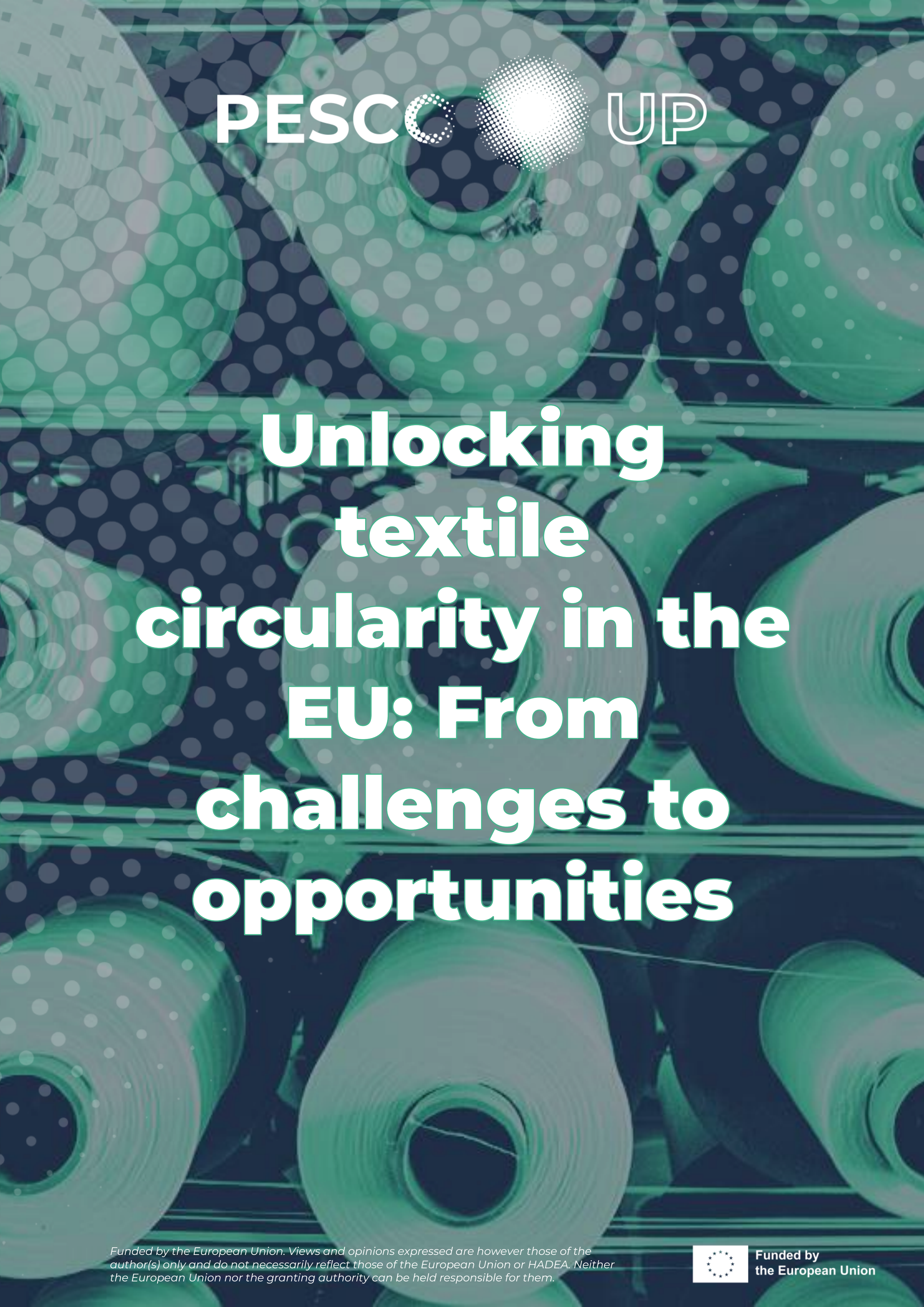

PESCO UP

Unlocking textile circularity in the EU: From challenges to opportunities

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The ambition of PESCO-UP is to transform the textile recycling industry by creating new raw materials from mixed wastes. It addresses the circularity across the textile recycling value chain, and reduces the industry dependency on virgin materials.

As the objective is to ensure the full circularity of the outcomes and encourage collaboration between industry stakeholders, technologies tested during the PESCO-UP project cover all the textile recycling processes throughout the value chain.

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This publication is based on a project deliverable for the PESCO-UP project, 'Deliverable 9.1: Report on barriers and enablers to textile recycling in the EU'. PESCO-UP is at the forefront of addressing the urgent challenge of recycling mixed textile waste, focusing on developing sustainable and innovative recycling solutions for polyester and cotton fibres. The acronym PESCO-UP is a direct reference to these textile blends, and "PES/CO" is used throughout this document when describing them.

Contents

Transitioning towards a circular textile economy has become a central objective of the European Union's sustainability policy. After all, the European textile industry is associated with considerable ecological impacts in the EU and abroad (Köhler et al., 2021). In 2020, it ranked third in putting the highest pressure on both water and land use, and fifth for the highest use of raw materials and greenhouse gas (GHG) emissions in the EU (EEA, 2026). This is the result of both production and consumption patterns. Producing natural fibres (like cotton) and synthetic ones (like polyester) relies on using land, water, fertilisers and pesticides, as well as energy and chemical feedstock (ETC/WMGE, 2021). Distribution and retail cause transport emissions and packaging waste. Usage of textiles draws on energy, water and detergents, and contributes significantly to waste at their end of life (EEA, 2022).

All of this has been exacerbated by the trend of 'fast fashion', in which cheap and low-quality textile products with short lifespans are discarded at the end of life (EEA, 2026). Indeed, around 73% of post-consumer textiles are currently landfilled or incinerated in the EU (EEA, 2025). Much untapped potential for reducing environmental pressure therefore lies in shifting to circular value chains. Circularity aims to retain the value of textiles for as long as possible, by employing strategies such as reuse, repair, remanufacturing and recycling. Beyond ecological and social benefits, circular textile value chains could also reduce dependence on virgin raw materials and strengthen the resilience of European value chains.

The urgency of this circular transition is reflected in the EU's policy framework. **The Commission's Circular Economy Action Plans identified textiles as a priority sector for intervention. The EU Strategy for Sustainable and Circular Textiles sets out a vision for ensuring that textile products placed on the European market are durable, repairable and recyclable by 2030.** Related upcoming initiatives under the Ecodesign for Sustainable Products Regulation will similarly seek to improve product sustainability, strengthen market incentives for circular practices, and facilitate better information exchange throughout textile value chains.

These policy developments are especially relevant for mixed polyester-cotton (PES/CO) recycling. Polycotton is the most widely used textile blend in the world, but the combination of these two fibre types, with their different physical and chemical properties, renders identification, sorting, separation and high-value recycling technically and economically difficult (Leenders et al., 2025). Tackling this waste stream is therefore highly relevant for improving textile circularity in the EU. **However, implementing textile recycling at scale and fulfilling the EU's circularity ambitions will require overcoming existing challenges beyond technical feasibility** (EEA, 2026). A transition towards comprehensive textile circularity relies on developing an integrated technical, organisational and policy infrastructure capable of supporting circular flows of products and materials across the value chain (Thomas et al., 2024).

This report sheds light on the most pressing barriers to setting up circular textile value chains (including PES/CO recycling), as well as on potential enabling factors. By consulting experts from across the textile value chain, we provide an in-depth assessment of barriers and enablers in various dimensions. The analysis is based on companies involved in circularity processes in the EU textile sector.

The report is prepared in the context of the PESCO-UP Horizon Europe project, which focuses on the recycling and upcycling of mixed PES/CO textile waste streams. It considers textile circularity in general, while giving specific attention to the conditions that affect the recovery and further use of cotton- and polyester-derived fractions from mixed textile waste. We aim to provide EU policymakers with policy-relevant conclusions to inform the ongoing discourse on circularity policy.

Textile recycling in the EU

Before delving deeper into the analysis of the current barriers and enablers that can hamper or facilitate circularity in the European textile industry, this section gives an overview of the present framework around textile circularity. First, it provides a concise outline of the most relevant policies and standards for textile circularity and recycling; second, it summarises important technological developments; and third, it gives selected examples of existing pilot projects for textile recycling.

Policy developments

EU policy examples

The regulatory landscape for textile circularity in the EU is still very much in the making. Puglia et al. (2024), investigating EU policies related to the fashion industry, find that they cluster mainly at the head and tail of the life cycle, emphasising the need for legislative action targeting pre-consumption, distribution, consumption and post-consumption phases. Furthermore, the study highlights a lack of policies to displace linear economy practices, which are deemed necessary for creating a coherent circular agenda.

Identifying the entire policy mix with implications for textile recycling and circularity exceeds the limits of this report; however, we provide an excerpt of relevant policies to allow for a contextualisation of the reported findings. Important policies and exemplary provisions of the European textile framework consist of the following:

- The EU Strategy for Sustainable and Circular Textiles (COM/2022/141 final) sets out a vision that by 2030 all textile products placed on the EU market should be durable, repairable and recyclable, while also providing the basis for new legislative initiatives addressing sector-specific issues.
- Regulation (EU) 2024/1781, the Ecodesign for Sustainable Products Regulation (ESPR), entered into force in July 2024 and prohibits the destruction of unsold apparel, clothing accessories and footwear. It ultimately entered into application for

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large enterprises on 19 July 2026[1]. Also associated with the ESPR is the provision of a framework for the Digital Product Passport (DPP), with textile-specific information requirements to be specified through subsequent delegated acts.

- Directive (EU) 2025/1892, the revised Waste Framework Directive, introduced mandatory separate collection of textile waste from 2025 and established extended producer responsibility (EPR) schemes.
- Regulation (EU) No 1007/2011, the Textile Labelling Regulation, which guides the marking of the material composition of textile products, is currently under revision. While its initial scope was to prevent barriers to the proper functioning of the single market and protect consumer rights, the growing importance of environmental considerations led the Commission to consider reviewing it to enable textile recyclers to access to clearer information on fibre composition. The expected revision should focus on better fabric identification and digital labelling technologies, and rules for textile labelling – including for clothing accessories and apparel – while especially targeting information on environmental impacts. The review is expected to increase clarity among consumers on their purchases and to help companies reduce compliance costs.
- The framework horizontally targets different industrial sectors, with implications for textiles, through Directive (EU) 2024/1760, the Corporate Sustainability Due Diligence Directive (CSDDD), Directive (EU) 2022/2464, the Corporate Sustainability Reporting Directive (CSRD), and the associated Delegated Regulation (EU) 2023/2772, the Sustainability Reporting Standards Regulation. However, both directives were substantially amended by Directive (EU) 2026/470 (Omnibus I), which entered into force in March 2026. Omnibus I reduced the scope and administrative burden of the CSRD and CSDDD by curtailing mandatory sustainability reporting to companies with more than 1 000 employees and over EUR 450 million in net annual turnover, and due diligence obligations to companies with more than 5 000 employees and over EUR 1.5 billion in net turnover. Consequently, fewer textile and apparel companies are directly covered, and smaller suppliers in their value chains encounter more limited sustainability-information requests from companies subject to the CSRD.
- On greenwashing specifically, the proposal for an EU Green Claims Directive remains pending, while the Empowering Consumers for the Green Transition Directive (Directive (EU) 2024/825) is supposed to be applied across Member States from 27 September 2026. This will concern the claims of brands around recycled content and the environmental performance of manufacturing processes. Furthermore, the Commission aims at providing consumers with commercial guarantees of durability and repairability at the purchasing stage (COM/2022/141 final).
- New end-of-waste criteria for textiles are expected to be presented by the European Commission in the fourth quarter of 2026, covering two distinct areas: preparation for reuse and remanufacturing, and the transition from waste to product status in textile recycling processes. The Product Environmental Footprint Category Rules for apparel and footwear provide a voluntary science-based methodology for assessing the environmental impacts of clothing and footwear across their entire life cycle. The rules support more sustainable product design and production, as well as

[1] Directorate-General for Environment (2026). Ban on destruction of unsold clothes and shoes enters into application. [online] Environment. Available at: https://environment.ec.europa.eu/news/ban-destruction-unsold-clothes-and-shoes-enters-application-2026-07-17_en [Accessed 29 July 2026].

