

Positioning Indian Textile Recycling Ecosystem Globally

Setting The Strategic
Intervention Areas For
Future Road Mapping



A White Paper By:



THE SWEDISH SCHOOL
OF TEXTILES
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The contents of this white paper are the responsibility of the authors.

Abbreviations:

BCI = Better Cotton Initiative
CAPEX = Capital Expenditure
EPR = Extended Producer Responsibility
ESG = Environmental, Social and Governance
EU = European Union
GOTS = Global Organic Textile Standard
GRS = Global Recycling Standards
IFC = International Financial Corporation
INR = Indian Rupees
MSME = Micro, Small & Medium Enterprises
Ne = English Count
NGO = Non-Governmental Organization
PCTW = Post-consumer Textile Waste
PIW = Post-Industrial Waste
REACH = Registration, Evaluation, Authorisation
and Restriction of Chemicals

RCS = Recycled Claim Standard
rPET = Recycled Polyethylene Terephthalate
RPSF = Recycled Polyester Staple Fibre
RWS = Responsible Wool Standard
SaaS = Software-as-a-Service
SDG = Sustainable Development Goals
SEZ = Special Economic Zone
SMETA = Sedex Members Ethical Trade Audit
TBL = Tripple Bottom Line
USD = US Dollar

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Abstract

India is now poised to become one of the most important recycling hubs of the world. In the recent years, large-scale infrastructural set-up for sorting, processing, and recycling textiles has received attention. Additionally, with the positive policy intervention from the government, textile recyclers and sorters are now investing in modern technologies and exploring new business models to reshape this industry. This opens up opportunities for developing novel industrial value chains and ecosystems for valorising textile waste inter-continently.

This white paper serves a strategic insight document for all stakeholders associated with the quadruple helix of Indian textile recycling ecosystem, that is, textile recycling sector, textile value chain players, governmental and financial institutions, academia, and special interest groups to vision the key strategic intervention areas and develop guidelines on future road mapping for designing a flourishing textile recycling ecosystem in India.

We have addressed **4 dimensions for scaling textile recycling ecosystems and its underlying value chains**, in terms of value chain optimization, supply-market strategic alignment, designing ecosystem sustainability and mobilizing external support to create a level playing field for value chain actors. **13 Strategic Intervention Areas (SIAs) are identified where actions are required.**

To sum up:



Value chain optimization calls for advancing existing technologies and building multi-technology flexible platforms to valorise diverse waste fractions. While legitimacy- building tools via certifications, standards and accreditations are crucial for brand image, of equal importance is supply network design for increasing effectiveness.



Mobilizing multi-stakeholder partnership through incentivization and circular financing from government, financial and public institutions will create more formal organization of the textile recycling ecosystem. Orchestration is crucial to create knowledge-based ecosystems with shared learning.



Strategic alignment in textile recycling value chains for matching supply and demands, calls for improving market, customer and supply chain orientation, for enhancing value opportunities. While improved data generation and visibility will drive such market and business intelligence potential, it is of tantamount importance to create balanced recipe of standardization and “out-of-box” innovation and creativity.



Lifecycle thinking and brand leadership should drive the textile recycling ecosystem forward towards profitability, scale and sustainability. A systemic perspective is crucial underpinned by radically new services and collaborations to bridge the value chain gaps in the ecosystem. Triple-bottom line sustainability in textile recycling is essential to mitigate unintended consequence of recycling and achieve net-zero.

Executive Summary

Positioning Indian Textile Recycling Sector Globally

Driven by the urgency to establish and industrially scale circular economy, textile recycling has gained huge prominence in the global textile sector. While India has always been a powerhouse in textile production globally, the blooming textile recycling industry in India has received little attention in the past. Interestingly, India is one of the largest recipients of global post-consumer textiles (approx. 7793 kilo tonnes, or 8.5% of global textile waste)^[1] with value of more than €100 million^[2]. India houses large sorting and grading facilities in the SEZ of Kandla, in the west coast in the state of Gujarat, employing up to 3000 workers to sort used clothing^[3]. 90 kilometres north of Delhi, in the city of Panipat in Haryana, India also houses one of the largest industrial clusters for mechanical recycling in the world with estimated between 900 and 2500 sorting, recycling and spinning units, and 4 million informal workers processing textile waste^[4]; though estimates vary substantially between existing reports. Adopting a circular path in economic production is critical for India. Given that some government estimates suggest that circular economy in India would bring monetary benefits to the tune of about 624 billion USD by the year 2050 and could reduce greenhouse gas emissions by about 44%^[5]. From the export point of view, it can be estimated from shipment data that in 2019 around 33,000 shipments carrying recycled products worth over US \$ 1.4 Billion was sent from Panipat to buyers worldwide, to companies like H&M Group, Primark, Wal-Mart among others^[6].

