



FASHION FOR GOOD  
**SORTING FOR CIRCULARITY**  
**INDIA**

---

**PRE-CONSUMER PILOT LEARNINGS**

# ACKNOWLEDGEMENTS

## AUTHORS:

### FASHION FOR GOOD

**Priyanka Khanna**, Head of Asia Expansion

**Khushbu Maheshwari**, Innovation Analyst

### REVERSE RESOURCES

**Nin Castle**, Co-founder and Chief Programme Officer

**Harshitha Venati**, Programme Manager

**Ranjit Sasi**, Business Development Manager, India

We would like to take a moment to recognise the key role of our innovator Reverse Resources in the pre consumer pilot. Apart from their knowledge and expertise in all things textile waste, their hands-on approach and astute interventions were instrumental in the success of the pilot. We would also like to acknowledge the significant contributions made by all our pilot stakeholders - brands, manufacturers, recyclers and waste handlers in making this pilot a success and support in substantiating our learnings with their insights. Our hope is that this pre-consumer pilot and the report act as a blueprint for implementing efficient and digitally traceable textile waste supply chains and amplifying textile waste recycling in Asia.

The authors would also like to thank the following industry experts, who gave their time and contributed their expertise to this pilot: Lakshmi Poti and Karan Kumar (Laudes Foundation), Vincent Delalandre and Tejas Sampat (PVH Corp.), Drishti Masand and Avanish Dwivedi (adidas), Liz Lipton-McCombie, Anuja Ojha, Venkatraman Raman (Levi Strauss & Co.), Carmen Chan and Sirajudeen Ali (TESCO), Nicole Morescu and Adarsh Immanuel (Primark), Abhishek Bansal and Snehit Kumar Rahul (Arvind Limited), Surya Valluri and Vivek Khare (Birla Cellulose), Rajender Sharma and Animesh Laha (Welspun India).

We also wish to thank Earl Singh, Lana Miller, Camilla Rama and Emily Cooper for their work on the design and editing assistance.

## DISCLAIMER

This report has been produced by a joint team from Fashion for Good and Reverse Resources. The authors take full responsibility for the contents and conclusions. The participation of the industry experts and affiliates who were consulted and acknowledged here, does not necessarily imply endorsement of the report's contents or conclusions.

To quote this report, please use the following reference:

Fashion for Good and Reverse Resources Waste, Sorting for Circularity India: Pre Consumer Pilot Learnings, December 2022.

Use of the report's figures, tables or diagrams, must fully credit the respective copyright owner where indicated. Reproduction must be in original form with no adaptations or derivatives. For use of any images in the report please contact the respective copyright holders directly for permission.

The images used in this report belong to the authors, with the consent of the individuals photographed.

This work is licensed under the Attribution-Noncommercial-Share Alike 4.0 International License:



Ergo, they are subject to the laws of copyright and intellectual property.

Attribution – You may give appropriate credit, provide a link to the licence, indicate if any changes were made.

Non-Commercial – You may not use the material for commercial purposes.

Share A Like – If you remix, transform, or build upon the material, you must distribute your contributions under the same licence as the original.

## ABOUT PILOT PARTNERS

**FASHION FOR GOOD** is the global platform for innovation. Fashion for Good unites the entire fashion ecosystem, from brands, manufacturers and suppliers, to consumers, to collaborate and drive the change towards a circular industry.

At the core of Fashion for Good is its Innovation Programme. The Innovation Programme supports disruptive innovators on their journey to scale, providing hands-on project management, access to funding and a robust ecosystem of mentors and experts. Fashion for Good also initiates Foundational Projects, consortium projects that bring innovators, brands, manufacturers and funders together to validate technologies and processes, to accelerate supply chain implementation. The Good Fashion Fund catalyses access to finance for manufacturers in India, Bangladesh and Vietnam to shift at scale to more sustainable production processes.

Fashion for Good's programmes are supported by founding partner Laudes Foundation, co-founder William McDonough and corporate partners adidas, BESTSELLER, Burberry, C&A, CHANEL, Inditex, Kering, Levi Strauss & Co., Otto Group, Patagonia, PVH Corp., Reformation, Richemont, Stella McCartney, Target and Zalando, and affiliate and regional partners Arvind Limited, Birla Cellulose, Norrøna, Pangaia, Paradise Textiles, Teijin Frontier, Vivobarefoot, Welspun and W. L. Gore & Associates.

To learn more, visit <https://fashionforgood.com/innovation-platform/>

**REVERSE RESOURCES** is an impact driven company with a fundamental mission to reduce the industry's dependency on our planet's finite natural resources. RR's software-as-a-service platform enables mapping, digital steering and tracing circular textile flows. Established over eight years ago, RR has been intently focusing on investigating market barriers and best use cases of textile waste streams. Having done extensive research and on-ground work (across Europe, Asia and parts of North Africa), RR has a demonstrated core competency in establishing textile waste feedstock routes for existing and emerging textile recycling companies. Till date RR has mapped waste across 20 countries for large fashion brands and organisations such as United Nations Industrial Development Organisation, Global Fashion Agenda, Accelerating Circularity, and now Fashion for Good.

