



D.1.2.2. REGIONAL REPORTs OF STATE OF THE ART OF TEXTILE WASTE MANAGEMENT AND RECYCLING

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PreVENTing and
ReDucing the
tExtiles waste mountain
in the MED area

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Executive Summary

This document represents Deliverable 1.2.2, **Regional Reports on the State of the Art of Textile Waste Management and Recycling**, part of Activity 1.2 within Work Package 1 - Reforming the Industry by Using Sustainable and Circular Practices in the VERDEinMED project.

The report comprehensively analyzes aspects of European textile waste management systems, focusing on the project partner regions, mainly in the Mediterranean area. These aspects include **legal, social, and technical dimensions** to identify the intricate interplay between regulatory frameworks, societal dynamics, and technological infrastructures.

Consequently, analyzing these dimensions will enable the identification of regional and collective challenges related to textile waste management practices. This comprehensive exploration will allow stakeholders to gain valuable insights into the complexities of the textile waste landscape, enabling them to formulate targeted and influential project solutions.

The document comprehensively overviews textile waste management across various European countries. It is structured into two main sections: the European Approach and Regional Reports.

I. European Approach:

- **Introduction:** Set the stage for the discussion on textile waste.
- **Textile and Apparel Industry – General Data:** Presents vital statistics and insights into the industry.
- **Textile Waste:** Discusses the types and volumes of textile waste generated.
- **Textile Recycling Challenges & Innovations:** Highlights the difficulties faced in recycling textiles and innovative solutions being explored.
- **Legal Framework:** Outlines the existing laws and regulations governing textile waste management.
- **R-strategies Initiatives:** Describes various initiatives aimed at reducing textile waste.
- **Social Responsibility & Awareness-raising:** Focuses on efforts to promote social responsibility and raise awareness about textile waste.
- **SWOT Analysis for Textile Waste Management and Recycling in EU:** Provides a SWOT analysis to evaluate strengths, weaknesses, opportunities, and threats in textile waste management.

II. Regional Reports:

This section includes detailed reports for several countries:

Greece, Spain, Portugal, Slovenia, Italy, North Macedonia and Bulgaria: Each report covers textile waste management practices, legal frameworks, R-strategies initiatives, social responsibility efforts, and a SWOT analysis specific to each country. The document concludes with a **joined SWOT analysis**, summarizing the **collective insights from the regional reports**, and includes a glossary of terms for clarity. Overall, it is a vital resource for understanding the current state of textile waste management in Europe and the collaborative efforts needed to enhance sustainability in this sector.



I. European Approach

I.1 Introduction

The European textile and clothing sector is significant in the global market and the European economy. With a rich heritage and a reputation for quality and innovation, Europe has long been a leader in **textile manufacturing**, **fashion design**, and **technological advancements**. However, this sector faces **considerable challenges**, particularly regarding **sustainability**, **waste management**, and **environmental impact**.

Europe generates over 5.8 million tons of textile waste yearly, primarily from household clothing and home textiles. Much of this waste is in landfills or incineration plants, leading to substantial environmental concerns. The **traditional linear model** of production and consumption—where products are made, used, and then disposed of—has proven unsustainable. It has prompted a shift towards a more **circular economy**, where products are designed for longevity, **reuse**, and **recycling**.

The European Union (EU) has taken a proactive approach to addressing these challenges. New regulations are being introduced to mandate separate textile waste collection by 2030, significantly increasing the textiles available for recycling. **The EU Strategy for Sustainable and Circular Textiles** also aims to create a framework that encourages using sustainable materials, reduces waste, and promotes recycling within the industry.

Technological advancements are at the forefront of this transformation. Innovations in mechanical and chemical recycling technologies enable the conversion of textile waste into high-quality fibres that can be reused in new garments. These advancements help reduce the textile **industry's environmental footprint** and provide economic opportunities for businesses willing to invest in sustainable practices.

Furthermore, the sector is actively working on reducing its carbon footprint. Initiatives like the ***Sustainable Apparel Coalition's decarbonization program*** assist companies in setting and achieving science-based targets for emission reductions. This move towards decarbonization is essential for aligning with broader environmental goals and ensuring the sector's long-term sustainability.

In summary, the European approach to the textile and clothing sector is characterised by a solid commitment to sustainability, innovation, and regulatory support. By addressing the pressing issues of waste management and environmental impact, Europe aims to maintain its leadership in the global textile market while paving the way for a more sustainable and circular economy.

I.2 Textile and Cloth Industry

The European textile and clothing sector, predominantly composed of small and medium-sized enterprises (SMEs), is vital to the continent's economy and global trade. According to the Euratex report "Facts & Key Figures 2024¹ on the European Textile and Clothing Industry," this industry employs 1.3 million people across 197,000 companies, with 99% of these being SMEs. With a turnover of EUR 170 billion, Europe

is the second-largest export of textile and fashion goods worldwide. The industry's strength lies in its comprehensive production chain, encompassing every step from fibre-making to finished products, all within Europe.

EU external trade in textiles and clothing is significant, with nearly €64 billion worth of products exported and almost €115 billion imported. The top five EU producers—**Italy, Germany, France, Spain, and Portugal**—are key players, producing fibres, fabrics, clothing, and home and technical textiles across various sectors.



Figure 1. Member States share in EU¹

However, the T/C industry faces many challenges related to environmental impact, waste management and sustainability.

1.2.1 Environmental effects of the T/C industry

The T/C industry is highly resource-intensive and waste-generating, accounting for 3% to 10% of global CO₂ emissions².

Adopting green technologies and sustainable materials is a huge concern nowadays to decrease the negative impact of the Textile and Clothing sector on the environment. Based on the same report from Euratex, **32%** of the EU textile SMEs reported using recycled materials, and **42%** adopted green technology or

¹ EURATEX Facts & Figures report 2024, <https://euratex.eu/wp-content/uploads/EURATEX-Facts-Key-Figures-2024.pdf>

² Global Fashion Agenda and McKinsey, 2020, Fashion on climate.

implemented a new green business model.

Table 1. Sustainable technologies used by EU textile SMEs³

Technologies	Already using
Recycled materials	32,0%
Energy-saving technologies	27,8%
Recycling technologies	24,3%
Clean production	24,3%
Bio-based materials	23,3%
Renewable energies	18,0%
Biotechnology	8,3%
Additive manufacturing	6,8%
Carbon capture technologies	6,0%
Hydrogen	1,3%

One of the green technologies they adopt is using natural gas, the primary energy source for the industry. Green transition requires considerable innovation and investment.³

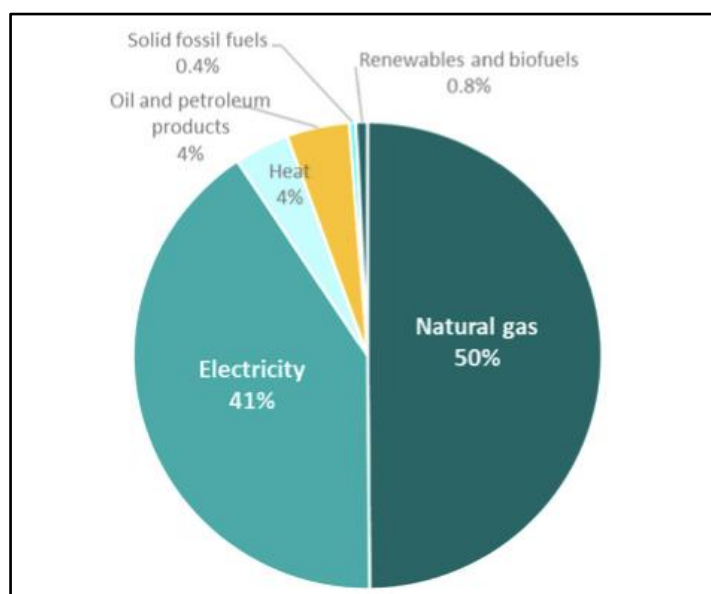


Figure 2. Energy consumption by fuels in the TCLF (Textile, Clothing, Leather and Footwear) sector.

To transform from linear to circular, the industry must simultaneously implement multiple solutions with particular emphasis on its upstream operations. Material production represents a significant share of greenhouse gas emissions (around 38% of total clothing and textile industry emissions), resource usage (for example, freshwater), and pollutants (for instance, chemicals). One promising avenue for progress is the adoption of closed-loop, fibre-to-fibre recycling. It would enable the clothing and textile industry to make a significant stride towards transitioning from a linear to a circular system. However, several critical challenges, including **technology development**, **capacity scale-up**, and **cross-value-chain collaboration**, must be overcome to realise this ambition.

The linear textile system places undue pressure on resources, fails to capitalise on

³ European Commission, "Monitoring the twin transition of industrial ecosystems", DG Grow 2023.

numerous economic opportunities, and has a detrimental environmental impact.⁴

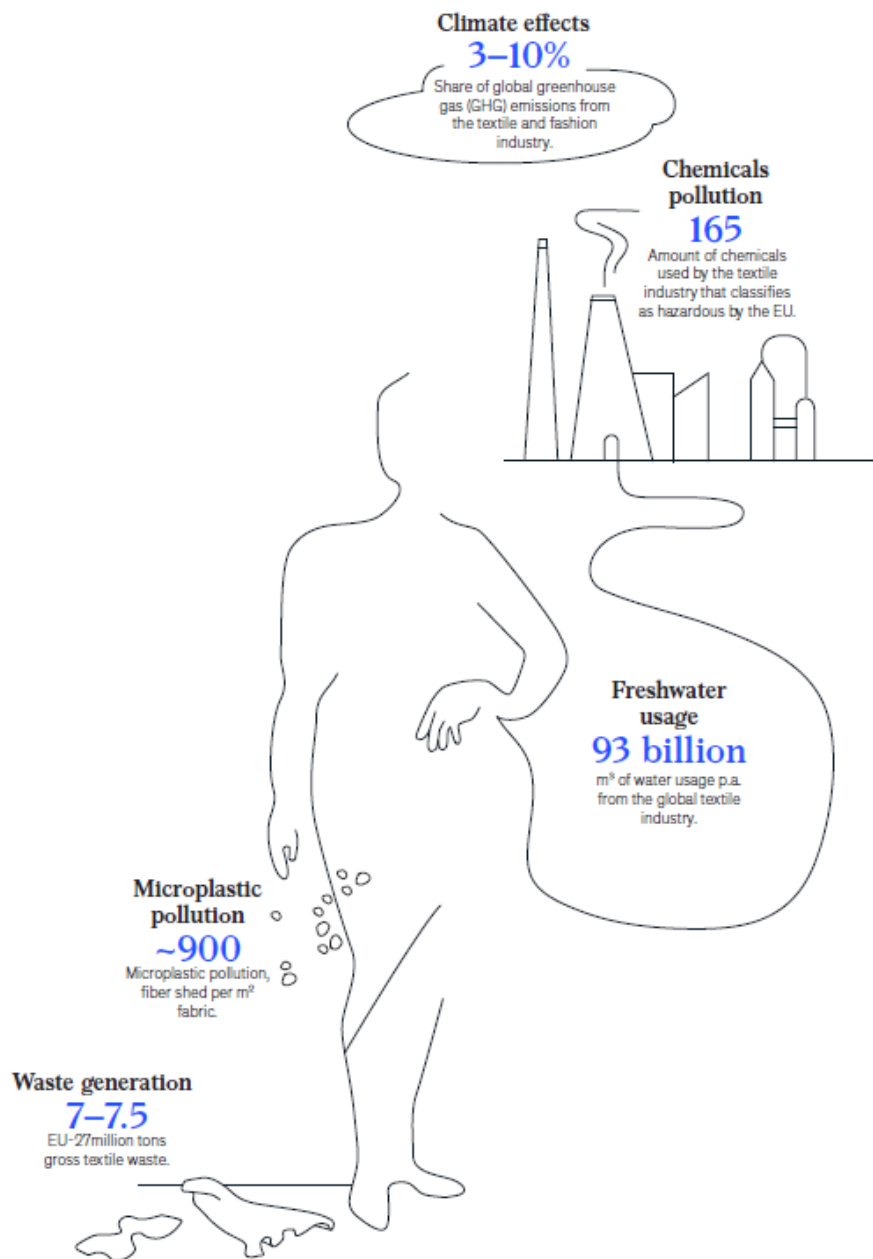


Figure 3. The clothing and textile industry has adverse environmental effects⁵

The EU Strategy for Sustainable and Circular Textiles, published in 2022, encourages businesses to prioritise fibre-to-fibre recycling over PET bottle-to-textile recycling⁶. Transforming the clothing and textile industry to circularity requires closed-loop recycling, keeping textile waste material within this industry—thereby decreasing the need for virgin materials. However, it remains true that open-loop recycling still must play a role, as closed-loop recycling is not possible in all cases, and **open-loop**

⁴ Scaling textile recycling in Europe – Turning waste into value, McKinsey Apparel, Fashion and Luxury Group, July 2022.

⁵ Scaling textile recycling in Europe – Turning waste into value, McKinsey Apparel, Fashion and Luxury Group, July 2022.

⁶ Hilde van Duijn and Jade Wilting, "Clothing labels: Accurate or not?" Circle Economy, 2018

recycling is a preferable solution to incineration or landfill.

Of the available impact levers, the improvement of material production stands out as having particular environmental value as, out of the industry's total GHG emissions, around 38 per cent is caused at the material production stage (Figure 4)⁴. Furthermore, the upstream operations require many resources across land use, water use, and energy consumption and are problematic from a chemical pollution perspective. New, innovative, and sustainable materials (such as bio-based) are being developed but must be scaled⁷.

In addition, waste reduction and management could be improved and expanded, and closed-loop fiber-to-fiber recycling could be ramped up.

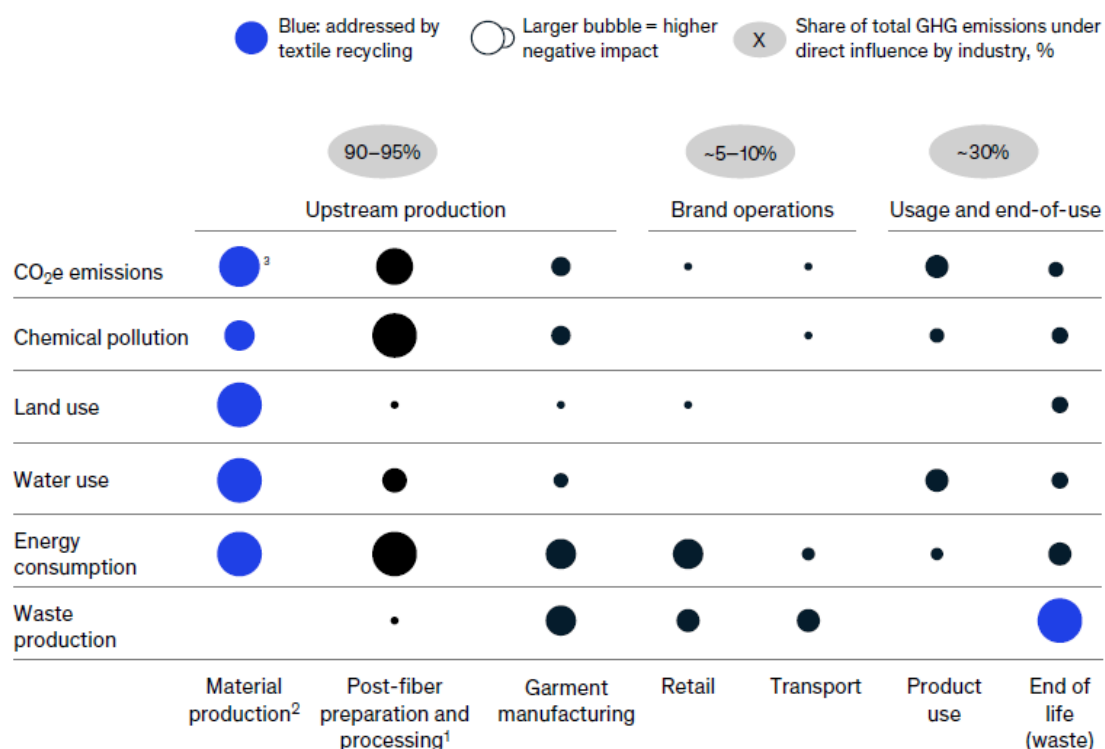


Figure 4. Material production and processing are high-impact areas representing significant resource use and most CO₂ emissions⁸.

Estimated CO₂ emissions and other resource use across the value chain:

1. Due to varying degrees of integration, most will be in the wet processes, including yarn production and fabric preparation steps.
2. The final step is fibre production.
3. Material production steps account for 38% of CO₂ emissions.

I.2.2 Sustainable practices in the T&C Industry

I.2.2.1 Increasing Material Efficiency

Through design, material selection, and manufacturing methods, companies can reduce the amount of material that ends up as waste. In effect, this minimises the

⁷ Pauline Harmset and Harriëtte Bos, "Textiles for circular fashion: Part 1: Fiber sources recycling option", Wageningen, 2020.

⁸ Scaling textile recycling in Europe – Turning waste into value, McKinsey Apparel, Fashion and Luxury Group, July 2022



GHG emissions from producing raw materials, for example, by requiring less cotton to make the same products. It has implications across the value chain. For instance, with higher material utilisation in cut and sew, less yarn would need to be spun, less fabric would need dyed, and so on⁹.

Some companies that are set as examples are ASOS, H&M, Nike, and Dystar.

1.2.2.2 Investing In and Scaling Sustainable Materials and Processes

According to Textile Exchange, “preferred” categorises a fibre or raw material that “delivers consistently reduced impacts and increased benefits for climate, nature, and people against the conventional equivalent, through a holistic approach to transforming production systems.” In 2023, Textile Exchange developed detailed assessment criteria for preferred materials.⁸

For the examples included below, sustainable materials are those with lower GHG emissions per unit basis compared with conventional alternatives.

Commitments and examples are from the following companies:

- **H&M Group**
 - In 2021, 80 per cent of materials were recycled or sourced more sustainably (e.g. BCI cotton). H&M Group’s goal is 100 per cent by 2030.
 - H&M Group tripled the share of recycled materials used in its garments from 5.8 per cent to 17.9 per cent in 2021 (the goal is 30 per cent by 2025).
 - By 2020, H&M Group achieved its goal of sourcing 100% more sustainably sourced cotton.¹⁰
 - In 2021, 63 per cent of all polyester was recycled, an increase from 8 per cent in 2019 (the goal is 100 per cent by 2025).¹¹
- **ISKO (largest denim producer worldwide)**
 - Currently, 85 per cent of fabric contains recycled materials.
 - ISKO’s R-TWO fabric consists of 50 per cent recycled or reused materials, including pre-consumer cotton and recycled polyester, converted on-site from waste PET at ISKO facilities.
 - ISKO aims to use 100 per cent bluesign® approved chemicals by 2025.¹²

1.2.2.3 Collaborative Efforts To Increase Sustainable Materials

Textile Exchange has a variety of initiatives underway to increase the usage of sustainable materials. To name one, the **2025 Recycled Polyester Challenge**¹³ was launched in 2021 by Textile Exchange and the Fashion Charter to improve the use of recycled polyester. The over 130 brands and suppliers that have signed up for the Challenge have committed to using at least 45 per cent recycled polyester by 2025. Textile Exchange is also working on “life-cycle assessment plus” studies for mohair, wool, and cashmere. It will expand this to include polyester, cotton, and leather in

⁹ Apparel Impact Institute, June 2023, Taking Stock of Progress Against the Roadmap to Net Zero

¹⁰ This includes cotton sourced through BCI, in-conversion organic cotton, regenerative cotton, and cotton from other innovative sources.

¹¹ H&M Group Sustainability Disclosure 2021.

¹² ISKO 2022 Sustainability Impact Report.

¹³ The 2025 Recycled Polyester Challenge.

2023 to produce better data and share it with other organisations.

Signatories to the Fashion Industry Charter for Climate Action have committed to source 100 per cent of priority materials that are both preferred and have low climate impact by 2030, while signatories to the CEO Fashion Pact have committed that 25 per cent of materials will have a lower climate impact by 2025.⁸

1.2.2.4 Accelerating the Development of Innovative Materials

The phrase “next generation” is used to designate preferred materials earlier in their commercialization than more widely available materials such as mechanically recycled polyester (from PET bottles) and BCI cotton. Next-generation materials include recycled fibres from textiles, plant-based leather, and bio-based alternatives to synthetics.

Textile Exchange’s annual PFMR (Preferred Fiber and Materials Market Report) is a good resource for identifying innovators and suppliers working on next-generation materials. For example, the 2022 PFMR lists eight suppliers offering bio-based polyamide (nylon) fibres, yarns and another 12 offering bio-based chemicals and resins for polyamide.

Given that most next-generation materials are in their early stages of development, it is not easy to determine their GHG impacts on an absolute basis and relative to incumbent materials (e.g. fossil-fuel-based synthetics). These materials are not yet included in data sets such as the **Higg MSI**. Of the materials included in the MSI, it is impossible to claim that all next-generation materials have lower GHG impacts. For example, mechanically recycled polyester has a lower GHG score than chemically recycled polyester, while fossil-fuel-based polyester has a lower GHG scope than the partially bio-based option in the MSI.⁸

There have been several promising developments, which are listed below :

- **LanzaTech**

Headquartered in the United States, LanzaTech captures and transforms carbon dioxide emissions into various materials, including sustainable fuels, fabrics, and packaging. LanzaTech has three commercial plants in operation and six additional under development. Over the last several years, LanzaTech has announced collaborations with apparel and footwear brands Lululemon, ON, and Zara, as well as Sumitomo Riko Company and Bridgestone.¹⁴

- **Lenzing**

Lenzing, an Austria-based speciality cellulose fibre producer, has developed a portfolio of next-generation materials with lower impact. For example, Lenzing offers commercial-scale TENCEL™ REFIBRA™ fibres containing 30 per cent recycled cotton waste and 70 per cent wood pulp and also developed TENCEL™ lyocell fibres consisting of 20 per cent hemp pulp and 80 per cent wood pulp. A TENCEL™ limited edition denim collection containing this hemp/wood pulp fibre was developed with Candiani Denim in 2022. To reduce the downstream impacts of dyeing, Lenzing has developed dope-dyed TENCEL™ modal fibres with “Eco Color” technology, which lowers energy use and GHG emissions. This innovation was extended to the denim category with dope-dyed fibres incorporating the indigo colour known as TENCEL™ Modal Indigo fibres. Also, to advance post-consumer textile recycling, Lenzing has partnered with Swedish forestry company Södra and

¹⁴ LanzaTech.

aims to process 25,000 tons of textile waste annually by 2025.¹⁵

- ***Natural Fiber Welding***

MIRUM® is a 100 per cent plant-based leather alternative. Natural Fiber Welding claims it has a significantly lower GHG footprint than leather and synthetic leather alternatives such as polyurethane¹⁶. Brands such as Allbirds, Camper, and H&M are using MIRUM®.

