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POSITIVE FASHION CIRCULAR FASHION INNOVATION NETWORK

UK National Textile Recycling Infrastructure Plan

2025-2035

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Foreword

I am delighted to present the '**National Textile Recycling Infrastructure Plan**' for the UK. The National Textile Recycling Infrastructure Plan represents the culmination of two years of in-depth research, dialogue, and collaboration across the entire textile value chain in the UK. The work has been led by UK Fashion & Textile Association and developed through the Circular Fashion Innovation Network in partnership with UK Research and Innovation. It has been supported by key partners including Veolia, and it outlines a set of industry and government recommendations to transition to a robust, circular textile economy by 2035 in the UK.

The UK's fashion and textile industry stands at a pivotal moment. As global attention intensifies around sustainability, resource efficiency, and circularity, the need to secure a domestic resource base and drive socio-economic impact through textile recycling has never been more promising. For the UK to remain competitive and resilient in a rapidly evolving global landscape, we must develop systems that not only reduce environmental impact but also unlock economic opportunity, foster innovation, and build long-term value across the sector. Throughout the research process, we have engaged with key organisations across the post-consumer textile supply-chain, from local authorities, collectors, sorters, graders, recyclers, manufacturers, innovators, technology providers, brands and retailers. We have engaged with international initiatives and organisations operating within the textile recycling landscape. These diverse voices have helped shape a vision grounded in the industry as it is and focused on practical solutions. The resulting plan is built around four key pillars: infrastructure, market capacity, skills and workforce, and technology, each essential to building a viable, scalable, and future-ready textile recycling system. This plan is a call to action for government and industry to support the transition to a circular textiles economy in the UK.

Our commitment remains clear: to support the development of an innovative and commercially viable textile recycling system that supports both environmental and economic goals. We thank all those who contributed their time, expertise, and insights to this project.

Adam Mansell
Chief Executive Officer
UK Fashion & Textile Association

Textile recycling glossary

Term	Definition
Biological recycling	Biological recycling uses enzymes and micro-organisms to break down textile waste into its constituent components, which can then be used to create new materials.
Chemical recycling	Chemical recycling is the process of converting textile waste materials back into their basic building blocks, i.e. to the polymer or monomer level, using processes such as glycolysis, hydrolysis and methanolysis. This can also involve purification by removing dyes and contaminants. These building blocks can then be re-polymerised back into new material.
Closed-loop recycling	Refers to the recycling of materials from one industry to create outputs for use in the same industry.
Disruptor	An element on clothing or textile products that disrupts the recycling process, such as buttons and zips. These usually need to be removed before the product can be recycled.
Downcycling	The process of recycling textiles to create a product of lower value or quality than the original (e.g. recycling clothes and home textiles into industrial rags). This can be within the same industry or using materials from one industry to create outputs for another industry.
End-of-life (EoL)	End-of-life refers to the stage when textiles are considered to be no longer usable, reusable or recycled, and are destined for waste management, which can include incineration or landfill.
Extended Producer Responsibility (EPR)	An approach either led by policy or industry, where producers are held accountable for the lifecycle of textile products, particularly their end-of-life management.
Fibre to fibre recycling	A recycling process in which textile waste is processed into recycled textile fibres.
Mechanical recycling	A type of recycling, where materials are mechanically processed and converted into recycled fibres. This includes processes such as cutting and shredding.

Term	Definition
Non-reusable post-consumer textiles (NRTs)	Post-consumer textiles that are not suitable for reuse or repair. These textiles need to be collected, sorted, and processed for recycling to divert them from ending up in energy recovery, incineration or landfill.
Open-loop recycling	Referring to the recycling of materials where inputs from one industry are recycled into outputs for another industry.
Post-consumer textiles	Textiles that have been used by an end-user and then discarded, including textiles generated by households or by industrial, commercial and institutional facilities in their role as end-users (e.g. hotel bed linens, uniforms, tablecloths).
Residual waste	Refers to waste that is not suitable for reuse or recycling and is typically disposed of and treated through incineration or landfill.
Residual textile waste	Waste textiles that end up mixed in residual waste and are consequently managed similarly to other residual waste streams, mainly incineration or landfill.
Reusable post-consumer textiles (RTs)	Post-consumer textiles that have been used by an end-user and are ready to be discarded but are still in a reusable condition in their current form or with minimal repair.
Sorting	The process used to assess the suitability of textile waste for reuse or recycling. Items are sorted into different grades based on quality and end market, and can be sorted by product type, fibre type and colour. This is usually a manual process, but automated sorting processes are being developed.
Textile recycling	The process of converting textile waste into new materials or products.
Thermomechanical recycling	A recycling method using heat and pressure to melt thermoplastic textiles, such as polyester and nylon. This allows the polymers to be recovered and re-spun into new fibres.
Waste management	Waste management includes the activities and processes involved in collecting, handling, processing, sorting, and transporting waste materials from their point of generation to their final disposal location. For textiles, this could include collection and processing of reusable textiles for reuse and non-reusable textiles for recycling or disposal.

1. Introduction

1.1. Circular Fashion Innovation Network: The work so far

The National Textile Recycling Infrastructure Plan represents a two-year industry research project by UKFT through the **Circular Fashion Innovation Network**, bringing together insights from across the textile recycling value chain.

The Circular Fashion Innovation Network (CFIN) is an industry-led initiative by the UK Fashion and Textile Association (UKFT) and the British Fashion Council (BFC), in partnership with UK Research and Innovation (UKRI). CFIN aims to accelerate the UK's journey toward a fully circular fashion and textile ecosystem. CFIN is funded by UK UKRI via Innovate UK, Arts and Humanities Research Council (AHRC) and Natural Environment Research Council (NERC). The programme has six main areas of focus: Recycling Infrastructure, Sustainable Manufacturing, Circular Business Models, Novel Technology, Diverse and Future-proof Workforce, and Green Growth.

The development of the plan has been undertaken under the 'Recycling Infrastructure' pillar. UKFT has examined challenges and opportunities within the key stages of the textile recycling supply-chain involving key stakeholder groups: local authorities, waste authorities, the charity sector, collection merchants, sorters and graders, textile exporters, automated sorting and pre-processing players, textile recyclers, innovators, technology providers, brands and retailers, industry associations and government.

The methodology has encompassed a wide range of activities including industry engagement, direct interviews, stakeholder workshops, field visits, and a comprehensive market research and literature review. This multi-faceted approach has ensured that the recommendations within the plan are grounded in practical industry insights.

Veolia has remained the recycling infrastructure pillar lead during the two-year period, giving guidance and direction to the work undertaken by UKFT.

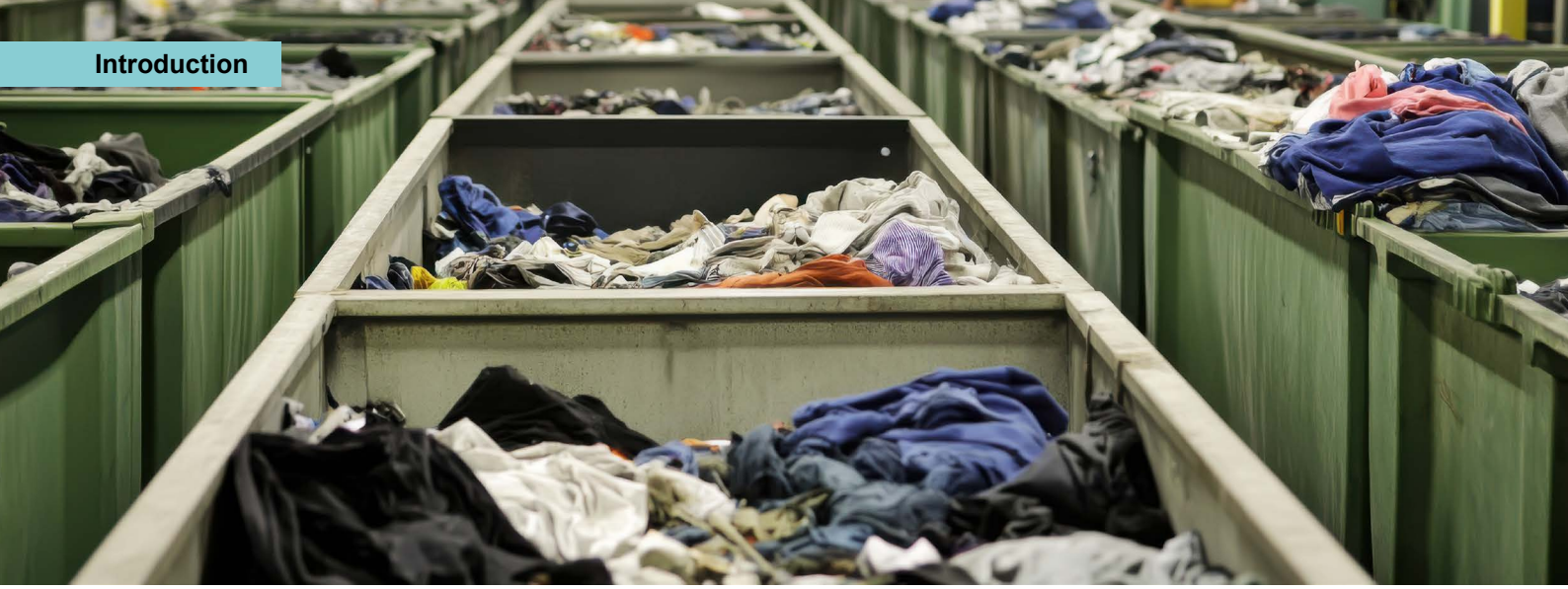
UKFT has also worked together with key industry organisations including **WEFT**, **BFC** and the **British Retail Consortium** (BRC) to advocate for a fair, industry-led EPR system under the **EPR Data Sandbox** project.

In addition, UKFT, has worked closely with **Oxford Economics**, to analyse the potential **socio-economic impact** of building textile recycling infrastructure in the UK.

Lastly, UKFT has led the **ACT UK** industry project, to establish the blueprint for an innovative Advanced Textile Sorting and Pre-processing facility (ATSP) in the UK.

The findings from all the research activities have been analysed using a framework based on four key pillars: infrastructure, market capacity and commercial viability, skills and workforce, and technology. This structured approach has ensured a comprehensive and standardised coverage of most relevant aspects of the textile recycling ecosystem in the UK.

The resulting National Textile Recycling Infrastructure Plan represents a synthesis of these insights, providing actionable government and industry recommendations for the development of a circular textile economy in the UK from 2025 to 2035.



1.2. Report aim and objectives

1.2.1. AIM

The **National Textile Recycling Infrastructure Plan** aims to support the UK's transition to a circular textile economy by providing a comprehensive framework for textile recycling development from 2025 to 2035. This plan establishes a strategic roadmap with concrete opportunities and recommendations to develop a robust textile recycling ecosystem, create economic opportunities, build necessary skills and workforce capacity, advance technological innovation, and ensure commercial viability, whilst contributing to environmental sustainability.

1.2.2. OBJECTIVES

The objectives of the National Textile Recycling Infrastructure Plan are:

1. **To present the current status of the UK's textile recycling supply chain** across key stages and stakeholder groups of the post-consumer textile supply chain, critically examining current challenges and opportunities in the four crucial pillars of infrastructure, market capacity and commercial viability, skills and workforce, and technology, as well as government.

2. **To present recommendations** across the key pillars for each stage of the textile recycling supply chain, addressing these specific challenges and opportunities identified through extensive stakeholder engagement and research, with a particular focus on government recommendations.

3. **To outline a vision with key recommendations** for the timeframe 2025-2035, prioritising actions into short-term (1-5 years) and long-term (5-10 years) as implementation phases, to inform a strategic roadmap for the development of robust textile recycling ecosystem in the UK.

1.3. Key pillars

The National Textile Recycling Infrastructure Plan is structured around four key pillars that form the foundation of a successful textile recycling ecosystem. These pillars represent the essential elements required to develop a robust infrastructure capable of supporting the UK's transition to a circular textile economy.

Infrastructure

Infrastructure refers to the underlying physical and organisational structures and facilities that support and enable economic activities related to textile recycling. This includes collection systems, sorting and grading facilities, pre-processing and automated sorting plants, logistics networks, and distribution channels that form the foundation of the textile recycling value chain. Infrastructure development requires significant investment and strategic planning to ensure appropriate geographical coverage, capacity, and efficiency across the UK. For optimal effectiveness, it is essential to develop a connected infrastructure where all supply-chain stages are strategically interlinked, creating an efficient network that facilitates domestic material flows throughout the UK's textile recycling ecosystem.

Market Capacity and Commercial Viability

Market capacity, also known as market size or market potential, refers to the total sales volume or economic value that the textile recycling market can potentially generate over a certain period. Commercial viability refers to the ability of the different stages of a textile recycling supply-chain (from collection to incorporation of recycled content in brand and retail offer) to generate profits and sustain themselves in the marketplace over the long term. This pillar addresses the economic aspects of textile recycling, including aspects such as collection costs, demand for recycled materials, price competition with virgin materials, and business models that can create value from textile waste, to name a few.

Skills and Workforce

Skills refer to the abilities, knowledge and expertise that individuals possess, allowing them to perform specific tasks or jobs effectively within the textile recycling value-chain. Workforce encompasses the people undertaking those jobs throughout the supply chain. Training is a particular area of importance to develop skills and competencies among the workforce, ensuring the sector has sufficient talent to support growth and innovation. As the transition to a domestic textile recycling outlook evolves, the skills and workforce requirements will continue to change. The UK must prioritise skills and workforce development by ensuring individuals within the sector are equipped with the appropriate technical, operational, and analytical skills necessary to meet the emerging demands of a circular textile economy, with a particular focus on textile recycling, as well as preparing for the workforce requirements of the future.

Technology

Technology enablers for recycling refer to the technological tools, systems, and innovations that facilitate an efficient textile recycling ecosystem. This includes automated sorting and pre-processing technologies, textile recycling technologies or digital platforms that support textile recycling, among others. Technological development is crucial for improving the efficiency, scale and economic viability of a textile recycling infrastructure in the UK.

Government as a Cross-Cutting Theme

While not a standalone pillar, government support is considered an essential driver for the development of a National Textile Recycling Infrastructure. The UK Government can create enabling conditions across all four pillars, from supporting infrastructure investment to incentivising market demand for recycled content. Throughout this plan, government support is integrated as a cross-cutting theme that influences the development of all aspects of the textile recycling ecosystem.

Innovation as a Cross-Cutting Theme

Innovation is the process of transforming creative ideas into practical solutions, leading to new or improved products, services, models and processes that address specific needs or challenges. Innovation has the potential to unlock new opportunities, drive benefits and address complex challenges. The UK is seeing a flourishing innovation ecosystem within the textile recycling landscape, specifically in relation to automated sorting for fashion and textiles and textile recycling.

2. Background and landscape

2.1. Background and landscape

The UK has a long-established role as a leader in the fashion and textile industry. The sector contributes more than £62 billion to GDP and supports 1.3 million jobs, which is equivalent to one in every 25 jobs in the country. Today, the industry is at a turning point. Global supply chains are under pressure to adapt, and the move from a linear to a circular model is reshaping how fashion and textiles are produced, used, and reused. This shift opens opportunities for growth that go beyond manufacturing and retail, extending into areas such as recycling, repair, resale, and innovative material development. The transformation now underway is redefining how the entire value chain operates, from design and sourcing to end-of-life management.

This shift expands supply chain capabilities to include end-of-life processes, where textiles are captured and brought back into circulation, recovering value from domestic raw materials and generating new circular markets that can drive growth in both UK and global economies[2]. In fact, the UK has one of the highest rates of fashion and textile consumption globally. UK consumers now buy five times more textiles than they did in the 1980s, generating significant textile waste that could serve as valuable feedstock and resource for a circular economy[3].

It is estimated that the UK produces 1,453 kilotonnes of post-consumer textiles each year[4]. In fact, **recent research** conducted by UKFT and University of Leeds estimates an even higher volume (3,264 kt) and the total post-consumer/ industry textile flow to be split roughly 50:50 between fashion and non-fashion items[5]. This highlights the significant scale of textile waste generated in the UK and the fact that textile waste extends well beyond fashion and household sources, also arising from various non-fashion sectors across key UK industries (e.g. hospitality, healthcare, public sector, automotive, agriculture, building and construction). This requires a comprehensive approach to circularity that involves cross-sector collaboration.

The reality is, the majority of these post-consumer textiles are non-reusable, either because of their condition (e.g. damaged, torn, stained, wet, contaminated) or because of a lack of an economically viable end market. **According to the recent ACT UK report an estimate of 744,000 tonnes are non-reusable textiles (NRT)**[6]. Additionally, the volume of non-reusable textiles into our waste stream is only expected to grow, as a result of a decrease in quality and lifetime of current textiles[7].

In the UK, nearly 50% of textiles are incinerated, and in some cases, sent to landfill, with Energy from Waste (EfW) remaining the dominant disposal strategy[8]. The UK is also a key exporter of post-consumer textiles for sorting and grading elsewhere, with the majority of non-reusable textiles currently being sent to Pakistan.

In fact, rising consumption rates and the resulting textile waste flows are contributing to a system breakdown, where many stakeholders tasked with redirecting post-consumer textiles to reuse and recycling are at risk of market failure[9]. This shift occurs due to the challenges of managing textile waste in a way that is economically sustainable.

The above context underscores the urgent need to develop textile recycling solutions that secure an economically viable resource base in a time in which the UK is failing to maximise the value of non-reusable textiles domestically.

