

# Upstream *Circularity*



Playbook

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#### About Global Fashion Agenda

Global Fashion Agenda (GFA) is a non-profit organisation that fosters industry collaboration on sustainability in fashion to accelerate impact. With the vision of a net positive fashion industry, it drives action by mobilising, inspiring, influencing and educating all stakeholders. The organisation has been leading the movement since 2009 and presents the renowned international forum on sustainability in fashion, Global Fashion Summit. GFA influences policy through its advocacy efforts, publishes thought leadership, implements impact programmes, presents educational guidance and connects companies with solutions.

To learn more, visit our [website](https://www.globalfashionagenda.org) or contact us directly via [impact@globalfashionagenda.org](mailto:impact@globalfashionagenda.org).

#### About Global Circular Fashion Forum

Launched in 2022, the Global Circular Fashion Forum (GCFF) is a global initiative, established by Global Fashion Agenda and supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and H&M Foundation, which spurs global and local action in textile manufacturing countries to accelerate and scale recycling of post-industrial textile waste – an effort to achieve a long-term, scalable, and just transition to a circular fashion industry. By mobilising industry stakeholders, investors, global brands and retailers, technology providers and others as well as by influencing policy environments and collecting, consolidating and disseminating best practices, GCFF intends to establish the necessary ecosystem for scaling post-industrial textile waste recycling programmes in manufacturing countries. Locally owned and led, these national Circular Fashion Partnerships (CFPs) are now established in Bangladesh, Cambodia and Indonesia, with forthcoming partnerships planned in Vietnam and Turkey, and an open invitation to collaborate in other countries.

To learn more, visit our [webpage](https://www.globalfashionagenda.org) or contact us directly via [cfp@globalfashionagenda.org](mailto:cfp@globalfashionagenda.org).

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# Opening address

*We must **rethink** and **redesign** our current systems and view circularity through the lens of **global value chains**, while paying greater attention to the perspective and role of **manufacturers** and **manufacturing regions**.*

By 2050, our goal is to create a net positive fashion industry – one that gives back more to the environment, society and the economy than it takes.<sup>1</sup> Achieving this requires a transition to a circular economy, where growth is decoupled from the consumption of finite resources, reducing our dependence on them, and where value is distributed fairly among all actors.

Transitioning to a circular economy involves eliminating waste and pollution, circulating products and materials at their highest value and regenerating nature. For this transition to succeed, we must rethink and redesign our current systems and view circularity through the lens of global value chains, while paying greater attention to the perspective and role of manufacturers and manufacturing regions. Textile and apparel manufacturing is crucial for driving innovation, creating jobs and upskilling the workforce as well as compliance with emerging circular economy and environmental mandates. A global approach to circularity demands collaboration across the entire value chain – brands, manufacturers, waste handlers, recyclers, investors, consumers, policymakers and more. By working together, we can create closed-loop systems that keep products and materials in use at their highest

value and prevent improper disposal. A just transition is vital to prevent risks such as job decline or poor working conditions, especially for marginalised groups, such as the informal workers and migrants often prevalent in waste handling and other exposed sectors.

In a fully circular economy, all waste is eliminated, including post-industrial textile waste flows. By-products and excess inventory are minimised, and where unavoidable, treated as valuable materials and used, for example, as recycled inputs. In transitioning to a circular economy, recycling post-industrial textile waste presents a significant and immediate opportunity. This is especially true in manufacturing countries, where large volumes of uncontaminated clippings and other textile manufacturing waste are currently discarded. Securing these high-quality feedstocks and properly segregating them from the outset to avoid contamination would help textile-to-textile recyclers achieve economies of scale and prepare for the more challenging task of recycling post-use clothing. As post-industrial waste continues to be produced during the shift toward full circularity, solutions upstream of the fashion value chain such as improved sorting, segregation and recycling are critical for capturing value and keeping

materials in use. These efforts complement circular design and business models that focus on preventing waste generation at source. Consequently, they play a crucial role in addressing the industry's immediate waste management challenges.

The [Global Circular Fashion Forum](#) is a global initiative to spur global and local action in textile manufacturing countries to accelerate and scale recycling of post-industrial textile waste – in an effort to achieve a long-term, scalable and just transition to a circular fashion industry. This initiative consolidates and shares valuable insights across the world. The publication you hold, available in multiple languages ([here](#)), offers key insights and best practices to help us all move towards a more sustainable, circular future. It presents an opportunity to learn from, and an invitation to collaborate with, peers and pioneers across the world working towards a more circular future that benefits all.

**Together, we can drive the change needed.**

# Opening address

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Capturing and recycling post-industrial textile waste presents significant opportunities on multiple fronts, among them economic development, job creation and the environment. From an economic perspective, it is estimated that scaling post-industrial recycling in key manufacturing countries such as Vietnam, Turkey, India, Malaysia, Indonesia and Bangladesh holds a market opportunity to the tune of USD 4.5 billion.<sup>2</sup>

Transitioning to a circular economy could create 1.8 to 9 million new jobs globally by 2030 in sorting, recycling, upcycling and repair, driving local economic growth and community development.<sup>3</sup> From an environmental vantage point, with material production responsible for 45% of greenhouse gas emissions, scaling recycling technologies could reduce reliance on virgin resources and aid decarbonisation efforts.<sup>4</sup> Moreover, studies already show that existing recycling technologies alone could achieve 80% circularity in fashion if fully scaled, delivering better economics than virgin materials.<sup>5</sup> When formalised, waste systems have the potential to ensure fairer value distribution, access to traceable materials, improved sorting efficiency and higher recycling rates, ultimately reducing waste exports and retaining value locally in manufacturing regions.

Driven by over 520 regulations globally, most prominently in the EU, the industry is seeing growing momentum towards adopting circular practices in a bid to start eliminating virgin resource use, waste and greenhouse gas emissions, while ensuring fairer value distribution.<sup>6</sup> Leading brands and manufacturers have outlined ambitious goals, with 80% of brands and 86% of producers setting targets on textile-to-textile recycling of post-industrial and post-use waste by 2030.<sup>7</sup> Leading initiatives, among them the

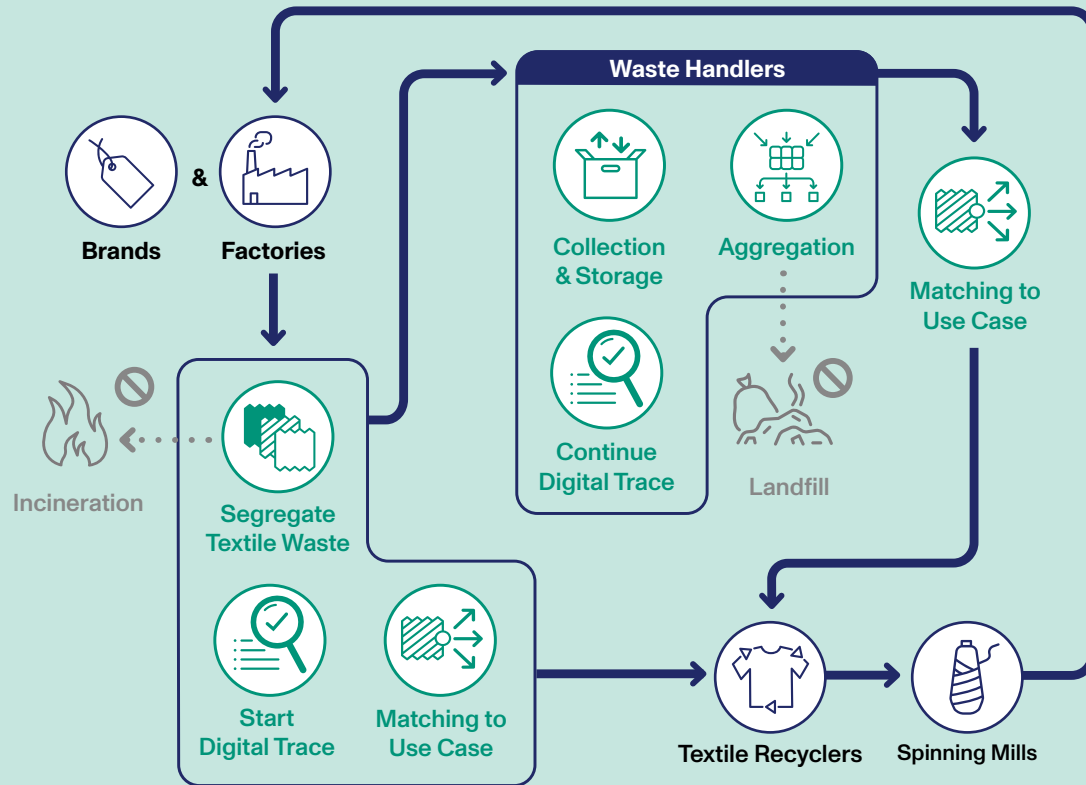
Circular Fashion Partnership, Sorting for Circularity and Accelerating Circularity, are also helping drive progress in collection, sorting and recycling processes. Meanwhile, technological advancements in mechanical, thermo-mechanical and chemical recycling are increasingly evident, most notably in Turkey, China, Pakistan and Vietnam.<sup>8</sup> Recent investments in recycling start-ups such as Syre and RE&UP likewise underscore a strong commitment to expanding the sector.

Despite these efforts, industry progress is slow. Less than 1% of textile waste is recycled into new fibre, equating to losses in excess of USD 100 billion annually.<sup>9</sup> The industry's circularity rate has fallen from 9.1% in 2018 to 7.2% in 2023, with 90% of materials globally wasted or unused.<sup>10</sup> Moreover, a recent study indicates stark variations in accessibility to recycled materials across key manufacturing regions, with 66% of companies reporting good access and 18% reporting poor access.<sup>11</sup> With textile consumption and waste set to continue to grow, the need for scalable solutions is more pressing than ever.

This report serves as a pragmatic guide, offering best practice examples to establish and scale circularity practices in garment manufacturing countries. It is focused on practices specifically upstream of the fashion value chain, such as enhancing the sorting, segregation and recycling of post-industrial textile waste – waste generated from industrial processes such as milling, spinning and garment production. It also outlines essential enablers needed to support a conducive environment for upstream circularity. The report aims to inspire and motivate public and private sector actions, including from manufacturers, brands, retailers, policymakers and investors, to implement and support upstream circularity.

# Establishing circular commercial collaborations: *A step-by-step guide*

Capturing and recovering the value of post-industrial textiles in manufacturing regions with a view to scale recycling capabilities, close the production loop and provide circular solutions at source, requires commercial collaboration between multiple actors. This section outlines the main stages involved in upstream circularity and highlights the challenges associated with each stage along with the key enablers necessary to overcome them.



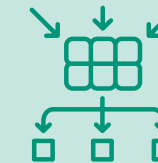
## 1 Segregating Textile Waste in Factories

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## 2 Digital Traceability of Textile Waste

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## 3 Collecting, Aggregating and Sorting

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## 4 Matching Textile Waste to Best Use Case

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## 5 Design and Recycled Materials

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## 1

## Segregating Textile Waste in Factories

*Implement textile waste management systems to manage, segregate and trace post-industrial textile waste within apparel factories, separating waste streams at source.*



Segregating textile waste at the factory level is essential for improving the value of post-industrial waste, enhancing traceability and boosting recycling efficiency, while improving the quality of recycled material. Effective waste management systems, such as utilising bins for keeping textile cuttings separate by composition and colour can help prevent contamination by ensuring clippings do not land on the factory floor. In addition, effective segregation enables manufacturers to earn more from their textile waste streams. Some manufacturers are now implementing internal systems to generate their own supply of materials from cutting waste.

