet processing stages are also major hotspots for chemical use, wastewater generation, and pollution. In addition, logistics and distribution contribute to the sector's carbon footprint through fossil-fuel-based transport and time-sensitive air freight. At the downstream end, fast fashion consumption patterns accelerate material throughput, while end-of-life management remains dominated by downcycling and informal recycling, resulting in significant losses of material value.

[55]https://www.oneplanetnetwork.org/knowledge-centre/resources/sustainability-and-circularity-textile-value-chain-global-roadmap

Table 3 : Life Cycle Hotspots Across the Textile and Apparel Value Chain

Life cycle Stage	Main Hotspots
Fibre Production	Water, pesticides, land use, GHG emissions, dependence on fossil fuels, high energy use
Manufacturing	Energy, chemicals, wastewater, hazardous waste and textile waste
Distribution	Transport emissions, packaging waste
Use	Energy, water, detergents, microplastics
End-of-Life	Waste, value loss



6.2 OVERVIEW OF THE INDIAN COTTON VALUE CHAIN

Applying a life-cycle approach reveals distinct environmental and social hotspots across each stage of the Indian cotton textile value chain. The section is structured in two parts - the first part provides an overview of the sustainability hotspots in the cotton value chain, and the second part delves into the key opportunities for strengthening sustainable and circular practices.

6.2.1 Sustainability Hotspots in the Cotton Value Chain

Table 4 : Life Cycle Hotspots Across the Cotton Value Chain

Production of Materials (Life Cycle Stage 1)	Manufacturing (Life Cycle Stage 2)	Distribution (Life Cycle Stage 3)	Use (Life Cycle Stage 4)	EOL (Life Cycle Stage 5)
40% of world cotton cultivation in area is in India with relatively low yield (1/4th of global avg), Low income of smallholder farmers, 7,000 to 10,000 liters of water required to produce just one kilogram of cotton Cotton cultivation is responsible for 50 per cent of pesticide use, Biodiversity loss linked to cotton cultivation, Diesel pumps in irrigation → high fuel dependence and GHG emissions	High energy use (Power dominates the consumption pattern in spinning/ weaving, while thermal energy for chemical processing)→ high fuel dependence (15-20%) of production cost and GHG emissions , Heavy dependence on grid electricity or captive coal-based power. Textile industries have been put under the categories of 17 highly polluting industries by CPCB Major environmental hotspots include - waste water discharge, adverse impact on receiving streams due to high pollution load, high color in effluents due to presence of dyes, ETP sludge disposal, ZLD high compliance and treatment costs, salt disposal and management . Heavy dependence on Migrant workers, Worker health risks, Poor OHS ,(ZLD, ETPs)	Fossil fuel-based transport, packaging waste, warehousing energy use Long lead time leads to overproduction, excess inventory, or outdated products Air freight produces 60 times more CO_2e per tonne-kilometre than shipping by sea	High Water Usage in home laundry and greywater discharge High Energy use in drying and ironing Chemical runoff from detergents and washing chemicals Fast fashion business models driving overconsumption	A total of 7800 Kilotons of textile waste is collected annually with 59% being reused or recycled and 19% being downcycled, 5% being incinerated and 17% reaching landfills. Cotton and cotton blends account for nearly 61% of the total textile waste Informal recycling sector with hazardous operations, Water pollution from recycling and processing Downcycling to low-value end markets

6.2.2 Key Opportunities for a circular and sustainable cotton value chain in India

India's strong presence across the cotton value chain provides significant opportunities to transition from a predominantly linear production model towards a sustainable and circular economy. Interventions at different life-cycle stages can simultaneously reduce environmental impacts, improve resource efficiency, strengthen livelihoods, and enhance long-term competitiveness of the sector. This section outlines key short- and medium-term opportunities for advancing circularity and sustainability across the Indian cotton value chain.