In the recent years, large-scale infrastructural set-up for sorting, processing, and recycling textiles has received attention in the call for scaling textile recycling world-wide. In very little time India has become a major recycling hub with multi-stakeholder investment projects currently run by Fashion for Good and Reverse Resources, with giant textile players like Arvind, Welspun India, Birla Cellulose etc. taking the lead and supported by international players like PVH, Adidas, Tesco, Target, Levi's. This opens up opportunities for developing novel value chains and business models for valorising textile waste inter-continently. Additionally, with growing purchasing power India is also a major producer of post-consumer textile waste domestically.



[1] Fashion for Good 2022 | [2] Pal et al, 2019 | [3] Pal et al, 2019; Paras et al., 2019

[4] Arisa & Sympany, 2020; Fashion for Good 2022) | [5] Ellen Macarthur Foundation, 2016 | [6] Arisa & Sympany, 2020

Value Of This White Paper

To mobilize an expanding textile recycling ecosystem in India, of crucial importance is creating a shared understanding of the critical success factors in this transforming landscape, along with pinpointing the key needs and challenges. Textile recycling has been a very niche premium segment with a major challenge of how to get the volume, cost, quality, and supply chain consistent. To valorise the textile recycling ecosystem, essentially there are 4 factors to consider: supply and availability of feedstock, infrastructure for collection and sorting, technology for recycling, and finally demand and market mechanism. Even if there is vast scope of improvement, India essentially has all these factors to develop into a competitive textile recycling ecosystem. Yet again the role of facilitating strategic collaborations is crucial to scale such value chains and ecosystems.

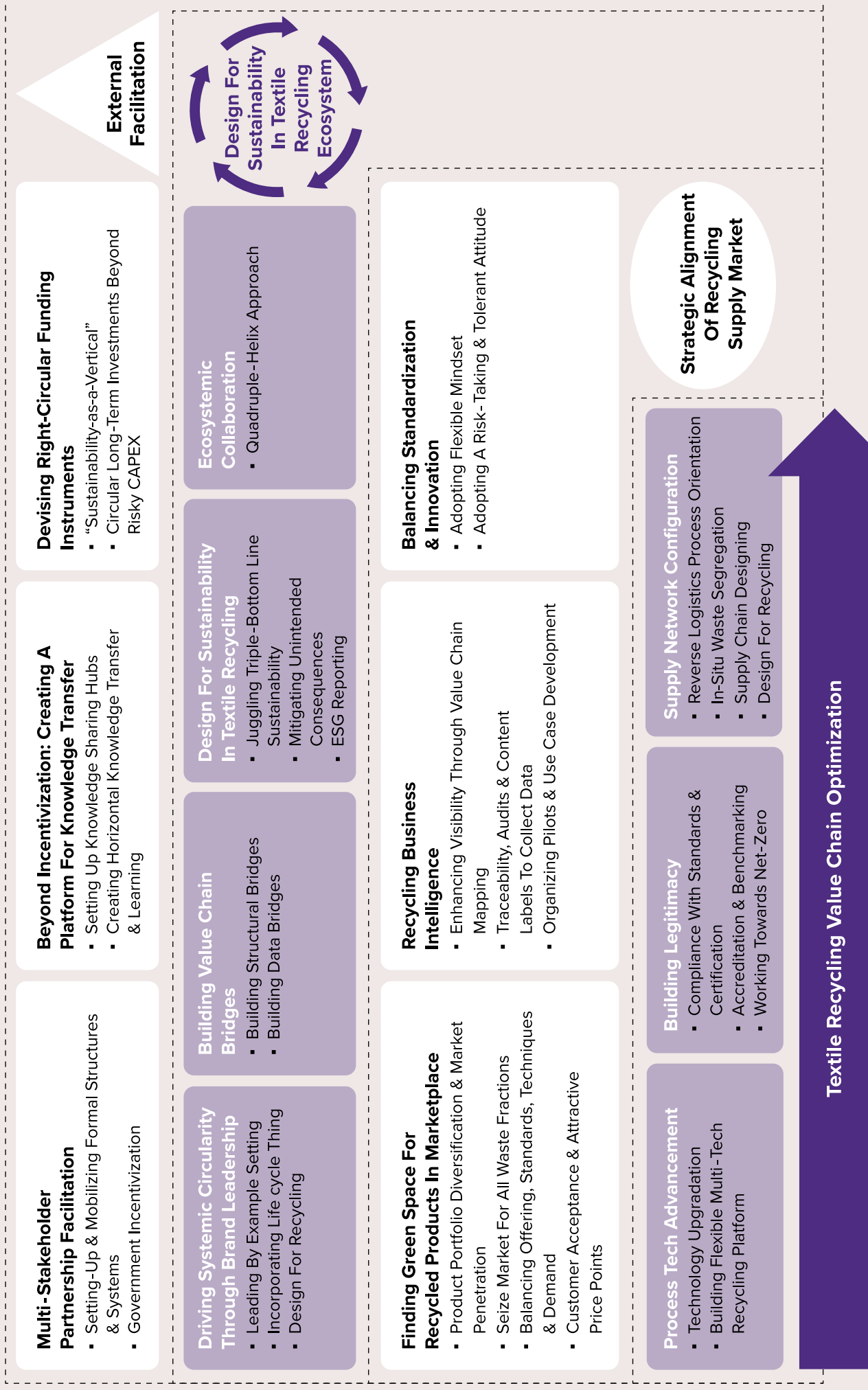
The main goals of this white paper are to:

- **Promote the establishment and adoption of multi-stakeholder, cross-border value chain, and inclusive and responsive working mechanisms to develop systemic solutions,**
- **Valorise cross-border textile recycling value chain to match supply and demand in the market,**
- **Highlight the scope of innovation, along with necessary intermediations required from governmental and regulatory bodies and institutions, to build public-private partnerships and capacity.**

This white paper can be treated as a strategic insight document for all stakeholders (textile recycling sector, textile value chain players, governmental and financial institutions, and even academia) to envision the key attention areas and develop guidelines on future road mapping for designing a flourishing textile recycling ecosystem in India. The white paper addresses the **4 dimensions for scaling textile recycling ecosystems and its underlying value chains**, and prescribes strategies that are contextually relevant to Indian textile recycling ecosystem on:

1. **What to optimize** in the textile recycling value chain?
2. **What are the factors** to consider for strategically aligning the recycling supply-market?
3. **How to design** sustainability in textile recycling ecosystem?
4. **What external facilitation** from government and other institutions are crucial?

To summarize, **13 Strategic Intervention Areas (SIAs)** are identified where actions are required, as depicted below and explained in detail in this white paper.



Our Approach

The strategic insights presented in this white paper have been the result of large-scale data collection, spanning several years, from representative Indian recycling ecosystem actors. As a starting point, data was collected via interviews and field visits conducted between October 2021 and February 2023 in the Panipat textile recycling industrial cluster, and previously in Kandla SEZ in 2016-17.

Overall, 12 semi-structured interviews were conducted with sorters, waste handling companies, recyclers and recycled textile producers located in Panipat. In addition, during extensive field visits conducted in 4 rounds, and cumulating into 30+ hours of on-site observations, we amassed 9+ field notes and several video clips and photos that provided detailed blueprints of the processes, operations, conditions, and challenges, including resources and capabilities.

Field Visit To Kandla SEZ (2016-17)

In 2016-17, during field visit to Kandla SEZ, 13 in-depth interviews were carried out with senior officials of 8 sorting factories and 2 trading organizations located in the zone. The purpose here was similar, that is, map the processes and flows, take an account of the key strengths and weaknesses, including technological advancements, working conditions, critical resources, practices and capabilities. Overall, this intervention created in-depth understanding of competitive positioning in textile recycling value chain & operations, its *status quo* and *quo vadis*.

Multi-Stakeholder Workshop At IIT, Delhi (2023)

A multi-stakeholder full day workshop was organized in February 2023 at Indian Institute of Technology, Delhi. The workshop included 20+ panelists from diverse stakeholders representing quadruple-helix: universities, ministry and embassies, financing institutions, circular textile value chain players, such as recyclers, sorters, global fashion brands & retailers, service providers, and designers. Over 300 participants were present in the hybrid event representing the quadruple helix, and also general interest groups, such as students. A more strategic level discussion underpinned the workshop objective, aimed at panellists not only sharing knowhow on their own endeavours, targets and approaches to address some of the crucial aspects of cross-border textile recycling ecosystem and its value chain, but also engaging in a joint brainstorming session.

