



Up2Circ – Boosting the Uptake of Circular Business Model, Product and Process Innovation

Horizon Europe 2021-2027

GRANT AGREEMENT NUMBER — 101091367

Sectorial catalogue

Textile



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1. Introduction to the textile sector

b. Textile introduction

Textiles are a broad category of flexible materials made through spinning raw fibers into long and twisted lengths that are interlocked into bundles of yarns or threads and then woven, knitted, matted, or otherwise bound together into fabrics. Fibers generally are categorized by their chemical origin, falling into two classifications: natural and manmade/manufactured/synthetic. Textiles can be comprised of single fiber types or a blend of two or more fiber types depending on the desired product characteristics (stretch, stain, water resistance, durability, expense etc.).



c. Textile industry

The textile industry is primarily composed by the design, production, and distribution of yarn, cloth, and clothing.

According to Mordor intelligence, the European Textile Market size is estimated at 165.03 billion euros in 2023, and is expected to reach 195.31 billion dollars by 2028, with a composed annual growth rate of 3.43% between 2023 and 2028. The textile industry is a major contributor to the economy, employing nearly 6% of the working class in total manufacturing in Europe. However, between 1998 and 2009 the sector lost about half its worker and turnover declined by 28%. This decline followed the phasing-out of the World Trade Organisation textile quotas, which began in the 1990s and ended in 2005. After this liberalisation in the textile trade, the share of imports in European clothing consumption increased from 33% in 2004 to 87% in 2012. China now dominates the production market, annually exporting an estimated \$109.9 billion worth of textiles and \$158.4 billion worth of apparel. Today, the production of textiles and clothing has a complex global value chain. According to Euratex, the European Union

imported textile products worth 112 billion euros, especially from China, Bangladesh, Turkey, India, Cambodia and Vietnam. However, the European Union textile and clothing sector export 48 billion worth of products, making the European Union the second largest exporter in the world after China.

About 5 % of household expenditure in Europe is spent on clothing and footwear, of which about 80 % is spent on clothes and 20 % on footwear. According to European Environment Agency (EEA) estimates, between 1996 and 2012, the amount of clothes bought per person in the EU increased by 40 %. This growth is driven by the fall in the prices of garments compare to the other prices. Indeed, between 1996 and 2012, the price of clothing increased by 3%, while consumer prices in general rose by about 60%. At the same the share of clothing in household consumption stayed the same, around 4-5%. The tremendous growth in textiles production, particularly since the mid-1990s, has been largely driven by the rise of fast fashion. Taxes on imports/exports diminished at that time, and manufacturing moved to countries with lower labor costs and reduced regulatory requirements. The term fast fashion describes the mass manufacturing and marketing of low-cost clothing that is quickly transferred from a design concept to retail stores. It is thus “fast” in several ways: (1) rate of production, (2) number of fashion cycles, delivery, consumers' decision to purchase, and (3) rate at which garments are worn and disposed.

d. Textile market trends

Europe textile market trends are the following:

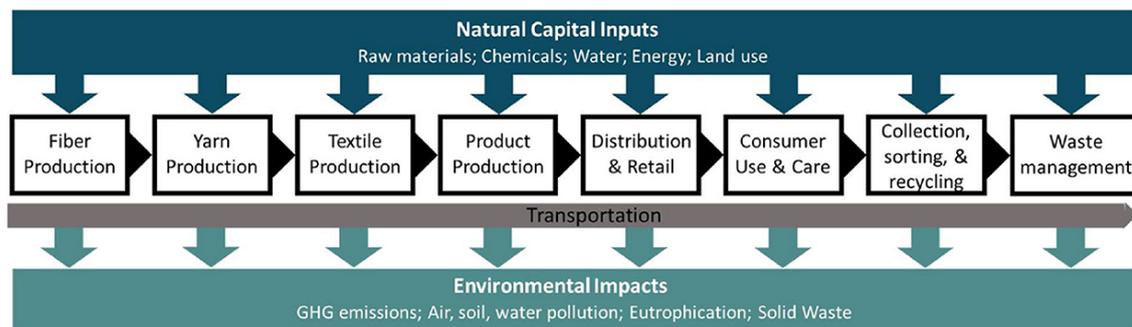
- While demand for cotton, wool, and cellulose has remained fairly constant over the decades, demand for synthetics, especially polyester, has increased tremendously. It is estimated that today 60% of clothing and 70% of household textiles comprise synthetic fibers, and this trend is expected to increase into the future as consumers in emerging economies adopt Western lifestyles and attire,
- Increasing preference for online shopping, including new business models introduced by “resale disruptors” offering their products via peer-to-peer marketplace (bringing buyers and sellers together within a hosted platform to perform transaction) and augmented marketplace (taking on logistics, photography and customer service to deliver a more convenient customer experience),
- There is now a two-sided market driven by fast fashion and premium and branded products.
- Rise in the demand for organic and/or recycled textiles and fabrics as more and more consumers become concerned about their health and the environment.