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transparent business-to-business reporting. They also contribute to implementation of the EU Strategy for Sustainable and Circular Textiles while aligning with the ESPR.
- Regulation (EC) No 1907/2006, the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation, protects human health and the environment by requiring industry to identify and manage chemical risks and by restricting or phasing out substances of very high concern. It includes specific provisions concerning substances used in textile articles and is relevant to circularity because dyes, additives and contaminants may remain in mechanically recycled fibres, potentially affecting compliance with current requirements. Although the Commission had announced a revision aimed at simplifying the Regulation, on 27 April 2026 it stated that it would not proceed with reopening REACH at that stage.

While requirements are still evolving, the regulatory and policy framework around the EU Strategy for Sustainable and Circular Textiles[2] has turned the circular transition into a need rather than an option, stirring the decision-making of major fashion brands towards greater circularity (Nath et al., 2025; Puglia et al., 2024).

Member State policy examples

Beyond the EU level, policy action on textiles has sometimes been anticipated by Member State-level initiatives (Puglia et al., 2024). Notable examples include France's EPR for end-of-use clothing, linen and shoes adopted in 2007. The EPR scheme allows textile entities (i.e. manufacturers, importers and distributors) to satisfy its requirements either by setting up take-back programmes or by financially contributing to an accredited producer responsibility organisation (PRO). In the latter case, tariffs are calculated on the previous year's expenses for recycling. Textile producers using recycled fibres benefit from a reduction of up to 50% (i.e. an eco-module tariff). Smaller companies also enjoy discounts on the PRO fee. French PROs contribute to consumer education as they provide an interactive website and a mobile application to signal the nearest collection points and share information on recycling practices for clothing. Overall, the literature assessing the French EPR for textiles finds positive results on recycling and collection levels, although it still falls short on waste prevention. Additionally, the French EPR was able to facilitate collaboration between producers and recyclers, and foster R&D projects (Bukhari et al., 2018; Puglia et al., 2024).

The Netherlands also offers a positive national example of a regulatory framework for circular textiles (Suarez-Visbal et al., n.d.; Puglia et al., 2024). The national government, as well as local and regional authorities, adopt circular procurement criteria to stimulate demand for more sustainable and circular clothing (ECAP, 2017; Ministry of Infrastructure and Water Management, 2024). The Dutch national government set a 2030 target consisting of 50% recycling and 15% reuse of disposed work clothes. The category planning used in the Netherlands is considered to be effective as it is able to address the specific features of singular supply chains within the clothing industry (ECAP, 2017).

Standardisation

As regulatory developments increasingly shape the transition towards textile circularity, international and European standards and certification schemes play a complementary role by providing harmonised methodologies for assessing recycled content, traceability and recyclability across global value chains. In this context, both the International Organization

[2] European Commission (2022.). *Textiles Strategy*. [online] Environment. Available at: https://environment.ec.europa.eu/strategy/textiles-strategy_en [Accessed 29 July 2026b].

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for Standardization (ISO) and the European Committee for Standardisation (CEN) have played a major role in the textile industry. The former operates at an international level as a non-governmental and independent organisation, developing voluntary standards; the latter has been officially recognised as responsible for voluntary standards development and definition at the EU level.

Existing standards relevant to textile circularity are unevenly distributed across different areas of the value chain. Current durability standards are primarily based on physical testing methods aimed at assessing product strength, resistance to wear and loss of appearance throughout use, including performance after laundering and colour fastness. These standards are mainly developed within ISO technical committees and subsequently adopted at the European level, reflecting the strong collaboration between ISO and CEN. Although the relationship between the two organisations is not always straightforward, their frequent cooperation contributes to the harmonisation of standards across international and European markets.

In recent years, significant progress has been made in the standardisation of circular textiles through the establishment of CEN's technical committee (TC) 248 and working group (WG) 39 (CEN/TC 248/WG 39)[3], which focuses on circular economy principles for textile products and value chains. Ongoing work includes standards on general circularity principles, minimum product requirements, design for circularity and the classification and requirements of non-virgin input materials. Nevertheless, important standardisation gaps remain, especially regarding recycled inputs and outputs, verification of recycled content claims and textile-specific recycling processes.

While private initiatives such as the Recycled Claim Standard (RCS), the Global Recycled Standard (GRS)[4] and the Content Claim Standard[5] have partly addressed these issues, harmonised public standards are still limited. Similarly, existing standards for mechanical and chemical recycling processes do not adequately address the specific difficulties associated with textile waste streams. At present, no equivalent ISO initiative mirrors the comprehensive work being undertaken by CEN/TC 248/WG 39, suggesting that the recent momentum in textile circularity standardisation has largely been driven by European policy developments, particularly following the adoption of the EU Strategy for Sustainable and Circular Textiles. The influence of European initiatives is further illustrated by the fact that the terminology developed within CEN working groups is being incorporated into emerging ISO standards.

Beyond circularity, ISO has also contributed to improving end-of-life management through standards addressing the biodegradation of fibres and textile materials. Standardisation efforts related to data transparency and traceability, however, remain relatively modest within both ISO and CEN. By contrast, organisations such as the United Nations Centre for Trade Facilitation and Electronic Business and several private initiatives have developed frameworks to support information sharing, product traceability and digital data exchange. These efforts are becoming increasingly relevant in view of the forthcoming

[3] CEN-CENELEC (2026). *CEN/TC 248/WG 39 Work programme*. [online] Available at: https://standards.cencenelec.eu/ords/f?p=205:22:::::FSP_ORG_ID,FSP_LANG_ID:2922255,25&cs=13BB154EE5DD210AC2BEDDE864D09DF65 [Accessed 29 July 2026].

[4] Textile Exchange (2024). The RCS and GRS are designed to boost the use of recycled materials. [online] Textile Exchange. Available at: https://textileexchange.org/recycled-claim-global-recycled-standard/ [Accessed 29 July 2026].

[5] Textile Exchange (2024). The Content Claim Standard. [online] Textile Exchange. Available at: https://textileexchange.org/recycled-claim-global-recycled-standard/ [Accessed 29 July 2026].

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implementation of the DPP, which is expected to require more robust systems for collecting, managing and communicating sustainability information throughout textile value chains.

National standardisation bodies have also played an important role in advancing circularity-related standards. In particular, the Dutch standard NTA 8195:2020 on Circular Textiles preceded the European work and was subsequently introduced within CEN/TC 248, contributing to the establishment of WG 39. Its principles are now being translated into European standardisation documents intended for EU-wide application.

To conclude, despite the growing policy attention devoted to textile circularity, the regulatory framework remains fragmented and exhibits multiple gaps. A large share of existing policies specifically targeting the textile sector are still under development or consist of voluntary instruments, restricting their ability to drive substantial change. Still, the EU has increasingly focused on textiles in recent years, with the revision of the Waste Framework Directive representing one of the most significant sector-specific initiatives through its introduction of an EU-wide EPR scheme and mandatory separate-collection requirements.

Technological developments

Textile recycling remains a highly complex process involving multiple interconnected stages – collecting, sorting, processing and remanufacturing – each requiring different technologies, infrastructure and technical expertise (Abrishami et al., 2024). Textile recycling can generally be classified into four main categories: upcycling, downcycling, closed loop recycling and open-loop recycling. While upcycling converts textile waste into materials of higher value, downcycling results in lower-quality applications. Closed-loop recycling reintegrates recycled *textile* materials into the same product cycle (i.e. textiles) without losing their inherent properties, whereas open-loop recycling redirects materials towards a range of applications, often leading to downcycling processes (Abrishami et al., 2024, ISO 5157:2023:en).

In addition to this classification, textile waste can further be distinguished into pre-consumer (or post-industrial), post-consumer and industrial waste. Pre-consumer waste stems from manufacturing processes and tends to be more uniform and therefore easier to recycle. Post-consumer waste consists of garments discarded at the end of their useful life. Industrial waste originates from commercial and institutional users (e.g. carpets, filters and conveyor belts), and is generally considered the most difficult to recycle due to collection complexity and chemical heterogeneity (Abrishami et al., 2024).

Since PES/CO blends are the focus of this work, it is important to bear in mind that in the textile industry, polyester is a family of synthetic thermoplastic polymers characterised by ester linkages in their molecular structure. In this context, this primarily refers to PET (polyethylene terephthalate), PTT (polytrimethylene terephthalate), PBT (polybutylene terephthalate), PCDT (poly-1,4-cyclohexylene-dimethylene terephthalate) and PLA (polylactic acid). While this has implications for understanding the listed recycling processes and obstacles, this report aims at giving a more general overview of current pathways for textile recycling without claiming to be comprehensive.

Mechanical recycling

Mechanical recycling is widely regarded as the most straightforward and efficient textile recycling method, encompassing two distinct mechanisms (Abrishami et al., 2024). The first relies on cutting, shredding and carding/garneting, and is applicable to most textile

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materials; however, the resulting fibres are shorter than virgin fibres, producing weaker yarns with reduced strength (Abrishami et al., 2024). These shredded fibres can be spun into yarn for woven or knitted fabrics, used directly in non-woven materials, or repurposed as 'shoddy' fibres for rags, carpets, insulation fillings and construction materials, including pressed and heated plates for sound and energy insulation (Abrishami et al., 2024). Garnett machines, which use wire teeth to tear fabric into individual fibres, play a central role in this extraction process; although their output is typically lower quality, recent advances in machinery have enabled the recovery of fibres suitable for wearable-grade fabrics (Abrishami et al., 2024).

A key characteristic of this method is the minimal need for further chemical processing such as dyeing, since fibres retain their original colour when textiles are sorted and batch-processed accordingly. Even so, Silva et al. (2026) classify this category of physical disintegration methods – cutting, shredding, tearing or carding, often followed by bleaching and re-spinning into new yarns – as secondary recycling, noting that it is best suited to mono-material inputs such as pure cotton, wool or acrylic, and to relatively clean pre-consumer waste. Mechanically recycled fabrics can typically incorporate only 20–30% of recycled fibre content without significantly compromising quality, though higher shares are feasible in non-woven products or lower-value applications where requirements on yarn strength and uniformity are less strict (Silva et al., 2026).