To learn more, visit <https://www.reverseresources.net/>

**FOR ANY FURTHER INFORMATION PLEASE REACH OUT TO**

**Fashion for Good:** [projects@fashionforgood.com](mailto:projects@fashionforgood.com)

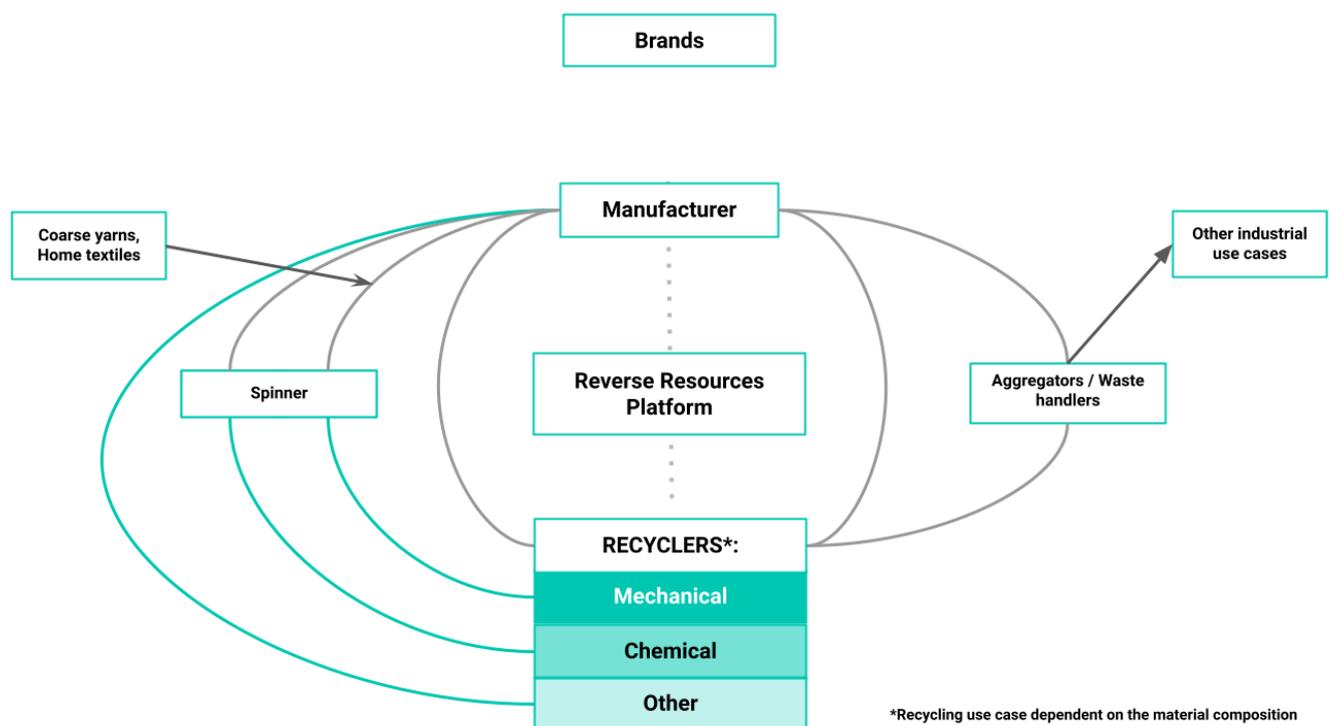
**Reverse Resources:** [nin@reverseresources.net](mailto:nin@reverseresources.net), [harshitha@reverseresources.net](mailto:harshitha@reverseresources.net) and [ranjit@reverseresources.net](mailto:ranjit@reverseresources.net)

The Sorting for Circularity India project was set up to organise the Indian textile waste market in a three phase approach so as to streamline, strengthen and foster the Indian waste market to drive the transition to a more circular economy that recaptures value to its maximum potential. The three phases of this approach aim to a) address the data gaps in textile waste supply chain; b) identify and pilot technologies which can organise the industry; c) build a roadmap to scale such technologies. This approach was designed to facilitate access to post- and pre-consumer feedstock that meets the quality requirements of advanced recycling technologies, giving these technologies an incentive to scale in India. Through this consortium project Fashion for Good aims to leverage the existing infrastructure of the Indian waste management industry and enable the scaling of sorting, mapping and recycling innovations to address the critical supply chain gaps.

The project was kicked off with understanding the landscape of textile waste in India and continues with validation of technology use in developing the pre-consumer and post consumer textile waste supply chain. This document presents the learnings from the pre-consumer waste pilot.

## ABOUT THE PILOT

The pre-consumer pilot through a multi-stakeholder approach demonstrates a 360 degree closed loop system for post-industrial waste (cutting waste) from the factory floor (**Fig.1**). In the pilot, the segregated waste at the factory floor was digitally traced, further accessed and processed by the recyclers/waste handlers and in selected cases, the new traceable recycled fibres were brought back in the production units.



**Fig 1 : Pre-consumer pilot with 360 degree approach of bringing factory waste back as new fibres**

The pilot has set out to:

1. Demonstrate the 360° model of moving pre-consumer waste into a circular value chain  
180° validation part 1 - Creating visibility and access to waste from manufacturers to recyclers  
180° validation part 2 - Use new traceable recycled fibres in the production units
2. Demonstrate the impact of segregation at source and digital traceability in the Indian textile waste supply chain; from the point of generation to recycling
3. Identify the challenges and mitigation strategies of moving recycled fibres back into the supply chain
4. Create brand level visibility of waste from their production units through the Reverse Resources(RR) platform
5. Test new business models, incentives and wider economic benefits for circulating recycled fibres back into global apparel supply chains

# PILOT STAKEHOLDERS

ORCHESTRATOR	PROJECT PARTNERS	MANUFACTURERS	INNOVATOR	RECYCLERS	WASTE HANDLERS
	Laudes ——— — Foundation  <b>LEVI STRAUSS &amp; CO.</b>        <b>PRIMARK®</b>      Birla Cellulose <small>Fibres from nature</small>   <b>WELSPUN INDIA</b> <small>HOME TEXTILES</small>	<b>SHAHI</b>                 <i>Dressing the Future</i>  <b>texport.</b>		<b>MECHANICAL RECYCLERS</b>   USHA YARNS LIMITED <small>RECYCLE TO PERFECTION ALONG WITH NATURE</small>   SVSM <small>SRI VELAYUDHACHARY</small> <small>SPINNING SKILLS</small>   <b>CHEMICAL RECYCLERS</b>  ambercycle	 muddleart <small>textile waste management</small>   SSR <small>TEX</small>  SS/JJ ENTERPRISE

## ACTIVITIES UNDERTAKEN IN THE PILOT

- 

1. Factory onboarding session
- 

2. Creation of profile on the RR platform
- 

3. Segregation of waste & data input
- 

4. Matchmaking
- 

5. Tracing waste to recycling

A selected group of brand nominated manufacturers were onboarded on the RR platform and were provided with the standard operating procedure to implement segregation and waste inventory management practices at the factory floor through on-ground training sessions. Once onboarded, manufacturers created profiles on the Reverse Resources platform where their information was analysed and their waste types that are of high value, based on the current market demand, were identified.