Table 5 : Key Opportunities for Advancing Circularity Across the Indian Cotton Value Chain

Production of Materials (Life Cycle Stage 1)	Manufacturing (Life Cycle Stage 2)	Distribution (Life Cycle Stage 3)	Use (Life Cycle Stage 4)	EOL (Life Cycle Stage 5)
Short Term Increase uptake of regenerative and organic cotton Reducing GHG emissions and improving farmer's income, Traceability systems, **Medium Term** Cotton waste (stalk and gin waste) used to produce biofuel, MSP to support farmers can be redesigned by linking reduced pesticide use and water efficient irrigation. Protection of biodiversity and ecosystem services through nature based solutions..	**Short Term** Sustainable and Circular Design practices Develop Energy, water, chemicals baselines for textile clusters Upgradation of spinning infrastructure Use of digital monitoring systems for energy management Implementation of water efficient and energy efficient programmes **Medium Term** Transition to cleaner chemicals; higher participation in initiatives like Zero Discharge of Hazardous Chemicals Implement wastewater management/ treatment solutions & infrastructure Scale up of new solutions such as waterless dyeing	**Short Term** Recyclable/ minimalist packaging, Maximise use of renewable energy for brand owned facilities, Efficient warehouses **Medium Term** Transition to Biofuels (focus on ethanol blended fuel); Discussions underway for Sustainable Aviation Fuel; Greener Shipping logistics Higher share of Electric Mobility in the distribution fleet	**Short Term** Consumer Awareness Programmes promoting sustainable and circular fashion Incentivise circular business models such as leasing/ rental repair services, thrift stores etc. Strengthen consumer information through eco-labelling, product content and care Identify solutions for reducing environmental and chemical footprint in use phase - e.g. greener detergents or correct usage of detergents; energy and water efficient washing machines etc. **Medium Term** Sustainable Public Procurement	**Short Term** Regulations for managing textile waste - ban on landfilling textile waste; EPR for textiles; disclosures on unsold stocks; Establishing local/ regional collection and sorting facilities Initiate R&D for textile to textile recycling Implement programmes for better working conditions for informal sector Set standards for recycled textiles **Medium Term** Scale Up Circular textile-to-textile recycling Use of mono materials for easier recycling Full Traceability systems

COMPETITIVENESS OPPORTUNITIES IN THE COTTON VALUE CHAIN

- Improve productivity and resource efficiency through sustainable farming practices, efficient irrigation, and cleaner production technologies.
- Strengthen traceability and transparency to enhance supply chain visibility, support regulatory compliance, and improve access to sustainability-conscious markets.
- Promote circularity and value addition by increasing the use of recycled fibres, improving textile waste collection, and advancing fibre-to-fibre recycling.
- Build resilience and competitiveness by reducing environmental impacts, improving farmer livelihoods, and positioning India's cotton value chain for long-term sustainable growth.



6.3 OVERVIEW OF THE SYNTHETIC VALUE CHAIN

Man-made fibres have an ever increasing role in India's textile and apparel industry as it becomes the dominant fibre in the global market. The segment is primarily dominated by synthetic fibres such as polyester, nylon, and acrylic. Regenerated cellulose fibres such as viscose also form an important part of the broader man-made fibre ecosystem. Man-made fibres offer advantages in durability, versatility, and cost, although their value chain is highly energy- and carbon-intensive, with significant environmental externalities across the life cycle.

India's synthetic textile value chain spans from petrochemical feedstock production to end of life management. Unlike cotton, synthetic fibres are largely decoupled from agriculture but remain deeply dependent on fossil fuels and chemical processing, making decarbonisation and circularity particularly challenging. Durability of synthetic fibres also doesn't necessarily mean that it will have a lesser contribution in textile waste.

