Resource Efficiency
and Circular Economy
Industry Coalition

FICCI 100
100 YEARS OF BUILDING TOMORROW

THREADING THE LOOP: BUILDING RESILIENT AND RESPONSIBLE TEXTILE VALUE CHAINS IN INDIA

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FOREWORD

Chair RECEIC

The transition to a circular textile economy requires coordinated action across the value chain, no single stakeholder can drive this shift in isolation. As the Secretariat of the Resource Efficiency and Circular Economy Industry Coalition (RECEIC), FICCI is committed to enabling this collective approach by bringing together industry, government, and knowledge partners to drive a cohesive and scalable circularity agenda.

Through its focused working group on textiles, RECEIC is facilitating structured engagement and sectoral action, aligning industry efforts with policy priorities and emerging global trends. This collaborative platform is enabling stakeholders to move beyond intent and towards implementation.

This report reflects these efforts. Drawing on inputs from industry members and stakeholders, it presents an evidence-based perspective on the opportunities, challenges, and pathways for advancing textile circularity in India. While it highlights the significant market potential and the opportunity for green job creation, it also underscores the need for sustained collaboration and systemic interventions across the value chain.

Importantly, this report marks a starting point. It lays the foundation for deeper engagement, pilot initiatives, and actionable interventions that RECEIC and its members will continue to advance in the coming years.

FICCI as the secretariat of RECEIC remains committed to supporting this agenda by strengthening partnerships and enabling industry-led action towards building a competitive, resource-efficient, and circular textile ecosystem & working towards the benefit of its members.

Manish Sharma
Chair RECEIC

FOREWORD

Chair RECEIC Working Group on Circularity in Textile and Apparel Sector

For those working at the retail end of the textile value chain, the shift toward circularity is not a distant goal - it is a practical challenge being navigated today, often without adequate data, standards, or infrastructure to rely on. The research presented here addresses that gap in a meaningful way. By tracing the flows of textile waste from production through to end-of-life, and by identifying where material value is lost and why, it gives industry a clearer picture of the systemic constraints that individual company action alone cannot resolve.

Our experience at ABFRL - through take-back programmes, supplier engagement, and efforts to integrate recycled content - confirms what this report documents: the barriers to scaling circular models are largely structural. The absence of a textile-specific EPR framework, the lack of unified sorting standards, and the limited formalisation of informal recovery workers are not gaps that voluntary industry initiatives can fill. They require coordinated regulatory intervention and cross-sector alignment.

The findings and recommendations in this report align closely with what industry practitioners have been articulating for some time. A policy environment that defines responsibilities clearly, supports MSMEs in adapting to circular practices, and creates the economic conditions for recycled materials to compete with virgin inputs - that is the foundation on which scalable change can be built. This study makes a substantive contribution toward that outcome.

Naresh Tyagi
Chair RECEIC Working Group on Circularity in
Textile and Apparel Sector & Chief Sustainability Officer
ABFRL (Aditya Birla Fashion and Retail Ltd.)

Executive Summary

Executive Summary

Finding 1: India's textile value chains face interconnected risks rooted in near-total virgin resource dependency.

Non-Exhaustive

1 Operational, Technology Risks	2 Climate & Nature Risk	3 Regulatory & Compliance Risk	4 Geopolitical & Trade Risk	5 Market & Financial Risk
Supplier dependency & concentration: 97% virgin input dependency	**Physical risks:** Yield reduction leading to cotton price increase by 1.75x	**ESG & sustainability regulations:** EU DPP compliance in near-term, potential EPR in long-term	**Trade tariffs:** Ambiguity with tariffs; $35B textile exports exposed	**Supplier financial distress:** India's textile sector is 70–75% MSME-dominated with limited access to financial instruments
Operations: Energy accounts for 15-20% of production cost making fluctuations impactful	**Nature risk:** Sourcing concentrated in monsoon-dependent states (~55% of India's cotton comes from rain-fed regions)	**Trade compliance:** No HSN code for upcycled textile products	**Armed conflicts:** No major risk envisaged	**Commodity & input cost volatility:** Low adoption and usage of commodity hedging
Traceability technology: Fiber ID only 40–50% accurate	**Climate Transition risks:** Growing demand for certified sustainable fiber will create margin pressure	**Labor & human rights:** Engages 45M formal and informal workers with sub-standard labor protections	**Political instability & civil unrest:** Polyester and other petrochemical-based materials at risk	**Consumer shifts:** Rising demand for synthetic fibers, which account for ~40% of production currently but low recycling rates (<1%)

Risk exposure: High (orange) | Medium (yellow) | Low (green)

Figure1 : India's textile value chains are exposed to a variety of distinct yet inter-related risk types

India's textile sector, valued at $225Bn and projected to reach $350Bn by 2030, is exposed to five categories of supply chain risk: operational and technology, climate and nature, regulatory and compliance, geopolitical and trade, and market/financial. The highest-impact risks share a structural root: **97% dependence on virgin input materials.** Domestic cotton prices are projected to rise ~1.75 times under sustained climate pressure, with sourcing concentrated in monsoon-dependent states (~55% of India's cotton from rain-fed regions). Energy accounts for 15-20% of production costs, amplified by a growing synthetic fiber mix. Concurrently, **$7.6Bn in EU textile exports face Digital Product Passport (DPP) requirements** mandating material-level traceability and recycled content, capabilities most of India's value chain is not yet equipped to provide.

These risks are straining the resiliency of India's textile supply chains and, left unaddressed, hold the potential to erode the sector's global competitiveness.

Finding 2: Circular materials can hedge key supply chain risks while unlocking ~$9.4Bn in unrealized value by 2030.

Circularity addresses these risks directly: recycled fiber creates a domestically controlled alternative to climate-exposed cotton, mechanical recycling operates at substantially lower energy intensity than virgin production, and the traceability infrastructure circular systems require simultaneously builds the visibility that export regulations will demand.

India generates approximately 7,125 KTPA of textile waste, currently realizing INR 22,196 Crore in value. **Under an optimized circular system, the same physical volumes would generate INR 99,801 Crore, a gap of approximately $9.4Bn in value that exists in the material but is not captured by the current system.**

This is not a shortage of waste, buyers, or market demand. What is missing is the system infrastructure - collection, identification, sorting, and market linkage. 85% of this value gap sits in reuse, resale, and upcycling alone whereas the remaining 15% requires recycling investment that India has the industrial base to deploy.

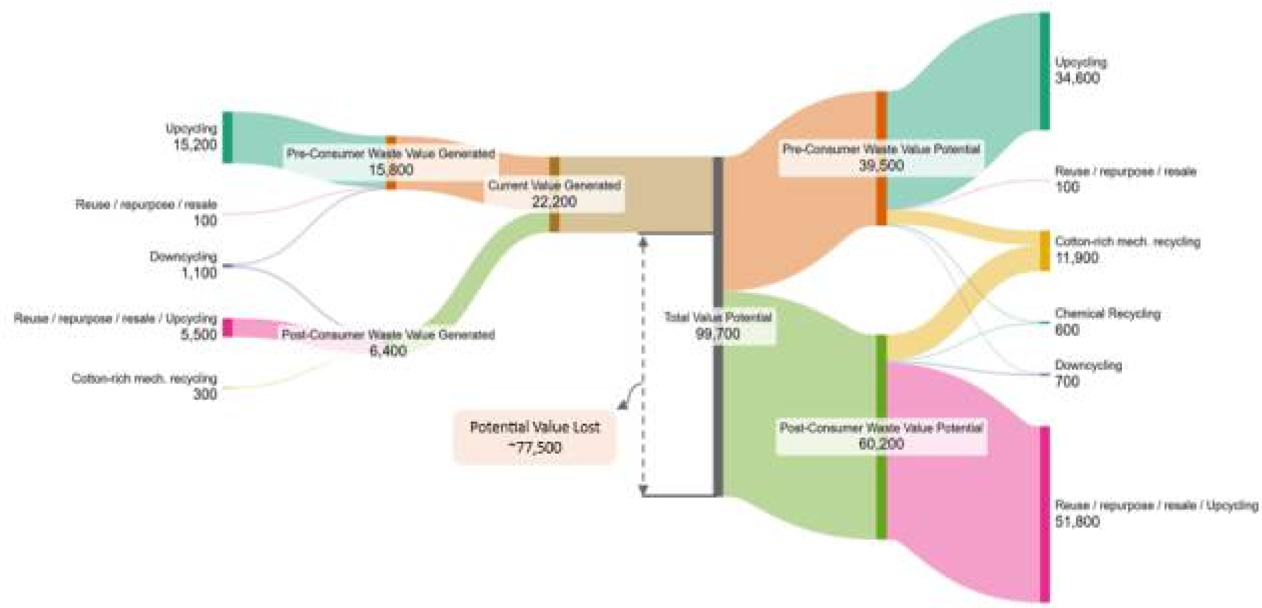

Figure 2: Value Captured vs Value Potential in India's Textile Waste System (INR Cr)

Finding 3: Structural inefficiencies in collection, sorting, and recycling prevent the current textile recovery system from capturing this value.

The $9.4Bn gap is not explained by a single failure. It is the accumulated consequence of six interconnected gaps across the three nodes of the recovery system.

Collection: losses are driven by two distinct failures: The first is absence from the system entirely: 1,897 KTPA - 45% of all post-consumer textile waste - never enters any recovery pathway, going directly to landfill or incineration at zero value. The second is waste mixing: approximately 66% of textile collection occurs through the municipal dry-waste stream, where textiles arrive contaminated with wet organic household waste before any sorting decision is made. Once soiled, a textile is disqualified from reuse on hygiene grounds and its fibre integrity is compromised for recycling. Recoverability under mixed-collection conditions stands at 25-30%.

Sorting is the value gate through which 100% of the $9.4Bn gap is either captured or destroyed - yet at 0.15% coverage of the post-consumer waste stream, India's sorting system barely exists at scale. Every textile stream in the value chain passes through a sorting decision; it is sorting that determines whether a kilogram of textile realises INR 5 or INR 400. Over 95% of sorting is manual, achieving only 40-50% accuracy for fibre composition. The consequences are three distinct failure modes: cotton-rich fractions cotton-rich fractions are routed to downcycling at 94% below their recoverable value - because no fibre identification happens at the sort; blended fabrics - approximately 27% of the waste stream - cannot be identified by touch and default to downcycling regardless of their actual composition; and contaminated input from mixed collection exits the system as co-processing fuel regardless of sorting effort or technology. Compounding all three, there is no national grading taxonomy and no bale-level documentation standard - meaning even well-sorted material trades at a discount because no buyer can verify what they are receiving.

Recycling: India's formal mechanical recycling capacity (~650 kTPA) runs almost exclusively on imported textile waste that meets quality thresholds, while domestic post-consumer waste, which is poorly sorted and contaminated, bypasses formal recyclers. Only 0.85% of domestic post-consumer waste enters closed-loop mechanical recycling. Improved sorting could unlock nearly 3,200 kTPA of quality-sorted feedstock, implying a residual capacity gap of ~400 kTPA. Additionally, India currently lacks commercial chemical recycling capacity despite ~1,350 kTPA of blended fiber waste that mechanical recycling structurally cannot process.

Finding 4: The interventions required to recover India's $9.4Bn in destroyed textile value are known, sequenced, and in several cases immediately deployable - what is missing is the system to activate them.

Closing the gap requires a coordinated system response across collection, sorting, and recycling - anchored by policy architecture that does not yet exist.

1. Establish a textile EPR framework with a **50% near-term collection target**, PRO-enabled compliance, and formal recognition of informal collectors as authorised partners

2. Designate textile waste as a **distinct municipal stream** with dedicated collection infrastructure separate from dry and wet waste

3. Drive **source segregation** through collection design - scheduled textile-specific drives and calendar-based windows - not awareness campaigns alone

4. Deploy NIR handheld and IVR bench devices at an estimated **INR 25-27 Crore Y1-Y2 investment - a ~230:1 return** ratio against the value at stake

5. Scale **TRF infrastructure from 9-10 facilities** to a national network; co-locate with DWCCs to reduce logistics cost and enable aggregation volumes

6. Establish a **national grading taxonomy** with mandatory BIS IS 1896 labelling enforcement as its prerequisite - without it, no sorting investment is bankable ($2.4Bn impact)
7. Scale **formalized mechanical recycling** infrastructure by an additional 300 kTPA ($1.5Bn impact)
8. **Catalyze chemical recycling** capacity to replace up to 26% of virgin cotton demand ($0.1Bn impact)
9. Create s**table offtake for recycled content** through procurement mandates in government sourcing. For instance, entities like Indian Railways and defense agencies can drive demand for recycled fiber through their textile needs

Finding 5: Realizing this value depends on activating a coordinated ecosystem of policy, technology, infrastructure, and partnerships.

Policy architecture is a foundational enabler. While India has made significant strides in waste management regulation, the textile-specific policy infrastructure remains at an early stage. Establishing an EPR framework for textiles, classifying textile waste as a distinct stream, developing a national grading taxonomy, introducing a BIS specification for recycled textile fiber, and creating an HSN sub-classification for recycled textile materials would provide the regulatory foundation the sector needs. An EPR framework would create a collection mandate, establish a demand floor, and bring formal recognition to the informal workers who sustain the system. A grading taxonomy would give sorters and recyclers the standardized language needed to make investment decisions bankable at scale.

Beyond policy, value realization requires **technology deployment** (AI-powered sorting, synthetic DNA markers for traceability); **infrastructure and investment** (development of a third recycling cluster, concessional MSME finance, and chemical recycling pilots); and **cross-value-chain partnerships** (brand-recycler offtake agreements, public-private models for technology piloting, and industry dialogue on recycled content standards).

Active participation and collaboration among key stakeholders spanning government bodies, development finance institutions, technology providers, and industry coalitions would be essential to implement these changes on the ground.

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CHAPTER 1

Building Resilient Textile Supply Chains in India

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Building Resilient Textile Supply Chains in India

1.1 India's Textile Sector at a Strategic Inflection Point

India's textile sector has long been a cornerstone of the country's industrial and economic growth, combining scale, diversity, and deep-rooted manufacturing capabilities. As one of the world's largest fiber-to-fashion ecosystems, the industry plays a critical role in **driving exports, generating employment, and supporting a wide network of micro, small, and large enterprises across the value chain.** The domestic market is currently valued at approximately USD 225 billion (2025) and is projected to reach USD 350 billion by 2030, growing at a CAGR of 10-12%[i]. The sector contributes around 2% to India's GDP - a share expected to more than double to ~5% by the end of the decade - and engages over 45 million people, making it the second-largest employment generator after agriculture[i].

This scale is supported by a decentralized and diverse production ecosystem spanning raw material production, spinning, weaving, processing, and garmenting. **The coexistence of large integrated players and MSME-led clusters has historically enabled cost competitiveness and production flexibility,** allowing the industry to serve both domestic and global markets on a scale. At the same time, this fragmented structure also creates variability in technology adoption, operational efficiency, and value chain coordination.

The operating environment for the sector is now undergoing a structural shift. Supply chains are increasingly exposed to **volatility in raw materials, energy costs, and demand**, while expectations around efficiency, transparency, and responsible production are becoming more prominent across global and domestic markets. **These shifts are changing how competitiveness is defined in the textile sector-from a primary focus on cost and scale toward the ability to manage variability, improve resource efficiency, and maintain stable operations.**

A key manifestation of this shift is visible in the growing scale of textile waste. India currently generates **over 7,125 kilotons per annum (KTPA)[iv] of textile waste annually**, reflecting both the scale of production and increasing consumption. While certain segments of the value chain, particularly pre-consumer stages, demonstrate high levels of recovery, **a significant portion of post-consumer waste is not effectively reintegrated into the value chain**, indicating inefficiencies in how materials are currently managed.

This disconnect between material generation, and recovery has direct implications for the sector. **A system that continues to depend on virgin resource inputs, while underutilizing recoverable material, remains exposed to input volatility and resource inefficiencies.** As subsequent sections of this report outline, addressing this gap is central to improving both resource productivity and supply chain stability.

Taken together, these trends indicate that the textile sector is at an inflection point. The industry is no longer operating in a context defined solely by scale and cost efficiency; it is increasingly shaped by its ability to manage resources effectively and respond to supply chain variability. **This report builds on this premise to examine how circular approaches-through improved recovery, recycling, and system-level interventions-can support more resilient textile supply chains in India.**

1.2 The Gap: $9.4 Bn Value at Stake

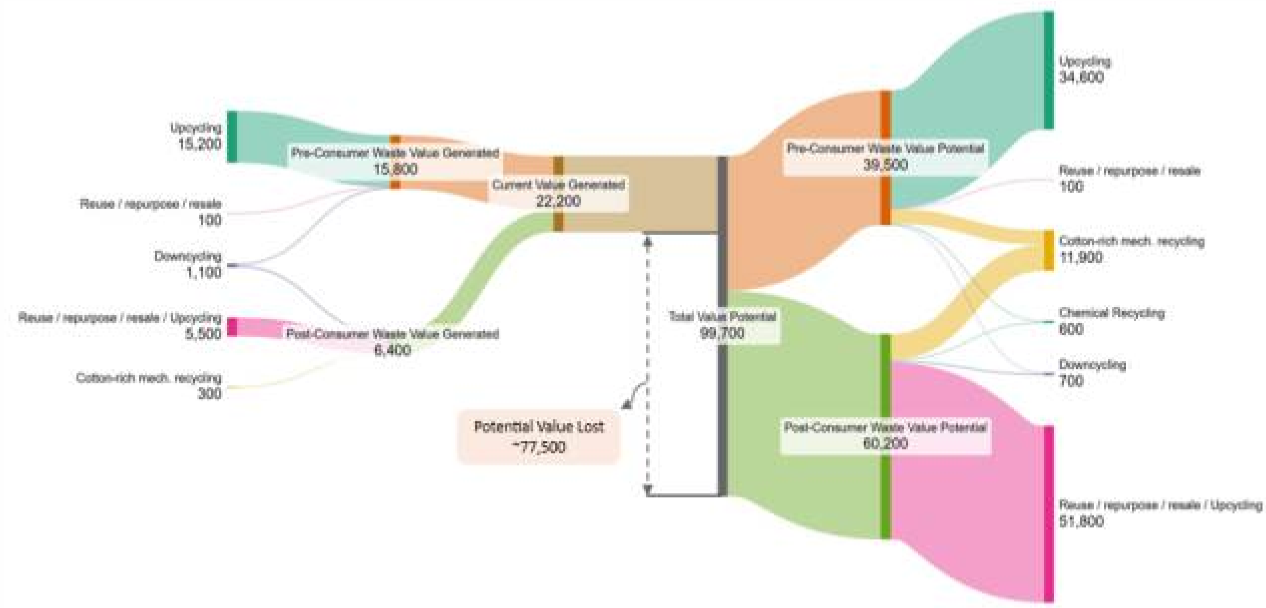

Figure1: Value Captured vs Value Potential in India's Textile Waste System (INR Cr)

India's textile waste system currently realises INR 22,196 Crore annually from approximately 7,125 KTPA of textile waste. Under optimal sorting and routing, the same physical volumes would generate INR 99,801 Crore. The difference, INR 77,605 Crore, or approximately USD 9.4 billion, is value that exists in the material but is not reached by the current system.