Thermal processes

Thermal processes are an alternative to mechanical ones. They include thermomechanical and thermochemical recycling. Thermochemical processes such as gasification or pyrolysis can handle more heterogenous waste streams, including textile waste mixed with other waste streams (Duhoux et al., 2021; Loo et al., 2023). This leads to greater economic viability and lower costs for sorting. Gasification has received more attention than pyrolysis as a recycling technology for textile waste; even so, its output does not close the fibre-to-fibre loop but rather contributes to fuel production (Duhoux et al., 2021). Therefore, gasification may pose risks in terms of greenwashing when it is presented as recycling if a substantial share of the output is used as fuel rather than as feedstock for the chemical industry (Duhoux et al., 2021). To counteract this, accurate knowledge of the waste composition would be needed, although this is not available in most cases and is threatened by the presence of contaminants, which can substantially reduce output quality as well as entirely halt the process (Loo et al., 2023).

Thermomechanical recycling is based on polymer degradation obtained through melting waste, which also causes loss of material quality (Loo et al., 2023). It is commonly applied in the open-loop recycling of plastic bottles into recycled polyester or nylon fibre, and is increasingly relevant to thermoplastic textile materials such as polyester and nylon (Abrishami et al., 2024). The process combines mechanical shredding with heating, agitation and filtration to break down fibres and remove impurities, potentially yielding higher-quality output than shredding-based mechanical recycling. But given the limited literature on fibre-to-fibre applications, contaminants in the feedstock are likely to markedly affect the quality and usability of the recycled polymer (Abrishami et al., 2024). Compared with chemical recycling, this method is faster and cheaper, requires no chemical solvents and consumes less energy. It may result in less quality degradation than standard mechanical recycling, while also producing less landfill waste and conserving resources, as well as lowering GHG emissions relative to virgin textile production (Abrishami et al., 2024).

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Chemical recycling

Given the widespread use of polycotton blends and the difficulties in mechanical recycling, researchers have increasingly focused on developing effective chemical recycling methods. These can be divided into two main approaches: polymer-level recycling, which uses solvents to dissolve either cellulose or polyester fibres, and monomer-level recycling, which breaks the polymers down into monomers through hydrolysis or glycolysis (Pavlopoulou et al., 2024). Yet, reviews of chemical recycling point to the lack of mature solutions, leading textile recyclers to continue to prefer mechanical processes, which appear to be more mature than chemical ones across technological, business and market dimensions (Dahlbom & Martvall, 2025; Duhoux et al., 2021).

Different chemical recycling methods have been identified as relevant to polycotton blends: (i) polymer recycling through solvent-based dissolution, (ii) the hydrothermal approach, and (iii) enzymatic recycling (i.e. biochemical recycling) (Duhoux et al., 2021; Loo et al., 2023). While polymer recycling leads to energy recovery (Duhoux et al., 2021), hydrothermal treatments substitute costly chemical solvents with water alone, partly addressing cost issues, but they have high water and energy requirements (Loo et al., 2023). Hydrothermal treatment is an emergent method for separating PES/CO (see Matsumura et al., 2024). However, the process requires high temperature and pressure and careful control, since PET molecular weight decreases and cotton damage becomes more severe above 230°C (Matsumura et al., 2024). Enzymatic depolymerisation used for biochemical recycling likewise suffers from high energy usage, as waste needs to be carefully pretreated (Duhoux et al., 2021; Loo et al., 2023).

Empirical research is also directing efforts towards repurposing textile wastes into value-added products with an emphasis on the recovery of cotton fibres (Subramanian et al., 2022). Notable examples include: (i) the use of enzymatic hydrolysis to recover polyester and glucose from polyester and cotton textile waste (Li et al., 2019); (ii) upcycling of PES/CO blends or of dyed cotton textile waste to regenerated cellulose fibres (Haslinger et al., 2019; Ma et al., 2020), and (iii) transformation of cotton-blended wastes into bioenergy feedstock (Hanoğlu et al., 2019; Hasanzadeh et al., 2018). Additionally, bioprocessing and electrospinning methods for recycling cotton waste is found to have potential in generating cellulose nanofibers that can be used in various value-added applications (Suen et al., 2023; Sharples et al., 2025).

Feedstock sorting

Regardless of the recycling category pursued, feedstock sorting based on fibre type is desirable in most recycling processes, especially for depolymerisation. When fibre types are separated, depolymerisation processes can be tailored to the specific material, leading to more successful recycling (Loo et al., 2023). Based on the properties of each fibre type, different chemicals and temperatures will be used to disassemble textile polymers. All the same, sorting textile waste is typically labour intensive and highly costly (Köhler et al., 2021), while automated technologies still face significant obstacles (Cura et al., 2021). Near infrared (NIR) spectroscopy uses infrared light which is absorbed differently depending on molecular composition for separating fibre types. But this technology can penetrate only the outer layer of garments; therefore, its usage with multilayer textiles is limited. The presence of dark colours and some types of finishes, as well as the ageing of the materials and the reduced detectability of low-content secondary fibres in blends can lead to NIR failure (Cura et al., 2021; Van Duijn et al., 2022).

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Tracking technologies can support the identification of environmental and social hotspots along textile value chains (Ebinger & Omondi, 2020; Ospital et al., 2022b). Data carriers like radio frequency identification (RFID) tags and QR codes enable product tracking (Agrawal et al., 2016, 2018; Silva et al., 2026). RAIN RFID has emerged as a promising solution, as embedded tags can also preserve information on fibre composition and product characteristics throughout the entire product life cycle.

Traceability

The diffusion of traceability technologies is supported by increasing regulatory requirements for product-level traceability, including the DPP, as well as by growing industry adoption driven by competitive pressures and advances in embedded and mobile-readable tagging systems. By enabling garments to be tracked from production and retail to collection, sorting and recycling, RAIN technologies have the potential to support smarter waste management and more effective fibre-to-fibre recycling systems (Ugale & Brewster, 2025). Complementing these systems, several types of tracers assist in identifying the origin of fibres. Notably, forensic tracers enable analysis of the biochemical composition of natural fibres to trace their geographical origin (Crowley et al., 2022). In turn, additive tracers can be applied to trace synthetic fibres along the entire supply chain (ibid.). Moreover, digital solutions such as blockchain technologies are driving greater transparency and traceability through decentralised systems for collecting environmental indicators across the life cycle of products (Alves et al., 2023).

Finally, technologies alone are not enough; their adoption also depends on organisational arrangements such as product-as-service models. Coordination among all the different stages of the supply chain ensures close alignment between actors and facilitates quicker responses to their needs compared with a linear model (Fischer & Pascucci, 2017). Dynamic earning models complement this by sharing risks and rewards among actors, addressing their uneven distribution – particularly for technology providers, which often bear greater risks while revenues are produced elsewhere (e.g. manufacturers or retailers) – and increasing internal motivation to innovate. In sum, these models augment the economic reward for innovators and encourage adoption and collaboration around the technologies described above (ibid.).

Recycling pilots and initiatives

Currently, several recycling pilot projects and initiatives are working to shape the new framework for circular business models (CBMs) around Europe. This section provides an illustrative and non-exhaustive overview of selected initiatives supporting textile circularity and recycling.

Soft policy instruments, such as multi-stakeholder platforms and networking collaborations, can lower coordination costs between actors that would otherwise operate in isolation (Farrukh & Sajjad, 2024; Rashid et al., 2025). For instance, EU funding through programmes like Horizon Europe can foster research cooperation between academia and industry, leading to technological solutions that respond to the market's needs (Farrukh & Sajjad, 2024).

Within this context, the **PESCO-UP** Horizon project is a notable example of an EU-funded scheme addressing textile circularity through a specific focus on polyester-cotton waste. These blended textiles represent an especially challenging stream for fibre-to-fibre recycling because polyester and cotton have different physical and chemical properties and therefore require effective identification, separation and recovery processes. The project

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brings together industrial partners, research organisations and policy stakeholders to develop and demonstrate solutions for recovering the two fibre fractions and reintegrating them into circular value chains. (PESCO-UP, 2024).

Alongside PESCO-UP, several other European projects and industry-led initiatives provide relevant examples of approaches supporting textile collection, sorting, reuse and recycling. The selected cases below illustrate how these collaborative mechanisms are being applied across textile circularity initiatives.

ReHubs, for example, aims to accelerate the development of large-scale collection, sorting and recycling infrastructure across Europe while fostering investment in recycling technologies and supporting the creation of a competitive market for recycled textile fibres. Its ambition is to process 2.5 million tonnes of textile waste annually by 2032 (ReHubs, 2025).

A related industry-led effort, **Feedstock Activation Europe** (FAE), led by Fashion for Good with Adidas as lead sponsor and support from Bestseller and Inditex, addresses a core gap in the value chain: sorters currently cannot prepare post-consumer material at the price, quantity and quality that recyclers require. The project aims to tackle this by developing a business framework for large-scale regional sorting and pre-processing hubs across Europe. Ultimately, FAE seeks to establish a practical, commercial framework that turns post-consumer textile waste into a viable raw material for textile-to-textile recycling at scale (Fashion for Good, 2026).

TexMat, coordinated by VTT and running from October 2025 to March 2029, is piloting an automated reuse and reward system for used textiles, rewarding consumers for returning reusable and recyclable items, and notifying responsible producers when discarded items require waste management. The project's concept of decentralised textile collection relies on smart, automated collection units that sort returned items, assess their quality, and gather information on materials and product history through DPPs. This is paired with new business models, payback schemes linked to second-hand markets, and policy tools that build on mandatory separate collection and EPR (TexMat, 2026).

CISUTAC (Circularity and Sustainability in Textiles and Clothing), led by Centexbel, similarly addresses multiple segments of the textile value chain, working on polyester and cotton and concentrating on different product categories. It intends to establish sorting for reuse and repair in fashion while substituting virgin fibres with recycled ones. For workwear and personal protective equipment, it aims at cost-efficient dismantling, circular design, and regulatory approval. For active goods such as outdoor gear and sportswear, it promotes repair and facilitates recycling once repair is no longer viable. The project also supports the development of large-scale circular infrastructure and generates evidence-based insights, including an Open Data Guide on data accessibility ahead of the mandatory DPP under the ESPR (CISUTAC, 2022).

SOLSTICE, active in four European regions (Berlin, Grenoble, Prato and Catalonia), demonstrates a holistic '5R' strategy (refuse/reduce, reuse, repair, repurpose and recycle) for climate-neutral textile circularity. It includes four chemical recycling technologies for challenging waste streams such as elastane and polyurethane, alongside improved sorting and DPP-based traceability, with an ambition to save at least four million tonnes of GHG emissions annually by 2030 (SOLSTICE, 2026).

Finally, some pilot initiatives operate primarily on municipal governance and local policy instruments rather than on pure technological solutions. **TEXAD**, an Interreg Europe project running from April 2024 to June 2028 and coordinated by the City of Borås, brings together

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six municipalities with established textile waste practices. The project strengthens local instruments for textile waste prevention, sorting, collection and valorisation, aligning municipal practice with EU requirements such as the separate collection obligations of the Waste Framework Directive, which have been mandatory since 2025 (Interreg Europe, 2026).

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Literature review of the barriers and enablers of textile circularity

As a basis for our empirical analysis, this section reviews the most relevant contributions by the academic literature. The literature review provides an overview of the barriers and enablers identified through desk research and is structured along several key dimensions, ranging from technological factors to societal dynamics. This provides a common framework for understanding the obstacles and opportunities for textile circularity (and PES/CO recycling, specifically) identified in both the theoretical and empirical parts of this report.