Aside from enabling the reuse of materials, this approach helps reduce emissions, prevent the loss of material value from unnecessary recycling and lower transport-related emissions. Systems for proper baling, packaging and labelling of waste are essential for dispatch to collectors, sorters or recyclers.

To ensure the effectiveness of these systems, factory workers need training so they can accurately identify the fabric types involved and employ effective sorting techniques. Workers also need to become proficient in using digital tools such as tags, scanners and tracking software. This process ensures that high-quality, uncontaminated feedstock reaches recyclers, increasing the value of the recycled materials and creating additional revenue streams for manufacturers. Case studies demonstrate that

the purchase value of aptly prepared textile waste exceeds the corresponding investment cost needed within the factory.

Certain challenges can complicate the segregation process. Currently waste textiles are often not separated by composition and colour and are sometimes dropped on the factory floors, leading to contamination and impairing the value of recyclable materials. This makes manual sorting complex, labour-intensive and costly, especially in view of the variety of fibre types, colours and treatments used. Contaminated or poorly sorted waste often ends up in low-value recycling or disposal – a missed opportunity for fully extracting the potential benefits of textile-to-textile recycling.

Managing this complexity may require sophisticated technology, such as advanced sorting machines and digital tools. However, their cost, coupled with the cost of the higher-skilled workforce needed to operate them, can make recycling at this stage unviable. Overcoming these challenges is vital not only for maintaining the quality of recyclable materials but also for compliance with regulations such as the EU Waste Framework Directive. Effective segregation can further improve environmental scoring, such as the Higg FEM 4.0 waste module, which can boost a manufacturer's reputation, afford a competitive edge as well as help attract buyers and secure investment.





2

## Digital Traceability of Textile Waste

*Optimise shared digital platforms for consistent data sharing and traceability of waste, registering quantities and characteristics to align separated materials with recycler requirements.*

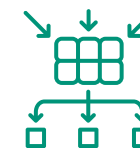


Digital traceability in textile waste management at the manufacturing level plays a crucial role in optimising the recycling process by aligning waste characteristics with recycler requirements. By documenting the qualities and characteristics of textile waste such as material type, colour, quality and condition, manufacturers can ensure that the segregated waste meets the specific needs for their reuse in-house or for recycling. The alignment process can be facilitated through shared digital platforms such as [Reverse Resources](#), which connects actors across the supply chain, enabling end-to-end oversight of textile waste flows. Such platforms permit real-time tracking of inventory data and monitoring of quantities and types of waste. As a result, they help ensure that the materials sent for recycling are precisely what recyclers need. Aside from enhancing accuracy and efficiency, the resulting digitised processes also support strategic planning for enhanced resource allocation and waste management.

Furthermore, digital traceability is essential when textile waste passes through intermediaries, including collectors, sorters and traders, before reaching recyclers. In many manufacturing regions, these actors often operate outside formalised processes, which reduces transparency and complicates efficient waste capture and utilisation. Digital records help maintain traceability throughout the chain, facilitating compliance with environmental regulations and improving reporting to stakeholders.

Integrating digital systems, however, has its challenges, particularly due to a lack of transparency in waste flows. This is often the case among informal collection and sorting handlers, for instance. The time and cost of adopting digital systems for these actors can be prohibitive without a compelling business case for data sharing, and it is not uncommon for mistrust of formal entities to further hamper adoption. It is therefore essential for manufacturers to leverage their relationships with waste handlers and actively bring them on board, enabling them to share the benefit of higher prices for textile waste through accurate traceability. To maximise efficiency and value, standardised data formats are needed to enable streamlined communication across the value chain, and stakeholders need support to build capacity and use traceability tools.





# 3

## Collecting, Aggregating and Sorting

*Define roles and streamline operations among intermediaries, such as collectors and sorters, ensuring that textile waste is properly prepared and delivered to recyclers while maintaining compliance throughout the process.*

Few factories have integrated systems to handle their own waste collection, sorting and direct recycling. Therefore, many operations rely on intermediaries to manage these processes effectively, including:

Other intermediaries may also be involved, depending on the local context and specific needs of the waste management process. These intermediaries might support:

parties, it is possible to increase operational efficiency, data accuracy and, in turn, the value of textile waste flows. Visibility of all actors also fosters social compliance as well as the identification and quicker mitigation of safety risks common in textile waste management, such as fire hazards and ventilation incidents. In addition, it is conducive to improving compliance and facilitating value sharing. Robust safety protocols are vital in the waste handling space, and shared investment is often needed to achieve compliance with regulatory standards and promote respectful and secure work environments as well as fair compensation.

- **Quality control** (i.e. performance and durability)
- **Logistics management** (i.e. storage and transportation)
- **Social and environmental compliance**
- **Pricing of waste**

Successful textile waste management ecosystems require increased visibility and clearly defined roles and responsibilities among the various actors. By identifying where steps such as segregation, cleaning and aggregation will take place, for instance, and which method will be used to trace the material flows between



### Collectors

Responsible for gathering textile waste from various factories and transporting it to aggregation facilities. By consolidating waste from multiple suppliers, collectors can aggregate larger quantities that meet recyclers' minimum volume requirements. This consolidation makes the recycling process more economically viable and ensures that the waste is processed in bulk.

### Sorters

Responsible for preparing the waste for recycling by material type, colour, size and quality, removing non-textile components and contaminants to ensure that the waste meets the specific requirements set by recyclers, as different recycling processes require distinct types of textile feedstocks.



## 4 Matching Textile Waste to Best Use Case

*Match textile waste types to the best use case and, accordingly, select the most suitable recycling technologies to ensure the highest quality of recycled material output.*

Recyclable textile waste can be directed through several channels. Below is a list of solutions by order of preference.

1

### Upcycling

Refurbish waste materials into higher-value products within the fashion industry.

2

### Recycling

Convert waste into high-quality fibres and yarns using advanced technologies.

3

### Downcycling

Process waste into lower-grade products, such as insulation or padding material.

**Where upcycling isn't an option**, textile waste should be matched to the next-best recycling use case. This involves a series of steps to ensure effective utilisation and high-quality outcomes.

- ① **Material Composition:** Identify and classify the textile waste into categories such as cotton, polyester, nylon or blends.
- ② **Quality Assessment:** Evaluate the textile waste's quality and contamination level to decide whether cleaning or pre-treatment is needed.
- ③ **Segregation and Sorting:** Sort the textile waste by material type, composition, colour and quality, using manual methods or automated technologies such as NIR spectroscopy (see previous section).
- ④ **Select Recycling Technology:** Choose the appropriate recycling technology based on material properties, accessibility, cost and location.
- ⑤ **Pre-Treatment:** Prepare the textile waste for recycling, for instance through cleaning, cutting into smaller pieces, shredding or applying chemical treatments in adherence with the recyclers' feedstock requirements.
- ⑥ **Recycling:** Use the selected technology to convert waste into recycled fibres for new products. In some cases, blend with virgin fibres to enhance quality.
- ⑦ **Quality and Safety Control:** Continuously monitor and test the recycled fibre for quality (performance) and safety (compliance), ensuring it meets standards and integrating feedback to improve recycling processes.








# 4

## Matching Textile Waste to Best Use Case

Currently available recycling technologies vary in their ability to handle different types of input materials. Accordingly, the quality of outputs is a function of both the input material and the choice of technology. Matching the appropriate technology to the textile waste type is therefore crucial for optimising recycling efficiency and ensuring high-quality material outputs.

Five types of recycling technologies will be at the core of the circular fashion system

 Pilot  Commercially ready

RECYCLING TYPE	INPUT/FEEDSTOCK	OUTPUT	EXAMPLE PLAYERS	READINESS TO SCALE*
<b>Mechanical fibre-to-fibre</b>	100% cotton, cotton-rich (>95%), wool (WO, WV, WS), denim, cotton polyester blends, solid colours, melange colours, synthetics	<ul style="list-style-type: none"> <li>Cotton fibre/yarn</li> <li>Wool fibre/yarn</li> <li>Needs to be mixed with virgin fibre for apparel application</li> </ul>	CYCLO, HILATURAS FERRE, RECOVER, RE&UP, COMISTRA (wool), RE.VERSO (wool), RDD, USHA YARNS, PURFI, BELDA LLORENS, SAENTIS (at Kipas Textiles), WOLKAT	 Commercial at scale today — focus on post industrial waste (except for wool)
<b>Regenerative cellulosic</b>	Cotton and cotton-rich textiles	<ul style="list-style-type: none"> <li>Man-made cellulosic pulp - For MMCF - lyocell and viscose applications</li> </ul>	INFINITED FIBER, EVRNU, SAXCELL, IONCELL, BIRLA CELLULOSE, LENZING (REFIBRA), SÖDRA (ONCE MORE), CIRCULOSE, REFACT, SHARETEX, CIRC	 Technology is commercially scalable — capacity is still limited. Still more expensive than MMCFs they are competing with like viscose and lyocell
<b>Regenerative synthetic</b>	100% Polyester Polyester-rich, knits and woven 100% Polyamide, Nylon	<ul style="list-style-type: none"> <li>Dimethyl terephthalate (DMT) Mono ethylene glycol (MEG)</li> <li>Terephthalic acid (PTA)</li> <li>Polyester chips</li> </ul>	EASTMAN, LOOP INDUSTRIES, INEOS, GR3N, CARBIOS, AMBERCYCLE, SYRE, PROTEIN EVOLUTION, QINGDAO AMINO (RE:LASTANE), DEPOLY, CURE TECHNOLOGY, ECONYL (Established), CIRC, SAMSARA, REJU,, EPOCH BIODESIGN, BASF LOOPAMID, RECYCELIT, SIXONE, RAVEL, REWIN, CYCLONE (Established), JIAREN (Established), JEPLAN, SAYA, REVALYU (mostly B2T)	 Promising technologies at laboratory, pilot, and demo scale and in the process of scaling commercially
<b>Thermo mechanical synthetic</b>	100% Polyester textiles, fibre and bottles 100% Nylon textiles and fibre	<ul style="list-style-type: none"> <li>PET pellets/fiber</li> <li>Polyester with same quality as virgin polyester</li> </ul>	TORAY GROUP, UNIFI (Repreve), POLYLANA, TEIJIN, TEX2TEX, EARTHPROTEX	 Recycling of PET bottles at scale slow adoption for recycling of textile feedstock
<b>Regenerative blended recycling</b>	Poly-cotton blends	<ul style="list-style-type: none"> <li>Cellulose powder/pulp and PET pellets/fiber/monomers with comparable quality as virgin polyester</li> </ul>	BLOCK TEXX, CIRC, WORN AGAIN TECHNOLOGIES, EEDEN, QINGDAO AMINO (RE:LASTANE), LOOPTWORKS, HYBRIDWORKS, RE&UP, SYNTETICA	 Promising technologies at pilot scale and in the process of scaling commercially

\* (Disclaimer: overall observed stage and capacity, however each company is at different level)

4

# Matching Textile Waste to Best Use Case



Additional important considerations in selecting recycling technologies include:

### *Availability and Location of Recycling Infrastructure*

Consider supportive infrastructure and/or logistics needed to transport textile waste to a suitable recycling facility. Consider the recycler's capacity and minimum quantity requirements, and seek a recycler located as close to the source of waste as possible to prevent unnecessary transportation.

