FASHION FOR GOOD

RECYCLING COTTON: CHALLENGES AND IMPACT

Dipanwita Ray
December 2023
### AGENDA

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Our Approach: Innovation and Scaling

Sitting at the intersection of innovation and industry, Fashion for Good brings together the entire fashion system - brands, retailers, suppliers, innovators, and funders – in a pre-competitive space as a pioneer of collaborative innovation.

Our global Innovation Platform scouts and screens the next generation of sustainable solutions fostering a deep understanding of the technical landscape and associated hurdles to widespread adoption. Through our various validation activities such as collaborative pilots and consortium projects we create a safe space for collaboration. This work enables the financing and scaling of these critical innovations.

Scout & Screen
- Map the Landscape/Pipeline
- Select the Winners (Due Diligence)
- Understanding the Hurdles

Validate
- Bespoke Support for Innovators
- Drive Pilots & Consortium Projects
- Access & Quantify Impact

Scale & Adopt
- Finance Scalable Solutions
- Facilitate Integration into Supply Chain
- Amplify Success Stories
## INNOVATION PLATFORM KEY METRICS

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<th>Metric</th>
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<td><strong>GLOBAL PARTNER BASE</strong></td>
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<td>Corporate Partners</td>
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<td><strong>SCOUTING &amp; SCREENING</strong></td>
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<td>Innovators Supported</td>
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<td><strong>BUSINESS DEVELOPMENT</strong></td>
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<td>Pilots Started</td>
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<td><strong>ROADMAP TO SCALE</strong></td>
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<td>Implementation Cases</td>
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<td><strong>CATALYSING INVESTMENTS</strong></td>
<td>€1.9bn+</td>
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<td>Capital Committed</td>
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Data from Quarter Q4/23

Pioneering Collaborative Innovation
In 2017, Fashion for Good was launched with Laudes Foundation as founding partner and co-founder William McDonough.

Over the past six years, the partner base has grown to 26 organisations acting in a trusted collective dedicated to practical action.

Our dynamic partner group represents key decision makers at the brand and retail level, as well as across the supply chain, working to jointly shape the strategic direction of the industry through pre-competitive collaboration and bold action.
Since the start of our programme, we have supported **173 innovators**, enabling valuable connections and deep engagements with brands, retailers, and funders to validate and implement their solutions.
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ALARMING QUANTUM OF TEXTILE WASTE

92 million tons of textile waste is produced every year globally and is expected to increase to 134 million tons by 2030.

18.6 million tons of textile waste ends up in landfills annually, and is expected to increase to 150 million by 2050.

50% of the industry around the world has not started to take action despite the discussion around the severity of these issues.

< 1% of textile waste is being recycled.

~ 20% of clothing is collected for reuse or recycling.

1. Per study by Ellen MacArthur Foundation
   Image source: Wealth in Waste report
INDIA GENERATES ~8% OF GLOBAL TEXTILE WASTE ANNUALLY

Data and Image Source: Wealth in Waste Report
TEXTEXTILE WASTE: A RESOURCE
TOO PRECIOUS TO WASTE

KEEPING WASTE OUT OF LANDFILL AND INCINERATION
REDUCE DEPENDENCY ON VIRGIN FIBRES, MINIMISE THE IMPACT
ALTERNATIVE FEEDSTOCK FOR MAN-MADE CELLULOSIC FIBRES
NEW REVENUE STREAMS BY VALORISATION OF THE WASTE
REGULATORY SHIFTS DRIVE CIRCULARITY
CLOSING THE LOOP:
NEED TO ORGANISE WASTE STREAMS
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COTTON RECYCLING: MECHANICAL AND CHEMICAL

Textile-to-textile recycling encompasses all textile recycling processes where the output is used again in this specific sector, in similar applications for which it was first developed. Cotton is a highly valuable feedstock for textile-to-textile recycling.

**MECHANICAL**

- Cotton fibre production waste
- Post-industrial textile waste
- Post-consumer textile waste

- Collection, Sorting, Separation
- Cleaning
- Separating foreign parts
- Mixing (w/ virgin cotton)
- Dust extraction
- Carding
- Spinning
- Blending
- Weaving/Knitting to Fabric

**CHEMICAL**

- Cellulosics
- Purification to Pulp
- Man-Made Cellulose (Solvent) Fibre Spinning
- Man Made Cellulosic Fibre (MMCF)

- Creates a new high strength, high quality material (MMCF) that can be recycled in a circular process
- Requires high purity feedstock which could have limited supply
- Not cotton-cotton recycling – i.e. circular with respect to the man-made fibre, but not cotton
INNOVATIVE SOLUTIONS  COTTON RECYCLING

SORTING
- Manual
- Semi- & Fully-automated

RECYCLING
- Mechanical
- Chemical

*Not an exhaustive list
CHALLENGES AND OPPORTUNITIES

1. REQUIRES ~100% COTTON FEEDSTOCK
   Developments in sorting technologies for accurate and efficient sorting

2. WEAKENING OF FIBRES AND PRESENCE OF CONTAMINANTS
   Blending with virgin fibres, combination of mechanical and chemical recycling

3. POTENTIAL LIES IN TEXTILE-TO-TEXTILE RECYCLING
   Value potential needs to be realised through advanced high-grade recycling

4. IMPACT OF RECYCLED YARN QUALITY ON END-PRODUCT
   Developments in spinning process to improve strength and quality of staple-fibre

5. APPROPRIATE TESTING INSTRUMENTS FOR RECYCLED YARN
   Developments of robust testing instruments suited for recycled materials
CHALLENGES AND OPPORTUNITIES