1.2.1 Reuse, Resale and Upcycling: 85% of the Opportunity by Value

The single largest value unlock in India's textile waste system does not require a new technology, a new market, or a new industry. **It requires identifying what the material is worth before deciding what to do with it.** Reuse, resale and upcycling - taken together - **account for 85% of the total value gap** between current and optimal outcomes. The buyers exist. The pathways exist. The material exists. What is missing is the infrastructure to match them reliably. The model distinguishes two streams.

The first is the **post-consumer reuse, upcycling and resale** stream, where 1,100 kilotonnes currently generates INR 5,500 Crore at INR 50 per kilogram through informal Waghri market channels. Under optimal routing - with condition-sorted, grade-assured material reaching organised resale buyers - the same stream generates INR 51,800 Crore at INR 400 per kilogram, on only an 18% volume increase. **Almost the entire gap is price, not volume. The constraint is upstream: no mechanism exists to identify what is rewearable before it is bundled into a lower-value bale.**

The **second stream is pre-consumer upcycling,** where 1,517 kilotonnes of manufacturing-stage textile waste is already being upcycled - the largest value-generating node in the current system at INR 15,170 Crore. This stream is not failing. It is underpriced. Informal upcycled textile products realise INR 100 per kilogram; organised channels with consistent quality grading and stable buyer relationships command INR 200 per kilogram. A further 204 kilotonnes of clean offcuts are currently buried within the pre-consumer mixed downcycling stream at INR 5 per kilogram - a rate that reflects their destination, not their quality. Identified and separated, they belong in the upcycling stream. Combined, the pre-consumer upcycling unlock is INR 19,458 Crore.

What connects these two streams is the same **upstream failure**. The post-consumer reuse stream is undervalued because no systematic condition sort identifies rewearable material before it enters the downcycling or recycling pathway. The pre-consumer upcycling stream is underpriced because no organised market linkage connects manufacturers to upcycling buyers at the quality and consistency those buyers require. In both cases, the value is present in the material. The routing decision is wrong.

The demand side is not in question. Sprecko Recycling observes that thrift stores consistently clear inventory at 30-50% below the price of equivalent virgin items; consumer interest in pre-loved goods is active and growing, particularly among younger urban consumers. The market is not waiting for a price premium to materialise. It is waiting for consistent, quality-assured supply at the volumes organised resale channels require. The barriers to supply are well understood from our interviews: quality assurance at scale, the absence of reverse logistics infrastructure, and hygiene and cultural factors that affect some consumer segments - though interviewees consistently noted that younger generations are substantially more open to thrifting than those that preceded them.[xviii]

> *"Of all the material we process, the fraction that goes to resale and thrift generates more value per kilogram than any recycling or downcycling pathway available to us today. Thirty percent of everything we sort goes back to people to wear."*
>
> *- Primary interview, Hasiru Dala Innovations, 2025/26*

On the pre-consumer upcycling side, a structurally important point emerges from our interview with I Was A Sari, which upcycles post-consumer pre-loved saris sourced through India's informal Waghri trader network. Unlike mechanical or chemical recycling, upcycling does not require fibre-type identification. Mixed fibre composition - the single most acute technical challenge for higher-value recycling - is not a constraint for upcycling. A blended fabric that cannot be mechanically or chemically recycled is entirely usable as an upcycling input. This gives upcycling a structural advantage: it can access a much larger fraction of the waste stream, including material that no other high-value pathway can process. The model is profitable with artisanal processes. Automation is not required to get started.[ii]

The scaling constraint for pre-consumer upcycling is not process capability. It is organised collection from manufacturing units and stable market linkage to buyers who can absorb consistent, quality-graded material at scale. I Was A Sari notes that the bottleneck is not supply volume but consistency and predictability: even with trusted vendor networks developed over years, quality cannot be guaranteed because no external grading or certification infrastructure exists. International buyers - who represent the majority of current demand for premium upcycled Indian textiles - increasingly require composition certification and traceability that the Indian upcycling sector cannot systematically supply.[ii]

The specific interventions required to unlock this combined value are distinct by stream but share a common logic:

1. **Condition sorting at collection:** the routing decision between reuse, upcycling, and recycling must happen earlier and more systematically. For post-consumer material, this means condition assessment before material is baled - identifying rewearable and upcyclable fractions that are currently being routed to lower-value pathways by default.
2. **Organised market linkage:** connecting pre-consumer manufacturers to upcycling buyers, and post-consumer sorters to organised resale platforms, requires aggregation intermediaries and buyer networks that do not currently operate at scale. The Waghri community provides informal aggregation; the organised layer that would raise prices does not yet exist in a form that reaches most of the material.
3. **Quality certification and standards:** grading and composition certification for upcycled products would unlock international market access for Indian enterprises and remove the burden of bespoke quality assurance from individual operators.
4. **Collection infrastructure:** a push-based household collection system - analogous to Swachh Bharat for dry and wet waste - would expand the recoverable post-consumer fraction and improve material quality at source. GIZ India notes that Kerala's calendar-based dedicated textile collection keeps material cleaner and more recoverable than mixed daily collection.

Each of these interventions are explored in detail across various upcoming sections.

Reuse, resale and upcycling account for 85% of the value unlock this analysis identifies. They are also the pathways that can move fastest: condition sorting and market linkage require no technology breakthrough, no new capital infrastructure at industrial scale, and no regulatory framework that does not already exist in draft form. The value is there. The question is whether the system is organised to capture it.

1.2.2 The Post-Consumer Landfill Stream: $0.7B from a Stream Currently at Zero

The reuse and upcycling opportunity is a routing problem - material collected but sent to the wrong destination. The landfill stream is a different failure. The 1,897 KTPA lost to landfill and incineration is not misrouted. **It is absent from the system entirely. Its current value is not low. It is zero.**

This is the one part of the value gap that sorting cannot close. The gate is collection - specifically, whether India builds the EPR architecture that gives material a reason to be collected in the first place. Without it, the 1,897 KTPA stream remains outside the economy regardless of how well TRFs operate or how sophisticated fibre identification becomes downstream.

Applying a potential India textile EPR collection target of 50% (suggestion, similar to Dutch figure)[iii] - and the source segregation recovery rate that separates clean from contaminated input - yields **806 KTPA entering the value chain for the first time, worth INR 6,564 Crore annually from a stream currently contributing nothing.** Cotton-rich material routes to mechanical recycling at Panipat. Rewearable fractions reach organised resale. Residual low-grade material enters industrial downcycling. India already knows how to process all of these streams. What it lacks is the collection infrastructure to feed them with domestic post-consumer material.

Of the INR 6,564 Crore, INR 3,225 Crore - the rewearable fraction routed to organised resale - is already embedded within the 60% reuse figure described above. The remaining INR 3,339 Crore is genuinely additive: value that no improvement in sorting, technology, or market linkage can unlock, because the material itself never arrives. EPR does not improve the system. It determines whether this part of the system exists at all.

1.3 Emerging Risk Landscape in Textile Supply Chains

India's textile supply chains are exposed to five interconnected risks that shape cost structures, supply stability, and the sector's ability to operate at scale. While each presents distinct challenges, they are not equally material.

Non-Exhaustive

1 Operational, Technology Risks	2 Climate & Nature Risk	3 Regulatory & Compliance Risk	4 Geopolitical & Trade Risk	5 Market & Financial Risk
Supplier dependency & concentration: 97% virgin input dependency	**Physical risks:** Yield reduction leading to cotton price increase by 1.75x	**ESG & sustainability regulations:** EU DPP compliance in near-term, potential EPR in long-term	**Trade tariffs:** Ambiguity with tariffs; $35B textile exports exposed	**Supplier financial distress:** India's textile sector is 70–75% MSME-dominated with limited access to financial instruments
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Risk exposure: High · Medium · Low

Figure1 : India's textile value chains are exposed to a variety of distinct yet inter-related risk types

1 **Raw Material Supply Risk - High Impact.** The most structurally significant risk. India's textile ecosystem remains overwhelmingly dependent on virgin fibre inputs, and this dependence is becoming more precarious as climate variability introduces meaningful volatility in domestic cotton production. **Domestic cotton prices are projected to increase by approximately 1.75×** under sustained climate pressure, compelling India to import medium-staple cotton in a category where it has historically been a net exporter. A system that generates **over 7,125 KTPA of textile waste** annually yet reintegrates only a fraction as usable fiber input remains unnecessarily exposed to this volatility.

2 **Energy Cost Volatility - High Impact.** Energy typically accounts for **15-20% of total production costs**, making even modest price fluctuations consequential - particularly within the MSME-dominated segments of the value chain. This exposure is compounded by the sector's shifting fiber mix: growing synthetic and blended production carries higher aggregate energy intensity per unit of output.

3 **Global Demand Fluctuations - Medium Impact.** With textile exports exceeding **$35 billion annually,** the sector is exposed to tariff shifts, geopolitical realignments, and changing sourcing patterns. The most damaging effects of demand shocks are amplified by upstream rigidities - a system with limited alternative material pathways is less able to absorb variability.

4 **Regulatory Requirements - Medium Impact (Rising)**. The EU's Digital Product Passport requirements will necessitate **material-level traceability** that most of India's value chain cannot currently provide. Domestically, the absence of textile EPR, separate waste stream designation, and standardized grading taxonomy means the sector lacks governance architecture to drive structured investment in material recovery.

5 **Operational and Structural Risks - Medium Impact.** The sector's fragmented, MSME-dominated structure creates persistent coordination challenges: limited standardization, low technology penetration, and weak visibility across nodes. In textile waste management, this is starkly visible - **approximately 9-10 TRFs nationally** against 4,100 KTPA of post-consumer waste, and transport costs reaching up to **60% of total waste management costs**.

Two risks stand out as most material: raw material supply and energy cost volatility. Both are structurally significant, and in both cases the system's dependence on virgin inputs is itself a primary source of exposure. **The following section examines how circular approaches can function as a strategic lever to address these risks, and how the capabilities required to operationalize circularity also strengthen the broader resilience of textile supply chains.**

1.4 Circularity as a Strategic Lever for Resilience

The two highest-impact risks facing India's textile sector - raw material supply vulnerability and energy cost volatility - share a common structural root: the value chain's near-total dependence on virgin resource inputs, within a system where a significant share of recoverable material is lost before it can be reintegrated. Circular approaches address this root cause directly.

On raw material supply, India generates **over 7,125 KTPA of textile waste**, yet approximately **1,845 KTPA of post-consumer waste** flows to landfill or incineration without entering any recovery pathway. Converting this waste into usable fiber creates an alternative input stream that is domestically controlled and not subject to the climate-linked variability that increasingly affects cotton. **On energy cost**, the connection operates through the fiber production pathway - mechanical recycling of cotton operates at substantially lower energy intensity than virgin production, and even chemical recycling can be materially improved through renewable energy co-location. A system that shifts a portion of its input from virgin to recycled sources reduces its aggregate energy exposure.

Circularity also strengthens the sector's position on the remaining risks. Multiple material pathways improve adaptive capacity against demand fluctuations; the traceability infrastructure required for circular systems builds the visibility that regulations such as the EU's Digital Product Passport will demand; and the coordination requirements of linking collection to sorting to recycling directly address the operational fragmentation that limits the sector today.

From circular intent to supply chain capability

Translating circularity into a functioning system is, in practice, a supply chain coordination problem. India's textile waste value chain today is characterized by fragmented material flows, weak demand signals, and near-absent infrastructure for moving material from collection through sorting to recycling - with fiber identification only 40-50% accurate, each source providing just 50-100 kg per color/material category, and only 9-10 TRFs nationally against 4,100 KTPA of post-consumer waste.

Two scenarios illustrate why supply chain capability matters as much as circular intent:

A demand-side shock - a tariff-driven order surge spikes raw material demand. In the current system, this translates directly into virgin fiber price pressure. In a system with functional circular infrastructure - recycled fiber at scale, sorting facilities that redirect material based on demand signals, recyclers with feedstock visibility - recycled inputs absorb a portion of the increase. The system flexes rather than strains.

A supply-side shock - a poor monsoon reduces cotton output. In a system where chemical recycling capacity exists and post-consumer waste is channeled into fiber recovery; recycled cotton provides a partial substitute not subject to the same climate variability. Whether the shock is absorbed or amplified depends on the supply chain's ability to sense disruption, reroute flows, and activate alternative sources.

In both cases, circular intervention is necessary but not sufficient. What makes it operational is the supply chain architecture: collecting at quality, sorting by composition, matching recycler specifications, delivering at volume. **Circularity defines what the system needs to do. Supply chain capability determines whether it actually can.**

A self-reinforcing investment logic

This convergence of circular objectives and supply chain capability also follows a self-reinforcing economic logic - where early, targeted interventions generate value that funds the next stage of system development.

Fashion for Good's Sorting for Circularity India project[xix] - a 26-month initiative with partners including adidas, H&M, Target, Arvind Limited, and Welspun India - provides concrete evidence for this sequencing. The project found that **approximately 48% of post-consumer domestic textile waste has the potential to be recovered for productive use through formalized sorting hubs. Of this, 35% can achieve better utilization by adopting semi-automated and automated sorting technologies, leading to a revenue increase of 10%.** At an industry level, this translates to **1,380 kilotons of waste and INR 388 crores of additional revenue in a single year** - rising to INR 1,348 crore under optimized scenarios.

The implication is significant: relatively modest investments in sorting infrastructure and technology - applied at the right points in the value chain - can unlock material revenue that strengthens the economic case for the next tier of investment. Better sorting produces higher-quality feedstock; higher-quality feedstock improves recycler economics; improved recycler economics create demand signals that justify further collection and sorting investment. Each stage improves the quality, volume, and consistency of material flowing through the system, creating self-reinforcing momentum. The system does not require full infrastructure to begin generating value - it requires targeted entry points, prioritised by where value destruction is highest.

This logic shapes the structure of the remainder of this report, which examines the three operational stages where circular value is either captured or lost: **collection** (Chapter 2), **sorting** (Chapter 3), and **recycling** (Chapter 4). In each, the analysis identifies current system performance, specific points of value leakage, and the interventions - in infrastructure, technology, workforce, and policy - required to close the gap.

CHAPTER 2

Collection – Current State, Challenges, Recommendations

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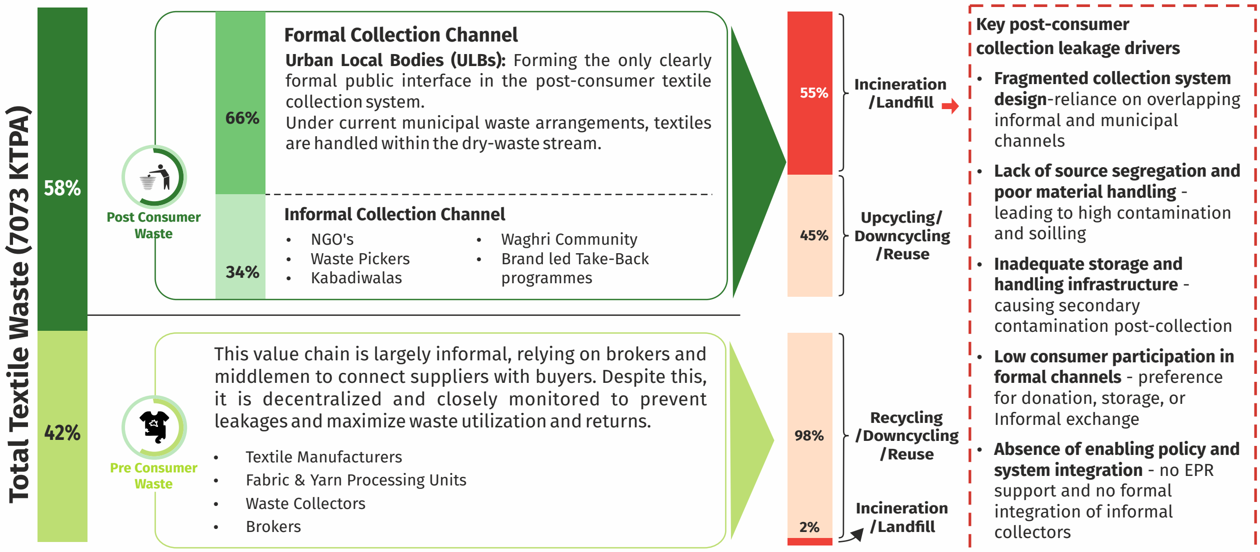
2.1 Current State of Textile Waste Collection in India

India generates approximately 7,125 KTPA of textile waste, distributed across pre-consumer (~2,973 KTPA) and post-consumer (~4,100 KTPA) streams[iv] and the collection system serving these two streams is highly uneven. Pre-consumer waste is captured through industry-embedded channels with near-total efficiency, while post-consumer textile waste, the larger of the two streams is dependent on fragmented collection system.