### *Energy Consumption and Environmental Impact*

Evaluate the technology's energy requirements and overall environmental footprint.

### *Regulatory Compliance*

Confirm adherence to local and international regulations, i.e. related to emissions, waste handling and chemical use.

### *Import/Export Regulations*

Consider the impact of the customs rules and regulations applicable in specific economic zones on the ability to distribute waste to local or international recycling partners.

### *Added Cost*

Assess both the initial investment and long-term operational expenses to determine overall affordability and viability.

### *Traceability*

Ensure the technology supports effective tracking and documentation of materials for transparency and accountability.



## 5 Design and Recycled Materials

*Reintroduce recycled material outputs into the value chain with due consideration of material properties in design and product and testing.*

Before introducing recycled materials into the value chain, several factors must be carefully assessed to ensure they can be processed in new products effectively. Key considerations include fibre quality, length and durability, all of which affect a material's ability to meet safety and performance standards for new product applications. The recycled material's compatibility with finishing treatments and production processes is likewise important, as it directly influences the final product's quality and functionality. Accordingly, brands need to adopt new approaches to product design that factor in the unique properties of recycled materials. They also need to work collaboratively to redefine quality standards and testing specifications in order to effectively scale industry-wide recycling efforts.

Traditionally, brands have controlled material selection and product design. Going forward, however, collaboration with manufacturers and recyclers can play a more prominent role and assist garment design for recyclability. Such partnerships can improve material recovery and recycling efficiency while minimising waste. Collaboration in this ambit is vital if new materials and technologies are to be adopted to enhance product durability and recyclability, contributing to the broader shared goal of circular design. Designers, too, can play a key role by reducing the complexity of materials used to produce textiles, allowing recycling innovation efforts to focus on a smaller palette of materials optimised for both functionality and recycling technologies. By doing so, they can increase input volumes for individual technologies and, in turn, support swifter scaling. Recent studies indicate a corresponding reshuffling of priorities along these lines, with 90% of brands and 85% of manufacturers having set targets to design for the circular economy by 2040.<sup>12</sup>



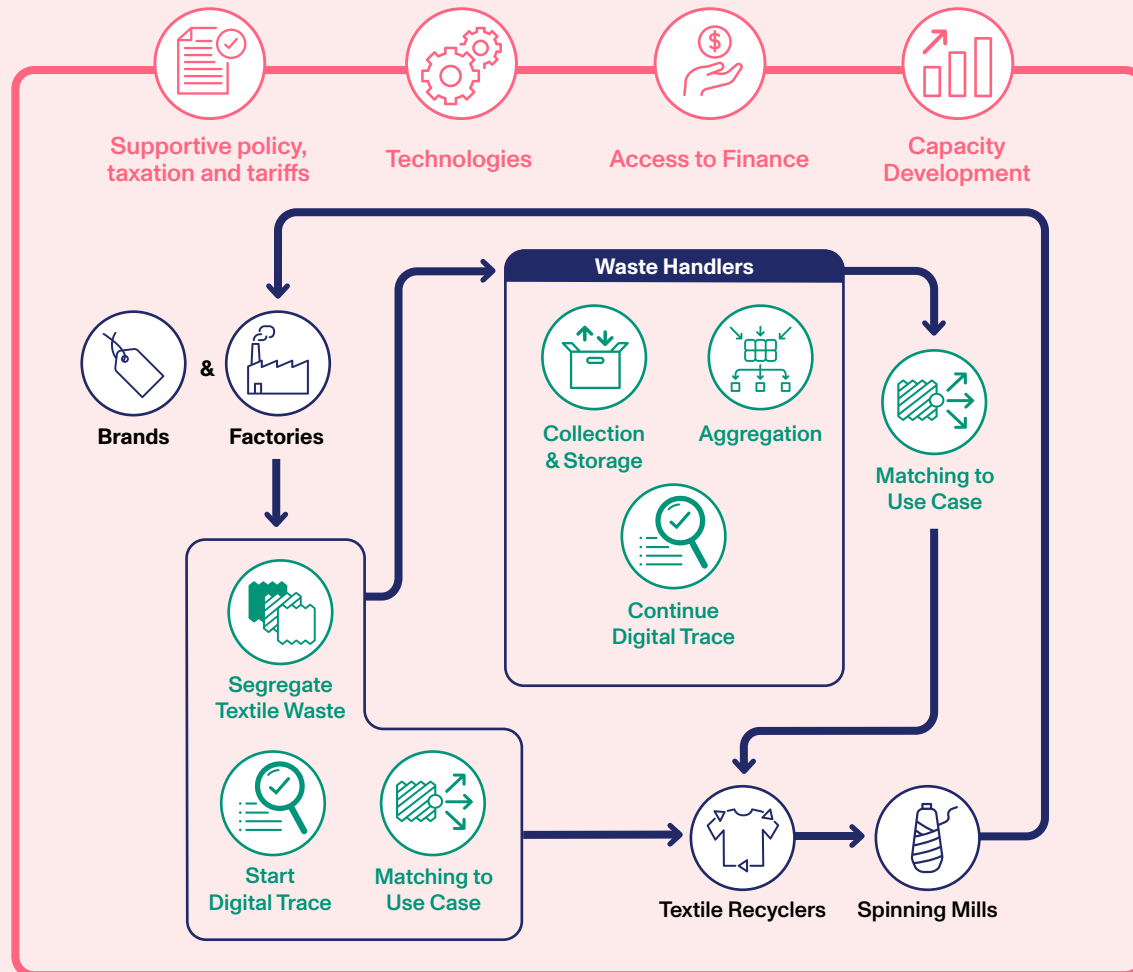
It is also in the interest of brands to provide greater transparency regarding material sourcing specifications and recycled material properties. This enables manufacturers to better adapt and refine recycled materials to satisfy product needs for greater quality and improved recyclability. Understanding how recycled materials may deviate from virgin materials, and how this can impact product performance, is crucial. In addition, manufacturing equipment is typically optimised for specific virgin materials, limiting the scope of options for using recycled materials. Close collaboration among all value chain actors is essential to develop new processes suited for integrating recycled materials, phase out those that exclude recycled

materials and explore suitable composites that render the desired garment characteristics.

The ability to meet performance and aesthetic standards is likewise dependent on effective collaboration between all actors. Strong partnerships can drive improvements that enhance consumer satisfaction, attract new business and ultimately raise demand for high-quality recycled fibres. As the market for these materials grows, players can improve their competitiveness, command higher prices and expand their customer bases, creating a virtuous cycle. That said, rigorous quality control is essential to avoid undermining consumer trust and stifling future demand.

# Criteria for a Conducive Environment for Circularity

While circular commercial collaboration between brands, manufacturers, waste handlers and recyclers is crucial for establishing effective systems to capture and extract the value out of post-industrial waste, engaging a broader ecosystem – encompassing technology and logistic providers, financiers, policymakers and consumers – is essential for creating an environment conducive to systemic change towards a more circular fashion industry.



1

**Supportive policy, taxation and tariffs**

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2

**Technologies**

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3

**Access to finance**

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4

**Capacity building**

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## 1

## Supportive Policy, Taxation and Tariffs

*Supportive policy, taxation and tariffs are needed to create a favourable environment for investment in textile recycling and compliance of circular value chains, such as tariff policies on imported recycled materials or incentives to formalise textile waste handling.*

While circular commercial collaboration between brands, manufacturers, waste handlers and recyclers is crucial for establishing effective systems to capture and extract the value out of post-industrial waste, engaging a broader ecosystem – encompassing technology and logistic providers, financiers, policymakers and consumers – is essential for creating an environment conducive to systemic change towards a more circular fashion industry.

It is important to raise awareness of the benefits a high-value domestic recycling industry offers amongst policymakers in manufacturing countries, and for them to be included in industry consortia, such as the Circular Fashion Partnership project to further support the development of national technology strategies. Recommended actions for policymakers in manufacturing countries are to:

- **Identify, incentivise and regulate** the informal textile waste management sector with a view to advancing social compliance and enabling participation in the formal value chain.
- **Explore tax-based and other incentives and disincentives** to encourage domestic textile recycling and discourage waste incineration, downcycling and export, including in the context of Export Processing Zones and with a long-term view to attracting international recyclers.
- **Establish policies and legislation to support green energy and infrastructure investment**, attract funding for larger chemical recycling facilities with access to renewable energy and help divert textile waste from incineration for energy recovery.

EU and other international policymakers should also engage in existing initiatives and platforms working on circular textiles. Recommendations to this group are to:

- **Build on the roadmap of the EU Strategy for Sustainable and Circular Textiles** to integrate a truly global dimension when developing national and regional circularity policies, develop synergised strategies and to stay abreast of, and contribute to, the development of criteria for successful and fair circular business models and work to establish a common understanding of legal issues such as waste ownership.
- **Foster the creation of more high-quality jobs and sustainable social value for manufacturing countries by training and upskilling workers.** The EU could expand its efforts to transfer skills to manufacturing countries, for instance under its Pact for Skills.
- **Explore how incentives such as taxation can encourage recycling and the increased adoption of recycled materials in garments**, for instance through a carbon tax or reduced taxation on garments that contain recycled fibres.
- **Establish policies and legislation to support green energy and infrastructure investment in manufacturing countries**, such as through the UNFCCC and its Fashion Charter WG4 on policy engagement working on this topic, to further attract investment in larger chemical recycling facilities that will be reliant on good access to renewable energy and to deroute textile waste from incineration for energy.







## 2 Technologies

*Optimising textile-to-textile recycling requires appropriate identification and traceability of feedstocks and matching to the best possible recycling technology.*

Ideally, textile waste is identified and sorted within a manufacturing facility, as this omits the need for identification technology since the manufacturer knows what material types and characteristics it uses. Through the adoption of tracing technologies, such as the Reverse Resources platform or blockchain solutions, manufacturers can then provide insights into the material characteristics and possibly certifications to textile waste collectors and textile recyclers.

At present, the textile waste reaching aggregators and sorters is often not clearly labelled and its source is unknown. Technologies such as NIR spectroscopy by TOMRA and optical sorting machines such as the Picvisa Ecoclip can be utilised for material recognition, optimising material recovery and reducing manual labour through automation in waste segregation and processing.

Recycling technologies – whether mechanical recycling solutions such as textile shredders and carding machines or chemical recycling methods such as depolymerization technologies and solvent-based recycling – are crucial for handling different types of textiles. (See the previous section for an overview of technologies and their maturity level.)

Given the energy-intensive nature of many recycling technologies, integrating renewable energy infrastructure is vital to meet decarbonisation goals, align with future regulations and reduce long-term energy costs, thereby enhancing the economic viability of recycling operations.

To enable the effective implementation of technology to scale textile-to-textile recycling in manufacturing countries, stakeholders are recommended to:

### *Keep it Simple*

Where possible, capture textile waste at its source, within a manufacturing facility, to avoid the need for complex material identification technologies. Apply simple steps such as bins and labelling, and establish credible traceability solutions directly from the cutting table, possibly via a waste handler, to a recycler.