- ***Renewcell (ceased production in 2024)***

In 2019, this Swedish company launched Circulose®, a branded dissolving pulp made from 100 per cent cellulosic textile waste and used to create various MMCF fibres. In 2022, Renewcell started running a new 100 per cent textile-to-textile recycling plant with a 60,000 tonnes per year production capacity, and it will increase this to 120,000 tonnes per year by 2023/24 and to 360,000 tonnes by 2030, given strong demand. Renewcell has several fibre-producing partners, including Sateri and Birla Cellulose, and entered into a multi-year offtake agreement with Lenzing in 2022. Brands including Filippa K, H&M, Levi's, and Zara have created products with Circulose®. H&M is also an investor in Renewcell.¹⁷

- ***Syre***

Syre is a textile impact company that will provide textile-to-textile circular polyester (cPET) quality on par with oil-based virgin polyester and a superior sustainability performance, reducing CO2e emissions by up to 85%. Its first production plant is being built in North Carolina, USA, and will be operational during 2024. Based on this blueprint, the manufacturing process will be rapidly scaled for global expansion, starting with Asia and Europe. Within ten years, Syre aspires to have 12 gigascale plants up and running at full speed and capacity worldwide, producing more than 3 million metric tons (MT) of circular polyester. The platform is agnostic and could expand into other fibres and technologies in the future. Founded in 2023, Syre was initiated by Vargas and H&M Group. The name translates to oxygen in Swedish and combines sy (Swedish for sewing) and re (Latin for over and over again).¹⁸

Many other examples illustrate innovations of different types that are moving to scale. For additional examples, see Fashion for Good's [website](#).

I.2.3 Textile Waste Management

I.2.3.1 Waste definition

To understand when textiles may become waste along the value chain, the legal definition of waste needs to be taken into consideration first, which derives from the European Union's Waste Framework Directive¹⁹, with the latest version being sourced from Directive 2008/98/EC of the European Parliament and of the Council

¹⁵ Lenzing, Innovative by nature.

¹⁶ Nature Fiber Welding.

¹⁷ Renewcell.

¹⁸ Syre.

¹⁹ EU Waste Framework Directive. European Commission.



on waste²⁰. According to the **Waste Framework Directive**, waste is “any substance or object which the holder discards or intends or is required to discard”²¹.

I.2.3.2 Textile waste in Europe

In the European Union (EU-27), approximately 7 to 7.5 million tons²² of textile waste are generated annually, equating to over 15 kilograms per person. Most of this waste (around 85%) comes from clothing and home textiles discarded by households, often ending up in incinerators or landfills, negatively impacting local ecosystems. The remainder of the waste originates from post-consumer commercial waste, post-industrial, and pre-consumer sources. Textile waste is fragmented, with consumer-discarded clothing and home textiles contributing the most significant portion, yet consumers and the value chain remain fragmented and partly opaque.

Only 30 to 35% of post-consumer household textile waste is collected. Of this collected waste, around 40% is exported to second-hand markets outside Europe, and the rest is sorted to find in-demand garments for reuse within Europe or other developed countries. About 60% of manually sorted waste in Europe is sold for reuse in local or global second-hand markets. Meanwhile, 0.5 million tons of post-consumer household waste and 0.2 million tons from other waste streams are theoretically available for recycling, but only a tiny fraction undergoes fiber-to-fiber recycling.

The European textile waste problem is projected to worsen, with gross waste volumes expected to rise to 8.5 to 9 million tons by 2030 due to increased consumption, population growth, and GDP growth. Recycling technologies, which are ready to scale, require larger volumes of well-sorted feedstocks to be effective. Implementing EU regulations on separate textile-waste collection by 2025 and establishing producer responsibility organizations (PROs) in member states could increase post-consumer household waste collection rates to 50% by 2030. In the long term, Europe aims to collect all textile waste, but achieving this will take time. By 2030, the share of post-consumer household textile waste available for recycling is expected to increase to around 1.7 million tons. Additional feedstock from other sources could almost triple to 0.5 million tons, bringing the total volumes available for recycling to around 2.2 million tons, or approximately 25% of gross volumes. Private households' discarded clothing and home textiles generate around 6 million tons of textile waste, accounting for about 85% of the total textile waste in Europe, with volumes expected to rise to around 7.3 million tons by 2030.

I.2.3.3 Categories of textile waste

The current production, distribution, and consumption of textiles and apparel follow a linear business model. The fashion industry's inherent dynamism, driven by fast fashion, just-in-time production, and the increasing outsourcing of production to developing countries with lower costs, has created an unsustainable model. This model results in widespread overproduction within the industry, leading to

²⁰ GOV.uk.2021. Definition of waste: 2018 Waste Framework Directive amendments [Accessed: 1st March 2023]

²¹ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance) (legislation.gov.uk).

²² World Bank (population data and GDP data), 2022.



overconsumption by consumers²³.

Shorter product life cycles due to cultural obsolescence, lower quality goods, and easier access to garments through e-commerce channels have resulted in the textiles and apparel industry becoming an ever-increasing burden on the environment. They will represent a quarter of the global carbon budget by 2050 if business as usual continues²⁴.

Based on where in the value chain the waste is generated, textile waste can be classified into three categories: industrial, pre-consumer, and post-consumer.

Pre-consumer textile waste

Pre-consumer textile waste can be classified into two different categories. The first category is pre-production waste generated at the manufacturing level. It encompasses sliver cuts, garment cutting excess, trimmings, print trials and errors in dye lots, yarn waste, end rolls and rejected materials. The second category is post-production textile waste. It occurs at the retail level, which includes unsold stock, customer returns, faulty goods, production surplus and excess inventory, among others^{25,24}.

Pre-consumer textile waste still holds significant value and has great potential for reuse and recycling²⁶.

Pre-consumer textile waste is often underestimated. When comparing data from different factories in developing countries, it has been estimated that the volume of various types of pre-consumer waste from fabric mills and garment factories is at least 25% of the resources used by these factories on average, in some cases even up to 47% of the fibres and fabrics bought by a factory.

Post-consumer textile waste

Post-consumer textile waste includes garments and household textiles which the end consumer no longer needs or wants. Reasons for a product being discarded at the post-consumer level can vary. Still, they could be due to wear and tear, damage, ill fit, low quality, or cultural obsolescence, commonly known as out of fashion. While durability is often the focus of extending the useful lifetime of textiles, WRAP highlighted in 2017 that the most frequently cited reasons for disposal of clothing were that they no longer fitted, they had worn out and that the respondent did not like it anymore.

At the post-consumer level, the product holds some value in most cases. A garment or product that is in reasonably good condition can be recovered and used as second-hand clothing. Alternatively, products not deemed in good enough condition for the second-hand market can still be shredded and converted back into raw materials for further use in manufacturing. Post-consumer waste can be either recycled to lower quality products or recycled on a fibre-to-fibre basis, in which case a garment is recycled into a new garment through chemical or mechanical processes.²⁷

Usually, at the end of life, post-consumer textiles enter the residual waste stream to go to landfill or incineration, be collected in municipal waste for recycling, or be collected separately through clothing banks, charity shops and doorstep collections

²³Körlü, A. 2020. Waste in Textile and Leather Sectors.

²⁴ Ütebay, B., Çelik, P. & Çay, A. 2020. Textile Wastes: Status and Perspectives.

²⁵Circular Apparel Innovation Factory. 2022. [Textile Waste: A starting guide](#).

²⁶WRAP. 2017. [Valuing our clothes: the cost of UK fashion](#)

²⁷ WRAP. 2019. Textiles Market Situation Report.



for reuse or recycling in the second - hand market.²⁸

1.2.3.4 Textile circularity

From an industry perspective, Textile Circularity starts with a demand, namely an order placed by a buyer, whether a fashion brand, retailer, public procurer, or another industry sector. Therefore, the best way to stimulate circularity is to promote a demand for circularity²⁹ from buyers and consumers. Many current products are not designed for durability, longevity, or recycling, often comprising mixed fibres and multi-material compositions that current technologies struggle to disassemble. Designers frequently lack the tools to create a circular textile system. Leading fashion organisations urge industry leaders to train their design and product development teams to focus on creating products with longevity, durability, disassembly, and recyclability in mind and to increase the use of recycled fibres. Retailers should enhance efforts to collect end-of-life garments. Recycling is particularly challenging for blends, especially those combining synthetic and cellulose fibres.³⁰

Buyers and designers play a crucial role in the textile and clothing supply chain by selecting materials, finishes, products, and accessories and defining the target market. Their role becomes more complex in a circular supply chain as they must also consider the product's end-of-life strategy and the use of secondary materials, essentially becoming circular chain managers. However, many designers lack the technical knowledge to fulfil this role and will need assistance from technologically skilled individuals or expert systems. Together, they must manage the circular supply chain, connecting stakeholders to optimise the chain and reduce environmental impact. While there is no single correct design manual for the textile and clothing chain, essential aspects include specifying the end product's service life, mechanical properties, physical properties, and aesthetic properties.³⁰

²⁸ Ward, G. et al. 2013. Waste and Resources Management. 166(1). pp. 29-37.

²⁹ Belgian initiative Circular Flanders, Green deal. Circular Purchasing, 2017.

³⁰ EURATEX, January 2020, Circular Textiles: Prospering in the circular economy.



More specifically, textile circularity and textile waste production depend on:***Efficiency in production***

The first waste reduction comes from avoiding waste/efficiency. Efficient production processes enable little raw materials, water, energy and chemicals consumption. Best practices for efficient productions are assessed under the Best Available Techniques (BAT) Reference document. The definition of BAT is currently being developed in cooperation between the EU Member States, the industry and NGOs under the coordination of the JRC. As part of this process, emerging techniques resulting from pioneering companies or research projects are also investigated. It shall be stressed that different product applications, such as garment or technical textiles, require different production processes.

Fibre making

The textile industry categorises raw materials into natural (e.g., cotton, wool, flax), synthetic (e.g., polyester, polyamide), and manufactured bio-based (e.g., cellulosic fibres), each with its own environmental and social impacts. For a circular economy, durable fibres are essential for recyclability, necessitating mechanical and chemical recycling technologies. Natural fibres require careful selection of seeds, productive soils, advanced irrigation, pest management, and efficient harvesting, packaging, and delivery techniques. Similar attention is needed for animal hair fibre production, with a global sharing of best available technologies (BAT) to optimise practices and minimise environmental impact.

Manufactured fibres must also utilise the best available techniques and equipment regulated by global authorities to achieve maximum efficiency. These manufactured fibres can be engineered for durability and modified to facilitate recycling, such as easy dye removal and depolymerization. Innovations in manufactured fibres, including the use of bio-based feedstock, require significant R&D development and financial support. Integrating advanced technologies and global cooperation is crucial for advancing circularity in the textile industry.

TEXTILE FIBRES				
natural fibres		man-made fibres		
plant based fibres	animal fibres	organic		inorganic
		natural polymers	synthetic polymers	
abaca coconut cotton hemp flax jute kapok maguey ramie sisal	alpaca angora cashmere camel lama mohair silk vicuña wool	acetate alginate cupro elastodiene (rubber) lyocell modal rayon triacetate viscose	acrylic aramid chlorofibre elastane elastodiene elastolefin fluorofiber melamine modacrylic polyamide polyester polyethylene polyimide polylactide polypropylene polyurethane triviny vinyl	carbon ceramic glass metal

 Figure 5. Types of most commonly used fibres³¹

Spinning mills

Spinning mills play a crucial role in the circular textile supply chain by transforming potential waste into high-quality yarns and intermediate products. The focus on using recycled materials in textile spinning is increasing, with garbage being repurposed into composite materials and insulation. Ensuring traceable, sorted fabrics based on colour and type enables spinning mills to contribute effectively to circular textile solutions.

Weaving and knitting

Weaving and knitting play a vital role in the application of yarns. The selection of the yarns is essential. Mono-materials are strongly preferred for mechanical recycling operations and based on current technologies. It is crucial for economic reasons to produce longer runs of one product in weaving and knitting.

Yarns from recycled materials are more difficult to process due to the more significant variations in strength and elasticity and their irregularity. However, some weaving and knitting companies have shown they can produce high-quality fabrics based on yarns with a high recycled content.

Product makers

Product makers transform textile material into a garment, a home, and technical

³¹ Purchase guide for circular textile – Raw materials – Textile Fibers.



textiles. Producers typically make finished products based on specifications received by buyers. Producers of Technical Textiles deliver high added-value products with specific performances and strict requirements to all types of industry value chains and customers (e.g. automotive, aerospace, medical, construction, agro-food, etc.) A garment maker is also known as a **CMT business** (Cut, Make & Trim). Weaving and Knitting can also produce a finished product. For instance, fully fashioned knitwear delivers a single piece of finished products such as t-shirts, sweaters, scarves, socks, etc. A weaver can provide a finished product at home or in technical textile applications.

Finishing

Some finishing processes enhance the mechanical properties, increase longevity, and ease of use of natural fibres (for instance, reduced drying energy and ironing needs), and could be used on virgin and recycled fibres.

Use and disposal

Successful change from the linear to the circular model and the speed of these changes depends on the knowledge, awareness, engagement and choices of all the participants in the value chain. The offer, quantity and quality of products and the manner of using these products influence the success and speed of this transition. Concerning the use phase, a designer has to be aware of the expected time of service, the lowest care impact, the care method, the care instructions and the way of repair and disposal at the end of life.

The environmental impact of the use phase of a product appears to be close to 30%³² of the total ecological impact. A large part of the impact can be attributed to the drying phase; therefore, the choice of fibres has a significant effect. Washing temperature represents another issue. For hygienic reasons, high washing temperatures might be needed (60-75 °C) to eliminate micro-organisms present in clothing. However, consumer awareness campaigns suggest that most textile items can be washed at 30 or 40 °C³³. The number of washings should be limited to actual needs as washing damages the material, reducing its lifetime.

As for disposing of textiles, high efficiency is gained by people bringing textile items damaged or in good condition (but clean and dry) to collection points or bins. Consumers' behaviour shall be considered as research suggests reasons for not handing in used clothing and textiles may be complex and include unknown factors³⁴. The bin location may influence the quality of the collection.

Collection and sorting

Materials can be reused at a large scale only if an efficient system is in place to collect, identify, trace, sort, and deliver such materials. As a comprehensive and widespread European collecting system, this represents a textile reuse and recycling challenge.

Collection, sorting and delivery of waste generated in production

Depending on the material costs, the production step required, quality level and other factors, a different range of production left-over can be made, ranging from 3% to 9% for household products and 10% to 21% for garment products. At the global

³² Beton A, Dias D, Farrant L, Gibon T, Le Guern Y, Desaxce M, Perwuelz A, Boufateh I. [Environmental Improvement Potential of textiles \(IMPRO Textiles\)](#).

³³ A.I.S.E., [I Prefer 30°C Campaign](#).

³⁴ [ECAP and used Textiles](#).



level, these amounts translate in large quantities, which manufacturing companies can address as an economic resource or a burden and cost to dispose of.

Collection, sorting and delivery of post-consumption waste

Textile waste collectors are essential in gathering and sorting quality textiles, which are either processed by themselves or sold to specialised sorting companies. Despite stable collection volumes, the declining quality of textiles is putting economic pressure on the industry. Various collection mechanisms exist across Europe, including municipality-operated, charity-based, mandatory, and voluntary business initiatives. While European countries are expected to establish separate textile collection schemes by the end of 2024, efficient mechanisms are still lacking. Barriers to effective collection include unclear waste legislation, financial and administrative burdens, and the limited recycling infrastructure, despite potential benefits like increased consumer awareness and collection mechanisms from Extended Producer Responsibility schemes³⁵.

Collection, sorting and delivery of products

Textile Services – oriented business model exists in several sectors, notably workwear and home textiles. Companies using these business models opt to lease rather than own textile products.

Sorting discarded textiles for further processing is a labour-intensive activity in which post-consumed discarded textiles are received, stocked, and manually clustered based on the **type of materials, colours, quality and possible destinations**.

Sorting requires the development of new technologies to overcome the most significant challenges, notably to address i) the **lack of a comprehensive and cost-efficient system** to collect and sort textile wastes on an industrial scale, ii) the **manual-intensity** increasing costs, and iii) the diversity of **fibre blends**, iv) **stable volumes** of incoming textiles waste from the quantity and quality points of view.

Textile materials have very different properties, and various fibres require different treatments. Developing sorting techniques would enable the mechanical shredding of fibres and promote the widespread use of recycling processes. Sorting is essential when recycling end-of-life textiles, but it is also crucial in efficiently processing leftover material from the textile industry (fabric cuttings, second-choice products, fabric fibre and yarn leftovers).

Reuse

When a designer creates a product following recycling principles, it should be reused or recycled upon disposal. The textile recycling industry requires steady volumes of clean textile waste to sort it into consistent, recyclable fractions. This process ensures the materials can be effectively recycled and reused, minimising environmental impact and maximising economic benefits.

1.2.3.5 Textile Recycling - Challenges & Innovations

The diversity of textile waste poses significant challenges for recycling efforts. Differences in materials, blended fabrics, and the presence of non-textile components complicate the recycling process. Addressing these challenges requires innovative recycling technologies and methods capable of efficiently handling the complexity of textile waste.

³⁵ VLAANDEREN CIRCULAR, [CIRCLETEX](#) (in national Language).

Recycling

Recycling can be mechanical, chemical or thermal. It uses textile waste as raw materials to make the same or new products. It is considered that textile waste will be a valuable raw material for businesses shortly. However, for this to happen, there is a need for critical mass to scale up the initiatives.

Textile recycling technologies

Recycling technology archetypes differ in several ways, including their energy efficiency and ability to return to or keep virgin quality. In general, however, the equally desirable traits of the ability to return to virgin quality and to be energy-efficient in the process are counter-correlated. The result is a trade-off between recycling textile waste through an energy-effective (cost-effective) method and a process yielding virgin-quality output. Therefore, the long-term solution likely includes many recycling technologies targeting different market niches. Also, the recycling technologies could realise synergies by operating in interplay. For example, the non-spinnable share of the output from mechanical recycling could be recycled through a chemical process.

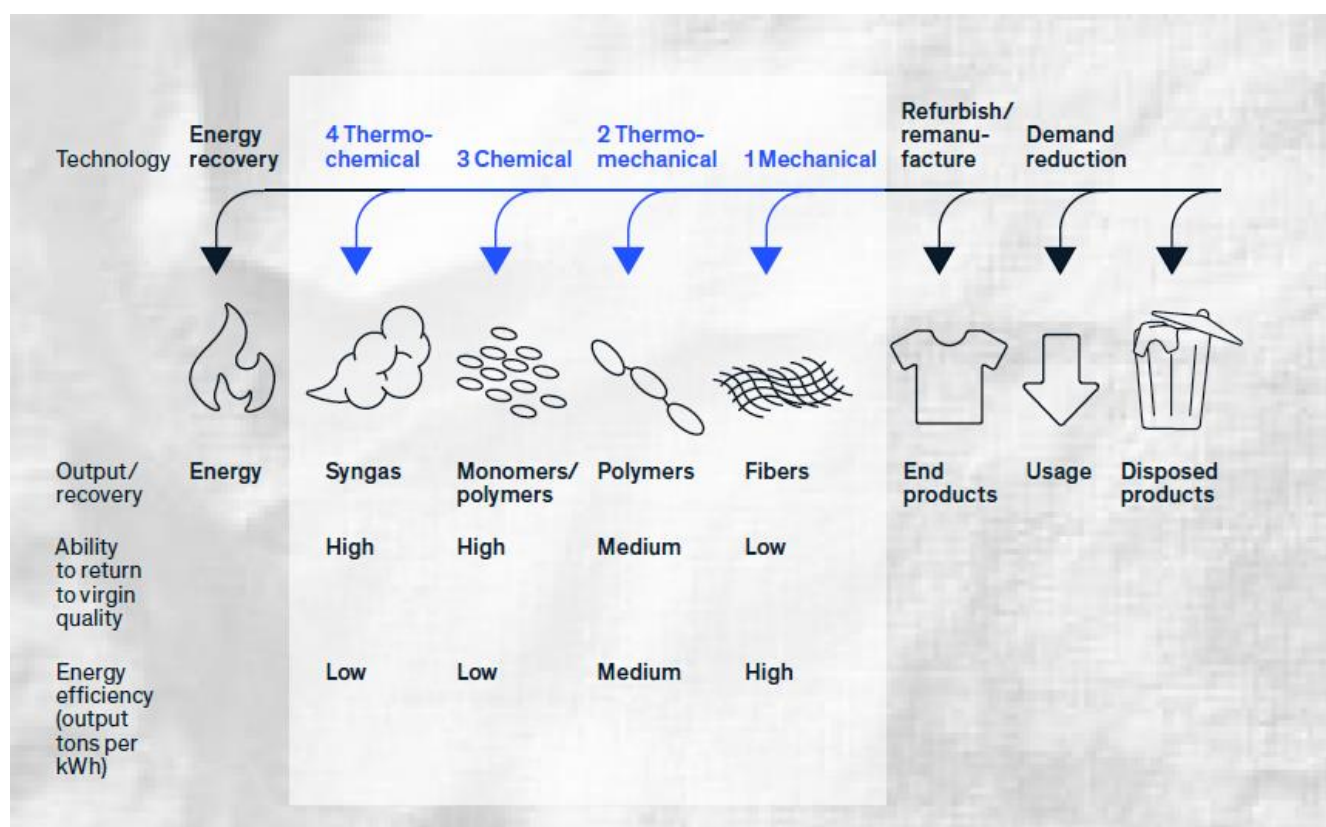


Figure 6. Four recycling technology archetypes are at the centre of addressing textile waste in Europe³⁶.

Mechanical recycling of materials

Mechanical recycling of textiles involves shredding waste, primarily pre-consumer industrial waste, to create new fibres, though each shredding cycle shortens and weakens the fibres. Historically prevalent in European textile districts, this process

³⁶ Scaling textile recycling in Europe – Turning waste into value, McKinsey Apparel, Fashion and Luxury Group, July 2022



produces recycled fibres used in non-woven applications like insulation and padding, with only a small percentage used in new textiles. Mechanical recycling is a proven, low-energy, cost-efficient method suitable for all fibre types, following the "what goes in, comes out" principle. The main challenge is fibre quality degradation, limiting closed-loop applications, but innovations like "soft" mechanical recycling and blending recycled with virgin fibres improve outcomes. Companies like Purfi and Recover are at the forefront of these innovations, enhancing the quality and efficiency of mechanical recycling^{37,38}.

Recycling by extrusion

Melting and extrusion of new fibres can only be done with 100 % synthetic fibres such as polyester and polypropylene. These fibres, reprocessed into monofilaments, are used for technical textiles or injection moulding. They are unsuitable for the textile industry because even small impurities may prevent the spinning of multi-filament fibres (breakage of filaments). The most common source of recycled polyester fibres used in the textile industry is PET bottles. However, obtaining high-quality fibres from recycled PET bottles is still challenging.

Chemical recycling of materials

Chemical recycling is a promising but not yet fully developed technology for textiles. It involves breaking polymers into their original monomers under controlled conditions, which can then be purified and synthesised into high-quality fibres like polyester and polyamide. The process includes purification, dye removal, and depolymerization into a cellulose solution for cotton and cellulosic fibres. Additionally, pyrolysis can convert textile waste into secondary raw materials or fuel. Chemical recycling offers significant CO₂ emission savings over incineration, with technologies including hydrolysis, glycolysis, methanolysis, and enzymatic processes. Although it requires more energy than mechanical recycling, it can produce nearly virgin-quality fibres. Currently, chemical recycling is not commercialised at scale, but several companies are developing pilot and commercial plants for cellulosic and synthetic recycling^{39,40}.