Post-consumer collection today takes place through formal Urban Local Bodies (ULB) linked channels and informal pathways such as hand-me-downs, donation drives, and community-level aggregation by informal actors such as NGOs, kabadiwalas, waste pickers, and organized community groups like the Waghri community. These informal channels are culturally embedded and operationally active, playing an important role in aggregation and reuse, while also supporting an estimated 4-4.5 million livelihoods, predominantly women from marginalized communities[iv], yet largely untracked and unquantified.

As a result, while losses in pre-consumer waste remain minimal at around 2%, nearly 45% of post-consumer textile waste still fails to enter recovery pathways and is instead lost to landfill or incineration[iv].

Waste Generation: Two Distinct Streams



Source: Ministry of Textile publication: Mapping of Textile Waste Value Chain in India

Figure 3 : Current State of Textile Waste generation in India

Pre-Consumer Waste

Generated within manufacturing facilities, this stream includes spinning waste, yarn waste, fabric waste, cutting-room scraps, rejected fabric, and unsold inventory. It is relatively clean, homogeneous, which makes recovery far more efficient than in post-consumer flows. The Ministry of Textiles estimates **pre-consumer textile waste at 42% of total textile waste in India**, of which about 97% is recovered through upcycling, downcycling or repurposing, **with only ~2% going to landfill or incineration**[iv].

Stakeholders

Pre-Consumer Waste Value Chain Stakeholders (42%)

This value chain is largely informal, relying on brokers and middlemen to connect suppliers with buyers

Textile Manufacturers

Textile manufacturers are the primary generators of pre-consumer textile waste, including spinning mills, weaving units, and garment factories that produce yarn waste, fabric offcuts, and defective materials during production. They often reuse it internally or dispose of mixed waste or sell it to recyclers and intermediaries

Fabric & Yarn Processing Units

Units such as spinning, weaving, knitting, dyeing, and finishing units generate intermediate textile waste streams like yarn waste, and fabric scraps during production. This waste is usually clean and homogeneous, allowing for easier recycling or reintegration into production systems, with spinning units in particular achieving near closed-loop recycling through in-situ reuse

Waste Collectors

Waste collectors are individuals or small enterprises, often part of informal networks, who purchase/collect, and transport textile waste from manufacturing units. They help connect waste generators to recyclers or traders, playing a supporting role in ensuring material flow within the value chain

Brokers

Brokers are intermediaries who facilitate transactions between waste generators/collectors and end-users such as recyclers and traders by coordinating supply-demand matching, pricing, and logistics

Post-Consumer Waste

Post-consumer waste arises from discarded garments, household textiles, and other used textile items spread across millions of households and commercial points. Unlike pre-consumer waste, it is geographically dispersed, materially heterogeneous, and more vulnerable to contamination before recovery begins.

Post-consumer textile waste accounts for approximately 4,100 KTPA, with around 2,725 KTPA (66%) flowing formally through ULB-linked systems and 1375 KTPA (34%) through informal channels. However, despite the apparent scale, formal collection remains limited in effectiveness, as textiles are not treated as a distinct waste stream, and the absence of dedicated collection procedures results in mixing textile waste with other waste leading to contamination at source. Informal systems, while deeply embedded in local practices, are largely unstructured and driven by resale value, leading to inconsistent capture of non-reusable textiles. As a result of these combined limitations, nearly 1845 KTPA 45% of post-consumer textile waste is ultimately diverted to landfill or incineration. This is therefore the primary point at which the system weakens.

Stakeholders

Post-Consumer Waste Value Chain Stakeholders (58%)

Formal Collection (66%)

Urban Local Bodies

the only clearly formal public interface in the post-consumer textile collection system. Under current municipal waste arrangements, textiles are handled within the dry-waste stream and are collected through door-to-door systems, transfer stations, and dry-waste collection centers. In practice, however, the degree of effective textile capture varies widely by city, and in most cases, textiles continue to be handled within broader dry-waste systems rather than through dedicated municipal textile infrastructure

Informal Collection (34%)

NGOs

NGOs and charitable organizations primarily operate in the product-life-extension part of the chain rather than in material recovery. They collect wearable clothing through donation drives, drop-off points, and institutional partnerships, sort it by usability, and redistribute it to underserved communities. Organizations such as Goonj as important actors in extending the life of post-consumer textiles through collection, sorting, repair, redistribution, and limited upcycling. The Neki Ki Deewar model (community-maintained public clothing drop-off points) extends garment useful life through informal peer redistribution

Waste Pickers

Waste pickers operate at the first point of recovery within the informal chain, extracting textiles and other dry waste from municipal bins, transfer points, and neighborhood disposal sites. Their role is important because early handling often determines whether textiles remain suitable for reuse, recycling, or only low-value recovery

Kabadiwalas

Kabadiwalas function as neighborhood aggregators within the informal recovery economy. They purchase or collect small, dispersed volumes of used textiles from households, waste pickers, and other local collectors, consolidate them into tradable lots, and route them onward to second-hand markets, aggregators, or recycling clusters. The kabadiwalas network is self-organized, price-signal-driven, and operates across urban and peri-urban India. It functions exclusively on economic viability: materials that cannot generate a margin are not collected

Waghri Community

The Waghri community represents one of the most established informal textile collection systems in India. Their model is based on door-to-door barter collection, typically exchanging utensils or other low-value household goods for used clothing. This model is highly effective because it removes the need for consumer initiative, provides an immediate and tangible exchange value, and embeds collection within an established social interaction. In the Raghubir Nagar market in Delhi, the study found that Waghri collectors sort textiles at home, retain some wearable items for direct use, and route the rest into second-hand markets; the market itself includes **around 2,000–3,000 sellers**, illustrating the scale and embeddedness of this network

Brand led Take-Back Programmes

Brand-led take-back remains a limited but emerging organized collection channel. Models such as in-store take-back, resale, and collection for reuse or recycling show potential to scale, but at present they remain small relative to ULB-linked and informal collection systems and do not yet account for a significant share of national textile flows

2.2Gaps and Challenges

45% of post-consumer collected waste is still lost to incineration and landfill - representing INR 19,195 - 149,194 crores in destroyed material value annually .

Textile waste collection in India has evolved through a mix of informal recovery networks, municipal systems, charitable redistribution channels, NGO-led initiatives, and limited brand take-back efforts. **These channels remain only loosely connected, which constrains the supply of clean, traceable, recycler-ready material on scale.** The disconnect is most visible in the post-consumer stream, where 45% of collected textile waste still flows toward incineration or landfill - representing INR 19,195 - 149,194 crores in destroyed material value annually.

Alongside the absence of a dedicated national collection architecture, this outcome is also driven by the weakness in the current collection systems itself, including inadequate last-mile collection infrastructure, source segregation gap and a consumer behavior gap that limits participation in collection channels.

The six main gaps are:

2.2.1 Ad-Hoc Textile Waste Collection

India's post-consumer textile collection system is fragmented across three weakly coordinated channels - informal waste pickers, municipal/ULB-linked collection, and producer or retailer take-back - none of which currently function at the scale or discipline needed to support industrial recycling.

2.2.1.1 Informal Collection

The predominantly informal nature of this value chain results in significant data gaps. Post-consumer textile waste flows are largely untracked and unquantified, with limited visibility into volumes, material composition, or end-use pathways. As a result, **India's textile recovery ecosystem can be characterized as robust yet highly unorganized and reliant on long-standing, trust-based relationships among traders, where even well-established actors face constraints in ensuring consistent quality and predictable supply volumes.**

2.2.1.2 Formal / ULB-Linked Collection

Where municipal integration exists, it is patchwork. Bengaluru's model, ward-level Dry Waste Collection Centres (DWCCs) with waste pickers formally assigned to wards under **From a national standpoint, formal textile waste collection is either absent or deeply fragmented, with municipal collectors typically segregating textile waste only after it has already been mixed in household bins and transferred to collection centres - by which point contamination has undermined its recovery value.**

> *"There is no formal ecosystem or defined procedure for textile-specific collection from households or producers. Unlike dry and wet waste under Swachh Bharat, textiles are not separately collected "*
> *- Academic Expert*

2.2.1.3 Retail / Producer Take-Back

Retail take-back has not functioned at scale in India. Consumers don't know where to return used textiles, collection and reverse logistics are fragmented, and there's no integrated supply chain or infrastructure[vi] . High retail space costs make in-store collection infrastructure economically unattractive for most retailers.

> *" Both pre- and post-consumer collection are undermined by insufficient infrastructure for segregation and the absence of consumer awareness of where to return textiles "*
> *- Fashion Retailer*

2.2.2 Source Segregation Gap

The most important driver of material loss in the post-consumer textile stream is contamination - specifically, the mixing of textile waste with wet organic household waste. This is not an incidental problem: it is a structural consequence of how textiles are collected.

Approximately 66% of textile collection occurs through the municipal dry-waste stream - where segregation at the household level is imperfect and enforcement is near-absent - a significant proportion of collected textiles arrive at collection points already exposed to moisture, food residue, and organic matter[iv]. Once a textile is soiled in this way, it is disqualified from two of the three primary recovery pathways: it cannot be resold through the second-hand market (hygiene), and its structural integrity is compromised for fibre recycling (contamination).

The destination for soiled textiles is deterministic: Contaminated textiles are routinely diverted to co-processing in cement kilns or to refuse-derived fuel (RDF) for power generation. These pathways represent, at best, low-value energy recovery from what might have been a high-value material recovery.

About 85% of post-consumer textile waste is theoretically recoverable if source segregation is practiced at the highest level - washed, packed, and handed over clean[v]. In practice, today's recovery stands at just 25-30%, with 50% achievable through better segregation behaviour alone[xxi]

2.2.3 Infrastructure Inadequacy

Even where collection happens, the physical infrastructure for textile-specific aggregation and sorting is grossly insufficient. **India has fewer than 10 dedicated Textile Recovery Facilities (TRFs) nationally**[xviii]**. The dominant infrastructure - DWCCs - was designed for dry waste broadly, not for textile handling, and is inadequate for the moisture management, storage, and multi-stage sorting that textiles require.**

At an operational level, textiles require dry, ventilated, and segregated storage conditions to prevent moisture absorption, fungal growth, and secondary contamination. However, most DWCCs:

- Lack covered and climate-resilient storage spaces
- Operate in high-density, space-constrained environments
- Do not have separate bays for textile categories (reusable, recyclable, reject)

This leads to a situation where even initially recoverable textiles degrade rapidly post-collection, losing both reuse and recycling value.

> *"DWCC infrastructure is not designed for textile sorting and storage, which leads to contamination and rejection by recyclers."*
>
> *- Waste Management Organisation*

2.2.4 Informal Worker Invisibility

India's post-consumer textile waste ecosystem is operationally dependent on informal waste workers, who form the backbone of collection, sorting, and primary aggregation. **It is estimated that 4-4.5 million livelihoods are sustained by this sector, with a significant proportion comprising women from marginalized and socio-economically vulnerable communities**[iv].

At the ground level, the system is driven by a dense network of actors including:

- **Waste pickers** recovering textiles from streets, dumpsites, and municipal bins
- **Kabadiwalas** (itinerant buyers) conducting door-to-door collection and resale
- **Community-based traders** (e.g., Waghri networks) operating barter-based aggregation systems

These actors ensure that textiles with residual value, particularly reusable garments-are captured before entering the municipal waste stream, thereby extending product life and reducing landfill burden.

However, despite their centrality, this workforce is institutionally invisible - excluded from formal supply chains, and benefit structures.

2.2.5 Consumer Behaviour Gap

Indian consumers - particularly in established middle-class households - tend to exhibit a "philosophical" orientation toward old clothing: garments are held as emotionally significant objects; donation is preferred to disposal; and the concept of paying for or participating in a waste management system for clothing runs counter to embedded cultural practices[xvii].

Additional layers of complexity are added by caste and purity norms, which influence which garments are considered appropriate for donation or redistribution (and to whom), and which are retained or destroyed within the household. These cultural dynamics create

> *"Collection remains a pull-based system someone has to come to the doorstep; there is no strong push mechanism from consumers."*
>
> *- Upcycler*

genuine barriers to institutional collection systems that require consumer action - and they cannot be resolved through awareness campaigns alone.

This creates a fundamental misalignment with formal collection systems such as drop-off bins or take-back programs that rely on active consumer participation in "waste disposal." Low participation rates and preference for informal channels highlight that the challenge is not awareness, but system design.

2.2.6 Regulatory Void

The five operational gaps above are each exacerbated by a single systemic absence: there is no national regulatory framework that treats textiles as a distinct waste category.

India's textile waste system operates in a near-complete policy vacuum, defined by two critical regulatory gaps that directly limit the development of a scalable and economically viable collection ecosystem.

First, there is no Extended Producer Responsibility (EPR) framework for textiles. Unlike plastics or e-waste, producers and importers of garments are not obligated to take responsibility for the post-consumer phase.

Second, textiles are not recognized as a distinct waste stream within regulatory frameworks. In the absence of formal classification:

- There is no mandate for source segregation at the household level
- Urban Local Bodies lack clear guidelines or targets for textile collection
- There is no enforcement mechanism to prevent co-mingling with wet waste

> *"Unlike plastic, e-waste, textiles have no regulatory mandate in India. Until that changes, domestic post-consumer supply cannot support industrial-scale circular production."*
>
> *- Textile Manufacturer*

This effectively stalls the transition from an informal, value-driven system to a formal, scalable circular economy model. Addressing these gaps is therefore foundational not incremental to enabling systemic change in textile waste collection in India.

2.3 Findings and Recommendations

Multiple collection channels exist in India, but they function unevenly. Collection moves through two largely separate routes: formal or municipal systems (66%) and NGO or informal channels (34%)[iv]. This split reflects the absence of dedicated national collection architecture and helps explain why material value is often lost before textiles can enter reuse or recycling pathways.

Taken together, these constraints suggest that the challenge is not only a disposal problem, that can be addressed through awareness campaigns or isolated pilots alone, but a structural weakness in the collection system itself. Strengthening textile recovery will require a more coherent collection architecture, with clearer source categories, infrastructure suited to textile handling, and better integration of informal actors. The recommendations that follow are framed with this objective in mind.

2.3.1 Establish an Extended Producer Responsibility (EPR) Framework for Textiles

POLICY

The absence of an EPR mandate for textiles is not one gap among several it is the structural precondition without which the entire system remains unanchored. No producer or importer bears any end-of-life responsibility for garments they place on the market, textile waste has no legal identity as a distinct stream, collection infrastructure lacks a mandate, informal workers who sustain recovery have no formal standing within the system, and municipalities absorb the cost of managing a waste stream they were not designed to handle.

India's experience with EPR for plastics and e-waste demonstrates that this instrument is not new to the country's regulatory architecture, which demonstrate that regulatory mandates, not voluntary action, are what shift systems at scale.

A practical textile EPR framework for India would need to cover the following:

- **Defining the scope of responsible parties -** EPR for textiles extends beyond just producers and importers. A well-designed framework would assign responsibility across the value chain, including brand owners, retailers, and e-commerce platforms that place garments on the Indian market - recognising that in a fragmented sector, the point of sale is often the most traceable and enforceable node
- **Registration, reporting and escalating targets -** all covered entities would register with a designated authority such as CPCB, report annual volumes placed on market by material category, and meet progressively rising collection and recovery targets linked to those volumes - creating an accountability loop that currently does not exist for textiles in India
- **Authorised actor guidelines -** the framework would define which collectors, sorters, recyclers, and processing facilities are recognised as compliant recovery partners, establishing minimum operational standards and creating a formal tier structure that currently exists only informally
- **PRO-enabled compliance -** given the large number of small and mid-sized players in India's textile sector, collective compliance through Producer Responsibility

Organisations (PROs) would be a practical necessity, with design considerations around how existing informal recovery networks are formally incorporated as authorised partners rather than bypassed

- **A near-term textile EPR collection target of 50%** is required to unlock meaningful value recovery at the sorting node. At this collection rate, applied against India's 1,897 KTPA post-consumer landfill stream and a source segregation recovery rate of 85% (validated through Hasiru Dala's cloth audit), approximately 806 KTPA becomes recoverable - generating an estimated INR 6,290 Crore in value that is currently destroyed.
- The Netherlands, which introduced mandatory textile EPR in July 2023, set a statutory target of 50% reuse or recycling by 2025, rising to 75% by 2030, directly establishing 50% as an achievable near-term benchmark for a functioning EPR system.[vii]
- India's own experience with value-linked collection offers a relevant domestic proof point. PET bottle collection in India has reached approximately **96% recovery** - not because of regulatory enforcement alone, but because bottles carry sufficient economic value that informal actors collect them as a priority. The same logic applies to textiles: **right value, automatically diverted from landfill.** A textile EPR framework that creates a price signal for collected material - through EPR fees, PRO-funded gate prices, or certification premiums - replicates the economic incentive structure that has made PET bottle collection one of India's most effective informal recovery systems. The challenge for textiles is that this value signal does not yet exist at the collection stage. EPR is the mechanism to create it.[viii]

2.3.2 Expand ULB-supported collection

PARTNERSHIPS

Weak last-mile collection remains one of the most immediate bottlenecks in the textile chain. Even where recycling or reuse capacity exists, textiles often do not reach those channels in the required quantity, quality, or regularity.

ULBs could therefore provide the backbone for future textile capture through dedicated textile collection centers. In cities where dry-waste systems already have some operational presence, this could begin with textile-designated collection windows within existing DWCCs and MRFs. These centers can support:

- household drop-off
- ward-level collection and temporary storage
- routing to reuse organizations, sorters, and recyclers

2.3.3 Improve infrastructure for textile-specific storage and handling

INFRA & INVESTMENT

Collection inefficiency is often compounded after capture. Even where textiles are collected separately, they are frequently stored in facilities designed for mixed dry waste, exposing them to moisture, dust, and cross-contamination.

DWCCs, MRFs, and ward-level collection points should be progressively upgraded with textile-appropriate storage and handling infrastructure, including:

- covered, dry storage areas
- separate bays or cages for textiles
- basic triage space for reusable and recyclable fractions
- handling protocols that prevent mixing with wet or dusty materials

In selected cities, ULBs could also pilot dedicated Textile Recovery Facilities, or textile-designated sections within existing centres. These are modest upgrades, but operationally important: they help ensure that textiles already captured do not lose value before they are even sorted.