> ***This presents a significant opportunity to scale a textile-to-textile recycling supply chain in the UK, to close the loop on post- consumer NRT textile waste, and to create a more sustainable future for the UK fashion and textile industry. A future where NRTs are recycled back into textiles or alternative products, and, ultimately, the UK is delivering considerably more socio-economic value from NRTs***
>
> - ACT UK (2025, p.15)[10]

The challenge of excessive volumes of post-consumer textile waste is global[11]. Therefore, international developments highlight a growing momentum towards textile circularity. From a government perspective, the EU's Strategy for Sustainable and Circular Textiles[12] with a key focus on expanding textile reuse and recycling, represents a significant shift in the EU's approach to textile collection and waste reduction. Additionally, advancements in fibre-to-fibre recycling are on the rise, especially in Europe, the US, and Asia, however, despite growing attention on textile and fashion circularity over the past decade, the industry is still in the early phases of transformation, particularly when it comes to recycling capabilities[13].

This moment presents a crucial opportunity for the UK to position itself as a leader in textile recycling, creating both economic benefits and reducing environmental impacts.

Transitioning toward a circular system that prioritises textile recycling requires significant investment in infrastructure, technology, and skills and workforce, alongside a compelling business case. This transition could necessitate a new sector and industrial strategy for the UK to maintain competitive advantage in the global landscape. The level of urgency is high, with implementation becoming increasingly pressing.

Importantly, achieving circularity cannot rely solely on traditional methods, skills, and technologies. Innovation must play a central role across the entire textile recycling supply chain. The UK has a significant opportunity not only to implement innovations developed globally but also to foster circular textile innovation domestically.

Currently, textile waste supply chains remain fragmented and non-circular, with different stages operating in isolation rather than as an integrated system. There is a need to reshape the textile value chain towards circularity and intervene to steer post-consumer textile systems towards circular growth[14].

2.2. The plan

This is precisely why a national plan is needed. Building a scalable, workable and resilient circular domestic textile recycling infrastructure in the UK requires careful examination of each stage of the end-of-use supply chain. We must understand how these stages need to be reconfigured to transition from the current linear, fragmented model to an integrated circular system. This plan takes a holistic view, recognising that circularity depends on connected stages that cannot operate in isolation.

2.3. The vision: UK textile recycling landscape

Under the CFIN project, UKFT has developed a vision for the UK Textile Recycling Infrastructure Landscape in the next decade, focusing on the flow of non-reusable textiles (NRTs). A unified and integrated supply chain with collaboration across stages is required to build an economically viable circular system for NRTs. The visual below showcases the outlined vision.

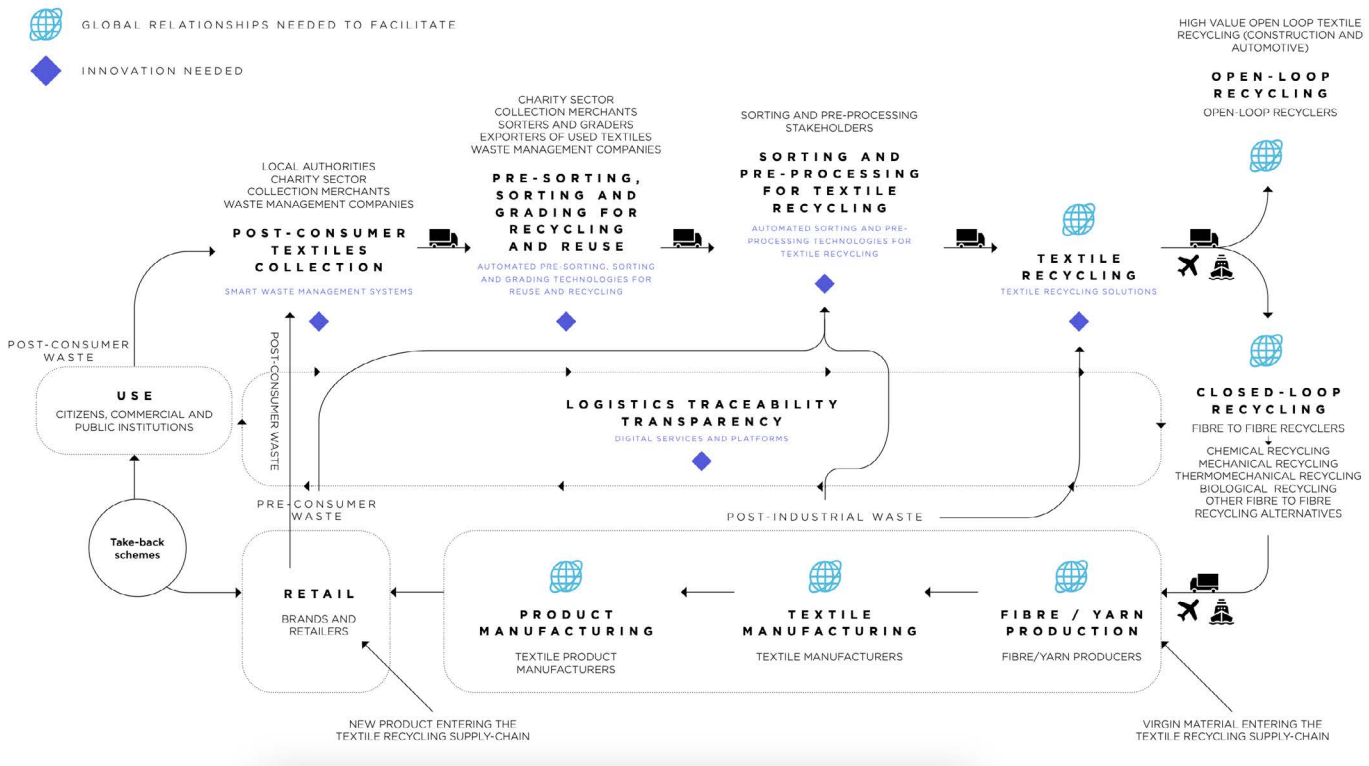


Figure 1. Vision of textile recycling in the UK: key stakeholders and non-reusable textile flows

Every stakeholder has a role in building domestic capabilities for textile recycling. While the UK already has, to some extent, established infrastructure for collection, sorting, grading and pre-sorting, there is a pressing need to expand capacity in automated sorting, pre-processing, and recycling. Acknowledging the global interdependencies and collaboration required to make this supply chain effective and economically viable is equally important. Efficient logistics and robust traceability systems will be central to its success. Innovation will be a driving force throughout the system, from smart waste management solutions to advancements in pre-sorting technologies, to automated sorting and pre-processing innovations, fibre-to-fibre recycling, as well as the development of enabling platforms and services for all stakeholders.

2.4. Socio-economic advantages

By keeping these materials within the UK, there is significant opportunity to capture their resource value, and generate socio-economic impacts.

It is within this context that under the Circular Fashion Innovation Network, UKFT, together with **Oxford Economics** and **Circle-8**, have progressed a study to understand the potential socio-economic impact of building a national textile recycling infrastructure in the UK[15].

The study includes a proposed vision for a national textile recycling hub in the UK which encompasses the development of three ATSPs (automated sorting and pre-processing plants), alongside an upstream textile chemical recycling plant in the UK. The ATSPs would be spread throughout the UK, with the East Midlands, North West and South West regions being selected as potential site locations. The accompanying chemical recycling facility would then be developed in the East Midlands. This hub would be one of the many needed to expand textile recycling in the UK and handle existing and future textile waste volumes.

The national textile recycling hub's development phase would commence in 2025, spanning a three-year period to 2028. The chemical recycling plant would then come on-stream in line with phased capacity rollout across the ATSP sites, with all plants becoming both fully phased and operational by 2031. Once fully operational the proposed three sorting sites are envisaged to have the capacity to pre-process nearly 150 thousand tonnes of textile waste, with 50 thousand tonnes being subsequently recycled for new clothing fibres via the chemical recycling plant, and the remaining 100 thousand tonnes being directed to further economic uses via alternative textile recycling.

The results of the proposed vision study indicate that these combined developments could potentially represent **£277 million investment with £58 million of this total realised within the UK.**

Key findings on a national level of both the development and operational phases are outlined in the figures below:

Development phase related benefits, UK, 2025-2028

Investment	**£58 MILLION INVESTMENT IN THE UK ECONOMY** An estimated 90% of capital expenditure will be realised within the manufacturing sector
GVA	**£46 MILLION TOTAL GDP CONTRIBUTION** £20m will be generated directly by the development f the four sites, with a further £26m being supported through the indirect and induced channels
Employment	**620 JOB YEARS OF EMPLOYMENT** With an estimated 240 job years created in the manufacturing sector during the development phase
Wages	**£26 MILLION IN EARNINGS** The activity of those directly employed throughout the development fit-out is estimated to support the £12m in earnings
Taxes	**£4 MILLION IN TAXES GENERATED** Over the three-year development period including income tax, national insurance and tax on consumption

Operational phase related benefits (fully phased), UK, 2031

Tonnes processed	**150,000 TONNES OF TEXTILES SORTED PER YEAR** 50,000 tonnes chemically recycled, while the rest directed to alternative textile recycling methods
GVA	**£53 MILLION TOTAL GDP CONTRIBUTION PER YEAR** £26m will be generated directly by the activity of the four sites, with a further £27m being generated through the indirect and induced channels
Employment	**SUPPORTING 720 JOBS NATIONWIDE** 340 jobs will be created directly across the four sites with a further 380 being generated through the indirect and induced channels
Wages	**£26 MILLION IN EARNINGS PER YEAR** The activity of those directly employed at the recycling facilities is estimated to support £12m of this total
Taxes	**£9.6 MILLION IN TAXES GENERATED PER YEAR** Including income tax, national insurance and tax on consumption

The vision outlined above illustrates the substantial socio-economic benefits that scaling textile recycling could bring to the UK. However, realising this potential requires significant investment in infrastructure to implement a new system.

3. Key stages of the textile recycling supply chain

3.1. Post-consumer textile collection

Post-consumer textile collection refers to collecting the textiles that have been disposed of, or donated, by the general public (GP), industrial, commercial and public institutions, to effectively manage these textiles. This includes both reusable (RT) and non-reusable (NRTs) textile waste which, later in the chain, is redistributed to key stakeholders that decide upon waste management strategies and end markets for these textiles. A key distinction to make in textile waste collection is residual post-consumer textile waste versus segregated textile waste.

More than 50% of post-consumer textiles end up in the residual waste, where the predominant waste management strategy is EoW (Energy from Waste), and a smaller proportion is landfilled. The rest is diverted into existing post-consumer textiles collection infrastructure. Currently, most diverted post-consumer textiles are exported to alternative end markets[16]. Yet, it is worth noting that the UK has one of the highest collection rates of used textiles globally[17].

3.1.1. KEY STAKEHOLDERS AND RESPONSIBILITIES

In the UK, the **key stakeholders and their main responsibilities** in the textile waste collection stage are:

Local Authorities

Local Authorities in the UK have a duty to collect waste from the general public, industrial, commercial and public institutions, but textile collection businesses or organisations will usually be responsible for paying for the collection of the textile waste. Different Local Authorities manage the process in various ways, but, in all cases, there will be a waste officer for the Local Authority with overall responsibility for each process. They will either:

- Manage their own waste collection service.
- Create their company under the Local Authority name to manage the collection service, so they have more control over the operational guidance of the service.
- Contract the service out to a third-party waste management company, such as Veolia, Biffa or FCC.
- Usually, post-consumer textiles will be managed in a different way (e.g. textiles through textile collection merchants or a charity sector partner).

Normally, Local Authorities will have established contracts or agreements with waste management companies, collection merchants, or the charity sector to handle textiles disposed of or donated by the general public, industrial, commercial and public institutions. When these third-party textile collection merchants or charity sector partners are sub-contracted, Local Authorities depend on them to collect textile waste. In many cases, these contractors pay Local Authorities for the collected waste, providing income that helps fund general waste services.

Generally, Local Authorities hold a key responsibility in textile waste collection as they are responsible for choosing the right waste management partners and authorising appropriate sites to operate textile collection points (e.g. textile bank collections).

Whereas in the EU, the mandatory separate collection of textile waste was established in January 2025, under the Waste Framework Directive, this is not the case for the UK[18]. In EU, Local Governments are strategically planning which infrastructures and systems to set in place. Currently in the UK (including Scotland but excluding Wales) there is no legal requirement to separate textile waste from other waste types.

Charity sector

The charity sector is currently one of the main players in post-consumer textile collection in the UK, and responsible of collecting and managing a large proportion of textiles diverted from residual waste. Particularly, charity shops are a common point of donation for post-consumer textiles in the UK. According to the Charity Retail Association, more than 10,000 charity shops exist today in the UK[19]. Once post-consumer textiles are received, these organisations assess all donations and prepare suitable reusable textiles for sale to the public. The remaining non-reusable textiles are sold to collection merchants or sorters and graders directly. Charity shops depend on these businesses, as without them, those textiles that aren't resold to the public would be sent directly to incineration through Energy from Waste (EoW) or landfill.

Textile collection merchants

These businesses offer textile waste collection as their main service, and sometimes, further manage this textile waste (e.g. sorting and grading). Textiles are collected from several different collection points (as detailed later in this section). Together with the charity sector, textile collection merchants are responsible for collecting most post-consumer textiles in the UK. Currently, there are approximately 76 known collection merchants in the UK, plus the unknown independent businesses, that are responsible for consolidating post-consumer textiles before the next process of sorting and grading for reuse or recycling.

Waste management companies

These businesses encompass waste management services (e.g. for Local Authorities) and effectively handle the collection, transportation, and disposal/recycling and monitoring of waste materials produced by the general public, industrial, commercial or public institution activity. Although the operational focus of waste management companies is not textile waste, they are key players within the system as they handle residual waste, which is where most post-consumer textile waste ends up.

Brands and retailers

Within their circular business model ambitions, brands and retailers in the UK hold a post-retail responsibility of textiles. Recently, brands and retailers have incorporated take-back systems to collect post-consumer textiles as part of their circularity strategies. These take-back systems are usually established through partnerships with other key stakeholders in the ecosystem (e.g. charity sector partners).

General Public (GP)

The general public is primarily responsible for donating/disposing their textiles responsibly, whether that's in the household residual waste or in segregated textile waste collection points.

Commercial and public institutions

These organisations are expected to manage their post-consumer textile waste effectively and donating/disposing their post-consumer and post-industrial textiles responsibly.

It is important to note that the outlined stakeholders operate in partnership in many instances to effectively collect textile waste. Some stakeholders not only handle collection, but also the subsequent stage, the textile waste management (e.g. waste management companies or collection merchants which are also sorters and graders, or the charity sector itself). Local Authorities and the charity sector are dependent on collection merchants to manage non-reusable textiles, while collection merchants, in turn, rely on sorting and grading merchants to purchase and process the textiles further.

3.1.2. COLLECTION INFRASTRUCTURE TYPES

The UK has the following established collection infrastructure for post-consumer textiles, which determines how individuals, businesses, and institutions can dispose of or donate their textiles:

Collection type	Description	Responsible stakeholders
Residual Waste (Black bin)	Post-consumer textiles are placed in the general waste (black bin). The outcome this textile waste is sent for incineration or landfill.	• Local Authorities • Waste management companies • General Public • Commercial and public institutions
Residual waste (Dry mixed recycling)	Post-consumer textiles are placed in the general waste (dry mixed recycling). The outcome of this is textile waste is sent for incineration or landfill.	• Local Authorities • Waste management companies • General Public • Commercial and public institutions
Residual waste (Kerbside)	Local authority pick-up services organised by collection rounds for typical waste streams. In some Local Authorities, textiles are collected as part of kerbside recycling programmes, and the items are consolidated at waste centres before being collected by the collection merchants.	• Local Authorities • Waste management companies • Collection merchants • General Public • Commercial and public institutions
HWRC (Household Waste Recycling Centres)	Council-operated centres where the general public, industrial, commercial and public institutions can drop off textiles. Also known as recycling centres.	• Local Authorities • Charity sector • Collection merchants • General Public • Commercial and public institutions
Textile banks in public spaces	Textile banks located in public spaces (e.g. supermarkets, parking). Owned by Local Authority, charity sector or collection merchant.	• Local Authorities • Charity sector • Collection merchants • General Public • Commercial and public institutions
Charity shops	The general public will donate textiles directly to charity retail shops for resale or reuse.	• Charity sector • General Public

Collection type	Description	Responsible stakeholders
Door to door collections	Door-to-door pick up services collecting post-consumer textiles directly from the household, commercial businesses or public institutions. Bags are delivered door-to-door, and the stakeholders are asked to fill with textiles to be collected on a specific day.	• Local Authorities • Charity sector • Collection merchants • General Public • Commercial and public institutions
Postal donations	The general public, commercial and public institutions will donate textiles via post.	• Charity sector • General Public • Commercial and public institutions
Shop take back schemes	Consumers return post-consumer textiles in-store to participating brands and retailers, often in exchange for discounts or store credit.	• Brands and retailers • Charity sector • Collection merchants • General Public
Online take back schemes	Consumers return post-consumer textiles via digital platforms that allows them to schedule donations to participating brands and retailers.	• Brands and retailers • Charity sector • Collection merchants • General Public
School programmes	Community-based programmes where schools collect textiles for donation, often as part of fundraising initiatives.	• Local Authorities • Charity sector • Collection merchants • General Public
Direct commercial or public institution donations	Organisations set up collection points where employees or customers can donate post-consumer textiles for recycling or reusing.	• Commercial and Public institutions • Charity sector • Collection merchants
Direct commercial or public institution collections	Commercial and public institutions can schedule collections for post-consumer textiles (e.g. used uniforms and corporate clothing after use or hospitality linen and towels).	• Commercial and Public institutions • Charity sector • Collection merchants

The predominant collection routes, however, remain: residual waste (all types), HWRC, textile banks and charity shops. The method of collection strongly impacts the condition of the textiles.