The Workshop Was Specifically Themed Into 4 Sessions:

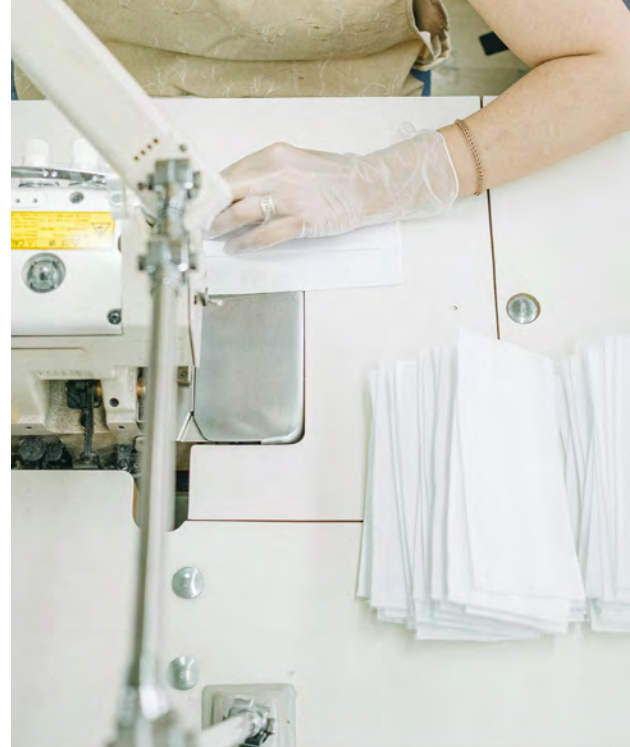
01 Policy Level Interventions: where the insights and strategic interventions at the policy level taken by governmental organizations were presented.

02 Matching Recycling Supply Chain and Market Opportunities: where the discussion points were around understanding green market space & competition with other recycling alternatives, today's and tomorrow's product portfolios, consumer needs and perception, market acceptance, and recycling business models.

03 Addressing Industrial Recycling Process Through Novel Technologies and Standards: where we discussed on novel recycling and sorting technologies, how to enhance recycling feedstock quality, role of global recycling standards and certifications, and what influence does multi-lateral and harmonized policy instruments play.

04 Holistic Recycling Value Network Through Design For Sustainability and Multi-Stakeholder Engagement: where more ecosystemic view was discussed in terms of fibre-to-fibre recycling value chain sustainability, procurement and material sourcing issues, innovations and scaling conditions, environmental and social issues, multi-stakeholder engagement and circular recycling ecosystem development.

The entire workshop (of ~6 hours) was recorded, and later discussion was transcribed, and key summaries extracted to develop the Strategic Intervention Areas (SIAs).



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- Mr. Vikash Gupta, Director, GSM Cotspin, India.
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Textile Recycling Value Chain Optimization

Value chain optimization calls for advancing existing technologies and building multi-technology flexible platforms to valorise diverse waste fractions. While legitimacy-building tools via certifications, standards and accreditations are crucial for brand image, of equal importance is the supply network design for increasing effectiveness.

SIA 01. Process Technology Advancement

Technological upgradation has progressively yielded better recycled output quality in terms of fibre length. Few Indian mechanical recyclers have achieved up to 27.5 mm of fibre length from cotton PIW with lower short fibre%, in a cost-effective way. From cotton-rich PCTW, technology has progressed to achieve finer count recycled yarns (of up to 30 Ne) but still requires blending with polyester to reinforce strength. Depending upon knitted or woven product application, the recycled yarn manufacturing parameters and machinery specifications also need adjustment and optimization. There is a tendency to overdo the things without going for process optimisation based on input materials.

Lessons can be learnt from R&D successes in different European ecosystems dedicated to textile circularity, and more specifically on PCTW recycling, such as **ReHubs**. In this context, **building flexible multi-technology recycling platform** is crucial to effectively bridge between feedstock and market needs. For instance, if the demand is on maintaining fibre length or dealing with degraded or contaminated waste then chemical recycling is the optimal solution to ensure blend separation and avoid poor output quality, while if similar blend of material is advantageous then mechanical recycling can be more cost-effective and eco-friendlier. Thus, the end use and feature requirement were highlighted to be main drivers of the process technology. At the same time, if processing technologies and machineries, e.g. for spinning and non-wovens can be utilized for different type of feedstocks, such as cotton-rich and synthetic this can yield higher process effectiveness.