6.3.1 Sustainability Hotspots in the Synthetic Value Chain

Table 6 : Life Cycle Hotspots Across the Synthetic Textile Value Chain

Production of Materials (Life Cycle Stage 1)	Manufacturing (Life Cycle Stage 2)	Distribution (Life Cycle Stage 3)	Use (Life Cycle Stage 4)	EOL (Life Cycle Stage 5)
Fossil fuel dependency - polyester and nylon derived from petrochemicals. High carbon footprint (1 kg nylon → ~20 kg CO_2e) and 1kg of Polyester generates 14.2 kgCO2 eq. Viscose production uses hazardous chemicals (e.g., carbon disulfide, sulfuric acid). GHG emissions high during polymerisation and extrusion processes Environmental friendly synthetic fibres accounts barely 0.07% of total production in India	High energy use in spinning, water use in dyeing, fabric waste, air emissions, Unsafe working conditions, chemical exposure CO2 emissions for 1 kg of T-shirt with polyester fabric is 1.7 to 4.5 kg CO_2e Energy consumption is 125 MJ/kg polyester fibre Process waste (chemical residues, wastewater sludge). PET fibres are hydrophobic and highly crystalline which mandates thermal assistance during dyeing which emits 2.31–4.14 kg CO2eq/kg finished textile	Fossil fuel-based transport, packaging waste, warehousing energy use Long lead time leads to overproduction, excess inventory, or outdated products Air freight produces 60 times more CO_2e per tonne-kilometre than shipping by sea. Textiles are the largest source of primary microplastics (especially from clothes made of polyester/acrylic), accounting for 34.8% of global microplastic pollution	Microfibre release into water bodies, high energy use in tumble drying and ironing, Low consumer awareness Present filters to filter the microfibres are currently expensive and reportedly difficult to install 50% of clothing is made from plastic and up to 700,000 fibres can come off our synthetic clothes in a typical wash	A total of 7800 Kilotons of textile waste is collected annually with 59% being reused or recycled and 19% being downcycled, 5% being incinerated and 17% reaching landfills. 19% of the textile waste in India is contributed by polyester and synthetic blends Informal recycling sector with hazardous operations, Polyester waste has low biodegradability; it accumulates in landfills. Energy Intensive and inefficient recycling techniques

6.3.2 Key Opportunities for Synthetic value chain in India

The synthetic textile value chain presents significant opportunities to reduce its environmental footprint while improving resource efficiency, innovation, and long-term competitiveness. Advancing circularity across the lifecycle from the increased use of recycled and bio-based fibres to cleaner manufacturing technologies, sustainable logistics, responsible consumer use, and high-value recycling systems can help reduce dependence on virgin fossil-based feedstocks and minimise waste generation. This section outlines key short- and medium-term opportunities for strengthening circularity and sustainability across India's synthetic textile value chain.

Table 7: Key Opportunities for Advancing Circularity Across the Indian Synthetic Textile Value Chain