2.3.4 Encourage collection models that reflect how households actually discard textiles

PARTNERSHIPS

Textiles are not discarded like daily household waste. They are stored for longer, passed on within families, donated, bartered, or sold before they enter the waste stream. This makes it harder for conventional daily municipal collection systems to capture them effectively.

Collection models for textiles should therefore be designed around actual household behavior rather than around standard municipal waste assumptions. More effective approaches may include:

- designated textile collection days
- scheduled textile collection drives
- housing-society or ward-level campaigns
- donation-linked collection systems
- barter-inspired or exchange-based incentives

These approaches are likely to work better than relying only on daily municipal disposal channels. They can improve participation, keep textiles cleaner at the point of handover, and channel more material into reuse and recycling before it is mixed with general dry waste.

One model with particular potential for India's context is **collection through Public Distribution System (PDS) infrastructure.** India's ration shop network reaches households across income levels, including those least served by formal municipal systems, and operates on a transactional logic that removes the need for consumer initiative - a structural advantage over drop-off or donation-based channels. Under a PDS-linked textile collection model, households would exchange used textiles at ration shops for a per-kilogram credit against their ration entitlement, using single-use plastic bags already in household circulation as packaging. This design addresses three simultaneous failures in the current system: it creates a positive incentive for household participation rather than relying on disposal behaviour; it keeps textiles out of the MSW stream by designating a separate collection channel; and it repurposes existing plastic packaging rather than requiring new infrastructure investment. The model is operationally simple, geographically universal, and culturally aligned with how lower-income households already interact with the state.[viii]

Green Worms - Calendar collection model

Context	Practice	Insight
Green Worms organization works with local governments in Kerala on collection, logistics, source segregation, and material recovery, and its community-based waste management model has been reported to operate across 40 villages in the state[ix, x] .	In the textile segment, Green Worms' Kuppayam initiative in Kozhikode illustrates a targeted collection model for used textiles. The initiative collected over 7,500 kg of textile waste within 45 days and linked collection to downstream circular pathways such as swapping, thrifting, upcycling, and redesign[xi].	The case demonstrates how textile collection can be integrated within a broader local waste management system through partnerships with informal collectors, and how collection design, particularly the timing and communication of collection, can improve the quality of textiles captured.

Kerala – Haritha Karmasena

Kerala's Haritha Karmasena offers a useful example of how municipal collection can be organized around the actual discard rhythm of non-daily waste streams. Established across all local self-government bodies in the state, the system relies on women-led ward-level teams to carry out door-step collection of cleaned non-organic waste at regular intervals, with user fees set by local bodies; the collected material is then routed through Material Collection Facilities and onward to recovery channels [xii, xiii]

2.3.5 Define clear collection categories for segregation at source

POLICY

Textile collection would likely become more efficient if segregation began at the household and institutional level through a limited number of clear, collection-oriented categories. The objective is not detailed material classification at source, but practical first-stage separation that supports cleaner collection and better downstream routing.

At a minimum, source segregation could distinguish:

- **wearable vs. non-wearable textiles**
- **clean vs. contaminated material**
- **natural vs. synthetic or synthetic-rich textiles**

This kind of basic categorization would make collection more usable from the outset. It would help preserve reuse value, reduce contamination of recyclable fractions, and improve the efficiency of sorting and channelization after collection.

2.3.6 Use PPP models to integrate informal collection actors and scale trusted collection channels

PARTNERSHIPS | TECHNOLOGY

Textile collection in India is unlikely to scale through fully formal systems alone. Informal recovery networks already handle a significant share of material flows, have deep local reach, and remain an important collection interface in many cities. Therefore, connecting these networks more effectively to formal collection systems becomes important.A practical approach would be to use **public-private partnership (PPP) models** that combine public legitimacy with operational flexibility. This could include:

- **ULB-supported collection drives** implemented with private firms, NGOs, or social enterprises
- **municipality-backed collection points** operated through external partners
- **structured routing arrangements** that link informal collectors to authorized sorting, reuse, and recycling channels

> *"Micro-entrepreneur models-based collection systems could support, but they need aggregation and scale to become viable."*
>
> *- Development Practitioner*

PPP models are particularly useful where public trust, citizen participation, and operational coordination matter as much as technical design. A ULB-backed collection point can improve legitimacy and participation, while private or nonprofit partners can manage collection logistics, sorting linkages, and downstream routing more efficiently.

Over time, these partnerships could be supported through a **dedicated portal or digital interface that:**

- lists authorised collection partners
- improves visibility for producer brands and organised offtakers
- supports better channelisation of collected textiles
- Strengthens future traceability

This approach would allow existing collection networks to be used more effectively, while creating a clearer pathway for gradual formal integration.

2.3.7 Strengthen the role of informal workers through targeted training and collection-stage support

INFRA & INVESTMENT

Informal workers are already present at the first point of recovery and can play an important role in improving textile collection outcomes. This is especially important in a system where the value of used textiles depends heavily on early-stage handling, and on whether material is directed toward reuse, repair, recycling, or disposal before contamination or mixing reduces its recovery potential.

Collection-stage informal workers' training and support should focus on practical capabilities that **improve first-level sorting and channelisation**, including:

- identifying key textile categories
- separating clean and contaminated fractions
- distinguishing wearable from non-wearable material
- routing collected textiles toward the most suitable downstream use

This should be **complemented by access to basic collection-linked infrastructure,** such as:

- sorting space
- dry storage
- simple handling systems that prevent mixing and secondary contamination

Strengthening these capabilities at the point of collection would improve channelisation, reduce avoidable value loss, and build on the role that informal workers already play in the post-consumer textile system.

Hasiru Dala - Hub and Spoke Model

Context	Practice
Hasiru Dala work has focused on improving livelihoods, advancing source segregation, and supporting the functioning of Dry Waste Collection Centres (DWCCs) as part of Bengaluru's wider waste management architecture. Within this broader institutional and operational context, textile waste emerged as an area requiring more structured handling, given its tendency to lose value when mixed with other waste streams.	To address this, Hasiru Dala piloted Hasiru Batte, a textile-focused intervention within the existing DWCC system. This initiative was implemented across 8 DWCC in Bengaluru, training 40 waste pickers in sorting and machine operations while also driving resident awareness to segregate textile waste as a clean, dry stream. These efforts improved the quality and volume of recyclable textiles, enabling greater acceptance by recyclers[xiv] January 2025, the Hub-and-Spoke model involving multiple actors had taken its final form, with one TRF serving as the hub and 16 Dry Waste Collection Centres (DWCCs) functioning as spokes. Together, they collected over 30 MT of textile waste in January and reached a peak in April 2025 by collecting more than 51 MT of textile waste in a single month, showcasing the potential of decentralized waste management systems when they work in sync [xv]

Insight

This illustrates how textile collection can be incorporated into an existing decentralised waste system through separate handling arrangements, dedicated recovery infrastructure, and structured involvement of waste pickers.

Figure 4 : Hasiru Dala Intrapreneur Collection Branch

CHAPTER 3

Sorting – The Value Gate

CHAPTER 3

Sorting – The Value Gate

3.1 Current State of Sorting in India's Textile Waste Value Chain

India's textile waste sorting system sustains approximately 4-4.5 million livelihoods, predominantly women from marginalised communities, and informal networks collectively achieve a **55% post-consumer waste recovery rate, almost entirely through manual sorting**, with no automated or sensor-based technology deployed at scale.[iv] Over 95% of all sorting activity in India today is manual. [xvi]

Waste Generation: Two Distinct Streams

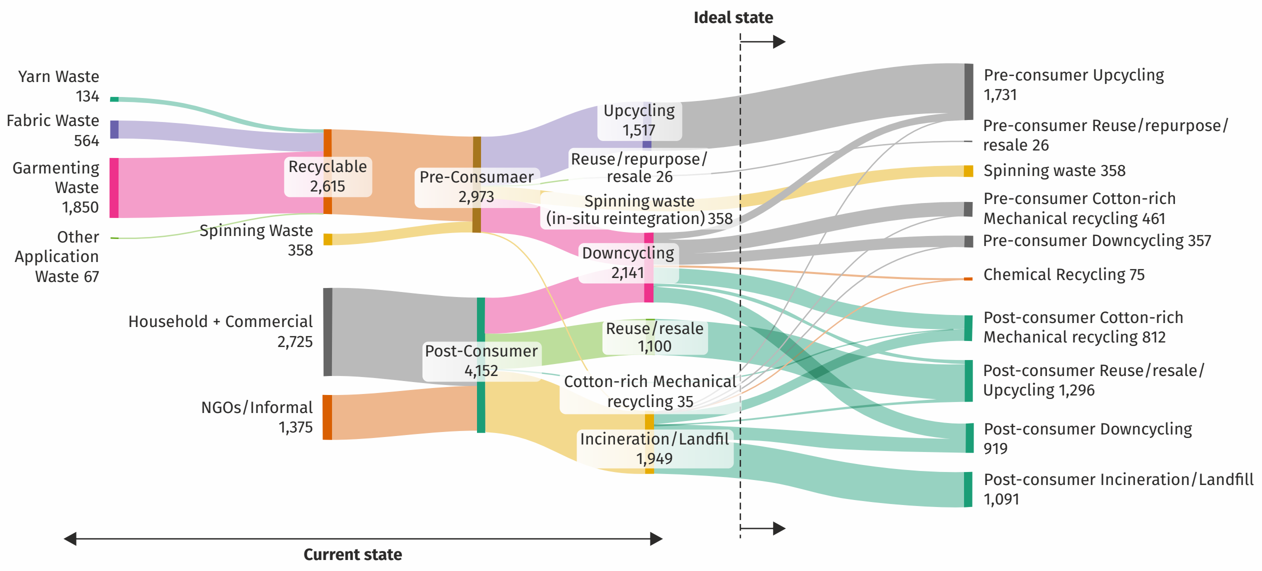


Figure 5: Ideal Sorting State, FICCI Analysis

3.1.1 Pre-Consumer Sorting

How sorting works

- **Pre-consumer sorting is the most functional part of India's textile waste system.** Waste collectors and aggregators purchase **cutting waste and fabric offcuts directly from factories and sort primarily by colour and broad fabric type**. Sorting is entirely tactile and visual - experienced sorters assess material by hand and eye, with no technology assistance at any pre-consumer sorting node in India today. [xvii,xvi]

- The dominant sorting operation at the pre-consumer stage is colour segregation - separating material into colour lots before dispatch to recycling clusters where colour consistency is a prerequisite for recycled yarn production. Fabric type sorting (cotton vs synthetic vs blended) also occurs but is less systematic and relies entirely on tactile identification, which fails for blends.[xvii,xviii]
- Fabric identification methods at pre-consumer sorting nodes today are limited to: visual inspection, tactile assessment, and - rarely - burn/flame/ash tests for fibre identification. Burn tests are acknowledged by sorters as impractical for any meaningful throughput. Labels, where present, are used but are frequently inaccurate: mislabelling of blends as 100% cotton is widespread across both informal markets and formal retail supply chains.[xvi,xviii]
- Garmenting waste - approximately **1,850 KTPA (~15% of India's total textile waste)** - is the largest pre-consumer stream and the primary input into this sorting system. It arrives at sorting nodes as a mix of cotton, polyester and blended clips from cutting floors, with composition varying by factory and season.[iv]

What sorting produces currently and what it misses

- Of the 2,615 KTPA recyclable pre-consumer waste, 97% enters some form of processing - 1,517 KTPA as colour-sorted feedstock for mechanical processing and 1,020 KTPA downcycled.[iv] [Govt. Report, Table 22, p.97] **The 1,020 KTPA going to downcycling at INR 5-15/kg contains a significant cotton-rich fraction - estimated at approximately 43% (~439 KTPA)[xix] which would qualify for mechanical recycling at INR 78-82/kg if correctly fibre-identified and routed.** It is not, because fibre identification does not happen at pre-consumer sorting nodes.[xx]
- **Blended fabrics** - estimated at approximately **27% of the pre-consumer downcycling stream** by our analysis are the most acute sorting failure at this stage. They cannot be reliably identified by touch or sight, default to downcycling, and represent the stream most in need of NIR-based identification for routing to chemical recycling.[xviii]
- Roughly **INR 62 crore** worth of imported textile waste, approximately **2,000 containers per month**, is diverted into the domestic market beyond its permitted re-export quota and enters the Panipat sorting and processing ecosystem.[iv]
- Large integrated home textile manufacturers have **established functional pre-consumer recycling loops for grey (pre-dyeing) cut waste** - mechanically shredded and reintroduced into fibre production through specialist vendors - with this ecosystem described as **well-established** and requiring no chemical processing.
- **Dyed cut waste**, however, requires partnering with specialist recyclers and presents a harder recycling challenge. The same dyeing constraint applies post-consumer: coloured polyester fabric cannot currently be recycled without decolouration processes that are too chemically intensive and costly to be viable at Indian scale, which is why recycled **polyester sourcing in India draws from PET bottle recyclate rather than fabric.**[xxi]

3.1.2 Post-Consumer Sorting: Two Active Tiers

India's post-consumer sorting system operates through two tiers that perform actual sorting - dry waste collection centres (DWCCs) and textile recovery facilities (TRFs). A third tier of informal aggregators performs a degree of pre-sort before material reaches either.

Tier 1 - Dry Waste Collection Centres (DWCCs): Primary Sort

What happens at this stage

- **DWCCs perform primary sorting** - the first-pass separation of textiles from other dry waste, and removal of obvious contaminants such as wet or heavily soiled material. This is entirely manual: workers pull textiles out of mixed dry waste and pack them for onward dispatch to a TRF.[xxii]
- Sorting at DWCC level does not extend to condition grading, colour segregation, fabric type or fibre identification. Material is packed by bulk category - textiles vs non-textiles, and sent as a mixed lot.[xxii]
- DWCC workers receive training from TRF operators to identify recoverable textile material, but awareness of finer distinctions - resale-grade vs recycle-grade vs downcycle-grade - is limited and requires continuous reinforcement.[xxii]

Tier 2 - Textile Recovery Facilities (TRFs): Secondary and Tertiary Sort

What happens at this stage

TRFs perform **secondary and tertiary sorting**[xxii] - the detailed, multi-step process that produces buyer-ready fractions that recyclers, upcyclers and resale aggregators can use. Sorting at TRF level follows a defined protocol:

1. **Step 1 - Condition and useability sort (manual):** Trained sorters assess each garment for condition - wearable, repairable, or non-wearable. This is a permanent manual operation; no technology is capable of replicating the tactile and contextual judgment required. Sorters with generational experience accurately assess condition and broad material type by touch, except for fibre composition in blends.[xvi]
2. **Step 2 - Grade sort (manual):** Within the non-wearable stream, material is graded - Category A (premium), B (standard), C (low-grade) - primarily for pricing and market routing. Large players typically handle only Category A material
3. **Step 3 - Colour sort (manual or UV sensor):** Material is separated by colour for recyclers who require colour-consistent bales. Dark and black materials require UV sensor assistance for accurate dark/colour separation - UV technology is available at Panipat but not yet widely deployed at TRFs.[xvii]
4. **Step 4 - Fabric type and fibre composition identification (IVR sensor at Hasiru Dala; manual elsewhere):** At Hasiru Dala's TRF, an IVR sensor-based device **(INR 4.5 lakh per unit;** German-manufactured, with Indian alternatives available) produces a composition report - e.g., "20% x material" - for each batch. This is the most critical sorting step for routing to mechanical vs chemical recycling, and the most consequential gap in the system where IVR is not deployed. At all other TRFs, fibre identification remains manual and achieves only **40-50% accuracy.**[xvi]

5. **Step 5 - Disruptor removal (manual):** Elastic, embroidery, beads, crystals and netted materials are physically removed from garments before dispatch to recyclers, as even small volumes of disruptors - **spandex at as low as 5% -** contaminate a batch and make it unusable for recycling. This step is entirely manual and labour-intensive.[xviii]
6. **Step 6 - Aggregation and baling by buyer specification:** Sorted material is aggregated into bales by colour, composition and grade to match specific recycler requirements. Recyclers need large, consistent volumes sorted by colour and composition. At present, each source in the fragmented system provides only 50-100 kg per colour/material category, making it extremely difficult to fill consistent recycler orders without aggregation across multiple TRF inputs.[xvi]

3.1.3 Scale and economics at TRF level today

- India has approximately **9-10 TRFs** operating at any meaningful scale nationally - a figure cited with concern across every interview conducted for this study.[xviii, xvi]
- Hasiru Dala's Bengaluru TRF has processed **719 MT** of collected material since 2022, with a peak monthly throughput of **51 MT**. Sorting outputs: resale/reuse 30%, recycling 17%, upcycling 3%, aggregators 5%, downcycling 9%, reject 6%, in-stock 30%. Market value of sorted post-consumer material is at most **5-6%** of what would be required to cover full sorting costs.[xxii]
- Sorting margin per item is approximately **INR 1-2**, only viable if daily throughput per sorter is significantly higher than current fragmented supply volumes allow. [xxii]
- Sprecko Recycling (Tamil Nadu) operates a TRF purpose-built for textiles, with a pilot for direct source collection from tailoring shops and communities in partnership with Tambaram City Municipal Corporation - one of the few operational municipal-TRF integration models in India. Its model formally separates textile waste as a distinct stream at the point of collection, materially improving input quality at the sorting stage.[xviii]

3.1.4 National sorting technology deployment today

- National sorting technology capacity across the entire system: manual **~2,000-2,400 KTPA;** UV colour sorting **~5-15 KTPA** (Panipat); NIR-based fibre identification **<1 KTPA**; conveyor NIR, hyperspectral, and AI-enabled automated sorting: **zero.**[xvi, xviii, xvii, xxii]
- AI-enabled sorting accuracy exceeds 90% for fibre composition identification against 40-50% for manual sorting - but deployment remains zero outside pilot contexts. India is not yet ready for fully automated sorting given current economics and fragmented supply volumes; semi-automated solutions using handheld IVR devices are the commercially viable near-term technology.[xvi]
- Fashion for Good's Sort to Sustain project (2024) targets expansion of at least four waste enterprises with TRFs by 2030.[xxiii]
- The GIZ-ABFRL Stitching the Circle guidelines (2024) identify TRF network development as a core infrastructure requirement for circular value chain development in India.[xxiv]

> *"Each source provides only 50-100 kg of each colour/material - there is no minimum feedstock requirement for AI sorting, but the demand and supply signal simply isn't there."*
>
> *- Kosha.AI*

3.2 Challenges and Gaps in India's Textile Waste Sorting System

Sorting type	Technology options	Current (KTPA)	Realistic ideal (KTPA)	Current material source → Realistic ideal state diversion
MANUAl - PERMANENTLY HUMAN				
Condition / useability	**Manual - tactile + visual assessment** *only viable option* *No technology replicates condition and wear judgment*	1,100	1,322	**Now:** Post-consumer garments entering the reuse and resale stream (1,100 KTPA) collected via dry waste collection centres and informal networks. A small pre-consumer reuse stream (26 KTPA) adds to this. **Ideal:** Grows by 222 KTPA: approximately 115 KTPA of material currently classified as recyclable or downcyclable is reclassified as rewearable with improved condition sorting; a further 80 KTPA is unlocked from the post-consumer landfill stream as source segregation improves collection quality.
↳ ↳ **Grade sorting**	**Manual - grader judgment** *only viable option* *Quality continuum - no sensor equivalent; sub-sort within condition sort*	627	324	**Now:** Sub-sort of the post-consumer reuse stream (~25%) plus a grade decision on pre-consumer garmenting waste routed to downcycling (253 KTPA). **Ideal:** Falls by 303 KTPA: the pre-consumer downcycling grade sort disappears entirely as that stream is re-routed to mechanical and chemical recycling. Only the reuse-stream grade decision (25% of 1,296 KTPA) remains.
Source / process segregation	**Manual - provenance knowledge** *only viable option* *Factory and process origin cannot be determined by any sensor*	358	358	**Now:** Spinning waste (358 KTPA) reintegrated in-situ at the manufacturing stage - no separate collection or sorting step required. **Ideal:** No change. This stream is already handled at source and requires no sorting infrastructure investment.