The segregation of the high value of waste (based on composition and colour) at the point of generation was advised with suitable labelling and inventory management practices. Furthermore, the manufacturers digitised this segregated textile waste inventory by inputting data on the Reverse Resources platform. This brought visibility to textile waste streams that until now remained untracked.

Next, offline matchmaking of this segregated waste inventory with suitable types of recyclers was facilitated based on parameters such as location, proximity, recycler demand, and technical specifications. As the Reverse Resources platform evolves, facilitating online matchmaking tools are also envisioned as part of the platform roadmap. In the case of this pilot, given that the market explored is new and the volumes of waste used in the trials low, offline matchmaking was necessary.

It is important to account for the current recycling potential of fabric compositions to better understand how matchmaking of said waste streams were done. Today, 100% cotton and cotton rich textile waste have the highest recycling potential and hence highest market value. However, as more recycling technologies emerge and reach commercial scale, the recycling potential of these fabric compositions will also increase.

Type	Current Grade: High to Low	Current Recycling Potential	Future Grade: High to Low
100% Cotton - knit		- Mechanical Cotton recycling (10-40 count yarns) - Chemical Cellulosic recycling <i>domestic</i>	
100% Cotton - woven		- Mechanical Cotton recycling, coarse yarns - Chemical Cellulosic recycling <i>international</i> - Wipes other industrial use cases	
Cotton Rich - knit/woven		- Mechanical Cotton recycling, coarse yarns. - Chemical Cellulosic recycling international - Wipes other industrial use cases	
Cotton-polyester blends		- (Knit) Mechanical Cotton recycling, coarse yarns. - Non wovens other industrial use cases	
Polyester and Polyester blends		- Non wovens other industrial use cases - Chemical synthetic recycling <i>domestic /international</i>	
Prints, Yarn-dyed and Multi-blends		- Non Wovens other industrial use cases	

**Fig2 : An estimate of the recycling potential change for different textile waste streams explained below**

In the above image, an estimate of the recycling potential change for different textile waste streams is provided. For ease of understanding, the fabric compositions are ranked in descending order with regards to their recycling potential and their grading. For example, 100% cotton knit has been highlighted the darkest because in the current market scenario it has the highest recycling potential and hence the highest grade of textile waste. When more poly-cotton and synthetic regenerative recycling technologies are fully commercialised, the demand for other synthetic and synthetic-rich textiles will also increase. 100% cotton woven, in the future, is highlighted dark as well to indicate that with the emergence of new technologies more materials will reach higher grades.

By way of data collection at every point of custody transfer, digital traceability was embedded in the supply chains. A reference of the factories are shared below:

MANUFACTURER PARTICIPANTS	RECYCLER (R) & WASTE HANDLER (WH) CONNECTIONS FACILITATED	VOLUME OF SEGREGATED WASTE SHIPPED & TRACED TO RECYCLERS
Texport industries	SSR Tex (WH)	7,508.80 kg
Aquarelle India	SS Enterprises (WH) [Existing]	35,149.72 kg
MAF Clothing	JJ Enterprise (WH) [Existing]	7,609 kg
Vamani Overseas	Kakkar Spinning Mills (R) Muddle Art (WH)	18,273 kg
Shahi Exports - North	Usha Yarns (R)	1,242 kg
Shivalik Prints	Usha Yarns (R)	7,640 kg
<b>TOTAL WASTE TRACED TO RECYCLERS</b>		<b>84,433.92 kg</b>

“ The Sorting for Circularity India project is a much needed research work. It has helped to map and provide valuable data to evaluate the potential of textile waste as a feedstock for recycling. It will also help to highlight the importance of textile recycling. ” - **Usha Yarns (Recycler)**