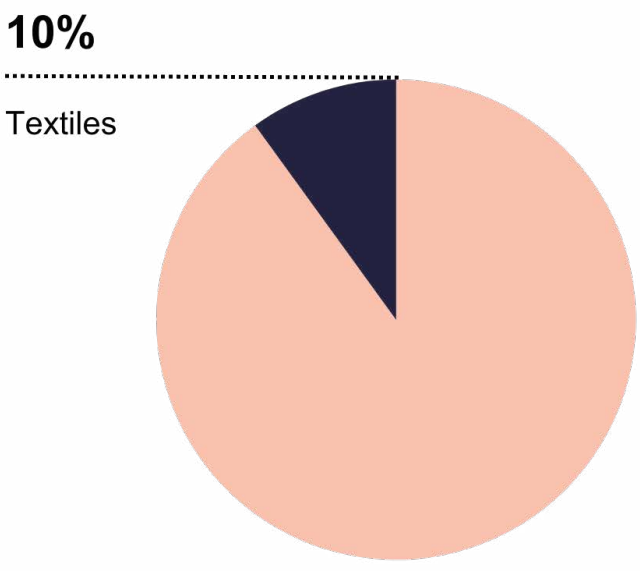
3.1.3 KEY CHALLENGES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce, and technology, as well as government challenges of the current system, are highlighted.

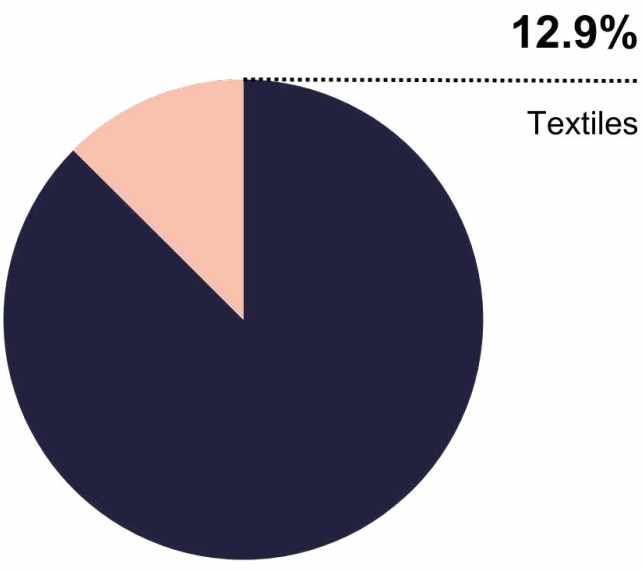
Infrastructure challenges

1. **Textile waste - an under prioritised stream:** Whereas for the textiles sector textile waste is a crucial issue to tackle, for responsible stakeholders (e.g. Local Authorities or Waste Management Companies), textiles equate to only a small proportion of their total residual waste. Therefore, it is not often considered a priority waste stream. Consequently, the majority of post-consumer textile waste ends up incinerated through EoW (Energy from Waste), or landfilled, resulting in higher GHG (greenhouse gas emissions) compared to the alternative waste management routes of textile reuse or recycling. Currently around 10% of residual waste is textiles, contributing to approximately 12.9% of the carbon intensity of residual waste streams.

Average Consumption of Residual Waste & Flow (kT)



Contributing Fossil Carbon Intensity of Waste Categories



Source: Confidential

2. **No obligation for separate textile waste collection:** Different Local Authorities have different schemes, making the collection of textile waste fragmented and unequal across geographical regions. Whereas some Local Authorities will have a robust textile collection infrastructure, others will not. It means there are regional differences in available infrastructure for the general public, commercial and public institutions for handling post-consumer textile waste.

Key stages of the textile recycling supply chain: Post-consumer textile collection

3. **Complex logistics and delocalisation:** The handling and managing of post-consumer textiles is logistically challenging, characterised by complex supply chains, resulting in uncoordinated collection and delocalisation of textile waste. Logistically, it is inefficient to move the textile waste across the UK prior to pre-sorting. Ecosystems are geographically fragmented and disconnected. Large-scale operation warehouses tend to be in industrial areas and geographically dispersed, making it harder to establish local recirculation of textile waste.

4. **Inefficient textile collection:** The operational infrastructure of textile collection is inefficient. For example, textile banks are collected before they are full.

5. **Mixed reusable (RT) and non-reusable (NRT) textiles:** Currently, it's not economically viable for individual stakeholders to develop separate collection routes for non-reusable textiles, so RTs and NRTs are mixed prior to sorting.

6. **Growing volume of NRTs:** The growing volume of non-reusable textiles in the waste stream creates significant infrastructural challenges. For example, charities often lack sufficient warehouse space to store the increasing quantities of non-reusable textiles they receive.

7. **Underdeveloped separate textile collection infrastructure and prioritisation of RTs:** Overall, separate collection infrastructure remains underdeveloped and fails to capture all post-consumer textiles. Moreover, existing systems often prioritise the collection of textiles considered suitable for reuse (RTs), rather than items that are non-reusable and better suited for recycling (NRTs).

8. **Established contractual arrangements:** Local Authorities currently hold established contracts or historical agreements with waste management companies, collection merchants, or charities, the termination of which could prove difficult. This makes it difficult to reconfigure partnerships and places a strong reliance on established contractual arrangements.

9. **Reusability and recycling challenges:** There exists reusability and recycling challenges associated with the feedstock arising from the main post-consumer textile collection infrastructure:

Collection type	Reusability and recycling challenges
Residual Waste (Black bin)	Textile waste ends up mixed with all the other waste, damaged, contaminated and sent for incineration or landfilled when the textiles could have been diverted. Not processable for reuse and recycling.
Residual waste (Dry mixed Recycling)	Textile waste ends up mixed with all the other waste, damaged, contaminated and sent for incineration or landfilled when the textiles could have been diverted. Not processable for reuse and recycling.
Residual waste (Kerbside)	Whilst textiles are separated from other waste streams, and it is a preferable option to black bin and dry mixed recycling, textiles can still get wet, damaged and contaminated. As separate bags are put out for collection, generally outdoors, they are not always collected in a form which protects them from weather conditions and other contaminants. Consequently, these textiles are often not processable for reuse and recycling. It is a costly process for waste management companies as textiles are not disposed of as often as other waste streams, and kerbside collections are too frequent for textile collections.
HWRC (Household Waste Recycling Centres)	HWRCs are frequently located in areas that are difficult to access, requiring individuals and organisations to travel significant distances to dispose of their textiles. There is, sometimes, still a chance of textiles getting wet and damaged as they are not always in weatherproof containers/locations.
Textile banks in public spaces	While textiles are separated from other waste streams and kept safe, textiles can get wet and damaged if the textile bank is outside. Moreover, many textile banks experience fly-tipping and, in some instances, theft.
Charity shops	While charity shops effectively handle reusable textiles, they are overwhelmed by the volume of non-reusable items they receive, creating operational challenges and straining their limited warehouse space.

Market capacity and economic viability challenges

1. **Local Authorities:** Currently, as textile waste only equates for a small percentage of the total residual waste weight, and the financial impact of textiles in the residual waste stream is low, it is not a priority for Local Authorities.

   There is currently a lack of Local Authority resource and funding allocated to textile waste. In fact, on a Local Authority level, collection actors pay for textiles in most cases, while other waste streams are collected and processed for a fee. This creates, in many cases, an income stream for Local Authorities.

   Local Authorities, already burdened by the financial and environmental costs of textile waste management, might face increased costs as and if the UK's Emissions Trading Scheme (ETS) approaches[20]. This scheme will penalise councils for emissions related to textile waste, further incentivising them to explore alternatives to incineration or landfill. If textile collection merchants (currently facing economic challenges as explored in the following paragraphs) were to reduce their capacity in the UK, this could imply that more post-consumer textiles would be incinerated through EoW (energy from waste) or land-filling, which would be an additional cost to Local Authorities.

2. **Charity sector:** The charity sector faces rising collection costs due to minimum wage rises, national insurance rise, labour shortages, rising vehicle costs, and higher rent and rates.

   Charity retailers depend on textile collection merchants to collect and pay for the non-reusable waste (NRTs) to avoid costs for the disposal of their unsellable items, as the end goal of the charity retail sector is to make money to support charitable causes. The price paid for these unsellable items has been driven down by exchange rates, rising costs globally and cheaper material from other countries, reducing the charity sector's margin.

   There are challenges in identifying a viable business case for non-reusable textiles (NRTs) in the charity sector (e.g. currently there is a pressure on charities that this is a revenue stream for them).

3. **Collection merchant:** Collection merchants face rising operational costs based in UK (such as wage increases of over 25% in the last two years, increases in operational costs, e.g. energy costs and fuel costs).

   If current trends continue, collection merchants may soon find their operations financially unsustainable. If these merchants were to scale back their operations in the UK, a greater volume of post-consumer textiles would likely be diverted to Energy from Waste (EfW) facilities or landfills, thereby increasing costs for Local Authorities, or exported, resulting in a lost economic opportunity for the UK.

   Collection merchants face significant limitations as independent businesses that receive no external funding. Their financial situation has worsened as the wholesale market price for collected textiles has dropped substantially, primarily due to the increasing proportion of non-reusable and low-quality items in the post-consumer textile stream.

Collection Merchants are dependent on the Reuse and Grading Merchants in the UK and abroad as they require them to buy the goods from them to pay for the services to collect from the textile collection routes. However, with the quality of the goods reducing so dramatically in the last 10 years there is an overall loss of reuse sales which funds this process so it is becoming difficult to sell on, as companies cannot make money from the goods. Overall, there is currently an overflow of unprofitable NRTs, when the positive margins are in the RTs.

Ultimately, the market for recycled textile content remains underdeveloped, with insufficient demand from consumers, brands, and retailers to make collecting non-reusable textiles (NRTs) commercially viable. This lack of demand creates a fundamental challenge to the business case for handling NRTs.

4. **Brands and retailers:** From a textile collection perspective, brands and retailers struggle to see the profitability at scale of take-back schemes. As there is still a lack of infrastructure and solutions to deal with NRTs, it is challenging to understand how collecting NRTs could potentially become commercially viable.

Skills and workforce challenges

1. **Local Authorities:** Currently, textiles don't sit under one department or role within Local Authorities, making it difficult to gain Local Authority buy-in.

   There is a lack of training and education in Local Authorities around circular textiles and more concretely, the projected development of the UK's circular system for managing post-consumer textiles.

   This knowledge gap contributes, in some cases, to a lack of effective oversight and governance, making it difficult to ensure appropriate circular management of collected textile waste.

2. **General Public (GP)/Commercial and public institutions:** While the general public, commercial and public institutions generally understand how to handle reusable textiles (such as quality second-hand clothing or commercial overstock), there is widespread confusion about the proper disposal of non-reusable textile items (NRTs), making it difficult for stakeholders to understand what to do with NRTs. This knowledge gap results in poor disposal practices and limited engagement with responsible and circular NRT management.

3. **Charity sector:** Charity shops, which serve as primary collection points, rely heavily on volunteer staff. This reliance on volunteers can lead to inconsistent sorting of donated textiles between resellable and non-resellable items in the UK.

4. **Waste management companies:** There is an education gap in waste management companies. Many lack the knowledge to effectively identify, analyse and utilise data on post-consumer textiles, and may not fully understand their role in the wider textile recycling landscape.

Overall, there is an education gap across the different players. Many stakeholders lack understanding of where their business fits within the wider outlook in a UK textile recycling system.

Government challenges

From a government perspective, the UK has no mandatory requirement for local governments to provide separate textile waste collection. This lack of regulation results in two significant problems: high volumes of textile waste ending up in general waste, and substantial regional inequalities in collection infrastructure and access points.

Textiles are not prioritised within waste streams given their lower volume in comparison to other residual and commercial waste streams. The importance to the effective management of waste is based on volume/weight, but not on environmental impact. Yet, textiles represent almost 13% of the carbon intensity of current residual waste streams.

There is no standardised reporting system for textile waste, resulting in the absence of reliable and accurate centralised data. Textile waste statistics are not detailed in current government statistics[21], and the reporting methods for Waste Data Flow are not standardised[22]. This lack of quality information hinders effective decision-making around textile waste management.

Currently, the licensing for managing textile waste is not stringent, making it, in some cases, simple and inexpensive to obtain a license to manage lower volumes of textile waste.

3.1.4. KEY OPPORTUNITIES

The post-consumer textiles collections landscape must be reimagined if circularity is to be achieved.

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce, technology, as well as government opportunities of the current system, are highlighted.

Infrastructure opportunities

1. **Build dedicated textile waste collection systems (1-5 years):** It is necessary to build a robust ecosystem for textile waste collection that develops specialised textile waste management programmes. These programmes should reduce the amount of textiles ending up in residual waste and divert post-consumer textiles from incineration and landfill, whilst increasing reuse and recycling rates. This would include creating dedicated textile collection routes and ensuring proper collection infrastructure is in place locally across the UK. Implementation should focus on better planning and more efficient operations, with the goal of processing post-consumer textiles as close to their point of collection as possible.

2. **Enhance collection infrastructure for maximum recovery (1-5 years):**

    - **Leverage existing infrastructure:** utilise the existing infrastructure and create closer relationships with available stakeholders, promoting existing routes that can improve reuse and recycling rates, hence, infrastructure in dry, warm places, away from damage and contamination.
    - **Ensure segregated collection of post-consumer textiles is convenient and accessible:** this could include, for example, collaboration with public collection points (i.e. supermarkets and shopping centres), making it easier to dispose/donate post-consumer textiles.
    - **Increase collection points:** expand the number of accessible textile collection sites, including in retail stores, community centres, and through kerbside programmes.
    - **Explore new textile collection alternatives that increase the reusability and recyclability potential of feedstock:** e.g. ‘bag in a bag’ option for dry mixed recycling, to avoid contamination.
    - **Explore post-consumer textile collection alternatives to pre-sort on a local level:** offer general public, commercial and public institutions different options to pre-sort post-consumer textiles, exploring effective ways to separate the collection of reusables and non-reusables prior to sorting.

3. **Integrate and collaborate with municipal waste systems (5-10 years):** Establish strong collaboration/sorting infrastructure in municipal waste management facilities to divert textiles from the residual waste stream and find avenues for textile recycling. This requires closer collaboration with waste management companies to understand how those textiles that end up mixed with other waste streams can be recovered for textile reuse/recycling.

4. **Develop regional post-consumer textile management hubs (5–10 years):** There is an opportunity to bring operations closer to collection points, enabling the development of predominantly domestic networks and reducing carbon emissions. One potential model involves the creation of localised textile sorting hubs to capture and process non-reusable textiles (NRTs), redistributing them within the UK's textile recycling supply chain. This approach supports better volume alignment by moving NRTs to central points, thereby avoiding unnecessary transport and associated costs. A tiered system could be established, with local hubs feeding into a National NRT Hub, optimising the use of materials while maintaining flexibility for local processing. By consolidating sorting and pre-sorting at localised hubs, stakeholders can avoid duplicating efforts and create economies of scale, making processing more economically viable. These consolidated collection points could also partner with existing facilities to maximise system efficiency and reduce overall costs.

Market capacity and economic viability opportunities

Incentivise responsible disposal (1-5 years): There is an opportunity to incentivise the general public, commercial and public institutions to donate/dispose their post-consumer textiles responsibly.

Skills and workforce opportunities

1. **Educate citizens and institutions (1-5 years):** There is a strong opportunity to educate the general public, commercial and public institutions, to equip them with the necessary skills around efficient post-consumer textiles donation/disposal to increase textile reuse and recycling rates. This is a necessary step to ensure post-consumer textiles are diverted from residual waste and collected in a way that prevents damage and contamination. This can be done through education campaigns, training activities, workshops, etc. More particularly, there is an opportunity to start this education in schools, with programmes focused on textile reuse and recycling. This could include school collection points, activities, field trips.

2. **Foster cross-sector partnerships (1-5 years):** There is an opportunity to create cross-stakeholder partnerships and collaborations that could build a more cohesive and efficient recycling ecosystem that works for all participants. More particularly, there is an opportunity to work closely with waste management companies to provide specialised training on post-consumer textile management, recycling processes and reuse opportunities.

Technology opportunities

1. **Implement digital platforms/ apps (1-5 years):** These platforms/apps would help consumers and organisations understand the value of their textiles and receive information on appropriate end-of-life routes for these items (e.g., potentially returning them to the original retailer or brand).

2. **Improve tracking and collection of textile flow data (1-5 years):** Implementation of new technologies and mechanisms to monitor post-consumer textiles.

3. **Implement smart textile collection systems (5–10 years):** Smart waste management systems represent a significant opportunity. Technology could support optimised and efficient collection and logistics for post-consumer textile waste. Specific applications include sensor technologies that monitor capacity levels in textile banks and automatically notify collectors when emptying is required. Such systems could improve operational efficiency while reducing issues like overflow and fly-tipping.
4.

3.1.5. GOVERNMENT RECOMMENDATIONS

Infrastructure Recommendations

Prioritise textile waste in policy frameworks (1-5 years): Incorporating KPIs beyond volume (e.g. Emissions Trading Scheme mechanism for waste management companies).

Reform local authority waste strategies (1-5 years): It is essential to ensure stakeholders have access to appropriate collection infrastructure that encourages disposal beyond residual waste in ways that promote textile reuse and recycling. This presents an opportunity to develop Action Plans (frameworks for local policy/regulation infrastructure) for Local Authorities on effective management of post-consumer textile waste. It also creates an opportunity to standardise post-consumer textile waste management across councils through the creation of consistent guidelines and best practices.

Strengthen licensing and environmental standards (1-5 years): There is an opportunity to revisit the UK's licensing process for textile waste collection and management and strengthen the required environmental compliance standards. Making this process more stringent would better support operations and infrastructure that align with circularity and environmental best practices.

Require the separate collection of textile waste (5–10 years): Establish a Mandatory separate collection of waste, in harmonisation with current EU regulations.

Require commercial textile waste separation (5–10 years): Establish an obligation for commercial and public institutions to effectively manage the collection of textile waste.

Market capacity and economic viability recommendations

Provide transitional financial support (1-5 years): There is an increased opportunity for financial support for textile waste management in Local Authorities (LA). Provide funding to LA to enhance textile collection infrastructure and education programmes. This could mean transition funding until an EPR system is in place that can partially fund this.