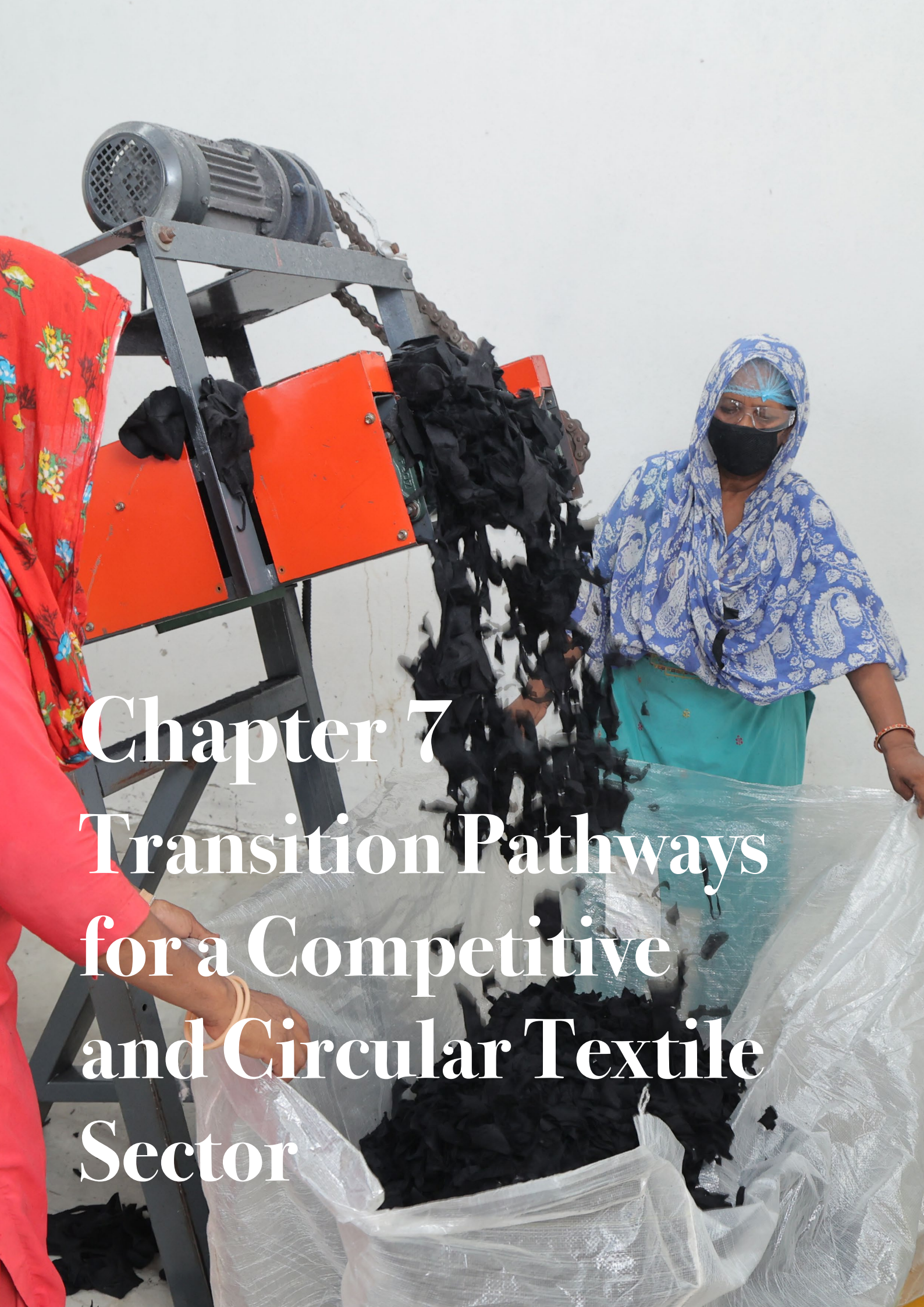
Production of Materials (Life Cycle Stage 1)	Manufacturing (Life Cycle Stage 2)	Distribution (Life Cycle Stage 3)	Use (Life Cycle Stage 4)	EOL (Life Cycle Stage 5)
Short Term Increased availability of recycled content through Textile to Textile recycling, Traceability for recycled content, **Medium Term** Bio-based polyester, Biosynthetic fibres can replace synthetic fibres because they are both recyclable and biodegradable Sustainable synthetic fibres can either be made from natural sources like fungi or sugar or they can be made from recycled petrochemical feedstocks	**Short Term** Salt-Free dyeing, renewable energy use, decent work standards,Cost savings through process efficiency Dope dyeing method, where pigments are extruded along with the melted polymer reduces environmental impact by 30 to 50% compared to conventional dyeing **Medium Term** Supercritical CO2 dyeing enables sustainable dyeing without water and eliminates effluents. This also achieves high dye fixation and uniformity in polyester dyeing without need of dispersing agent (or) auxiliary chemicals	**Short Term** Recyclable/ minimalist packaging, Maximise use of renewable energy for brand owned facilities, Efficient warehouses **Medium Term** Transition to Biofuels (focus on ethanol blended fuel); Discussions underway for Sustainable Aviation Fuel; Greener Shipping logistics Higher share of Electric Mobility in the distribution fleet	**Short Term** Widespread adoption of microfibre capture devices, low-impact detergents **Medium Term** Legislations to ensure all new washing machines are fitted with effective filter to capture maximum amount of microfibres possible	**Short Term** Regulations for managing textile waste - ban on landfilling textile waste; EPR for textiles; disclosures on unsold stocks; Establishing local/ regional collection and sorting facilities Initiate R&D for textile to textile recycling Implement programmes for better working conditions for informal sector Set standards for recycled textiles **Medium Term** Scale Up Circular textile-to-textile recycling Modernise recycling facilities Full Traceability systems

COMPETITIVENESS OPPORTUNITY FOR THE SYNTHETIC VALUE CHAIN

As global fibre demand continues to shift towards man-made fibres, improving the sustainability profile of synthetic textile production will become increasingly important for maintaining competitiveness and market access.

Given the growing dominance of synthetic textiles along with high carbon intensity, fossil fuel dependence, and end-of-life challenges associated with synthetic fibres, transitioning towards a circular textile value chain is both urgent and strategic for India. While some interventions can deliver near-term efficiency gains and compliance benefits, deeper structural changes, particularly in material innovation, dyeing technologies, and recycling systems will be critical over the medium term

This section outlines key opportunities across the life cycle of synthetic textiles, distinguishing between short-term and medium-term pathways.