# TRACE OF SEGREGATED TEXTILE WASTE FLOWS ORCHESTRATED IN THE PILOT

me unit: kilograms (kg)  
 rial flow data duration: 07/22 - 11/22

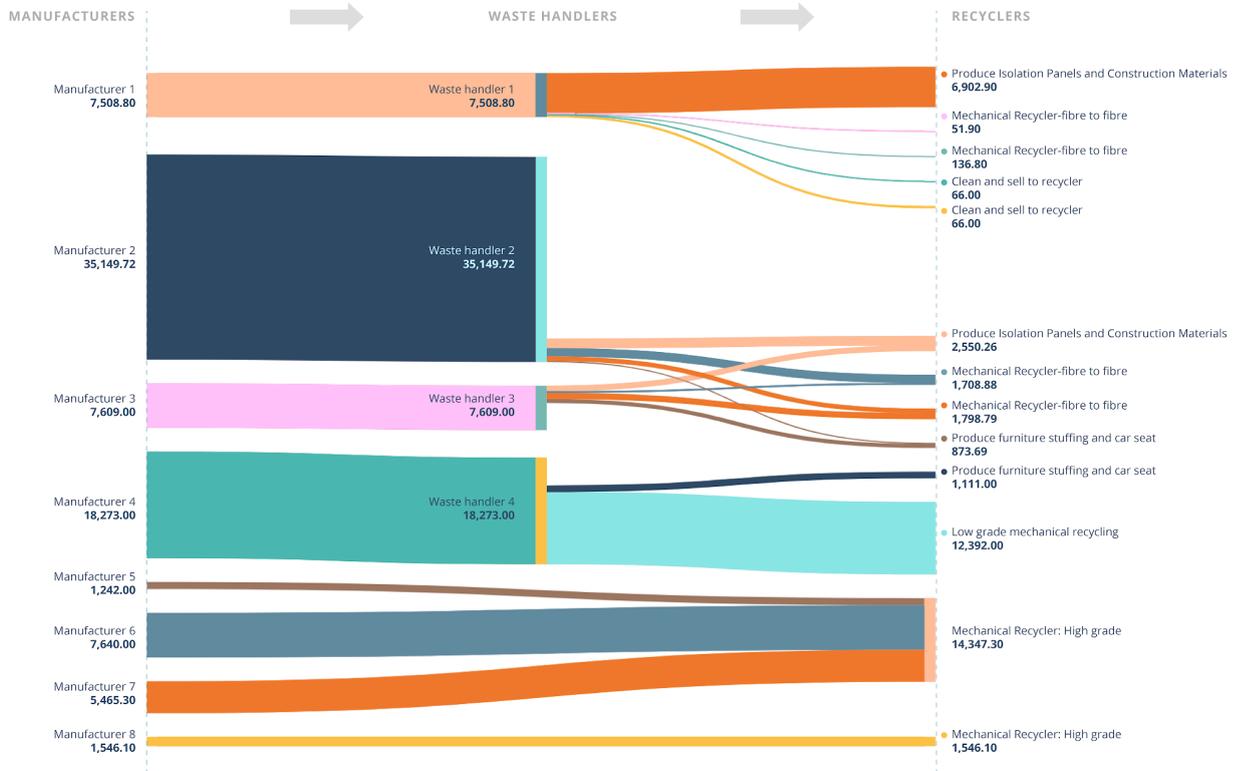
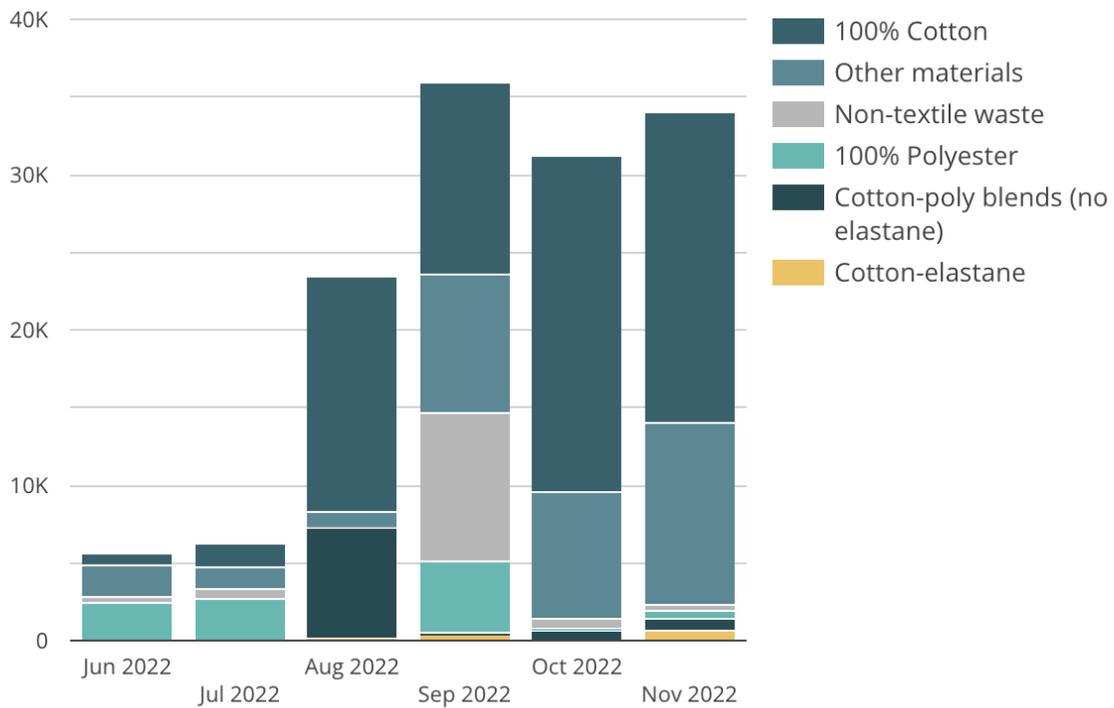


Fig 3 : Waste flows orchestrated and traced in the pilot

“ This project is a productive approach and for traceability it is a must to do so, we would like to partner with more partners and increase our traceable volumes. ” - **Kakkar Spinning Mills (recycler)**

## KEY PILOT HIGHLIGHTS AND SUCCESS

1. Segregation training and inventory digitisation activities done by RR brought visibility to the textile waste streams being generated on the factory floor. As shown in **Fig4**, the pilot activities put a spotlight on the textile waste compositions and their corresponding volumes that were being generated. Eventually by the end of the pilot, ~84 tonnes (and counting) of segregated waste were shipped and digitally traced to recycling and other solution providers in the past four months.



**Fig 4: Composition of the waste registered on Reverse Resources platform**

2. With the segregation, digitisation and matchmaking of waste streams, middle men were minimised and efficiencies were implemented in textile waste supply chains. For instance, refer to **Fig 3, Waste flows orchestrated and traced in the pilot**, to observe that each shipment does not have more than one waste handler involved. This is a great step away from the typical supply chain that consists of multiple middle men and one that ends up making the recycled outputs expensive. In some cases manufacturers were able to send shipments directly to the recyclers. For instance, SP Apparels and Sri Lakshmi clothing shipped segregated textile waste directly to Usha Yarns and Sri Velayudhaswamy mills, respectively.