### *Build Capacity and Support Training*

Organisations should create training initiatives for their employees and stakeholders involved in the recycling process to enable them to use textile waste management systems that allow effective segregation of textile waste and to use traceability tools that permit matching textile waste to a suitable recycling solution.



### *Participate in Collaborative Projects*

Industry stakeholders should participate in projects that bring together brands, recyclers and other actors to develop and test recycling processes in real-world settings. Such collaboration can provide valuable insights, refine processes and demonstrate the practical benefits of new technologies in textile recycling. Examples include Circular Fashion Partnership (Bangladesh, Cambodia, Indonesia, Vietnam, Turkey) and Sorting for Circularity (India, Europe) projects.



3

## Access to Finance

*enables critical investments to be made in advanced recycling technologies and the necessary infrastructure to achieve effective textile waste processing.*

The high initial costs associated with establishing large-scale textile waste processing and recycling facilities make recycled fibres more expensive than virgin ones today. Consequently, achieving economies of scale is critical for reaching long-term cost parity. In addition, manufacturers seeking to integrate textile waste processing in their operations need upfront investment for machinery. Vertical integration can improve efficiency and reduce the cost of waste handling. It can also potentially lower material sourcing costs by converting currently wasted materials into new usable materials in-house. Access to low-interest loans facilitated thanks to collaboration arrangements with brands and banks and co-financing mechanisms to share costs and benefits can support such investments. Beyond recycling technologies and machinery, funding is also vital for R&D efforts to innovate and enhance recycling technologies.

Grants and private investments also have an important role to play in advancing textile recycling initiatives. For instance, H&M Group has invested in polyester recycler Syre and BESTSELLER in cotton-rich recycler Infinited Fiber Company in a bid to secure access to recycled material output. Such initiatives are partly motivated by legislation such as the Ecodesign for Sustainable Products Regulation (ESPR) that will impose requirements regarding the share of recycled materials in most products. By securing multi-year contracts with fashion brands, recyclers can significantly enhance their long-term profitability and investor confidence as the resulting reliable and predictable revenue streams improve planning certainty in both operating and investment activities.

Furthermore, such long-term agreements demonstrate stability and commitment to stakeholders, making the business more attractive to investors who seek sustainable growth opportunities and fostering further investment in innovative technologies and practices.

Stakeholders in manufacturing countries are recommended to:

### *Facilitate Access to Financial Support*

Governments and financial institutions should create tailored financial programmes such as low-interest loans and co-financing mechanisms specifically designed for the textile recycling industry.

### *Promote Vertical Integration*

Manufacturers should consider vertical integration strategies that allow for in-house processing of waste materials. Investing in machinery to convert waste into new materials can enhance efficiency, lower waste handling costs and improve the quality of recycled outputs.



### *Encourage Long-Term Partnerships*

Brands should establish long-term agreements with manufacturers, while recycling companies should seek to establish multi-year contracts with fashion brands to ensure stable feedstock supply and recycled material offtake. Such formal long-term arrangements can help secure steady and predictable revenue streams for recycling operations, while also signalling to investors a commitment to sustainable practices.



4

## Capacity Building

*across the supply chain, conducted in a deliberate and coordinated manner, is essential in multiple domains.*

At the factory level, workers need to be trained in textile waste segregation. Digital traceability tools are critical for matching textile waste with appropriate recycling solutions and usage starts at the factory level. Other stakeholders, especially the informal waste sector, also need support in adopting these technologies to ensure accurate traceability to recycling. Upskilling is also necessary for external service providers managing tasks like quality control, logistics and compliance.

To complete the circular system, consumer education is vital. Public and private sectors should invest in campaigns to raise awareness of the benefits of recycling and encourage responsible purchasing decisions. Interactive initiatives, such as workshops, can engage consumers and drive demand for upcycled products, reinforcing circularity throughout the industry. For instance, Patagonia's Worn Wear programme hosts repair workshops that teach customers how to fix their products, emphasising the importance of recycling and reusing rather than discarding items. Similarly, H&M's Garment Collecting programme encourages customers to return unwanted clothes for recycling and complements this with educational campaigns about the recycling process and its environmental advantages. When brands activate their audience through interactive experiences, they not only increase consumer loyalty but also cultivate a community of advocates for recycling. This heightened engagement and understanding leads to increased demand for recycled products, pushing industries to adapt and innovate.

Private and public sectors are recommended to:

### *Adapt Technology Strategies to Available Skills and Future Requirements*

Technology strategies need to be grounded in realistic assessments of the skills available in manufacturing regions as well as the potential for up- and reskilling through partnerships with local organisations and educational institutions. It is equally important to ensure that envisaged capacity building efforts do not compromise the long-term viability of recycling operations.

### *Introduce Policies that Support Skill Transfer*

Production countries need to introduce policies conducive to the transfer of skills from advanced economies in order to foster high-quality job creation.

### *Form Industry Alliances and Public Private Partnerships to upskill the informal sector*

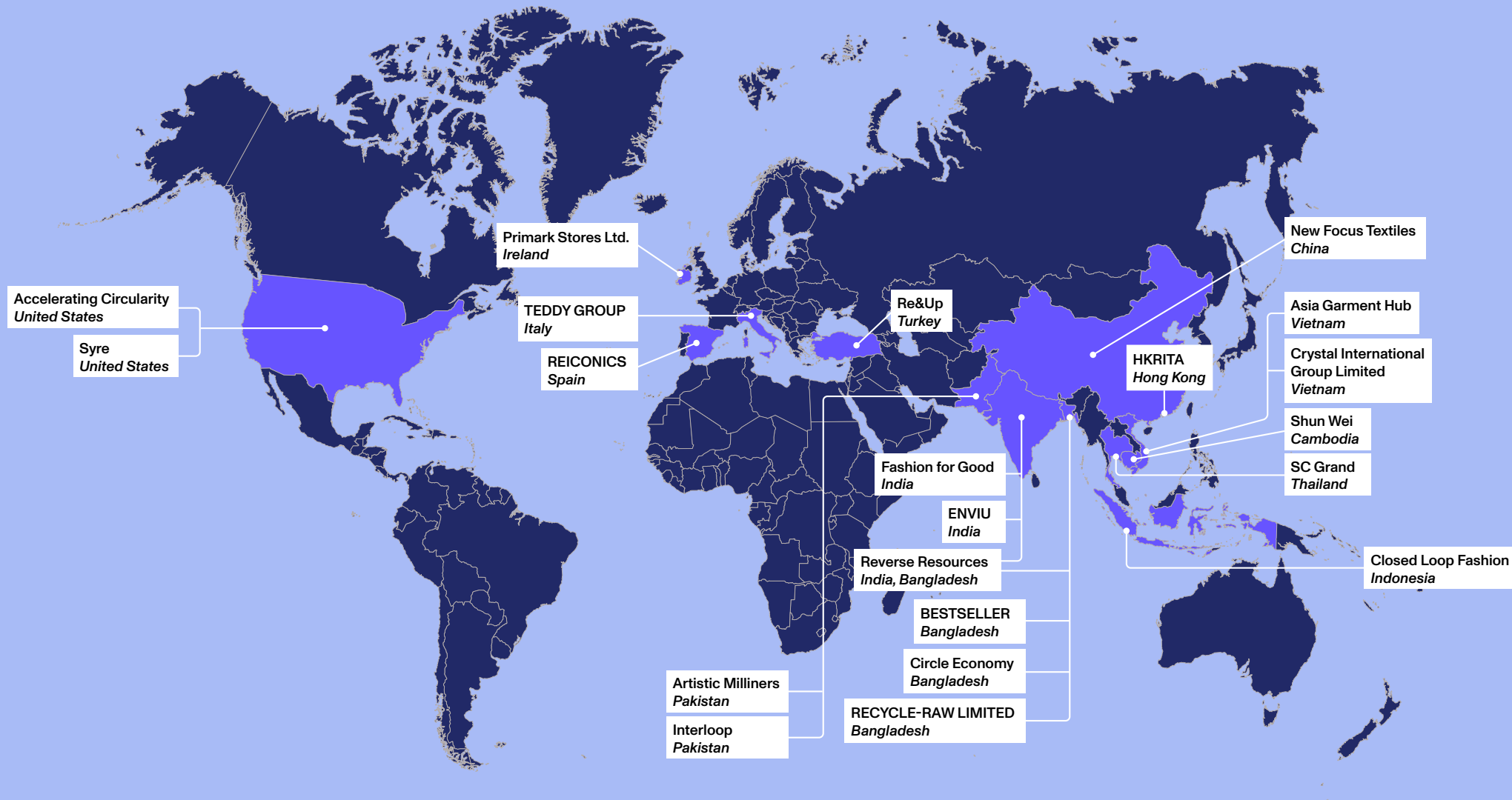
The public and private sectors should join forces and make concerted efforts to professionalise the informal sector. NGOs and international development cooperation organisations can play a pivotal role in such initiatives.

### *Invest in Consumer Education Campaigns*

Allocate resources to develop education campaigns and community events that clearly highlight the benefits of recycling and of purchasing products with recycled material, using informative content, interactive platforms and workshops to enhance consumer understanding of recycled materials' value.

# Exploring Regional Case Studies

Pioneering companies and institutions are already implementing, testing and scaling upstream circularity practices in manufacturing countries around the world, often in collaboration with peers and partners in the value chain. These pockets of progress provide promising examples for replication and an invitation to collaborate. Furthermore, they demonstrate how our step-by-step guide can be tailored to fit local contexts. In this spirit of collaboration, best-practice sharing helps build a solid foundation for a globally connected circular fashion value chain.



# RECYCLE-RAW LIMITED

*Safe and Respectful Waste Handling*



## Bangladesh

Social compliance is crucial in the textile waste management sector as it ensures ethical labour practices and promotes worker safety, two areas in which improvement is urgently needed in Bangladesh. RECYCLE-RAW has made significant strides in improving working conditions through various comprehensive initiatives, such as providing friendly working conditions, proper dining facilities, purified drinking water stations and qualified first-aid support with well-stocked kits. Workspaces are designed with natural light, well-marked aisles and advanced ventilation to enhance safety. Rigorous safety protocols, training, a well-equipped firefighting team and separate clean restrooms for men and women contribute to workers' well-being and health. Additionally, salaries are paid on time and working hours comply with labour laws. Recently, RECYCLE-RAW applied for Sedex accreditation, which verifies social compliance across several global labour standards, aiming to provide a comprehensive textile waste management solution.

Established in 2015, RECYCLE-RAW LIMITED is a pioneering textile waste management company that is leading the way in social compliance in Bangladesh and is now expanding into Indonesia, India and Europe. The company sources post-industrial textile waste from key zones and is currently researching post-use waste, collaborating with factories and informal syndicates to collect, clean and segregate waste for recyclers. By removing unwanted components, matching colours and compositions and scaling single-fibre materials, RECYCLE-RAW produces fully traceable, premium-quality feedstock.