SIA 02. Building Legitimacy

Compliance with standards and certification schemes is crucial in establishing recycling ecosystems, such as compliance with **GRS and RCS certification of recycled cotton and wool, GOTS, BCI, RWS, Oeko-Tex, additionally REACH certified dyes, including social sustainability schemes like Fair Trade**. Such certifications enable verified traceability of recycled fibres in some way, thus building legitimacy and recognition for recyclers to be nominated and become certified feedstock suppliers for international clothing brands. Technological and data advancements render legitimacy to the textile recycling value chain actors in the eyes of the clothing brands. Brands have started nominating recyclers by asking their manufacturers to provide PIW, and procure material (e.g., recycled yarn) from these recyclers. This ensures supply of good quality raw material to the recycler and in turn books forward-order contracts. **Accreditation** is crucial, e.g., SMETA, to provide legitimacy to the recyclers in working with brands and retailers and ensure clear **benchmarking** to attest the quality of recycled material. **Working towards net-zero** is also a proactive strategy for the recyclers to build green image in line with SDGs. For working with novel materials and making the product commercially acceptable by end consumers and selling it to brands, the role of standards is to legitimize the marketability and authenticity of the product and process. From a broader picture, zero waste certification encompasses a very holistic sustainability measure including **Reduce-Reuse-Recycle** approach, in terms of diversion of waste from landfills, sustainable materials and processes such as in-house composting, end-to-end traceability and safe handling of hazardous waste. However, while the standards and certifications are important for building market and customer orientation of the product, it is perhaps more crucial to have the intent of following the standards.

SIA 03. Supply Network Reconfiguration

An overall reconfiguration is pivotal for redesigning and restructuring recycling production networks. Crucial driver of such reconfiguration is underlying **reverse logistics process orientation** that of collection and sorting, which ensures directing the different material streams to the optimal recycling disposition choice suited to feedstock quality and end need. For PIW, **in-situ waste handling and segregation** by the textile producers is crucial to avoid mixed waste streams, in terms of colour or composition, and has the potential to sufficiently shorten the role of intermediaries or middlemen before ending at the recyclers. This can effectivize the procurement channel by improving feedstock homogeneity, lowering lead time, improving data veracity and process efficiency, and achieve up to >30% lower price to recycler. For PCTW, **efficient collection and granularized sorting** (in terms of composition and colour) to deal with are crucial to consider. While feedstock suitability in terms of quality is crucial, meeting demand requirements from textile recyclers is of tantamount importance. BVH Services is ongoing developments in capability and infrastructure to deliver variety of feedstock based on its composition. With BVH Services' biggest sorting and pre-processing plant located in Kandla SEZ, enabled with large-scale infrastructure equipped with NIR spectroscopy and hand-held scanners e.g., Matoha, precise sorting based on colour, composition and contamination is possible based on recyclers' requirements. **Supply network design decisions** also play a crucial role in geographical scoping of the multi-technology recycling platforms. For textile PIW recycling, it is important to process waste closer to the waste genesis, i.e., in textile producing nations like India, while PCTW should be perhaps handled closer to where it is consumed, particularly keeping in mind the impact of EU's circular economy directives such as the waste shipment directive.





Strategic Alignment Of Recycling Supply-Market

Strategic alignment in textile recycling value chains for matching supply and demands, calls for improving market, customer, and supply chain orientation, for enhancing value opportunities. While improved data generation and visibility will drive such market and business intelligence potential, it is of tantamount importance to create balanced recipe of standardization and “out-of-the-box” innovation & creativity.

Finding Green Space For Recycled Products In The Marketplace

Brands have the power to both **diversify the product portfolio and penetrate the market** to drive scalability of PCTW recycling value chain. In this context, finding new application areas is crucial for recyclers to align to the needs of the brands and retailers by identifying the market “green space” of radical product innovation with recycled materials. The leading recycling companies in Panipat have successful instances of how recycled yarn are well adopted and adapted in developing export-quality home textile products, such as, rugs, mats, felts, and blankets. Another recent advancement has been in using fabric waste or shoddy – which in Indian market has primarily been used for mechanical recycling in Panipat – and converting it into agglomerated materials for making polyester yarns. From an application point of view this is used for developing structural material in footwear. To scale sustainably, it is crucial to stop cherry picking from the waste and instead **seize market for all waste fractions**. For the brands and retailers, it is equally crucial to understand its consumers’ acceptance of novel recycling materials and adopt “storytelling” approaches to educate the consumer. Here brands need to play a crucial role as a trendsetter, and influence and sensitize the consumers to expand their expectation/preference window. Driven by consumer expectations, benchmarking with products made from virgin fibres and material is always a comparison that recycled materials and products must endure. However, product/material characteristics or features should not be the only benchmarking criteria, and instead process sustainability should be taken into consideration from an environmental cost perspective. Ensuring a **fine melange between product offering, standards and techniques, and demand** can yield a commercially viable finished product for end consumers.