3. Cost centres were also highlighted/quantified as part of the pilot; specially for mechanical recyclers given that India has a huge market for mechanical recyclers.

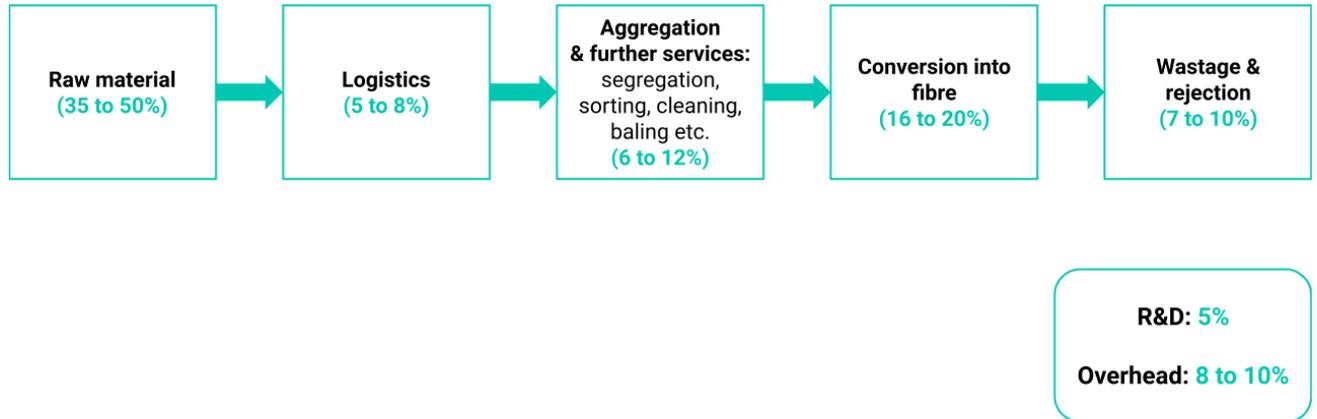


Fig 5: Cost Centres

4. Digital trace established and provided evidence for monitoring “Zero Waste to Landfill” targets. For instance, SSR tex, a waste handler, can now exactly trace the textile waste moving from their premises to both textile-to-textile recycling uses and non-textile use cases
5. Recyclers are using the RR platform to access good quality digitally traced waste. For instance, Usha Yarns (high grade mechanical recycler) as a result of the engagement in the pilot has agreed to expand their RR platform usage to begin registering recycled material created against sourced textile waste. This would enable proving how much brand waste went into a specific finished product. A verification document (**Fig6**) can be secured from RR by recyclers with additional data registration. On the right is an example of a verification document.



## Verification of the source of reclaimed materials used in a textile product

Body issuing the verification of source:	Reverse Resources OÜ Raekoja plats 1, 51003, Tartu, Estonia Ann Runnel ann@reverseresources.net	Reference number of the verification:	RRTC123456789
Seller of the product:	Name	Date of delivery to the customer:	dd.mm.yyyy
Buyer of the product:	Name	Invoice number/date:	1234 / dd.mm.yyyy
Address of destination:	Address	Reference to transport document:	123456789
		Tracking code:	RR-12345-99

### Textile product

	Product name / description	Share of reclaimed material used in the product with verified source	Share of branded waste in the product	Gross weight (kg)	Net weight (kg)
1.	Open end yarns 70% recycled pre-consumer cotton; 30% polyester  Shipment information entered to the platform as free text shows up here.	%	brand name	4100.00	4000.00

### Input material

	Tracking code of shipment in RR platform	Date of shipment of source	Quantity (kg) delivered end-to-end	Waste material	Supplier / Source of the material	Date of delivery confirmed by recycler
1.	TX-123456-12	03.03.2022	4,507	Product: Knit cutting scraps Material: 100% cotton Colour: Black Source: Cutting room waste	Factory: Factory name Location: Narayanganj, Bangladesh Certificates of the factory: Sedex, Oeko Tex100, BCI  Comment: This is a comment	03.04.2022

#### Declaration of the Verifying Body:

This is to verify that the waste used in the recycled product has been delivered from a known original source and through a transparent supply chain where all steps of the process have been checked by the verifying body. The original supplier of the waste did not deliberately choose to produce such material and has no internal process that can use this material in a better way internally. This document confirms that all of the materials listed above, purchased by the Customer are Reclaimed Materials that would have otherwise gone into the waste stream.

Each transaction listed in this document is digitally recorded and can be authenticated at <http://app.reverseresources.net>

Place and date of issue:	Sep 12, 2022	Stamp of the issuing body:
Signature of the authorized person of the verifier:		
Name:	Ann Runnel	