2. Challenges for the sector with regards to sustainability

a. Environmental impacts of textile industry

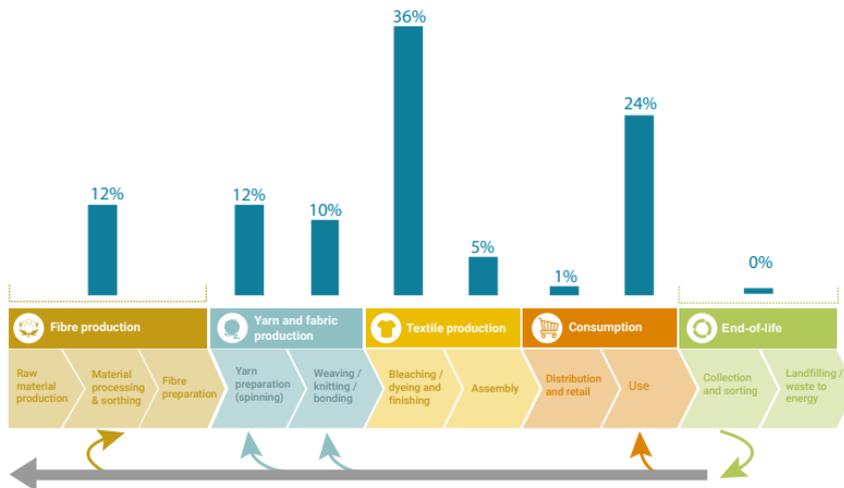
The production and consumption of textile products traditionally follows a largely linear (take, make, use, discard) economic model. The European Union generates 12.6 million tonnes of textile waste per year. Clothing and footwear alone accounts for 5.2 million tonnes of waste, equivalent to 12 kg of waste per person every year.



According to European Parliamentary Research Service, clothing accounts for between 2 % and 10 % of the environmental impact of European consumption.

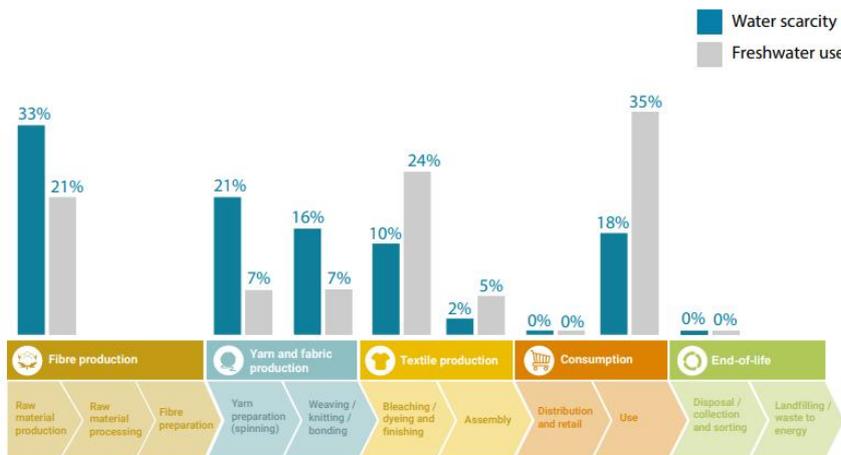
The production of raw materials, spinning them into fibres, weaving fabrics and dyeing require enormous amounts of water, lands and chemicals, including pesticides for growing raw materials. Textiles are currently being produced in greater volumes than ever before, even after accounting for population growth, and unwanted products are discarded in mass quantities, most of which ends up in landfills or incinerated.

Consumers use also has a large environmental footprint due to the water, energy and chemicals used in washing, tumble drying and ironing, as well as to microplastics shed into the environment. According to Euromonitor International Apparel & Footwear (2016), between 2000 and 2015, while the clothing sales has doubled, the clothing utilisation has continually decreased.