Customer acceptance is of prime importance for establishing market for recycled textile products. For large- and mega- fashion brands like M&S, H&M, Inditex, etc. to have large consumer base locked-in, compromising with the material/product quality is not an option. Thus, in reality it is essential that most of the quality features rendered by virgin fibre are attained in recycled outputs as well. Virgin polyester still holds the largest share among all fibres in a brand's basket and is going to persist over time because of its functional performance and properties. While recycled PET (r-PET) is increasingly used in brand's material palette, it does not really solve the PCTW challenge. Alternatives such as textile PIW has been processed extensively in Panipat as input feedstock for producing raw materials and agglomerated materials for Recycled Polyester Staple Fibre (RPSF), and carded materials for geo-textiles and other non-woven applications. However, given the complexity and heterogeneity of PCTW, its valorisation is difficult. In this context, **offering attractive price point** to consumers holds a key strategic lever. While it is needed that recycled polyester containing products should be 15-30% cheaper than those made of virgin polyester for early-stage market uptake, most brands are currently selling recycled products at premium price, which decelerates its adoption. Even though waste has no price in itself, the logistics costs in the reverse supply chain makes the process less viable. For instance, in the Indian market, the window of profit in RPSF production is low (24 INR/kg) given polyester virgin staple fibre price is around 100 INR/kg and recycled fibre is around 80 INR/kg; while post-industrial PET waste processing cost = 44 INR/kg and collection cost (by rag pickers) = 10 INR/kg. The lack of consumer willingness to pay a premium price for recycled material containing circular products is a major bottleneck for market uptake, which originates from the high consumer price sensitivity in the fashion clothing sector. In this context, regulatory measures are utmost crucial to both drive and at times shield the industry from lack of existing market now and prepare it for future potential.



SIA 05. Recycling Business Intelligence

Enhancing visibility through value chain mapping is crucial to understand the textile waste landscape of PIW and PCTW, in terms of both volume and characteristics, generated domestically and imported cross-border. Fashion for Good's ongoing initiative with waste management organizations to identify PCTW stream and identify the waste composition in the flow is an important step in this regard. The ultimate outcome is to segregate the waste as prospective feedstock suited to recycler's demand requirements and maintain real-time visibility. **Traceability** is a key driver of running effective and feasible textile recycling value chains in this context. An important issue is **cross-border data collection** along the textile waste recycling value chain, all the way from the large-scale recyclers located in India to their circular raw material users, like international brands and retailers. Reverse Resources' Software-as-a-Service (SaaS) platform is a crucial asset for ensuring traceability and data sharing, and benchmark for future. While such digital SaaS platforms can create material traceability and process visibility, **advanced content labels** on the other hand enable sorters and graders to scan PCTW and extract necessary information. However, **proper auditing procedures and metrics** to account the data is crucial, but largely missing worldwide. **Organizing pilot projects** are crucial to create such learning through **viable "use case" development**. For example, the pilot run by Fashion for Good and Reverse Resources jointly with several international brands operating in India, including Indian brands and producers and their supply chain partners, provide the opportunity to locate the textile PIW generated in factory floors, characterize it, and connect this feedstock to potential recyclers, both mechanical and chemical ones, using digital platforms and marketplaces. Such pilots also enable development of on-ground training modules and process routines for waste segregation and sorting and holds the potential to transform the informal and unorganized textile waste recycling value chain towards becoming more structured and organized. Pilot-based learning can also enable experimentation with not only product features and portfolios, but also perform reality check with business model feasibility and evaluate scalability potential.



SIA 06. Balancing Standardization And Innovation

Recyclers call for broadening the mind-set of brands and its consumers, on fibre content in products and increasing our tolerance to what we can expect from textile waste characteristics. Designing with recycled material is challenging due to raw material inferiority, heterogeneity, and lack of standards. As a bottom-up approach for innovation the recyclers think that adopting a flexible mind-set during productification based upon feedstock characteristics is crucial. When working with recycled material, the key is not the material itself but what can be made from it. On the contrary, increased standards and benchmarking for recycled materials and products are equally needed to meet the consumers' and brands' requirements for process standardization, routinization, and legitimization. However, a dilemma is that it might take away the creativity and innovation that working with such novel value chains and raw materials should entail. This also prevents attaining zero waste, i.e., valorising all waste fractions into an end-market product. Convincing the brands and retailers to **adopt a risk-taking and tolerant attitude** when it comes to waste valorisation, functionalization and productification is crucial. The key questions to be raised here are:



1. How is the market risk shared by the recycling value chain actors?



2. Should the brands ask for more stringent regulations to make the recycling value chain more compliant to the quality and other standards in comparison to linear product value chains or be more tolerant of the limitations?



3. How does the consumer willingness-to-pay get accounted?





Design For Sustainability In Recycling Ecosystem

Life cycle thinking and brand leadership should drive the textile recycling ecosystem forward towards profitability, scale, and sustainability. A systemic perspective is crucial underpinned by radically new services and collaborations to bridge the value chain gaps in the ecosystem. Triple-bottom line sustainability in textile recycling is essential to mitigate unintended consequence of recycling and achieve net-zero.