Chapter 7
Transition Pathways for a Competitive and Circular Textile Sector

India's textile and apparel sector can be seen standing at an inflection point. The analysis presented in the earlier chapters demonstrates that continuing along a linear model of take-make-dispose, will increasingly affect competitiveness, reduce market access, and strain environmental sustainability.

The transition to a sustainable and circular textile sector will require a phased approach. In the short term, priority should be given to circular product design, resource efficiency, data and measurement systems, cleaner energy adoption, improved wastewater and chemical management, traceability, policy signals such as EPR, and MSME capacity building. In the medium term, greater emphasis should be placed on increasing availability of quality recycled and alternative fibres, textile-to-textile recycling, sustainable finance mechanisms and shared cluster infrastructure. Over the longer term, India has the opportunity to become a global leader in sustainable textiles through innovation, fibre-to-fibre recycling, low-carbon materials, advanced manufacturing technologies and circular business models.

Table 8: Short-, Medium-, and Long-Term Transition Priorities for India's Textile Sector

Short term : Foundations (1- 3 years)	**Medium term: Scaling (3-5 years)**	**Long-term: Transformation (5 years +)**
Data and measurement systems, traceability , circular product design, resource efficiency (improved wastewater and chemical management), cleaner energy adoption, EPR, MSME readiness.	Recycled and alternative fibres, textile-to-textile recycling, finance, shared cluster infrastructure, sustainable finance mechanisms for market development	Global leader in sustainable textiles through innovation, scaling of fibre-to-fibre recycling, low-carbon materials and circular business models

For India, the transition offers an opportunity not only to mitigate risks, but to unlock and create new value pools through efficiency gains, innovation, job creation, and leadership in emerging sustainable textile markets.

7.1 WAY FORWARD

7.1.1 Short Term priorities: Establishing the Foundations (1- 3 years)

In the short term, priority should be given to creating an enabling ecosystem for sustainable and circular textiles across the value chain. This includes:

Table 9. Short-Term Priority Actions for Advancing a Competitive and Circular Textile Sector (1–3 Years)

Recommendation	**Linkage with Indian budget 2026 & FTAs**
Promote circular product design principles, including durability, repairability, recyclability and increased use of mono-materials, in collaboration with brands, manufacturers and design institutions.	Budget 2026's focus on sustainable manufacturing, resource efficiency, and value addition through the Tex-Eco initiative provides an opportunity to mainstream circular design principles, foster innovation, and encourage the adoption of sustainable materials and product development practices across the textile value chain. **Impact / Shift to Circularity** • Extends product lifespans and reduces material consumption. • Improves repairability, recyclability, and fibre recovery at end-of-life. • Promotes design-for-circularity and greater use of recyclable mono-materials. • Enhances the competitiveness of Indian textiles by aligning products with evolving sustainability requirements.

Recommendation	Linkage with Indian budget 2026 & FTAs
Accelerate resource efficiency, cleaner production, and clean energy transitions across textile clusters by improving water efficiency, wastewater treatment, chemical management, renewable energy adoption, energy efficiency, and low-carbon production systems based on cluster level assessments and action plans	Budget 2026's emphasis on sustainable textiles, clean energy, and green manufacturing provides an opportunity to support the adoption of resource-efficient technologies, cleaner production practices, renewable energy systems, and energy-efficient infrastructure through cluster modernisation and technology upgradation initiatives. **Impact / Shift to Circularity** • Reduces water, energy, and chemical consumption while minimising pollution and emissions. • Lowers operating costs and improves resource efficiency across textile clusters. • Accelerates the adoption of renewable energy and low-carbon manufacturing systems. • Enhances the competitiveness, resilience, and environmental performance of India's textile sector.
Strengthen data, measurement and traceability systems by increasing the availability of India-specific primary life-cycle data and establishing harmonised reporting and disclosure frameworks aligned with domestic and international requirements. Industry consultations indicate a strong need for a common data strategy that defines what data should be collected, how it should be collected and how frequently it should be reported. (*This activity needs to be done over the next 1 year*)	Budget 2026's focus on digital modernisation, export competitiveness, and MSME cluster upgradation provides an opportunity to strengthen traceability platforms, life-cycle data systems, and ESG reporting tools through initiatives such as Tex-Eco and cluster modernisation programmes. **Impact / Shift to Circularity** • Strengthens material traceability and transparency across the textile value chain. • Improves lifecycle assessment, environmental reporting, and data-driven decision-making. • Enhances preparedness for Digital Product Passports (DPPs) and evolving sustainability disclosure requirements. • Builds credibility and competitiveness in domestic and global value chains.
Establish clear policy signals including EPR, R&D incentives, sustainable procurement approaches, infrastructure support, and incentives for circular business models.	Budget 2026-27's ₹12.2 lakh crore capital expenditure allocation and continued focus on cluster modernisation, sustainable manufacturing, and innovation provide an opportunity to strengthen policy instruments such as EPR, R&D incentives, sustainable public procurement, and investments in shared recycling, wastewater treatment, and resource recovery infrastructure. **Impact / Shift to Circularity** • Creates a predictable policy environment for investment in circular technologies and business models. • Accelerates the development of shared recycling and circular infrastructure. • Strengthens resource efficiency and material circularity across the textile value chain. • Enhances the long-term competitiveness and resilience of India's textile sector.