[Learn more here](#)

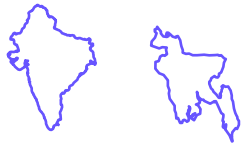


**“RECYCLE-RAW is the only compliant entity in Bangladesh right now. That means that we are competing with all non-compliant units for orders. Buyers need to understand the importance of compliance. They should motivate and support us by placing more orders. This is what we are trying to make them understand as a part of our next steps.”**

**Abdur Razzaque**, Managing Director, RECYCLE-RAW LIMITED

# Reverse Resources

## Universal Code of Conduct and Compliance



India Bangladesh



A universally accepted Code of Conduct (CoC) for waste handlers is necessary to create compliant, safe and respectful work environments within circular supply chains. Reverse Resources is collaborating with brands, NGOs and recyclers to establish a CoC and align it with existing compliance standards. The company is also developing a comprehensive compliance monitoring and reporting system while providing direct support to waste handlers to help them meet these standards, and regularly measures baseline progress. Initial efforts since the system’s launch among the group of waste handlers selected in Bangladesh and India have led to notable improvements, including an increase in full-time employment (40% yearly increase within four years on average) and reported business and revenue growth. Reverse Resources intends to publish the CoC for waste handlers in the near future, aiming for broad implementation and adoption by the recycling sector to support their transition to formalised operations and compliance. Reverse Resource’s goal is for waste handlers to only be subject to one compliance system. Consequently, it welcomes feedback and support from brands, recyclers and other stakeholders in applying its approach industry-wide.

Founded in 2014, Reverse Resources is a leading digital traceability platform that connects textile waste with recycling solutions. It operates in 800+ factories across Bangladesh, India, Vietnam, Indonesia, Pakistan and Africa, and includes more than 160 textile recyclers. As a core partner of the Circular Fashion Partnership since 2020, the Reverse Resources Platform enables companies to register waste quantities and characteristics in their supply chain, providing real-time tracking and end-to-end transparency of waste flows to recycling solutions.

[Learn more here](#)



**“RR’s innovative approach has significantly improved our daily operations. We now monitor the flow of materials, identify waste sources and optimise collection routes. (RR) aided us in implementing minimum social compliance in our workplace, encouraging us to get ISO 14001 certification.”**

**Muthu Sathish**, Managing Director, JK Traders

# REICONICS – Recover™, Evlox and Jeanologia

## Collaborative Recycling Solution from Fibre to Finish



Spain

In textile recycling, diverse stages, actors and solutions need to be integrated and complement each other to enable knowledge exchange and deliver comprehensive, effective recycling solutions. Launched in 2023, REICONICS, a recycled denim capsule collection, embodies this collaborative approach. Aiming to enhance circularity in the denim industry from fibre to finish, the collection was born from collaboration between industry experts Recover™ (recycled cotton fibre specialists), Evlox (established denim manufacturer) and Jeanologia (technology developer for eco-efficient production).

Each piece in the REICONICS collection is made entirely from cellulosic fibre, including 32% Recover™ recycled cotton fibre from post-industrial waste. This mono-material approach, which includes sewing threads, significantly enhances recyclability. By integrating Recover™'s recycled cotton fibre and Jeanologia's advanced finishing technologies, the production of a REICONIC jacket permits the conservation of up to 760 litres of water compared to traditional methods. Jeanologia's innovative finishing processes, including laser, G2 ozone, eFlow and ATMOS, additionally replace traditional stone washing and achieve up to 80% water savings in the finishing stage. Furthermore, Jeanologia's EIM self-accreditation tool monitors environmental impacts, recording water and energy consumption, chemical use and worker health – a tool now widely adopted across the industry. The collaboration between recyclers, spinners, weavers and finishers has resulted in high-quality, responsible denim made from recycled post-industrial waste and proves that recycled fibres can be adapted into stylish, unique pieces through innovative sustainable solutions. Going forward, the partners aim to continue showcasing what is possible in design and finishing with recycled materials.

[Learn more here](#)



**“Recover™ is proud to be part of the REICONICS collection, a groundbreaking project that will pave the way towards a more sustainable future. Together, we are offering brands a pathway to reduce their environmental impact caused by raw material production and waste.”**

**Alfredo Ferre**, Chief Product, Innovation and Sustainability Officer, Recover™

# HKRITA

## Separating Blended Textiles at Scale



### Hong Kong

Recycling blended materials poses a significant challenge due to the difficulty of separating mixed fibres during processing. To address this, HKRITA developed the Green Machine in 2016, a groundbreaking technology designed to separate blended textiles, specifically targeting cotton and polyester. This solution preserves the quality of polyester fibres, enabling efficient fibre-to-fibre recycling. The Green Machine is both commercially viable and cost-effective, utilising a hydrothermal process that requires only heat, water and less than 15% biodegradable green chemicals. Its closed-loop system continuously reuses water, heat and chemicals, eliminating secondary pollution. The technology processes post-use waste, achieving a recovery rate of over 97% for polyester fibres, which are then ready for use in new fabrics. It also produces recycled cotton cellulosic powder for use in super-absorbent materials for agricultural applications, a durable water-repellent finishing reagent and regenerated cellulose fibres. To date, the technology has been adopted by an international denim manufacturer and a US textile recycling manufacturer. The Green Machine 2.0, with a daily recycling capacity reaching 1 metric tonne, is now operated in Open Lab in Hong Kong, fostering the circular economy and sustainable development in the textiles and fashion industry.

Established in 2006 in Hong Kong, HKRITA leads research and development in the fashion and textile industry, fostering sustainable growth and pioneering technical solutions to industry challenges. Their ongoing goal is to develop the Green Machine into a complete industrial treatment process.

[Learn more here](#)



**“We’ve witnessed the rapid evolution of the Green Machine from a mere research idea to a cutting-edge technology for the industry. The industrial-scale Green Machine at Open Lab now offers a practical and sustainable solution for recovering and utilising valuable materials.”**

**Edwin Keh**, Former CEO, HKRITA



# Re&Up

## Innovative Recycling Technology for Blended Materials

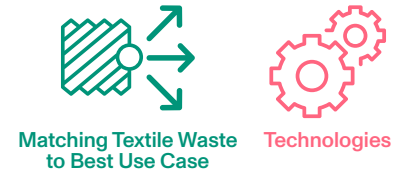


### Turkey

It is becoming increasingly challenging to meet rising industry demand for quality recycled textile fibres that are commercially viable. In 2023, Re&Up pioneered a revolutionary technology, becoming the first in the industry to effectively recycle poly cotton blends into high-quality raw materials at scale. This innovative process, consisting of six key steps, establishes a closed-loop system for end-of-life textile waste. To do this, Re&Up collects waste from post-industrial and post-use waste sources, sorts it based on composition and prepares it for either patented mechanical or thermo-chemical recycling. The result is two distinct reusable products: next-gen cotton fibres and next-gen polyester chips. These recycled fibres not only match the performance of virgin materials but also offer high quality, traceability, competitive pricing and significantly better resource efficiency, with up to 95% less water use and 85% lower carbon emissions. Complying with standards such as GRS and RCS, the fibres are used by yarn manufacturers and in the entire apparel industry. Going forward, Re&Up plans to expand its annual recycling capacity to over 200 thousand metric tonnes in Turkey by 2025 and increase its global capacity to over 1 million metric tonnes by 2030.

Founded in 2023, [Re&Up Recycling Technologies](#), a new venture of Sanko Holding, specialises in recycling and upcycling textile waste. Operating initially in Turkey, the company plans to expand to high-potential regions, starting with Europe. Re&Up is dedicated to advancing innovation in quality cotton and poly blend materials.

[Learn more here](#)



**“We’re proud of our efforts to advance circular textile recycling through continuous innovation. Our goal is simple: to deliver innovative, next-gen, long-lasting solutions that benefit both the industry and the planet.”**

**Ebru Özküçük Güler**, Chief Sustainability Officer, RE&UP

# Closed Loop Fashion

## Standardised Post-Industrial Textile Waste Management in Factories

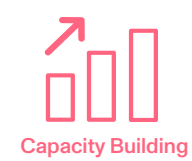


### Indonesia

Standardised textile waste management is crucial for accurately quantifying waste, optimising recycling processes and reducing reliance on virgin resources. Closed Loop Fashion has developed a textile waste management standard which is currently the only dedicated industry standard. The methodology applies an in-depth, comprehensive assessment of current waste management practices at factories, covering six modules and about 120 compliance points. Customised corrective action plans are defined on this basis and capacity building is developed to help factories enhance their waste management practices. Establishing standardised textile waste management practices makes feedstock for recycling more accessible, traceable and profitable and allows for enhanced compliance with international standards such as Higg FEM and GRS. As a key consortium partner of the Circular Fashion Partnership Indonesia, Closed Loop Fashion will implement its standard within the project framework. This includes assessment and capacity building of 30+ manufacturers and a target of more than 9,000 metric tonnes of post-industrial textile waste to be properly managed and made accessible as feedstock for recycling during the project.

Founded in 2011, [Closed Loop Fashion](#) serves as an established competence hub for applied sustainability and circular economy practices in the textile and apparel industry across Asia, North Africa and Europe and is an implementation partner of the [Circular Fashion Partnership](#). Specialising in custom-tailored projects, CLF guides brands, textile manufacturers and related organisations, focusing on environmental sustainability, climate change targets and circular economy principles.

[Learn more here](#)



**“Natural disasters caused by climate change and other risks relating to the accessibility of virgin resources are increasingly significant threats to our industry. Creating effective circular supply chains and functioning recycling eco-systems is key to reducing this reliance and risk. And to achieve this, establishing textile waste management practices is an essential starting point.”**

**Marina Chahboune**, Founder, Closed Loop Fashion

# Fashion For Good

## Industry Alliance for Textile Recovery



India

Pre-competitive collaboration and open knowledge sharing are vital to accelerate innovation, reduce effort duplication and enable collective problem-solving to advance circularity in textile waste industries. Recognising this, Fashion For Good launched the [Sorting for Circularity India Project](#) in 2021 to transform India's textile waste market into a circular system. The project employed a three-phase approach: increasing visibility and access to textile waste, harnessing India's recycling potential, and establishing the necessary systems, infrastructure and regulations for waste management. Key insights from the project have led to the publication of a comprehensive [open-access toolkit](#) including the [Wealth in Waste](#) study, which provides a detailed analysis of India's textile waste landscape alongside the lessons learned from innovative post-use and post-industrial pilots. To scale these efforts, Fashion For Good, in collaboration with IDH, Laudes Foundation and Canopy, established the Re-START Alliance (Recover by Sourcing, Tracing, and Advancing Recycling Technologies) to create the conditions to scale and unlock the full value of textile waste, initially targeting India and ultimately striving to reintegrate 1 million metric tonnes of recycled fibres into global supply chains.

Established in 2017, [Fashion for Good](#) is a sustainable fashion innovation platform that connects disruptive solutions with industry networks. Its programmes offer project management support, access to funding and a robust ecosystem of mentors and experts.