Barriers to textile circularity

Technological barriers

Many barriers to implementing circularity in the textile sector concern technical issues. Starting from product design, mixed blends – especially cotton and polyester ones – can achieve qualities highly appreciated by consumers (e.g. breathability, softness, colour stability, and abrasion resistance), but their recyclability is low (EEA, 2022; Silva et al., 2026). Since one of the main issues at the end of life remains the mixed material composition of textiles, design should facilitate the separation of components. However, finding suitable green components is often difficult(Farrukh & Sajjad, 2024; Hedrich S. et al., 2022).

Design is also constrained by the limited selection of colours and qualities achievable when using recycled fibres. These are typically shortened during recycling, thereby leading to downcycling and usage in lower-quality applications such as insulation (Celep et al., 2023; Watson et al., 2017). Properties such as UV protection, colour stability, fire-retardant textures and so forth are achieved through intensive chemical treatments that make recycling more

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complicated and energy intensive (Duhoux et al., 2021; Hartley et al., 2022). Moreover, recycled materials are found to be negatively correlated with product durability, while synthetic materials such as elastane are durable but difficult to recycle (EEA, 2022; Hartley et al., 2022). Finally, redesigning textile products for increased circularity is associated with both costly raw materials and labour (Köhler et al., 2021).

Beyond product design, technical issues arise in recycling post-consumer textile waste. Collecting post-consumer waste based on polymer type is difficult due to the mixture of materials normally included in clothing items, worsened by the lack of automated and commercially viable sorting technologies for separating fibre types (Abrishami et al., 2024; Charnley et al., 2024). The inconsistency and variability of post-consumer textile feedstocks further complicate recycling, as material composition, quality, and availability may vary significantly across locations, seasons, and collection systems, limiting the standardisation of recycling processes (Thomas et al., 2024). Pre-consumer textile waste presents different impediments for circularity: while it is generally more homogeneous and easier to trace, the barriers related to collection systems, technological upgrading, and market competitiveness remain considerable (Chen et al., 2024).

To add value to recycled textile material and to guarantee that the input material for recycling processes is of sufficient quality, it is essential to be able to accurately recognise and sort items according to their material content. Therefore, there is a need for an economically viable and effective way to recognise and sort textile materials. Automated recognition and sorting lines provide a method for ensuring better quality of the fractions being recycled and thus enhance the availability of such fractions for recycling.

Although new technologies have been able to improve the sortability rate in the textile sector, some of them still show pitfalls. NIR-based recognition, for example, is limited with multilayer textiles and leads to failure under certain material conditions (dark colours, finishes or coatings, ageing and blends) (Cura et al., 2021; Van Duijn et al., 2022). In addition, separating hard elements (i.e. zippers and buttons) and synthetic fibres is still highly arduous (Cura et al., 2021; Loo et al., 2023). Difficulties in identifying the material composition of products are further exacerbated by missing or incorrect labels due to ruining washing procedures or unreliable information to begin with (Köhler et al., 2021).

On PES/CO recycling processes, reviews of the current technological status (Celep et al., 2023; Duhoux et al., 2021) highlight the main shortcomings of the more common techniques, which often degrade fibre quality and mechanical performance, leading to downcycling rather than true closed-loop recycling (Silva et al., 2026). Mechanical recycling, despite lower costs (Celep et al., 2023; Duhoux et al., 2021), is limited in separating mixed blends in the absence of efficient sorting systems (Loo et al., 2023). Moreover, the mechanical disintegration of waste leads to significant losses in fibre quality, forcing recycled output to be further mixed with virgin materials, with a fraction of spinnable polycotton ranging from 25% to 55% of the input (Celep et al., 2023; Charnley et al., 2024).

These limitations are particularly relevant to PES/CO blends, since conventional mechanical recycling cannot effectively separate the interwoven cotton and polyester fractions (Pavlopoulou et al., 2024). The treatment therefore produces shorter mixed fibres with reduced strength and quality, which are generally unsuitable for fibre-to-fibre clothing applications and are more likely to be downcycled (Rosini et al., 2026). Mechanical processes are also unable to remove dyes, contaminants and additives, which could make the recycling output non-compliant with recent regulations (Duhoux et al., 2021).

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Thermochemical recycling like gasification or pyrolysis, while able to handle mixed waste streams, can cause material quality loss (Loo et al., 2023) and is highly sensitive to the molar mass and viscosity of polymers. As such, it is more suitable for recycling production waste than post-consumer waste (Duhoux et al., 2021). Thermochemical processes are also less sensitive to material degradation and more tolerant of contaminants than thermomechanical ones (Qureshi et al., 2020), but their consumption of energy leads to significant environmental impacts compared with those of thermomechanical recycling (Duhoux et al., 2021; Loo et al., 2023). Furthermore, the application of thermochemical recycling is still quite difficult for polycotton blends, as its textile feedstock can only consist of a single polymer type or compatible polymer types (i.e. for the same temperature of degradation), a limitation further compounded by the impossibility of treating mixed coloured products (Loo et al., 2023).

Finally, chemical recycling – despite its ability to completely restore even heavily degraded and contaminated polymers (Duhoux et al., 2021) – is typically associated with high investment costs and skill requirements (Charnley et al., 2024; Loo et al., 2023). The presence of dyes and finishing agents creates additional issues for the recycling of cotton–PET blends (Rosini et al., 2026). In addition, the required usage of solvents can be quite costly (Loo et al., 2023) and toxic (Celep et al., 2023), leading to greater costs and environmental impacts than those of mechanical and thermomechanical recycling (Duhoux et al., 2021).

Financial and economic barriers

From an economic perspective, many challenges arise when implementing circular solutions, with recycled textile materials often remaining more expensive than virgin alternatives, thereby reducing their economic attractiveness for manufacturers (Abrishami et al., 2024).

First, scaling up recycling processes is inhibited by the high costs of textile sorting and recycling (EEA, 2022; Van Duijn et al., 2022). In particular, the cost of raw materials such as chemical solvents and commercial enzymes has been found to be a crucial factor in the economic viability of recycling processes (Koszewska, 2018; Subramanian et al., 2022). This is further exacerbated by competing and cheaper recycled materials, such as polyester from PET bottles, already available at scale and providing a less costly and quicker way for brands to achieve self-imposed recycling targets (Hedrich et al., 2022).

Second, the scattered nature of the supply chains drives up the costs of reverse logistics (Ljungkvist et al., 2018; Koszewska, 2018). According to studies, only a few companies have enough in-house resources to implement CBMs or enhance product sustainability autonomously (Ljungkvist et al., 2018; Köhler et al., 2021). Research and development costs also add up in reducing the attractiveness of CBMs, as far as labour costs are concerned.

Finally, certification costs also constitute another barrier (Franco, 2017). The sum of these costs and negative demand effects reduces the competitiveness of CBMs in the textile industry.

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Policy and regulatory barriers

Regulatory aspects also hamper the industrial transition towards circularity. The majority of regulatory barriers identified by the literature consists of deficiencies and gaps in the framework. The literature points to a lack of coherent rules at the EU level regarding textile waste collection (Watson et al., 2017; Duhoux et al., 2021). The EU regulatory landscape has recently evolved through the introduction of the mandatory separate collection of textile waste across all Member States from 2025 (Directive (EU) 2025/1892), but it remains too early to assess the effectiveness of this measure. Organisations willing to collect and sort the waste need to obtain permission from each municipality, which is a disincentive due to the bureaucracy and complexity of the process (Duhoux et al., 2021; Köhler et al., 2021).

Regulatory barriers also result from inadequate and unclear provisions. Labelling requirements under the Textile Labelling Regulation lack the detail required for automated sorting technologies. Waste classification under the Waste Shipment Regulation remains imprecise for textile-related materials, and the waste/non-waste distinction introduced by the Waste Framework Directive has led to divergent interpretations across Member States (Duhoux et al., 2021). While waste management policies are generally crucial for improving textile circularity, some authors emphasise the need for policies that tackle waste generation itself, prioritising longevity over recyclability (Bhatnagar et al., 2025).

There are also significant gaps in standardisation on aspects such as recycled fibres, worker and animal welfare, the sustainability of raw materials, data transparency and traceability along the supply chain. The proliferation of standards and guidelines can cause confusion for companies in navigating which standards to adopt and adversely influence consumer perception of green certification (UNECE, 2020). The absence of a clear and shared definition of circular economy practices within the textile sector also acts as a barrier to transparency and accountability (Bhatnagar et al., 2025; Thomas et al., 2024). Reviews have furthermore identified a policy gap regarding social requirements for textile products placed on the EU market (Köhler et al., 2021), leaving fashion brands with no incentive to select more sustainable suppliers, despite violations of workers' rights or environmental harm.

An additional issue is the exclusion of the textile industry from the Emissions Trading Scheme (Directive 2003/87/EC), motivated by competitiveness concerns, which leaves industry players without an obligation to price in environmental impacts (Köhler et al., 2021). The REACH Regulation constitutes a further regulatory barrier to textile recycling, especially for mechanical and thermomechanical recycling. Duhoux et al., 2021 highlight the risk of non-compliance for textile recyclers, as textile waste may contain substances – contaminants, additives or dyes – no longer allowed on the EU market under the current REACH regime.

Lastly, as most of the policymaking activity on textiles is still ongoing, stakeholders face a high level of regulatory uncertainty. In turn, this inhibits present day investment in circular solutions as the extent of both reward and punishment is still highly unclear (Salmi & Kaipia, 2022).

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Supply chain barriers

The textile industry is characterised by a highly globalised supply chain within which the variety and geographical dispersion of different actors – such as those involved in sourcing, design, manufacturing and waste management – hampers circular development (Abbate et al., 2023; Silva et al., 2026). Adopting circular economy practices across different stages of the textile supply chain, which is historically characterised by little transparency and weak information exchange (Colombo et al., 2025; Thomas et al., 2024), remains slow and difficult.

In this context, only companies with greater agency can drive industry-level circular shifts. Changes are usually prompted either by upstream actors (i.e. fibre manufacturers and chemical companies) or downstream ones (manufacturers and retailers). Consequently, middle actors – such as providers of single components or services (e.g. dyeing or spinning) – often fail in pushing demand for circular solutions from manufacturers and retailers, which usually are small and medium-sized enterprises (SMEs) lacking the financial capacity and risk tolerance required to scale innovative recycling solutions (Chen et al., 2024; Franco, 2017). Some specific obstacles are the lack of direct control that clothing brands have over upstream processes and the outsourcing of production, which remove the responsibility of brands by shifting duties onto suppliers, manufacturers and intermediaries (Salmi & Kaipia, 2022). This affects compliance with social or environmental criteria along the chain of production (Köhler et al., 2021).

The structural complexity of the supply chain poses further barriers to circularity by inhibiting close relationships among actors. This constrains the level of trust and leads each actor to prefer free-riding on the willingness of others to change (Salmi & Kaipia, 2022). For instance, the scalability of the fibre-to-fibre process requires long-term capital investment (Silva et al., 2026) that most textile recyclers are unwilling to make without partners committing to buy from them (Köhler et al., 2021).

Geographical dispersion along the supply chain contributes to the impersonality of business partnerships (Abbate et al., 2023; Salmi & Kaipia, 2022). A lack of communication between clothing brands and textile recyclers was also identified as a crucial barrier (Köhler et al., 2021).