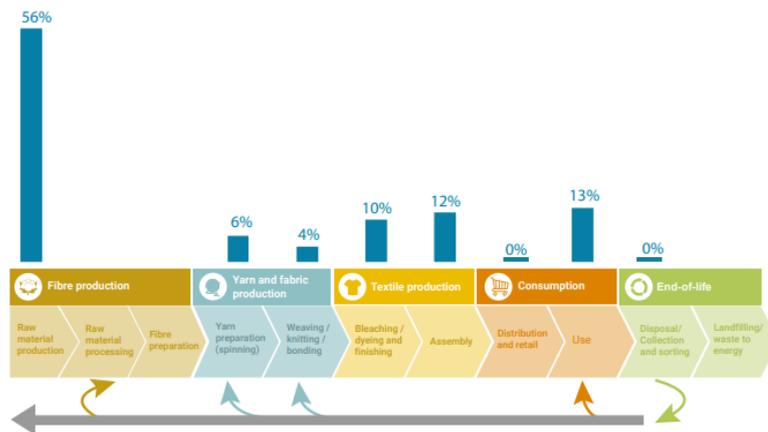
Climate impact across the global apparel value chain

Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking. (NB data is from previous UNEP report and is out of scope for this study. For details on methodology and limitations please refer to UNEP 2020.)



Land- Freshwater use and water scarcity footprint across the global apparel value chain

Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking. (NB data is from previous UNEP report and is out of scope for this study. For details on methodology and limitations please refer to UNEP 2020.)



Land-use impact across the global apparel value chain

Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking. (NB data is from previous UNEP report and is out of scope for this study. For details on the methodology and limitations, please refer to UNEP 2020.)

b. Challenges with the current textile value recovery system

Current textile collection generally includes online and physical thrift stores, charities, drop-off centers, curbside collection programs, donation bins, and retail store takeback programs. However, currently, only 22% of post-consumer textile waste is collected separately for reuse or recycling, while the remainder is often incinerated or landfilled.

You will find below the challenges and opportunities regarding collection.

Collection	
Challenge	Opportunity
No established infrastructure for convenient, consistent, widespread, and reliable collection	Need significant evolutionary change, not incremental improvement
Current system is fragmented and <i>ad hoc</i>	Expanding collection on the scale necessary requires involvement and cooperation from brands and retailers as well as legislation
No harmonized textile collection rules or standards: materials must be clean, dry, and have no odor or hazardous chemicals to maintain value	Need harmonized collection rules with an emphasis on preserving the quality without contamination
High transportation costs	Consumers need to recognize the value of used textiles and know options and best practices for collection

Sorting/Grading	
Challenge	Opportunity
Currently relies on manual labor, which is expensive	Development of high-speed automated sorting systems
Manual sorting cannot identify fiber composition	Advancements in sorting technologies, identification of fiber composition, and digital identification on products
Existing technologies are incapable of screening for current styles and trends or identifying rips, stains, or wear	Advancements in artificial intelligence (AI) algorithms to identify and automatically screen textile inputs
No harmonized sorting standards or criteria	Standards and best practices for sorting criteria
Lack of dedicated textile sorting facilities	Establishment of dedicated domestic sorting facilities

Reuse of used textile products is the highest value approach when compared to alternative pathways and offers the lowest impact from an environmental standpoint. Recycling is the next approach to retain value in textile products after reuse and repair. The term recycling refers to the conversion of textile waste into something approximating the same value (such as recovering fibers back into fibers) but is often also used as the catch-all for all forms of recovery pathways. Upcycling refers to turning discarded textile material into something of higher value (such as making new garments or products with materials from waste textiles). Downcycling is the turning of waste textile material into something of lower value such as rags. However, less than half of used clothes are collected for reuse or recycling when they are no longer needed, and only 1 % are recycled into new clothes, since technologies that would enable recycling clothes into virgin fibres are only starting to emerge.

You will find below the challenges and opportunities regarding reuse and repair.