SIA
07.

Driving Systemic Circularity Through Brand Leadership

While governmental role is a crucial denominator for orchestrating the textile recycling ecosystem in India due to its inherent fragmented and unorganized structure dominated by MSMEs, of equal importance to drive the ecosystem partnership and profitability is the powerful role of the fashion brands as they are driving the entire supply chain. Brands should embrace a style of **leading by example**, stepping forward to propel the advancement of the recycling market potential. A key role that large brands play is trying on enabling the whole industrial ecosystem to focus on systemic circularity aspects, such as lifecycle thinking, zero-waste to landfill, and circular product design. .



For instance, Aditya Birla Fashion and Retail Limited has taken a very ambitious action plan for moving beyond resource efficiency to resource optimization, and with systemic circularity becoming imperative by **incorporating lifecycle thinking approach**. Its apparel brand Peter England has showcased a good example of how to convert the textile PIW by sending it to Birla Cellulose to convert into pulp to produce fabrics and garments.

Of course, achieving such degrees of systemic circularity is much more complex with post-consumer textile waste. **Design for recycling** is a key driver for proactive system change and should be led by brands and retailers and can be achieved by adopting diverse circular design strategies, such as using mono-material in garments or by making apparel easily disassemble. Holistic initiatives taken by brands also illuminate adopting sustainability practices, and how to roll them out at a broader value chain level with focus on circular product design and development, circular market and consumer- centricity and circular lifecycle management along supply chain.

SIA 08.

Building Value Chain Bridges

Organizations acting as a **structural bridge** within such complex value chain is crucial. For instance, BVH Services in Kandla SEZ plays an important role to make the cross-border value chain functional by working with 500+ charities across the globe to collect post-consumer textiles, largest vintage retailer in Europe, and PCTW suppliers in Panipat for textile-to-textile recycling. On the other end, it supplies large quantities of PCTW as feedstock to recyclers.

Data bridges are equally crucial; Reverse Resources' SaaS platform connects diverse players from the textile recycling value chain. Large-scale implementation of the SaaS platform with more than 1000 manufacturers joining the network is essential to build such functioning networks to ensure better pricing and margins, social and environmental compliances, and certifications offering ESG sustainability, improved feedstock quality, and create deeper insights on waste flows.

Design For Sustainability (DFS) In Textile Recycling

Sustainability of the entire recycling ecosystem is an underlying motivation. Recycling does not necessarily mean sustainable, and this must not be recognized as a trade-off. From a brand perspective, while it is crucial to meet the target of net-zero by 2030 or 2040, it is impossible without taking recycling into consideration. However, to achieve such targets, more scalable recycling business ventures need to flourish as business model. Of key essence for scaling and flourishing the long-term positive impact of textile recycling business models is **juggling triple-bottom line sustainability**, in terms of increasing economic viability, reducing ecological or carbon footprint, and having market acceptance. For brands, even though waste management poses the biggest challenge across their value chain, the operating gamut should be wider than just recycling to reach net-zero. With current trans-national recycling value chains in place, we need to be cautious towards **mitigating unintended consequences** of increasing carbon emission for the sake of recycling. The circular ecosystem needs to be designed correctly right from start by taking care of both current and future needs and impacts. In terms of circularity and more specifically recycling and using of recycled contents, a number of crucial guiding principles are prioritized at H&M. These include prioritizing recycled materials from both pre- and post- consumer waste, using fewer virgin resources to considerably reduce impact on climate & biodiversity, sourcing of low environmental impact materials, and emphasize focus on sourcing virgin raw materials that are produced using regenerative agriculture practices. In this regard the notions of monitoring TBL sustainability via **ESG reporting** in textile recycling value chain is worth considering. While working for environmental sustainability and circularity, the SDGs related to social sustainability should not be compromised. Mechanical recyclers must give adequate attention to human health, well-being and safety of workers.



SIA 10. Ecosystemic Collaboration

Establishing ecosystem-level collaboration, among academia, regulatory bodies, brands & retailers, the unorganized sector and consumers including innovators, is crucial, and often a **quadruple-helix approach** is necessary to jointly design a better system for future, however, is a mammoth task. Such collaboration needs to take into consideration that **one-size-does-not-fit-all**, that is, there are differences in objectives, incentives, capacities, and speed of change of different players. For instance, MSMEs are more agile in responding to the pace of climate change and in implementing circular solutions compared to the larger brands and players, whereas the latter have much more power and capacity to influence change. In this regard, how to coordinate and govern different collaborations in the ecosystem is crucial.