Behavioural and cultural barriers

Behavioural, cultural and attitudinal aspects can hamper textile circularity on both the consumer and the company side. Textile suppliers often lack an intrinsic motivation towards sustainability (Peters & Simaens, 2020). Empirical qualitative analyses reveal that a growth-mindset of textile companies consistently leads them to prefer profitability over sustainable and circular practices (Farrukh & Sajjad, 2024). According to Sudolska et al. (2020), this issue extends beyond the environmental dimension to all topics related to

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corporate social responsibility (CSR). Indeed, circularity is often accidentally achieved as a by-product rather than as the focus of business models, with many large retailers offering take-back schemes to enhance consumer loyalty rather than shifting towards CBMs (Köhler et al., 2021).

Behavioural barriers also pertain to the demand side, with limited customer readiness alongside uncertainty over the uptake of recycled fibres constraining the large-scale deployment of textile recycling solutions (Dahlbom & Martvall, 2025). Despite the increasing interest in sustainable fashion (EEA, 2022; Hedrich et al., 2022), the perceived lower quality of recycled garments is still deemed a major barrier (Salmi & Kaipia, 2022; Chen et al., 2024). Even so, price, functionality and aesthetic are argued to be greater determinants of consumption preference with respect to sustainability (Abrishami et al., 2024; Salmi & Kaipia, 2022). Alternative business models based on servitisation of the clothing item (e.g. rental services) have been found unable to provide a sense of ownership, identity and personal style to consumers (EEA, 2022; Salmi & Kaipia, 2022).

Consumer behaviour during the usage phase is classified as a cultural barrier as it is often due to lack of knowledge of fibre characteristics. Excessive washing or drying at high temperature severely damages fibre quality, reducing clothing lifespans and adding to the technical difficulties of recycling (Duhoux et al., 2021; Köhler et al., 2021). Low consumer awareness also worsens waste separation practices at the household level, exacerbating difficulties in post-consumer waste collection and sorting (Abrishami et al., 2024; Koszewska, 2018).

These behavioural and attitudinal aspects interact with each other, creating a vicious circle. Consumer expectations fail to push the industry towards circularity, and fashion brands fail to encourage consumers to shift their mindset and preferences.

Organisation barriers

A number of barriers to textile circularity arise at the company level. First, path dependency often results in the perpetuation of linear business models. Transitioning to CBMs would require systemic changes in organisational structure, culture and methods (Kazancoglu et al., 2020; Chen et al., 2024). Insufficient awareness of the role of circular economy practices in sustainable development, for example, hinders the adoption of circular models, particularly in developing textile-producing countries (Sharma et al., 2025). The literature finds that most textile companies lack the circular economy-related skills that could foster such transformations (Jia et al., 2020; Rashid et al., 2025). In particular, companies do not have the skilled human resources or tailored training programmes for reverse logistic operations (Jia et al., 2020). Skill shortages add up to the lack of performance measurements for circular systems (Kazancoglu et al., 2020).

Additional issues stem from the lack of consensus about the meaning of sustainable fashion and the identification of core problems in textile production (Hur & Cassidy, 2019; Thomas, 2020). This is partly due to different views of sustainability depending on an individual's role within the company, which can become a barrier to a coherent sustainability agenda (Jia et al., 2020; Thomas, 2020). For example, business managers are found to associate

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sustainability with lowering energy and water consumption, switching to less harmful chemicals and gaining economic benefits. On the other hand, designers generally have more simplistic views and mostly define sustainability in terms of recycling textiles (Hur & Cassidy, 2019). Mid-level managers are argued to be poorly aware of the economic benefits associated with CBMs (Daňo et al., 2020; Sudolska et al., 2020).

Moreover, case studies in the literature find a general lack of knowledge around circular practices among industry actors (Daňo et al., 2020; Hur & Cassidy, 2019). Beyond these differences, inadequate leadership and limited top-management commitment are identified as among the most significant barriers to circular economy implementation in the apparel sector, highlighting the importance of managerial engagement in supporting and prioritising circular economy initiatives (Colombo et al., 2025; Rashid et al., 2025).

Societal barriers

The social dimension of the textile circular transition is underreported in the literature, partly because of the absence of well-recognised and sector-specific frameworks for social impact assessment. This contributes to the lack of knowledge around the possible benefits of circular strategies for job quality, gender equality within the workforce and community wellbeing (Suarez-Visbal et al., 2024). For example, there is a lack of data on total employment in the global textile and apparel industry owing to the high degree of informal work in manufacturing countries (e.g. China and Bangladesh) (Suarez-Visbal et al., n.d.). Knowledge gaps influence company behaviour, as there is low awareness of what social aspects should be monitored when implementing CBMs or which strategies could prevent potential negative impacts (Farrukh & Sajjad, 2024; Suarez-Visbal et al., 2024).

Suarez-Visbal et al. (2024) assess the social impacts of circular strategies in the Dutch apparel sector and fail to find a connection between enhanced circularity and better working conditions. In both the linear and the circular models, most of the low-income employees suffering from poor job quality are women. In the textile context, CBMs such as repair, resale and rental might fail to generate high-quality jobs as they are added as an extension of traditional customer services (Suarez-Visbal et al., 2024). This means that the implementation of circular practices in the textile sector might cause a reorganisation of tasks without a transformative restructuring of the workforce. An example of this phenomenon is the pronounced share of migrant workers in both linear and circular textile business models due to their willingness to accept lower salaries and more precarious contracts (Suarez-Visbal et al., 2024).

This dynamic is consistent with the perceptions firms have about social improvements as additional costs (Farrukh & Sajjad, 2024; Suarez-Visbal et al., 2024). The literature therefore calls for policymakers to convey the social impact ambition of the circular economy more effectively (Farrukh & Sajjad, 2024; Suarez-Visbal et al., 2024).

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Enablers of textile circularity

Technological enablers

The literature acknowledges ecodesign and sustainable fabrics among the main drivers of the circular transition for the textile industry, as they facilitate disassembly, recycling and composting processes while reducing material complexity (Farrukh & Sajjad, 2024; Silva et al., 2026).

Novel technologies can also enable more efficient sorting of post-consumer textile waste. Automated sorting is expected to benefit from significant investment in the next few years as a result of the mandatory waste-collection targets in the EU (Cura et al., 2021). Currently, the more viable option is NIR scanners (Policy Hub, 2021).

Innovations in mechanical recycling technologies, together with biotechnology-based solutions, are recognised as key opportunities for advancing scalable circularity (Thomas et al., 2024). Enzymatic recycling and depolymerisation techniques are considered capable of improving fibre recovery while simultaneously reducing environmental impacts (Silva et al., 2026). Recent advances in chemical recycling have further developed and validated at the pilot scale a sequential hydrolysis and glycolysis process capable of recovering both cotton- and polyester-derived feedstocks from post-consumer polycotton textiles (Leenders et al., 2025). At the same time, electrospinning can transform recycled polymer feedstocks into high-value products, reducing dependence on virgin resources and landfill disposal. Finally, recent advances in industrial-scale systems and successful trials indicate growing potential for integrating recycling pathways into closed-loop systems (Sharples et al., 2025).

That said, Silva et al. (2026) argue that fibre-to-fibre recycling is likely to scale faster in technical applications such as non-wovens, composites and insulation, where functional performance outweighs aesthetics and feedstock variability is more easily tolerated, making these sectors chief enablers of circular textile systems.

At the same time, upcoming technological developments are expected to further streamline data gathering thanks to the integration of artificial intelligence (AI) into blockchain technologies (Happonen & Ghoreishi, 2022). Generally, recent evidence suggests that technological readiness has reached relatively advanced levels, indicating that technological feasibility is no longer the main obstacle to scaling recycling systems (Dahlbom & Martvall, 2025).

Financial and economic enablers

According to the literature, textile companies perceive cost efficiency from resource savings as a major economic advantage of the circular economy, with cost savings outweighing

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expenditure in initial investment (Farrukh & Sajjad, 2024; Nath et al., 2025). Circular practices in the textile industry reduce risks connected to supply chain disruptions, thus driving down costs in the long term. Furthermore, early adoption of profitable circularity strategies enables first-mover competitive advantages (Farrukh & Sajjad, 2024).

Grants and loans conditional on CBM implementation can play a considerable role in addressing the limited budgets of SMEs (European Commission, 2019). Public and private funding can also reduce the cost of textile waste management and scale up R&D projects (ibid.). Blended finance mechanisms combining public, private and philanthropic capital can help mobilise the high-risk investment required to commercialise emerging recycling technologies, while green financing incentives supported by regulation may facilitate the deployment of large-scale circular infrastructure projects (Charnley et al., 2024).

Additional economic enablers include circular procurement, EPR schemes and lower value added tax (VAT) for circular products. EPR fees in the fashion industry can lead to a higher degree of internalisation of the environmental and social impacts of the garment sector. In turn, this triggers demand for circular textile products (Ecopreneur, 2019). Tax reliefs on repair services, including VAT reductions (e.g. in Sweden) have been found to have minor but positive effects (Milios, 2021).

Policy and regulatory enablers

The importance of policy instruments and governance frameworks in accelerating textile circularity is highlighted by the literature (Abrishami et al., 2024; Charnley et al., 2024), since regulatory support, standardisation initiatives and coordinated industrial strategies are considered necessary for bridging existing technological and implementation gaps (Dahlbom & Martvall, 2025; Silva et al., 2026). Government intervention is classified by the literature as an enabler when it reduces the upfront investment costs of CBMs or introduces targets for recycling and reuse (Jia et al., 2020). The EU's circular economy ambition is reported to encourage circular practices both within Europe and globally (Nath et al., 2025). In turn, global suppliers and manufacturers located in developing countries (e.g. Bangladesh) are implementing circular economy principles to enhance their competitiveness on the EU market (Nath et al., 2025).

Jia et al. (2020) list financial support, legislation on packaging and recycling, and sustainability standards for suppliers among the more relevant policy enablers. Although data are still lacking on the effects of the evolving EU textile circularity framework (Puglia et al., 2024), preparatory assessments are optimistic on the effects of waste collection targets, stricter reporting requirements and the DPP, which is supposed to ease regulatory compliance and improve circularity along the supply chain (Alcayaga et al., 2024; EPRS, 2024). Additionally, the literature recommends that policymakers provide fiscal incentives, create platforms for sharing best practices and harmonise standards to ensure data quality and interoperability (Vellanki & Gopinath, 2023).

The introduction of minimum standards for environmental and social responsibility can further enable circularity (European Commission, 2019). The benefits of standards also

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extend to the dimension of data traceability and transparency, as exemplified by the UNECE initiative 'Traceability for Sustainable Garment and Footwear'. The initiative includes a harmonised set of standards to define minimum data requirements and levels of traceability along textile value chains (UNECE, 2020). Evidence from pilot projects suggests that standards are enablers of circularity when they are open source and supported by accessible digital infrastructure (UNECE, 2023). More generally, circular procurement policies are acknowledged as an enabler of CBMs because they provide a strong incentive for environmentally and socially responsible players (European Commission, 2019).

Supply chain enablers

Inter-firm collaboration and informal networking alongside the textile supply chain are enablers of circularity by enhancing trust and communication among different actors (Farrukh & Sajjad, 2024; UNECE, 2020), leading to knowledge and data-sharing routines (Colombo et al., 2025). Moreover, goal congruence in partner selection and high levels of transparency, based on environmental commitment, accountability and shared sustainability goals, can support circular economy implementation across the value chain (Colombo et al., 2025). The literature also highlights the need for multi-stakeholder partnerships involving businesses, policymakers, civil society organisations and communities across both producer and consumer countries (Charnley et al., 2024).