Recycled fibres used in garments

Implementing recycled fibres into garments reduces the volume of virgin materials used in the production and minimises overall water, energy and waste consumption. Many companies already have products that are made with recycled content⁴¹. However, the recycling of garments is still complicated nowadays: mixed composition, seams and buttons make recycling very challenging, and dividing the garments for further processing is costly.

³⁷ Shoddy fibres can be used in many industries. While it is correct that shoddy fibres can also be used back into the textile value chain, we do not classify this as closed-loop, fibre-to-fibre recycling because it becomes a product that is different in nature from its original form.

³⁸ Soft mechanical recycling is a process that uses a longer production line (upward ten times longer than a traditional shredding line) with maintained fibre length as a result. The longer fibre length minimises losses from the subsequent carding and spinning processes. The soft mechanical technology is however significantly more capital intensive than the traditional.

³⁹ Existing brands with recycled PET include EcoCircle™, ECOPET™ or Repreve. Existing recycle PA6 include: ECONYL or Aquafil.

⁴⁰ Market based. Solutions include REFIBRATM by Lenzing (Austria), Re:Newcell (Sweden), Infinited Fiber Company (Finland) while other examples, some still in development, include Evrnu (USA), Ioncell-F (Finland), SaXcell (The Netherlands).

⁴¹ Such example of European garment makers with products, that contain recycled content can be found on [Circularity](#).

Thermo-mechanical recycling

Thermo-mechanical recycling combines pressure and heat to melt synthetic textiles (polyester and polyamide) and recover polymers. The technology cannot be used for natural fibres (such as cotton or wool) or MMCF (such as viscose). It has relatively low energy usage and can potentially achieve less quality degradation than most mechanical recycling technologies. Thermo-mechanical recycling is a mature technology proven commercially for non-textile waste (for example, PET bottles) and at a demonstration scale for textiles. Specific technical challenges remain for textiles (e.g., viscosity issues for PET), and feedstock requirements are stringent today (more than 99% single or compatible polymers), limiting feedstock availability.

Thermo-chemical recycling

Thermo-chemical recycling uses gasification to produce syngas through the partial oxidation reaction of polymers, and it is compatible with all forms of fibres. However, this technology is not a closed-loop application for textiles. The primary uses of the virgin-quality syngas recovered are methanol, ammonia, synthetic fuels, oxo-alcohols for plasticizers, adhesives, and construction materials. Thermo-chemical recycling as a core technology exists commercially. However, this technology needs some adaptation or development to treat textile waste.

Recycling challenges (including collection, sorting, and pre-processing)

Textile sorters are crucial in the circular value chain, categorising textile waste into reusable, recyclable, downcycled, or incinerable materials. Europe's top five textile sorters handle 80,000 to 100,000 tons each, sharing about 25% of the market, while the middle segment manages 25,000 to 80,000 tons each, sharing 30%. Smaller sorters, handling less than 25,000 tons annually, makeup 40-50% of volumes but often have low sorting accuracy. These small companies frequently export goods for reuse to international markets, causing issues in receiving countries with inadequate waste management infrastructure, leading to rogue landfills and environmental harm.⁴²

In Europe, the textile recycling sector faces significant challenges and opportunities. Regulatory measures, such as potentially prohibiting the export of unsorted textile waste outside the EU, could drive consolidation in the sorting industry. Manual sorting predominates, but there's a growing need for precise fibre sorting due to the stringent requirements of various recycling technologies. Near-infrared scanning systems (NIRS) show promise in improving sorting accuracy, though integrated systems are still in development. Pre-processing remains a costly bottleneck, involving cleaning, removing non-recyclable parts, and cutting textiles into usable swatches, which is crucial across all recycling methods. While there is potential for improved design for circularity to lessen these pre-processing burdens in the long term, current textile waste collections are based on older production volumes, complicating the shift.

The economic and environmental benefits of reuse surpass those of recycling, influencing the dynamics of the textile sorting industry. Manual fibre sorting remains economically challenging despite its dominance, with up to 300 categories for reuse based on quality and seasonality. Revenue primarily comes from selling top-quality textiles to second-hand markets in Western countries, where prices range significantly higher than in international export markets. Conversely, textiles

⁴² Poisoned gifts, Greenpeace International, April 2022.



unsuitable for reuse fetch lower prices when recycled into shoddy fibres or cleaning rags, highlighting the economic disparity within the sorting industry. As collection volumes increase, the proportion of textiles sold for reuse is expected to decrease, posing further challenges for sorters balancing profitability with sustainable recycling practices.

1.2.3.6 Key actors responsible for textile circularity

Policymakers and legislators should collaborate with resource management leaders to implement policies like extended producer responsibility (EPR) schemes and robust waste management infrastructures and use economic instruments such as tax breaks and subsidies to promote textile recycling. Brands, designers, and manufacturers should make sustainable decisions from the concept phase, focusing on longevity, re-manufacturing, and using high-quality and recycled materials. Retailers should encourage sustainable textile creation by giving more store space to verify sustainable products. Textile collectors must minimise landfill and incineration by implementing systems prioritising reuse and fibre-to-fibre recycling. Sorters and recyclers should invest in and upgrade technology and infrastructure to maximise material recovery and enable high-quality feedstock for recycling. Waste management companies should ensure textiles are correctly sorted, collected, and maintained for reuse, repair, recycling, or disposal. Investors should support the collection, sorting, and fibre-to-fibre recycling infrastructure, boosting the industrial sector and creating jobs. Consumers can make sustainable choices by purchasing items designed for recycling and made from recycled materials. The media can educate the public about textile recycling and its benefits and hold stakeholders accountable⁴³.

Mapping of key actors⁴⁴

- The mapping of key actors in Europe identified 43 actors. Nine are manual sorters, and five are automatic sorters, 25 are mechanical recyclers, 10 are chemical recyclers, and one thermal recycler.
- The number of manual sorters is likely higher, but only twelve could be identified due to a lack of information about them.
- **Italy has the most sorting and recycling actors**, primarily mechanical recyclers. The Netherlands is second to most actors, with manual and automatic sorters and mechanical and chemical recyclers. Only one thermal recycler could be identified—an actor based in Spain.
- The number of collectors varies significantly within each European country, with locally centralised collectors per each country (for example, charities' containers and in-store collection) and some familiar stakeholders working internationally (Human Bridge, Red Cross, etc.).
- Few European countries have a separate collection structure for textiles that is readily available for residents. One example is France, which has a national Extended Producer Responsibility (EPR) scheme for textiles and footwear that has been in place since 2007.
- The Baltic States (Estonia, Latvia and Lithuania) imported over 90,000 tonnes of used textiles 2018 for sorting or processing. All three are among the top five importers in Europe in terms of kg per capita: Lithuania is number one,

⁴³ Thinkstep integrates sustainability into next generation of product design.

⁴⁴ Sustainable Clothing futures, Mapping of textile actors in sorting and recycling of textiles in Europe 2023



followed by the Netherlands, Latvia, Estonia, and Hungary.

- The total capacity for the seven sorters sorting post-consumer textiles was estimated at 560,000 tonnes per year from now to 2025, of which 230,000 tonnes would be automatic sorting.
- Several established and emerging recycling actors were identified within Europe, showing that mechanical recycling is more common than chemical recycling (25 vs 10 actors).
- The researchers identified 12 sorting actors with a total capacity of 560,000 tonnes annually from now to 2025. The actual sorting capacity in Europe is estimated to be significantly higher as the manual sorting actors were challenging to identify.
- Further, 33 recycling actors were identified and are at a commercial scale in fibre-to-fibre recycling post-consumer textiles in Europe, with a total capacity of 1.3 million tonnes per year from now up to 2025.
- Many actors in the research and development phase of textile recycling were not included in this mapping.
- Many actors promise large capacities within a few years, and together with the upcoming requirement of a separate collection of textiles in 2025 in the EU, the textile sorting and recycling industry in Europe will most likely thrive moving forward.

See Annex I for detailed information on the key actors involved.

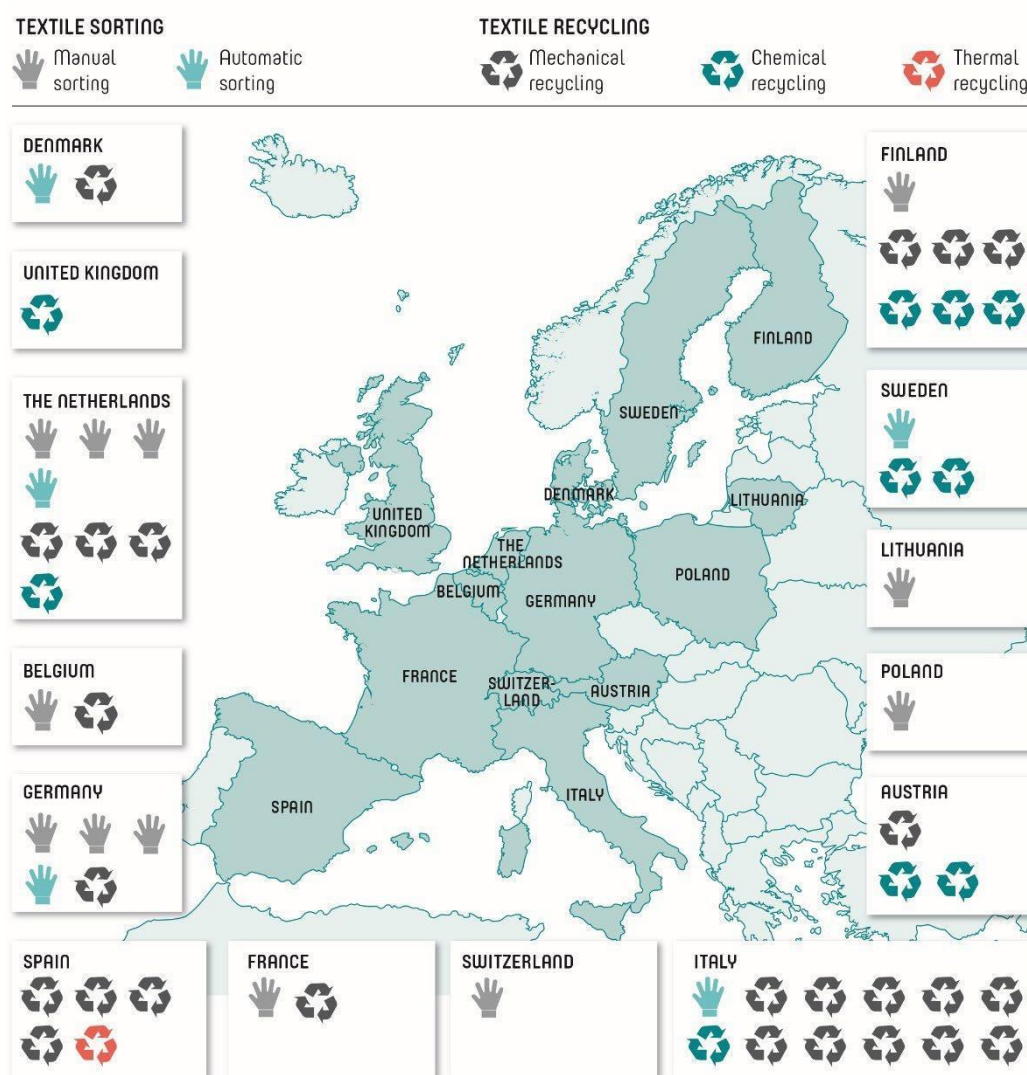


Figure 7. Visualisation of the mapped actors working with sorting and recycling of textiles within Europe (countries with a darker colour have one or more actors), with explanations of the different symbols and colours⁴⁵

1.2.4 Legal Framework

1.2.4.1 Policies, guidelines and regulations relevant to the circular economy

An economy is circular when the value of products, materials, and resources is kept for as long as possible. The generation of waste is reduced, and recycling is a reality. For the textile sector, a circular economy also implies new ways of designing, producing, and choosing products.

The European textile industry has been pioneering new sustainable product types and re-using different materials, such as jeans or plastic bottles. These examples are the avant-garde of circular textiles, yet higher costs, technical difficulties and legislation limit the number of cases.

While the industry is working on making circularity a reality, the EU is pioneering policies for sustainable goods and production. The primary reference is the Circular Economy Action Plan, released in March 2020. The action plan aimed to change the way products are made and consumed by focusing on some key sectors like textiles,

⁴⁵ Sustainable Clothing futures, Mapping of textile actors in sorting and recycling of textiles in Europe 2023

resulting in the [EU Strategy for Sustainable and Circular Textiles](#)⁴⁶.

Ecodesign Requirements for Sustainable Products (ESPR)

The [ESPR proposal](#), published in March 2022, establishes a framework to improve the environmental sustainability of products and their circularity, where textiles have been identified as one of the priority groups. Companies placing products on the EU market must adhere to specific ecodesign performance and information requirements communicated via the Digital Product Passport⁴⁷.

Waste Framework Directive (WFD)

The [Waste Framework Directive](#) (WFD) sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery. The WFD also regulates other essential aspects, such as when specific waste ceases to be waste and becomes a product or a secondary raw material (end-of-waste criteria). It obliges the EU Member States (MS) to collect textile waste as of January 2025 separately. It also encourages MS to use extended producer responsibility (EPR) schemes as an economic tool to achieve the objectives of the Directive and provides some essential guidance on EPRs⁴⁸.

Extended Producer Responsibility (EPR)

EPR is being assessed by EU and Member State policymakers as a potential instrument to promote sustainable textiles and textile waste management following the waste hierarchy and to support handling the expected increase in textile collection volumes. On 5 July 2023, the European Commission proposed harmonised [EU EPR rules](#) for textiles as part of the revision of the WFD.⁴⁹

End-Of-Waste Criteria

End-of-waste criteria specify when specific waste ceases to be waste and becomes a product or a secondary raw material. According to the Waste Framework Directive, specific specified waste ceases to be waste when it has undergone a recovery operation (including recycling) and complies with specific criteria.

Waste Shipment

The Waste Shipment Regulation (WSR) implements international commitments and sets out the EU rules on transporting waste within and outside the Union. It aims to protect environmental and human health, establish greater legal clarity, and harmonise transboundary waste shipments. In 2020, the Commission launched the review process of the Regulation and published in November 2021 a proposal for revision.

Microplastics

On 16 October 2023, the European Commission presented a Regulation proposal to tackle the unintentional release of microplastics from plastic pellets, considered one of the primary sources of microplastic releases apart from tyres and textiles.

An impact assessment was included in the Commission proposal, and it refers to data gaps and other legislative proposals currently being negotiated. These would

⁴⁶ [Circular Economy Action Plan](#)

⁴⁷ [ESPR proposal](#)

⁴⁸ [Waste Framework Directive](#)

⁴⁹ [Extended Producer Responsibility \(EPR\)](#)

allow specific measures to be taken on all other identified sources.

Green Claims

The Green Claims proposal⁵⁰, published on 22 March 2023, sets requirements for companies to substantiate claims they make about the environmental performance of their products by using standard methods for quantifying them, aiming at making the claims reliable, comparable and verifiable across the EU.

1.2.4.2 Relevant policies, guidelines and regulations for a sustainable supply chain

- ***Product Environmental Footprint***

The Product Environmental Footprint (PEF) is a methodology measuring the environmental footprint of products following similar rules across the European Union.

The overarching purpose of PEF information is to enable us to reduce the environmental impacts of goods and services, considering supply chain activities (from extraction of raw materials through production and use to final waste management).

- ***Traceability and DPP***

The adoption of digital product passports was outlined in the EU's **Ecodesign for Sustainable Products Regulation (ESPR)**, which has a set of rules to ensure traceability in various sectors, including textiles. The tool aims to facilitate market surveillance authorities with product compliance verification and allow consumers to make informed decisions.

- ***Corporate Sustainability Due Diligence Directive***

The Directive proposal published in February 2022 aims to foster sustainable and responsible corporate behaviour in global value chains. It sets forth the rules companies must comply with when instituting due diligence in their operations.

- ***Corporate Sustainable Reporting Directive***

The proposal entered into force on 5 January 2023, and it amends requirements under the former Non-Financial Reporting Directive intending to standardise corporate social and environmental reporting across the EU. Companies subject to the Directive must report according to European Sustainability Reporting Standards (ESRS), notably via European Financial Reporting Advisory Group (EFRAG) standards.

1.2.4.3 Relevant policies, guidelines and regulations for sustainable textile production

Industrial practices are highly regulated in the European Union to restrain harmful emissions. The Industrial Emissions Directive (IED) is the main reference point for this. The legislation identifies industrial activities required to operate following permits granted by the authorities in EU Member States. The recent revision proposed in 2022 increases the focus on energy, water and material efficiency, reuse, and safer industrial processes.

⁵⁰ [Proposal for a Directive on Green Claims](#)

- ***Industrial Emissions Directive***

The Directive identifies industrial activities required to operate per a permit granted by the authorities in EU Member States. The proposed revision aims to improve the Directive by focusing on energy, water and material efficiency, reuse, and safer industrial processes.

- ***Textile BREF***

The Best Available Techniques (BAT) Reference Document (BREF) for the Textiles Industry is part of a series of documents presenting the results of an exchange of information between EU Member States, the industries concerned, and non-governmental organisations promoting environmental protection. This BREF addresses pretreatment installations (washing, bleaching, mercerisation) or dyeing of fibres or textiles.

I.2.5 R-strategies Initiatives⁵¹

The R principles can be expanded into the 9R framework, which includes refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover. Prioritising the initial principles over the latter ones is crucial to minimise downcycling and maximise the sustainability of materials.

In summary, the circular economy promotes a life-cycle perspective to reduce waste and enhance sustainability, particularly within the textile industry, by employing technical and biological recycling processes. The emphasis on the R principles helps ensure that resources are used more efficiently and waste is minimised, fostering a more sustainable and environmentally friendly approach to production and consumption.

I.2.5.1 R0 - Refuse

The R0 principle in the textile industry promotes eliminating the need for production by replacing one product with another. It can be achieved through "slower" fashion, with fewer annual collections, or by creating "timeless" designs that remain in style as long as the garments are durable. The slow fashion approach, emphasising quality over quantity and incorporating new business models, is a frequently discussed concept and has seen partial integration into the textile industry.

I.2.5.2 R1 – Rethink

R1-Rethinking in the textile industry focuses on extending product lifespan through multifunctional design and shape transformation. It includes renting textiles, a practice common in the workwear sector. The inability to rethink design highlights the need for companies to innovate business models with environmental and social considerations. Rethinking extends to policy, value chains, territory, management, business models, and corporate social responsibility. Technically, it involves using renewable, recycled, or revitalised materials, analysing food and textile waste for reuse, and proposing bio-based materials like bacterial cellulose that require minimal water and energy for production.

⁵¹ Schnatmann, A. K., Schoden, F., Ehrmann, A., & Schwenzfeier-Hellkamp, E. (2023). R principles for circular economy in the textile industry – a mini-review. *Communications in Development and Assembling of Textile Products*, 4(2), 295–305.



I.2.5.3 R2 – Reduce

Reducing resource use can be achieved by increasing production and use efficiency, minimising waste, and using recycled and bio-based materials instead of virgin ones. It includes considering returned products and losses during production and in stores and addressing environmental impacts such as air emissions, wastewater, harmful material use, and environmental accidents. Economic aspects like material procurement costs, energy use, and waste-related fees and fines should also be minimised. Additionally, users can reduce resource consumption by decreasing unnecessary washing and drying of textiles.

Reduced textile waste can be achieved by wearing clothes longer and effectively recycling and reusing textile waste as raw materials. This approach is often associated with green chemistry, which aims to reduce pollutants, waste, and energy costs. The principles of the 9R framework are interlinked, suggesting that redesigning products and manufacturing processes can also reduce waste. Furthermore, reducing vehicle emissions from textile transport can be addressed through optimised planning, cleaner urban freight transport, and local production to minimise the negative impacts of international supply chains. However, the circular economy rebound (CER) effect can occur if only material resource flows are considered, potentially leading to increased demand and higher material or energy consumption due to lower prices.

I.2.5.4 R3 – Reuse

The R3 principle of reuse, part of the strategy “extending the life of products and their parts,” involves donating or reselling used but still intact textiles. While reuse is a common practice, it is under-researched in the circular economy, particularly in the textile industry. Reuse helps reduce the production of new textiles, aligning with “slow fashion” or “long-lasting fashion” made from durable materials. Despite its potential, reuse accounts for only 8% of solid textile waste in Europe, compared to 10% for recycling and 57% for landfill. Design-based approaches are emerging to enhance reuse, and the Waste Framework Directive mandates separate textile collection and treatment by 2025 to improve reuse and recycling rates.

I.2.5.5 R4 – Repair

Repairing textiles and clothing extends their usability, encompassing simple fixes like buttons and zippers to more complex repairs such as seams and textile structures. While consumers can often handle minor repairs, more intricate fixes might require professional intervention or supportive tools like patches. Repairing is widely discussed and practised, but challenges such as lack of skills, time, and the cost of repairs compared to new, cheap textiles deter many consumers. Community repair initiatives, like repair cafés, can foster awareness and provide support. The repair industry faces issues like low profitability, a shortage of skilled workers, and the poor quality of new products, making repairs less viable.

I.2.5.6 R5 – Refurbish

In the textile sector, refurbishing addresses fashion trends and issues like garment



fit due to body changes by refitting or redesigning, such as adding new features or changing colours. Both consumers and companies, particularly those offering leased textiles, can carry out refurbishing. Manufacturers can refurbish products to original standards, but leasing models often face economic challenges due to high resale values in second-hand markets, like those for children's clothing.

I.2.5.7 R6 – Remanufacture

Remanufacturing in the textile industry involves creating new products from industrial and consumer waste, presenting significant challenges due to the variability in the quality and quantity of returned textiles. This process is less established than recycling or repair, particularly for low-value clothing. To address these challenges, designing textiles specifically for remanufacturing is crucial, prompting proposals for design methods that extend product life through remanufacturing and other circular economy principles.

I.2.5.8 R7 – Repurpose

Repurposing in the textile industry involves creating new products from raw materials sourced from other industries or using textile waste and surplus materials for new functions. This approach offers a solution to the issue of textiles collected for recycling being exported to countries lacking proper collection infrastructure. Several textile and shoe companies have implemented repurposing practices, such as reusing plastic bottles and leather scraps. Additionally, pre-consumer waste can be transformed into merchandise for circular fashion, while unwanted items can be repurposed to address fast fashion's overconsumption and disposal problems.

I.2.5.9 R8 – Recycle

Principles R8 (recycling) and R9 (recovering) focus on the beneficial use of materials when other circular economy principles are not applicable. Recycling of discarded textiles, whether pre-consumer or post-consumer waste, typically begins with sorting and proceeds through chemical, mechanical, thermal, or mixed recycling processes. Recycling is more straightforward for single-material textiles than for multi-material fabrics. The quality of recycled fibres varies, with high-quality fibres used for new apparel and lower-quality fibres repurposed for composites and other low-value products. Although recycling is widely used and studied as a method to make the textile industry more circular, challenges remain. Companies often prefer using the best available raw materials over recycled materials to maintain product quality. Additionally, most recycling processes tend to degrade the quality of the final product compared to the original, highlighting the need for innovative models that enhance rather than downgrade the quality of recycled products.