Recommendation	Linkage with Indian budget 2026 & FTAs
Strengthen MSME capacity and technical support systems for cleaner production, circularity, traceability and compliance readiness. Common infrastructure such as testing facilities, local information clinics for export related regulations and requirements, sustainability cells should be established in clusters. Other common infrastructure should be set up based on cluster assessments and baselines.	The Budget's Samarth 2.0 skilling reforms and cluster-based upgradation programmes provide a strong institutional mechanism to integrate circular economy principles, sustainable production practices, traceability, and technical textile skills into national training curricula. This can strengthen MSME capabilities and support their participation in both domestic and global value chains. **Impact/Shift to Circularity:** • Builds systemic capability rather than isolated best practices. • Reduces compliance risk for SMEs entering FTA markets. • Encourages design-for-recycling and waste minimisation at source. • Creates behavioural shifts across value chains—from production to consumption.

7.1.2 Medium Term Priorities: Scaling Circularity and Competitiveness (3-5 years)

As foundational systems take shape,the medium term must focus on addressing structural constraints that limit large-scale circular adoption.

Table 10. Medium -Term Priority Actions for Advancing a Competitive and Circular Textile Sector (3 - 5 Years)

Recommendation	Linkage with Indian budget 2026 & FTAs
Scaling the adoption of recycled and alternative fibres and advancing textile-to-textile recycling systems.	Budget 2026's focus on sustainable textiles, circular manufacturing, and innovation can accelerate the development and commercialisation of recycled and alternative fibres, while supporting investments in textile-to-textile recycling technologies, collection, and sorting infrastructure. **Impact / Shift to Circularity** • Reduces dependence on virgin raw materials and fossil-based feedstocks. • Increases the availability and uptake of recycled and alternative fibres. • Diverts textile waste from landfill through high-value fibre-to-fibre recycling. • Strengthens circular material flows and resource efficiency across the textile value chain.

Recommendation	Linkage with Indian budget 2026 & FTAs
Leverage public, private and international financing mechanisms, including institutions such as SIDBI and BEE, and climate finance channels to support technology adoption and infrastructure upgrades.	Budget 2026's allocation for **sustainable textiles** can leverage public finance, green credit, blended finance, and concessional lending through institutions such as **SIDBI** and **BEE** to support MSME adoption of cleaner technologies and circular infrastructure. **Impact / Shift to Circularity** • Accelerates the adoption of cleaner technologies and resource-efficient manufacturing. • Reduces financial barriers for MSMEs transitioning to circular production models. • Enables large-scale investment in circular infrastructure and technology upgrades. • Accelerates the transition from pilot initiatives to sector-wide circularity.
Developing public–private partnerships to invest in shared, cluster-level infrastructure for recycling, wastewater treatment, renewable energy, and resource recovery.	Budget 2026's support for sustainable textiles and green manufacturing can enable viability gap funding, blended finance, and capital subsidies for developing common circular infrastructure, including CETPs, zero-liquid discharge (ZLD) systems, textile waste aggregation hubs, and renewable energy integration across textile clusters. **Impact / Shift to Circularity** • Enables shared circular infrastructure and reduces compliance costs for MSMEs. • Improves resource efficiency through enhanced recycling, wastewater management, and renewable energy adoption. • Accelerates the transition from fragmented compliance to systemic circular resource management.
Investing in brand-building and narrative development for "Sustainable Textiles from India", supported by credible data, traceability, and verified performance.	Budget 2026's emphasis on export competitiveness, digital infrastructure, and sustainability can strengthen national textile promotion schemes by supporting digital traceability, ESG reporting, certification, and the "Sustainable Textiles from India" brand. **Impact / Shift to Circularity** • Strengthens India's positioning as a trusted supplier of sustainable textiles. • Enhances product value through verified sustainability and traceability claims. • Improves competitiveness in domestic and global value chains.