[Learn more here](#)



**“The Sorting for Circularity Project revealed the tremendous opportunity that exists for India to be the leader in textile-to-textile recycling. Our reports show a business case for circularity; however, a lot of unlocks are needed in parallel to make this work.”**

**Priyanka Khanna**, Innovation Director, Fashion for Good

## SC Grand

### *Mechanically Recycling Textile Waste into New Fibres and Materials*

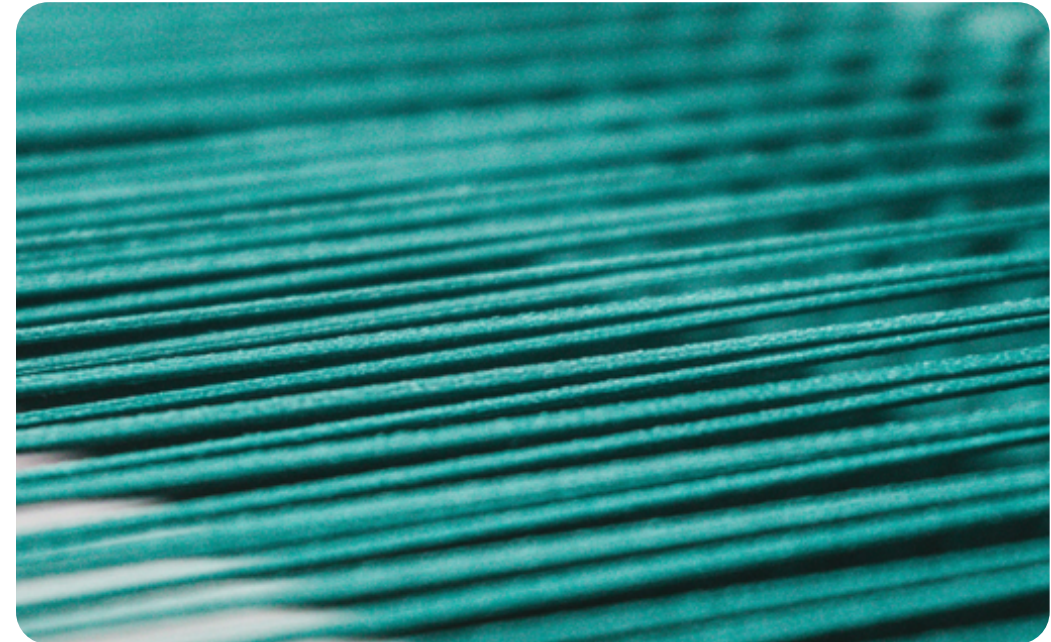


#### Thailand

An increasing number of brands are seeking out recycling solutions to repurpose their textile waste and thereby reduce discard and their environmental impact. In 2022, SC Grand launched the Closed Loop project in Thailand to recycle and transform textile waste from fashion brands into valuable items. Acting as a supply chain partner, SC Grand turns the fashion industry’s unused clothing and fabric scraps into new knitted or woven fabrics, home textiles and final products. The mechanical recycling process it applies commences with textile segregation, which is followed by shredding and spinning into new fibres and materials suitable for use in clothing and accessories. This process revitalises the value of these materials and reduces their environmental impact, saving 440 litres of water and mitigating close to 4 kg of carbon emissions for every kilogramme of fabric recycled. Moving forward, SC Grand aspires to establish itself as a recycling hub in the ASEAN region and position itself as a central figure in the sustainable textile ecosystem, fostering collaboration with textile and fashion companies keen to tackle textile and agricultural waste.

Founded in 1987, SC Grand specialises in recycling textile and agricultural waste into new products, with a strong emphasis on reducing environmental impact. In addition to its Closed Loop project, the company offers sustainable fabrics and provides made-to-order design and production services tailored to its customers’ needs.

[Learn more here](#)



**“We try to inspire the fashion industry and other sectors to be part of the solution for our shared future.”**

**Wat Jirarot**, Managing Director, SC Grand

# ENVIU

## Innovative Venture Building to Reduce Textile Waste and Increase Employment



India

Innovative ventures can unlock new possibilities for discovering advanced solutions to recycle textile waste, driving significant progress towards circularity within the industry and setting the stage for a more sustainable, waste-free future. In 2017, Enviu launched the Reweave programme to develop ventures with sustainable, circular manufacturing processes, creating value from textile waste streams. One such venture in India, The Good Felt, repurposes both post-industrial and post-use fabric waste into high-quality felt products, including acoustic panels, bags and home decor items. In collaboration with local textile waste collectors, The Good Felt initiative has to date diverted 3,000 kg of waste from landfills and created 90 employment days. Part of the project includes capacity building to support informal workers in sorting effectively and establish a business case to create inclusive value chains. The Good Felt initiative aims to divert 2,000 metric tonnes of textile waste from landfills by 2028. Looking ahead, the Reweave programme is validating additional business interventions and increasing market linkages to ensure that the business models become self-sustaining by 2028, allowing them to operate without reliance on philanthropic funding.

Founded in 2004, Enviu develops entrepreneurial programmes to repair broken value chains and drive industries towards sustainability. The organisation validates new business models by creating, replicating and accelerating ventures across logistics, textiles, food and agriculture in multiple countries.

[Learn more here](#)



**“The Good Felt, with its innovative material, has redefined textile waste management by transforming fabric waste into a versatile non-woven material for multiple industries and creating green jobs. Our vision is to see The Good Felt widely adopted, making a lasting global impact.”**

**Anurag Jain**, CEO, The Good Felt

## Artistic Milliners

### Fostering Centralised Textile Waste Recycling Hubs

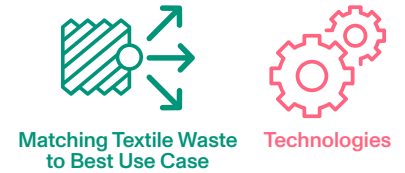


#### Pakistan

Reducing post-industrial textile waste on a large scale demands cutting-edge facilities capable of efficiently managing and recycling significant volumes of material. In 2022, Artistic Milliners opened Circular Park in Pakistan, a 70,000-square-foot recycling facility designed to serve as a central hub for collecting its primarily cotton-based manufacturing waste along with some post-industrial waste. Equipped with capacity to recycle 500,000 kilogrammes of post-industrial and post-use waste each month, Circular Park ensures that materials are reintegrated into the production loop as high-quality fibres, rather than being discarded. Powered by solar energy and equipped with state-of-the-art recycling machines, the facility operates at net-zero energy. It keeps 334 metric tonnes of waste out of landfills monthly, conserves almost 1 billion litres of water and significantly mitigates carbon emissions compared to using conventional virgin fibre. Artistic Milliners is now working on blockchain-enabled traceability and experimenting with other tracer technology as well as mapping and verifying internal and external waste supply chains to track and trace its raw materials including its recycled fibre and feedstock and further increase the credibility of its recycled products.

Founded in 1949, Artistic Milliners is a multinational specialised in denim manufacturing. Focused on innovation, sustainability and women empowerment, Artistic Milliners is committed to keeping all its denim manufacturing processes sustainable and eco-friendly. The company drives various initiatives, including the Milliner Cotton Initiative, an organic cotton farming project promoting local ethical cotton sourcing in Pakistan.

[Learn more here](#)



**“The jewel in our circular manufacturing crown, Circular Park is outputting up to half a million kilogrammes of recycled fibre from pre- and post-use sources using clean energy. Circular Park is set to become the hub of fibre recycling efforts company-wide.”**

**Omer Ahmed**, Managing Director, Artistic Milliners

## New Focus Textiles

### *Upcycling School Uniforms Through Mechanical Fabric Recycling*

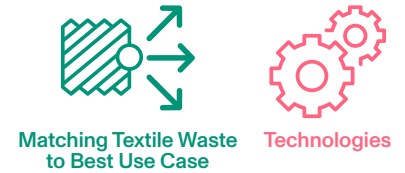


China

Upcycling using advanced recycling methods plays a pivotal role in reimagining how fabrics can be repurposed and given a second life. In 2021, New Focus Textiles introduced circular-loop fabric upcycling services for post-industrial and post-use textiles and garments using its mechanical fabric recycling facilities. With a recycling process that minimises water and chemical use, combined with special yarn-spinning techniques, the company’s Huzhou factory in China upcycles school uniforms and textiles from the hospitality sector. In addition, it collaborates with major garment cutters to collect and upcycle their cutting waste. The waste is sorted by colour and fibre composition and labelled with QR codes for tracking. Between 2021 and 2023, these efforts mitigated almost 180,000 kilogrammes of carbon emissions and saved close to 3.5 million cubic metres of water, while diverting over 37,000 kilogrammes of cotton scraps from landfills. Going forward, New Focus Textiles plans to collaborate with three additional schools in China in a uniform recycling project and aims to expand in Europe, partnering with schools and hospitality businesses in recycling initiatives and for research into materials recycling and upcycling.

Founded in 2007 and headquartered in Hong Kong, New Focus Textiles Limited is a circular woven fabric manufacturer with production hubs in China, Vietnam and Portugal. With expertise in circular mechanical recycling and as a GRS-certified supplier of recycled cotton, the company has a strong focus on sustainable practices and has won the Lenzing™ Strategic Partnership Award.

[Learn more here](#)



**“We’re seriously committed to finding solutions that drive progress in the textile industry. It’s important for corporations and future generations to engage in efforts to make progress and it is our social responsibility to educate students about circularity.”**

**Philip Yu**, Managing Director, New Focus Textiles Ltd.

## Asia Garment Hub

### Waste Management Training and Knowledge Exchange

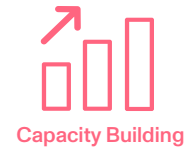


Vietnam

Effective training in textile waste management is essential for standardising best practices, improving resource efficiency and ensuring industry compliance. The collaborative initiative Waste No More (WNM) established by GIZ aims to advance closed-loop recycling of post-industrial textile waste while promoting decent health and safety standards in Vietnam's waste sector. WNM engages multinational brands, business associations as well as waste collectors and recyclers within Vietnam's textile, apparel and footwear industries to drive these efforts forward, serving as a prime example of collective action. WNM provides freely accessible training courses in the local language as well as focused working groups. By April 2024, over 1,100 officers from 490 manufacturers and brands had completed training in waste management for circularity, while more than 140 manufacturers engaged in peer working groups promoting the implementation of waste segregation and waste data collection through peer learning and networking. From 2025 onward, the initiative is expected to be transferred to private sector stakeholders, ensuring the continuous implementation of waste improvement efforts and securing high-quality post-industrial feedstock for both mechanical and advanced recycling processes, thereby contributing to Vietnam's potential as a future textile recycling hub.

The [Asia Garment Hub](#), established by GIZ's FABRIC project and ILO in 2020, is a digital knowledge platform that hosts several tools and resources and connects diverse stakeholders to promote and implement decent work and sustainable practices in the Asian garment industry.