I.2.5.10 R9 – Recover

Recovering textiles through incineration for energy recovery represents the final option for reclaiming the value of used textiles, albeit it does not align with the principles of the circular economy. Many textile materials are incinerated as a last resort instead of disposed of in landfills.

I.2.6 Notable Collaborations and Initiatives

- EURATEX: European Apparel and Textile Confederation, representing the interests of the European textile and clothing industry at the level of the EU institutions. <https://euratex.eu/>
- EuRIC: The European Recycling Industries' Confederation (EuRIC) is the umbrella organisation for the recycling industries in Europe. Through its 75 members from 23 European countries, EuRIC represents more than 5,500 large companies and SMEs involved in the recycling and trade of various resource streams. <https://euric-aisbl.eu/>
- Ellen MacArthur Foundation: Works with businesses, governments, and academia to accelerate the transition to a circular economy, with specific initiatives focusing on the textile sector. <https://www.ellenmacarthurfoundation.org/>
- The Sustainable Apparel Coalition: A global alliance of retailers, brands, suppliers, and other stakeholders working to reduce the environmental and social impacts of apparel and footwear products. <https://cascale.org/>
- Global Fashion Agenda: Leads several initiatives to mobilise the international fashion industry to take bold and urgent action on sustainability. <https://globalfashionagenda.org/>
- Textile Exchange: A global non-profit that works closely with members to drive industry transformation in preferred fibres, integrity and standards, and responsible supply networks. <https://textileexchange.org/>
- Textile Recycling Association: Promotes textile recycling and develops sustainable practices in the textile industry. <https://www.textilerecyclingassociation.org/>
- REHUBS: Initiative which develops technologies for converting unused textiles into valuable products, promoting the circular economy, and reducing waste in the textile industry. <https://www.rehubs.eu/>
- WRAP: British organization that promotes sustainable resource use and waste reduction. It focuses on sustainable consumption, recycling, and effective waste management. It initiates projects across various sectors, including fashion, food, and construction, aiming for a more sustainable environment. <https://www.wrap.ngo/>
- Fashion for Good: Promotes sustainable fashion by connecting businesses, consumers, and innovators to shape a better future for the fashion industry. <https://fashionforgood.com/contact/>
- Science-Based Target initiative (SBTi): Commits companies to set targets for reducing greenhouse gas emissions based on science. These targets align with the Paris Agreement to limit global warming to below 2 degrees Celsius, ideally 1.5 degrees. Companies analyze emissions, set targets, and take action, aligning with climate science to help mitigate climate change. <https://sciencebasedtargets.org/>
- Sedex: Platform that helps companies manage and improve their social and environmental performance in the supply chain. <https://www.sedex.com>
- Higg FEM and vFEM: The Higg FEM (Facility Environmental Module) and vFEM (Value Chain Environmental Module) are sustainability assessment tools developed by the Sustainable Apparel Coalition (SAC). Higg FEM focuses on sustainability at the facility level, while vFEM assesses environmental performance across the entire supply chain. <https://howtohigg.org/>
- Bluesign®: Certification widely recognized in the industry for its high quality

and sustainability approach. It confirms sustainability in producing textiles and chemical products, focusing on using safe chemicals and reducing harmful impacts. <https://www.bluesign.com/en/>

- ACR+: International network of cities and regions aiming to promote sustainable resource management and accelerate the transition towards a circular economy on their territories and beyond. <https://www.acrplus.org/en/>
- Roadmap to Zero & ZDHC: Two initiatives aimed at reducing the apparel and textile industry's harmful environmental and health impacts. Roadmap to Zero aims for zero emissions and efficient resource use, while ZDHC strives to eliminate hazardous chemicals and create a safe and sustainable supply chain. <https://www.roadmaptozero.com/>
- The Policy Hub: Platform that provides information and analyses on public policies and legislation. It is primarily used by professionals, researchers, and public officials to monitor developments in policy and legislation. <https://www.policyhub.org/>
- Microfibre Consortium: A group that researches and works on reducing the emission of plastic microfibers into the environment, primarily from the fashion and textiles sector. <https://www.microfibreconsortium.com/>

1.2.7 SWOT Analysis for Textile Waste Management and Recycling (EU context)

Strengths

- Closed - loop mechanical recycling is technically capable of treating almost any fibre composition, but the market demand for and acceptance of blended fibres is a crucial variable in determining the volume potential of mechanical recycling.
- Chemical recycling targets various fibre types, including cotton, MMCF, polyester, and synthetic fibres.
- The variety of fibre uses across different industries enhances the diversity and resilience of the fibre market.
- The top textile sorters handle a significant amount of collected textiles, showcasing their efficiency and market dominance.
- Emerging technologies like near-infrared scanning systems (NIRS) offer promising solutions to improve sorting accuracy and efficiency.
- Established supply chain and retail systems are optimised for linear operations, facilitating rapid turnover of new fashion collections. This tendency can create a self-reinforcing dynamic, solidifying market dominance.
- The textile industry Within the EU focuses on technical textiles and premium apparel, offering more significant profit potential than other textile categories like clothing and home textiles.
- The European textile industry is at the forefront of developing sustainable products and re-using different materials, such as jeans and plastic bottles, leading the way in circular textile practices.
- New ways of designing, producing, and choosing products that align with circular economy principles are being developed and implemented.



Weaknesses

- The textile recycling value chain cannot function on a small scale. Critical scale across the value chain is required to provide sufficient feedstock⁵² to the necessary fibre-to-fibre recycling technologies and allow those recycling technologies to operate at scale. Therefore, the industry must set bold scaling targets and meet them.
- In EU-27 and Switzerland, as much as 7 million to 7.5 million tons of gross textile waste—a bit more than 15 kilograms per person—is generated yearly⁵³. By 2030, this annual gross textile waste figure could rise to 8.5 million to 9 million tons, corresponding to just below 20 kilograms per person.
- The global fashion industry is estimated to emit 3 to 10 per cent of global greenhouse gas emissions.⁴¹ If the industry continues implementing decarbonization initiatives at the current pace, emissions in 2030 will remain the same as they are today—nearly double the maximum required to stay on the UN Paris Agreement's 1.5 pathway by 2050.
- The global textile industry uses approximately 93 billion cubic metres of water per annum, which is enough to meet the annual consumption needs of five million people⁵⁴. For example, around 3,800 litres of water are required to produce one pair of jeans, and dyeing a single kilogram of textiles uses up to 150 litres of water.
- The clothing and textile industry uses 1,900 chemicals, of which 165 are classified as hazardous by the European Union. In addition, global textile production is estimated to be responsible for around 20 per cent of global clean water pollution due to the dyeing and finishing of products⁵⁵.
- The increasing usage of synthetic fibres in clothing and home-textile products results in the release of microplastics into the environment during the product's lifetime (for example, through machine washing). The long-duration plastic (PET) used to make synthetic fibres—like polyester—takes several hundred years to break down. The complete effects of this are not yet apparent. However, it may have adverse effects on nature. Microplastic pollution is estimated to be approximately 900 fibres shed per square metre of fabric.
- Across the EU countries, there is a need to review national/ local legislation on “waste” management or shipment to understand what barriers to circularity shall be removed and how to harmonise legislation.
- Collecting and sorting discarded textiles is complex and time-consuming but can be improved through partnerships, logistics and new technology.
- The cost of using recycled materials remains higher than that of virgin materials. It hinders widespread adoption in the market. Increased demand from brands/retailers and public authorities encourages investment in available solutions and new research.
- A bottleneck is a lack of standardised recycled materials and quality and the absence of end-of-waste criteria. We require agreed European/global standards. Private initiatives like GRS are utilised and seem adequate.

⁵² Textile waste available to recycling.

⁵³ Eurostat Prodcom database; Intecus, Germany report, 2020; ISPRA, 2021; ISPRA, 2022; Modare, Spain report, 2021; Nordic Council for Ministers Baltic countries report, 2020; Refashion, France report, 2020; Rebel, Netherlands report, 2021; Umweltbundesamt, Austria report, 2022.

⁵⁴ A new textiles economy: Redesigning fashion's future, Ellen MacArthur Foundation, 2017

⁵⁵ Environmental impact of the textile and clothing industry, European Parliamentary Research Service, European Parliament, January 2019.

Opportunities

- Several of the main challenges ahead are best solved in a highly collaborative manner. Business leaders across the value chain, investors, and leaders of public institutions would need to unite in an unprecedented way to engage in a highly operational joint effort to overcome the barriers to scale.
- Several parts of the value chain must be built from scratch, requiring significant capital expenditure. Private investors would lead this journey by taking the initiative to finance building the value chain.
- Leaders of public sector institutions would have to help drive textile recycling. Measures include driving up collection rates, limiting the export of unsorted textile waste, engaging in demand stimulation, creating harmonised frameworks for increased circularity, and other initiatives.
- Thermo-mechanical recycling as the technology evolves, the requirements for high purity may be reduced, paving the way for broader application of thermo-mechanical recycling.
- High (virgin-like) quality regenerated fibres have a high revenue potential as they can be used directly in garment production, creating a lucrative market for high-quality recycled fibres.
- Business partnerships between fashion brands/authorities and makers (from fibres to finished products) are essential to educate and pilot projects. Collaboration among EU authorities, NGOs, industry, farmers, retailers, waste managers, and machine manufacturers is vital to leverage each other's strengths and develop the Circular Economy Action Plan. Industry stakeholders must join discussions and contribute their manufacturing expertise.
- Green public procurement and short supply chains, such as personal protective equipment (PPE) and workwear, offer relatively more accessible circular opportunities. Public procurement's interest in circularity for textiles is encouraging and should lead to innovation and technical discussions. National, regional and local suppliers can play a vital role in incentivising the transition to circularity through their choices, signalling in markets and rewarding efforts. Public-private funding is needed to trigger i) the creation of reverse logistic infrastructure for consumers and companies, ii) research and innovation and iii) "Materials pools" storing recycled materials. We need bold investments and support for marketing new ecological solutions to make innovations commercially profitable. It is also paramount in the circular economy that the solutions are told about and that the marketing of innovations to consumers is invested in.

Threats

- Thermo-mechanical recycling technology has been chiefly proven for non-textile waste (with a more predictable and stable input), thus causing some uncertainties on the forward-looking potential.
- Uncertainty regarding the demand for recycled mixed fibres can limit the growth potential of mechanical recycling.
- Technical constraints, such as the requirement for a minimum purity of 65% in closed-loop mechanical recycling, can restrict the flexibility of the technology.
- High purity requirements can limit chemical recycling technologies' flexibility and economic viability.



- The demand for specialised treatment of fibre waste may pose a challenge to the environment, as some recycling processes may be energy-intensive or generate environmental waste.
- Although, according to the analysis, the textile recycling industry could become self—standing and profitable once it has matured and scaled, transition funding will be needed soon.
- Inefficient sorting practices can lead to adverse environmental impacts, including excessive waste generation and landfilling, threatening local ecosystems.
- Traditional mechanical recycling often reduces fibre length, leading to output quality below that of virgin fibres, which could impact market acceptance.
- The legacy of chemical substances in recycled materials appears not to be a problem in chemical recycling if it can be controlled by testing, traceability in the supply chain, or other ways. However, better market surveillance will be necessary to ensure REACH compliance of products introduced to the EU market. Products made from recycled materials should fulfil the exact requirements of products made from virgin materials.
- Heightened public awareness regarding microplastic pollution may decrease consumer acceptance of synthetic fibres like polyester, potentially prompting stricter regulatory measures.
- The textile value chain is highly fragmented and globalised, posing challenges for the implementation of sustainable and circular practices, as well as for the improvement of social justice and workers' rights.
- The current gaps in information can lead to inefficiencies and mismanagement of pre-consumer textile waste, negatively impacting sustainability efforts.



II. Regional Reports

This section presents a regional view of the T&C sector of each partner region of VERDEinMED. Below, the different areas are presented and organized as project partners, including **Greece, Spain, Portugal, Slovenia, Italy, North Macedonia and Bulgaria.**

II.1 Greece

II.1.1 Overview of Greece's Textile Business Sector

For over 50 years, Greece's textile industry has maintained a competitive edge globally, receiving orders for nylon fabrics and high-quality cotton textiles from across Europe. The clothing industry, which developed in the late nineteenth century, mainly in Northern Greece, has seen revenue surge tenfold in the past five years, with internet sales driving significant growth. This expansion has helped establish Greece as a renowned supplier of diverse textile products to international markets.⁵⁶ Over the past decade, the Greek textile industry has undergone significant transformations due to globalization, textile trade liberalization, and increased competition. The industry now focuses on higher-value items, offers design services, and has outsourced production to neighbouring South-East European countries.

Greece's textile industry has become a globally recognized supplier of different types of textile products. There are approximately 6000 companies in the textile sector of the country, of which 3900 are in clothing and 1500 in fabrics manufacturing. The vast majority, approximately 92%, of the textile sector businesses are small enterprises (1-9 employees) with the turnover of the textiles industry in the country reaching 2.5 billion €⁵⁷. The Greek textile business sector is vital to the economy, accounting for 23% of total exported commodities and 47% of exported industrial products, contributing 28% to the country's industrial output⁵⁸. Greece is also the most essential cotton producer of the continent, with 80% of the European cultivated area. Because of the warm climate, most garments are made from cotton.

II.1.2 Textile Waste Management

Studies have shown that the history of Greece is intertwined with textile reuse and recycling practices (Gravas & Priniotakis, 2019). During the post-war period (1950 to 1970), a great quantity of clothes were reused, with garments being passed on within families or given to others. Clothing was not thrown away; instead, unneeded items were repurposed into cleaning rags or used for making mattresses and pillows. As time passed and the economy improved, the reuse of clothes declined. Between 1970-1990, it is estimated that a 35% of textiles were discarded due to the working class enjoying a higher standard of living. This trend continued from 1990-2010, with less clothes being reused and 71% turning to waste. Following the the Greek economy's turning point in 2010 when the economic crisis started, a rise in garment reuse was observed. Also, the recession drove more people to donate unused clothes to the Church or other organisations, which distribute them to underprivileged

⁵⁶ <https://www.textileinfomedia.com/textile-industry-in-greece>

⁵⁷ Eunomia (2021) Support on EPR schemes for mattresses and textiles for Greece, Final Report

⁵⁸ <https://www.stiafilco.com/%CF%80%CE%B1%CF%81%CE%BF%CF%85%CF%83%CE%AF%CE%B1%CF%83%CE%B7-%CE%BA%CE%BB%CE%AC%CE%B4%CE%BF%CF%85/>

families, further increasing garment reuse⁵⁹.

Until 2010, Greece lacked an organized program for garment reuse and recycling, with efforts mainly handled by local governments and the Church. Initial attempts by local authorities in 2012-13 to establish such programs failed. However, by 2015, private companies successfully launched comprehensive garment reuse and recycling initiatives. These companies manage collection, transportation, and sorting, with over 60 local authorities participating by placing special containers in cities. Public response has been strong, with collections nearly doubling within a year. Recyclers sort donated garments into reuse, rags, and fiber, with about half being reused. Some garments are exported to developing countries or sold in thrift shops.

The research indicates that for about seventy years, Greeks have been deeply accustomed to reusing garments, driven by the need for survival. This widespread practice may explain why systematic garment collection by local authorities only began in 2016, much later than in most other European Union countries, and there are no recycling facilities of post-consumer T&C in Greece yet. In conclusion, Greeks are well aware of what "garment reuse" means, but "recycling" of garments is still in its early stages⁶⁰.

Table 2. Production and recycling of textile waste (ton) of Greece's T&C sector.

	2012	2014	2016	2018	2020
Textile waste (ton)	1.679	1.560	1.268	9.100	12.649
Recycling of textile wastes (ton)	1.319	1.226	1.958	98	135

According to the data from Eurostat in 2023^{61,62}, The textile waste generated by Greece's Textile & Clothing (T&C) sector has steadily risen, increasing from 1,679 tons in 2012 to 12,649 tons by 2020. Actual recycling rates are very small (reaching a 1% in 2020) but they do not take into account the quantities of T&C that are forwarded to energy recovery facilities, which has increased in the past years (reported to be 202, 5768 and 7780 tonnes in 2016, 2018 and 2020 respectively). Thus, it is estimated that the rate of T&C waste that end up in landfills in Greece is increasing, ranging from 21,4% in 2012 to 37,4% in 2020.

II.1.3 Legal Framework

Governments enact and update regulations to address environmental concerns in the textile industry, promoting sustainable practices and waste reduction.

Regulatory and certification entities play an essential role in all activity sectors. To

⁵⁹ Gravas, E., & Priniotakis, G. (2019, August). 4A4_0233_ TEXTILE REUSE AND RECYCLING IN GREECE, FACT OR FICTION?. In Proceedings of the 19th World Textile Conference-Autex 2019.

⁶⁰ Gravas, E., & Priniotakis, G. (2019, August). 4A4_0233_ TEXTILE REUSE AND RECYCLING IN GREECE, FACT OR FICTION?. In Proceedings of the 19th World Textile Conference-Autex 2019.

⁶¹ https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN__custom_7396092/bookmark/table?lang=en&bookmarkId=646ce0a9-2988-464d-bd35-1b67e726a8db

⁶² https://ec.europa.eu/eurostat/databrowser/view/ENV_WASTRT__custom_7396182/bookmark/table?lang=en&bookmarkId=a6d83881-d12c-441f-acd3-5c5dca6ec3dc



ensure that companies and products comply with legal and regulatory requirements, regulatory and accreditation requirements should exist, as well as a commitment between these entities and companies, involving close and transparent collaboration with governmental agencies and certification bodies.

II.1.3.1 Regulations

Table 3. A short explanation of legislation in Greece in the T&C sector

Directive 2008/98/EC	Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing specific Directives provides the legislative framework covering the disposal of all wastes, including textiles.
Law 4819/2021	Enactment of Law 4819/2021 came into force in July 2021 and concerns waste management, plastic products, and the protection of the environment. Greece incorporated the two most important EU directives of the second European Action Plan for the Circular Economy (2020) (i.e., EU Directive 2018/851 on waste and EU Directive 2018/852 on packaging and packaging waste) into the national legislation. The law supports the national waste management plan to minimize landfills to 10% by 2030, five years earlier than the EU requirement. Waste management legislation and policy now include, in addition to re-using and recycling, other waste streams such as energy recovery. There is a provision in the law for creating waste energy recovery units, where the solid waste will be used for energy production (article 63). Since January 2022, all non-recyclable waste (residue) can be used as secondary fuel in energy-intensive industries and utilization units. As part of this legislation, several textiles relevant requirements were introduced the following: - The prohibition on landfill textiles commences in 2024. - The requirement is to introduce textile EPR and organize a Producer Responsibility Organisation (PRO) by the end of 2023. The Extended Producer Responsibility (EPR) scheme will be responsible for implementing the Waste Framework Directive's textile separate collection requirement.
Regulation (EU) No 1007/2011	Regulation (EU) No 1007/2011 of the European Parliament and of the Council of 27 September 2011 on textile fibre names and related labelling and marking of the fibre composition of textile products and repealing Council Directive 73/44/EEC and Directives 96/73/EC and 2008/121/EC of the European Parliament and of the Council.

II.1.3.2 Policies

Strategies	
National Waste Prevention Programme 2021-2030	The National Waste Prevention Programme 2021-2030 aims to promote sustainable consumption and the reuse of products, as well as raise awareness and change behaviour.
Sustainable and Circular Textiles	Sustainable and Circular Textiles by 2030, through which the Commission is working on a Transition Pathway for the textile ecosystem to achieve the green and digital transitions successfully and for the ecosystem to become more resilient. Today marks the start of a co-creation process in which stakeholders are invited - through a survey and workshops - to propose specific actions and work towards these shared objectives. The EU Strategy for Sustainable and Circular Textiles addresses the production and consumption of textiles whilst recognizing the importance of the textiles sector. It implements the commitments of the European Green Deal, the Circular Economy Action Plan and the European industrial strategy. The Strategy looks at the entire lifecycle of textile products and proposes coordinated actions to change how we produce and consume textiles.
European Green Deal	Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green



	Deal will transform the EU into a modern, resource-efficient and competitive economy, ensuring: • no net emissions of greenhouse gases by 2050 • economic growth decoupled from resource use • no person and no place is left behind The European Commission has adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990—more information on Delivering the European Green Deal.
Action Plans	
The EU Circular Economy Action Plan	The European Commission adopted the new circular economy action plan (CEAP) in March 2020. It is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth. The EU's transition to a circular economy will reduce pressure on natural resources and create sustainable growth and jobs. It is also a prerequisite to achieve the EU's 2050 climate neutrality target and to halt biodiversity loss.
National Action Plan on Circular Economy (NAPCE)	The National Action Plan on Circular Economy (NAPCE) aims to promote the circular economy in Greece. It focuses on further applying the waste hierarchy, preventing waste production and recycling, and supporting circular economy consumption patterns of re-using. Among other categories, NAPCE calls for creating, organising, and licensing the new Producer Responsibility Organisation (PRO), which is responsible for collecting, sorting, and recycling textile waste.
National Waste Management Plan of Greece	The National Waste Management Plan of Greece sets the strategic framework and the main objectives for the prevention and management of waste in Greece, which are in line with EU legislation and the principles of circular economy. They cover all types of waste, including textile waste, and aim to reduce their generation, increase their reuse and recycling, and ensure their safe disposal. It makes separate textile waste collection mandatory for all of Greece.
National Green Public Procurement (GPP) Action Plan (2021)	National Green Public Procurement (GPP) Action Plan (2021) sets specific criteria for promoting sustainability and circular economy for 15 categories of products and services. Sustainable Textile Products are also a particular category, but GPP for textiles is not obligatory for public organizations.
Regional Waste Management Plan of Western Macedonia	The Regional Waste Management Plan of Western Macedonia defines the specific actions and measures for the integrated waste management system of the regions, per the national and European policies and strategies.
Subvention schemes	
Hellenic Recycling Agency	After introducing a textile Extended Producer Responsibility (EPR) scheme and organising a Producer Responsibility Organisation (PRO), the Hellenic Recycling Agency will distribute all relevant revenue towards separate textile collection and management.
Just Transition Funding	Aimed at the region of Western Macedonia and the Municipality of Megalopolis (Region of Peloponnese), the Just Transition Fund covers circular economy implementation, both for public organizations and private companies, and it could be utilized for implementing circularity in the whole life-cycle of textiles (both in manufacturing and end-of-life management).
Partnership Agreement (PA) for the Development Framework 2021-2027	The PA constitutes the main strategic plan for growth in Greece, which is based on significant resources originating from the European Structural and Investment Funds (ESIF) of the European Union. It can support public entities collecting textile waste and private entities interested in implementing a circular economy for textiles.