1. OPEN-LOOP PROCESS
   Embracing the advent of Next-gen fibres

2. REQUIREMENT OF HETEROGENEOUS FEEDSTOCK
   Developments in sorting technologies for accurate and efficient sorting

3. SCALE-UP REQUIRES CONSISTENT FEEDSTOCK SUPPLY
   Development of an ecosystem to facilitate collection, sorting, recycling

4. REDUCTION IN THE DEGREE OF POLYMERISATION OF CELLULOSE
   Creating efficient cellulosic dissolution processes and process innovations

5. LACK OF COLLABORATION BETWEEN ACTORS ACROSS SUPPLY CHAIN
   Advocating collaborative action and bringing together different stakeholders
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SORTING FOR CIRCULARITY INDIA PROJECT

OCTOBER 2021 - DECEMBER 2023
OBJECTIVES OF SORTING FOR CIRCULARITY INDIA

1. Understand the current textile waste material flow in India
2. Identify mapping and sorting technologies
3. Pilot the solutions for organising textile waste
4. Build implementation roadmap
~50 STAKEHOLDERS INVOLVED IN THE PROJECT
A first-of-its-kind study, this report is the most comprehensive analysis of the Indian textile waste landscape.

A comprehensive analysis digitally mapping pre-consumer textile waste in India.

An in-depth analysis of post-consumer textile waste with automated sorting technologies, explaining how the waste can be valorised to its best.

Demonstrating the commercial viability of sorting hubs with manual sorting practices, semi-automated and fully-automated sorting technologies.
WEALTH IN WASTE
INDIA’S POTENTIAL TO BRING TEXTILE WASTE BACK INTO THE SUPPLY CHAIN

A FIRST-OF-ITS-KIND STUDY, THE MOST COMPREHENSIVE ANALYSIS OF THE INDIAN TEXTILE WASTE LANDSCAPE
KEY COMPONENTS EXPLORED AND PRESENTED THROUGH THE STUDY

- Types of textile waste
- Geographical flows of the waste
- Textile waste value chain
- End-use of waste
- Quantity of textile waste
- Textile Waste Hierarchy
- Material composition
- Challenges And Opportunities
A COMPREHENSIVE ANALYSIS OF PRE-CONSUMER TEXTILE WASTE IN INDIA AND DIGITAL MAPPING WITH REVERSE RESOURCES
DEMONSTRATING A 360° APPROACH FOR PRE-CONSUMER WASTE
AN IN-DEPTH ANALYSIS OF POST-CONSUMER TEXTILE WASTE WITH SEMI- & FULLY AUTOMATED SORTING TECHNOLOGIES, EXPLAINING HOW THE WASTE CAN BE VALORISED TO ITS BEST
DEMONSTRATE COLLECTION AND SORTING INFRASTRUCTURE FOR POST CONSUMER DOMES

1. Collection, sorting and pre-processing of post consumer textiles
2. Traceability from waste source to recycled fibre
3. Assessing the quality of traceable textile waste and its viability for new production
4. Enabling sorting systems and infrastructure with sorting technology

CIRCLE ECONOMY
Circle Economy has been a crucial knowledge partner for the project, providing best practices based on learnings from the previous pilots.

INNOVATION PARTNERS
- MATOHA
- PICVISA
- REVERSE RESOURCES

SATTVA CONSULTING
Sattva conducted the Business Case Assessment for the Sorting for Circularity post-consumer pilots
EFFICIENT AND ACCURATE SORTING BY SEMI- AND FULLY-AUTOMATED SORTING TECHNOLOGIES

1. Inclusive Material Library
   - > 15 pure and blended material

2. Broad Colour Library
   - 14 colour input options at a time
   - Spectrum of hues - shade & tint

3. Productivity Increase
   - Semi: 100 kg per day, per sorter
   - Fully: 7k kg per day, per line

4. Accuracy
   - High (~95%)
   - Trainable AI model

5. Infrastructure
   - Customisable and modular
   - May require industrial set-up

Technical Feasibility Assessment
DEMONSTRATING THE COMMERCIAL VIABILITY OF SORTING HUBS WITH MANUAL SORTING PRACTICES, SEMI & FULLY-AUTOMATED SORTING TECHNOLOGIES
RELEVANCE OF SORTING INFRASTRUCTURE FOR RECYCLING

48% of domestic post-consumer waste can be pushed up the waste value valorisation due to formalised collection systems.

35% of domestic post-consumer waste can be pushed further up the waste value valorisation due to proper sorting infrastructure.

1380 ktons

10% increase in Revenue at Sorter’s level

INR 388 Cr additional revenue at the industry level
SCENARIO ANALYSIS

1. INCREASED DAILY CAPACITY
   - Economies of scale
   - Significant ecosystem development

2. STRENGTHENED REWEARABLES MARKET
   - Ideal for manual sorting
   - Strong rewearables market

3. HIGH PRICE OF REWEARABLES WITH HIGH PRICE OF WASTE
   - High operating cost
   - Profitable for all methods

4. HIGH PRICE OF REWEARABLES Y-o-Y REDUCING PRICE FOR RECYCLABLE OUTPUT
   - Highly probable scenario
   - Strengthen all types of markets for sorted waste

5. INCREASE IN BLENDED FABRIC, ADVENT OF ADVANCED RECYCLING
   - Potential to valorise 2287 kt (58%) of waste annually
   - Model in conjunction with EPR
TOOLKIT FOR ORGANISING TEXTILE WASTE IN INDIA
Re-START
Recover by Sourcing, Tracing, and Advancing Recycling Technologies
https://www.re-startalliance.com/
THANK YOU

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