[Learn more here](#)



**“It (Waste No More) definitely helped to increase awareness and improve practices in the factories. That will also help us to have better data to actually be able to engage with more stakeholders. Brands are not more important than manufacturers, GIZ or waste aggregators: all parties need to join forces and collaborate together.”**

**Veronique Rochet**, Senior Director of Sustainability, PUMA



## Shun Wei

### Advancing Waste Management Practices in Textile Recycling

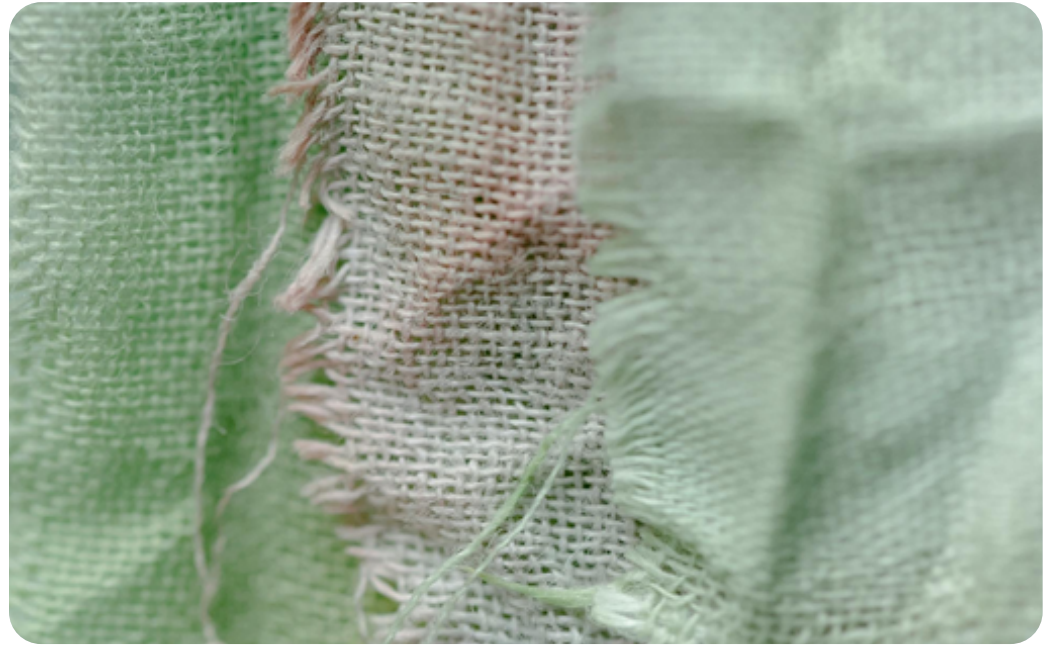
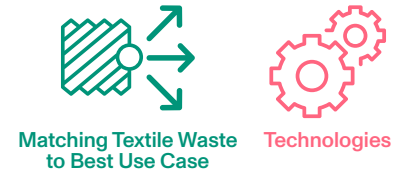


Cambodia

Identifying effective sustainability practices in waste management is essential to establish a unified approach capable of driving recycling efforts forward within the textile sector. With support from GIZ, Cambodia-based textile recycler Shun Wei implemented a waste improvement pilot project to enhance the segregation and recycling of post-industrial textile waste. By securing strong support from top management for sustainability objectives, providing training for staff and waste handlers, and incorporating waste management principles throughout its operations, such as using technology to track the collection process and enhance the accuracy of reporting, the pilot project has established a new benchmark for scalable and sustainable waste management practices in Cambodia. Through collaboration with garment factories, the company has significantly optimised sorting and waste collection processes, achieving a 30% increase in textile recovery rates while also enhancing the quality of recycled materials. Moving forward, the company intends to expand its outreach to more garment factories and aims to achieve a 50% recycling rate by the end of 2025, utilising key performance indicators such as waste reduction, material recovery rates and financial savings to track progress.

Shun Wei Fang Zhi Ke Ji Co., Ltd is a recycling company specialised in high-quality yarn production. The company invests in recycling projects for industrial waste in garment factories to help reduce local waste.

[Learn more here](#)



**“This initiative has allowed recycling waste that would have normally been sent to the landfills, burned or channelled to informal waste collection actors.”**

**Yuth Seng**, Owner, Shun Wei

# BESTSELLER

## Building The Business Case for Scaled Waste Collection and Recycling

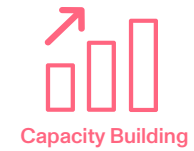


### Bangladesh

Manufacturing countries have not yet fully capitalised on their access to large volumes of recyclable textile waste and production capabilities. Starting in Bangladesh, BESTSELLER is spearheading the Switch to Upstream Circularity pilot project in collaboration with GFA, Reverse Resources and BGMEA. The pilot is aimed at expanding traceable textile recycling with BESTSELLER suppliers. The project focuses on capturing and valorising post-industrial textile waste, reducing reliance on virgin materials and making recycled resources more accessible to local manufacturers. Key objectives include developing a business case and toolkit for waste segregation and recycling, increasing the volume of collected waste traced to recycling and optimising the quality of recycled materials through R&D. So far, the project has surveyed 70 manufacturers, onboarded 16 BESTSELLER factories and segregated over 4,600 metric tonnes of post-industrial waste, with 500+ tonnes traced to textile-to-textile recycling. Going forward, BESTSELLER, in collaboration with its manufacturers, will continue approaching and presenting clear business incentives to formalise all aspects of circular value chains in Bangladesh. Recognising their influence in Bangladesh’s waste sector it seeks to include waste collectors and sorters with the aim of integrating them further into the formal system to increase traceability, compliance and enable profit sharing.

Launched in 2020, the global [Switch to Circular Economy Value Chains project - SWITCH2CE](#) aims to support micro, small and medium-sized suppliers in the value chains of large EU manufacturers and buyers to jointly identify, adopt and excel in circular economy practices. SWITCH2CE is co-funded by the European Union and the Government of Finland, led by UNIDO, in collaboration with Circle Economy, Chatham House, and the European Investment Bank.

[Learn more here](#)



**“This work is crucial, and it requires the collective effort of the entire industry to challenge the current system. We need a transparent waste flow system that will improve access to high-quality waste and boost the utilisation of recycled materials.”**

**Alexander Granberg**, Senior Project Specialist, Sustainability & Innovation, BESTSELLER

# Crystal International Group Limited

## Closing the Loop on Post-industrial Textile Waste

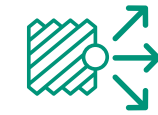


### Vietnam

Recycling post-industrial textile waste into new products presents a major opportunity to advance the circular economy, especially in manufacturing countries with abundant high-quality feedstock. In 2021, Crystal launched Second Life, an initiative to recycle post-industrial denim waste from its Vietnam operations into new fabrics. This closed-loop system sends fabric scraps from the cutting process back to the original supplier for reintegration into textile production, involving close collaboration with brand customers, garment factories, and fabric suppliers to ensure successful material reclamation. Crystal has now developed 10 different RCS-certified denim fabrics, all fully traceable, with QR codes providing customers detailed information. Currently, the initiative recycles roughly 10% of fabric scraps, diverting some 200 metric tonnes of waste from landfills annually, reducing Scope 3 emissions and lowering logistics costs. Going forward, Crystal aims to divert 100% of its production waste, expand the initiative to additional facilities, improve collection and explore further opportunities for upcycling post-industrial waste.

Founded in 1970, Crystal International Group Limited is a global apparel manufacturer with 20 facilities across Vietnam, China, Cambodia, Bangladesh and Sri Lanka, employing some 80,000 people. Specialising in denim, intimates, sportswear and outdoor apparel, Crystal is committed to sustainability through five pillars: environment, innovation, product integrity, employee care and community engagement, with a goal of net zero emissions by 2050.

[Learn more here](#)



Matching Textile Waste to Best Use Case



Technologies



**“Crystal has been relentlessly striving towards a circular economy and our 2030 goal of zero landfill of production waste. Establishing a local network is not only enabling material recycling to be more cost viable, but also reduces carbon emissions associated with logistics. The key lies in seamless collaboration with local partners and customers.”**

**Miles Lam**, Assistant General Manager, Crystal Denim

# Syre

## Scaling Up Polyester Recycling



### United States

As polyester is the most widely used and fastest-growing textile fibre and the biggest CO<sub>2</sub>e emitter, scaling up its recycling is essential for a circular, sustainable textile industry. Syre is currently finalising its USA blueprint chemical recycling plant, with operations expected to commence by mid-2025. This facility will focus on producing circular polyester, maintaining the same high quality as virgin polyester while providing enhanced sustainability, with carbon emission reduced by up to 85% compared to oil-based virgin polyester production. First commercial sales are expected in 2025, after which the company plans to replicate two giga-scale textile-to-textile recycling plants in Vietnam and Iberia. Also driven by strong ambitions in ESG and social sustainability embedded across the whole value chain, Syre aims to influence the broader ecosystem, for example within the informal waste sector, where transparency, responsibility and human and labour rights pose significant challenges. Going forward, the company intends to rapidly expand its operations, with a target of establishing 12 fully operational recycling plants by 2032, capable of producing over 3 million metric tonnes of circular polyester each year.

Founded in Sweden in 2023 by H&M Group and Vargas Holding, Syre is an impact-driven company dedicated to decarbonizing and reducing waste in the textile industry through large-scale recycling, initially focused on polyester. In May 2024, Syre raised \$100 million in a Series A round led by founding investor TPG Rise Climate, with participation from H&M Group, Giant Ventures, IMAS Foundation, Norrsken VC, Volvo Cars, and Leifmotif.

[Learn more here](#)

Matching Textile Waste to Best Use Case

Access to Finance



**“Syre marks the start of the great textile shift. We envision a world where every textile fibre sees a new day. By implementing true textile-to-textile recycling at hyperscale, we want to drive the transition from a linear to a circular value chain by putting textile waste to use, over and over again.”**

**Dennis Nobelius, CEO, Syre**

# Accelerating Circularity

## Advancing Cotton Recycling Through Industry Collaboration

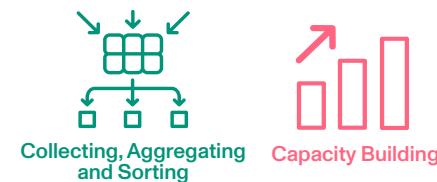


### United States

Effective collaboration between industry stakeholders is vital to bridge knowledge gaps in cotton-based textile recycling and advance sustainable practices. In 2021, Accelerating Circularity initiated two series of system trials for cotton-based textile recycling, one in the US and one in Europe. These trials aimed to fill in the gaps in circular textiles research by bringing together stakeholders to develop the products and processes necessary for transitioning from a linear to a circular system. Pilots were organised on collecting, sorting and preprocessing, textile-to-textile recycling, fibre and fabric manufacturing and garment making, and tested on specific performance, quality and safety standards to show that circular materials effectively meet industry standards. The results, revealed in the [Global Cotton Report](#) in 2024, demonstrate that transitioning to circular systems is both scalable and achievable. They notably highlight the importance of precise sorting, automation and colour control, also noting that the recycled cotton fibres used in the trials facilitated the development of a wide range of yarns that meet standard performance and quality criteria. Accelerating Circularity has recently announced plans to expand the geographic scope of its trial programme.

Established in 2020, [Accelerating Circularity](#) is a non-profit organisation dedicated to building circular systems that transform used textiles into new raw materials through research, pilot projects and industry partnerships.