Fund R&D Innovation (1-5 years): Government funding for start-ups in the field of collection and supportive of existing R&D initiatives in this stage.

Implement climate-based performance indicators (1-5 years): Prioritisation of textiles within waste streams requires new KPIs beyond weight. Performance indicators should include metrics such as carbon emissions, particularly as Local Authorities could face financial penalties for textile waste emissions under the upcoming Emissions Trading Scheme (ETS). This suggests a shift is needed from weight-based targets toward climate-based and net zero targets.

Support collection merchant viability (1-5 years): Financial support to collection merchants handling high volumes of NRTs. This could mean transition funding until an EPR system is in place that can partially fund this.

Establish Extended Producer Responsibility (1-5 years): Introduce a mandatory, eco-modulated EPR scheme to finance the shift toward, and long-term sustainability of a circular textiles economy in the UK. Funding could be used to improve or expand collection points for textiles that can drive textile reuse and recycling. This would also alleviate pressure on Local Authorities' general waste systems. Scaling up separate collection systems requires structural funding.

Skills and workforce recommendations

Develop LA training programmes (1-5 years): There is an opportunity to provide targeted training for Local Authorities regarding textile waste management, reuse and recycling strategies. This would support the development of specialised textile waste management programmes aimed at reducing textiles in general waste streams and prepare LAs for upcoming regulations such as the UK Emissions Trading Scheme (ETS).

Support and implement public outreach campaigns (1-5 years): Funding the public education campaigns could promote proper textile donation/disposal, recycling, and reuse.

Implement school education programmes (1-5 years): Funding and promoting the school education programmes across the UK.

Transparency and data recommendations

Standardise data collection and reporting mechanisms (1-5 years): Review and update current data collection and reporting requirements to enhance transparency around the collection and end-of-life (EoL) management of textile waste. Strengthen national data systems to enable more accurate and consistent reporting such as on volumes and composition of textiles collected, to support evidence-based policy and decision-making. Introduce mandatory, standardised, and rigorous reporting obligations for local authorities, collection businesses, and both public and private institutions.

3.2. Textile management

Management of post-consumer textiles refers to what happens once the textiles have been collected and prior to being reused, recycled, incinerated or landfilled. This includes both reusable (RT) and non-reusable (NRT) post-consumer textiles, as well as textile waste per se. At this point, the relevant stakeholders separate, sort and grade the post-consumer textiles with the intent for domestic reuse, international reuse, domestic recycling, international recycling or domestic or international end of life (EoL), in response to end market demand and economically viable options.

This stage is particularly characterised by the sorting and grading of post-consumer textiles. Sorting, grading and pre-processing represent crucial steps in assessing post-consumer textiles, as they determine the most suitable next use. Without proper sorting, textiles can be incinerated or landfilled, regardless of their condition or quality, resulting in higher CO2 emissions. Currently, the management of post-consumer textiles happens to those textiles that are segregated from residual waste, as textiles that are mixed with other residual waste streams are (in most cases) unsorted and classified as waste. From a circularity perspective, the end goal of this stage is to maximise the potential for reuse, recycling, and overall recovery of these textiles.

3.2.1. KEY STAKEHOLDERS AND RESPONSIBILITIES

In the UK, the key stakeholders and their main responsibilities in the textile waste management stage are:

Collection merchants who separate, sort and grade

Certain collection merchants, after they collect post-consumer textiles through partnerships/ contract agreements with Local Authorities and charity shops (among others), go one step further by separating/sorting the textiles before passing them on to a sorting and grading merchant. The key advantage of this separation process is that it can reclassify the textiles. This process is simpler than the traditional sorting process and involves separating items by type, such as winter and summer clothing, or removing “contaminants” like non-textile items. Examples of sorting/separation at this stage includes:

- Separate clothing into different styles of reuse for graders across the world, for example ones specialising in African grading and one who specialise in the winter/heavier weighted good which tend to go the Eastern Europe markets.
- Separate out vintage clothing to sell direct to vintage clothing traders.
- Removal of any contaminated items such as coat hangers or non-textile items.
- Removing any items which clearly have no reusable properties (non-reusables).
- Some collection merchants go one step further by sorting and grading themselves, hence, they are also classified as sorting and grading merchants.

Sorting and Grading merchants

Sorting and grading of post-consumer textiles happens both in the UK and abroad, for the textiles to be processed preferably for either reuse or recycling. In the UK back in 2014 it is estimated that there were about 60 businesses doing this operation, however, there are now only 12 known. A map of current Reuse and Grading Merchants is found here:

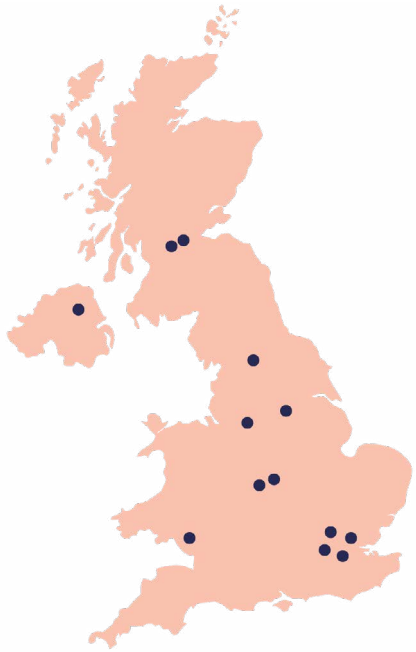


Figure 2. Geographical UK location of key stakeholders

Company	Location
Clyde Recycling	Glasgow
TRI - Nathans Wastesavers	Glasgow
TRI - Cookstown Textile Recycling	Antrim
TRI - SWD Premier Clothing Exports Ltd	Manchester
Randisi Textile Recycling Ltd	Bradford
TIC International Ltd	Birmingham
TRI - JMP Wilcox	Bilston
Tex-Trade UK	Newport
ELT Global	Romford
Zenith Textiles Ltd incl Genisis	Erith
Chris Carey Collections	Bromley
Lontex Exports Ltd	Barking

Once the Sorting and Grading merchants receive the items, they go through a meticulous sorting process. In the UK, Reuse and Grading merchants generally follow the process outlined below, although practices can vary between operational facilities:

- Removal of any contaminated items such as coat hangers or non-textile items.
- Separation into different types of clothing product types such as trousers, t-shirts, dresses, blouses, etc.
- Each type of textiles will be sorted and graded by skilled operatives, who are usually highly trained and skilled workers who can assess the quality of clothing by touch and sight. They evaluate the post-consumer textile materials based on various factors such as brand, cleanliness, wear, and reusability, a mix of market value and potential demand. While guidelines are typically provided to sorters, these are flexible due to the wide variety of collected textiles and fluctuating market conditions. Sorting decisions also depend on the individual worker, the specific sorting process, current demand, and the intended next use. Additionally, the condition of textiles is often influenced by the collection method, whether from kerbside collections, recycling banks, charity shops, or in-store drop-offs.
- Once the items have been sorted and graded, they will then be weighed and packaged up ready for the suitable markets for sale. A sorter and grader who operates for all markets will sort and grade into over 250 different product types, demonstrating the complexity of its operations. The sales process is complex, as matching the type of clothes to the correct markets and having the required volumes available (as they are not always available due to nature of the collection) can be an extensive balancing act. Reusable post-consumer textiles are therefore usually sold to reuse markets, and non-reusable post-consumer textiles to recycling markets.

Key countries which UK Sorting and Grading merchants sell reusable grades into are:

- UK for the Vintage and Charity Shop markets
- East Africa, Kenya, Uganda, Tanzania.
- West Africa, Ghana, Togo, Cote D'Ivoire.
- Eastern Europe, Poland, Ukraine, Romania, Lithuania.
- Jordan.
- Small, limited volumes are also sent for specialist items to Spain, Portugal, Philippines, Italy, Chile.

Key countries which UK Sorting and Grading merchants have stated they sell repair or recycling grades are:

- UK for a very limited amount of mechanical recycling grades.
- Pakistan.
- India.
- Morocco.
- Turkey.

Countries which UK Sorting and Grading merchants have stated they sell wiper grade are:

- UK for a very limited amount.
- Pakistan.
- Eastern Europe, Poland, Ukraine, Romania, Lithuania.

Exporters of used textiles

Some businesses, including Sorting and Grading merchants, are primarily focused on the export of both sorted and unsorted post-consumer textiles to international end markets. Used textiles cross numerous international borders. In African and Eastern Europe countries, imports are primarily intended for local reuse. In contrast, in many Asian countries, local reuse is more restricted. Instead, textiles are typically either mechanically recycled or re-exported for reuse in Africa or recycling in other countries, depending upon their grade (reusable vs non-reusable). Those that cannot be recycled or re-exported often end up in local waste management systems, where they are typically landfilled. The volume of post-consumer textiles heading to Asia is growing. Pakistan and India are key post-consumer textile importers and leaders in mechanical textile recycling with major recycling hubs in cities such as Panipat, Amroha, and regions like Tamil Nadu in India, or Faisalabad and Karachi in Pakistan. The United Arab Emirates also plays a central role, acting as a major hub for the import, sorting, grading, and re-export of post-consumer textiles.

Charity sector

The charity sector plays a crucial role in the sorting and grading of the donated goods, as they are currently one of the main responsible stakeholders for collection of post-consumer textiles through donations in the UK. They are responsible for assessing all the post-consumer textile donations received and prepare suitable textiles for sale to the public, which is mainly done by volunteers. The remaining post-consumer textiles are sold to collection merchants or sorters and graders directly, meaning some of the donated post-consumer textiles go through several separation, sorting and grading operations. Certain charity shops sell ‘bought in goods’ as well, meaning they represent an end market for certain sorters and graders selling UK reuse grades.

Sorting and pre-processing for recycling businesses

While not yet fully integrated into the traditional post-consumer textile supply chain, a number of emerging businesses are increasingly focusing on the sorting and pre-processing of post-consumer textiles, particularly targeting non-reusable feedstock, with high value textile recycling as the intended end-use. Detailed and accurate sorting is essential for successful high-value textile recycling. These businesses are primarily engaged in sorting by material composition and colour, removing contaminants, or disruptors, and preparing the feedstock for recycling processes. These businesses often collaborate closely with, or are integrated into, existing post-consumer textile management systems. Moreover, traditional sorters and graders are beginning to explore the integration of these capabilities into their own business models, recognising the growing importance of textile recycling in a circular economy.

3.2.2. KEY CHALLENGES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce, and technology, as well as government challenges of the current system, are highlighted.

Infrastructure challenges

1. **Limited domestic sorting and grading capacity:** There is very limited infrastructure to sort and grade post-consumer textiles in the UK. The number of domestic UK Sorting and Grading stakeholders has decreased drastically in the past decades. There are currently few formally established Sorting and Grading merchants operating in the UK, hence, leading to a decreased capacity for handling post-consumer textiles domestically. As it currently stands, most post-consumer textiles are being exported to be sorted and graded internationally, meaning the UK is losing the opportunity to maintain the non-reusable feedstock domestically to input into a textile recycling stream. The shift to international Sorting and Grading means the UK cannot control the management of post-consumer textiles and is reliant on other countries dealing with UK textiles. In fact, this outsourcing creates a new set of challenges, including a loss of control over quality and ethical practices, further complicating efforts to establish a robust, sustainable textile recycling system. If sorting and grading doesn't happen in the UK current efforts focusing on textile recycling will fail.

2. **Inefficient global supply chain infrastructure:** Meanwhile, international importers and re-exporters of NRTs (non-reusable textiles) stand at a unique opportunity to leverage existing infrastructure and resources to emerge as leading circular regions. Yet, circular supply-chains are still lacking infrastructure and are not fully efficient and organised, resulting in the inefficient realisation of textile waste potential, globally.

3. **Overwhelming textile waste volumes:** There is a global challenge, which consequently affects the infrastructural capacity, which is the volume of clothing, which is now produced, consumed and thrown away. Domestic and international markets are being swamped with an oversupply of post-consumer textiles, which leads to a disproportionate waste management burden in domestic and international markets. Domestically, in the UK, this means that there is genuine concern within the industry about the inability to collect from charity shops, recycling centres, and community textile banks, among others, as processing plants are nearing full capacity. This could imply accumulation of textile waste in incineration plants and landfills.

4. **Limited high-value recycling infrastructure:** Current textile recycling infrastructure primarily supports lower-value processes, such as mechanical recycling. Globally, the industry lacks a mature, large-scale infrastructure capable of processing non-reusable textiles (NRTs) and recovering profitable value from them.

Market capacity and economic viability challenges

The used textiles industry in the UK is facing financial strains and challenging profitability. This is impacted by:

1. **Low demand for recycled content:** Despite an oversupply of post-consumer textiles (PCT), demand for recycled content remains low, creating an imbalance that hinders commercial viability. Non-reusable textiles (NRTs) generate negative margins across the supply chain. As a result, the focus shifts toward reusable textiles, overlooking the substantial volume of NRTs in the PCT stream. At the same time, the influx of low-quality textiles into the recycling system is accelerating, indicating that the proportion of NRTs is likely to continue rising. Overall, the growing share of non-reusable textiles (on which sorters and graders typically incur losses) has intensified financial pressure, as profitability remains low. This has a significant impact on the ability of Sorting and Grading merchants to manage textile waste.

2. **Rising operational costs with declining margins:** In addition, stakeholders at this stage face increased operational costs (e.g. energy and fuel) while dealing with lower-quality textiles. Profit margins have significantly decreased, threatening the viability of their operations. In fact, one of the primary reasons for delocalising the management of post-consumer textiles and pushing the operations abroad, are the high labour costs in the UK. In countries like the UAE, cheap labour and tax incentives (free zones) make it more economical.

3. **External market pressures:** Other financial pressures for post-consumer textile stakeholders include:

    a. The crisis in the Red Sea has disrupted shipping lines, significantly escalating operational costs (e.g. freight) for textile merchants.
    b. Increasing taxation and measures from African and Asian markets that would typically take on post-consumer textiles coupled with mounting pressure to curb waste exports also results in immense financial strain.
    c. Fluctuating and volatile demand from international market due to geopolitical instability and shifts has affected the financial stability of some stakeholders.

4. **Intensified competition:** The competition is rising. In the reuse market, stakeholders who would typically resell used textiles at a lower price are facing growing international competition due to an influx of low-quality, inexpensive new clothing imported from abroad, often sold at prices comparable to second-hand items. At the same time, rising global textile waste is leading other markets to export non-reusable textiles (NRTs) to countries that import post-consumer textiles from the UK.

Most of the market capacity and commercial viability challenges arise from the interdependencies between the actors of the end markets, which leads to a cascading effect of unprofitability. The decrease in quality and influx of NRTs has cascading effects throughout the system, from charity retail to collection and sorting and grading merchants, who are finding it increasingly difficult to sort and recycle these items profitably, leading to a reduced ability to manage waste effectively. These relationships become strained, leading to inefficiencies and potential breakdowns in the system. If one link in the chain falters, such as a collapse in collection operations or a halt in international grading, the result could be a dramatic increase in textile waste being diverted to incineration or landfill.

The current system is challenging the long-term business model of NRTs. Yet, current business practices are firmly rooted, creating obstacles to changing longstanding commercial routes and partnerships that rely on conventional systems, which complicates the shift toward a circular supply chain.

Skills and workforce challenges

1. **Dependence on skilled manual labour:** As currently sorting and grading relies mainly on manual sorting, the decision of whether a used textile is still reusable or not and how to categorise each item needs the expertise of a well-trained sorting staff. Sortation and grading workers interpret material quality for the next use, including brand, cleanliness, wear and reusability (a combination of value and likely demand). Skilled workers play a critical role in the initial separation, sorting and grading stage. The grading process for textile reuse is labour-intensive, requiring skilled workers to assess the quality of garments accurately. At present, the workforce engaged in sorting and grading predominantly comprises women from the UK and Eastern Europe, many of whom possess limited formal education and receive remuneration at the minimum living wage level. Although UK-based sorting and grading merchants still participate in this industry, much of this work has been offshored, particularly to countries like the UAE. These factors have led to a shift away from UK operations, despite the importance of skilled labour in ensuring high-quality sorting.

2. **Loss of skilled workforce:** The notable loss of skilled labour in the UK's textile sorting and grading sector is due to:

    a. High labour costs, compounded by the economic impacts of the UK's exit from the EU.
    b. As the wages payable are invariably close to minimum wage it results in a limited pool of staff available. The sector is failing to attract new talent, and this wage constraint also presents significant challenges in staff retention.
    c. Consequently, high rotation among sortation and grading workers requires facilities to continuously invest time and resources into frequent, routine training. Currently, it takes up to 6 weeks to train how to sort and grade clothing in a facility.
    d. The availability of cheap labour and tax-free zones makes certain geographical locations (e.g. UAE), more economically viable to outsource sorting and grading.

3. **Lack of standardisation:** Although sorters and graders and the charity sector are generally provided with 'guidelines', these remain flexible due to the diverse range of collected textiles and shifting market conditions. Sorting outcomes also vary based on individual workers, the specific processes in place, current demand, and the intended end use. As a result, the sorting and grading definitions and processes in the UK lacks consistent standardisation.

Technology challenges

1. **Limited technology adoption:** Overall, the adoption of technology in the sector remains limited, with operations still heavily dependent on manual labour. Financial constraints prevent many sorters and graders as well as the charity sector from investing in technological advancements.

2. **Early-stage sorting technologies:** Technologies for sorting and grading textiles for reuse and recycling are still in early stages of development. These processes require nuanced understanding of material quality, branding, end-market requirements, and regional variations, all of which add complexity and hinder technological advancements and automation.

3. **Limited transparency and traceability:** The sector also faces a lack of transparency and traceability, which could be addressed through digital and technological innovations to improve oversight and accountability throughout the value chain. There is limited visibility of what happens to textiles once they have been collected.