Traceability along the supply chain is considered an important driver of circular end-of-life management in the textile industry (Kazancoglu et al., 2020; Riemens et al., 2023). This directs suppliers towards tailored waste management, including recycling (Riemens et al., 2023), which can be further emphasised by digital traceability systems that facilitate more efficient waste identification and recycling operations (Silva et al., 2026). This dynamic can also be supported by geographical proximity (Colombo et al., 2025), bolstering regional circular economy systems where localised infrastructure can improve resource efficiency, reduce transportation impacts, and better adapt recycling processes to local waste streams and consumer needs (Thomas et al., 2024).

In highly globalised supply chains, circularity is propelled when fashion multinationals incorporate CBM practices (e.g. take-back schemes, repair/reuse services, or recycled collections). A significant number of suppliers and manufacturers in the textile sector need to shift towards a circular economy to satisfy the related demand (Farrukh & Sajjad, 2024). Research on the textile and apparel sector in developing countries finds that international buyers are increasingly pressuring local companies towards sustainable sourcing and non-virgin inputs (Nath et al., 2025).

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Behavioural and cultural enablers

Consumer attitudes towards fashion are reportedly evolving towards greater awareness of social and environmental impacts (European Commission, 2019; Farrukh & Sajjad, 2024). This is partly driven by a rise in knowledge around critical hotspots of the textile value chain as well as the environmental benefits of ethical purchasing (European Commission, 2019; Kazancoglu et al., 2020).

Consumer education could further raise awareness and improve purchasing, disposal and recycling habits (Abrishami et al., 2024; Silva et al., 2026). Circular purchasing behaviours are widely acknowledged by the literature as among the more notable enablers of circularisation (De Aguiar Hugo et al., 2021; Farrukh & Sajjad, 2024). For this reason, fashion practitioners are increasingly interested in research around consumer behaviour as a tool to help tailor design strategies to the growing environmentalism of users (Hur & Cassidy, 2019; Jia et al., 2020). Finally, consumer participation in textile reuse and recycling initiatives may grow substantially when collection systems are accessible and convenient (Charnley et al., 2024; Thomas et al., 2024).

On the supply side, the successful implementation of CBMs is often motivated by reputational benefits, which inspire companies to voluntarily adopt codes of conduct or industry agreements that include environmental and social responsibilities (European Commission, 2019; Saha et al., 2021). Indeed, use of recycled fabrics or second-hand markets benefit a brand's image in the context of growing consumer awareness (De Aguiar Hugo et al., 2021; Farrukh & Sajjad, 2024).

Organisational enablers

Organisational factors can encourage the execution of circular strategies at the company level. A company's product portfolio is a meaningful factor affecting its opportunities for circularity (Salmi & Kaipia, 2022). For instance, luxury brands might be better suited to rental services compared with fast fashion retailers. More broadly, the dynamic capabilities (i.e. the ability to adapt, integrate, and align resources and practices with the external environment) of a company and its individual employees are strong enablers of circular economy adoption (Colombo et al., 2025; Salmi & Kaipia, 2022). Firms with highly adaptive features are more likely to perceive circularity as opportunities for cost efficiency, reputational benefits, and technological innovation (Hur & Cassidy, 2019; Salmi & Kaipia, 2022). In line with this, the growing willingness among brands and retailers to invest in circular textile systems is demonstrated (Thomas et al., 2024) through resale models, recycled content integration, and take-back schemes aimed at supporting reuse and recycling practices (Charnley et al., 2024).

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Farrukh & Sajjad (2024) find that when the organisation's mission and vision are centred around environmental or social concerns, CBMs are more likely to be adopted. This is especially true for smaller companies, while bigger corporations might struggle to incorporate sustainability into their core values (European Commission, 2019). Employee motivation towards sustainability could also inspire circularity, for instance by increasing the awareness of circular economy benefits at the top management level (Jia et al., 2020; Nath et al., 2025). Clearly, willingness and readiness to change of managers is crucial for enabling an organisational shift to CBMs (Kazancoglu et al., 2020).

Societal enablers

Existing research highlights how societal factors can enable circularity in the textile sector (Farrukh & Sajjad, 2024). Community pressure from advocacy groups and non-governmental organisations was recorded as an enabler in several case studies (Jia et al., 2020; Silva et al., 2026). This includes guidelines and multi-stakeholder groups created by non-governmental and research-oriented entities (e.g. the Ellen MacArthur Foundation and the Better Cotton Initiative) (Farrukh & Sajjad, 2024). Social and cultural movements might also be circularity drivers, although research on their direct connection with textile production strategies is missing (Thomas, 2020). Beyond the role of formal institutions, societal norms and values are influencing fashion practitioners in circularisation efforts (Jia et al., 2020). These refer to a generally lower threshold of acceptability among the public with respect to human rights violations and environmental impacts (ibid.).

As CSR is commonly associated with better working conditions, there might be a connection between circular practices as part of CSR strategies and social benefits for the workforce. Nevertheless, research on the topic is scarce and suggests that social issues connected to linear models tend to persist in circular ones (Suarez-Visbal et al., 2024). Yet, current estimates on job creation when scaling up textile recycling are strongly positive (Suarez-Visbal et al., n.d.).

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Methodology

This report is based on extensive desk research to identify the main barriers and enabling factors discussed in the existing literature on textile circularity, as well as a qualitative analysis of stakeholder perspectives. Our principal method for collecting stakeholder perspectives of the barriers and enablers involved in building a circular textile value chain in the EU was in-depth interviews (Voss et al., 2002). The first step was developing a sample of stakeholders that, to the extent possible, represented the full textile value chain. We initially relied on the partners participating in the PESCO-UP project and subsequently complemented this list with additional companies identified through our professional network and expert judgement, following a method often referred to as a snowball sampling approach (Staicu, 2021). This resulted in a sample of 20 stakeholders representing different stages of the textile value chain, including producers, retailers, collectors, and recyclers (see Table 1).

Table 1: Anonymised list of interviewed companies

No.	Sector	Company size	Positions of the interviewees
1	Textile and plastics research and technology	SME	Standards and Technical Regulations Manager
2	Innovation and digital advisory consultancy	Large company	Senior Consultant and Associate Partner
3	Chemical recycling of polyesters	SME	Owner
4	Sports clothing and gear	Large company	Global Policy and Public Affairs Manager
5	Traceability and impact measurement software for textiles	SME	Regulatory Affairs Officer
6	Clothing brand	Large company	3 Public Affairs Head Office and Group Sustainability

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No.	Sector	Company size	Positions of the interviewees
7	Resin manufacturer	Large company	Technology Manager and Technology Manager Transportation EMEA
8	Chemical recycling	SME	Public Affairs, Senior Account Manager (at a supporting consultancy) and General Counsel
9	Collection, repair, reuse and redistribution of second-hand sports and leisure equipment	Micro-enterprise	Co-founder
10	Post-consumer mechanical recycling	SME	Director of Partnerships
11	Textile-to-textile recycling	SME	Programme Analyst and Business Development & Innovation Manager
12	Design and production of apparel and accessories from recycled textile fibres	SME	Founder & CEO
13	Higher education and scientific research	Large company	Researcher
14	R&D	SME	Researchers in the Department for International Cooperation and Non-Wovens and Recycling
15	Textile collection and sorting	SME	Manager of Retail
16	Data for textile resources	Micro-enterprise	Director
17	Textile-to-textile recycling technology and recycled-material production	Micro-enterprise	Co-founder
18	Synthetic leather production	Micro-enterprise	Project Manager & R&D
19	Research, development and innovation services	Large company	Principal Scientist, Principal Scientist & Project Manager, Senior Researcher and Research Professor
20	Online fashion retail and digital fashion platform	Large company	Senior Public Affairs Manager & Sustainability, Senior Circularity Manager and Sustainability Strategist

Having completed the sample, the research team then proceeded with the interview process. A semi-structured interview guide was developed based on the barrier and enabler categories identified through the literature review (see Section 3). The interview guide was shared, together with a consent form, with all participants in advance. Interviews were conducted online[6] and lasted approximately one hour each. A detailed transcript was subsequently prepared for each interview.

The interview data were coded in a combined top-down and bottom-up approach (Ossenbrink et al., 2019). For the top-down process, we used seven categories of barriers and enablers derived from a synthesis of the existing literature: technology, finance, policy, supply chain, behaviour and culture, company organisation, and society. Technical aspects

[6] Interviews took place between February and July 2025.

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refer to technologies, data and tools for the design, sorting and recycling stages. Finance includes financial access possibilities, viability, tax regimes and competitiveness arguments. Policy and regulations refer to both national and EU policies as well as standards. Supply chain entails relationships along the supply chain, including data sharing along the life cycle. The category of behaviour and culture refers to general behaviours and attitudes towards circular textiles, including consumer awareness. Company organisation encompasses factors related to the top management mindset and employee skills. Finally, society refers to social factors such as the impact of circular economy initiatives on community wellbeing and job quality.

Within these predefined categories, the transcribed interview text then received bottom-up codes developed on the basis of the text, with each code briefly describing the respective barrier or enabler. The coded data were then transferred to an Excel spreadsheet to be filtered according to the available categories and codes, and facilitate the analysis.

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Empirical results

This section describes the empirical results of the 20 coded interviews. It first gives an overview of the most important barriers identified and then moves on to the enabling factors highlighted by the interviewees. The individual coded barriers and enablers (in bold) are grouped along the seven categories of barriers and enablers used for the analysis (see Section 4).

Barriers to textile circularity

Technological barriers

Overall, the interviews point to a **lack of technological readiness for scaling up recycling value chains** in the textile industry across the different actors – including mechanical and chemical recyclers as well as sorters, yarn spinners and fibre producers. Although solutions and processes do exist, the level of technological maturity may not be high enough just yet. Beyond financial reasons and lack of investment, this is connected to various technological factors.

For instance, there are inherent **trade-offs in product design** between repairability, recyclability, sustainability, and production at scale, but likewise between recyclability and durability, for example. Design for recycling can also be difficult as it depends on the fabric use case.

Furthermore, **textile sorting is technologically challenging**. Sorting for reuse relies on a lot of parameters that are hard to detect, like quality, aesthetics, and the presence of minor imperfections or flaws. Sorting for recycling, however, focuses more on aspects like material, structure, and colour. Manual sorting is labour intensive, yet automated sorting (like NIR

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technologies) exhibits limitations too, e.g. regarding multilayers, carbon black textiles, and reflective surfaces.

For recycling itself, there are barriers related to both input and output. On the former, the current **volumes and quality of feedstock are too low** for the input specifications of recyclers. The interviewees brought up persisting discrepancies between the sorting technology of textile collectors and sorters and the input requirements of recyclers, as well as insufficient amounts of feedstock to scale up recycling technologies. This is also connected to obstacles posed by **product complexity, feedstock contaminants and textile blends**, which complicate both separation and recycling (specifically, upcycling). The physical form and purity of post-consumer textile waste have considerable impacts on its suitability for various recycling technologies.

Turning to recycling output, it can still be **difficult to meet fabric requirements with recycled fibres**, depending on the use case. For technical textiles, for instance, where safety is paramount, recycled materials need to be able to approximate the quality of virgin ones. But even for apparel items, the quality of recycled textiles is still an issue, especially at a price that brands or retailers might be willing to pay. An interviewee remarked that '[a]fter the recycling process, it's very challenging to reach the tenacities of primary material with the recycled fibres. So maybe this also makes it necessary to think of blends [with virgin fibres].' Both mechanical and chemical recycling processes were mentioned as challenging in this regard.