Challenge	Opportunity
Lagging consumer and industry acceptance that reuse is highest and best use for the environment	Education regarding garment care, reuse, and repair Education to support increased popularity and awareness of the benefits of reused/ repaired products
General public lacks knowledge, tools, interest, or time to repair garments	Workshops or educational resources that help the general public learn basic garment repair skills
Disenfranchised repair industry	Programs aimed at assisting those employed in the repair industry
Materials must be clean and dry and have no odor or hazardous chemicals	Consumer education on best practices for donating and purchasing used products
People throw unwanted materials away and do not understand reuse capabilities	Build industry acceptance and support for resell and repair industries
Fast fashion clothing quality is inferior, not suitable for resell or conversion and appropriate only for lower uses, e.g., wiping rags	Consumer education on the true impact of fast fashion and lower quality goods and standards for quality and durability of textiles

c. Consumer shift

More eco-conscious consumers are now shifting towards sustainable clothing. In response to consumer demand and pressure to green its operations, the textile industry is shifting. It is quite proactive in undertaking research work for the development of new and innovative products as well as new business models. Indeed, the report “Pulse of the Fashion Industry” published in 2017 by the Global Fashion Agenda and the Boston Consulting Group, warns that unless fashion brands take decisive action, they could see their profitability levels fall by 3 percentage points by 2030.



d. Regulations evolution

In 2018, the European Union adopted a **circular economy package** that ensures that textiles are collected separately. The Waste Directive requires Member States to set up such schemes at the latest by 2025. Although not specifically aimed at textiles and clothing, other directives in the circular economy package could also mitigate some of the environmental impacts of textiles and clothes. The Packaging Waste Directive introduces targets for the recycling 60 % of all packaging by 2025 and 70 % by 2030. It also introduces material-specific targets for recycling, for instance, plastics, paper and cardboard packaging.

The European Union also lays down **European standards relating to textiles and clothing**. Some of the standards relate to minimum performance requirements for certain types of textile products, and environmental aspects of textile products, so for instance, the European standard CEN/TS 16822:2015 refers to self-declared environmental claims. In addition, the European Union ecolabel for clothing and textiles, a voluntary certification programme, establishes ecological criteria guaranteeing limited use of substances harmful to health and environment, reduction in water and air pollution, as well as criteria for extending the lifetime of clothes (resistance to shrinking during washing and drying and colour resistance to perspiration, washing, wet and dry rubbing and light exposure).

Finally, the **EU Green Public Procurement (GPP)** criteria for textiles facilitates the inclusion of green requirements in public tender documents. It is a voluntary instrument that Member States and public authorities can implement to the extent to which they themselves wish.

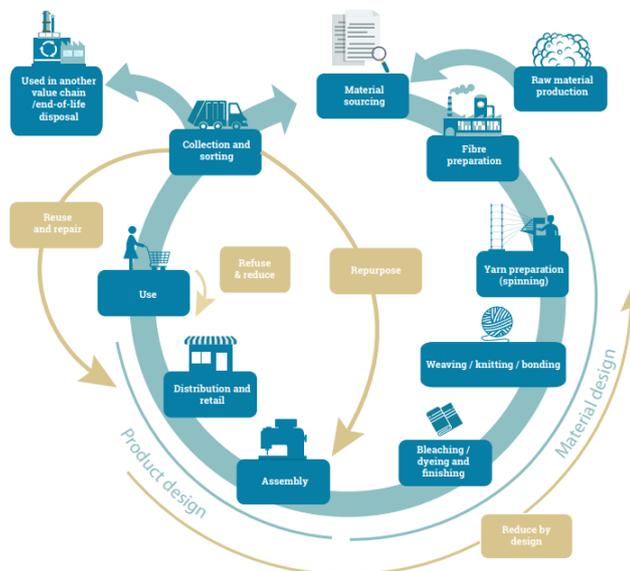
On the 5th July 2023, the European Commission has proposed rules to make producers responsible for the full lifecycle of textile products and to support the sustainable management of waste. The Commission has proposed to introduce mandatory and harmonised **Extended Producer Responsibility (EPR)** schemes for textiles in all EU Member States, as it is already done for packaging, batteries and electric and electronic equipment. Producers will cover the costs of management of textile waste, which will also give them incentives to reduce waste and increase the circularity of textile products. The payment scheme will be adjusted based on the environmental performance of textiles according to the “eco-modulation” principle.