4. **Resistance to innovation:** Overall, the established industry shows resistance to embracing novel approaches to post-consumer textiles management, including technological innovations, that have the potential to increase sorting and grading efficiency for both reuse and recycling, thereby impeding development.

Government challenges

1. **Lack of sector support:** The UK government currently offers no support programme for the sorting and grading sector, which faces a real risk of collapse. This neglects the potential economic and environmental consequences of failing to collect and process higher volumes of post-consumer textiles in the UK.

2. **Unclear legal definitions:** There are no clear legal definitions distinguishing post-consumer textiles for reuse, recycling, or disposal, making effective management and regulation of textile flows difficult.

3. **Weak licensing standards:** Currently, the licensing for managing textile waste is not stringent, making it simple and inexpensive to obtain a license to manage textile waste.

4. **Limited tracking and oversight:** Post-consumer textiles are currently not tracked, hence there is no guarantee that goods are going to correct countries. The lack of control of what is being exported creates a blurred picture of post-consumer textile flows. The global trade in post-consumer textiles is vast but remains somewhat opaque. There is significant uncertainty about the types and quality of textiles being exported, as well as the actual levels of reuse and recycling they undergo. Scotland, through SEPA (Scottish Environment Protection Agency), has stricter rules on textile exports.

5. **Outdated trade regulations:** More concretely, outdated customs codes are creating legal and financial barriers for second-hand clothing (SHC) and textile recycling shipments, threatening the textile sector's transition[23].

3.2.3. KEY OPPORTUNITIES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce, technology, as well as government opportunities of the current system, are highlighted.

Infrastructure opportunities

1. **Strengthen existing UK sorting and grading capacity (1-5 years):** Leverage and support the existing infrastructure that exists in the UK that is currently capable of sorting and grading post-consumer textiles domestically.

2. **Build global partnerships (1-5 years):** Establish relationship with global import circular hubs of NRTs (e.g. Pakistan and India) and exchange best practices to leverage infrastructure development in the UK and in global export locations.

3. **Optimise NRT material flow (1-5 years):** Rethink the inefficient flow and management of NRTs through the system (e.g. NRTs going to charity shops when they are later recirculated through collection merchants). There is an opportunity to work with stakeholders (e.g. charity shops) to understand what infrastructure could be leveraged to make this process more efficient.

4. **Develop automated sorting and pre-processing infrastructure (1-5 years):** Build national infrastructure for automated sorting and pre-processing for textiles recycling.

5. **Expand post-consumer textile management capacity (5-10 years):** Given the current oversupply of textiles among many sorting and grading operators, there is an opportunity to support larger facilities or expanded storage capacity to accommodate post-consumer textiles. This presents a chance to develop more localised infrastructure, creating regional hubs for textile waste, rather than relying on widespread, dispersed processing across the country.

Market capacity and commercial viability opportunities

1. **Attract investment for infrastructure modernisation (1-5 years):** Attract and mobilise investment capital to scale up post-consumer textile (PCT) management infrastructure, with a strategic focus on modernisation, and particularly, automated sorting and pre-processing systems to enable efficient and high-quality feedstock for textile recycling.

2. **Support emerging circular businesses (1-5 years):** Attract and mobilise investment capital to support emerging circular businesses, particularly those that offer innovative solutions to sorting, grading and pre-processing of post-consumer textiles.

Skills and workforce opportunities

1. **Create structured training programmes (1-5 years):** Sorters and graders must consistently invest time and resources into workforce training. This presents an opportunity to develop structured training programmes, such as apprenticeships, that can serve as a continuous onboarding and skill-building platform for new and departing staff in sorting and grading facilities.

2. **Integrate new technologies with manual skills (1-5 years):** There is also an opportunity to upskill sorters and graders in the use of new technologies, enabling them to work more efficiently within a hybrid model that combines digital tools with their existing manual expertise. This will ensure that the sector keeps pace with technological advancements.

3. **Foster innovation adoption (1-5 years):** It is essential to encourage traditional stakeholders to embrace innovation and collaborate with new market entrants and solution providers.

4. **Standardise sorting and grading criteria (1-5 years):** There is an opportunity to create industry-wide standardisation and criteria around sorting and grading for both the sorting and grading sector and charity shop volunteers, to make this process and criteria more standardised throughout the current UK workforce.

5. **Develop higher education curricula (5-10 years):** There is an opportunity to integrate textile recycling skills (particularly those related to emerging technologies such as AI, robotics, and automation) into current higher education curricula. As the industry evolves, cross-sectoral expertise will become increasingly important to meet future workforce demands.

Technology opportunities

1. **Implement hybrid operational models (1-5 years):** Hybrid operational models that blend manual skills with digital tools can significantly improve productivity and adaptability in the textile recycling sector.

2. **Deploy automation and robotics (1-5 years):** The integration of automation and robotics into post-consumer textile (PCT) processing offers significant potential to enhance both the efficiency and scalability of reuse and recycling operations. By developing and deploying advanced sorting systems (capable of identifying fibre types, colours, and garment conditions), businesses can reduce reliance on manual labour, increase throughput, and improve material recovery rates.

3. **Build transparent supply chains (5-10 years):** A digitalised and transparent post-consumer textile supply chain is critical to achieving circularity goals. The use of tracking and transparency tools can enable better traceability of materials, reduce data leakage, and support regulatory compliance. This could enhance the market value of recycled content.

3.2.4. GOVERNMENT RECOMMENDATIONS

Infrastructure Recommendations

Enable infrastructure for post-consumer textiles management (1-5 years): Enable the provision of adequate space and infrastructure to support the development of large-scale facilities for sorting and handling textile waste, in response to increasing waste volumes funded by the industry through an Extended Producer Responsibility (EPR) scheme.

Strengthen waste licensing controls (1-5 years): More stringent controls of waste licensing in the UK.

Market capacity and commercial viability recommendations

Prevent sector collapse through financial support (1-5 years): Government needs to understand the strong importance of focusing on rebuilding the UK Sorting and Grading sector, as it plays a critical role to enable circular supply-chains in the short-term as well as to keep post-consumer textile flows in the UK. It is an essential step prior to the automated sorting and pre-processing of textile recycling and is highly dependent on manual skilled labour. Funding could reinvigorate the manual sorting and grading industry, particularly by supporting operational costs related to labour. Since textile sorting and grading is labour-intensive, this would help bring more of the sorting and grading process back to the UK, improving quality control and job creation. This could mean transition funding until an EPR system is in place that can partially fund this.

Fund workforce training initiatives (1-5 years): Funding could also support training initiatives for workers involved in sorting, grading, and recycling textiles. This would help address the labour shortages within the industry and improve the overall quality of operations, particularly in the labour-intensive sorting process for reuse.

Support R&D for circular textiles (1-5 years): Continue to support research and development (R&D) within the circular textiles ecosystem by providing targeted innovation funding. Sustained R&D funding will accelerate the development of novel solutions, foster collaboration between academia and industry, and help position the UK as a global leader in circular textile innovation, with a focus on textile recycling.

Support SME textile recycling network (1-5 years): More particularly, focus on supporting the UK's growing SME textile recycling network to absorb more NRTs.

Establish Extended Producer Responsibility (1-5 years): Introduce a mandatory, eco-modulated EPR scheme to finance the shift toward, and long-term sustainability of a circular textiles economy in the UK. Prioritise allocating substantial funding to the development of automated sorting and textile recycling infrastructure.

Skills and workforce recommendations

Support skilled worker recruitment (1-5 years): The sector needs support with recruitment of skilled workers for sorting and grading.

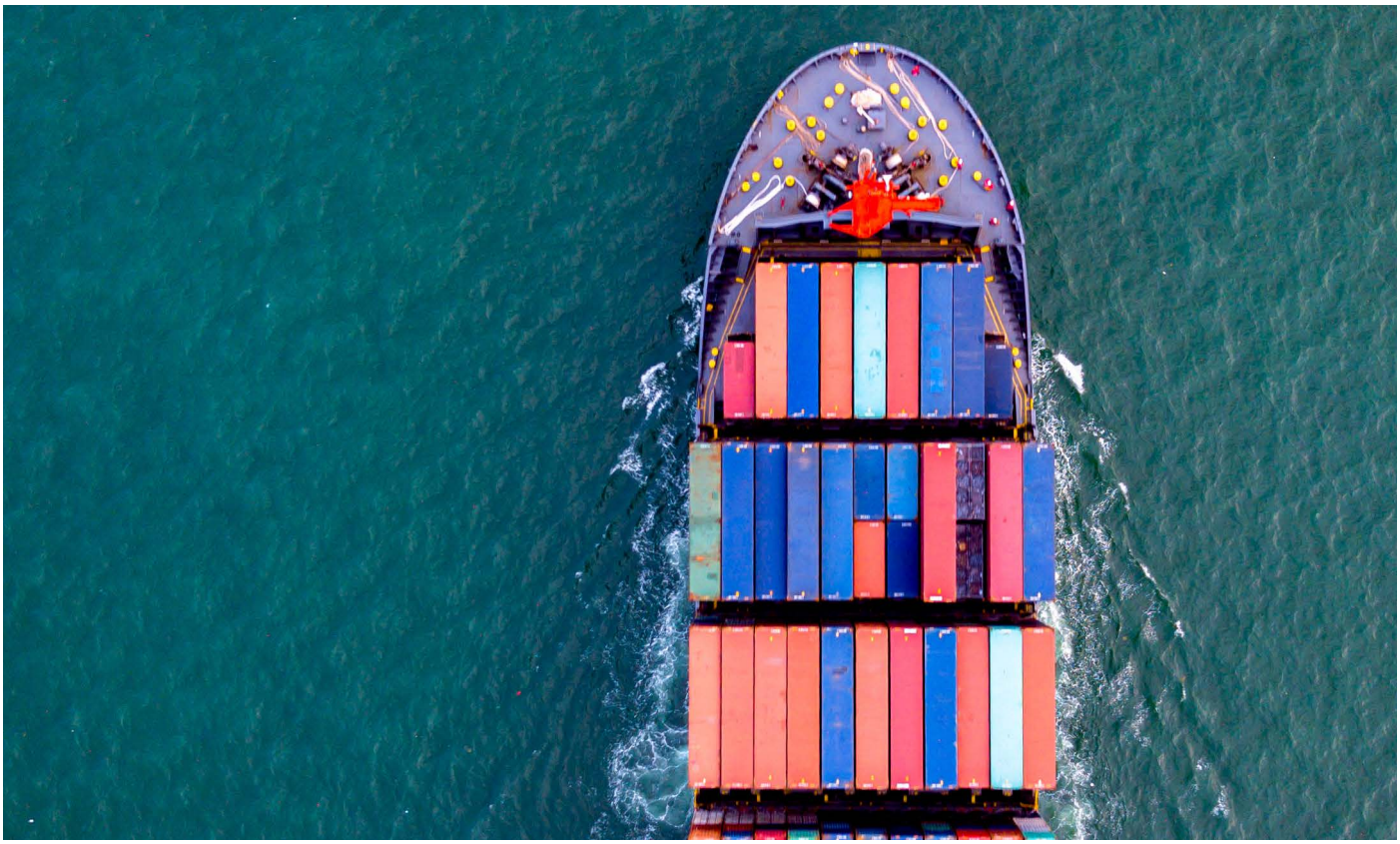
Support the standardisation of sorting and grading criteria (1-5 years): There is an opportunity to create industry-wide standardisation and criteria around sorting and grading for both the sorting and grading sector and charity shop volunteers, to make this process and criteria more standardised throughout the UK. There is a need to revisit industry standards to fit within the textile recycling outlook.

Used textiles trade recommendations

Strengthen export controls (1-5 years): Clearer rules of waste shipment in the UK, particularly exports to non-OECD countries.

Standardise legal terminology (1-5 years): Standardise legal terminology of used textiles to enable a circular transition.

Revise trade codes (1-5 years): Revise trade codes to be fit for purpose for textiles circularity.



3.3. Textile recycling

Textile Recycling refers to the process of converting textile waste into new materials or products and can be either closed-loop or open-loop. Closed-loop recycling refers to the recycling of materials from one industry to create outputs for use in the same industry, and more concretely, fibre-to-fibre recycling is a recycling process in which collected textile waste is processed into recycled textile fibres. Open-loop recycling refers to the recycling of materials where inputs from one industry are recycled into outputs for another industry.

3.3.1. KEY STAKEHOLDERS AND RESPONSIBILITIES

In the UK and globally, the key stakeholders and their main responsibilities in textile recycling are:

Open loop textile recyclers

Wiper merchants: A wiper merchant is essentially an open loop recycler, as they take textiles and re-purpose them to produce wiper cloths for the manufacturing or motor industries. The input for this process is most usually cotton-rich materials (e.g. towels, bedsheets, t-shirts) which are turned into cloth for manufacturing or mechanical cleaning purposes. The process usually also involves disruptor removal. Wiper merchants benefit from increased access to low-grade textiles that are unsuitable for reuse but still valuable for wiper production, however, they are dependent on the supply of consistent plain fabrics.

Shredding service providers: Stakeholders who utilise mechanical recycling methods to process textiles, breaking them down into reusable fibres. These reclaimed fibres are then repurposed for various applications, such as insulation, mattress filling, acoustic panels, and pet bed stuffing.

Closed loop fibre-to-fibre textile recyclers

Closed-loop fibre-to-fibre textile recyclers use advanced methods, such as mechanical, chemical, enzymatic, biological and thermo-mechanical recycling, among others, to break down fibres into raw materials. These processes are particularly suited for pure or blended fibres like polyester and cotton.

Academic and research institutions

They play a critical role in advancing textile recycling technologies. They are actively exploring new recycling methods and developing innovative solutions to improve the sustainability and circularity of the textile industry.

Brands and retailers

This stakeholder group plays a critical role in driving the adoption of textile recycling infrastructure. Brands play a key role by forming commercial partnerships with recyclers, helping to create consistent demand for recycled fibres. Additionally, brands are instrumental in validating new recycling technologies by testing and integrating these materials into their pre-existing product lines, ensuring recycled fibres meet the necessary quality and performance standards.

3.3.2. KEY CHALLENGES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce and technology, as well as government challenges of the current system, are highlighted.

Infrastructure challenges

1. **Insufficient capacity for textile waste volumes:** The proliferation of low-quality garments has intensified the need for recycling, yet the current infrastructure is not scaled to manage the increased volume or material complexity. The UK lacks sufficient capacity to handle non-reusable textiles (NRTs) at scale.

2. **Limited domestic mechanical recycling infrastructure:** Mechanical recycling in the UK is not financially viable at scale and is hampered by quality issues. The process is largely limited to low-value outputs and is reliant on materials that meet narrow specifications. In contrast, countries like Pakistan have established more robust mechanical recycling infrastructure capable of processing a broader range of textiles. Textile recycling practices are therefore increasingly delocalised, with significant portions of activity relocated to other countries (mainly Pakistan and India). This offshoring has reduced domestic visibility and control over material flows and value recovery of non-reusable textiles.

3. **Predominance of low-grade recycling infrastructure:** Overall, existing UK and global infrastructure predominantly supports low-grade mechanical recycling, such as shredding textiles into fibres used for padding or insulation. Most of such processes now occur outside the UK, where operational costs are lower.

4. **Limited fibre to fibre recycling capacity:** Fibre to fibre recycling presents significant future potential, particularly for processing complex material blends. The UK has made initial advancements, including a pilot facility. However, current capacity is very limited.

5. **Feedstock quality and availability constraints:** Emerging recycling technologies are highly dependent on specific feedstock compositions. Most processes require materials with high levels of purity, such as polyester content exceeding 90 percent. Sourcing such materials at scale is currently a significant constraint, both in terms of volume and quality assurance.

6. **Complex material contamination challenges:** Recyclers face major challenges due to textile contamination and increasingly complex fibre blends, which are common in both fashion and technical textiles. These issues often render materials unsuitable for either mechanical or chemical recycling and inhibit the development of reliable input streams.

7. **Inadequate feedstock preparation infrastructure:** Overall, the UK's recycling infrastructure is not equipped to meet the volume or complexity of current textile waste streams. Existing facilities are limited in both capacity and technological capability. Additionally, there is no comprehensive infrastructure in place to manage the preparation of feedstock supply in line with the requirements of emerging technologies at scale.

Market capacity and commercial viability challenges

1. **Decline of UK mechanical recycling sector:** The UK once had a functional mechanical recycling sector; however, rising operational costs and a lack of viable end markets have contributed to its significant decline. Many viable textiles are now exported for processing abroad, resulting in missed opportunities to retain value and stimulate domestic economic activity.

2. **Low-value outputs with limited profitability:** Current infrastructure (both in the UK and globally) mainly supports low-grade mechanical recycling, such as shredding textiles into fibres for insulation, bedding, or industrial wipers. These processes degrade material quality and result in low-margin outputs that offer limited commercial return and profitability.

3. **High operational costs reducing competitiveness:** UK-based recyclers face considerable cost challenges, particularly related to staffing and operations. These pressures reduce competitiveness compared to countries such as Pakistan and parts of Eastern Europe, where labour and operating costs are significantly lower and infrastructure is more established.

4. **Negative economic margins for NRT recycling:** Today, the recycling of non-reusable textiles presents a negative economic margin. There is little commercial incentive to invest in their recovery at scale under current market conditions.

5. **Limited demand from brands and retailers:** There remains a notable lack of demand from brands and retailers for recycled fibres. Without consistent purchasing commitments, textile recyclers struggle to cover operational costs or justify investment in capacity expansion.

6. **Cost disparity with virgin materials:** Virgin textile materials often remain cheaper than recycled alternatives. This cost disparity undermines the financial rationale for integrating recycled inputs, both for manufacturers and retailers.