Financial barriers

On financial and economic factors, many interviewees underscored the point that **recycled materials are less cost efficient** than virgin ones, which severely impacts the business case for recycling. Since neither mechanically opened nor chemically recycled fibres are available at scale yet, this tends to lead to higher and more volatile prices. Several companies cited this as their biggest obstacle to establishing circular textile operations. While the textile industry, especially in the area of cheap consumer products, demands very low prices, secondary raw materials still tend to be significantly more expensive – especially when aiming for high-quality recycled output. An interviewee involved in textile collection and sorting argued that '[f]rom a producer's perspective, using organic or virgin cotton is cheaper than collecting used clothes, sorting them, removing buttons and labels, and then recycling them for another feedstock'.

This may also be a result of the comparatively **high costs of labour, energy and logistics** related to recycling and reuse pathways. Circular processes tend to be work-intensive, requiring high-skilled labour at certain points, and involve many, often energy-consuming steps. Some of the interviewed stakeholders argued that this creates price competition with non-EU players offering either cheaper virgin material or recycled fibres produced at lower cost.

As a result, scaling up circular textile solutions requires **large investment by industry**. Interviewees expressed this as particularly problematic as circularity operations are likely to only become profitable in the long term, while it is unclear exactly where to focus

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investment. As one representative of a large retailer put it, '[t]here's a chicken-and-egg situation; you can't get the prices down without scale, but you can't get the scale up without an affordable price. It's a real challenge for everyone.' Further complicating the scale-up at present is **a lack of high-quality recycled material** available to fibre producers.

Given the difficulties of establishing a business case for recycling, especially for post-consumer textiles, a majority of the interviewed companies also pointed to a **lack of harmonised, effective and accessible financial incentives** from the EU and its Member States. Many companies reported that accessing EU funding instruments like Horizon programmes was a struggle for them. At the national level, taxation and financial incentives for textile circularity are not harmonised, and financial support for innovation may not always be available to all the relevant actors in the ecosystem.

Policy and regulatory barriers

With the EU policy framework for textile circularity still evolving, several companies highlighted that the **long timelines of the policymaking process and the related uncertainty** about policy direction can considerably hamper investment. This can be compounded by changes in existing policies, which make it hard for companies to develop concrete strategies for implementing CBMs.

Barriers were further identified in the area of **policy design**. For instance, several actors mentioned end-of-waste criteria as an issue complicating cross-border shipments of recycling material within Europe, but also in the context of global textile supply chains. This is exacerbated by **diverging national legislation**, which companies considered a barrier to the uptake of CBMs and initiatives. National policy fragmentation can hinder the aggregation of textile waste at the regional level and the subsequent cross-border transport for recycling. This applies to differences between policy regimes within and beyond the EU, which complicate, for example, shipping materials to the yarn and fibre spinners outside Europe.

In addition, interviewees pointed to **overlaps and conflicts between various EU policies** and standards. This might also be connected to the sheer number of EU policies and standards relevant to textile circularity, more broadly, along with the nature of policymaking processes. One interviewee explained: 'Green claims, ESPR, consumer awareness, due diligence – certain simple core definitions were deviating because they updated it in one place and didn't update it in the other text. And especially between DGs, the danger for inconsistency increases.' Companies also brought up the time and cost increase potentially induced by different legislation requiring the same type of sustainability information in dissimilar formats.

In a similar vein, policies may **fail to address the conflicting priorities and needs of actors**. For example, recycled content criteria might not always be the most relevant for every textile use cases. Especially in the field of technical textiles, circularity should be subordinate to aspects like quality and safety, which might not be achievable with secondary materials. Actors also reported difficulties in staying up to date on complex and evolving legislation, as well as in carrying out the necessary administrative work.

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Supply chain barriers

The interviewed experts identified several critical bottlenecks in the supply chain for scaling up textile circularity. Above all, the complex and **fragmented nature of textile supply chains** complicates waste management and circularity operations. The absence of geographical proximity across the different steps of the value chain hampers logistics, as there is little concentration of, for instance, yarn spinners, fabric manufacturers and garment manufacturers within the same area.

Furthermore, given the relative lack of fibre spinners or related skills within Europe, the circular textile value chain will inevitably extend to other regions like Asia. As one company representative explained, '[m]ost of the companies can't really handle their own waste. So, for example, non-woven producers can open up their production waste and reprocess their recycled fibres. But besides them, spinners can't do that. All the other textile producers like manufacturers, weaving companies, finishing companies, knitwear producers cannot do that. If they have waste, they have to have partnerships in their supply chain that can handle their waste, handle fibres, and reproduce the products they need. They would have to rely on their partners who are probably distributed across the globe, which is extremely complex to manage.'

Exacerbating the situation, **supply chain partners are sometimes still unaware** of important textile circularity specifications, while other actors are unwilling to pay the (higher) price of recycled fibres, especially in the context of fast fashion and the availability of low-quality imports at cheap prices.

Consequently, several interviewed experts observed that the **supply chain is not ready for a functional recycling and second-life ecosystem**. There are important gaps in the value chain, including the aggregation of textile waste, the building of automated sorting facilities to sort for recyclers in line with their specifications, and preparation for recycling, according to an interviewed chemical recycler. More broadly, there is a lack of experience, know-how and machinery across different supply chain partners.

Behavioural and cultural barriers

The general behaviour of consumer and business customers and their attitudes towards circular textiles play a large role in establishing textile recycling, by generating demand. The interviewed companies reported that the **demand for sustainable and circular textiles is still too low** among both final consumers and business customers to create a business case for textile recycling and second-life applications. Given the nature of textile usage, performance and product quality is often more valued than recyclability. For clothing items, specifically, fashion and aesthetics can be valued more by consumers, with recycled products often not meeting the same aesthetic expectations. This results in an overall lack

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of a circularity culture among consumers. As one interviewee put it, '[w]e trimmed textiles towards being high consumption products for very cheap prices and short consumption cycles'.

This lack of demand may also be connected to **limited consumer awareness** about sustainable textile purchasing, proper textile usage and end-of-life options. Consumers often tend to cut off labels or wash clothing items too often and at unsuitable temperatures, degrading the textile quality and its later potential for reuse or recycling. This lack of awareness also manifests at the purchasing stage, consolidating the low demand for sustainable and circular textile products.

This behavioural culture also manifests in a **low willingness to pay** more for circular textiles, among both consumers and brands as well as retailers. One of the interviewed companies said that 'there are tiny segments in the markets that are willing to pay for that, but it is not anywhere near impactful'. While brands and retailers may want to avoid raising prices in a highly competitive environment, consumer buying behaviour often only reflects preference for the lowest price rather than sustainability.

Organisational barriers

On the organisational culture of companies, including management mindsets and employee skills, only a few companies identified potential barriers to textile recycling and circularity. It was described as **difficult to find the workforce skilled in circular processes** and new technologies, which is combined with a more general lack of textile know-how within Europe, given the outsourcing of fibre spinning to Asia.

Interviewees mentioned that it was difficult to hire skilled and experienced operators or production managers in the face of continuously emerging technologies. One stakeholder emphasised that 'switching to a circular model, especially when there are shared resources between different industrial facilities, where someone's waste is another's feedstock, really cannot be done when people are skilled only in the old-fashioned way of working with machines and materials'.

Another issue emerged in **changing linear company mindsets**, especially if there is no interest in circularity or, even more problematically, when greenwashing occurs. Luxury fashion brands were highlighted as actors with sometimes rather linear mindsets, not least because they tend to perceive the quality of post-consumer recycled material as low (although in other instances interviewees noted that brands could also create a pull effect towards more circular value chains). Even if the interest in more circular activities *is* there, the notion of short-term profitability can often stand in the way of actual implementation, according to some of the interviewees.

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Societal barriers

Only a few barriers were identified in the realm of social factors and dynamics that are connected to textile circularity. One such barrier emerged in the form of **insufficient or inefficient infrastructure at the end of life and circularity incentives to support consumers**. For instance, it was noted that '[m]aybe, this is also a cultural problem. When I no longer have shoemakers where I can repair my shoes, then I will throw them away. This is also something to do with a change in society and the loss of experience of how to do something.'

Beyond that, it was argued that the circular economy transition alone is **insufficient for tackling broader systemic challenges in the textile industry**. Companies emphasised that circularity is no silver bullet. Issues like underpaid, low-quality jobs, especially those located in the textile value chain outside Europe, would not be resolved by making value chains more circular.

Enablers of textile circularity

Technological enablers

In the realm of technology, interviewees most frequently pointed to **innovation in sorting and separation technology as a key enabler**, citing developments in AI, NIR spectroscopy, machine learning and sensor-based systems as central to improving recycling outcomes. Several respondents described automated sorting as a fast-developing field, noting that greater automation – supported by AI and substituting manual sorting – is essential for making sorting economically viable in Western Europe given rising labour costs. Others referred to fibre-scanning technology as a way to obtain more accurate material information efficiently. By contrast, one interviewee argued that despite ongoing weaknesses, current sorting technologies are already highly competitive on speed and price compared with alternatives.

Improvements in chemical and mechanical recycling processes were also widely cited. Advances in fibre mechanical opening, carding and spinning technologies, alongside improvements in the quality and reduced contamination of recycled feedstock, were mentioned most frequently. On the chemical side, depolymerisation was highlighted for enabling a return to clean cellulose fibre for materials such as cotton. Product testing was also reported to increasingly show that chemically recycled fibres no longer suffer the quality degradation historically associated with recycling.

A smaller number of people pointed to **alternative processes that avoid critical chemicals** as a further enabler, viewing solvent-free processes as both environmentally and

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commercially advantageous, as well as a broader need to phase out problematic chemicals used in textile colouring and finishing.

Financial and economic enablers

Subsidies and public funding stood out as the most important financial enabler, with respondents referring to a wide range of instruments from innovation subsidies and tax incentives (such as the Dutch Research and Development Promotion Act, WBSO) to national and regional funding calls supporting CBMs and start-ups. Several interviewees stressed that these tools work best in combination, and that public support remains crucial for early-stage technologies until regulation on, e.g. EPR schemes, have fully developed. Others pointed to further policy tools that could promote this, such as reduced VAT on sustainable fashion or repair bonuses financed through EPR.

Closely related, **finding solutions that make recycled materials economically viable** was seen as key. Price was widely recognised as the main obstacle. Experts argued that political incentives combined with market mechanisms, such as absorbing the price premium of recycled products or funding the cost gap for pilot projects, will be necessary as the market is unlikely to resolve this on its own. Business models such as leasing or product-as-a-service were also mentioned as ways to offset higher costs, alongside the expectation that scaling up recycling could gradually close the price gap in the medium term.

EU-funded projects were frequently cited as a financial enabler, notably for smaller companies at the early laboratory-stage level of research. One expert stressed that European funds help to industrialise technology, since no private company is currently willing to invest at this stage. Programmes such as Horizon Europe and Digital Europe, which enable research projects like PESCO-UP, are valuable support for trialling new technologies – especially among smaller companies.

Finally, **luxury brands could encourage circular fashion**, given that niche customers are more willing to pay for higher-cost materials. This was described as a likely starting point for the transition, with lower price segments following once recycled materials become more affordable.