7.1.3 Long-term priorities: Innovation and system transformation

Table 11. Long-Term Priority Actions for Advancing a Competitive and Circular Textile Sector (5+ Years)

Recommendation	Linkage with Indian budget 2026 & FTAs
Strengthening research, development, and innovation ecosystems for advanced recycling technologies, low-impact dyeing, wastewater management, and alternative fibres.	Budget 2026's support for sustainable textiles, research and innovation, clean energy, and manufacturing competitiveness can strengthen textile R&D clusters, Centres of Excellence, and industry-academia collaborations to accelerate the development and commercialisation of advanced recycling technologies, low-impact dyeing processes, wastewater management solutions, and alternative fibres. **Impact/Shift to Circularity:** • Enables technological leapfrogging from mechanical recycling to advanced circular systems. • Reduces environmental footprint at process level. • Anchors circularity as a core industrial capability rather than a compliance response
Supporting the scale-up of next-generation solutions, particularly in fibre-to-fibre recycling and low-carbon synthetic alternatives.	Budget 2026's allocation for sustainable textiles and green manufacturing can support the commercial scale-up of fibre-to-fibre recycling, low-carbon synthetic alternatives, and advanced recycling technologies through targeted financial incentives, pilot-scale support, and technology deployment. **Impact / Shift to Circularity:** • Accelerates the transition from waste downcycling to high-value fibre-to-fibre recycling. • Reduces dependence on virgin petrochemical-based inputs. • Expands the adoption of low-carbon materials and circular manufacturing solutions.
Promote circular business models and position India as a global leader in sustainable textiles.	Budget 2026's focus on sustainable manufacturing, digital infrastructure, and innovation can accelerate the adoption of circular business models, strengthen traceability systems, and enhance the global competitiveness of Indian textiles. **Impact / Shift to Circularity** • Accelerates the transition from linear to circular value chains. • Extends product life and improves resource efficiency. • Strengthens traceability and consumer confidence. • Positions India as a global leader in sustainable and circular textiles

7.1.4 Cross-cutting Priorities

Across all phases, continuous emphasis must be placed on knowledge sharing, peer learning, and collaboration across textile clusters, enabling replication of successful models to be adapted and replicated where relevant. This helps accelerate implementation while reducing duplication of effort.

India's textile sector has historically demonstrated adaptability, entrepreneurial capacity, and resilience. Sustainability and circularity has always been present in its growth pathway- just not in prominence and highlighting this, will not be a departure from this legacy, but a natural evolution of it. With coordinated action across policy, industry, finance, and civil society, India can position itself as a favoured global textile manufacturing hub with leadership in sustainable and circular textiles, balancing economic growth with environmental stewardship and social well-being.

7.2 CONCLUSION

India's Textile and Apparel (T&A) sector has long been defined by its scale, diversity and adaptability. As global markets increasingly value sustainability, circularity and resilience, these strengths provide a strong foundation for the next phase of growth. The transition to a sustainable and circular textile economy is not only an environmental imperative, but also an opportunity to enhance competitiveness, create quality employment, strengthen resilience to future disruptions and capture emerging market opportunities. By combining coordinated policy action, industry leadership, innovation and investment, India can position itself not only as a leading textile producer, but as a global leader in sustainable and circular textiles.

InTex India

UN environment programme

CONTACT US

Centre for Responsible Business
Institutional Area, USO House USO Road, 6,
Shaheed Jeet Singh Marg, Special, New Delhi,
Delhi 110067

+91-11 4108 8853

www.c4rb.org

For additional details about the project visit our website here or
Contact Us : info@c4rb.in, unep-textiles@un.org

With the kind financial contribution of
Ministry of Environment and Gender Equality of Denmark

National Implementing Partner
CRB Centre for Responsible Business
Enabling Change for Impact

In collaboration with
CEE
Centre for Environment Education