**Fig6: Reverse Resources verification document for recyclers**

# ACCESS TO REVERSE RESOURCES DIGITAL TOOLS AND REPORTS

## FOR BRANDS

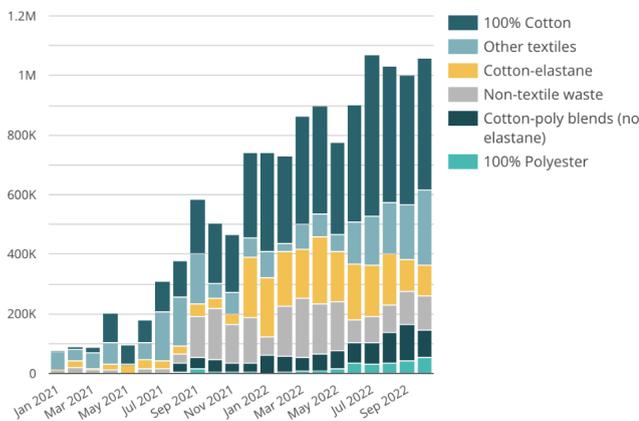


From: Jan 2021 To: Oct 2022 Project Brand: All facilities  
 Country Supplier

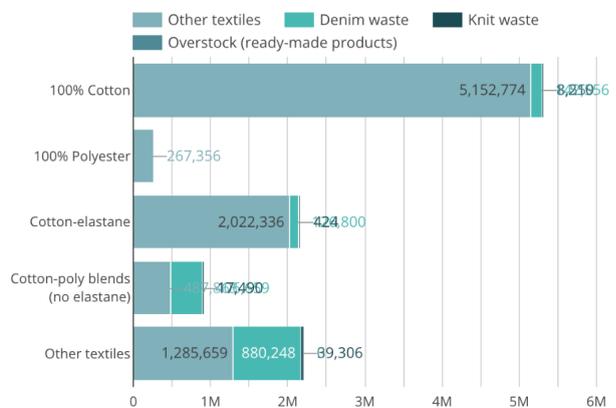
### Waste volumes and compositions

Total waste registered on the platform during the period (kg)	Brand share of the waste	Share of textile waste from total waste volume	Volume in inventory by end of the report period (kg)	Number of suppliers*
12,791,754	100.0%	85%	1,710,544	191

Compositions of all waste registered on RR platform



Key compositions & materials types of textile waste



Waste composition ^	Waste inventory at the beginning of the period (kg)	Inventory added during the period (kg)	Moved out of factories during the period (kg)	Inventory at the end of period (kg)	Share of textile waste
100% Acrylic	0	0	0	0	
100% Lycra / Elastane	0	24,002	24,002	0	100%

Fig7: Brand Dashboard live statistics

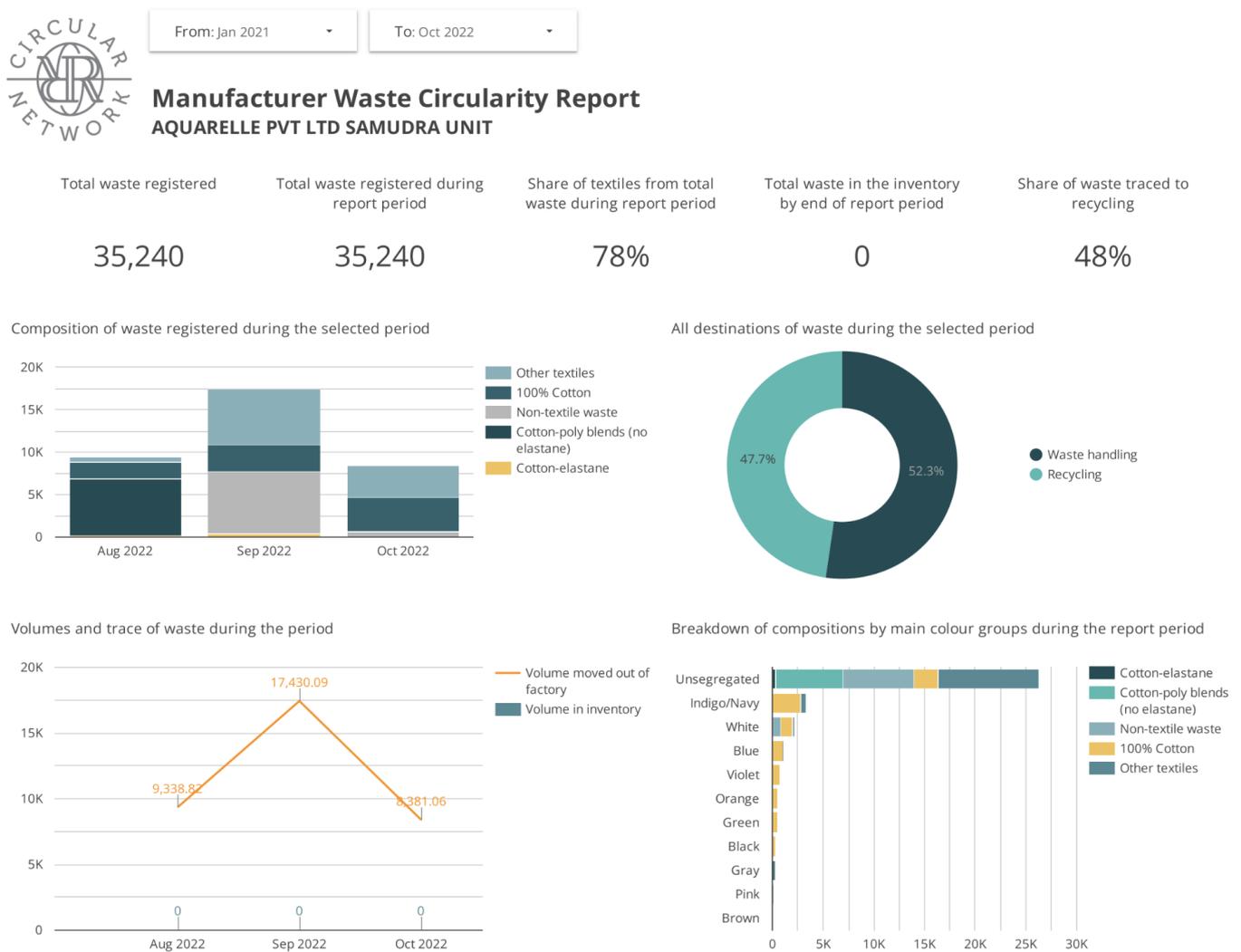
The brand participants, in the pilot, have been given access to the Brand Dashboard on the RR platform. The brand dashboard provides live data and insights:

- List of their manufacturers on the platform (active vs inactive) who are segregating waste
- Volumes of waste by material type, composition and colour
- Overview of the disposal methods of waste by the manufacturers
- Volumes and types of waste received by brand nominated recyclers
- Coming soon: overview of volume of recycled products made of the waste

Note that **Fig8** is an example of the dashboard and the functionality of the Brand dashboard is expected to evolve more in the future. Within this dashboard, brands can also access a LIVE statistics report that provides an overview of all the data from the platform with regards to composition, volumes and types of waste traced in easy to read charts and graphs.