7. **Investment gap compared to other regions:** Compared to Europe and Asia, the UK is lagging in investment for textile recycling. Other regions have attracted significant public and private capital to support recycling technologies, pilot programmes, and industrial-scale operations, putting the UK at a competitive disadvantage.

Skills and workforce challenges

1. **Knowledge gaps in recycling methods:** A knowledge gap still exists concerning textile recycling methods and solutions for handling various material compositions and blends.

2. **Limited brand and retailer expertise:** Brands and retailers often lack a clear understanding of available recycling technologies and the practical steps required to incorporate recycled content into product design and manufacturing. This knowledge gap hinders collaboration with recyclers and slows the adoption of circular practices.

3. **Shortage of specialised technical skills:** There is a widespread shortage of specialised skills in textile recycling technologies, including both mechanical and chemical processes. Few professionals possess the technical knowledge required to operate advanced recycling systems, manage fibre sorting, or handle material separation at the precision needed for high-quality outputs in the UK.

4. **Resistance to innovation in traditional sector:** The textile sector remains largely traditional in its approach, with longstanding commercial relationships and operational models that resist innovation.

5. **Fragmented skills across value chain:** The skills required to build a closed-loop textile recycling system are spread across multiple, disconnected parts of the value chain.

Technology challenges

1. **Immature processing technologies for complex materials:** Technologies required to process and recycle complex, or multi-material blends are still immature, in development or not commercially viable. These materials are difficult to separate or break down using existing technologies, limiting effective recycling.

2. **Early-stage sorting and grading technologies:** Similarly, technologies for sorting and grading textiles for reuse and recycling are still in early stages of development. These processes require nuanced understanding of material quality, branding, end-market requirements, and regional variations, all of which add complexity and hinder technological advancements and automation.

3. **Limited tracking and traceability systems:** There is a lack of reliable tracking and traceability systems to identify and classify materials throughout their lifecycle, especially at end-of-life. This makes it difficult to recognise the type, quality, or origin of feedstock entering recycling systems.

Government challenges

Lack of EPR framework and eco-design requirements: The lack of an EPR framework and eco-design requirements for textiles is hindering development in the sector. Without mandated responsibility for post-consumer textile waste, brands face little pressure to design for recyclability, recycled content or fund recycling systems. This policy gap paralyses both private investment and the development of long-term infrastructure needed for a circular textile economy.

3.3.3. KEY OPPORTUNITIES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce, technology, as well as government opportunities of the current system, are highlighted.

Infrastructure opportunities

1. **Utilise existing open-loop infrastructure (1-5 years):** Utilise existing open-loop textile recycling infrastructure in the UK to establish a domestic supply base (e.g., wiper market, shredding) and make the UK competitive with overseas operations.

2. **Engage with established international infrastructure (1-5 years):** Engage with established infrastructure (e.g. Europe, Asia) to implement textile recycling routes that increase the resource potential of UK-sourced NRTs.

3. **Develop automated sorting and pre-processing infrastructure (1-5 years):** Build national infrastructure for automated sorting and pre-processing for textiles recycling.

4. **Expand domestic fibre-to-fibre recycling infrastructure (5-10 years):** Develop and expand domestic fibre-to-fibre recycling infrastructure. This would reduce dependence on textile exports, securing a domestic resource base and positive socio-economic and environmental impact.

Market capacity and commercial viability opportunities

1. **Attract investment for automated sorting infrastructure (1-5 years):** Attract and mobilise investment capital to scale up automated sorting and pre-processing infrastructure, to enable efficient and high-quality feedstock for textile recycling.

2. **Attract investment for textile recycling infrastructure (1-5 years):** Attract and mobilise investment capital to develop and expand domestic fibre-to-fibre recycling infrastructure.

3. **Support emerging textile recycling businesses (1-5 years):** Attract and mobilise investment capital to support the advancement and commercialisation of emerging circular businesses, particularly those that offer innovative solutions to textile recycling.

4. **Establish commercial partnerships with recycling innovators (1-5 years):** Establish commercial partnerships with emerging textile recycling innovators to support scalability and attract investment into next-generation recycling infrastructure.

5. **Enable recycled fibre integration into high-value sectors (1-5 years):** Enable the reintegration of recycled fibres into high-value sectors (such as automotive, industrial, and consumer application) through cross-sector collaboration and market development.

6. **Foster cross-sector collaboration (1-5 years):** Foster cross-sector collaboration to reintroduce recycled fibres into high-value applications such as industrial, automotive, and consumer products.

7. **Expand Market Exploration Beyond UK Fashion and Textiles (1-5 years):** Broaden investigation into end-use applications outside the UK and traditional fashion and textile sectors. Identify opportunities in alternative industries and international markets to strengthen the commercial viability of recycled content and support long-term business growth.

Skills and workforce opportunities

1. **Develop textile recycling training for brands and retailers (1-5 years):** Develop practical toolkits and training programmes to equip brands and retailers with the knowledge to adopt recycling technologies, incorporate recycled materials into product design, and design products that are themselves recyclable.

2. **Enable interdisciplinary research and education (1-5 years):** Addressing the challenges of textile recycling demands interdisciplinary thinking that bridges design, engineering, materials science, supply chain management, etc. There is an opportunity to enable this at a higher education level and in academia.

3. **Further develop higher education curricula (5-10 years):** There is an opportunity to integrate textile recycling skills (particularly those related to emerging technologies such as AI, robotics, and automation) into current higher education curricula. As the industry evolves, cross-sectoral expertise will become increasingly important to meet future workforce demands.

Technology opportunities

1. **Support technological advancement of textile recycling technologies (1-5 years):** Support the technological advancement of textile recycling technologies capable of processing complex fibre blends to address current system limitations.

2. **Deploy automation and robotics (1-5 years):** The integration of automation and robotics into post-consumer textile (PCT) processing offers significant potential to enhance both the efficiency and scalability of recycling operations. By developing and deploying advanced sorting systems (capable of identifying fibre types, colours, etc), businesses can reduce reliance on manual labour, increase throughput, and improve material recovery rates, as well as ensure consistent feedstock for recycling.

3. **Build transparent supply chains (5-10 years):** A digitalised and transparent post-consumer textile supply chain is critical to achieving circularity goals. The use of tracking and transparency tools can enable better traceability of materials, reduce data leakage, and support regulatory compliance. This could enhance the market value of recycled content.

3.3.4. GOVERNMENT RECOMMENDATIONS

Infrastructure Recommendations

Enable infrastructure for textile recycling (5-10 years): Enable the provision of adequate space and infrastructure to support the development of large-scale industrial facilities for textile recycling, funded by the industry through an Extended Producer Responsibility (EPR) scheme.

Market capacity and commercial viability recommendations

Support R&D for textile recycling (1-5 years): Continue to support research and development (R&D) within textile recycling (closed-loop and open-loop solutions) by providing targeted innovation funding. Sustained R&D funding will accelerate the development of novel solutions, foster collaboration between academia and industry, and help position the UK as a global leader in circular textile innovation, with a focus on textile recycling.

Support larger investment to scale textile recycling (1-5 years): Support larger investment to scale textile recycling in the UK, building on the foundation of established automated sorting and pre-processing capabilities, as well as fibre-to-fibre recycling to create a fully integrated recycling ecosystem.

Establish eco-design requirements (1-5 years): Introduce eco-design regulations and incentives that promote the use of recycled content and improve the recyclability of materials. This will drive better product design and stimulate long-term demand for recycled inputs. Of particular importance is the alignment with EU's eco-design requirements.

Establish Extended Producer Responsibility (1-5 years): Introduce a mandatory, eco-modulated EPR scheme to finance the shift toward, and long-term sustainability of a circular textiles economy in the UK. Prioritise allocating substantial funding to the development of automated sorting and textile recycling infrastructure.

3.4. Manufacturing of recycled content

Manufacturing of recycled content refers to the use of recycled fibre for spinning of yarn, weaving and knitting of fabric. The manufacturing of recycled yarn can become a crucial link in a supply chain that works with the unified purpose of collecting textile waste, sorting and pre-processing it, recycling it, and manufacturing it for closed-loop and open-loop applications that deliver socio-economic benefits to the UK.

3.4.1. CURRENT OVERVIEW

In the UK, the key stakeholders and their main responsibilities in the manufacturing of recycled content are:

Yarn manufacturers

A yarn manufacturer transforms fibres (whether natural, synthetic, or recycled) into yarns that can be used for weaving or knitting textiles. Within the textile recycling supply chain, yarn spinners play a crucial role by converting recycled fibres into high-quality yarns suitable for new fabric production. Their expertise ensures that recycled materials maintain strength, consistency, and performance. By integrating recycled fibres into yarn production, yarn spinners help close the loop in textile circularity, supporting sustainable manufacturing and reducing reliance on virgin raw materials. Their role is vital in enabling brands and manufacturers to incorporate recycled content into their products without compromising quality or functionality.

Textile manufacturers

Textile manufacturers are equally important stakeholders in the recycling stage, as they are responsible for processing and producing materials using recycled fibres. Their role involves adapting existing machinery and processes to accommodate new types of inputs, such as mechanically or chemically recycled fibres. Manufacturers must also collaborate with brands and recyclers to ensure compatibility between recycled materials and existing production standards. Their technical expertise and willingness to innovate are essential to scaling up textile recycling and making it commercially viable.

Brands and retailers

This stakeholder group plays a critical role in driving the adoption of textile recycled content manufacturing. They are an instrumental stakeholder in validating new recycling technologies by testing and integrating these materials into their pre-existing manufacturing supply-chains, ensuring recycled fibres meet the necessary quality and performance standards.

3.4.2. KEY CHALLENGES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce, and technology, as well as government challenges of the current system, are highlighted.

Infrastructure challenges

The UK has historically been a global leader in the manufacturing of fibres, textiles, and leather. However, today, the manufacturing of fibres, textiles, and leather is more limited than the manufacturing of fashion and textile goods. While manufacturers of fashion and textile goods created an estimated £3.6bn gross value-added contribution to UK GDP in 2021, manufacturers of fibres, textiles, and tanners generated a combined £980million. This difference highlights the disparity between the UK's current capacity to manufacture fibres and textiles, and its capacity to produce finished fashion and textile goods.

1. **Lack of domestic spinning capacity:** At present, the capacity to convert recycled textiles into high-quality yarns suitable for apparel or textile production is limited, with only partial success achieved in the UK using wool. The UK lacks any commercial scale spinning capacity for both cotton and polyester yarns, creating a significant bottleneck in developing a domestic circular textile economy. Given that cotton and polyester make up the largest share of fibres placed on the UK market, the inability to produce these yarns locally represents a fundamental challenge in the transition towards manufacturing of recycled content in the UK. Facilities are limited in number and scope, operating primarily at pilot or research and development levels, as well as the non-woven sector, rather than at the scale required for industrial production. This missing link in the supply chain means that even when recycled fibres are available, they cannot be processed into yarns within the UK, making the UK reliant on overseas manufacturing capacity.

2. **Outdated manufacturing machinery:** Much of the existing textile manufacturing machinery in the UK is not suitable for cotton and polyester high-volume yarn production. Global textile manufacturing leaders have adopted highly automated, large-scale equipment that can consistently process fibres, including recycled materials, with efficiency and precision. In contrast, UK facilities typically lack this advanced technology, particularly when it comes to processing post-consumer fibres, which require specific handling due to variability in fibre quality and length, among other parameters.

3. **Underdeveloped supporting infrastructure:** Automated textile sorting and pre-processing, which is critical for supplying consistent recycled feedstock as well as textile recycling infrastructure, remains critically underdeveloped in the UK. Without the infrastructure to supply consistent feedstock and recycle these materials at scale, the UK cannot generate the volume or consistency of recycled fibre feedstock needed to support further manufacturing stages.

The above context highlights a critical gap in scaling up textile manufacturing using recycled content, as the UK currently lacks the capacity to produce recycled yarn at an industrial scale.

Market capacity and commercial viability challenges

1. **Low-value market applications:** In the UK, recycled textile waste is currently being directed mainly into low-value, open-loop markets such as industrial wiping cloths and rags. These applications represent a significant loss of potential economic value, as the materials are not being used in higher-value, circular applications like textile-to-textile recycling.

2. **Lack of domestic supply chain:** One of the fundamental challenges is that textile manufacturing has largely moved offshore, meaning the UK lacks a robust domestic supply chain. Establishing this infrastructure would require substantial investment across the value chain, particularly in processing and spinning.

3. **Cost competitiveness challenges:** Even if the UK had the capacity to manufacture recycled content at scale, there is no guarantee that brands and retailers would provide sufficient demand. Recycled materials currently carry a significant cost premium, which may deter retailers who are sensitive to price margins and consumer price points. Furthermore, UK-made recycled yarn would be competing against global production hubs that can manufacture similar materials more cost-effectively. The higher cost of manufacturing in the UK poses a competitive disadvantage, making it harder to gain market traction for ‘UK recycled content’.

4. **Limited appeal to recyclers:** Textile recyclers do not currently view the UK as a viable short-term end market for their recycled outputs. For many, offshoring the yarn manufacturing process remains the more economically attractive proposition, both in terms of cost and scalability.

5. **Weak investment case:** Overall, the lack of investment in infrastructure to support textile-to-textile recycling makes it difficult to build a strong business case for investing in domestic manufacturing.

As it stands, there is no commercially viable business case for domestic manufacturing of recycled content. Without clear demand signals and coordinated investment across the supply chain, the development of scaled manufacturing capacity remains out of reach.

Skills and workforce challenges

1. **Dual skills gap:** A dual skills gap is challenging the UK's manufacturing future. Firstly, traditional manufacturing skills are declining, compounded by a lack of young talent entering the sector, limiting growth potential in this stage of the supply-chain. Secondly, the industry currently lacks the digital, innovative, and circularity skills necessary for a modern, sustainable manufacturing ecosystem.

2. **Knowledge gap in industrial applications:** Overall, there is a knowledge gap in the industrial application of recycled materials. Much of the current research in this area remains confined to laboratory-scale trials, which do not fully capture the complexities of merging industrial scale textile recycling with large-scale manufacturing

Technical/Technology challenges

1. **Quality limitations of recycled materials:** Recycled textiles, particularly post-consumer waste, often face significant quality and processing limitations that hinder their use in industrial yarn production. Common issues include reduced tensile strength, inconsistent fibre lengths, and contamination, all of which compromise yarn manufacturing performance compared to virgin fibres.

2. **Limited use of post-consumer textiles:** Most recycled yarns currently rely on post-industrial waste. Use of post-consumer fibres remains limited to R&D or niche product lines and typically requires blending with virgin or post-industrial fibres to meet performance requirements. Finally, lab-scale recycling trials do not yet translate effectively to industrial manufacturing, limiting scalability and commercial application.

3. **Immature recycling technologies:** Recycling technologies for complex or multi-material textile blends remain at an early stage, often still in development or not yet commercially viable. As a result, fibre-to-fibre recycling is difficult to trial effectively, even at lab scale, limiting progress toward scalable manufacturing solutions.

Government challenges

1. **Lack of sector support:** Despite the significant socio-economic potential of domestic textile manufacturing, there is currently no dedicated support programme from the UK government to back the sector. This absence of policy and financial support places UK manufacturers at a disadvantage, particularly in the development of innovative, circular, and sustainable textile solutions.

2. **Lack of EPR framework and eco-design requirements:** The lack of an EPR framework and eco-design requirements for textiles is hindering development in the sector. Without mandated responsibility for post-consumer textile waste, brands face little pressure to design for recyclability, recycled content or fund recycling systems. This policy gap paralyses both private investment and the development of long-term infrastructure needed for a circular textile economy.

3.4.3. KEY OPPORTUNITIES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce and technology, as well as government opportunities of the current system, are highlighted.

Infrastructure opportunities

1. **Integrate with global manufacturing infrastructure (1-5 years):** The UK cannot scale domestic recycled textile manufacturing in isolation. Integration with global and neighbouring manufacturing infrastructure is essential. Leveraging these existing capabilities through strategic partnerships can support near-term commercialisation while domestic infrastructure catches up.

2. **Develop phased spinning capacity (5-10 years):** Spinning capacity for key textile fibres should be developed gradually, through small-scale, incremental steps, to test the viability of a circular domestic textile supply chain before committing to industrial scale infrastructure.

Market capacity and commercial viability opportunities

While the manufacturing gap is considerable, the manufacturing of fibres and textiles already contributes to the growth of the UK economy. While the existing manufacturing capacity is limited, it provides a valuable foundation for growth and represents an opportunity to consider the significant role this stage of the supply chain could play in a domestic textile recycling ecosystem in the UK.

1. **Expand market exploration beyond UK fashion (1-5 years):** Broaden investigation into end-use applications outside the UK and traditional fashion and textile sectors. Identify opportunities in alternative industries and international markets to strengthen the commercial viability of recycled content and support long-term business growth.

2. **Invest in modernised manufacturing capacity (5-10 years):** Existing equipment is limited (e.g. spinning), and mostly incapable of processing recycled fibres at the scale or quality needed to compete internationally. Significant capital investment is therefore needed to acquire new and modernise existing machinery, hence, investing in UKs manufacturing capacity. However, it is recommended that large-scale investment in UK manufacturing capacity occurs only once core circular infrastructure (including automated sorting, pre-processing, and textile recycling) is in place.