1. Circular economy opportunities in the textile industry for businesses

a. Circularity for the circular value chain

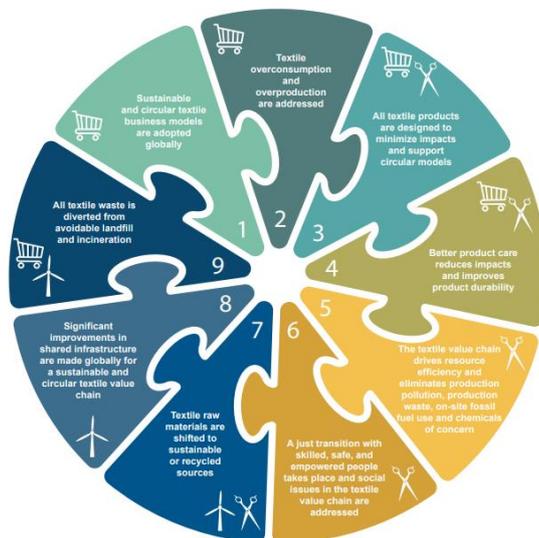
Circularity goes well beyond recycling fibers: “reduce by design” aims to reduce the amount of material, particularly raw material, and hazardous chemicals consumed during production and during use from the very beginning of product and service conceptualization. Production and consumption patterns as well as end-of-life processes of textile products are optimized via innovative product designs and business models, resulting in not only eliminated harmful impacts and waste but also improved social protections and business resilience.



Source: UNEP (2019). Circularity Platform.

Representation of activities in a circular textile value chain

United Nations Environment Programme Industry and Economy Division provides a model to transform the current linear textile economic model towards a sustainable future. UNEP’s circularity approach builds on **nine value retention processes** and an **overarching ‘reduce by design’ approach**. All building blocks consider the key drivers of environmental and/or socioeconomic impacts within the value chain, support the delivery of the existing industry goals, and require multiple stakeholders to act together.



The nine value retention processes

b. Shift consumer patterns

According to the report “New textiles economy: redesigning fashion’s future” by the Ellen McArthur foundation, if the number of times a garment is worn is doubled on average, the GHG emissions would be 44 % lower.

This requires a significant shift in perception of what ‘value’ means for consumers, brands and retailers. It also requires a combination of increased clothing utility (how long a product is used) and shifting consumer norms and aspirations towards lower consumption through engagement with the social and emotional aspects of behaviour.

Businesses can make durability more attractive to consumers through several means:

- **Seize opportunities in market segments where there is already demand for high quality, durable cloths** by creating a common quality labelling, offer warranties to replace or repair any product or component, maximise the potential of durable clothe through long-term rental and maintenance as a service. The French company [Brun Vian de Tiran](#) offers premium products, with the world’s finest silks and wools with quality labels.
- **Scale up services to provide increased personalisation of clothes at purchase**, creating an emotional bounding with the clothes by involving consumers in the making or remaking of their garment, adapting clothing to individual body shapes and styles thanks to new technologies, designing modular garment that will adapt to changing user needs.



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- **Make resale attractive** by putting customer experience first and making resale models convenient and accessible, for traditional brands implement resale activity either directly or in partnership with third parties with know-how on logistics, renewal or repair. For example, the French company [Vinted](#) offers a marketplace to sell without fees and browse unique items from vintage fashion to second-hand homeware.
- **Boost clothing care** by implementing new clothing services such as such as garment restyling or consulting, to advise on upgrades, customisation, and mending at home, either directly or through a third parties as well as introducing clear labels and guidance for maintenance (eg. repair instructions or washing and storing tips to reduce wear and tear), repair and disposal. For example, the French company [Protectus](#) offers a solution for hospitals to reduce their textile waste, with washable and recyclable garment.

c. Improve practices

All textile products are **designed to minimize impacts and support circular models**. Improved data and feedback loops will be critical to take into account knock-on effects of design at each stage of production, use and end of use.