### FOR MANUFACTURERS

A manufacturer waste circularity report is provided to the manufacturing participants which gives an overview of total volumes, types, composition and colours of waste registered on the platform with a share of textile waste that is sent to recyclers/waste handlers. **Fig8** is a snapshot of the report.



**Fig8 : Waste circularity report for manufacturers and its waste volumes and compositions**

“Sorting for Circularity programme is definitely a good initiative and need of the future. Looks interesting and I hope this will be a requirement from brands in the near future. The only challenge is that the price offered by approved recyclers is not encouraging. This leads to less interest as a manufacturer.” - **SP Apparels (manufacturer)**

# CHALLENGES, LEARNINGS AND SOLUTIONS

CHALLENGES	LEARNINGS AND MITIGATION STRATEGIES	POTENTIAL LONG-TERM SOLUTIONS
<b>PEOPLE AND OPERATIONS</b>		
No agreement reached between manufacturers and suitable recyclers	<ul style="list-style-type: none"> <li>Recyclers (especially chemical recyclers) could not match the price factories currently receive from existing waste handlers</li> <li>Manufacturer's hesitation to shift from existing relationship with current waste handler (reasons varied from family ties to additional services provided by existing waste handler)</li> </ul>	<ul style="list-style-type: none"> <li>Factories need more benefits and support from brands to motivate and improve waste handling practices</li> <li>Onboarding existing waste handlers and embedding traceability into the established network</li> </ul>
Lack of education of waste handlers and limited understanding of shift in the market	<ul style="list-style-type: none"> <li>Waste handlers are resistant to opening up their supply network and working transparently</li> <li>Success was found when waste handling companies:               <ul style="list-style-type: none"> <li>were set up as social enterprises</li> <li>had younger family members who could understand the concept of digital tools to help scale business and improve compliance</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Education and shared learning among the waste handling industry to effectively communicate opportunities through peers.</li> <li>Regional Indian language tools and communication</li> </ul>
High waste supply chain costs and low volumes	<ul style="list-style-type: none"> <li>Some factories only segregated waste to complete one shipment on brand demand</li> <li>Waste volumes were dispersed across multiple locations and logistics costs were too high to motivate recyclers</li> </ul>	<ul style="list-style-type: none"> <li>The importance of building a network of waste handlers who can aggregate and store textiles</li> <li>Educating on the importance of segregating the waste and creating a business value for manufacturers</li> <li>Scaling and onboarding more manufacturers will enable more efficient waste supply chains.</li> </ul>
Manufacturer desire for all textile waste material types to be "lifted"	<ul style="list-style-type: none"> <li>Manufacturers prefer to sell waste straight to recycling and receive a higher price</li> <li>Recyclers prefer to buy waste straight from the manufacturer at a lower price, however they only wish to buy waste that meets their recycling feedstock specification i.e. high value waste</li> <li>Manufacturers want all textile waste to be taken at once :               <ul style="list-style-type: none"> <li>Lack of storage space</li> <li>No use case for low value waste</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Waste handlers or locations to aggregate textile waste are required in the majority of waste supply chains. However these can be established by the recycler if there is a strong enough business case</li> <li>Waste handling companies can be linked with emerging chemical recycling technologies who will be able to recycle this lower value textile waste. However they will need export licences until local plants are established</li> </ul>
Manufacturer willingness to be transparent	<ul style="list-style-type: none"> <li>Manufacturers are concerned about losing income on the sale of waste and being forced by brands to give waste away for free or have this income deducted.</li> </ul>	<ul style="list-style-type: none"> <li>Manufacturers are more motivated to establish a relationship with recyclers and develop recycled products to offer circular solutions to their brand partners at a premium price.</li> <li>However brands need to signal their willingness to pay for this extra effort and service</li> <li>Transportation cost of waste can be significant and in future setting up factories closer to the supply chain would be much needed.</li> </ul>
Low quantities of waste	<ul style="list-style-type: none"> <li>Aggregation of waste is needed at the waste handler level</li> <li>Elimination of middlemen and informal set up is crucial</li> <li>Consistency of waste and volume commitments can be maintained</li> </ul>	<ul style="list-style-type: none"> <li>Support the formal and socially compliant waste handlers</li> </ul>
Types of waste,	<ul style="list-style-type: none"> <li>Brands got a clear understanding on the</li> </ul>	<ul style="list-style-type: none"> <li>Internal alignment with different team such as</li> </ul>