Skills and workforce opportunities

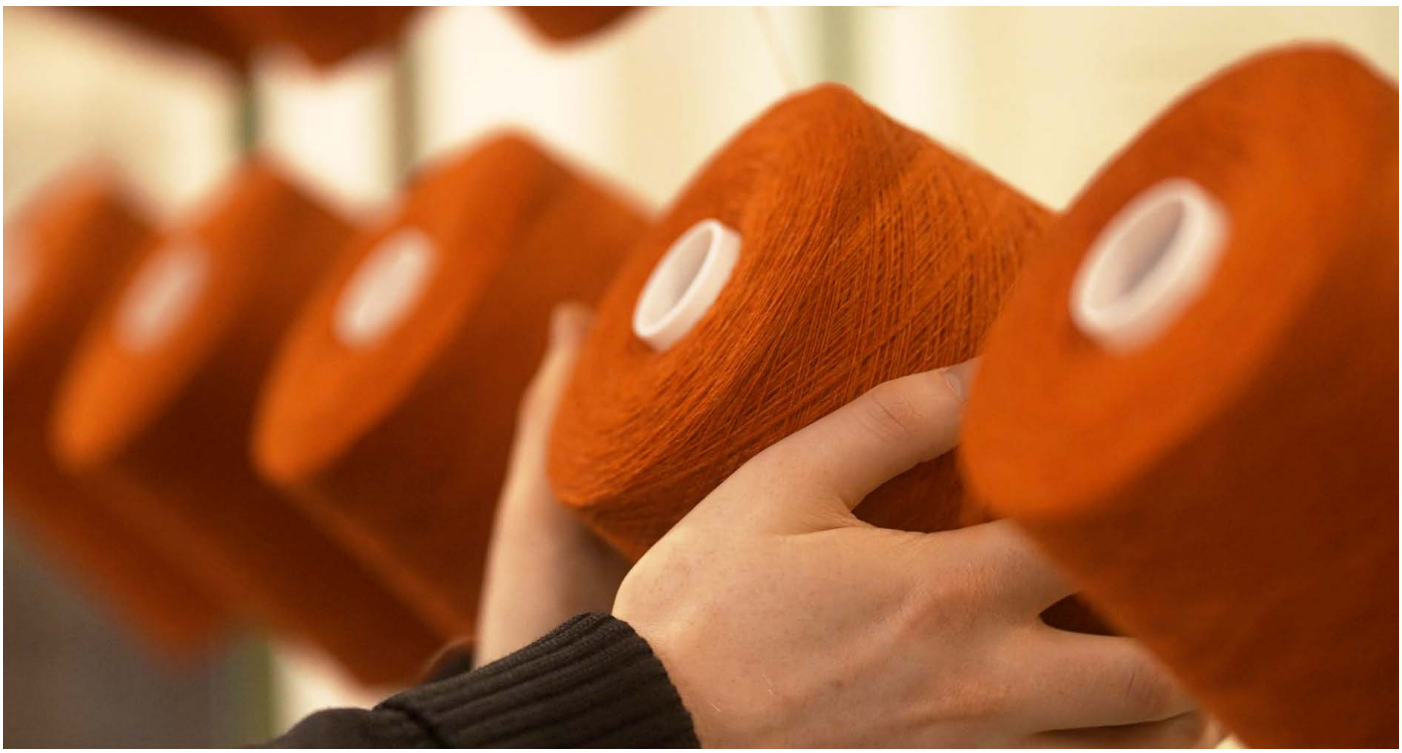
1. **Address technical knowledge gaps (1-5 years):** Significant research and development (R&D) is still required to fully understand how recycled content can be integrated into large-scale industrial manufacturing. Current efforts remain fragmented, and without this foundational knowledge, the production of high-quality, high-performance recycled yarn will continue to face limitations in consistency, strength, and scalability.

2. **Build expertise in recycled content manufacturing (1-5 years)**: To successfully scale recycled textile production in the UK, it is essential to build specialised manufacturing expertise in recycled content. This requires targeted upskilling across the workforce through structured training and education programmes. The shift towards circular textile manufacturing presents a valuable opportunity to create green jobs and develop new career pathways.

Technical/Technology opportunities

1. **Expand R&D beyond textile recycling technologies (1-5 years):** R&D efforts must go beyond recycling technologies alone and address the full manufacturing pipeline. Trials should not only demonstrate recyclability, but also focus on producing commercially viable, high-quality end products.

2. **Foster international collaboration (1-5 years):** There is a clear opportunity for the UK to collaborate with countries that have more advanced recycling and manufacturing systems. Sharing knowledge, aligning R&D priorities, and benchmarking international best practices will help fast-track progress and strengthen the UK's position in the global circular textiles market.



3.2.4. GOVERNMENT RECOMMENDATIONS

Infrastructure Recommendations

Establish a dedicated UK textile manufacturing support programme (1-5 years): Establishing a national support programme would provide targeted investment and policy backing for reshoring, skills development and innovation.

Market capacity and commercial viability recommendations

Support R&D for recycled content manufacturing (1-5 years): Continue to support research and development (R&D) within recycled content manufacturing (closed-loop and open-loop solutions) by providing targeted innovation funding.

Establish eco-design requirements (1-5 years): Introduce eco-design regulations and incentives that promote the use of recycled content and improve the recyclability of materials. This will drive better product design and stimulate long-term demand for recycled inputs. Of particular importance is the alignment with EU's eco-design requirements.

Establish Extended Producer Responsibility (1-5 years): Introduce a mandatory, eco-modulated EPR scheme to finance the shift toward, and long-term sustainability of a circular textiles economy in the UK. This will drive the development of automated sorting, pre-processing and textile recycling infrastructure, required to build the business case for 'UK recycled content'.

Support investment in spinning capacity linked to circular infrastructure (5–10 years): As part of a long-term strategy to re-establish a resilient and circular UK textile supply chain, the government should support investment in domestic spinning capacity. This support should be timed to follow the successful development and scaling of automated sorting and textile recycling infrastructure. Building spinning capabilities will enable the UK to process recycled fibres into new yarns domestically.

Skills and workforce recommendations

Support development of skills training to strengthen UK manufacturing (1-5 years): To ensure the long-term competitiveness and growth of the UK manufacturing sector, the government should invest in the development of training programmes that attract new talent and upskill the existing workforce. This includes targeted support for vocational education, apprenticeships, and industry-led training focused on advanced manufacturing, sustainable production, and reshoring capabilities.

3.5. Recyclable and recycled content in brand, retail and alternative end markets

Recyclable and recycled content in brand, retail and alternative end markets: In a brand and retail context, recyclable and recycled content refer to two key aspects of a company's circular strategy. Recyclable content means the products a brand sells are designed to be recyclable at the end of their life. Recycled content means the products are made with materials that have been recycled. The use of recyclable and recycled content in the UK is essential to create domestic circular markets and enable the development of domestic textile recycling capacity. There is also an opportunity to expand recyclable and recycled to industries beyond fashion and textiles (alternative end markets)

3.5.1. CURRENT OVERVIEW

The key stakeholders and their main responsibilities in the incorporation of recyclable and recycled content are fashion and textiles brands and retailers, as well as other industry markets (e.g. hospitality, automotive, construction).

Brands and retailers

This stakeholder group plays a critical role in driving the adoption of textile recycled content and placing recyclable products on the market. They are instrumental in validating new recycling technologies by testing and integrating these materials into their existing manufacturing supply chains, ensuring that recycled fibres meet the necessary quality and performance standards. Beyond integration, brands and retailers must adopt a proactive approach within their sourcing and design teams to prioritise the use of recycled content and materials that are easier to recycle at end-of-life.

This includes committing to recycling infrastructure, designing with recyclability in mind, and making intentional choices that support a circular economy. Their influence across the value chain positions them uniquely to set standards, influence supplier behaviour, and drive consumer demand for sustainable products.

Alternative end markets

Industries beyond fashion and textiles (such as automotive, construction, and furniture) offer valuable opportunities to absorb recycled textile materials. These markets can potentially help increase demand for recycled content and support the scaling of recycling technologies.

3.5.2. KEY CHALLENGES

In this section, the key infrastructure, market capacity and commercial viability, skills and workforce, and government challenges of the current system, are highlighted.

Infrastructure challenges

1. **Limited recycling infrastructure availability:** Brands and retailers face significant challenges due to the limited availability and scale of textile recycling infrastructure. The absence of robust, reliable systems for collection, sorting, and recycling reduces confidence in the recycling ecosystem and restricts integration of recycled materials into existing supply chains. Many recycling technologies are still emerging or unproven at commercial scale, further hindering widespread adoption and limiting the ability of brands to meet sustainability targets.

2. **Disconnected alternative end markets:** Alternative end markets, such as construction, automotive, and furniture sectors, often lack established links with textile recyclers. These industries typically do not have dedicated infrastructure for sourcing or processing recycled textile content, and there is limited awareness or integration of textile recycling into their supply chains.

Overall, the lack of established textile recycling infrastructure restricts market adoption of recycled content.

Market capacity and commercial viability challenges

1. **Inconsistent demand for recycled fibres:** A major barrier is the ongoing lack of consistent demand for recycled fibres. Without strong and sustained purchasing commitments from brands, textile recyclers struggle to secure funding, cover operational costs, or justify investment in expanding capacity.

2. **Cost competitiveness with virgin materials:** Additionally, there is a cost competitiveness issue. Virgin textile materials often remain cheaper and more readily available, creating a price gap that undermines the business case for using recycled content. Brands also face commercial pressure to keep product prices low.

Skills and workforce challenges

1. **Limited guidance on material recyclability:** A major challenge in designing for recyclability is the lack of clear guidance on the recyclability of diverse materials and fabric compositions. This limits the ability of brands and retailers, as well as alternative end markets, to understand how their choices impact recyclability.

2. **Limited understanding of recycling technologies:** Additionally, many organisations lack a clear understanding of available recycling technologies and the practical steps needed to incorporate recycled content into product design and manufacturing.

3. **Siloed knowledge within organisations:** Within brands and retailers, knowledge tends to be siloed across teams. There is insufficient interdisciplinary collaboration between design, product development, sourcing, finance, and sustainability functions. This lack of integrated understanding slows the adoption of circular decisions. Additionally, limited involvement and understanding from C-suite leadership can restrict strategic prioritisation of textile recycling strategies within the organisations.

4. **Limited awareness in alternative markets:** In alternative end markets, awareness of recycled textile materials and their potential uses remain limited. These industries typically prioritise functional performance over sustainability, which leads to low demand for recycled content.

Government challenges

Lack of EPR framework and eco-design requirements: The lack of an EPR framework and eco-design requirements for textiles is hindering development in the sector. Without mandated responsibility for post-consumer textile waste, brands face little pressure to design for recyclability, recycled content or fund recycling systems. This policy gap paralyses both private investment and the development of long-term infrastructure needed for a circular textile economy.

3.5.3. KEY OPPORTUNITIES

In this section, the key market capacity and commercial viability, and skills and workforce opportunities of the current system, are highlighted.

Market capacity and commercial viability opportunities

1. **Establish commercial partnerships with recycling innovators (1-5 years):** Establish commercial partnerships with emerging textile recycling innovators to support scalability and attract investment into next-generation recycling infrastructure.

2. **Increase demand for recycled content (1-5 years):** Increase demand for recycled content overall, make it work within company strategy, include into financial planning etc.

Skills and workforce opportunities

1. **Educate consumers to drive demand for recycled products (1-5 years):** Brands and retailers should implement consumer education campaigns to raise awareness about the benefits of recycled textiles. By highlighting the environmental impact and quality of recycled products, they can build stronger consumer demand, which can lead to greater adoption of recycled content.

2. **Invest in training for design and product development teams (1-5 years):** Brands and retailers should provide ongoing, interdisciplinary training programs that equip these teams with the knowledge and skills necessary to create recyclable and circular products.

3. **Develop clear recyclability guidelines and standards (1-5 years):** Brands and retailers need clear, accessible guidelines on material selection, design for recyclability, and integration of recycled content. Establishing standardised criteria will help brands and retailers make informed decisions.

4. **Develop databases of existing textile recycling solutions (1-5 years):** To accelerate the growth and effectiveness of textile recycling, it is essential to create centralised, accessible databases that catalogue current recycling technologies and their services.

3.5.4. GOVERNMENT RECOMMENDATIONS

Market capacity and commercial viability recommendations

Establish eco-design requirements (1-5 years): Introduce eco-design regulations and incentives that promote the use of recycled content and improve the recyclability of materials. This will drive better product design and stimulate long-term demand for recycled inputs.

Establish Extended Producer Responsibility (1-5 years): Introduce a mandatory, eco-modulated EPR scheme to finance the shift toward, and long-term sustainability of a circular textiles economy in the UK. It is recommended that the EPR scheme is eco-modulated, with a particular focus on incentivising the use of recyclable and recycled materials. It is recommended that this scheme is harmonised with existing schemes. Of particular importance is the alignment with EU's eco-design requirements.

4. Innovation landscape review

In the last five years, the UK's fashion and textiles innovation landscape has seen steady growth, especially in the post-consumer textiles supply-chain. At the same time, innovations have emerged globally. While technological advancements remain the primary drivers of progress in textile recycling, this review of the innovation landscape also highlights the importance of exploring new processes, systems or business models, extending beyond technology alone. This section gives an overview of the innovation landscape in the UK textile recycling landscape, including innovations in collection, pre-sorting, pre-processing and sorting for recycling, fibre-to-fibre recycling and open-loop recycling, to name a few. Some global innovations are also included to highlight significant opportunities for further innovation.

4.1 Collection of non-reusable (NRT) post-consumer textiles

Innovations in post-consumer textile collection are focused on increasing the amount of post-consumer textiles diverted from residual waste (with a particular focus on NRTs), redirecting NRT flows to domestic textile recycling solutions, as well as making textile waste management collection more efficient and optimised.

NRT TAKE-BACK SOLUTIONS

An innovative solution for diverting textiles from residual waste and conventional textile disposal locations are take-back services that include both reusable and non-reusable textiles by brands and retailers. These can operate either online, in-store or in public spaces, where most often the general public (as well as other players) can return unwanted textiles.

While some brands and retailers manage their own take-back services with existing collection merchants or charity stakeholders, in the past years, innovators have started to provide take-back services on behalf of brands and retailers.

RE_SKINNED™

Reskinned is a retailer for pre-loved fashion, offering a take-back service to its customers where clothes are resold, repurposed or recycled.

Brands and retailers can use these types of solution providers to help manage their take-back and post-consumer textile management strategy. Innovative business models like these that divert textiles from being disposed of in residual waste, and provide alternative routes for these textiles by engaging diverse stakeholder groups in post-consumer textile collection, will be key for transforming the way the general public, commercial and public institutions manage their textile waste.

Moreover, traditionally, many take-back schemes have been focused on returning textiles with reusable value, with clear guidelines and indications to stakeholders on what to send back (e.g. quality non-damaged items). The introduction of non-reusable textiles in take-back schemes is not a service that has been historically offered.

An example of this, is Marks and Spencer's take-back of both reusable and non-reusable textiles through their 'Another Life' programme.

PRE-SORTING: RTS AND NRTS

Within current collection of post-consumer textile waste donations or disposals from the general public, commercial and public institutions the feedstock usually contains a mixture of reusable (i.e. good quality items that can be resold) and non-reusable textiles (i.e. damaged, stained, faded items that can't be resold). If these can be separated before the collection stage, then this could potentially streamline the sorting process and allow NRTs to be redirected to domestic textile recycling. This pre-sorting at the collection stage was trialled as part of the ACT UK[24] project where, for the first time on this scale, various routes for collection were provided with pre-sorting carried out by the general public.

As part of the Automated-sorting for Circularity in Textiles (ACT) UK project, a series of collection trials were carried out to understand how the public use different types of collection methods. These showed high engagement and public appetite for services for donating both reusable and non-reusable clothing and textiles.

CONNECTING TEXTILE WASTE TO EOL SOLUTIONS

Whereas traditionally post-consumer textiles go through pre-determined stages in the post-consumer textiles pipeline before reaching a textile recycler, innovative business models and services can connect different players of the supply-chain directly, for example, collection merchants with textile recyclers. Technology can be a key enabler to drive these relationships and connections.

Eslando is a marketplace platform for sourcing and selling recyclable waste textiles. Recyclers can find the type of feedstock they need for their process (chemical, mechanical or other recycling) while manufacturers can maximise their revenues whilst reducing their environmental impact.

Solutions that enable connections between stakeholders in the textiles recycling sector will help to facilitate more widespread adoption of recycling and circularity practices by making it easier to collaborate.

CONSUMER-TO-CONSUMER (C2C) PLATFORMS FOR EXCHANGE OF LOWER QUALITY POST-CONSUMER TEXTILES

Whereas traditionally there are certain post-consumer textiles that are not kept for resale in the UK because they don't meet end market demand, there is an opportunity to further recirculate post-consumer textiles that have very low domestic resale value within the UK, by for example, donating them to people living in the UK experiencing clothing poverty.

Give Your Best is a London-based social enterprise that has created a platform for donating used clothing to people in need, who are able to shop for free. Donators can post the clothing directly to those who need it.

SMART WASTE MANAGEMENT

Smart waste management involves developing systems and technologies that can improve and streamline efficient collection of waste by optimising the processes and logistics involved. This could involve innovations such as the use of sensors at collection points to notify the collector when the textile bank needs emptying, or potentially even to identify the fibre type of items placed into the textile bank. Smart waste management platforms can be used to optimise the logistics of textile waste collection, ensuring that the most efficient routes are chosen to reduce fuel consumption and save time.

Reen is a waste management technology provider (based in Norway but also operating in the UK) who help companies to streamline their waste management and recycling operations. Sensors are used to register collected waste, weight and location. The system then generates optimised routes for the waste, with the ability to track and analyse the data from waste collections. With improved logistics efficiency, companies can reduce operational costs and CO2 emissions.

4.2. Pre-processing

Innovations at this stage are focused on the steps that can be carried out prior to the textile recycling process which can improve the quality of feedstock and increase recycling efficiency, including removal of disruptors (buttons, zips etc.) and dyes.

DISRUPTOR REMOVAL

Disruptors are components that are part of a textile product, such as buttons, zips, sequins, prints etc. which need to be removed from the product before the textile recycling process as they cannot in most cases safely pass through the textile recycling processes.

As part of the ACT UK project, The Manufacturing Technology Centre (MTC) carried out a market review and researched the emerging technologies that could be utilised for sorting and pre-processing of textile waste prior to recycling, including material feed/conveyance systems, fibre identification, size reduction and disruptor removal. They also carried out trials to investigate these technologies and methods.