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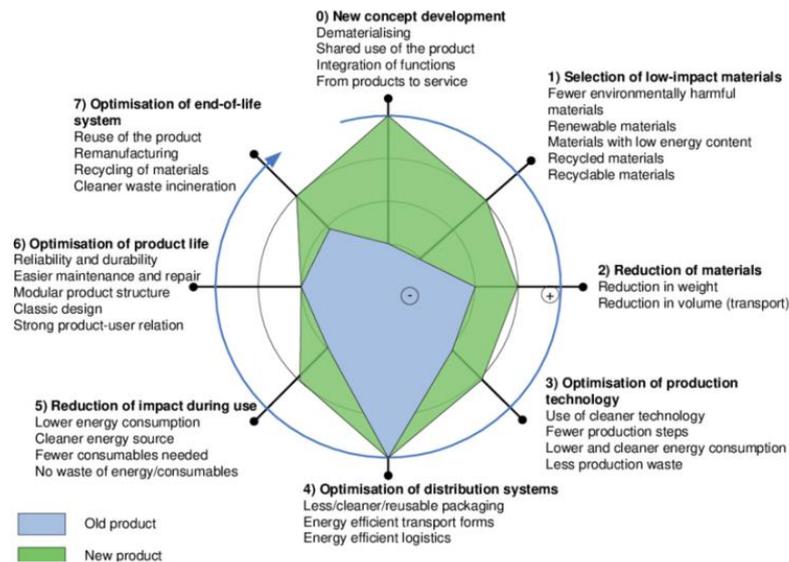


Figure 5: The ecodesign strategy wheel (Brezet and van Hemel, 1997)

Businesses can capture additional value by engaging with technical experts **to engage and train design and product development teams for optimal outcomes, purchase decision and sourcing support tools**, and support the funding of **further data collection to allow for detailed analysis of impacts**. For example, the Dutch company [Circularity](#) make them clothes from used clothing such from industry customers, sheets from hospitals, and unsold items that would otherwise go into incinerators.

Replacing non-renewable resources with **recycled feedstock** is a key contributor in reducing resource usage. For example, the French company [Triloop](#) uses recycled polyester from scraps of fabric or plastic bottles to make their sport gear. However, virgin materials will still be required. Where such input is needed and no recycled materials are available, it should increasingly come from **renewable feedstock produced in regenerative ways**. In addition to being essential for a system that works in the long term, achieving this ambition would allow the industry to reduce risks related to resource price volatility and security of supply. Businesses can move to **regenerative agriculture for biobased materials**. Businesses need to work collaboratively with suppliers to implement more efficient textiles production methods.

According to the Ellen McArthur report, 87% of material used for clothing production is landfilled or incinerated after its final use, representing a lost opportunity of more than 100 billion dollars annually, coupled with negative environmental impacts.

Businesses can capture this current loss value by aligning clothing design and recycling processes with **more transparency on the materials flowing**, a **work on the reduction of the complexity of materials used**, and on **alternative materials that can be economically recycled**.



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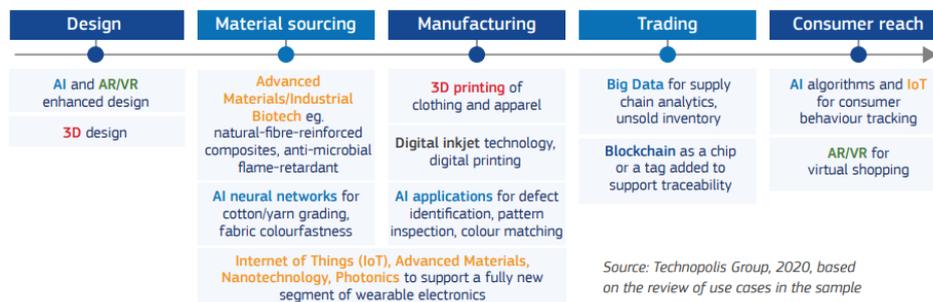


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2. Tech-savvy solutions to increase circularity in the sector

Many technologies exist to increase circularity in the sector.

You will find some of them below:



[Trimco group](#) develops innovative solutions for brand identity, supply chain traceability, and RFID technology, helping brands optimize their business, protect their image and identity. Their solutions enable businesses to track their products at every stage of the supply chain, from raw materials to finished goods as well as to provide real-time visibility into their inventory and assets, helping them optimize their operations and reduce costs.

3. Links to sector specific online contents

a. Sources

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CLEANTEX PROJECT - Clean and Innovative Textiles Strategy for Circular Economy, *Practical guides on implementation of life cycle assessment and eco-design applied in textile design and manufacturing* (2022) <https://www.ntf.uni-lj.si/toi/wp-content/uploads/sites/7/2022/06/CLEANTEX-e-book.pdf>





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b. Online webinars

Cleantex Project, *Cleantex MOOC* <https://cleanteproject.eu/mooc/>

c. Communities

<https://eit.europa.eu/news-events/news/eit-community-agree-innovation-agenda-circular-textiles-and-fashion>



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