Sorting type	Technology options	Current (KTPA)	Realistic ideal (KTPA)	Current material source → Realistic ideal state diversion
MANUAl - PERMANENTLY HUMAN				
Reject sorting	**Manual - output of condition sort** *only viable option* *Same tactile judgment as condition sort; permanently manual*	**1,949**	**2,366**	**Now:** Post-consumer textile waste currently entering the landfill and incineration stream (1,897 KTPA) plus pre-consumer landfill fraction (52 KTPA). Material that fails the condition sort with no viable recycling pathway today. **Ideal:** Grows by 417 KTPA in the realistic near-term state: pre-consumer synthetics (357 KTPA) and most post-consumer blended and synthetic waste (919 KTPA) that would in the long-term ideal route to chemical recycling instead remain here near-term as chemical recycling infrastructure is not yet commercially viable at scale in India. The genuine non-recoverable floor is 1,091 KTPA.
TECHNOLOGY-ENABLED				
Colour sorting - non-black	**RGB / optical camera** ⋆ *recommended* *INR 5–10 lakh per unit (India-manufactured)* Manual (visual) *40-50% accuracy; insufficient at scale*	**732**	**1,011**	**Now:** Pre-consumer upcycling stream (1,517 KTPA) × 40% requires colour separation before dispatch to upcyclers. Small post-consumer mechanical recycling fraction (35 KTPA) × 25% also passes through colour sort. **Ideal:** Grows by 279 KTPA: the upcycling stream expands to 1,731 KTPA. Mechanical recycling grows sharply from 35 to 811 KTPA - 25% of that stream requires colour sorting for Panipat bale specification.
Colour sorting - dark/black	**UV / visible light sensor** ⋆ *recommended* Manual with UV lamp *Partial — limited to Panipat; low throughput*	**244**	**318**	**Now:** Dark and black fraction of the post-consumer recycling and downcycling stream, which requires UV sensor assistance to separate from non-black material. **Ideal:** Grows by 74 KTPA: a new pre-consumer cotton-rich mechanical recycling stream (461 KTPA × 25% = 115 KTPA) is added in the realistic ideal state, alongside expanded post-consumer mechanical recycling (811 KTPA × 25% = 203 KTPA).
Fabric type / construction	**IVR bench (NIR + RGB + AI)** ⋆ *recommended* *INR 4.5 lakh per unit* Manual (tactile) *Fails for blended fabrics; no blend detection*	**537**	**1,039**	**Now:** Pre-consumer upcycling stream (1,517 KTPA) × 60% requires fabric type and construction identification before upcycling routing decisions can be made. **Ideal:** Nearly doubles (+502 KTPA): the upcycling stream expands to 1,731 KTPA, including 214 KTPA of clean offcuts newly separated from the pre-consumer downcycling stream. All require IVR bench identification before routing to upcycling.

Sorting type	Technology options	Current (KTPA)	Realistic ideal (KTPA)	Current material source → Realistic ideal state diversion
TECHNOLOGY-ENABLED				
Fibre sorting-pure mono-fibre	**NIR handheld (near-term)** ★ *recommended* *INR 4.5 lakh per device* NIR conveyor (at hub scale) Manual sorting *40–50% accuracy - structurally incapable of blend detection*	**971**	**676**	**Now:** Cotton-rich fraction of pre-consumer downcycling waste (~439 KTPA) and post-consumer downcycling waste (~481 KTPA), currently passing through NIR to confirm fibre identity. Small fraction of material already mechanically recycled (35 KTPA). **Ideal:** Falls by 295 KTPA: with dedicated routing, pre-consumer cotton-rich mech recycling (461 KTPA × 50% = 231 KTPA), pre-consumer synthetics to chem recycling (40 KTPA), and expanded post-consumer mech recycling (811 KTPA × 50% = 406 KTPA) sum to 677 KTPA - lower than current as routing is now more precise.
Fibre sorting - blends	**No sorting investment recommended near-term** ★ *recommended* Hyperspectral imaging *Most accurate technology for blend composition identification* *€200,000-500,000+ per line (Finland - indicative)* **NIR handheld / conveyor** *Can flag material as a blend but cannot determine full composition* *Near-term constraint: chemical recycling infrastructure is not at commercial scale in India. Blend identification is the correct long-term technology investment, but only once chemical recycling offtake exists. Invest in chemical recycling infrastructure first.*	**648**	**35**	**Now:** Post-consumer cotton-rich downcycling (482 KTPA), blended fabric downcycling (302 KTPA), and synthetic downcycling (336 KTPA) — currently passing through blend identification sorting before downcycling dispatch. **Ideal:** Falls sharply to 35 KTPA: only a small volume of post-consumer blended and synthetic waste is currently routable to chemical recycling in India. The majority remains in the downcycling and reject stream as chemical recycling offtake at commercial scale does not yet exist.
Total sorting operations		**7,166**	**7,449**	*Exceeds waste volume of 7,125 KTPA: grade sorting is a sequential sub-sort of material already counted in condition / useability. All other sorting types are mutually exclusive partitions of the 7,125 KTPA waste stream.*

Table 1: Missing Sorting Capability

Source: FICCI analysis 2025/26. Sorting operations total exceeds waste volume of 7,125 KTPA because grade sorting is a sequential sub-sort of material already counted in condition / useability; all other rows are mutually exclusive.
★ denotes recommended near-term technology.

3.2.1 Gap 1: Sorting & Fibre Identification Failure - The Most Consequential Gap, that can Drive 100% of the Value Unlock

The single most value-destructive failure in India's sorting system is not the absence of infrastructure - it is the **inability to identify what a textile is made of, and separate textile waste from other waste.** Every textile stream in the value chain passes through a sorting decision; it is sorting that determines whether a kilogram of textile realises INR 5 or INR 400. Our sorting model maps **1,619 KTPA** of India's total waste stream as requiring fibre-level identification **676 KTPA of pure mono-fibre and 648 KTPA** of blended fabric. Current NIR-based fibre identification capacity nationally is **under 1 KTPA**. The gap: approximately **1,618 KTPA unserved** - a volume equivalent to the entire pre-consumer recyclable waste stream.[xxv]

The financial consequence is direct and quantifiable. Our value model shows that the **1,020 KTPA** of pre-consumer material and **1,155 KTPA** of post-consumer material currently going to downcycling - at INR 5-15/kg - each contain a cotton-rich mono-fibre fraction of approximately 43% (~439 KTPA and ~482 KTPA respectively) that qualifies for mechanical recycling at INR 78-82/kg.[xxvi] That is a **5-16× price uplift per kilogram**, unrealised purely because fibre identification does not happen at the sorting stage.

- **Manual sorting is only 40-50% accurate** for fibre composition identification - sufficient for condition and colour but structurally incapable of blend detection. Material sorted manually can only be downcycled, not recycled.[xvi]
- **Blended fabrics - 648 KTPA in our sorting model** - cannot be reliably identified by touch or visual inspection; even experienced sorters with generational knowledge cannot distinguish compositions.[xvi, xviii, xxii]
- **Dark and coated fabrics** do not reflect NIR light sufficiently, creating machine identification failures even where devices are deployed - affecting the **203 KTPA dark/black colour stream in our model.** [xvi, xviii, xxii]
- **Disruptors** - spandex, elastane, embroidery, beads, netted materials - contaminate otherwise sortable streams. Spandex at as low as 5% renders a batch unrecyclable for most mechanical recyclers. Disruptor removal is entirely manual with no technology solution at scale. [xvi, xviii, xxii]
- **Labels are absent, inaccurate, or unreadable.** Mislabelling of blends as 100% cotton is widespread not just in informal markets but across large domestic retailers - meaning even the most basic traceability input in the system cannot be trusted.[vi]

3.2.2 Gap 2: Infrastructure Scarcity and Design Inadequacy

The physical infrastructure for sorting is so scarce that the gap may be more acute than the technology gap. India has **9-10 TRFs** operating at any meaningful scale nationally, against a total post-consumer waste stream of **4,100 KTPA**. At Hasiru Dala's TRF peak throughput is **51 MT per month**. If every TRF in India achieved that throughput, total national TRF capacity would be under **6 KTPA:** a coverage rate of **0.15%** of post-consumer waste.[xxii, xvii]

- **DWCCs serve as a stop-gap sorting arrangement**, not purpose-built infrastructure. Contamination at DWCC level is the single biggest determinant of what can be sorted downstream. Hasiru Dala's cloth audit found that of a collected batch arriving under current mixed-collection conditions, only **25-30% of material is recoverable** in any form. With household-level source segregation delivering clean, dry, separately stored textiles, this rises to **85%. The gap - roughly 55-60 percentage points - represents material destroyed by contamination before sorting even begins.** [xxii]

- **No conveyor-based sorting lines** are deployed anywhere in India commercially. Technology deployment across our ten sorting types today: UV sensor **~5-15 KTPA** (Panipat only), RGB optical camera **0 KTPA**, NIR handheld **<1 KTPA**, NIR conveyor **0 KTPA**, hyperspectral 0 KTPA, AI-enabled automated sorting **0 KTPA**. The entire national post-consumer sorting system operates at the level of visual inspection and hand-sorting.
- **Sorting infrastructure is geographically concentrated**. With recycling capacity anchored in Panipat and Tirupur, material from other regions - particularly South India - faces transportation costs that can represent **60% of total waste management cost**, making the economics of routing sorted material to recyclers non-viable regardless of sorting quality. [xxii]
- **Fragmented supply** means each source provides only **50-100 kg per colour/material category** - far below the consistent, large-volume bales that recyclers need. Without aggregation infrastructure, even well-executed TRF sorting cannot generate the volumes at which economics become viable. [xxii, xviii]
- **Recycled polyester integration in Indian manufacturing currently draws entirely from PET bottle recyclate, not from recycled polyester fabric** - because coloured polyester fabric requires **decolouration** before reuse, a process currently too **chemically intensive and costly** to compete with virgin polyester. This means the optimal routing for the blended, coloured polyester-rich fraction of India's waste stream exists in the model but not yet in commercial practice - the sorting investment unlocks the identification, but the downstream pathway is contingent on chemical recycling reaching commercial viability in India.[xxi]

3.2.3 Gap 3: Economics of Sorting are Unviable Without a Demand Signal

India's sorting economics are caught in a circular dependency that markets cannot self-resolve: sorters cannot produce recycler-ready fractions without knowing what recyclers need; recyclers will not commit to domestic post-consumer feedstock without consistent quality; neither side moves without the other. This dynamic was cited unprompted by every interviewee across the value chain.

- **Market value** of sorted post-consumer material is at most **5-6%** of what is required to cover full sorting costs at TRF level. Sorting margin per item is approximately **INR 1-2**, only viable if daily throughput per manual sorter is significantly higher than current fragmented supply allows. [xxii]
- **Without EPR**, there is no mechanism to create a demand floor. Even the cheapest available fibre identification technology - an IVR device at **INR 4.5 lakh** - cannot be financially justified when the market provides no assurance of volumes or offtake prices.[xxii]
- **Recyclers prefer imported waste** over domestic post-consumer due to higher and more consistent quality - structurally depressing the demand signal for **domestically sorted material** and reinforcing the incentive not to invest in sorting infrastructure.[xviii]

- **The quality differential between imported and domestic post-consumer waste** is confirmed at the manufacturing level. Western geographies benefit from laundry and household collection infrastructure that produces cleaner, better-segregated material; India has no equivalent collection system, centralisation, or incentive structure. Until a domestic collection architecture comparable to that which exists for plastics is built, the quality gap between imported and domestic post-consumer feedstock is structural, not incidental.[xxi]

- **The technology adoption barrier is reinforced from the demand side**. Large-scale integrated manufacturers indicate that sorting technology is not a current procurement priority - recycled post-consumer fibre is not yet a material input concern because virgin fibre availability has historically matched demand and because no consistent supply of quality-sorted domestic post-consumer feedstock exists. Until buyer pull from large manufacturers creates a commercial anchor for consistently sorted, certified post-consumer feedstock, technology investment at TRF level lacks the offtake demand signal it requires to be financially justifiable. [xxi]

- **The demand constraint is compounded by a structural economy consideration**: India is the world's largest cotton producer, with an estimated 30-50 million farming livelihoods dependent on **cotton cultivation, and domestic supply and demand are closely matched at current yields**. Large-scale substitution of virgin cotton with recycled fibre at industrial input scale would create competitive displacement for cotton farmers - a live policy tension that complicates any regulatory mandate to increase recycled content. **Circularity policy in India must be designed to coexist with the cotton agriculture economy** rather than compete with it. [xxi]

- Our value model quantifies what this **economics failure costs:** the sorting-attributable value loss across **downcycling streams is ~INR 10,565 Crore annually**, and from **post-consumer landfill material recoverable through correct sorting** and routing, **a further ~INR 6,290 Crore (conservative)**. Together, these represent foregone value on material that already exists in the system.

3.2.4 Gap 4: Absence of Standards and Grading Taxonomy

India's textile waste system has no equivalent of the standardised categories that made plastics recycling economically functional. There is no national grading taxonomy, no BIS specification for recycled textile fibre, no bale-level documentation standard, and no accepted definition of a "recycler-ready" bale. Our sorting model identifies **ten distinct sorting types** across the value chain - not one has a formal grading definition attached to it in any Indian standard.

- **Without standard grades**, recyclers cannot specify requirements, sorters cannot consistently produce what is needed, and buyers cannot verify what they receive. Even well-sorted material trades at a discount because the buyer has no mechanism to trust its composition - and at **40-50% manual sorting accuracy** for fibre composition, that scepticism is well-founded.[xvi]

- **Bale-level documentation and traceability** are absent. A recycler receiving a bale from a TRF today has no verified record of its composition - the fibre content is whatever the sorter believed it to be. This is the single biggest barrier to brand procurement of domestically sorted recycled content at scale.

- **The absence of an HSN code** for upcycled textile products removes a layer of economic motivation for higher-grade sorting: without formal trade classification, upcycled outputs cannot access export incentives, formal market channels, or EPR credits.[xxvii]

3.2.5 Gap 5: The Human Backbone: Indispensable, Yet Unrecognised

India's sorting workforce is its most underleveraged asset. Sorters with generational expertise accurately assess condition, rewearability, and broad material type - tasks that no commercially viable technology can currently replicate. Our sorting model shows that **4,034 KTPA (56% of total sorting volume)** requires operations - condition, grade, source segregation, reject - that are permanently manual regardless of technology advancement. This is not a transitional state; it is structural.[xxii]

- **Yet this same workforce is structurally incapable of fibre composition identification** in blends - the one sorting task that determines recycling pathway and unlocks the largest value uplift. The remaining **44% (3,131 KTPA)** of sorting volume is technology-addressable, **not by replacing human sorters but by adding sensor-based identification that human hands cannot provide**. The expertise and the gap are not the same problem.[xvi]
- **Sorters produce what buyers will pay for.** Without clear demand signals from recyclers specifying colour and composition requirements, sorting effort is misdirected - producing mixed-grade bales rather than the composition-sorted fractions that command a premium.[xxii]
- **Labour economics only function if volume per sorter per day is sufficient.** At current fragmented supply - **50-100 kg per colour/material category per source** - throughput is too low for per-item margins of INR 1-2 to aggregate into a viable operation.[xxii]
- Despite sustaining approximately **4-4.5 million livelihoods** and being the backbone of India's entire textile recovery system, waste pickers and sorters receive **no formal recognition**, no employment protections, and no policy support.[xxii]
- Informal sorter communities run the risk of job instability, low/no benefits and protection despite being critical to the value chain. This implies **a significant risk to the value realized at the end of the value chain, if the manual workforce is not formalized.**

3.2.6 Gap 6: Source Segregation: The Input Problem That Determines Sorting Outcomes

A challenge that precedes sorting but entirely determines its outcome: the condition of material arriving at TRFs. **Mixed collection with wet waste** destroys fibre quality before any sorting decision is made. Hasiru Dala's cloth audit makes this starkly clear - the difference between **25-30%** and **85%** recoverability is not sorting capability, technology, or workforce skill. It is the condition of material at intake.[xxii]

- **Contaminated material** cannot be sorted into recycler-ready fractions regardless of effort or technology - it exits the system as landfill or co-processing waste. Our value model shows **1,091 KT (non-recoverable floor at 50% EPR)** of the post-consumer landfill stream is genuinely non-recoverable regardless of any intervention. The remaining **806 KT (recoverable at 50% EPR collection)** that is recoverable with source segregation is currently lost not due to sorting failure but due to contamination-driven quality destruction upstream of sorting. Sorting investment delivers zero return unless feedstock quality at intake is adequate. [xviii]

- **Post-consumer fibre quality** in India is further degraded by use patterns - heavy washing and extended wear reduce fibre length and strength before a garment is discarded, limiting recycler yield even from well-sorted, clean material.[xviii]

3.2.7 Gap 7: Technology Adoption Barriers

Technology capable of closing India's fibre identification gap exists, is commercially available, and is in some cases manufactured in India. The barrier is not technical readiness - it is that the business case for adoption makes no sense at current scale without structural support.