II.1.3.3 Initiatives

Supporting structures	
Re-use Centers in Western Macedonia (DIADYMA SA)	Re-use centres are local non-profit centres for collecting materials, which increase creativity, reduce waste, promote cooperation, and improve living conditions and the environment through public awareness and the active participation of the community/citizens. The six centres that operate under the supervision of DIADYMA and are located within the existing Local Waste

	Management Units (Kastoria, Florina, Grevena, Amyntio, Servia, and Siatista) are a simple building infrastructure for the classification and storage of materials, which also have exhibition areas for the materials. Materials that can be gathered for re-use are books, household items and utensils, personal care items, tools, toys, and textiles such as clothes, shoes, bags and other items that are in good condition and do not have significant damages that would make them unsuitable.
Separate collection bins for textile waste (East West Greece IKE, RECYCOM, TEXCYCLE):	Three private companies collecting textile waste currently cover a significant area of Greece. East Waste Greece aims to implement the proper management of textile waste in Greece by protecting the environment and better serving the citizens. Specifically, East West has installed a unique collection of purple bins for textile waste and has managed to serve more than 80 municipalities in Eastern Macedonia, Thrace, Central Macedonia, Western Macedonia, Thessaly, Epirus, Ionian Islands, Central Greece and Attica. This action primarily aims to manage damaged textiles, including clothes <u>correctly</u> (https://eastwest-greece.com/). RECYCOM has installed red bins for clothing and footwear recycling in many places throughout Greece to promote textile waste recycling. They collaborate with over 106 municipalities in Attica, Peloponnese, Northern Aegean, Southern Aegean, Crete, Western Greece and Epirus (https://www.recycom.gr/). TEXCYCLE is a textile collection and sorting company. Its main facilities are located in Bulgaria, but its Greek branch is collaborating with the municipality of Serres in Northern Greece, where 23 collection bins have been installed in Serres and some other neighbouring settlements. The company is growing fast and intends to create a textile recycling facility soon (https://texcycle.gr/).
Government initiatives	
Ministry of Environment and Energy (MEEN), Hellenic Recycling Agency	Government Authorities (i.e. MEEN and the Hellenic Recycling Agency) have as their main priority to mandate the performance targets for textile waste, to provide authorisation for the scheme to operate, to approve fee structures and Operational Plans and establish a working group that will coordinate the development of the Extended producer responsibility (EPR)

As referred before, the Directive European Directive ((EU) 2018/851) amending Directive 2008/98/EC on waste obliges Member States to begin separate collection of textile waste by January 2025 and to set targets for the preparation for re-use and recycling of textile waste.

II.1.3.4 Inconsistencies or gaps in the legal structure that may hinder effective (textile) waste management and recycling

In Greece, the overall legal framework concerning textile waste management is not specific and has a lot of gaps. Textile waste management in Greece is based on EU policies and regulations. Consequently, legal frameworks must be more specific and focus on textile waste management. Also, the establishment of an Extended Producer Responsibility (EPR) scheme has proved to be very difficult, and it is being delayed due to the many different factors controlling the textile market (high quantity of imports, international online shopping, small production of textile products in Greece, etc.).

II.1.4 R-strategies Initiatives

A survey of initiatives has been developed, relating real case studies to r-strategies in Greece. Table 4 provides an overview of each initiative, project, innovative process, technology, or product and an outline of its maturity level.

Table 4. R-strategies initiatives in the Greek landscape.

R-strategies	Name of the initiative	Maturity Level	Description	Contact
00 Refuse	Awareness campaigns on textiles	full-scale solution	Refusing to buy new T&Cs can be cultivated and reinforced by informing citizens and thus raising their awareness of textile waste management. Both in Western Macedonia and generally Greece, all the above principles have already been cultivated through informing events concerning waste management, including textile waste, to emphasize the importance of not buying unnecessary things and not creating waste. Textile waste and its management have already been communicated and shared with citizens through the operation of reuse centres in Western Macedonia and the collection of damaged textiles all over Greece from East Waste, RECYCOM, and TexCycle (also running information and awareness actions). In addition, DIADYMA is operating a digital reward platform through which citizens can be rewarded for implementing circular practices.	DIADYMA www.diadyma.gr https://reuse.diadyma.gr/ RECYCOM https://www.recycom.gr/ East West Greece https://eastwest-greece.com/ TexCycle https://texcycle.gr/
01 Rethink	Zero waste design and rental practices	full-scale solution	As consumers get more acquainted with sustainable fashion, some textile and accessories brands in Greece are rethinking their products with the aim of circularity and sustainability, incorporating principles such as zero waste design and using materials with higher quality and durability to extend the life-cycle of their products. An excellent example of this practice is Social Fashion Factory (SOFFA, https://soffa.gr/), which incorporates zero-waste practices and has core sustainability and social justice values. Also, renting instead of buying new clothes is a principle many stores offer, especially for wedding and occasion wear (almost all wedding dress stores have a rental option).	SOFFA, https://soffa.gr/
02 Reduce	Reduction of resources and waste	full-scale solution	Reducing the consumption of natural resources and increasing the efficiency of product manufacturing is a sustainable strategy gaining ground among all businesses in Greece. Many are rethinking their whole manufacturing systems to reduce waste, use renewable energy sources and reduce their carbon footprint.	Tsiakiris Silk House http://www.silkhouse.gr/

			An example of this practice is done by Tsiakiris Silk House (http://www.silkhouse.gr/), a traditional silk production company in Soufli, in Thrace, where even quality silk cocoons are used to make a product so that nothing goes to waste. Also, small silk parts are not thrown away and utilised to make accessories.	
03 Re-use	DIADYMA Reuse centres	full-scale solution	In Western Macedonia, the re-use centres (RC) operation promotes one of the most basic principles of the circular economy, the “re-use” principle. The principle is a full-scale solution, as the reuse centres have been operating for the last 4 years. Specifically, the first re-use centres operated in Western Macedonia were the re-use centres of Kastoria (25/9/2020) and Florina (9/10/2020). Through re-use centres, about 17,5 tonnes of textile waste have been re-used from all the re-use centres till today.	DIADYMA www.diadyma.gr https://reuse.diadyma.gr/
	Second-hand shopping and reuse platforms	Development phase	Second-hand shopping (thrift) has grown significantly over the past decade, especially in urban areas. New vintage shops are opening, and the market is blooming. Also, re-use platforms (privately owned) have appeared where you can send your surplus clothing and get credits to buy something different from their collection, such as SWAPPLANET (https://swapplanet.com/), which is focusing on kid’s clothing or CashForClothes (https://cashforclothes.gr/) which will buy any textile surplus from organizations or citizens and forward them for re-use. A cultural shift is slowly happening where used textiles are seen as having more advantages, considering their limited environmental impact, than new products. Still, according to the relevant legislation, more reuse centres need to be established in urban areas (L. 4819/2021). Thus, re-use is in the development phase for the rest of Greece.	SWAPPLANET https://swapplanet.com/ CashForClothes (https://cashforclothes.gr/)
04 Repair	Promoting repair culture at DIADYMA reuse centres	Pilot	For the RC of Florina, in parallel with re-use, the repair procedure has been added as a good practice in waste management, including textile waste. Citizens can take the item to a repairer if it is not in good condition, but it can be repaired and reused. The main target is that the citizens interested in this will pay the repairer a discount to obtain the product. The “repair” principle is at a pilot level as the reparability has already been added as a choice on DIADYMA’s site related to the reuse centres (https://reuse.diadyma.gr/). Still, the principle has not been applied yet on a full scale. Through the project BECircular-Boosting Employment Through Entrepreneurship in Circular Economy (INTERREG IPA CBC Programme “Greece – Republic of North Macedonia 2014 – 2020”), the principle of “repair” was introduced in the re-use centre of Florina by DIADYMA.	DIADYMA’s site related to the re-use centres: https://reuse.diadyma.gr/

	Repair Cafes & private repair companies.	Full-scale solution	Pop-up repair cafes have operated in the past in other parts of the country (such as the ones that NGO InCommon runs https://www.incommon.gr/), but they were operating on rare occasions. However, in the textile, shoe, and upholstery repair sector, many private companies exist, which are very small on most occasions (1-person). They are widespread and can fix most of a product's issues. Thus, this is common practice in Greece, but national policies should support it even more.	Eunomia (2021) Support on EPR schemes for mattresses and textiles for Greece, Final Report InCommon https://www.incommon.gr/
05 Refurbish	MakerSpace laboratories	Pilot	Refurbishing textile waste into new products is rare in Greece. Still, it is a crucial area of focus for MakerSpace laboratories that are emerging (Athens, Piraeus and Thessaloniki), as well as some small businesses dedicated to upcycling: Salty Bag, which creates bags and other accessories from used sails (https://saltybag.com/), ConvertArt, which make bags and other accessories out of used tyres, safety belts and advertising banners (https://www.convertart.gr/el/) and 3QUARTERS, which make their products (bags and other accessories) out of leftover awning fabrics (sunshades) (https://3quarters.design/). The maturity level of this solution country-wise is Pilot.	Salty Bag https://saltybag.com/ ConvertArt https://www.convertart.gr/el/ 3QUARTERS https://3quarters.design/
06 Remanufacture		In development phase	Limited or no remanufacturing of textile products occurs in Greece (in the development phase).	
07 Repurpose	Using textile waste as cleaning supplies	Full-scale solution	At the national level, a few companies are repurposing pre-consumer textile waste, mainly for cleaning materials.	Simoni Vera https://www.simonivera.com/
08 Recycle	East-West Greece Textile waste collection for recycling	Full-scale solution	East West Greece provides services in the collection (collection, transport) and management of textile products. Primarily, East West Greece serves over 80 municipalities in Greece, specifically in Eastern Macedonia and Thrace, Central Macedonia, Western Macedonia, Thessaly, Epirus, Ionian Islands, Central Greece and Attica by installing a network of two thousand (2000) purple bins with cooperating municipalities throughout Greece to strengthen sorting at the source. Since 2020, when the first reuse centres operated, about 6,5 tons of textile waste have been delivered from DIADYMA to EAST West Greece for recycling purposes.	East West Greece https://eastwest-greece.com/ DIADYMA reuse.diadyma.gr
	RECYCOM	Full-scale solution	RECYCOM is a company that recovers items that are out of habit or necessity and end up in the trash and landfills. It restores its collaboration with citizens, producers, supermarkets, charities and	RECYCOM https://www.recycom.gr/

	Textile waste collection for recycling		NGOs, local governments, and public organizations. By installing red bins for clothing and footwear recycling in many places throughout Greece, RECYCOM cultivates the right mindset regarding recycling issues that concern textile waste management. Through the recycling of clothes, and with proper management, only 2% ends up in the trash, while the remaining percentage is extracted for reuse. Textile waste, such as clothes unsuitable for reuse, is recycled to create suitable garments. Old clothes can also be used to make work uniforms, material for sound insulation and thermal insulation, stuffing for car seats, etc. Even though these two companies cover a large percentage of the country, it is essential to note that they are not yet operating as a Producer Responsibility Organisation (PRO) (as mentioned by the relevant legislation) within an established EPR scheme. Also, there are no textile recycling units in Greece. Most of the textiles are being sent abroad for recycling.	
	TexCycle Textile waste collection for recycling	Full-scale solution	TexCycle is another textile waste collection company in Greece, with collection bins in Serres, Central Macedonia. The company has a sorting and recycling factory in nearby Bulgaria, but it is trying to expand its operations in Greece with recycling facilities. They are also participating in awareness-raising activities, and they have an online digital tool at their website, the Textile Eco Calculator, which calculates the amount of resources & energy saved from separating T&C waste instead of sending it to landfill.	TexCycle https://texcycle.gr/
	Recycling of pre-consumer textile waste	Full-scale solution	COMO has been a Greek textile recycling company for over 30 years. They receive pre-consumer cotton textile waste from the fashion industry and recycle it into felt and wadding used for mattresses, furniture and other purposes.	COMO https://como.gr/
09 Recover	SRF/RDF used in cement factories and Waste-to-Energy plants	In development phase	Even though there are no waste-to-energy plants in Greece as of 2024, which are included in the National Waste Management Plan to be built in the future, there are cases where textile fractions included in SRF / RDF (solid recovered and refuse recovered fuels) are used for energy recovery at cement factories. Also, a small amount of textiles characterized as sanitary waste (from hospitals, etc.) are being sent to a sanitary waste incinerator.	General Secretariat of Waste Management Coordination, Hellenic Ministry of Environment and Energy https://ypen.gov.gr/ TITAN cement company https://coprocessing.titan.gr/syhnes-erotiseis

II.1.5 Social Responsibility & Awareness-raising Initiatives

Greece's social initiatives were analyzed to assess their impact on the community's awareness about clothing consumption, use and end-of-life disposal.

In the Greek textile and clothing industry, the commitment to social responsibility is reflected in the integrity, ethics and transparency of companies and organizations in all their practices in respecting human rights throughout the value chain. The initiatives are diverse, encompassing various sectors, including research centres, companies, NGOs, the government and the general community.

II.1.5.1 Awareness campaigns

There have not been any specific awareness campaigns in Greece besides those that particular NGOs and textile management companies run concerning sustainable, circular and ethical fashion, re-using, upcycling and recycling textiles, clothing, footwear and accessories.

II.1.5.2 Educational Programs

Environmental education (DIADYMA SA)

DIADYMA SA, the Regional body for the Solid Waste Management of Western Macedonia, focuses on cultivating the new generation's environmental awareness with a view to sustainable waste management and environmental protection. DIADYMA also develops ecological education and awareness programs for primary and secondary education students, adapted according to their learning abilities. The environmental education activities of DIADYMA aim to inform students about waste management issues, to raise awareness about problems associated with them and to learn through the activities and visits in DIADYMA's facilities basic terms and concepts for waste management and understand the specificity of their region. They also aim to develop stable cooperation with the educational community of Western Macedonia to actively participate all citizens in recycling and reduce the waste generated daily. More information is available at: <https://diadyma.gr/en/draseis/perivallontiki-ekpaidefsi/>

Fashion Revolution Summer School (Athens University of Economics and Business & Fashion Revolution Greece, NGO)

The NGO Fashion Revolution Greece and the Athens University of Economics and Business run the Fashion Revolution Summer School, which is an educational journey of sustainable fashion global game changers centred on global trends and heritage, in collaboration with leading Universities and sustainable fashion institutions in the USA, Europe, and Latin America. It is a 3-week programme intended for professionals and students where they travel through Greece to learn and apply the latest sustainable innovations in the fashion industry, build more vital resources for compliance, innovative solutions and transparent circular system approaches to support global UN SDG goals and fortify company CSR outcomes, join with local artisans in their studio spaces, create a new network and connect as an international game-changer in fashion. More information is available: <https://greece.fashionrevolution.org/en/about-summer-school/>



Social Fashion Factory training program (SOFFA)

SOFFA is a creative tailoring production studio, a cooperative of fashion designers and professionals aiming to create sustainable fashion garments with significant social and environmental impact. They support the global ecosystem of sustainable fashion brands and designers by offering them an ethical solution to manufacture their garments. Customers are international sustainable brands and corporate merchandising for festivals and conferences. It is a social enterprise: 90% of its shareholders are refugees (60%) and unemployed Greeks (30%). Soffa is operating within the fashion world by tackling at the same time the four main issues of fashion:

- the environmental crisis and exploitation of resources;
- human rights, fair wages and working conditions;
- waste management and approach to resources,
- and the lack of action from existing fashion brands and institutions.

They also run campaigns and give talks to raise awareness about these issues. They provide training and work to vulnerable social groups (women survivors, victims of human trafficking and refugees). More information is available at <https://soffa.gr/>.

Sustainability Expert UdemY (online course created within the framework of the ECO TEX ERASMUS+ project)

The Sustainability Expert course aims to empower learners to understand global garment supply chains and their impact on people and our planet. It builds strategies for change by driving forward a Textile and Clothing industry that supports people, planet, profits and creativity in equal measure. The Sustainability Expert course is intended for learners who wish to focus on the long-term benefits of creating an efficient sustainability approach for their company/business, acknowledging the social and environmental impacts of production and consumption. It includes, primarily, Textile and Clothing industry professionals, especially those in leadership and managerial roles (<https://www.udemy.com/course/textilesustainabilityexpert/>).

II.1.5.3 NGOs – Non-government organizations (NGO)s initiatives

Fashion Revolution Greece

The Fashion Revolution is a global movement fighting for a safer, cleaner, fairer and more transparent fashion industry responding to the unprecedented pollution caused by the industry and violations of the human rights of workers. Its strategic objectives are:

- To raise public awareness of the actual cost of fashion and its impact at every stage, from production to consumption and disposal.
- To help people understand that change is possible. We showcase and celebrate those who prove that fashion can work with respect for people and the planet.
- To bring people together from all along the supply chain, from farmers to factory workers, from brands to buyers, from consumers to activists, to pose questions, doubting the way that fashion is made and by whom, and working to reconnect the broken links between those who produce, those who sell and those who buy fashion.
- We aim to work towards a long-term and universal change across the global fashion industry so that fashion is a source of good and we have safe, healthy, and equal working conditions for all people in the fashion supply chain.
- To ensure that no tragedy like the Rana Plaza ever happens again.

More information is available at <https://greece.fashionrevolution.org/>.

Fabric Republic (run by IASIS NGO)

Fabric Republic is an innovative and integrated surplus clothing management system focusing on today's social needs, sustainability and sustainable development. It is based on Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste, according to which targets for waste reuse and recycling to transition to a European Recycling Society with high resource efficiency. Its services include collection of surplus clothing, sorting, cleaning, packaging and storage, distribution to non-profit organizations, promotion of recycling, re-use (design and production of upcycled creations) and communication activities. It aims to optimize and modernize the circular management of surplus clothing. Our vision is the collective social and ecological consciousness development for a zero-waste reality. The program has an extensive network of collaborators. More information at: <https://www.fabricrepublic.gr/en/>

Ecological Recycling Society (ECOREC)

ECOREC is a non-profit environmental organization founded in 1990 to promote prevention, reuse, recycling - and alternative waste management and to inform and raise awareness among citizens. The main objective of ECOREC is the joint action of citizens, public authorities, and the state to create cities without waste in the foreseeable future by implementing integrated actions of the circular economy. Throughout their vast experience and multiple collaborations, ECOREC has been rooting for waste prevention, reuse, repair and recycling for all different waste streams, including textiles.

More information at: <https://www.ecorec.gr/ecorec/index.php?lang=en>

MiaAlliZoi (MiAZo)

MiAZo is a social cooperative business located in a multipurpose space that operates in terms of moral, social and solidarity economy, promoting a cultural change against waste and climate change. It is based on the support and participation of the local community. The basic principle is to save resources and goods as everyone can participate by donating, searching, supplying, and reusing. Also, relevant re-use and upcycling workshops are given there regularly.

More information at <https://miazog.gr/>.

II.1.5.4 Research projects – Specific research partnership

Research on textile waste management and recycling in Greece is limited. Some research is conducted through the:

Research Laboratory of Design and Development of Knitted Innovative Textiles and Clothing Products

Of the University of West Attica (<https://sapke.uniwa.gr/>). Their research interest is developing new yarns and textiles from recyclable materials and waste. Some of the projects that the laboratory is participating in are the following:

- FASHION.ED (Supporting Entrepreneurship in Eco Design, <https://fashionedproject.eu/>)
- SHOEDES (New Footwear Designer Qualifications for Sustainable Products that Comply With the Emerging Demands Of Circular Economy, <https://shoedes.eu/>)
- REWAFT (Reducing water footprint in textile (Helping the textile industry reduce its water footprint, <https://textilewaterfootprint.eu/>)

- CIRCUTEXT (Circular economy in fibrous composites and technical textiles through the use of virtual laboratories, <https://circutex.eu/>)
- IBDPTEC (Innovative Bridal Dresses and Baptismal Clothes From Peach Textile With Eco-consciousness, <https://newthreadoflife.com/>)
-

“Creative Design and Clothing” School - International Hellenic University of Greece

Additionally, research on the sustainability of textiles and fashion is being carried out at the “Creative Design and Clothing” School of the **International Hellenic University of Greece** in Serres, established in 1999 and currently operates as the sole Department in Greece involved in Fashion Design & Clothing Technology in higher education. (<https://cdc.ihu.gr/>)

EBETAM S.A. - MIRTEC S.A.

Anonyme Company of Industrial Research, Technological Development and Laboratory Testing, Certification and Quality (EBETAM S.A.) is the Greek multi-disciplinary, multi-technological laboratory control and certification centre for industrial and consumer products, materials, facilities and management systems. Its goal is to develop multidimensional partnerships and create strong relationships with our customers by creating added value to the products they produce and the services they offer to the market. Textiles are one of the sectors in which they have experience, working on multiple projects alongside the industry. (<https://ebetam.gr/>)

II.1.5.5 Collaborative Initiatives

Collaboration between industry *stakeholders, governments, and non-governmental organizations* is becoming more common in addressing the textile industry’s systemic waste management and recycling issues.

EcoFashionEU project

The “EcoFashionEU – Promoting the sustainability of small and medium textile and fashion manufacturers” project aims to support small and medium-sized textile and fashion industry enterprises to adopt sustainable and circular practices, following the EU Strategy for Sustainable and Circular Textiles. The project leader is the Athens Chamber of Crafts, which includes 5 more partners from the Greek fashion industry. More information at <https://ecofashioneu.com/>.

Fashion Earth Alliance (FEA-VEE) – Vocational Excellence and Enterprise united for training, policy reform, and sustainability in the fashion, textiles and apparel industries

FEA-VEE contributes to attracting more young people in the fashion, textiles and clothing sectors, and thus, in producing a new workforce that is VET-recognized, skilled and competent for the 21st-century labour needs, trained through work-based training and apprenticeships in direct liaison with the industry.

Furthermore, the project aims to develop greener, more circular, and sustainable economic models in the fashion, textiles, and clothing sectors, as well as more ethical and concentrated on fair trade values.

More widely, FEA-VEE wishes to establish a Green Entrepreneurship policy reform pathway for incorporating sustainability concerns within entrepreneurial planning while promoting



entrepreneurship through start-ups and incubation, as well as entrepreneurial skills and competencies among the workforce within educational institutions and after graduation as part of lifelong learning.

Among the FEA-VEE project activities, the project partnership will create innovative training materials for teachers and trainers in the textile sector. Furthermore, a transnational cooperation platform is foreseen to match students and workers with training and internship opportunities throughout Europe. Finally, some partners will take care of organizing short mobility courses for students to be held in Germany and Spain.

The FEA-VEE partnership comprises 12 partners from 6 European countries (Greece, Spain, Bulgaria, Romania, Germany, and Sweden)—more information is available at <https://fea-vee.eu/>.

Fashion Employment Hub - Upgrade of skills for young designers, fashion graduates and start-ups in the cross-border area and development of a Fashion Employment Hub (INTERREG IPA-CBC Programme “Greece – Republic of North Macedonia 2014 – 2020”)

Short description: The project aims to create a fashion centre as an employment hub of cross-border character and impact, offering integrated and innovative support services, tools, and knowledge to professionals and prospective entrepreneurs in the wider cross-border area. The Employment Hub will act as a unique centre, bringing together all stakeholders in the fashion industry and providing them with new training skills and professional competencies. It will also facilitate the exchange of innovative ideas and sustainable methods, enhance know-how transfer, and promote creative thinking and development.

The project is being implemented by 4 partners in Greece and North Macedonia—more information at <https://fashionemploymenthub.eu/en/>.