Policy and regulatory enablers

EU policies around EPR schemes, recycled content targets and ecodesign requirements as drivers of circularity action were by far the most frequently mentioned enablers in the policy dimension. Several interviewees described mandatory recycled content as particularly powerful because it creates a level playing field that voluntary brand commitments cannot achieve. An interviewee argued that a minimum threshold of around

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30% would force the industry to fundamentally reinvent itself rather than rely on incremental change. Others specified EPR fee structures as a concrete mechanism already reshaping business models, for instance by rewarding sorting and collection activities financially. The Waste Framework Directive and its evolving end-of-waste criteria, together with the Green Claims Directive, were also seen as key in curbing greenwashing. The REACH Regulation was perceived as instrumental in restricting harmful chemicals, and the Corporate Sustainability Reporting Directive as a first step towards transparency. The establishment of a DPP was also listed as a crucial enabler of textile circularity, as discussed in Urban et al. (2026).

Policy harmonisation, consistency and predictability were a recurrent theme. The importance of coherence across the ESPR, the Waste Framework Directive and EPR schemes was highlighted, as fragmentation or abrupt regulatory reversals could undermine years of corporate investment and planning. The standardisation of life cycle assessment methodologies and environmental certifications were raised as a way to ensure comparable sustainability claims across the value chain.

Well-designed tax incentives and import tariffs were also mentioned. Experts proposed differentiated taxation based on recycled content or circularity, tax reliefs for companies investing in circular solutions, and tariffs on virgin materials or fast fashion imports from outside the EU. One interviewee described this as necessary to 'close the tap' on cheap linear imports before European circular capacity can scale. In a similar vein, several respondents called for **EU policy to more actively facilitate the development of a European circular textile value chain**, by supporting local yarn spinning and processing capacity in place of outsourcing it.

National and regional policies were raised as well, including green public procurement, mandatory textile-collection obligations, and clearer national criteria for the classification of waste to ease the cross-border movement of textile waste. In this vein, **extended lifespan and repair-focused rules** were mentioned, with interviewees asking for mandatory repairability requirements and eco-modulated EPR bonuses.

Supply chain enablers

On supply chains, **collaboration across value chain actors** emerged as the most important enabler. Many interviewees stressed that circularity cannot be achieved by any single actor in isolation, describing it as 'a holistic approach' where failures at the collection or sorting stage inevitably undermine recycling and reuse further down the chain. Interviewed stakeholders highlighted the potential benefits of matchmaking platforms and digital marketplaces in connecting waste handlers with the feedstock requirements of recyclers, and of closer relationships between research and industry partners. Systemic cooperation is particularly important in scale-up processes that introduce high levels of complexity to lab-scale solutions.

Experts specifically mentioned the **role of forerunner companies willing to take on risk** as a driver of supply chain circularity. Such companies share a common mindset and willingness to pilot new approaches, build business cases for early-stage investment, and

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share the associated costs and risks. Interviewees singled out the advantages of **collaborating with geographically close suppliers**, arguing that proximity can reduce complexity and improve access to cleaner feedstock, while also allowing for technology choices to be optimised for local environmental and economic conditions.

Behavioural and cultural enablers

From a behavioural point of view, **raising consumer awareness of the environmental impacts of the current textile system** was identified as the most impactful enabler of textile circularity. Some interviewees mentioned generational shifts, with younger consumers showing greater openness to sustainability and second-hand consumption, while others cited climate change itself as a factor pushing consumers to reflect on their consumption patterns. Stakeholders also described the current momentum as part of a broader 'hype cycle' in which initial enthusiasm around sustainability may temporarily recede before stabilising into a durable mainstream shift.

Similarly, a broader **value shift among consumers** was described by several interviewees as a spur of demand for circular textiles. One respondent observed that increasing public awareness around recycling issues is 'the most important development', arguing that once consumers show a preference for recycled or design-for-recycling materials, brands would follow suit.

If consumer awareness is pivotal to a circular shift, then **consumer education could enable more sustainable and circular purchasing choices**, as stated by several experts. This requires targeted communication and information campaigns. As one interviewee put it, 'you need some user education to change buying behaviour', adding that EU-level initiatives and projects such as dedicated consumer education websites are already contributing to this effort.

Finally, some interviewees pointed out that **brands themselves can support circular consumer choices by making them more accessible**, for instance through take-back schemes or by making circular options as convenient as possible.

Organisational enablers

From an organisational perspective, **management motivation and strategic target setting** appeared to be decisive factors for circular innovation. Stakeholders described this as a deliberate, top-down commitment. They linked this to the broader role of recycled content and science-based targets, remarking that as brands set recycling targets, they are pushed to map their supply chains and address waste hotspots. Private-label sustainability

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targets around phasing out virgin polyester and conventional cotton were mentioned as examples of strategic rationales anticipating compliance requirements.

Several interviewees noted that **start-ups are particularly well positioned to embrace circularity mindsets**. One expert argued that smaller companies tend to have more flexibility in changing their processes, as a start-up culture can be built from scratch around circularity rather than having to overcome established conventions. Moreover, interviewees pointed to the **importance of a skilled workforce in obtaining good results**, especially when working with recycled fibres, which often demand specific technical capabilities from processors and highly trained teams to deliver reliable outcomes in research and production. In this context, experts referred to the role of universities and re-skilling programmes in preparing a new generation of professionals for the circular textile sector.

Societal enablers

The societal category was dominated by the **new and quality job opportunities that CBMs can offer as part of the green transition**. An interviewee described this as an opportunity to bring employment back to regions affected by industrial decline. Others linked this to building a European textile-to-textile industry, arguing that this could bring back genuinely specialised and well-paid jobs that had previously been outsourced to third countries. This shift was also described as attracting a new and diverse talent pool into textile recycling drawn by the opportunity to move into greener industries.

Finally, some interviewees held that the **societal value given to circularity could generate greater interest in acquiring related skills** and that the **businesses adopting CBMs have a positive societal impact**, when sustainability is a core part of a company's mission and communication.

Summarising our findings, several crucial barriers to and enablers of textile recycling emerge from the interviews and desk research. These are presented in Table 2. The related policy recommendations for supporting the increased uptake and scale-up of textile recycling in the EU are provided in Section 6.

Table 2: Main barriers to and enablers of textile recycling

Category	Barrier	Enabler
Technological	Lack of technological readiness for scaling up textile recycling value chains	Innovation in sorting and separation technology as a key enabler for improving recycling output
Financial	Recycled materials are less cost efficient than virgin ones	Subsidies and public funding can support the business case at least in the short term

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Policy	Uncertainty due to a slowly evolving policy landscape complicates investment	EU policies around EPR schemes, recycled content targets and ecodesign requirements as central drivers of circularity action
Supply chain	Complex and fragmented nature of textile supply chains complicates waste management and circularity operations	Collaboration across value chain actors, like matchmaking platforms and digital marketplaces, can support recycling value chains
Behavioural	Demand for sustainable and circular textiles is still too low among both final consumers and business customers to create a business case for textile recycling	Increasing consumer awareness of environmental impacts of textile consumption
Organisational	Challenging to find the workforce skilled in circular processes and new technologies	Management motivation and strategic target setting for circularity
Societal	Insufficient or inefficient infrastructure at the end of life and circularity incentives to support a change in textile consumption patterns	New and quality job opportunities that CBMs can offer as part of the green transition

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Conclusions and policy recommendations

The empirical findings of this report suggest that the transition towards circular textile value chains in Europe is constrained not by a single bottleneck but by a combination of interdependent barriers. These interdependencies are reflected in several examples. For instance, technological limitations in sorting and recycling reduce the quality and availability of recycled fibres, which in turn weakens the business case for investment. At the same time, uncertain policy frameworks and dispersed supply chains discourage the long-term investment that would be necessary to achieve economies of scale that would facilitate the scale-up of recycling technologies. As such, textile circularity should be understood as a systemic transition rather than a result of isolated technological improvements.

At the same time, the interviews highlight that fundamental enabling conditions are already emerging in the EU. Technological innovation in sorting, fibre identification and recycling processes, combined with stronger collaboration across value chain actors, has the potential to address many of the current technical and logistical constraints. Likewise, interviewees highlighted the importance of a stable, coherent and predictable regulatory framework centred on instruments such as ecodesign requirements, recycled content targets, EPR and DPPs. Beyond their potential for sustainability improvements, these measures were also viewed as mechanisms for creating demand, stimulating investment and strengthening cooperation throughout the value chain.

The lack of economic viability of recycled materials vis-à-vis virgin ones arose as a major barrier, with the results signalling the need for demand-side measures. Improvements in sorting and recycling technologies are unlikely to be implementable at scale without stronger market demand for recycled materials and circular textile products. Consumer awareness, willingness to pay, corporate commitment and strategic management decisions were therefore identified as equally influential factors of circularity.

Overall, the findings reinforce the view that accelerating textile circularity requires an integrated policy approach addressing multiple dimensions simultaneously. Investment in

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technological innovation needs to be accompanied by predictable regulation, targeted financial support, harmonised standards, stronger supply chain collaboration and measures that stimulate demand for circular products. The policy recommendations presented below build directly on these empirical insights and propose concrete actions to support scaling up textile recycling and circular textile value chains in the EU.

Recommendation 1: Support demand-side measures that create a business case for textile recycling

A recurring finding across the interviews is that weak market demand for recycled fibres and circular textile products undermines the business case for textile recycling. Companies reported that the higher costs of recycled materials compared with virgin alternatives, combined with a low willingness to pay among consumers and business customers, make it difficult to scale CBMs. The EU could strengthen demand through a combination of regulatory and economic instruments. Mandatory recycled-content requirements and green public procurement could support predictable demand for recycled fibres, while eco-modulated EPR schemes and targeted consumer incentives for circular products could help bridge the price gap between virgin and recycled materials. In the short term, public funding and subsidies could also help underpin the business case.

Recommendation 2: Continue funding research and innovation for textile sorting and recycling technologies

As shown by our empirical results, despite significant technological progress in recent years, scaling up textile recycling value chains remains constrained by the insufficient technological readiness of several key processes. This applies to both textile sorting and recycling technologies. While promising solutions are emerging in such areas as using AI and sensor-based systems for improved sorting or in mechanical and chemical recycling processes, these continue to need support from dedicated R&D funding programmes to fill knowledge gaps and help stay at the innovation forefront. EU-funded projects like PESCO-UP can be critical in this regard. Solutions with alternative processes, such as those that are solvent-free, would also need to be further explored by such projects.

Recommendation 3: Strengthen collaboration across the textile value chain

Our interview evidence highlighted the challenges to circularity stemming from the fragmented nature of textile supply chains spanning across various geographical regions. This fragmentation implies that developing scalable circularity solutions requires partnerships, for example, between manufactures of certain textiles and actors capable of handling their processing waste.

Support for supply chain collaboration could help fill important gaps such as the aggregation of textile waste and the development of automated sorting facilities to prepare material according to the specifications of recyclers. The need for closer coordination is likely to grow more pressing with the introduction of the DPP for textiles, which will highlight the necessity of data sharing and supply chain traceability. Policymakers should therefore promote collaborative initiatives through dedicated funding and governance mechanisms, including knowledge-sharing platforms, communities of practice and industrial partnerships. Such initiatives could facilitate the exchange of knowledge and data and help the development of commercially viable circular solutions.

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