- **IVR/NIR devices at INR 4.5 lakh per unit** are available domestically and technically proven at Hasiru Dala's TRF.[xxi] Our infrastructure gap analysis estimates **~197 NIR** handheld devices and **~303 IVR bench devices are needed in Y1-Y2 to begin addressing the fibre identification gap - a total Y1-Y2 CapEx of approximately INR 25-27 Crore** across all technology types. Even at this relatively modest scale, CAPEX cannot be justified against current INR 1-2 sorting margins and uncertain feedstock volumes without external support.
- **AI-enabled sorting accuracy exceeds 90%** - more than double manual accuracy - but full automation is **not viable at current economics**. India is not a market for conveyor-scale NIR lines today; the commercially viable near-term path is semi-automated IVR handheld and bench devices within existing TRF infrastructure.[xvi]
- **At industrial automated sorting scale, capital costs are prohibitive and technology obsolescence risk is a genuine deterrent. A fully automated sorting line capable of processing 50 tonnes per day** requires an estimated capital investment of approximately **USD 125 million** - a threshold that no single private actor in India's fragmented sorting ecosystem can justify, and one that is further complicated by the pace of technological change in sorting systems. Operators considering large-scale capital commitments face the real risk that the technology they deploy today will be superseded before the investment is recovered. This reinforces the case for the semi-automated, modular approach - handheld NIR and IVR bench devices within existing TRF infrastructure - as the commercially rational near-term path: lower capital exposure, no obsolescence cliff, and deployable without a greenfield facility.[viii]
- **Each source provides only 50-100 kg per colour/material category** - far below the minimum efficient scale for any automated sorting line. Fragmentation simultaneously constitutes a collection problem, an aggregation problem, and a technology adoption barrier; these cannot be solved independently. [xvi]
- **There is no reverse supply chain architecture** in India to aggregate material to sorting hubs at scale. Without this, even a well-capitalised TRF with adequate technology cannot achieve the throughput at which its fixed costs become viable.[xvi]

> *"Manual sorting is 40-50% accurate - material sorted manually can only be downcycled, not recycled."*
> *- Kosha.AI*

3.3 Findings, Insights and Recommendations: Sorting as India's Textile Value Gate

Main Finding: India is Destroying ~USD 9.4 (INR 77,500 Crore) Billion in Textile Value Annually - and Sorting is the Gate That Can Recover It

India's textile waste is not primarily an environmental problem or a policy problem. It is a sorting problem. Our end-to-end value model shows that the gap between what India's textile waste currently generates and what it could generate at optimal routing is **~USD 9.4 billion annually (INR 77,500 Crore, conservative estimate)**

This is the calculated consequence of misrouting 7,125 KTPA of waste - material worth **INR 78-400/kg in its optimal pathway but sold for INR 5-15/kg as downcycling feedstock, or realising INR 0 in landfill or incineration.** The single step that determines which outcome a tonne of textile waste reaches is sorting - specifically, what happens at the TRF before material is dispatched to a recycler, upcycler, or resale market. **Source segregation at the household level is a necessary precondition and on its own contributes 8% of total value. The $9.4B+ is not unlocked at collection, It is unlocked - or destroyed - at the TRF.**

3.3.1 Recommendation 1: Deploy Sorting Technology at Scale: INR 25-27 Crore (~USD 3 million) to Begin Closing the Fibre Identification Gap

TECHNOLOGY **INFRA & INVESTMENT**

The most consequential sorting failure - fibre identification - affects **1,619 KTPA** of India's waste stream. Current NIR-based identification capacity is **under 1 KTPA**. The technology to close this gap exists, is commercially available in India, and requires no greenfield infrastructure. Our infrastructure gap analysis estimates the following investment for Y1-Y2[xxv]:

Table 2 : Sorting Technology Investment Needed

Technology	Sorting type addressed	Volume today	Units needed (near future)	Unit cost	Y1–Y2 CapEx
UV / visible light	Colour -dark/black	244 KTPA	~8 setups	INR 4-12L	INR 4-12 lakh
RGB / optical camera	Colour - non-black	895 KTPA	~39 units	INR 5-10 L	INR 195-390 lakh
IVR bench (NIR+RGB+AI)	Fabric type / construction	537 KTPA	~303 devices	INR 3.5-4.5L	INR 1,364 lakh
NIR handheld (e.g. Matoha FabriTell, IVR sensor)	Fibre mono-fibre ID	971 KTPA	~197 devices	INR 3.5-4.5L	INR 887 lakh
Total Y1–Y2		**2,813 KTPA**			**~INR 25-27 Crore**

Against a conservative total value unlock of ~USD 9.4 billion (INR 77,500 Crore), the Y1-Y2 investment-to-value ratio is approximately **~230:1.** Even on the **sorting-attributable recycling value loss alone of ~INR 10,565 Crore, the ratio remains highly compelling.**

The most critical near-term device is the **NIR handheld at INR 3.5-4.5L per unit**, deployable immediately within existing TRFs, and the only device that moves India's fibre identification accuracy from **40-50% (manual) to over 90%.**[xvi, xxii]

3.3.2 Recommendation 2: Scale TRF Infrastructure - 0.15% Coverage is Not a System

INFRA & INVESTMENT

Technology without infrastructure is inert. India's ~10 TRFs cover approximately **0.15% of the post-consumer waste stream at peak capacity.** Closing the sorting gap requires a network of decentralised TRFs co-located with or near existing DWCCs, reducing logistics cost and enabling the aggregation volumes that make both economics and technology viable. [xxii]

Figure 6 : Hasiru Dala TRF Sorting Operations, Bengaluru

Three structural conditions currently absent at most facilities must be addressed:

- **A systems-level infrastructure ratio offers a practical planning anchor.** From an upstream manufacturing perspective, a functional national sorting system requires approximately one TRF per **one million population, ten TRFs per recycling facility, and five recycling facilities per large-scale yarn manufacturer.** Against India's current base of 9-10 TRFs nationally, this ratio makes visible the order-of-magnitude infrastructure gap that the 0.15% coverage statistic describes: not an incremental shortfall, but a system that does not yet exist at the scale required to supply consistent, volume-adequate feedstock to upstream recyclers.[viii]

- **Minimum viable feedstock volume:** at least 50-100 MT per month of clean, segregated input. Each source currently provides only **50-100 kg per colour/material category** - aggregation infrastructure is as critical as the TRF itself.[xvi]
- **Clear recycler demand specifications:** sorters must know what colour, composition and grade recyclers need before they can produce it consistently. This requires active linkage between TRF operators and recycler buyers.[xxii]
- **Geographic decentralisation:** with transport costs representing up to 60% of total waste management cost, TRFs must be proximate to both collection points and recycling clusters. The current concentration in a handful of cities structurally excludes most of India's waste.[xxii]

3.3.3 Recommendation 3: Sorting for Resale & Upcycling Can Drive ~85% of the Unlock Potential (Reuse, Resale and Upcycling)

INFRA & INVESTMENT

Of the ~USD 9.4 billion (INR 77,500 Crore) conservative value destroyed annually in India's textile waste system, the single largest component, **INR 46,345 Crore (~USD 5.6 billion) unlock potential, sits not in recycling or chemical processing, but in the post-consumer reuse and resale stream. This is not a technology gap. It is a sorting and formalisation gap.**

The value delta is structural: material currently reaching informal resale markets realises **INR 50-100/kg.** The same material, correctly condition-graded and routed to organised resale channels - thrift platforms, brand take-back programmes, formalised secondary markets, especially upcyclers - commands **INR 400-800/kg** (sometimes even INR 5k+ for premium brands)[xxviii]. The **8× price differential is determined** entirely at the TRF, at the **condition and grade sorting step**, which requires no capital equipment beyond trained labour and grading discipline.

This makes **upcycling, reuse and resale the most asymmetric opportunity in the entire value chain:** the highest value unlock, achieved through the most immediately deployable intervention. Unlike fibre identification (which requires NIR devices) or chemical recycling (which requires upstream infrastructure), condition and grade sorting is already practiced informally across India's TRF network. What is absent is the formalised grading taxonomy, the buyer linkages to organised resale channels, and the throughput scale to make consistent graded output viable.

The international benchmark for repair and reuse underscores how far India's current recovery rate sits from its structural potential. TRFs in **Denmark recover approximately 80%** of collected material for reuse and repair - a rate that reflects decades of investment in source segregation, condition grading infrastructure, and organised secondary markets. India's current equivalent is estimated at **10-15%** of collected material directed to repair and reuse. The gap is not primarily cultural or technical; it reflects the absence of the same upstream conditions - clean input, grading discipline, and buyer linkage - that this chapter's recommendations are designed to build.[viii]

The implication for investment sequencing is direct: scaling TRF infrastructure and formalising grade sorting should be understood not primarily as enablers of recycling, but as the primary mechanism for unlocking reuse value. The recycling pathway is higher-technology and longer-horizon. The reuse pathway is available now, at scale, through sorting alone.

3.3.4 Recommendation 4: Fibre Traceability and Digital Labelling - Close the Loop That Sorting Alone Cannot Close

TECHNOLOGY

Sorting identifies what a material is. Traceability verifies what it was made of - and proves it to a buyer who cannot see inside a bale. These are complementary, not competing, interventions. Even with NIR handhelds at every TRF, a critical gap remains: physical labels are stripped, fade, or are mislabelled from the outset - Hasiru Dala's IVR sensor regularly detects compositions that contradict what is printed on the care label, including blends labelled as 100% cotton by large domestic retailers.

Two complementary traceability approaches address different parts of the problem:

- **Digital product passports and QR/NFC tags -** unlike physical fibre labels which are cut off during use or laundering, a digital product passport stores composition data in a cloud registry linked to a scannable code. The garment can be stripped, washed, and worn for years, but the composition data persists and is readable at a TRF scanner. This is the most practical near-term solution for India's domestic market, where label accuracy is already low and NIR devices are becoming available at TRFs. It requires upstream adoption by brands and manufacturers - a compliance push, not a capital investment.
- **Synthetic Artificial DNA (Technology #3 - providers: Safetraces, Haelixa)** - the most promising physical traceability solution for India's specific challenge. Three attributes make it the strongest option in the matrix: **high operational feasibility for polyester** (the dominant synthetic in India's blended waste stream and the hardest to route correctly); **on-site and off-site detection** (markers readable both at TRF sorting stage and by downstream buyers, creating an unbroken chain of custody); and critically, **multi-fibre detection - the only technology in the matrix capable of tagging and reading across multiple fibre types simultaneously,** directly addressing blended fabric identification. Applied upstream at the brand or manufacturer level, synthetic DNA markers mean that by the time a garment reaches a TRF, its composition is already verified. Sorting becomes a routing exercise rather than an identification exercise, eliminating the 40-50% accuracy ceiling of manual composition assessment entirely. [xxix, xvi]

Together, digital labelling (near-term, low cost, high reach) and synthetic DNA (medium-term, higher cost, highest accuracy for blends and polyester) form a two-tier traceability stack that addresses what NIR sensors alone cannot: verified origin composition that persists through the garment lifecycle and is readable at the point of sorting.

3.3.5 Recommendation 5: Formalise the Sorting Workforce

INFRA & INVESTMENT

Our sorting model shows that **4,034 KTPA (56% of total sorting volume)** requires manual operations, at least in the short term - condition assessment, grade sorting, source segregation, and reject sorting. No commercially viable technology replicates this. Formalisation is both ethical and economic:

- **Economically:** formalised sorters with stable employment, fair wages, and throughput-linked incentives produce better-sorted output - directly improving the quality and consistency of TRF fractions. The gap between informal transient sorting and trained consistent sorting is measurable: it is the difference between **25-30% and 85% recovery rates.**

- **Structurally:** the TRF model depends on trained, stable labour. Informal workers cannot maintain the grading discipline that recycler specifications require - particularly for IVR sensor operation and composition reporting, which require documented training and consistent protocol.
- **For scale:** formalisation enables throughput targets, quality monitoring, and training investment - the three inputs that convert a sorting operation from a cost centre into a value-generating infrastructure node.

Figure 7 : Hasiru Dala Training Sessions

3.3.6 Recommendation 6: Source Segregation - The Precondition That Doubles the Recoverable Pool

PARTNERSHIPS | INFRA & INVESTMENT

Source segregation is a recommendation about the input into sorting, not sorting itself - but its impact on sorting value is larger than any single technology intervention. Hasiru Dala's cloth audit shows the recoverable fraction rising from **25-30% to 85%** with household-level source segregation. Applied to India's **1,897 KTPA post-consumer landfill stream:**

- **Currently recoverable** (no segregation): **~522 KTPA**
- **Recoverable with source segregation at 50% EPR** collection (near-term target): ~806 KTPA - an additional ~284 KTPA unlocked
- **Non-recoverable residual floor at 50% EPR: ~1,091 KTPA** (non-recoverable floor at 50% EPR)

Our value model estimates the optimal value of the recoverable 806 KT (at 50% EPR collection)- applying composition splits across reuse, mechanical recycling, and chemical recycling pathways - at approximately **~INR 6,564 Crore** at conservative blended pricing (INR 40-70/kg). Source segregation and sorting are not alternative interventions - they are sequentially dependent. A TRF receiving clean, **separately stored textiles recovers 3× more material than one receiving contaminated mixed input,** making source segregation the highest-leverage single behaviour change in the value chain.[v]

3.3.7 Recommendation 7: Establish a National Grading Taxonomy - The Market Infrastructure That Makes All of the Above Bankable

POLICY

Every recommendation in this section depends on a common language between sorters, recyclers, brands and financiers. Without a national grading taxonomy - minimum viable grades, bale documentation standards, accepted composition verification protocols - sorting investments cannot produce the trusted, standardised outputs that make recycler procurement, brand offtake, and investor financing possible. Our sorting model identifies **ten distinct sorting types** across the value chain - not one has a formal grading definition in any Indian standard. Not one bale of TRF-sorted textile waste in India today carries verified, standardised documentation of its composition.[vi, xviii, xvi, xxi]

A minimum viable taxonomy requires four elements:

- **Composition grades:** cotton-rich mono, synthetic mono, blend - with accepted tolerance ranges (e.g. ±3%, matching the current informal recycler standard). *[Primary interview, Kosha.ai, 2025/26]*
- **Condition grades:** rewearable, recyclable, downcyclable, reject.
- **Colour grades:** light, mid, dark, black - aligned to mechanical recycling yield requirements.
- **Bale documentation minimum:** weight, composition, source, sort date, technology used for identification.

- **Dedicated HS code sub-classification for recycled textile materials.** Currently, no trade classification in India's harmonised system distinguishes recycled from virgin textile inputs, making it impossible to incentivise, track, or mandate recycled content through normal trade and procurement mechanisms. A practical solution - applicable without a full HS code revision - is to introduce deci-text identifiers at the 7/8 or 9/10 digit level specifically denoting recycled material content. Paired with **GRS (Global Recycled Standard) chain-of-custody certification** as the accepted verification protocol, this would create the classification infrastructure needed for EPR credits, export incentive eligibility, and government procurement mandates to function. Without a formal trade identity for recycled textile material, every downstream policy instrument - from recycled content mandates to green procurement thresholds - operates without an enforcement mechanism.[viii]

- **Labelling enforcement is structurally undermined by the scale of unorganised retail.** Approximately **80% of India's garment retail is unorganised** - small traders, street markets, and informal vendors with no registration requirement and no compliance infrastructure. This means that even a well-designed labelling mandate, anchored in BIS IS 1896, will cover at most 20% of garments placed on the Indian market in its initial phase. The grading taxonomy must be designed with this reality in mind: standards calibrated only to the formal retail tier will not produce the volume of labelled, traceable garments needed to improve sorting outcomes at scale. A phased approach - beginning with formal retail and e-commerce platforms, where traceability is already partially established, and progressively extending to unorganised retail through registration incentives and EPR linkage - is more likely to shift system-level label accuracy than a uniform mandate that the majority of the market cannot absorb. [viii]

This creates a direct policy mandate: mandatory accurate material labelling, enforced by the Bureau of Indian Standards and aligned to **BIS IS 1896 (care labelling requirements for textiles), should be treated as a prerequisite infrastructure for the grading taxonomy to function.** Specifically, this requires:

1. **Full fibre composition disclosure** by weight percentage on all garments sold in India; prohibition of rounding that obscures blend content (e.g. labelling a 65/35 cotton-polyester blend as "100% cotton")

2. **Third-party verification requirements** for composition claims above a defined threshold

3. **Enforcement:** Without this, the grading taxonomy simply shifts the misidentification problem one step downstream - from manual sorter to scanner - without eliminating it.