CREATIVE HUB - Development of a Creative Hub for offering support to fashion graduates, young artists start-ups and development mechanisms to the fashion sector of the cross-border area (Interreg V-A “Greece-Bulgaria 2014-2020” Cooperation Programme)

The project's general objective is to address the common cross-border challenges of the fashion sector by establishing the Creative Hub, a Fashion Center that will support SMEs and young graduates in the fashion and fashion-related sectors (footwear, leather, jewellery). It will not only deliver real, practical benefits of high-added value to the project target groups (graduates, students, SMEs), but it will also help ensure the competitiveness of the cross-border area for the textile and apparel industries, as opposed to Asian countries. After all, the proposed Fashion Center will enhance the development of cross-border economic activities by utilizing the existing potential and the emerging opportunities for collaboration and experience-sharing.

The leader beneficiary of the project is the Thessaloniki Chamber Of Commerce & Industry, supported by 4 additional partners from Greece and Bulgaria. More information is available at <https://fashioncreativehub.eu/>.

CREATE project

CREATE is a two-year Erasmus+ project to produce a new learning programme for women to co-create a sustainable fashion collection. The project aims to make learning materials and train people to unlock female entrepreneurship's potential to create inclusive employment opportunities for marginalized groups by producing sustainable, zero-waste

fashion “capsules”. It will further foster women’s ability to deal with change, act with a critical and responsible stance and motivate them to participate in lifelong learning possibilities <https://women-create-eu.com/> (SOFFA is the Greek partner of the project).

Material Match Making Platform -M3P (Life 2014-2020)

The main objective of M3P was to demonstrate and experimentally apply a model of territorial management of industrial waste to promote the Industrial Symbiosis. Through the proposed model, the project aimed to boost the overall efficiency of industrial processes in the target areas by increasing industrial waste and reducing landfill, storage and transport. Implementing and using the online platform allowed us to address the lack of information about the industrial waste produced in a local area through a systematic approach oriented to the life cycle of products and the material chain needed to make them. In particular, the partnership –from Italy, Belgium, Spain and Greece – aimed to strengthen local networks for improving industrial waste, fostering their use in other local businesses and reducing the needs for treatment, storage, transport and the consequent environmental impact. DIADYMA (the only partner from Greece) focused on the fur and wood sectors for the region of Western Macedonia, especially on specific small and medium-sized enterprises that were trained, became users of the platform, and were led to establish collaborations. The ultimate goal was the application of circular economy in the specific activity fields—more information is available at <http://www.lifem3p.eu/en/>.

Boosting Employment Through Entrepreneurship in Circular Economy- BECircular (INTERREG IPA CBC Programme “Greece – Republic of North Macedonia 2014 – 2020” - Project ID 5063490)

The BECircular project is based on circular economy concepts to create jobs for young engineers, scientists, artists and technicians, further training and preparing the young population to operate as entrepreneurs utilizing skills and knowledge of higher education. More specifically, I will use the know-how acquired in previous projects, which explored the potential of the bioeconomy in the region, as well as record waste that could be upgraded by repair and re-use, including textiles—BECircular aims to seize this opportunity by establishing and operating Re-use and Entrepreneurship Centers in Florina and Pelagonia. By upgrading state-of-the-art technology to Circular Economy platforms linked to jobs, employment, and sustainable business models, BECircular will seek to provide a way out of unemployment and low-paying jobs for young people by supporting new employment opportunities in the cross-border area. DIADYMA (a partner from Greece) was the coordinator of the program. Through the Re-use Center that operates in Florina city, the project strengthened entrepreneurship in the region by creating new opportunities, either for young people who want to enter the labour market or for existing businesses, based on the circular economy, re-use and repair. In addition, through the project, the principle of “repair” was introduced by DIADYMA in the reuse centre of Florina, which concerned items gathered, including textiles. (More information at <https://becircularproject.eu/>).

Erasmus + Project TORP – “Towards communities of reuse practices.”

The Ecological Recycling Society (Greece) participates in the Erasmus+ program TORP - “Towards communities of reuse practices” with partner organizations Zelena akcija (Croatia) and Volonterski centar Vojvodine – VCV (Serbia). The project's goal is to increase community engagement in the culture of reuse and repair, with the involvement of volunteers and active citizens. Empowering organizations involved in such actions may result in various



social and environmental benefits: Actions promoting reuse and repair in local communities contribute to addressing unsustainable resource management and waste issues, enhancing social cohesion, and developing skills for vulnerable and marginalized groups. Meanwhile, educational tools and methodologies will be created for all interested institutions, available online, and guidelines for citizens to raise awareness about reuse and waste prevention issues. More information at:

https://www.ecorec.gr/ecorec/index.php?option=com_content&view=article&id=709:erasmus-torp-erasmus-project-torp-towards-communities-of-reuse-practices&catid=8&Itemid=481&lang=en

ECO TEX – «Circular Economy Innovative Skills in the Textile Sector» ERASMUS+ project

The main objective of the project ECO-TEX is to design, develop and pilot a new job qualification profile and correspondent training curricula on the subject of “How to implement circular economy techniques in Textiles Industry” to improve competitiveness in Textiles, based on the development of skills and competences of the workforce. The ECO TEX project aims to design and implement an innovative and comprehensive training toolkit. The platform will focus on online training, facilitating knowledge dissemination and sharing experiences. Moreover, it will serve as a medium for all stakeholders in the field to share concerns and advice and promote employment opportunities. Its main results include:

- Developing a deep knowledge of occupation and training is needed to implement sustainable manufacturing in the textile sector and possibly already existing learning opportunities.
- Engagement of textiles and clothing industry staff in lifelong learning
- Establishment of a digital training platform
- Improvement and extension of high-quality learning opportunities tailored to the needs of the textiles and clothing industry
- Contribution to the modernization and professionalism of significant SMEs through the use of a high-quality ICT Tool
- Definition of a professional profile for the sustainability expert (focused on SME's)
- We are raising awareness of the need for a sustainable manufacturing strategy.

(More information at <http://www.ecotexerasmus.eu/>).

ECO-TEXTILE - Introduction and Promotion of the ECO-LABEL to the Greek textile industry (LIFE03 ENV/GR/000204)

The ECO-TEXTILE project's overall objective was to introduce, promote and implement the EU's Integrated Product Policy (especially sustainable production and consumption) in the Hellenic fashion industry. It was to involve key market actors and potential end-users (consumers, retailers, traders). The Green Product concept and Eco-label scheme were to be promoted widely in the Hellenic textile industry by establishing the necessary partnerships, marketing network, and technical infrastructure. Eco-label projects were to be demonstrated at five selected enterprises. An Eco-label best practice guide and methodology for evaluating Eco-label potential were to be compiled. The Hellenic Fashion Industry Association led the project with the support of 3 additional partners from Greece. The website is not available any more.

UPTEXTILE project: We give a new life to textiles

TAG-Green, a Greek non-profit company, in partnership with the Greek Women's

Engineering Association, the NTUA and the Municipality of Lykovrisi-Pefki, implemented the UPTEXTILE project to improve the efficiency of resources in the textile industry throughout the value chain (production, use, processing, disposal) and to strengthen the national policies in the implementation of separate collection but also prevention, reuse, processing, recycling with information and awareness actions for students, citizens and involved bodies and at the same time promote separation of textile waste and reuse of textile products. The Green Fund of Greece funded the project. More information at <https://www.uptextile.gr/>

EUCOTTON - European Cotton Alliance (ECA)

EUCOTTON initiative is driven by the European Cotton Alliance (ECA), a group of cotton associations and federations located in Spain and Greece, countries that account for 100% of European cotton production. It is headquartered in Larissa, Greece, with a branch office in Seville, Spain. Through this initiative, the European cotton sector represented in ECA seeks to promote the visibility of European cotton and its sustainability, traceability and transparency qualities. Under the slogan: “Europe designs a sustainable future with cotton from Europe”, EUCOTTON focuses on raising awareness among consumers and industries for the quality characteristics of European cotton, its sustainable production model and the unifying trademark applied for its traceability. <https://eucotton.eu/european-cotton-alliance/>

Athens Fashion Film Festival

The Athens Fashion Film Festival (<https://athensfff.com/>) is a yearly event separate from filmography, and fashion is also interested in opening the discussion around sustainability and the industry's future. During the 2023 event, the «Sustainable fashion: On track to the circular economy» panel discussion was held, welcoming people from diverse backgrounds to discuss these critical topics.

Thrift Festival

The Thrift Festival (<https://thriftfestival.gr/>), held in Thessaloniki, is a weekend-long thrift and vintage market featuring unique curated clothing, accessories & more for all genders, all ages, and from all decades. Thrift Festival features a selection of Greece's most established and up-and-coming thrift, vintage stores, and independent vendors. This unique event focuses on thrift, vintage and handmade goods from local vendors, bringing Greece an event they can be part of to support sustainable fashion. Each store's brand focus offers diverse styles of thrift and vintage clothing, accessories, vinyl collectables, & more, ranging from early 80's pieces to in-demand current fashion items and everything in between. It is free & open to the public.

II.1.5.6 Effectiveness of current awareness campaigns and educational programs

In the context of cultivating environmental awareness in the new generation, educational programs emphasize the rational use and the need to protect natural resources by linking concepts such as “quality of life”, “culture”, and “responsibility” as the critical components of the development of modern human culture. In addition, the environmental education activities aim to inform citizens, especially students, about waste management issues, raise awareness about associated problems, and learn through the activities and visits in DIADYMA's facilities basic terms and concepts for waste management and understand the specificity of their region.

II.1.6 SWOT Analysis

The following table presents the SWOT analysis for the Greece paradigm to identify strengths and weaknesses, opportunities and threats in the local management and recycling of textile waste, with a vision of the implications for global efforts. The SWOT analysis concerns the regional (Western Macedonia) and country levels (Greece).

Table 5. SWOT Analysis for Textile Waste Management and Recycling in Greece

Strengths	Weaknesses
- Robust textile waste collection infrastructure: specific textile collection/reuse/recycling bins have been established in many areas of Greece. - Through the reuse centres in Western Macedonia, about 24 tonnes of textile waste did not end up in landfills. - Dedicated textile NGOs with experience in the subject - Emerging sustainable and circular fashion brands	- Small gaps in waste management policies and regulation: - Policies and rules concerning textile waste might be more specific in Greece - large amounts of textile and clothing waste are produced - Management of textile waste is not of central focus among citizens and governments - The EPR scheme has not yet been established - Re-use centres are needed in the rest of Greece - No textile recycling facilities are available in the country - Limited regulation concerning incoming and outgoing textiles from the country - There is no precise data concerning the quantities of textile waste (how much is landfilled, recovered, or re-used). - Very few awareness campaigns for the public
Chances/ Opportunities	Threats
- Enhancements of policies concerning textile waste need to be implemented - Business opportunities for re-use, repair, refurbishment, remanufacturing and recycling in the sector. - Research opportunities on recycling, biobased textiles and repurposing of fibres. - Information campaigns for behavioural change dedicated to textile waste and its management transmitted among citizens in a better way. - Frequent repair cafes, workshops or events	- Social resistance and resistance to change - Large amounts of textile and clothing waste are produced - Large amounts of textile waste are exported - Large amounts of textile products are imported or bought by consumers from international sellers. - More low-quality textiles are on the market than ever before

II.2 Spain

II.2.1 Overview of Spain's Textile Business Sector

This section aims to provide a general overview of the legal frameworks related to circularity in the textile industry at the national level in Spain and, in particular, to present the legal frameworks in the regions of Andalusia and Valencia.

Spain is a significant player in the EU textile industry, with 19.676 companies and around 130000 employees; Spain's fashion sector is at the top of EU member states. The vast majority of Spanish textile companies are SMEs. Turnover of 2023 Spain's textile sector is 14,765 M€ [1].

The Spanish fashion business is gaining strength and increasing its importance to the Spanish economy in the context of general growth. In 2022, the fashion sector's contribution to the Spanish Gross Domestic Product (GDP) stood at 2.8%, representing an increase of one-tenth compared to the previous year and four-tenths compared to 2020, when the pandemic dropped this ratio to 2.4% [1].

The textile industry remains the one with the highest turnover, 6.652 M€, and manages to surpass pre-pandemic figures. The leather and footwear sector records the highest increase, 12.7%, in industrial production, continuing with the recovery. The largest group of workers in the sector is in the textile industry, representing 36%, closely followed by leather and footwear, which comprise 35% of the total [1].

In 2022, the Spanish fashion industry reached a historical record of exports totalling 32,428 million euros, boosted by inflation and the sector's recovery, with France, Italy, and Portugal as the main clients. However, the weight of the fashion industry in overall Spanish exports stood at 8.3% in 2022, below the 2021 statistics [1].

Concerning the distribution of T&C production regions of Spain, the Valencian region, once again, took the lead in terms of the number of workers and companies. At the same time, the community with the highest revenue continues to be Catalonia. Galicia and Andalusia still contest the third position. While Galicia has the third place in revenues, Andalusia has more workers and companies. Madrid maintains the fourth position in terms of workers, companies and revenue.

Andalusia is one of the four most critical autonomous communities in the Spanish textile industry, with a production of €206,126 million, representing 4.7% of Spain's total [2].

Sector de Textil y Confección: establecimientos (2021)
(porcentaje sobre el total nacional)

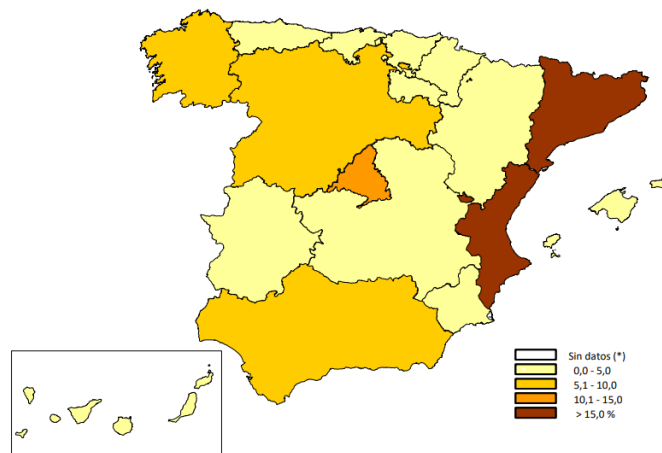


Figure 8. Textile and Clothing Sector: Establishments 2021 [3].

From 2013 to the present, the textile industry has been steadily expanding in Andalusia, with 810 textile industry premises, 1,367 clothing manufacturing premises, and 406 leather and footwear industry premises in 2020. The significance of these sectors is further highlighted by the value of their production, which in the textile sector alone is 206 million euros, 165 million euros in clothing manufacturing, and 189 million euros in leather and footwear. This industrial growth is also reflected at the national level, with the Spanish textile sector employing 120,517 people in 2020, comprising 19,601 companies and generating a turnover of approximately 13,000 million euros [2].

Valencian Community and Catalonia lead the fashion industry in Spain. In 2022, Valencian territory was again the first region of Spain in terms of the number of workers and companies, while Catalonia was the first in terms of industry turnover. The fashion industry in the Valencian Community registered 36,178 workers and 4,544 companies in 2022. The Valencian fashion industry turnover in 2022 was 4,016 million euros. Cataluña has 32863 employees, 4186 companies and a turnover of 4656 M€ [1].

The fashion sector in the Valencia region is led by the footwear and leather industry, which consists of 2170 companies (48% of the total). Textile production and clothing total 30 % and 22 %, respectively [1].

Sustainable fashion is becoming increasingly popular worldwide, and Spain is no exception. This trend focuses on producing products using organic and recycled materials, reducing chemicals, and minimizing environmental impact. Several associations of companies are leading this movement in Spain, such as the Sustainable Footwear Association of Spain, a non-profit organization whose purpose is to work towards a footwear industry that is more respectful of the environment, people, and economic growth. Another one is the Spanish Association of Sustainable Fashion (AMSE), a business organization that brings together 130 brands that sell clothing, footwear, and accessories made of eco-friendly materials and techniques. It is still a minority trend in the vast fashion sector, but the growing societal demand is giving it increasing strength.

II.2.2 Textile Waste Management

The legislative framework governing waste management is established at various administrative levels in Spain. National authorities are responsible for the national plans and attend to the authorization and inspection of waste shipments to/from third countries (outside the EU). At the regional level, the autonomous regions are responsible for issuing strategic waste management plans for each area. They also attend to the authorization, inspection and sanction of waste management activities and waste shipment to/from EU countries. Finally, at the local level, municipal authorities manage municipal waste (residential, industrial and commercial, offices and services), including separate collection and transportation of municipal solid waste.

An analysis of the composition of municipal waste shows that the average composition of municipal waste from the textile sector is 5% [4]. High-convenience collection services cover a low share of the population. Textile waste is mainly collected at civic amenity sites, which is less convenient for citizens. In cities, textiles are usually collected by social economy entities through containers in the streets (low-density bring points) [5].

In terms of textile waste management, an essential topic for VERDEinMED, according to the data from Eurostat in 2023^{63,64} shows that production of textile waste in the Spain T&C is:

Table 6. Production and recycling of textile waste (ton) of Spain's T&C sector.

	2012	2014	2016	2018	2020
Textile waste (ton)	76508	110321	98881	94334	100621
Recycling of textile wastes (ton)	14656	41329	34616	40344	35823
Recovered textile waste (%)	19	37	35	43	36

To improve resilience and promote the circular economy in the sector, the Ministry of Ecological Transition will allocate 195 million to promote the circular economy in the textile, fashion, and plastics sectors [7]. The aim is to finance projects that support the transition to a circular economy in these sectors. The allocation for the textile sector will be €97.5 million and will fund the best-selected initiatives, with amounts ranging from €100,000 to €10 million per project and beneficiary [8].

II.2.3 Legal Framework

Governments enact and update regulations to address environmental concerns in the textile industry, promoting sustainable practices and waste reduction.

Regulatory and certification entities play an essential role in all activity sectors. To ensure that companies and products comply with legal and regulatory requirements, regulatory and accreditation requirements should exist, as well as a commitment between these entities and companies, involving close and transparent collaboration with governmental agencies and certification bodies.

⁶³https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN__custom_7396092/bookmark/table?lang=en&bookmarkId=646ce0a9-2988-464d-bd35-1b67e726a8db

⁶⁴https://ec.europa.eu/eurostat/databrowser/view/ENV_WASTRT__custom_7396182/bookmark/table?lang=en&bookmarkId=a6d83881-d12c-441f-acd3-5c5dca6ec3dc

In Spain, waste management responsibilities are divided among different administrative levels:

- National authorities oversee national plans and regulate waste shipments to/from non-EU countries;
- Autonomous regions develop strategic waste management plans and authorise, inspect, and sanction waste management activities and shipments within the EU;
- Municipal authorities manage household, commercial, industrial, office, and service waste, including collection and transportation.

II.2.3.1 Regulations

Table 7. A short explanation of legislation in Spain in the T&C sector

Law 7/2022 on Waste and Contaminated Soils	Concretely, article 12.3 of law 7/2022 on waste and contaminated soils for a circular economy, included within the National Waste Management Framework Plan, provides a diagnosis of the situation, promoting a new strategy and guidelines for waste policy, as well as the minimum targets for separate collection, preparation for reuse, recycling, recovery and disposal. It is a crucial topic in the previously mentioned document that the destruction or disposal by landfill of unsold surplus of non-perishable products such as textiles is prohibited. In conclusion, these products must be destroyed following new sustainable regulations for consumer protection and safety reasons.
Andalucía's Circular Economy Law 3/2023	Concretely, Chapter IV focused on textile products, and Article 47 focused on targets for separate collections of textiles. Article 48 concentrates on research, development, and innovation in the textile industry and eco-design, and Article 49 focuses on the reuse and recycling of textiles.
Integrated Waste Plan for Andalusia. Towards a Circular Economy in the 2030 Horizon (PIRec 2030)	To update its prevention, recycling, recovery and disposal targets in line with the new European and national targets and to adapt its structure, content, duration and frequency of evaluation and revision to the provisions of the National Waste Framework Plan (PEMAR) 2016-2022 and the new European directives. Special priority will be given to the products identified in the value chains included in the Action Plan, such as electronics, ICT and textile products.
Law 5/2022 of Comunitat Valenciana Region on waste and circular economy	Main objectives: by 2025, a reduction of waste generation (weight) of 13% (compared with 2010) and, by 2030, 15%. • Promote the reuse of products and product components, among others, through donation and implementing systems that promote repair, reuse, and upgrading activities, particularly for electrical and electronic appliances, batteries and accumulators, textiles and furniture, packaging and construction materials and products. • Destruction or disposal by landfill of unsold surpluses of non-perishable products such as textiles, toys, or electrical appliances is prohibited. These surpluses must first be allocated to reuse channels, including donation, and when this is not possible, to preparation for reuse or the following waste hierarchy options. To facilitate preparation for reuse and high-quality recycling, local authorities must establish separate collections of textile waste before December 31, 2024.

II.2.3.2 Policies

Strategies	
Spain's Circular Economy Strategy 2030	It aims to become a reference framework for public administrations, businesses and citizens. It considers the following economic sectors to be particularly relevant: construction, industry, consumer goods, tourism, textiles and clothing, agri-food, fisheries, and forestry, for which it is carrying

	out specific planning and monitoring. Quantitative objectives are the following: • Reduce national material consumption by 30% relative to GDP, using 2010 as the reference year; • Reduce waste generation by 15% compared to 2010 levels; • Reduce food waste generation across the entire food chain: 50% reduction per capita at household and retail levels and 20% in production and supply chains from 2020 onwards; • Increase reuse and preparation for reuse to reach 10% of municipal waste generated; • Improve water use efficiency by 10%; • Reduce greenhouse gas emissions to below 10 million tons of CO₂ equivalent; Concerning textiles, this strategy states that the necessary regulations will be developed to facilitate the implementation of the extended producer responsibility instrument for textile waste so that the required resources are available to finance separate collection of textile waste and progress is made in preparing for reuse, recycling, and in the development of products using recycled materials.
CRECE value chain plan for the textile, leather and footwear industry in Andalusia	The objective is to promote industrial activities for manufacturing textiles, footwear or leather goods and garments with a value chain vision that includes strengthening the Andalusian industry's technological, logistical and commercial capacities.
Estrategia Territorial de la Comunitat Valenciana 2030	The Territorial Strategy of the Valencian Community is the instrument that establishes the objectives, goals, principles, and guidelines for planning the territory of the Valencian Community. It aims to achieve a more competitive, economically, environmentally respectful, and socially inclusive territory. Concerning waste and circular economy, the present strategy states that actions promoted must pursue zero waste, recycling all byproducts from production chains, and valorising produced waste.
Action Plans	
Plan Estatal Marco de Gestión de Residuos (PEMAR) 2016-2022	This Plan is the instrument to guide waste policy in Spain in the coming years, to promote the necessary measures to improve detected deficiencies, and to foster actions that provide better environmental outcomes, ensuring that Spain complies with legal objectives.
Valencia Autonomous Region Integrated Waste Management Plan (PIR)	PIR is a planning instrument that provides a strategic framework for comprehensive and coordinated waste management, culminating in eleven territorial waste plans. Updated by Decree 55/2019.
Subvention schemes	
Some Spanish subvention schemes and economic instruments supporting the textile or fashion industry circular economy are the following:	
Strategic Projects for the Economic Recovery and Transformation Towards Circular Economy (PERTE EC)	The Spanish Ecological Transition Ministry allocates 195 million euros to boost the circular economy in the textile and fashion sectors and plastics, aiming to finance projects contributing to the transition towards a circular economy. The initiative includes research and development, digitalisation, environmental protection, and waste management. Each project will receive a minimum of 100,000 euros and a maximum of 10,000,000 euros. The circular economy project has a budget of 492 million euros in subsidies, augmented by over 1.2 billion euros in public and private investment until 2026.
Furthermore, taxation and incentives in Spain are as follows:	
Taxes and bans for landfilling residual or biodegradable waste	Law 7/2022 on Waste and Contaminated Soils introduces a national landfill tax, replacing the taxes established by some regional authorities. The tax set at the national level establishes the minimum baseline; regional authorities (autonomous communities) can opt to increase this landfill tax in their respective regions. The tax distinguishes municipal solid waste (MSW) (40 EUR/t) and rejects the treatment of MSW (30 EUR/t). In general, the landfilling of waste without prior treatment is banned, and there is an express prohibition of the landfilling of separately collected waste and unsold surpluses of non-perishable products such as textiles, toys or electrical appliances. [5]

Taxes on municipal waste incineration	The new Law on Waste and Contaminated Soils introduces a tax on incineration at the national level, replacing the taxes currently established by the regional authorities. Regional authorities (autonomous communities) can increase this national landfill tax in their regions.
Incentives for the promotion of the circular economy in the textile, fashion, clothing and footwear sector	Biodiversity Foundation. The Foundation supports projects that contribute to reducing the consumption of virgin raw materials, reducing waste generation and improving waste management. The call for applications is for grants awarded on a competitive basis for projects that contribute to improving the sustainability and circularity of business processes in the textile and fashion sector and improving the competitiveness and innovation of the industrial fabric within the circular economy framework. This call for applications forms part of the Recovery, Transformation and Resilience Plan and the PERTE for the Circular Economy. • Call year: 2024 • Total amount of the call for proposals: The total amount available is 97.5 million euros. • The amount per project is: The funding range is between €100,000 and €10 million. The source of funding is The Recovery, Transformation and Resilience Plan.