[Learn more here](#)



**“As a follow-up to our work, Accelerating Circularity made a Clinton Global Initiative Commitment to Action in September 2024 to recycle 325 metric tonnes of used textiles, launch a groundbreaking textile mapping tool, and deliver critical educational resources to empower both brands and consumers to make more sustainable choices.”**

**Karla Magruder**, President, Accelerating Circularity

# Circle Economy

## Circular Economy Capacity Building Programme

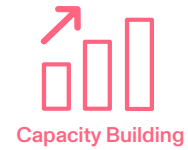


### Bangladesh

Building capacity and sharing knowledge are essential for driving the shift towards circular economy practices in global value chains. In 2023, Circle Economy launched CircularityAcademy, a gamified e-learning platform designed to enhance understanding of circular principles at scale. Initially rolled out in Bangladesh through the SWITCH2CE project, the programme featuring six action-inspiring modules supports suppliers in the value chains of large EU manufacturers to jointly adopt circular economy practices. To date, the Circle Economy’s Circularity Academy has been utilised by over 500 industry representatives, with around 30 trainers trained in Bangladesh. Under the SWITCH2CE project, 500 suppliers will be trained across three value chains: textiles and garments, plastic packaging and electronics. Additionally, Circle Economy has developed a training programme to promote responsible manufacturing and accelerate the transition to a circular textiles industry. This capacity development programme is already being successfully replicated in Indonesia as part of the Global Circular Fashion Forum project. The momentum will continue with plans to expand the e-learning and training programme to Vietnam, Cambodia and Turkey, bringing the transformation towards a circular economy closer to reality.

Founded in 2011, Circle Economy is a global impact organisation with an international team of experts based in Amsterdam. Circle Economy empowers industries, cities and nations with practical and scalable solutions to put the circular economy into action. With a track record of collaborating with more than 150 businesses, 130 cities and 48 countries worldwide, Circle Economy aims to double global circularity by 2032.

[Learn more here](#)



**“An enabling environment, shaped by thoughtful policies and strategic financing, alongside the capacity development of suppliers, brands and industry stakeholders, is essential for fostering collaboration and innovation, paving the way for a successful transition to a circular economy.”**

**Hilde van Duijn**, Managing Director, Circle Economy Foundation

# TEDDY GROUP

## Ecodesign Training for Sustainable Product Development



### Italy

To unlock true product circularity and effective sustainability strategies, brands must integrate key ecodesign principles at the core of their development processes. In order for this to succeed, product designers and developers need to be equipped with effective training and tooling. In 2024, Teddy Group introduced dedicated ecodesign training sessions for all roles in product development, acknowledging that the traditional linear approach to garment design will soon be supplanted by a circular model, particularly with the introduction of the Ecodesign for Sustainable Products Regulation and the Waste Framework Directive in the EU, which mandate brands to adopt more circular practices. Recognizing that ecodesign cannot be solely driven by the brand’s sustainability office, product developers are engaged from the outset to identify sustainable practices related to durability, recyclability, and other factors, which they present during internal pre-collection briefings. Starting with top management, the training will continue through 2025, ensuring all product department employees are trained. Moving forward, Teddy Group will create an ecodesign manual featuring guidelines for circular garment design developed in direct collaboration with the product departments, followed by the implementation of an ecodesign tool to help product developers align sustainable practices with their business plans and corporate sustainability targets.

Teddy Group is an Italian retailer founded in 1961, specializing in apparel for men, women, and children. With over 800 flagship and franchise stores across 39 countries, Teddy Group owns several brands, including Terranova, Rinascimento, Calliope, Kitana, and QB24.

[Learn more here](#)



**“The leverage to broaden the mentality towards Ecodesign is to demonstrate a tangible added value.”**

**Luca Galvani**, ESG Manager, Teddy Group

# Interloop

## Integrated Textile Recycling and Textile Waste Traceability



### Pakistan

Accurate textile waste tracking is essential for effective resource recovery. Based in Pakistan and currently operating in six countries, Interloop is a vertically integrated manufacturer that collects its industrial textile waste from its in-house manufacturing operations and converts it into fibrous form using its Rag Opening Machines. Similarly, Interloop processes agricultural and post-use waste within its facilities to create new recycled materials. To increase traceability of these flows, within its operations and the wider Pakistan apparel and textiles sector, Interloop started to develop in March 2024 a waste-mapping programme in partnership with Reverse Resources and Pakistan’s National Textile University. By digitising inventory throughout the waste supply chain, from source to recycling, Interloop’s system will provide comprehensive waste traceability, mapping waste handlers and monitoring each stage of the recycling process. Waste types segregated at source are categorised by multiple properties, including colour and composition. Training and standardisation ensure seamless integration with Reverse Resources’ digital platform, enabling transparent tracking of waste types, quality and quantity. Full-scale rollout is planned across all Interloop facilities by 2025, with local recyclers and waste handlers integrated under partnerships to serve as case studies for wider implementation across Pakistan’s textile ecosystem. Next steps include integration with Interloop’s proprietary traceability platform, Looptrace, to provide supply chain partners full product traceability, from design to disposal.

Founded in 1992 in Pakistan, Interloop is a vertically integrated supplier of hosiery, denim, knitted apparel and seamless activewear for top brands and retailers, with a workforce of over 30,000 employees. Recognised globally for environmental and social responsibility, Interloop holds LEED certification for its facilities, has obtained Fair Trade certification, and is a member of the United Nations Global Compact—committed to sustainable development and transparency in the fashion industry.

[Learn more here](#)



**“At Interloop, achieving 100% waste diversion from landfills is central to our circular economy efforts. Segregation at source maximises waste value, while traceability ensures efficient waste tracking. Our partnership with Reverse Resources offers a multi-stakeholder digital platform for full visibility and informed decision-making.”**

**Fauz Ul Azeem**, Head of Sustainability & Chemical Management, Interloop Limited



# Primark Stores Ltd

## Accelerating Circular Design Through Partnerships



### Ireland

Building innovative partnerships and fostering collaboration are essential keys to tackling the intricate challenges of circular design. In 2023, Primark launched its Circular Product Standard, a framework outlining what constitutes a ‘circular’ product, guiding design towards prioritizing durability, recyclability, and the use of recycled or more sustainably sourced fibres. To meet this standard and improve the integration of recycled fibres into its collections, Primark partnered with Recover™, a company specialized in recycled cotton fibres, integrating their mechanically recycled cotton into its Circular Design guidelines. Since the launch of its first circular product collection, which sold over three million units of clothing, Primark has collaborated closely with Recover™ to include its recycled cotton in the circular lines for denim and jersey products. Moving forward, Primark intends to expand the use of Recover™ recycled cotton into its circular collections and scale its circular design principles, notably by upskilling its product teams and key suppliers through a training programme.

Primark, founded in 1969 in Ireland, is a global retailer with 450 stores worldwide, offering women’s, men’s and children’s apparel, along with beauty products, homeware and accessories. In 2021, Primark unveiled Primark Cares, a sustainability strategy outlining the company’s commitments to becoming more sustainable and circular by 2030, and plans to engage in the upcoming Circular Fashion Partnership in Cambodia, furthering its commitment to sustainability.

[Learn more here](#)



Design and Recycled Materials



**”We’re excited to be working with innovative materials like Recover™ recycled cotton. Our collaboration is a key part of embedding circularity into our product design, and we’re proud to be driving positive change that enhances product durability and reduces textile waste.”**

**Lynne Walker**, Director, Primark Cares

# Index

## *Circular commercial collaboration*

A collaboration between two or more stakeholders such as a brand, manufacturer and recycler who cooperate to develop and implement a circular business model.

## *Export Processing Zones*

Industrial zones with special incentives designed to attract foreign investors and in which imported materials undergo some degree of processing before being exported again.

## *Mechanical fibre-to-fibre recycling*

Mechanical recycling of cotton fibres to cotton fibres. In this process, typically textile cutting waste and yarns are torn and opened up into a fibre form ready to be re-spun again. Typically, this recycled fibre needs to be blended with a virgin fibre to achieve higher quality/strength.

## *Near-infrared (NIR) spectroscopy*

A spectroscopic method that uses the near-infrared region of the electromagnetic spectrum to assess the chemical composition of various materials.

## *Post-use textile waste*

Textile waste after consumer use, e.g. disposed apparel or household textiles such as sheets and towels.

## *Post-industrial textile waste*

Any textile waste coming from an industrial process such as milling, spinning, printing and garmenting processes.

## *Social compliance*

Refers to how a business protects the rights and the occupational health and safety of its employees as well as workers upstream and downstream of its value chain.

## *Textile-to-textile recycling*

Also commonly referred to as 'textile recycling', this is the process of creating new products from salvaged and reclaimed textile waste (which can include pre- and post-industrial textile waste, post-use waste).

## *Thermo-mechanical recycling*

Converting PET bottles into virgin-equivalent polyester fibre.

# Endnotes

## *Imprint*

1. Global Fashion Agenda (2023). *GFA Monitor 2023*.

## *Introduction*

2. Global Fashion Agenda (2021). *Scaling Circularity*.
3. Circle Economy, ILO, S4YE (2023). *Decent Work in the Circular Economy*.
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5. Ibid.
6. PWC (2023). *The Circular Economy Transition for Asia Pacific*. Available from: <https://www.pwc.com/gx/en/issues/esg/esg-asia-pacific/the-circular-economy-transition-for-asia-pacific.html#>
7. Global Fashion Agenda, United Nations Environment Programme (2024). *Fashion Industry Target Consultation*.
8. Bangladesh Circular Economy Summit (2024). *Fashion, Circular Economy & Bangladesh*.
9. Ellen MacArthur Foundation (2027). *A New Textiles Economy: Redesigning Fashion's Future*.
10. CGRI, Deloitte (2023). *The Circularity Gap Report*.
11. Global Fashion Agenda, United Nations Environment Programme (2024). *Fashion Industry Target Consultation*.

## *Establishing Circular Commercial Collaborations: A Step-by-Step Guide*

12. Global Fashion Agenda, United Nations Environment Programme (2024). *Fashion Industry Target Consultation*.

# Participation

GCFF intends to establish the necessary ecosystem for scaling post-industrial textile waste recycling programmes in manufacturing countries. Locally owned and led, these national Circular Fashion Partnerships (CFPs) are now established in Bangladesh, Cambodia and Indonesia, with forthcoming partnerships planned in Vietnam and Turkey, and an open invitation to collaborate in other countries.

To learn more, visit our [webpage](#) or contact us directly via [cfp@globalfashionagenda.org](mailto:cfp@globalfashionagenda.org).

To help transform insights into actionable steps and influence our current circularity initiatives, the Global Circular Fashion Forum and Circular Fashion Partnerships, we invite key stakeholders in the circular fashion supply chain to participate in our survey (available in multiple languages).

Aside from providing us with valuable insights into the present landscape, your participation in the survey is a unique opportunity for you to share your perspective and help shape the development of both ongoing and future programs.

In the survey, we also invite you to indicate whether you would like to be informed about future industry consultations or impact initiatives, so you can stay connected and informed about upcoming events and opportunities to get involved. We value your involvement and can't wait to share what's next!

Thanks for being part of our community!



# Thanks

A global approach to circularity demands collaboration across the entire value chain – brands, manufacturers, waste handlers, recyclers, investors, consumers, policymakers and more.

By working together, we can create closed-loop systems that keep products and materials in use at their highest value and prevent improper disposal.

A just transition is vital to prevent risks such as job decline or poor working conditions, especially for marginalised groups, such as the informal workers and migrants often prevalent in waste handling and other exposed sectors.

*GFA thanks its partners and funders*

BGMEA  
Chatham House  
Circle Economy  
Closed Loop Fashion  
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH  
H&M Foundation  
Rantai Tekstil Lestari  
Reverse Resources  
UNIDO



Global Circular  
Fashion Forum

# Upstream *Circularity*

     **Playbook**