This taxonomy - backed by mandatory upstream labelling - is the market infrastructure on which all downstream investment, in sorting technology, TRF scale-up, recycler offtake agreements, and brand procurement commitments, can be built. Without it, every transaction in the value chain remains a negotiation from first principles, and no sorting investment is bankable at scale.[xvii, xxvii, xviii]

Case Study: Hasiru Dala Innovations - A Replicable Model for Formalised Post-Consumer Textile Sorting

Hasiru Dala Innovations (HDI) is a Bengaluru-based social enterprise that integrates informal waste workers into the circular economy. Under the Saamuhika Shakti collaborative programme, HDI established Bengaluru's first dedicated Textile Recovery Facility (TRF) in 2024 - a 3,800 sq. ft. facility in Hirandahalli, set up with seed grant support from HDI and the Circular Apparel Innovation Factory (CAIF). The facility has since generated four women waste entrepreneurs trained through its operations.

Sorting protocol and throughput

The TRF receives textile waste from 16 DWCCs across Bengaluru wards and directly from bulk waste generators and citizens. Sorting follows a three-tier protocol: primary contamination removal at DWCC level; secondary condition and category sorting at the TRF (recyclable, reusable, downcyclable); and tertiary colour and composition sorting to meet specific recycler specifications. Fibre composition is assessed using an IVR sensor-based device (INR 4.5 lakh per unit, German-manufactured with Indian alternatives available), which generates a composition report for each batch. The network has processed 719 MT since 2022, with a peak monthly throughput of 51 MT. Sorting outcomes to date: resale/reuse 30%, recycling 17%, upcycling 3%, aggregators 5%, downcycling 9%, reject 6%, with 30% in stock pending buyer linkage.

A cloth audit comparing recovery rates from mixed-collection input versus source-segregated input produced a finding central to this paper: 25-30% of material is recoverable under current mixed-collection conditions, against approximately 85% when input arrives source-segregated. This 55-60 percentage point gap directly quantifies the effect of input quality on sorting outcomes - and is derived from operational data, not modelled assumptions.

Key takeaways for a national sorting system

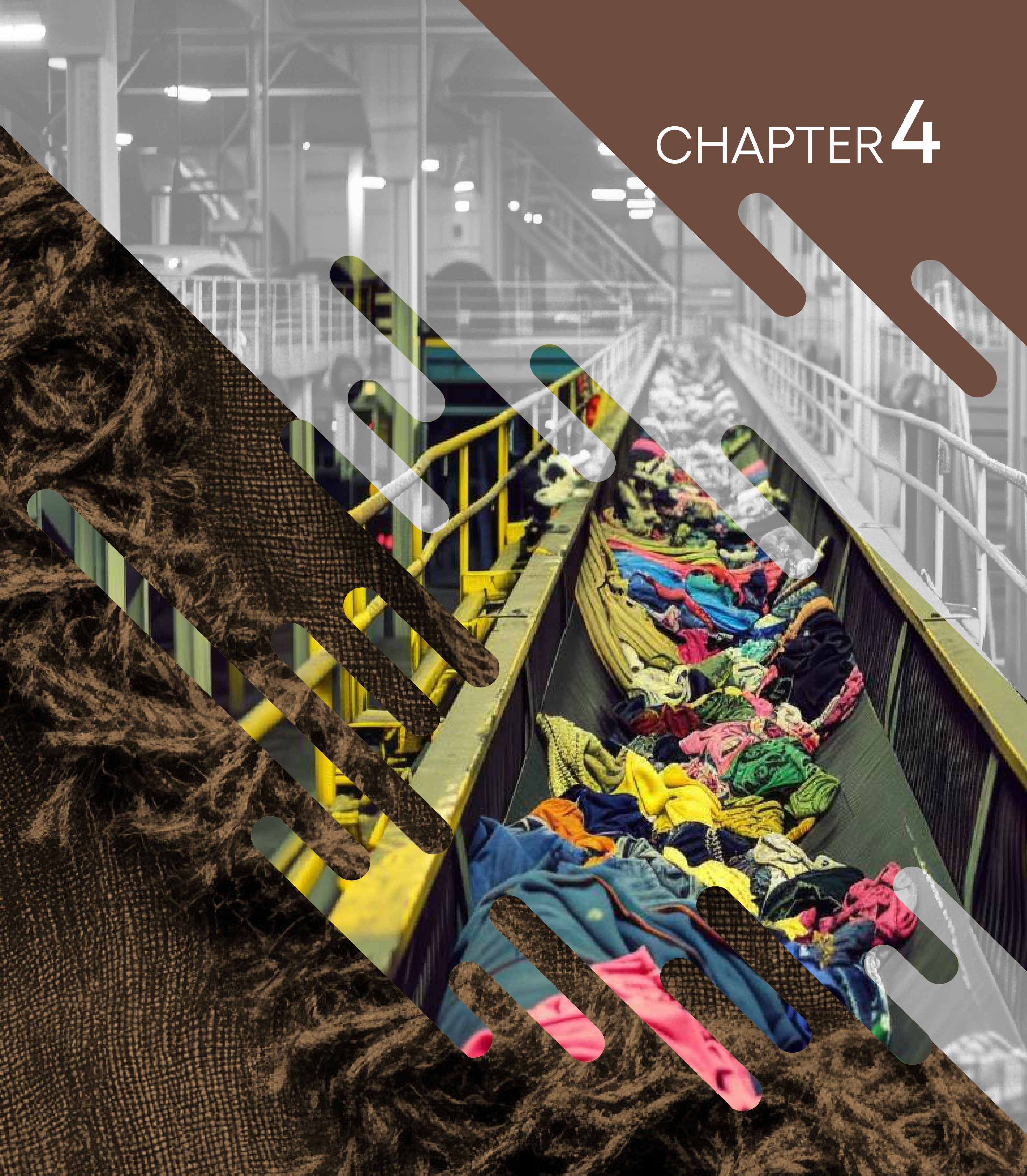
1. **A three-tier sorting protocol is operationally viable within India's existing DWCC infrastructure.** The HDI model demonstrates that secondary and tertiary sorting - including fibre composition identification - can be layered onto primary sorting that already occurs at DWCCs, without requiring standalone greenfield facilities.
2. **IVR-based fibre identification is deployable in the Indian TRF context today.** At INR 4.5 lakh per device, composition detection is not a prohibitive cost. The constraint is the commercial case for investment, not technology access.
3. **Input quality is the single largest determinant of sorting yield.** The 55-60 percentage point difference between mixed and segregated input recovery rates - quantified through HDI's own cloth audit - establishes that sorting infrastructure investment alone cannot

unlock full recovery without parallel improvements in source segregation.

4. **Sorting economics require structural intervention to become self-sustaining.** Transport subsidies or cluster co-location, recycler offtake commitments that give sorters forward visibility into grade requirements, and EPR-linked revenue support are necessary conditions - not optional enhancements - for TRF viability at scale.

5. **Sorter-to-recycler linkage is as critical as sorting capacity itself.** HDI's data shows 30% of sorted material remains in stock pending buyer decisions. Sorting throughput and sorting yield are meaningless without active demand-side connections to recyclers, upcyclers, and resale aggregators.

CHAPTER 4



Recycling – Challenges, Recommendations, and the Path Forward

CHAPTER 4

Recycling – Challenges, Recommendations, and the Path Forward

4.1 Current Recycling Landscape: A Tale of Two Waste Streams

India's textile recycling ecosystem presents a study in contrasts. While the country has developed a strong, if largely informal, infrastructure for handling pre-consumer textile waste, post-consumer waste management remains critically underdeveloped - and the gap between the two represents a significant value capture opportunity in India's textile value chain.

India's textile waste generation comprises roughly 2,615 kT of pre-consumer waste (cutting scraps, production rejects, and mill waste) and 4,100 kT of post-consumer waste (discarded garments and household textiles).[iv]

Pre-consumer waste benefits from proximity to industrial processing infrastructure, well-established trader networks, and relatively homogeneous fiber composition - and as a result, very little of it is lost entirely. Of the 2,615 kT generated annually, approximately **1020 kT is currently downcycled** - converted to shoddy or other low-value outputs rather than recovered in a closed loop. This means that while pre-consumer waste avoids landfill at a high rate, **a meaningful share of its fiber value is still being destroyed through downcycling**. Improved upstream sorting and collection, as addressed in earlier chapters, hold the potential to **redirect around 500 kT into formal closed-loop mechanical or chemical recycling -** representing a significant, if underappreciated, value capture opportunity within the pre-consumer stream.

The case of post-consumer waste, however, is starkly different. Of the 4,100 kT generated annually, approximately 1,100 kT is reused as-is or passed on through secondary markets and generational transfer. A further 1,120 kT is downcycled mechanically into shoddy - a low-value fibrous material used in industrial wiping, insulation, and padding. The remaining **1,897 kT - nearly 46% of all post-consumer textile waste - is either incinerated or sent to landfills**, yielding no material or economic value whatsoever.[iv] Only **0.85% of total domestic post-consumer textile waste is currently reintegrated** into the textile supply chain through closed-loop mechanical recycling.

India's recycling infrastructure is almost entirely mechanical in nature, with no commercial chemical recycling capacity in the country. Approximately **900 recycling units** - a mix of formal and informal operators - process textile waste through physical shredding, garnetting, and re-spinning.[xix] These units are concentrated in two principal clusters: **Panipat in Haryana and Tirupur in Tamil Nadu**, which together form the operational backbone of India's textile recycling economy.

The two clusters serve structurally distinct quality tiers that reflect their different feedstock environments and end-market orientations. **Panipat** processes the highest volumes — including 100% recyclate inputs — but produces coarse yarn and low-count outputs that are sold into informal industrial markets and are not marketed to end customers as recycled content, because the quality positioning would reduce rather than enhance value. **Tirupur**, by contrast, operates in the 30–34 count range for export-quality knitwear, where recycled content can be branded as a sustainability credential and commands a price premium from international buyers. The value of recycled yarn in Tirupur's ecosystem is therefore not determined by input quality alone but by the end-customer type and the brand's ability to communicate and certify recycled content — reinforcing that demand-side certification infrastructure is as important as supply-side sorting quality in determining whether recycled material generates premium or commodity pricing.[viii]

Panipat, often described as Asia's largest textile recycling hub, hosts a spectrum of operators that reflects the dual character of India's recycling system. Formal recycling units - equipped with modern machinery and operating to consistent quality standards - process clean, pre-sorted imported textile waste into closed-loop recycled fiber: yarn, blankets, and home textiles that re-enter the value chain. Alongside them, a significant number of informal operators process domestically sourced post-consumer waste into shoddy - converting volume but destroying fiber quality and foreclosing re-entry into the textile economy. **It is this informal, shoddy-producing segment that handles the bulk of India's domestic post-consumer waste**, while formal closed-loop recycling is sustained almost entirely by imported feedstock. Tirupur's recycling ecosystem is more tightly integrated with its dominant knitwear manufacturing base, processing primarily pre-consumer cotton offcuts and production waste in a relatively cleaner and more consistent feedstock environment.

In terms of capacity, **India's formal mechanical recycling capacity - units capable of producing closed-loop recycled fiber for re-entry into the textile value chain - stands at approximately 650 kTPA**[xxx], running almost exclusively on imported feedstock.[iv] Alongside this, the informal mechanical recycling segment, which handles the bulk of domestically collected post-consumer waste through downcycling into shoddy, operates at an estimated **2,150 kTPA** - giving India a combined mechanical recycling capacity of approximately **2,800 kTPA**[xxx]. Chemical recycling capacity, by contrast, stands at zero - no commercial-scale facility exists anywhere in India.

Taken together, this capacity picture reveals a recycling ecosystem performing within its current constraints but significantly limited by them - and one that will require both redirection of existing capacity and investment in new capacity to meet the potential of an improved upstream system. The following section examines the four interconnected challenges that must be addressed to unlock this value.

4.2 Challenges in India's Textile Recycling Ecosystem

India's recycling constraints operate at four interconnected levels: the quality of domestic feedstock reaching recyclers, the inherent limitations of mechanical processing, the geographic concentration of recycling infrastructure, and the complete absence of chemical recycling. Addressing value recovery at scale requires confronting all four.

4.2.1 Poor Domestic Feedstock Quality and the Import Dependency

The most immediate constraint facing India's formal mechanical recyclers is not capacity - it is the quality of what arrives at their gates. Domestic post-consumer textile waste, as it currently reaches recyclers, is typically poorly sorted, contaminated with non-textile material, and inconsistent in fiber composition. This disqualifies it from the input requirements of formal closed-loop recycling, where clean, fiber-specific feedstock is essential to producing output of re-usable quality. Stakeholders are unambiguous on this point: *"If recycling volumes doubled, sourcing good quality material would become the main constraint."*

As a result, India's formal mechanical recyclers - with approximately 650 kTPA of closed-loop capable capacity - have structurally shifted their sourcing toward imported textile waste. **India currently imports approximately 600 kTPA of textile waste** - which arrives meeting closed-loop quality thresholds.[iv] Domestic post-consumer waste, failing the quality threshold, bypasses formal recyclers and flows instead to the informal segment, where approximately 2,150 kTPA of capacity converts it to shoddy at a fraction of its recoverable value. The structural consequence is stark: India generates over 7,000 kT of textile waste annually, yet its closed-loop recycling infrastructure depends almost entirely on imports to function.

Improving upstream sorting quality - as addressed in previous chapters - is a necessary first step, but the capacity picture makes clear it will not be sufficient on its own. Projections indicate that improved collection and sorting infrastructure could unlock approximately **3,200 kTPA of good-quality textile waste** available for recycling (inclusive of pre-sorted good quality imported textile waste). Against India's current combined mechanical recycling capacity of ~2,800 kTPA - even accounting for the upgrade of informal recycling units to handle better-quality feedstock - this implies a **residual capacity gap of approximately 400 kTPA** that cannot be absorbed by existing infrastructure. India must start redirecting existing capacity toward domestic waste and build approximately **400 kTPA of net new recycling capacity across both mechanical and chemical technologies** to continue recycling imported waste. Sorting investment is the unlock; capacity investment is the complement that determines how much value is ultimately captured.

4.2.2 Inherent Limitations of Mechanical Recycling

Even where feedstock quality is adequate, mechanical recycling carries inherent technical constraints that cap its value recovery potential. The most significant is its **inability to handle blended fiber waste.** Mechanical processes - shredding, garneting, re-spinning - operate through physical separation and cannot decompose a fabric into its constituent fiber types. A cotton-polyester blend, once shredded, yields a mixed fiber output unsuitable for high-quality closed-loop yarn production and is in practice diverted to shoddy. This confines viable closed-loop mechanical recycling to single-fiber streams - primarily cotton - limiting its applicability to a portion of the overall waste mix.

Blended textile waste comprises approximately **19% of total textile waste across both pre- and post-consumer streams - approximately 1,350 kT annually** - and the entirety of this stream is currently being downcycled, destroying an estimated ₹10,000 crore in recoverable annual value.[xx] A secondary but compounding limitation is fiber length degradation: each pass through mechanical recycling shortens average staple length, reducing the quality and range of applications that recovered fiber can serve. This means that even material successfully recycled in a closed loop has a limited number of viable recycling cycles before degrading below usable quality - constraining the long-term durability of the circular loop itself.

The economics of recycled yarn production are further constrained by two quantifiable operational penalties that virgin production does not carry. First, **recycled yarn production runs at approximately two-thirds the speed of virgin yarn production,** creating a direct throughput cost that is not recoverable through raw material savings at current recycled input prices. Second, the **scale differential between virgin and recycled production** is extreme: virgin yarn is produced in runs of approximately 2 million kilograms; recycled yarn is typically produced in runs of 5,000–10,000 kilograms, commissioned only at customer request. The resulting absence of economies of scale means that recycled yarn cannot reach cost neutrality with virgin yarn through process efficiency alone — it requires either consistent large-volume demand commitments from brands, or external support mechanisms such as recycled content mandates or preferential procurement, to make production runs economically viable. Under current market conditions, neither exists at the scale required.[viii]

Upstream manufacturers confirm that **the practical recycled content ceiling under current GRS standards is 30% for cotton-only recycled inputs,** rising to a working optimum of approximately **55% recycled cotton / 45% recycled polyester** for blended recycled yarn destined for export-quality end uses such as T-shirts. These thresholds are not merely regulatory conventions — they reflect the fibre length and tensile strength constraints that mechanical recycling imposes on output quality. Beyond these thresholds, yarn count, strength, and consistency degrade to the point where the output is no longer suitable for the product categories that carry a recycled content premium. This places a structural ceiling on how much recycled content a given product category can absorb, independent of cost or supply availability, and must be reflected in any recycled content mandate design to avoid creating compliance that is technically unachievable at commercial quality standards. [viii]

4.2.3 Geographic Concentration and the Transportation Cost Burden

India's recycling infrastructure is concentrated in essentially two clusters - Panipat and Tirupur - while textile waste generation is dispersed across urban and peri-urban centres nationwide. This geographic mismatch creates a structural cost burden: **transportation**

accounts for approximately 50-60% of total recycling-related costs under current conditions, rendering the economics of processing lower-grade domestic waste - which demands greater sorting effort for lower output value - deeply unfavourable.[xxii]

This concentration also creates systemic fragility. Disruptions to feedstock supply - whether from trade policy changes affecting imports, logistical shocks, or shifts in global second-hand clothing flows - have an outsized impact because no alternative processing clusters exist to absorb displaced volumes. Waste generated far from Panipat or Tirupur faces transportation costs that effectively exclude it from the formal recycling economy, reinforcing both landfill dependence and the economic advantage of imported over domestic feedstock. Regional diversification of recycling infrastructure would reduce unit transportation costs, improve domestic waste utilisation, and build systemic resilience into the recycling value chain.

4.2.4 Absence of Chemical Recycling and the Barriers to Its Development

Chemical recycling - encompassing solvent-based dissolution, hydrolysis, glycolysis, and related processes - is the only pathway capable of recovering constituent fibers from blended textiles and producing closed-loop output at near-virgin quality. Yet **chemical recycling capacity in India stands at zero**, and its absence is not merely a gap - it is a structural ceiling on the value that India's recycling ecosystem can recover from its most problematic waste streams.