II.2.3.3 Initiatives

The Commission will propose a comprehensive EU strategy for textile products, considering inputs from the industry and other stakeholders, aiming to promote the market for sustainable and circular textile products in the EU. This strategy will include the following measures:

- We are implementing a new framework for sustainable products in the textile sector based on eco-design.
- Promote incentives and support for "product as a service" models, circular materials, and production processes and enhance transparency through international cooperation.
- Advice on achieving high levels of separate collection of textile waste.
- Promoting the sorting, reusing, and recycling of textile products

Supporting structures	
The most relevant supporting structures of the textile and fashion sector in the Spanish Region are listed below.	
The Textile Industry Research Association (AITEK)	It is a research & innovation centre formed by Valencia Region companies and supported by the regional government. The AITEK's core objective is to create and transfer knowledge of textiles to the private sector, making the textile industry more competitive and opening up doors to new opportunities with a high added-value factor. AITEK has a network of ten international offices covering its associates and clients in fifty countries, leading to the centre becoming one of Europe's leading research centres.
The Association of Textile Businesses of the Region of Valencia (ATEVAL)	whose primary purpose is to defend and represent the common interests of companies in the Valencian textile industry. With more than 300 member companies, ATEVAL's main objective is to help its associates to be more efficient in their business models, save costs, and receive professional advice and institutional and commercial support.
Ontinyent Textile Cluster	This cluster was formed by the city council of Ontinyent and the textile sector of this municipality to guarantee the quality and origin of sanitary textile products made in Ontinyent City.
Moda + sostenible València	Las Naves city of València municipal innovation centre. This working group focuses on sustainable fashion in light of its environmental impact. This group organizes workshops, seminars, training activities, and festivals (such as the Upcycling Festival)—cultural and Creative Industries action line.
Seville Clothing Manufacturers' Association.	The association was established in 1977 as a non-profit organization representing companies' textile and clothing sector interests. Its formation was prompted by the publication of the Order of 14 April 1977 (Law of Associations). The activities they undertake include the following:

	• FORCEM offers companies the opportunity for their employees to participate in training courses and gain access to information on labour and taxation. • The dissemination of all orders and laws published in the BOE and BOJA, as well as any other pertinent information, to companies in the textile and clothing sector. • The Ministry of Science and Technology has requested assistance with projects on new technologies. • The organization also holds seminars on various topics of interest to the textile and clothing sector, including regulations on labelling textile products, thermo-fixing, machinery, etc. The installation of a textile laboratory for the analysis of fabrics is underway.
SOSTENIO. Assoc. para la innovación de la moda sostenible	SOSTENIO is a Seville-based organization that aims to raise awareness of sustainable fashion's advantages and promote and stimulate innovation in its creation, production, sale and use.
Association for the Management of Textile and Footwear Waste	It represents the first Spanish Collective System of Extended Producer Responsibility (SCRAP in Spanish) that boosts textile and footwear recycling in Spain. The participating companies are dedicated to managing textile and footwear waste, aiming to enhance their capacity to address challenges and transition towards a more innovative and sustainable model.
Agreement for Circular Fashion in Catalonia	An exciting initiative has been launched in Catalonia, where an Agreement for Circular Fashion in Catalonia. The Agreement for Circular Fashion emerged to coordinate efforts to address the sector's challenges and implement a clear vision towards a more sustainable and circular fashion. Some of the objectives are the following: • The agreement sets objectives for each segment of the textile chain, which address the sector's environmental, social, and economic challenges. • In the manufacturing sector, for example, it aims to increase product durability and the percentage of recycled material incorporated into fabrics, reduce and eliminate the use of harmful materials, increase reuse through the implementation of new business models, and deploy cleaner and more efficient production strategies, among other scaling and innovation measures. To reduce between 5 and 10% of textile waste generation, achieve between 25 and 30% in the selective collection of this fraction by 2024, and increase the percentage of material valorisation of the selectively collected part. Specifically, between 55 and 60% must be allocated to preparation for reuse and between 40 and 50% to recycling textile waste.

II.2.4 R-strategies Initiatives

A survey of initiatives has been developed, relating real case studies to r-strategies in Spain. Table 8 provides an overview of each initiative, project, innovative process, technology, or product and an outline of its maturity level.

Table 8. R-strategies initiatives in the Spanish landscape.

R-strategies	Name of the initiative	Maturity Level	Description	Contact
00 Refuse	LAS NAVES - Sustainable fashion working group (city of València)	full-scale solution	LAS NAVES innovation centre, run by the City Council of Valencia, launched 2021 a new working group addressing sustainable fashion, an area of creation that significantly impacts the environment. As part of the work to support the Cultural and Creative Industries in the city of VMAcontexalencia, Las Naves will promote this 'Fashion + Sustainable' working group, aligned with the innovation strategy Missions València 2030, which aims, among other things, for a more sustainable city. Some activities are the following: - Upcycling festival. This event aims to bring sustainable fashion closer to all audiences through Upcycling. With "upcycling" or creative recycling, the aim is to give new life to garments and textiles, applying creativity and preventing them from becoming waste. During the event, projects and brands that use these techniques will participate. - Future of fashion congress: From ideas to action. An international sustainable fashion congress was established as a platform for creation, experimentation, and knowledge exchange centred around design for transforming the fashion industry. Organizations of workshops, dissemination events, meetings, and seminars about sustainable fashion invite international and local actors such as Bárbara León, Re Click, and CoCosint Coop. V, etc. Also R1.	https://www.lasnaves.com/ https://www.lasnaves.com/las-naves-organiza-el-ii-upcycling-festival-para-reciclar-creativamente-la-ropa/?lang=es https://futurefashion.design/
	Circular Fashion Agreement	Full-scale solution	The Circular Fashion Agreement is a voluntary agreement among (Catalonian) institutions and companies from the different links of the Catalan textile value chain, which will facilitate the incorporation of circularity measures, the promotion of collaborative projects, and the improvement of sectoral competitiveness.	https://mediambient.gencat.cat/ca/05_ambits_dactuacio/empresa_i_produccio_sostenible/economia_verda/catalunya_circular/english-

01 Rethink			The stakeholders of the textile value chain that are integrated into the Agreement for Circular Fashion work together to transform the way the textile sector in Catalonia (and, by extension, the rest of Spain) produces, supplies, consumes, and uses clothing and textiles to reduce textile waste. Several thematic groups have been created to focus on deploying necessary measures. The current groups are the following: - Collection, classification, and resale of textile waste. - Development of a local textile waste recycling industry. - Promoting eco-design, environmental labels, and public procurement in the textile value chain. - Consumer awareness of responsible textile consumption and the dissemination of the Agreement. Circular Fashion Pact 2024 objectives are: - Reduce the generation of textile waste by 5-10% - Increase up to 25-30% of textile waste collected separately - Increase the % of textile waste collected separately that is recycled. 55-60% of textile waste is prepared for reuse. 40-50% of textile waste recycled	version/circular-fashion-agreement/ https://mediambient.gencat.cat/web/content/home/ambits_dactuacio/empresa_i_producto_sostenible/economia_verda/Obs-economia/moda-circular/Circular-Fashion-Pact_220419_summary.pdf https://youtu.be/7lOYriWAQjA
	RUN TO WEAR	Full-scale solution	The platform, which is based on the circular economy, enables customers to share and prolong the life cycle of their clothing, thereby optimizing its value. They are the first online store in Spain to offer a convenient and affordable way to purchase clothing in an eco-friendly manner. Runwear users upload their clothes and receive tokens, the platform's currency. Each item of clothing is worth a token, and wearing it increases your chances of winning another item worth the same token. The company's objective is to rethink the current fashion industry, making it more sustainable and affordable.	Claudia Ojeda Email: claudia@runtowear.com Web: www.runtowear.com
02 Reduce	Ecoalf	full-scale solution	It leads the ranking of environmental responsibility in Spain.	+34 919025049 contacto@ecoalf.com
	Cajón de Sastre	full-scale solution	It aims to raise awareness and involvement through participatory action. The aim is to strengthen the sense of community and promote recycling and reducing and reusing clothes. To this end, an online meeting place has been created to promote the sustainable and circular use of clothing. The 3 objectives: - "mercadillo" Purpose: to exchange clothes and give them a second life. - "FALTRIQUERA". Purpose: to give textiles a second life. There is a section on the website where you can upload tricks or ideas that will allow us to provide any unused textile garment a second life, transforming it for a new use.	https://www.ceoe.es/es/ceoe-news/sostenibilidad/iniciativa-el-cajon-de-sastre-lo-que-puedes-hacer-por-reducir-los-residuos

			- DONATE". Purpose of solidarity.	
03 Re-use	Humana	full-scale solution	To protect the environment through the reuse of textiles and to improve the living conditions of developing communities, both nationally and internationally, through programmes based on solidarity. Also R2	Polígono Industrial L'Ametlla Park c/ Aiguafreda 12 08480 L'Ametlla del Vallès (Barcelona) Tel. (+34) 93 840 21 82
04 Repair	Repair Café Textil	full-scale solution	This initiative proposes the right to repair as a core strategy for enhancing sustainability and circularity in the textile and fashion industries.	https://www.lacasaencendida.es/medio-ambiente/repair-cafe-textil
05 Refurbish	Veritas Textile Project	in development phase	The initiative was launched at the end of 2019 and is currently available in the Metropolitan Area of Barcelona. Veritas Textile Project uses a reverse logistics system to work through the Veritas online shop. Thus, once Veritas delivers the purchase, it collects the clothes, footwear and accessories that the buyer wishes to donate free of charge. The items are then transferred to the Humana Foundation, which is responsible for giving them a second life. This project is carried out in collaboration with Humana and Etransport, and has the support of the Agència de Residus de Catalunya.	https://veritas.es/veritas-textile-project/
	FAN·TOCHÉ	Full-scale solution	The brand is patented by Cáritas Diocesana de Asidonia-Jerez and is committed to upcycling. Upcycling involves creatively recycling out-of-stock, defective or second-hand garments, creating new designs with minimal environmental impact. It is achieved by avoiding decomposition or creating new materials from scratch. This fashion brand was created to generate employment opportunities, with the profits from its activity being reinvested in creating decent jobs for people in situations of social exclusion.	Parque Empresarial Jerez C/Newton, nº 2 11407- Jerez de la Frontera Tlfn: 956 06 63 45
06 Remanufacture	NATURATEX	in development phase	The NATURATEX project aims to research and develop a new generation of fabrics based on textile fibres obtained from natural and renewable sources (alternatives to cotton and synthetic fibres from fossil sources) and the reintroduction of recycled raw materials. To this end, they will conduct a comprehensive review of the entire production chain, from the raw material to the garment proof of concept, focusing on critical environmental and industrial indicators relevant to the retail sector.	https://cetim.es/portfolio-item/naturatex/?lang=en
07 Repurpose	Loopamid	demonstrative level	The Loopamid project, offered by German chemical company BASF and Inditex in partnership with Moda-re, is a collaborative effort to increase sustainability in the textile industry. Loopamid is a synthetic polyamide made entirely from regenerated textile waste.	https://www.loopamid.com/global/en.html

			The new material enables the chemical recycling of textile waste into high-quality synthetic fibres. The development of this novel polyamide enables the reuse of previously non-recyclable items, thereby reducing the production of fossil-based resources. The first result of this collaborative initiative was the creation of a coat made entirely from nylon 6 derived from textile recycling.	
08 Recycle	Circular Economy Project in the Sierra of Cadiz.	Pilot	The Sierra of Cádiz Circular Economy Project is a project whose geographical scope is the 19 municipalities comprising the Sierra de Cádiz region and whose material scope is managing municipal waste generated there. The project is designed with the primary objective of achieving the three key objectives of the circular economy: 1. <u>The environmental objective</u> is to comply with the recycling percentages of municipal waste established by the new Law 7/2022 on garbage. 2. <u>The economic objective</u> is to establish a business network that will utilize a significant portion of the municipal waste fractions within the Sierra de Cádiz region. 3. <u>The social objective</u> is to create stable, quality green employment in the area and to raise environmental awareness among citizens.	https://www.juntadeandalucia.es/medioambiente/portal/areas-tematicas/residuos-suelos-contaminados-economia-circular/economia-circular/proyecto-sierra-de-cadiz
	RECICLATEX	full-scale solution	Textile recycling is a means of socio-employment insertion of people with disabilities and environmental protection. RECICLATEX is responsible for: • Socio-employment insertion: It focuses on the search for community and social well-being and the employment insertion of people with physical or mental disabilities. • Commitment to the environment: Through the collection of textile waste, contribution to the circular economy through the transformation of waste and its subsequent sale. • Non-profit social interest: Reducing the environmental impact of waste and textile material on the market is a crucial objective. Furthermore, the integration of people with disabilities is supported. Also R3 in R4	Tel. 954 033 100 EMAIL: administracion@reciclatex.com Seville
09 Recover	Recover	Full-scale solution	Recovo solves one of the industry's biggest problems: textile waste. The company's mission is to transform waste into value through three core strategies: reducing waste and pollution, preserving natural resources, and extending the life of materials worldwide through technology.	https://recovo.co/es

II.2.5 Social Responsibility & Awareness-raising Initiatives

Spain's social initiatives were analysed to assess their impact on the community's awareness of clothing consumption, use and end-of-life disposal.

In the Spanish textile and clothing industry, the commitment to social responsibility is reflected in the integrity, ethics, and transparency of companies and organizations in all their practices in respecting human rights throughout the value chain. The initiatives are diverse, encompassing various sectors, including research **centres**, companies, NGOs, the government and the general community.

II.2.5.1 Awareness campaigns

There have not been any specific awareness campaigns in Spain besides those that particular NGOs and textile management companies run concerning sustainable, circular and ethical fashion, **reusing**, upcycling and recycling textiles, clothing, footwear and accessories.

Raising awareness about recycling textile material

Entity: Consorci Terra A2 and Sant Vicent del Raspeig municipal council. June 2022.

Description: An initiative focused on raising awareness and selectively collecting textile waste for full reuse and mechanical recycling for new spinning and garment processes. During 2 days, collection points were set up, and the population was informed about the appropriate locations for these waste materials to be disposed of, as they should never be placed in regular containers but instead be taken to those exclusively dedicated to textiles.

Website: <https://consorcioresiduosa2.diputacionalicante.es/terratextil-es/>

RECYCLE YOUR CLOTHES. GIVE THEM A NEW LIFE

Entity: Novelda city council. July 2021.

Description: The aim is to inform and raise awareness among citizens about the responsible use and consumption of clothing, **emphasizing** a series of actions to **optimize** use and reduce consumption. To facilitate textile recycling, the City Council increased the number of containers installed in public areas from 12 to 18 and renovated the existing ones. Clothing management is carried out by the NGO "Recicla Alicante."

Website: <https://www.novelda.es/el-ayuntamiento-pone-en-marcha-la-campana-recicla-tu-ropa-dale-una-nueva-vida>

<http://www.novelda.es/medio-ambiente-incrementa-el-numero-de-contenedores-para-la-recogida-de-textiles>

PROMOTION OF TEXTILE RECYCLING

Entity: Consorci Ribera-Valldigna.

Description: Environmental educators conduct textile reduction, reuse, and recycling awareness activities.

Website: <https://www.alzira.es/es/alzira-fomenta-el-reciclaje-del-textil/>



CICODE COURSE

Workshop on clean clothes, recycling and responsible consumption of clothes.

Entity: SETEM Andalucía

Date: April 2021

Description: The programme included activities such as the Clothes World Map, an alphabet soup on responsible consumption, clothes recycling workshops, videos and songs for reflection, and spaces for dialogue. These activities were designed to promote the values of more accountable and sustainable consumption among young people of different ages.

Website: <https://www.setem.org/andalucia/curso-cicode-taller-ropa-limpia-reciclaje-y-consumo-responsable-de-ropa/>

Clothes have "more lives than a cat."

Entity: Mayor of Granada and Inagra.

Date: October 2023

Description: The "Clothes with the Lives of a Cat" campaign aims to encourage children and young people from educational centres to collaborate by donating their unused or damaged clothes to the containers that Inagra distributes in schools. It will ensure that these clothes are not discarded inappropriately.

Website: <https://www.youtube.com/watch?v=lzDxu9itOTc>

Madre Coraje launches its #VísteteDeCoraje campaign to promote Fashion Solidarity.

Entity: ONG Madre Coraje

Date: June 2020

Description: The objective is to promote the circular economy, reuse, fulfil the SDGs, generate funds for social and educational projects, and pay attention to vulnerable families.

Website: <https://www.madrecoraje.org/vistetedecoraje/>

The Clean Clothes Campaign

The campaign is an international initiative coordinated at the national level by the SETEM Federation. Its objective is to improve working conditions in the textile sector. To achieve this, the campaign denounces, raises awareness and pressures large multinationals to be transparent throughout their production chain. One of the key objectives is to minimise the environmental impact of textile production.

Website: <http://www.ropalimpia.org/>

THE CARITAS TEXTILE PROJECT COLLECTED 43,000 TONNES OF CLOTHING FOR REUSE AND RECYCLING.

The non-profit social initiative cooperative promoted by Caritas, Moda re-, ended 2022 with the collection of 42,975,475 kilos of used textiles, 2 million kilos more than the previous year. It represents more than 42% of the total collected in Spain and positions the cooperative as the largest operator in Spain and one of the leading operators in Southern Europe.

Website: <https://www.residuosprofesional.com/proyecto-textil-caritas-2022-reutilizacion-reciclaje/>



II.2.5.2 Educational Programs

REDUCE, RECYCLE, AND REUSE IN FASHION

Provider: Valencian Technological Textile Institute (AITEEX).

Description: Free 60-hour course offered by AITEEX 2023 to learn about textile sustainability concepts, pattern-making and garment construction under ecological and sustainable principles, and how to reuse garments while preserving the idea and following fashion trends.

Website: <https://www.aitex.es/courses/reducir-reciclar-y-reutilizar-en-moda/>

Ecodesign in the textile sector

Provider: Valencian Technological Textile Institute (AITEEX)

Description: Textile companies must design and develop products based on eco-sustainable concepts. This course aims to understand and apply concepts such as circular economy, carbon footprint, and water footprint to the design of textile products. 28 hours.

Website: <https://www.aitex.es/courses/ecodiseno-sector-textil/>

Textile Sustainability and Current Certifications

Provider: Valencian Technological Textile Institute (AITEEX)

Description: To learn about the parameters involved in the sustainability of textile products. Aimed at quality technicians and product managers in the textile apparel sector, you will acquire knowledge about current certifications in sustainability, along with current regulations and requirements for their implementation. 8 hours.

Website: <https://www.aitex.es/courses/curso-sostenibilidad-textil-y-certificaciones-actuales-6a-edicion/>

Upcycling workshop: A New Life for Clothes

Provider: Espacio Campingás.

Description: This workshop demonstrates the textile 'upcycling' process, whereby paint transforms a used garment into an original piece. Upcycling is a specific form of recycling that gives a new life to a discarded material or object. Unlike simple recycling, where the raw material of the object or product is used, in this case, it is given a creative 'twist', creating an original piece.

Moda Re-

Provider: Spanish Caritas Confederation.

Description: They disseminate new knowledge engagingly, offering guided tours of the treatment plants, conducting environmental education sessions based on the specific case of textiles in educational institutions, and participating in environmental initiatives focused on responsible consumption.

They provide educational resources for schools and academic **centres** that enable them to work on sustainability, waste reduction, reuse and recycling, responsible consumption and the circular economy based on the specific case of textiles.

Website: <https://modare.org/quienes-somos/>



'Tejidos Educativos' Programme

Provider: Humana.

Description: In addition to the selective textile waste collection initiative, Humana has developed an awareness programme to raise awareness of the importance of waste prevention and the reuse of used textiles. This programme also highlights the relationship between textile reuse, global sustainability, environmental protection, and development cooperation.

Website: <https://humanaenaccion.wordpress.com/>

RECAPACICLA

Provider: Junta de Andalucía.

Description: Funded by the Department of Sustainability, Environment and Blue Economy of the Andalusian Regional Government, the Andalusian Federation of Municipalities and Provinces, Ecoembes and Ecovidrio. These institutions collaborate to promote and encourage the selective collection, recovery and recycling of packaging waste by **organizing** awareness-raising campaigns. Their training courses include 'Eco-design strategies in fashion.'

Website: https://www.juntadeandalucia.es/medioambiente/portal/landing-page-%C3%ADndice/-/asset_publisher/zX2ouZa4r1Rf/content/recapacicla-1/20151

II.2.5.3 NGOs – Non-government organizations (NGO)s initiatives

NGO Recicla Alicante

Description: It focuses on social-humanitarian and environmental work, collecting used clothing and footwear for reuse and recycling. Recicla Alicante repurposes clothing in good condition as donations for emergency packages, while clothing unsuitable for wear is sent to a recycling plant.

Website: <https://reciclaalicante.org/>

NGO Debra Piel de Mariposa

Description: It focuses on social-humanitarian and environmental work, collecting used clothing and footwear for reuse and recycling. Recicla Alicante repurposes clothing in good condition as donations for emergency packages, while clothing unsuitable for wear is sent to a recycling plant.