The report can be read **here**.

DYE REMOVAL/ RECYCLING

For textile recycling, particularly mechanical textile recycling, the colour of the recycled fibre is determined by the colour of the feedstock fibre, which limits the feedstock volume and colour options available for mechanical recyclers and designers using recycled fibre content. A recycler may also be required to wait for sufficient volumes of a particular requested colour-way before being able to process the feedstock for an order, and repeatability is difficult to achieve. Fabrics that have been dyed with carbon black dye can also cause issues with fibre identification, since Infrared scanning technology cannot detect these black items. Dye removal is therefore an innovation that could bring many benefits to the pre-processing of recycling feedstocks for improved recycling.

Dye Recycle is a UK-based company who have developed a system to remove dye, enabling both the textile and the dye to be recycled. Their technology enables separation of dye from synthetic textile waste, so both components can be recycled.

DYE
RECYCLE

DESIGN FOR DISASSEMBLY

Design for recyclability is important for ensuring that the end of life for a textile product is considered before it has been made. Considerations such as using mono-materials rather than blends and avoiding use of difficult-to-remove disruptors can make the recycling process significantly easier. Designing for disassembly by developing sewing thread that can be easily removed during pre-processing, not only increases efficiency, but could also reduce the number of threads that contaminate the recycling feedstock, which can cause issues during mechanical recycling and spinning of recycled yarn.

Resortecs is a Belgian company which has developed a heat-dissolvable sewing thread for easy disassembly of garments for recycling, as well as an automatic disassembly system for removing disruptors.

4.3. Automated sorting

Innovations at this stage focus on technologies that enable automated sorting for NRTs in order to streamline the sorting for recycling process. The use of automated sorting has the potential to enable a much higher capacity in the UK for textile recycling at a lower cost.

PRE-SORTING/ IDENTIFICATION

AI-assisted software and identification systems can be used even before the stage of identifying fibre type, disruptor location, etc. by helping to distinguish between reusable and non-reusable textiles. Using AI software to separate NRTs for recycling has the potential to significantly reduce the manual labour and time involved.

REDIVIVUM

Redivivum (Germany) have developed an AI-assisted software solution for processing large volumes of garments which may have been returned to a retailer, unsold, or donated. The technology can gather information about an item including the type of product, which disruptors it contains, any damage present, the colour and other data which can be used for categorising and grading.

FIBRE IDENTIFICATION

Identifying the fibres present in NRTs is a crucial step in the recycling process, since the fibre type(s) and composition present will determine the type of recycling process that the item will be suitable for. Technology-based innovations in this area are being developed to support the implementation of automated sorting of textile waste in the UK.

Tracking technologies such as radio frequency identification (RFID) are expected to contribute significantly to the future of the textiles sector, where they can enable traceability and provide important information relevant to how to process an item for recycling. For example, using RFID on clothing labels means that the fibre details are easily available which can streamline the sorting of NRTs for recycling.

AI can be used to support fibre identification, for example, when combined with infra-red or hyperspectral sensors to distinguish between different fibre types and blends. This can assist in manual sorting, as well as enabling automated sorting systems.

Matoha
What will you scan next?

Matoha is a UK-based company which has developed a material identification technology which can identify numerous fibre types and blends from scanning the surface of a textile. The technology is based on Infrared sensors combined with AI-assisted learning, so that the system can be trained to detect new types of fibres and materials. This technology is utilised by sorters and recyclers to ensure that textiles can be separated and sent to the correct recycling process.

BUSINESS MODELS/ SERVICES FOR AUTOMATED SORTING

As well as the technology-based innovations used to enable automated sorting, there are also innovative business models and services that are being developed to ensure that facilities and infrastructure are in place for scaling up the use of these technologies. There are different approaches that can be taken, with either local services or larger scale sorting facilities. For the UK to be able to process the large quantities of textiles that are discarded, automated sorting capacity will be crucial in ensuring the demand can be met.

circle-8
textile ecosystems

Circle-8 Textile Ecosystems has focused on developing the blueprint for the UK's first Automated Textile Sorting and Pre-processing facility (ATSP), and have secured equipment to establish UKs first ATSP.

kapdaa®

Kapdaa is a UK company selling upcycled products with repurposed textile offcuts, but they have also developed an AI powered automated sorting. This service allows for waste textiles to be process locally, using a mobile system within a lorry. Its solar- and AI-powered sorting machine sorts donated clothing type, and treats it to kill bacteria. RTs are separated using a manual process, and the remaining NRTs are then sorted by the machine to separate by fibre type.

The mobile nature of the service means that it can be utilised by various stakeholders, including local authorities, charities or retailers, without the need for high infrastructure investment.

4.4. Fibre-to-fibre recycling

Innovations at this stage are focused on the ways that NRTs can be processed back into new fibres. The type of fibre-to-fibre recycling used is dependent on the type of fibre. Various methods can be used, including mechanical, thermomechanical, chemical and biological recycling. Although some of these methods have been used for many years in the textile industry, there are innovations emerging that seek to find novel, efficient, or low energy solutions, including for hard-to-recycle fibre types and blends.

Biological recycling involves the use of enzymes or microorganisms to break fibres so that they can be re-spun. This is an area of textile recycling that is not yet widely utilised as it is still largely under development, although there are a few companies that have commercialised biorecycling processes.

Epoch Biodesign is a UK company that has developed a biorecycling system using AI-designed enzymes to recycle synthetic textiles (nylon and polyester) using a low heat process. The recycled polymers are then extruded into new fibres.

Polycotton blends are used extensively in clothing production and therefore make up a large proportion of NRTs. These mixtures of fibres, however, are more difficult to recycle. Innovations that enable recycling of these materials, and particularly the separation of the two fibre types therefore provide an opportunity to recycle more NRTs.

Worn Again is a UK-based company which has developed a method for recycling polyester/cotton blends (which are traditionally very difficult to recycle) using a closed loop chemistry process. It separates the polyester from the cotton, then the polyester can be re-extruded into new fibre, while the cotton is broken down into cellulose and spun using a wet spinning technique into cellulose fibre.

Circ is a US company that has developed an innovative hydrothermal process to recover polyester and cotton from blends to create new polyester and lyocell fibres.

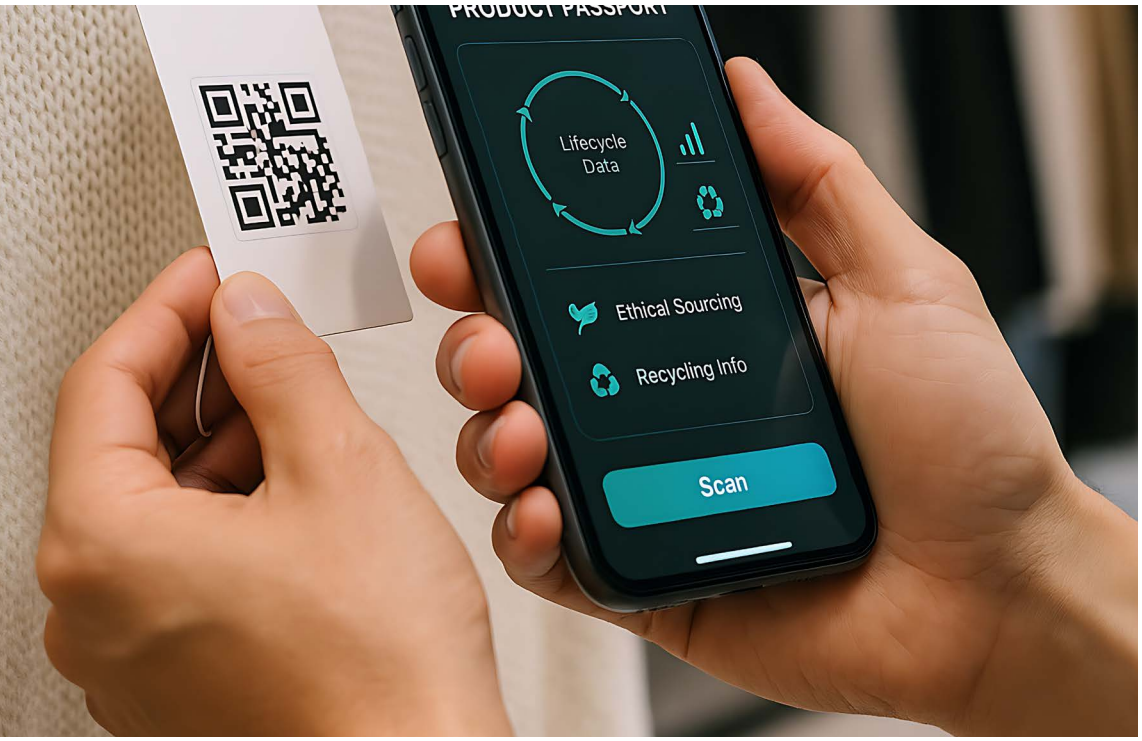
An alternative to mechanical recycling of cotton textiles is to use these in a chemical recycling process to produce man-made cellulosic fibres like viscose and lyocell, which would otherwise use wood pulp as a feedstock.

Infinited Fiber (Finland) have developed a new fibre called Infinna™ made from cotton-rich textile waste, which is compatible with existing yarn production machinery. Clothes made from Infinna™ can be recycled alongside other textile waste at the end of their life.

Recover is Spanish company that recovers fibres from pre-consumer textile waste so they can be re-spun. Its processes include cutting, anti-static treatment, shredding and baling, ready for use by spinning partners.

4.5. Traceability

Traceability within the textiles supply chain means that brands and textile producers can oversee the origins of materials and processes carried out to manufacture a product, and all stakeholders can be kept accountable. There are innovations within the area of traceability which can be used to support a circular textiles ecosystem, through providing information on the whereabouts of products and the processing that they've gone through. Tools such as RFID and DNA markers are used to trace textiles.



4.6. Open loop recycling

Open loop recycling involves using waste materials for a different purpose or to use in a different industry than where it was originally used. Although fibre-to-fibre recycling (closed loop) is the most circular solution for recycling textiles, there are opportunities within open loop recycling to utilise textile waste for both high and low value products, which would otherwise use virgin materials.

Waste textiles are commonly used to produce wiping rags (e.g. for industrial and commercial cleaning), stuffing for furniture, and insulation materials, however these are low value products. There is a significant opportunity in the UK to develop innovative open loop solutions for textile waste to produce higher value products.

FIBRELAB

Fibrelab is a company in London that take waste post-consumer textiles and create new products including upcycled garments, paper products e.g. tags and notebook covers, cushion inserts and bespoke design projects.

FAB Materials

FAB MATERIALS textile-to-board process turns end of life textiles into a valuable feedstock for the fibreboard industry. Boards produced using FAB Materials' technology can be used for a wide variety of furniture, construction, display and design applications.

Waste textiles can be used as fibrous reinforcement (usually in the form of loose fibre or nonwovens) for composite materials, which have applications in automotive, aerospace, defence and the built environment. There has been significant research into the use of post-consumer textile waste for composite materials in construction and building. Cellulose-based composites that use waste cotton fibre can also have the added benefit of being biodegradable or recyclable, depending on the material used for the matrix. Producers of high-performance composites that use carbon or glass fibre, e.g. for aerospace and automotive components, are developing products using their recycled production waste or composites that have reached their end of life, however there are fewer commercial examples of products that utilise post-consumer textiles. The performance of these composites remains crucial, especially if being used for load-bearing applications, but as demonstrated by the abundance of academic research, there are promising opportunities for using post-consumer textiles within composites.

Refashion is a private non-profit organisation in France, that oversee the end-of-life management of textile products and promote a circular economy within the sector. They were involved with a working group led by NIMROD Composites, which investigated the use of yarns derived from NRTs within composites, with a view to industrialise the process for applications in the sports and leisure sector e.g. kayak oars, bicycle rims, and tent frames.

4.7. Innovation gaps and conclusions

The UK is seeing promising innovation in the textile recycling sector, but there is still a significant journey ahead to build a fully interconnected textile ecosystem, one that can effectively capture and process the vast quantities of non-reusable textiles (NRTs) produced in the UK. Technological advancement will play a critical role in achieving this goal. Emerging tools such as digitalisation, automation, robotics, and particularly artificial intelligence (AI), offer transformative potential for managing textile waste more efficiently and intelligently.

Smart waste management stands out as a high-potential area for UK-led innovation. While many of the core technologies such as sensors, logistics platforms, and advanced tracking systems already exist, their adoption across the textile recycling sector, and particularly the collection stage, remains limited.

There are some early developments in automated sorting and pre-processing of NRTs, but these solutions are not yet mature. In particular, there is a notable gap in technologies for effective disruptor removal and decontamination, an essential step to improve the recyclability of post-consumer textiles.

Another key opportunity lies in high-value open-loop recycling. The use of recycled NRTs in alternative applications (e.g. composite materials), particularly for applications in the construction and built environment sectors, holds significant promise. However, much of the innovation in this space is still at the academic or pilot research stage and requires further development, investment, and scaling.

Ultimately, the most critical challenge and opportunity lies in unlocking viable textile recycling solutions for complex material blends and product compositions.

5. The way forward: Recommendation roadmap

5.1. Conclusion

Achieving a circular textile economy in the UK will require a coordinated transformation of the currently fragmented supply chain. This includes aligning policy frameworks with industry priorities and accelerating investment across infrastructure, innovation, technology, and workforce development. The plan sets out a call for a clear agenda of systemic change, aiming to unlock socio-economic value domestically, boost UK's global competitiveness in textiles circularity, and drive progress toward sustainable, green growth.

To guide this shift, the plan outlines a phased set of recommendations spanning two key periods: 2025–2030 and 2030–2035.

5.2. Recommendations 2025-2030

INDUSTRY

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology
Collection	• Build dedicated textile waste collection systems • Enhance collection infrastructure for maximum recovery • Integrate and collaborate with municipal waste systems	• Incentivise responsible disposal	• Educate citizens and institutions • Foster cross-sector partnerships	• Implement digital platforms/apps • Improve tracking and collection of textile flow data
Management	• Strengthen existing UK sorting and grading capacity • Build global partnerships • Optimise NRT material flow • Develop automated sorting infrastructure	• Attract investment for infrastructure modernisation • Support emerging circular business models	• Create structured training programmes • Integrate new technologies with manual skills • Foster innovation adoption • Standardise sorting and grading criteria	• Implement hybrid operational models • Deploy automation and robotics

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology
Recycling	• Utilise existing open-loop infrastructure • Engage with established international infrastructure • Develop automated sorting infrastructure	• Attract investment for automated sorting infrastructure • Attract investment for textile recycling infrastructure • Support emerging textile recycling businesses • Establish commercial partnerships with recycling innovators • Enable recycled fibre integration into high-value sectors • Foster cross-sector collaboration • Expand Market Exploration Beyond UK Fashion and Textiles	• Develop textile recycling training for brands and retailers • Enable interdisciplinary research and education	• Support technological advancement of textile recycling technologies • Deploy automation and robotics

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology
Manufacturing	• Integrate with global manufacturing infrastructure	• Expand market exploration beyond UK fashion	• Address technical knowledge gaps • Build expertise in recycled content manufacturing	• Expand R&D beyond textile recycling technologies • Foster international collaboration
Brand, retail and alternative end markets		• Establish commercial partnerships with recycling innovators • Increase demand for recycled content	• Educate consumers to drive demand for recycled products • Invest in training for design and product development teams • Develop clear recyclability guidelines and standards • Develop databases of existing textile recycling solutions	

GOVERNMENT

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology	Other
Collection	• Prioritise textile waste in policy frameworks • Reform local authority waste strategies • Strengthen licensing and environmental standards	• Provide transitional financial support • Fund R&D and innovation • Implement climate-based performance indicators • Support collection merchant viability • Establish Extended Producer Responsibility	• Develop Local Authority training programmes • Support and implement public outreach campaigns • Implement school education programmes		• Standardise data collection and reporting mechanisms
Management	• Enable infrastructure for post-consumer textiles management • Strengthen waste licensing controls	• Prevent sector collapse through financial support • Fund workforce training initiatives • Support R&D for circular textiles • Support SME textile recycling network • Establish Extended Producer Responsibility	• Support skilled worker recruitment • Support the standardisation of sorting and grading criteria		• Strengthen export controls

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology	Other
Recycling		• Support R&D for textile recycling • Support larger investment to scale textile recycling • Establish eco-design requirements • Establish Extended Producer Responsibility			
Manufacturing	• Establish a dedicated UK textile manufacturing capital support programme	• Support R&D for recycled content manufacturing • Establish eco-design requirements • Establish Extended Producer Responsibility	• Support development of skills training to strengthen UK manufacturing		
Brand, retail and alternative end markets		• Establish eco-design requirements • Establish Extended Producer Responsibility			

5.3. Recommendations 2030-2035

INDUSTRY

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology
Collection	• Integrate and collaborate with municipal waste systems • Develop regional post- consumer textile management hubs			• Implement smart textile collection systems
Management	• Expand post-consumer textile management capacity		• Develop higher education curricula	• Build transparent supply chains
Recycling	• Develop automated sorting and pre-processing infrastructure • Expand domestic fibre-to-fibre recycling infrastructure		• Develop higher education curricula	• Deploy automation and robotics • Build transparent supply chains

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology
Manufacturing	• Develop phased spinning capacity	• Invest in modernised manufacturing capacity		
Brand, retail and alternative end markets				

GOVERNMENT

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology	Other
Collection	• Require the separate collection of textile waste • Require commercial textile waste separation				
Management					

GOVERNMENT

Stage	Infrastructure	Market Capacity and Commercial Viability	Skills and Workforce	Technology	Other
Recycling	• Enable infrastructure for textile recycling				
Manufacturing		• Support investment in spinning capacity linked to circular infrastructure			
Brand, retail and alternative end markets					

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