production of recycled garment and internal alignment	<p>factories and types of waste generated</p> <ul style="list-style-type: none"> <li>Brands are now building on the types of material that can be recycled and used in their production unit</li> </ul>	<p>raw materials and design teams are required which will take time but are in conversations</p> <ul style="list-style-type: none"> <li>Awareness of the available recycled materials needs to be ensured within brands' internal teams and accordingly also raise awareness to moderate the expectations of consumers (for a garment made of recycled materials)</li> </ul>
<b>TECHNOLOGY</b>		
Waste Handler platform adoption	<ul style="list-style-type: none"> <li>Many waste handling companies do not own computing equipment and struggle with online tools and internet access on a computer</li> </ul>	<ul style="list-style-type: none"> <li>Most waste handlers own a smartphone and are accustomed to using user friendly apps on their phone</li> <li>RR will in the future launch a mobile app version of the platform so that all companies can easily access the network and enable the trace of textile waste</li> </ul>
Local interventions required	<ul style="list-style-type: none"> <li>Preference to work with technologies available locally due to advantages of proximity</li> </ul>	<ul style="list-style-type: none"> <li>Technology upgrade of existing mechanical recyclers which will require investments and advanced solutions</li> </ul>
New textile recycling technologies still at an early stage	<ul style="list-style-type: none"> <li>Opportunities to trace waste to new technologies was challenging due to the limited feedstock options</li> <li>For example a polyester recycler was keen to chemically recycle polyester but at this time, only accepting 100% polyester in greige and white which was hard to accumulate during the course of this pilot</li> <li>Acceptance of materials by recyclers, for instance, currently a mechanical recycler can work with 100% cotton knits (without elastane) solid colours to produce finer quality yarns</li> <li>Lower quantities of specific feedstock were produced which can't be processed at scale with chemical recycler</li> </ul>	<ul style="list-style-type: none"> <li>As technologies develop and feedstock sourcing specifications widen, more recycling opportunities will emerge</li> <li>Need experts in recycling to support the advancement of the technologies. As currently with open end yarn mechanisms coarser yarns are produced. Also, innovative solutions are required for the treatment of elastane</li> </ul>
<b>COST/BUSINESS CASE</b>		
Cost for domestic players	<ul style="list-style-type: none"> <li>As the Indian market has a well established domestic recycling industry, there is a huge demand for textile waste. So the price at which textile waste is sold in the market is also significantly higher than the price offered by the neighbouring countries</li> </ul>	<ul style="list-style-type: none"> <li>The business case for stakeholders will be maintained in the long run with appropriate change in demand and supply of the quality textile waste to advanced recyclers as well as quality recycled fibres/yarns to manufacturers/brands</li> </ul>
Cost for International recyclers	<ul style="list-style-type: none"> <li>Buying price of the waste by the international recyclers is low and they prefer to purchase the waste from other manufacturing regions than India</li> <li>Transportation cost and GHG emissions are also added</li> </ul>	<ul style="list-style-type: none"> <li>India's domestic recycling industry needs to upgrade its recycling capabilities to be able to valorise textile waste suitably. For this, investment into new technologies is important.</li> <li>This way textile waste can be valorised closer to the source of generation and also keep transportation costs and GHG emissions in check.</li> </ul>

*“ We are very positive about the response that we are getting from the suppliers, that they are now finally looking for waste handlers, like us, who can help them appropriately handle textile waste. But still, we are facing a challenge of only getting low value textile waste from the suppliers although we want to source both high and low value textile waste. Another challenge is that some of the suppliers compare us to their existing waste handling partners in terms of commercials. These suppliers would need to understand that Muddle Art apart from providing conventional textile waste management services, also ensures social compliance in its operations. But yes absolutely I’m liking the positive momentum at the moment. And we look forward to onboarding more and more recyclers on the platform, to fill the gaps and have the 100% traceability of the waste. Thank you for having us participate in this pilot and great initiative. ” - Muddle Art (waste handler)*

## RECOMMENDED NEXT STEPS

### 1. **Brands: Building partnerships with Tier 4 recyclers**

When producing a circular product, more engagement is required with Tier 4 (recycling partners) than is typically needed for a Tier 4 fibre producer within a linear supply chain. This design-led approach is critical for the brand to not only produce recycled products effectively but also, to properly benefit from textile waste management. Building relationships with existing and emerging recycling technologies will be critical to make sure recycle fibre supply chains are established.

### 2. **Scale the Digitisation of textile waste: Segregation and tracing**

The industry would benefit from the momentum created to continue and increase the volume of textile waste being segregated and increase the transparency across all textile waste streams that get generated.

- a. This would enable **brands** to effectively monitor and create benchmarks for waste related targets (Zero waste to landfill etc.) and scale textile to textile recycling targets whilst proving they have closed the loop on their linear supply chain.
- b. **Manufacturers** can benefit from establishing more control over their waste, be better placed to identify opportunities for recycling and effective valorisation of their waste. Even if the fibre can not be brought back into their supply chain or recycled back into a new garment with today's current technology. Producing garments within a verified circular supply chain or that at a minimum level proves all waste has reached its best recycling use case creates a value or premium to their products.
- c. **Recyclers** can build efficient and stable waste supply chains. Through the tracing of waste they can access the background data on the textile they are recycling (chemical compliance, non Xinjiang etc) and monitor the compliance within their waste handling supply network.

### **3. Scaling by onboard existing waste handling partners**

Manufacturers can onboard their existing waste handling partners on the RR platform to enable effective scaling. This would enable the trace, provide transparency for brand partners and validate “Zero waste to Landfill” claims, whilst also positioning the manufacturer (and their brand partners) to more effectively steer waste towards preferred recycling partners.

### **4. Regional Onboarding required for India**

To accumulate sufficient volumes and create efficient and cost effective waste feedstock supply chains a regional approach for onboarding factories should be used within the context of India. This would enable larger volumes of waste to reach a higher value use case.

### **5. Waste mapping across brand's global supply chains.**

Conducting waste mapping across brands' global supply chains can be straightforward and fast-paced for brands (brands can complete a waste mapping report within 60-90 Days through RR Platform). This report will identify:

- a. Data on waste volumes across different regions, in what form is that waste and the fibre composition.
- b. Data on the disposal methods of the waste: how much is incinerated, already being recycled into new textile fibre, sold on or landfilled.
- c. An analysis on the current best recycling use case for the waste. What is the recycling potential today and how will this change and evolve over the next 5 years.
- d. Calculating the circular opportunities within a brands supply chain and identifying regions for scaling in the short-term vs long-term, where waste can be more effectively valorised into new products, and via which recycling channel.