External Facilitation By Government And Financial Institutions

Mobilizing multi-stakeholder partnership through incentivization and circular financing from government, financial and public institutions will create more formal organization of the textile recycling ecosystem. Orchestration is crucial for creating knowledge-based ecosystems with shared learning.

SIA 11. Multi-Stakeholder Partnership Facilitation

Multi-stakeholder partnerships and conversations between start-ups, large retailers, brands & recyclers, waste collectors & traders and NGOs is envisaged as a starting point to work collaboratively in transforming the Indian textile recycling value chain and build a strategic roadmap with examples of good practices, in terms of EPR and awareness raising programs. As the fashion consumer landscape in India evolves, domestic Post-Consumer Textile Waste (PCTW) is on the rise. However with the EU's circular textiles roadmap established, future mandates may soon limit the exportation of waste materials. This can potentially be a problem for India's large sorting and recycling infrastructure set-up in Kandla, Panipat and Karur. **Setting up formalized structures and systems** for handling textile waste, procurement of good quality feedstock and delivery of optimal recycled material for the apparel industry is thus the call of the hour. Attaining this as a scaled solution would require immense partnership among all the stakeholders, to create knowhow and aggregate the textile waste streams, and develop a viable business case around it. Clear facilitation role played by the Ministry of Textiles of Government of India is of utmost importance to drive the participation of the informal sector and MSMEs in this context.

It's crucial to integrate sustainability practices into the industry through government incentives, thereby establishing a "green space" for operations. Collaboration and partnership will be key factors for sustainability to endure. At the value chain level, this can mobilize the innovators, such as Reverse Resources and Fashion for Good, who are closely working towards bridging the value chain data gap through partnership orchestration to realize the potential and opportunity to transform this huge informal economy into a formalized system. Role of other knowledge players and international collaborators can be accelerated through higher level support. Overall, this can create level playing field for innovation and development of viable business cases around sustainability and circularity as a means to nudge utmost participation from the informal sector and MSMEs – the mainstay of the Indian recycling system.



SIA
12.

Beyond Incentivization: Creating A Platform For Knowledge Transfer

As a commitment, the Ministry's initiative Project SU.RE - an alliance between 16 brands facilitated by the Indian Government – to establish a sustainable pathway for the Indian fashion industry is a great example. For initiating a transformational journey for the growth of Indian textile recycling sector there is an ardent need to incubate a natural information and **knowledge sharing hub or knowledge-based ecosystem** on textile circularity, a lesson learnt from success stories in other European countries e.g., Sweden, to remain ahead of the curve. Such hubs can play a vital role to converge the diverse sustainability-oriented initiatives in the Indian landscape, coming from industry powerhouses, start-ups, and NGOs, into a knowledge-based partnership-driven ecosystem. At this point, the crucial aspect of multi-stakeholder engagement and working for **horizontal knowledge transfer and learning** with other department of the government working on urban and solid waste management issues is important to create and institutionalize a circular transition pathway.

- For instance, as a top-down initiative, there is immense possibility to converge several tools developed by Government of India, such as the Ministry of Housing and Urban Affairs' Swachh Survekshan survey for cleanliness, hygiene and sanitation across India for understanding textile waste landscape across India.
- Learning from the PET bottle recycling sector in India could be seen as a success story in terms of how such regulatory intervention can enable organic growth in recycling segment, such as to organize collection hubs and take-back schemes of brands.

SIA 13.

Devising Right Circular Funding Instruments

Beyond public-private partnership management, the right composition of public-private funding schemes is crucial to accelerate the industrial scalability of the Indian textile recycling sector. Planning of new **"sustainability-as-a-vertical" funding scheme** is envisaged as a notable step forward for incentivizing resource efficiency, cleaner production, and circularity replacing the subsidy-driven Technology Upgradation Fund Scheme of Ministry of Textiles. International financial institutions like IFC plays a vital role in this regard through **circular long-term investment**. IFC's financing portfolio encompasses various transformative priorities, including providing funding and advisory support to diverse circular implementation projects, such as those focused on circular and responsible fashion and green technologies. The overarching goal is to foster the creation and connection of markets that facilitate the integration of players within the textiles and apparel value chain from developing nations into global value chains. This initiative aims to build capabilities, connect workers to employment opportunities, and enable them to enhance their skills and capacities. Additionally, several bilateral funding schemes are poised to facilitate cross-border collaboration and partnerships, particularly between countries like India, Sweden and Denmark, in areas such as sustainable futures, green strategies, and circular economies. These partnerships are essential for reinforcing innovation collaborations and are necessary to complement private financing for initiatives, projects and risk assets associated with Capital Expenditure (CAPEX).

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