Two structural barriers must be addressed together. The first is cost: chemical recycling currently costs approximately **2.5 times the cost of virgin fiber production in Asia**.[xxxi] Without regulatory mandates for recycled content, domestic brands and consumers show no demonstrated willingness to absorb this premium, leaving any nascent chemical recycling capacity wholly dependent on export offtake - a commercially fragile position that concentrates risk and deters long-term capital commitment. The second is energy intensity: chemical recycling processes require approximately **90 MJ of fossil energy per kilogram of fiber recovered, compared** to **15 MJ per kilogram for virgin cotton production** - a six-fold energy penalty that, at current grid costs, makes chemical recycling more expensive than virgin production and raises questions about net environmental benefit without renewable energy integration.[xxxii]

Importantly, **chemical recycling is not yet commercially scaled even at a global level** - India is not uniquely behind. Europe leads in pilot and early commercial deployment, driven by regulatory pressure and brand sustainability mandates, but true industrial scale remains nascent everywhere. This means that the window for early-mover investment in India remains open, and the cost and energy barriers - while real - are amenable to improvement through scale, technology advancement, and renewable energy co-location rather than being permanent constraints.

4.3 Strategic Imperatives and Recommendations

India's recycling gap is both a waste management challenge and an economic and strategic one. The case for action rests on three converging imperatives - the need to close an emerging capacity gap, the need to build future resilience against a structurally changing waste mix, and the need to de-risk India's textile manufacturing base against mounting climate-related raw material risk. Addressing these imperatives requires three targeted interventions, spanning mechanical recycling formalisation, chemical recycling development, and demand-side market creation.

4.3.1 The Burning Platform: Why India Must Act Now on Recycling

As established in Section 4.2, even if upstream sorting and collection infrastructure is significantly upgraded, the ~3,200 kTPA of quality sorted textile waste expected to become available will outstrip India's current combined recycling capacity of ~2,800 kTPA[xxx]. A residual **capacity gap of approximately 400 kTPA** will need to be filled through new investment. Moreover, the ~1,350 kTPA of blended fiber waste - a stream that mechanical recycling cannot address - will require chemical recycling pathways to avoid continued downcycling and value destruction.

Looking further ahead, the composition of India's textile waste is itself evolving. As the share of blended fabrics in domestic consumption grows - driven by the continued expansion of synthetic and mixed-fiber apparel - **the proportion of waste streams that mechanical recycling can address in a closed loop will progressively shrink.** Investing only in mechanical capacity today would therefore solve the near-term gap while leaving India structurally underprepared for the waste mix it will face in the next decade. A dual-track investment strategy - scaling mechanical recycling as a cost-effective, near-term solution while building chemical recycling as a future-facing capability - is not a choice between two options; it is the only approach that delivers both immediate value recovery and long-term resilience.

Beyond the waste management rationale, there is a deeper structural risk to India's textile industry that makes accelerated recycling investment a strategic necessity. Cotton - India's primary textile raw material - is increasingly exposed to climate-related risks including water scarcity and yield variability. Erratic monsoon patterns, rising temperatures, and water table depletion in key cotton-growing states have already begun to translate into meaningful production volatility. Domestic cotton prices are projected to increase by approximately 1.75 times based on historical instances, placing pressure on spinning margins and compelling India to import medium-staple cotton - a category it has historically been a net exporter of. Scaled recycling - both mechanical and chemical - addresses this directly: for instance, mechanically recycled fiber (from pre and post-consumer waste) could supply up to 26% of India's total cotton demand, providing a domestically controlled, climate-resilient alternative to imported virgin cotton.

4.3.2 Recommendation 1: Formalise Mechanical Recycling and Develop a Third Recycling Cluster

INFRA & INVESTMENT

The most immediately actionable investment opportunity lies in mechanical recycling - a proven, cost-effective technology with substantial existing infrastructure that can be upgraded and expanded at comparatively modest capital cost. Two interventions are required in parallel.

The first is the **formalisation and upgrade of India's informal mechanical recycling base.** The ~2,175 kTPA of informal capacity currently engaged in shoddy production represents a significant latent asset. Much of this infrastructure, with targeted investment in equipment upgrades, quality management systems, and input traceability, could be repositioned to handle better-quality sorted feedstock in a closed-loop setting rather than defaulting to downcycling. Formalisation also improves environmental compliance, worker conditions, and the traceability requirements that export markets and domestic brands increasingly demand.

The second is the **development of a third major recycling cluster to address much of the residual 400 kTPA capacity gap and reduce geographic concentration risk.** As detailed in Challenge 3, the concentration of recycling infrastructure in Panipat and Tirupur imposes transportation costs of 50-60% of total recycling costs and renders distant domestic waste streams economically unviable to process. A strategically located third cluster - ideally in a high-waste-generating region such as the western or southern textile belt - would reduce unit transportation costs for a large share of currently stranded domestic waste, improve overall system economics, and reduce the systemic fragility of a two-cluster model. Investment in this cluster should be anchored by co-location with sorting infrastructure, logistics connectivity, and proximity to large waste generation centres to maximise feedstock availability from day one.

4.3.3 Recommendation 2: Catalyse Chemical Recycling Through Targeted Investment and Enabling Policy

INFRA & INVESTMENT | TECHNOLOGY | POLICY

While mechanical recycling addresses the near-term capacity need, chemical recycling must be developed in parallel as India's strategic hedge against a blended-fiber-dominated waste future. Given the structural barriers outlined in Challenge 4, market forces alone will not deliver the necessary investment at the required pace. Government facilitation - through financial instruments, regulatory signals, and institutional coordination - is essential to initiate the investment cycle.

A realistic first-mover target of 75 kTPA of chemical recycling capacity by 2030 provides a credible, time-bound anchor for policy design. At an estimated realised value of approximately ₹ 14 per kilogram of fiber recovered above its downcycled equivalent, a 75 kTPA facility would generate approximately ₹ **1,125 crore in incremental annual value** relative to the current shoddy pathway - a meaningful return that improves significantly as the cost curve matures.

Achieving this target requires action across three dimensions simultaneously. **Investment facilitation:** viability gap funding or concessional financing mechanisms should be made available to anchor chemical recycling projects in existing textile clusters, particularly Panipat and Surat, where feedstock aggregation and logistics infrastructure already exist. Public-private partnership structures - with offtake risk partially absorbed by government procurement commitments - can reduce the risk profile sufficiently to attract private capital. **Energy transition linkage:** given that chemical recycling's energy intensity (~90 MJ/kg) is the primary driver of both cost and carbon penalty, investment in co-located renewable energy capacity - through industrial solar parks or dedicated green energy corridors - should be a design requirement, not an afterthought. **Demand-side regulatory signals:** extending existing quality control orders and Bureau of Indian Standards frameworks to include recycled content labelling requirements - and over time, minimum recycled content thresholds for certain product categories - would create the regulatory demand signal that domestic brands currently lack.

4.3.4 Recommendation 3: Anchor Recycled Fiber Demand Through Government Procurement

POLICY

Supply-side investment in both mechanical and chemical recycling will only be sustained if domestic demand for recycled fiber is predictable and durable. Without a demand anchor, recyclers remain exposed to volatile export markets and the absence of a domestic premium for recycled content - conditions that deter the long-term capital commitment required for both formalisation and new capacity investment. The most powerful near-term lever to create this anchor is **government procurement**.

Government procurement can anchor 5-10% of India's recycled textile demand, creating a baseline of stable, price-insensitive offtake sufficient to de-risk early-stage investment across both mechanical and chemical recycling. **Indian Railways alone procures an estimated 6-8 lakh bedroll sets annually**, each comprising approximately 3-4 kg of textile material, implying annual demand of 20-30 kT from railways alone. Aggregated across **defence uniforms (~15-20 kT), police and paramilitary forces (~10-15 kT), public hospitals (~20-25 kT), and state-run welfare schemes and institutional buyers (~50-100 kT)**, total government-linked textile demand conservatively exceeds **120-180 kT annually**.[xxxv]

A mandated 5-10% recycled fiber content across these procurement categories would generate 6-18 kT of immediate guaranteed demand, scaling to **60-150 kT annually** as coverage expands. This represents a meaningful share of India's current recycling output (~800-1,300 kT) and - critically - provides the kind of stable, long-term offtake signal that investors in new mechanical clusters and chemical recycling facilities require before committing capital. Government buyers are not subject to consumer preference cycles or competitive margin pressures; their commitment, once mandated, is structurally durable in a way that private brand commitments are not.

IKEA: Creating a Sustainable Secondary Raw Material Value Chain in Textiles Sector of India[xxxvi]

In a significant stride towards sustainability, the 'Secondary Raw Material Value Chain' Project at IKEA Services India Pvt Ltd - Supply Area South Asia (Inter IKEA Group) achieved a breakthrough in establishing a scalable and commercially viable recycled textile value chain. The initiative, which began with a Proof of Concept (POC) in Phase 1, was successfully transitioned into a robust system, paving the way for widespread adoption

Phase 1

In Phase 1, a Proof of Concept (POC) was created for recycled textiles, demonstrating that post-consumer textiles can be transformed into cost-effective, responsibly sourced recycled materials. The project involved:

- Value Chain mapping: Identifying different supply chain actors involved in collection, sorting, and recycling, along with their role and importance.
- Supply chain transparency and traceability: Mapping the current state of supply chain

transparency and identifying areas for improvement.

- Risk identification: Identifying risks associated with textiles recycling and understanding the types of textiles coming into the collection process.
- Pilot trial: Conducting a pilot trial with SAAHAS, a social enterprise, to establish proof of concept and check social impact.
- Feedstock supplier selection: Identifying and securing a stable feedstock supplier, SAAHAS, with optimized costs.
- Yarn manufacturer selection: Identifying Usha Yarns as a yarn manufacturer capable of sorting, shredding, recycling, and spinning.

Phase 2: Scaling Up for Success

Building on this success, Phase 2 aimed to establish a scalable, repeatable, and commercially viable recycled material value chain, focusing on post-consumer textile waste. The objective was to strengthen ecosystem capacity, reduce supply chain risks, and define a clear framework for replication.

Operational Strategy

The program was executed through a structured pilot-led, ecosystem-driven approach, integrating feedstock suppliers, recyclers, spinners, home furnishing suppliers, compliance teams, and category stakeholders. Key enablers included:

- **Feedstock ecosystem development:** Scaling existing partner SAAHAS/Second Spin, while exploring additional pre- and post-consumer recyclers. Strengthening collection, sorting, and processing capabilities, with improved composition visibility, traceability, and throughput readiness.
- **Pilot-based validation:** Executing a Range IKEA article with a defined recycled composition mix, ensuring learning is grounded in real product, volume, and customer timelines.
- **End-to-end technical trials:** Conducting trials across multiple spinners and Home Furnishing suppliers to validate yarn strength, yield, and process stability, ensuring product performance parity with virgin materials.
- **Compliance-first execution:** Systematically studying chemical compliance risks (notably APEO in PCR feedstock) through controlled exceptions, enhanced testing protocols, and segregation logic, enabling learning without compromising final product safety.

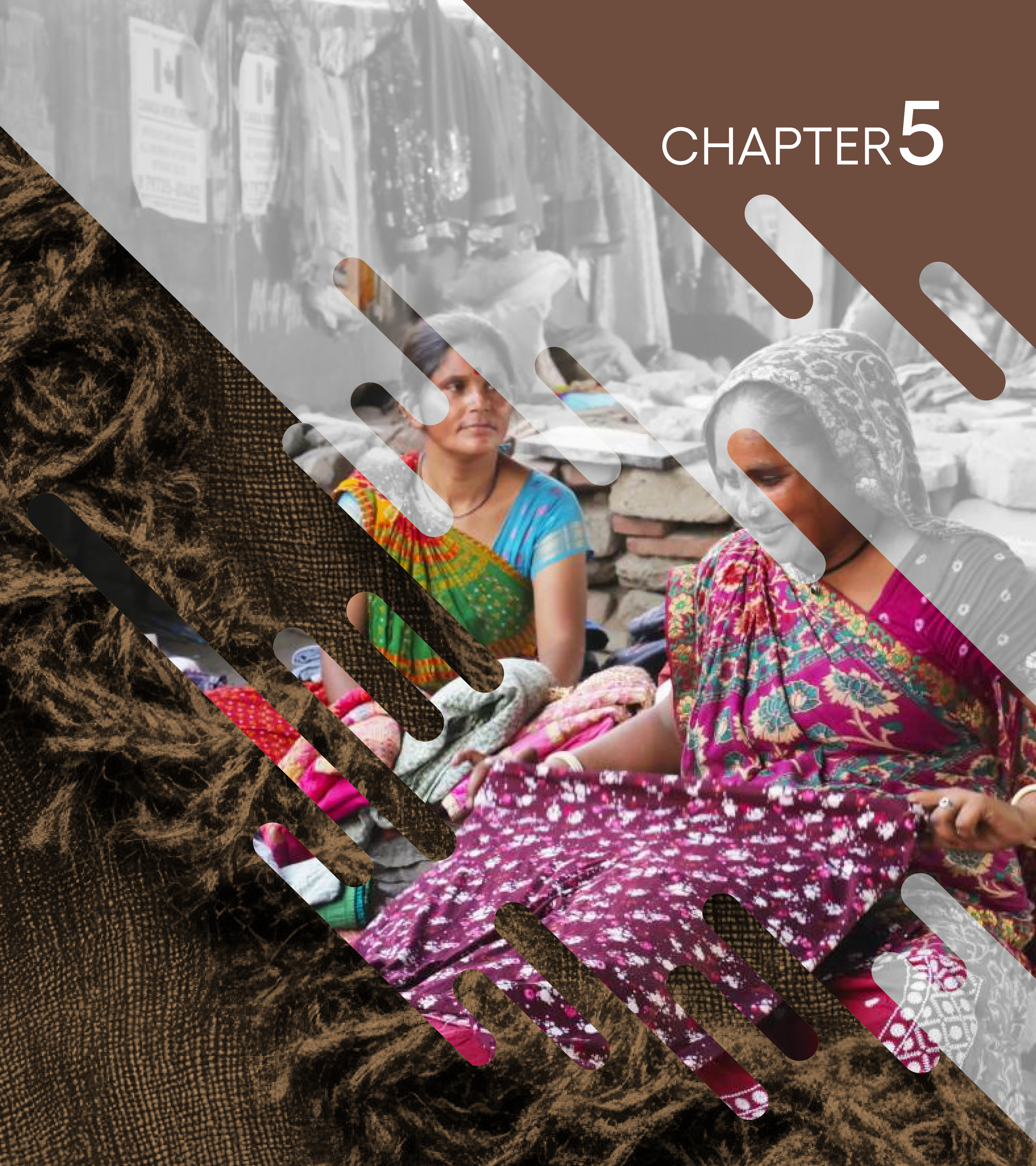
Overcoming Challenges

The project faced several challenges, including feedstock variability, sorting challenges, chemical compliance risks, system inefficiencies, and technology limitations.

Achievements and Outcomes

- **Scalable Value Chain:** Feedstock partners demonstrated readiness to scale up to 15-20T/month, with improved processing throughput and delivery reliability.
- **Compliant End Product:** The final products were fully compliant, validating the effectiveness of the recycling process.
- **Breakthrough in Circularity:** The project proved that post-consumer textiles can be industrialized responsibly, commercially, and at scale, delivering materially higher carbon mitigation benefits.
- **Clear Roadmap:** A replication-ready roadmap, including onboarding new feedstock suppliers and integrating technology, sets the stage for widespread adoption.

CHAPTER 5



Acknowledgements

CHAPTER 5

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CHAPTER 6

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About FICCI

Established in 1927, Federation of Indian Chambers of Commerce & Industry (FICCI) is the largest and oldest apex business organization in India. A non-government, not-for-profit organization, FICCI is the voice of India's business and industry. FICCI has direct membership of over 3000 corporate, including SMEs and MNCs, as well as public sectors and more than 500 chambers of commerce and business associations, and an indirect membership of companies from regional chambers of commerce. FICCI espouses the shared vision of Indian businesses and speaks directly and indirectly for over 250,000 business units.

FICCI maintains the lead as the proactive business solution provider through research, interactions at the highest political level and global networking. FICCI works closely with the government on policy issues, enhancing efficiency, competitiveness and expanding business opportunities for industry through a range of specialized services and global linkages. It also provides a platform for sector specific consensus building and networking. FICCI has a national network with 20 states.

FICCI serves as the first port of call for Indian industry and the international business community. Our presence is in regions such as Africa, Arab, Israel, Asia Pacific, East Asia, Europe, Latin America, the Caribbean, North America, South Asia, etc. FICCI is also involved with diaspora engagement, forum of parliamentarians, Commonwealth of Independent States (CIS), multilateral, international policy, and strategy

For more information and to join as a member, visit https://www.ficci.in/

Resource Efficiency and Circular Economy Industry Coalition

About RECEIC

The G20 New Delhi Leaders' Declaration acknowledges the critical role being played by circular economy, extended producer responsibility and resource efficiency in achieving sustainable development. Notably, the 'Green Development Pact for a Sustainable Future' declaration part of the G20 India Presidency in para 37 has mentioned the launching of Resource Efficiency and Circular Economy Industry Coalition.

RECEIC as envisaged is a G20 centric coalition driven by industry. It is first of its kind high-level initiative on encouraging resource efficiency and circular economy which is industry led, independent and self-sustaining, includes all sectors from across the globe, is inclusive and integrative.

FICCI has been entrusted with the responsibility of serving as the secretariat of RECEIC. The coalition is guided by 15 members Steering Committee and drive the agenda basis industry priorities in collaborative manner. With 60 global industries as its members, RECEIC currently has five operational working groups constituted on Packaging Reimagined – Alternate and innovative Solutions; Material Transition in Chemical Sector; Resource Efficiency & Circularity in Used Oil sector; Circularity in Textiles & Apparels sector & Dry Cell Batteries.

For more information and to join as a member, visit https://receic.com/

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This report is based on information made available by FICCI and other partners, as well as on data and assumptions existing at the time of analysis. Such information has not been independently verified by Accenture and does not purport to contain or incorporate all relevant information.

The analyses and conclusions herein are based on various assumptions and are subject to inherent uncertainties, including factors and events that may not remain valid over time. Statements of expectation, forecasts, and projections are forward-looking in nature and actual outcomes may differ materially from those expressed or implied.

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