Website: <https://pieldemariposa.es/>

NGO Rastro Betel

Description: It **specializes** in home collections of items, such as clothing, furniture, appliances, and scrap metal, if they can be reused. It invests its proceeds in a program to support people in situations of social exclusion, mainly focusing on drug addicts.

Website: <https://www.rastrobetel.org>

El Rastrell

Description: It focuses on the home collection of all items, including clothing. Once the items are sorted, they are transported to their two stores in Valencia to be resold at a low price or taken to a recycling platform to use the raw materials. While fulfilling its recycling mission, it creates job opportunities related to its activities for disadvantaged individuals.



Website: <https://rastrell.org>

NGO Madre Coraje

Description: NGO Madre Coraje's core mission is to promote recycling as a funding source and an environmentally conscious initiative. The **organization** works to educate the public on waste management and responsible consumption, and it reuses products collected from the public. These products are sold through Solidarity Shops and external companies, generating funds for social, educational, and cooperative actions.

Website: <https://www.madrecoraje.org/>

NGO SETEM Andalusia

Description: SETEM Andalusia is a non-governmental **organization** (NGO) established in 1991 with a clear objective of driving social transformation through collaboration, international volunteering, fair trade and education for development.

The **organization** has offices in Granada and Cordoba. It is involved in various initiatives, including the "Clean Clothes" campaign, which aims to reduce the environmental impact of textile production.

Website: <https://www.setem.org/andalucia/>

Cáritas Diocesana de Sevilla

Description: Caritas has opened a clothing recycling shop in the capital of the Andalusian region. The goal is to provide textile resources to individuals and communities lacking them and promote reuse and environmental responsibility.

Website: <https://caritas-sevilla.org/>

II.2.5.4 Research projects – Specific research partnership

Some research is conducted through the:

Consorcio CREA

Description: CREA waste Consortium is involved in a study entitled BIOREQ II, together with the Valencia Footwear Technology Center (INESCOP, <https://inescop.es/es/>) and other public and private organizations, whose aim is to evaluate biodegradability and compostability of leather and fur waste from the footwear sector.

Website: <https://inescop.es/es/inescop/actividad/proyectos-i-d-i/proyectos-i-d-i-ivace/ivace/51-2020-1/572-bioreq-ii>

AITEX, the Valencian Technological Textile Institute

Description: The MELTEX project is to validate the applicability of recycled materials from thermoplastic textiles to new textile raw materials and products of related industries. It will foster intersectoral cooperation and create business opportunities in textile companies generating thermoplastic waste, either in their production process or in other sectors related to textiles, albeit unrelated to their daily activities.

The MELTEX project is funded by IVACE (Valencia Region Government). ERDF funds.

Website: <https://www.aitex.es/portfolio/meltex-2021-economia-circular-aplicada-a-residuos-textiles-de-naturaleza-termoplastica/>

Besides the MELTEX innovative project, AITEX is conducting other R&D projects such as the

ones included in the following link: <https://www.aitex.es/innovacionydesarrollo/>

The Association of Textile Businesses of the Region of Valencia (ATEVAL)

Description: ECOMODA In a European ERASMUS+ program, the project is to create a digital environment that allows young people to develop sustainable business skills in the fashion industry.

<https://ateval.com/proyectos-ateval/ecomoda/>
https://ecomoda-programme.eu/leaflet/leaflet_en.pdf

The Association of Textile Businesses of the Region of Valencia (ATEVAL)

Description: ATEVAL participates in a European project within the INTERREG program that promotes collaboration in research and development for the textile industry to establish a systematic circular economy business model throughout the EU. RegioGreenTex encourages research and development collaboration among 43 partners from the four main sectors of society - industry, government, research institutes, and the public sector - for the textile industry. The partners come from 11 regions in 8 European countries.

<https://www.regiogreentex.eu/dashboards/home>

The Association of Textile Businesses of the Region of Valencia (ATEVAL)

Description: ATEVAL participates in a European project within the LIFE program, LIFE REWEART, the aim of which is to generalize the proactive waste management in the footwear sector at the design stage and conceive a new business model, services, and related tools that allow the selection of the most suitable materials and processes to create a new product of 100% recycled and organic footwear.

<https://life-reweart.eu/>

The Association of Textile Businesses of the Region of Valencia (ATEVAL)

Description: ADATEX is a region-funded project whose objective is to analyze the current situation of post-consumer textile waste in terms of generation and management. This will allow the current problem of textile waste accumulation in the Valencian Community to be assessed so that Public Administrations can jointly address, together with all involved stakeholders, the sector's adaptation to the new Waste and Contaminated Soils Law for a Circular Economy,

<https://ateval.com/proyectos-ateval/adatex/>.

II.2.5.5 Collaborative Initiatives

Description: The PROSTECO project is a collaboration initiative promoted by AITEX (the Textile Industry Research Association Centre) and the Valencia Regional government. PROSTECO aims to transfer to companies the knowledge of sustainable processes that are scalable at an industrial level so they can implement them, thus improving the production of the textile and cosmetic sectors.

Website and further details: <https://www.aitex.es/portfolio/sustainable-processes-textile-cosmetic-sector/?lang=en>

Description: VALHABITAT 2023 project that seeks to promote strategic design among companies in the home textile sector. This project was developed by AITEX and funded by the Valencia Regional Government (the Textile Industry Research Association Centre) after



. an exhaustive investigation of social trends, markets, and products, promoting strategic and sustainable design for home textile companies.

. Website: <https://www.aitex.es/portfolio/valhabitat-2023-investigando-tendencias-cualitativas-cuantitativas-fomentando-diseno-estrategico-empresas-textiles-hogar/>

Description: FUNDACIÓ DEL DISSENY Comunitat Valenciana is a private and non-profit organization promoting design, encouraging institutions, industry and companies from different sectors to incorporate design into their strategies. The Design Foundation of the Region of Valencia was formed to offer a space that joins the design ecosystem, which aims to support the culture of knowledge in the creative, economic and social spheres and emphasize the importance of design as a tool for creating value. A necessary tool to increase the competitiveness of companies and contribute to a better quality of life for citizens. The future of fashion and its sustainability is one of the action lines of this foundation.

This entity grouped private sector, public entities and other associations such as ATEVAL (Association of Textile Businesses of the Region of Valencia)

Website: <https://fundaciodisseny.com/en/home-page/>

II.2.6 SWOT Analysis

The following table presents the SWOT analysis for the SPAIN paradigm to identify strengths and weaknesses, opportunities and threats in the local management and recycling of textile waste, with a vision of the implications for global efforts.

Table 9. SWOT Analysis for Textile Waste Management and Recycling in Spain

Strengths	Weaknesses
- The "regenerated" technology is well known in Spain, and there is a long tradition and vast experience in this field [1] - Experience of companies in the sector in integrating into international markets. - Some chemical technologies used in textile recycling are very advanced, such as polyester recycling.	- Lack of innovation to attract the public to use second-hand clothing. - Lack of legal certainty due to the complexity of the regulatory framework affecting or influencing the development of industrial activity. - Uncertainty in the collection process of textile waste: Where will it be collected? Separation of textiles? - Many municipalities lack waste management planning, information collection, and communication with other administrations and citizens. [9] - Local Entities will also require technical assistance to identify, select, and implement the new measures to be developed. [9] - Information and training for citizens, businesses, and industries are key factors in achieving their active collaboration in the new habits and behaviours required by the new management model. [9]
Chances/ Opportunities	Threats
- The global and local context of textile waste is evolving (Spain will soon ban the burning of excess production) - More than one million tons of textile waste are managed following circular economy ideas and logic. - New synergies will emerge: Different actors and extended producer responsibility schemes will coexist. - New sources of funding need to be identified and enabled for local authorities if Spain, as a member state of the European Union, intends to fulfil its obligations arising from the new legislative framework. [9] - Regarding the separate collection and subsequent treatment of new fractions (law 07/2022). As a solution, expand the producer's responsibility to these flows. [9]	- Local authorities must make an economic and logistical effort to implement the provisions of the Law on Waste and Contaminated Land. - Cost restructuring and viability: certain companies must become authorized waste managers. - Many expensive facilities must be built to deal with the massive waste produced.

II.3 Portugal

II.3.1 Overview of Portugal's Textile Business Sector

Portugal's Textile & Clothing (T&C) sector has earned global recognition and prestige for its quality, innovation, creativity, resilience and responsiveness. Portugal is one of the most important players in Europe. Most production facilities in Portugal own the entire production chain, from spinning to dyeing and finishing, and they are mainly located in the **northern part of Portugal** (Porto, Braga, Guimarães, Famalicão). According to the first Sustainability Report of the Portuguese T&C sector, more than 8000 companies are dedicated to the textile industry and around 3500 to the clothing sector (Figure 1).⁶⁵

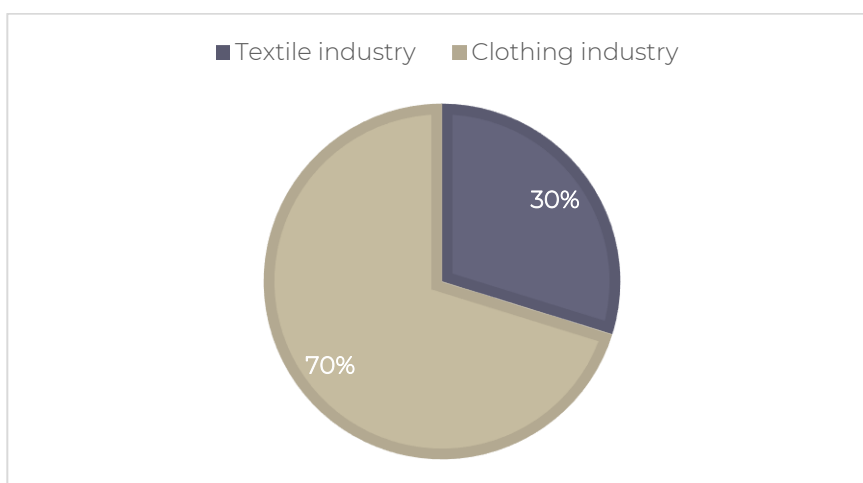


Figure 9. Companies from the T&C sector in Portugal in 2022.

Data from Textile and Clothing Association of Portugal (ATP))⁶⁶ In 2022, the Portuguese T&C sector represented 8% of the turnover in the Portuguese manufacturing industry and 5% of the EU T&C turnover. Regarding employment, 19% of the employment in the Portuguese manufacturing industry is provided by the T & C sector, representing almost 10% of the EU T&C employment. The **north** of Portugal has a higher employment concentration in this sector when compared with other European Regions (EU-28).⁶⁷ Regarding exports, textiles (excluding home textiles) increased by 17%, clothing by 13% and home textiles and other made-up articles by 5% compared to 2021. The top 5 markets are Spain, France, Germany, USA and Italy. Recent data shows that the 2023 export value decreased by around 5% compared to 2022⁶⁸.

In recent years, the Portuguese T&C sector has intensified its focus on innovation and sustainability by transitioning towards using more renewable resources in opposition to materials from fossil origin and increasing the production of materials with recycled content. To help consumers **identify** more ecological products, many companies go through a certification process to obtain different product eco-labels. In fact, in 2022, 96% of companies reported to have at least one certification. OEKO-TEX® Standard 100 (31% of the companies), GOTS (25%), OCS (18%), GRS (15%) and RCS (11%) are the certifications most used by players⁶⁹.

⁶⁵ https://static.citeve.pt/share/2024-03/31eef65c-a86f-4a52-ac20-325dfd0b2d9/e878fbf3-b07c-4163-a63a-ab697a7a5251/pt_pt_file/286ac85d-b50b-486a-a68a-9507fc174de1/20240327142740/Relatorio_Sustentabilidade_STV_be@t_vPT_.pdf

⁶⁶ <https://atp.pt/pt-pt/>

⁶⁷ <https://keep.eu/projects/18768/REsearch-centers-of-Excellence-EN/>

⁶⁸ <https://portugaltextil.com/exportacoes-da-itv-confirmam-queda/>

⁶⁹ <https://static.citeve.pt/share/2024-03/31eef65c-a86f-4a52-ac20-325dfd0b2d9/e878fbf3-b07c-4163-a63a->

II.3.2 Textile Waste Management

In terms of textile waste management, an essential topic for VERDEinMED, according to the data from Eurostat in 2023^{70,71} shows that production of textile waste in the Portuguese T&C sector has been increasing significantly, except for 2020, due to COVID-19 (Table 10). Similarly, as expected, the quantity of recycled textile wastes from the Portuguese T&C sector has increased.

Table 10. Production and recycling of textile waste (ton) of the Portuguese T&C sector.

	2012	2014	2016	2018	2020
Textile waste (ton)	40.948	45.986	56.160	68.149	43.881
Recycling of textile wastes (ton)	4.931 (12%)	7.281 (15,8%)	8.287 (14,8%)	9.956 (14,6%)	7.979 (18,2%)

Recent data from APA – Portuguese Environment Agency – shows that, in 2022, the production of urban waste in Portugal was more than 5000 thousand tons, with the value remaining practically constant compared to the value recorded in 2021. Around 4% corresponded to textiles.^{72,73}

It is possible to find more information about textile waste management in the first Sustainability Report of the Portuguese T&C sector launched in 2023. Within the scope of the be@t project⁷⁴ Led by CITEVE, this report aims to quantify some indicators regarding sustainability related to environmental, social and governance pillars. Data presented in the report are based on a sample of companies in the T & C sector from 2019 – 2022. Regarding textile and waste management, this report shows that the amount of generated waste is reduced by 13%, and residues that end up in landfills are reduced by 28%. Textile fibres and paper packaging are the categories of waste with the highest weight in total quantity. Regarding hazardous and non-hazardous wastes, according to the report, there was an increase of 32% in non-valorised dangerous wastes, which can be partially explained by the 9% increase in companies that started to quantify and report this indicator. Figure 10 shows the type of process involved.⁷⁵

ab697a7a5251/pt_pt__file/286ac85d-b50b-486a-a68a-9507fc174de1/20240327142740/Relatorio_Sustentabilidade_STV_be@t_vPT_.pdf

⁷⁰ https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN__custom_7396092/bookmark/table?lang=en&bookmarkId=646ce0a9-2988-464d-bd35-1b67e726a8db

⁷¹ https://ec.europa.eu/eurostat/databrowser/view/ENV_WASTRT__custom_7396182/bookmark/table?lang=en&bookmarkId=a6d83881-d12c-441f-acd3-5c5dca6ec3dc

⁷² https://apambiente.pt/sites/default/files/_Residuos/Producao_Gest%C3%A3o_Residuos/Dados%20RU/RARU_2022_V1.pdf

⁷³ <https://noctula.pt/residuos-texteis-em-portugal-cerca-de-200-mil-toneladas-por-ano-vai-para-o-lixo/>

⁷⁴ <https://bioeconomy-at-textiles.com/>

⁷⁵ https://static.citeve.pt/share/2024-03/31eef65c-a86f-4a52-ac20-325df1d0b2d9/e878fbf3-b07c-4163-a63a-ab697a7a5251/pt_pt__file/286ac85d-b50b-486a-a68a-9507fc174de1/20240327142740/Relatorio_Sustentabilidade_STV_be@t_vPT_.pdf

ab697a7a5251/pt_pt__file/286ac85d-b50b-486a-a68a-9507fc174de1/20240327142740/Relatorio_Sustentabilidade_STV_be@t_vPT_.pdf

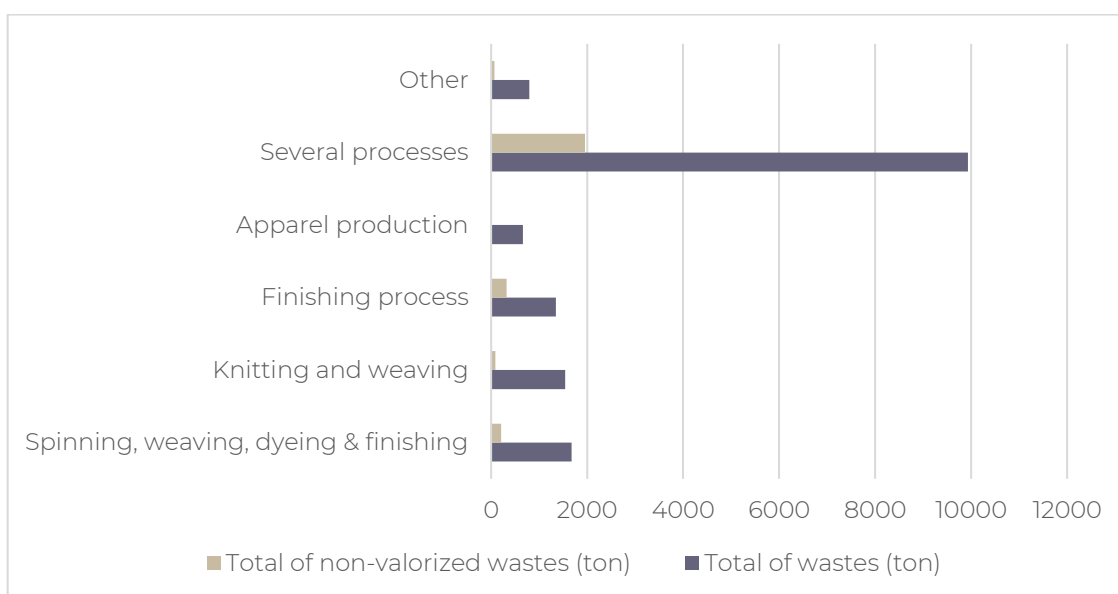


Figure 10. Total of generated and non-valORIZED wastes in 2022 by type of process.

II.3.3 Legal Framework

Regulatory and certification entities play an essential role in all activity sectors. To ensure that companies and products comply with legal and regulatory requirements, regulatory and accreditation requirements should exist, as well as a commitment between these entities and companies, involving close and transparent collaboration with governmental agencies and certification bodies. IPAC⁷⁶ (Portuguese Institute for Accreditation) is Portugal's national accreditation body, which assesses the competence and capability of organizations that provide certification, testing, inspection, and calibration services. According to the Sustainability Report of the Portuguese T&C sector, since 2019, companies increasingly adopt certifications (Figure 11).

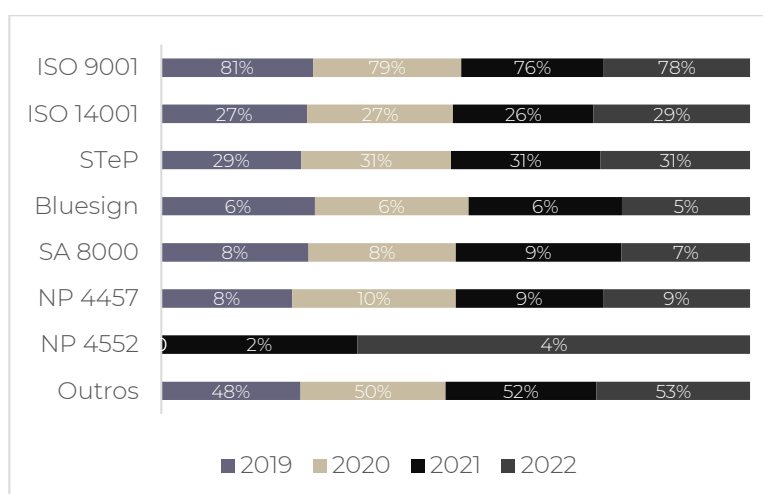


Figure 11. Certifications adopted by the Portuguese companies of the T&C sector from 2019 to 2022 (sample: 68% (2019 e 2020), 70% (2021) e 71% (2022))

Table 11 summarizes the most applied certifications in the Portuguese T&C sector.

⁷⁶ <http://www.ipac.pt/>

Table 11. A short explanation of certifications adopted by Portuguese companies in the T&C sector from 2019 to 2022.

ISO 9001⁷⁷	Globally recognized standard for quality management: It helps organizations of all sizes and sectors to improve their performance, meet customer expectations and demonstrate their commitment to quality. Its requirements define how to establish, implement, maintain, and continually improve a quality management system.
ISO 14001⁷⁸	Internationally recognized standard for environmental management systems (EMS): It provides a framework for organizations to design and implement an EMS and continually improve their environmental performance.
OEKO-TEX® STeP⁷⁹	Step sets the highest social and environmental standards for textile and leather production and industrial laundry. It signifies responsibility towards employees and the environment and supports a company's journey towards more sustainable production.
Bluesign®⁸⁰	The bluesign® standard offers an independent approval system for the textile industry, considering the whole production process, minimizing the impact on the environment, and safeguarding human health.
SA 8000⁸¹	Based on internationally recognized standards of decent work, including the Universal Declaration of Human Rights, ILO conventions, and national laws. SA8000 applies a management-systems approach to social performance and emphasizes continual improvement—not checklist-style auditing.
NP 4457⁸²	NP4457 aims to define the requirements of an effective Research, Development, and Innovation (RDI) Management system, allowing the organizations that adopt it to define an RDI policy and achieve their innovation goals.
NP 4552⁸³	NP 4552 - Management System for Reconciliation between Professional, Family and Personal Life - is a Portuguese standard certifiable that helps define and implement measures and good practices within an organization to elevate the well-being, quality of life and satisfaction of all involved.

As referred before, the Directive European Directive ((EU) 2018/851) amending Directive 2008/98/EC on waste obliges Member States to begin separate collection of textile waste by January 2025 and to set targets for the preparation for re-use and recycling of textile waste. In Portugal, the **Strategic Plan for Urban Waste (PERSU 2030)** aims to continue the application of the national waste policy, guiding the agents involved to implement actions that allow the country to be aligned with community policies and guidelines, contributing to increased prevention, recycling, and other forms of recovery of urban waste, with the consequent reduction in consumption of natural raw materials with limited resources. Focused on preventing waste production and selective collection, PERSU pays particular attention to new fractions: textile waste, hazardous waste, and bio-waste, also giving importance to promoting the use of materials from waste (fuel derived from waste, compost, recovered recyclables, biogas, and ash/slag). APA (Portuguese Environment Agency) prepares, reviews, and implements PERSU.⁸⁴ PERSU 2030 was approved by Resolution of the Council of Ministers no. 30/2023, of 24 March.⁸⁵

⁷⁷ <https://www.iso.org/standard/62085.html>

⁷⁸ <https://www.iso.org/standard/60857.html>

⁷⁹ <https://www.oeko-tex.com/en/our-standards/oeko-tex-step>

⁸⁰ <https://www.sgs.com/en/services/bluesign-certification>

⁸¹ <https://sa-intl.org/programs/sa8000/>

⁸² <https://apcergroup.com/pt/certificacao/pesquisa-de-normas/189/np-4457>

⁸³ <https://strongstep.pt/en/servico-np-4552/>

⁸⁴ <https://apambiente.pt/residuos/plano-estrategico-para-os-residuos-urbanos-persu>

⁸⁵ <https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/30-2023-210923318>

II.3.4 R-strategies Initiatives

A survey of initiatives has been developed, relating real case studies to r-strategies in the Portuguese landscape. Table 12 provides an overview of each initiative, project, innovative process, technology, or product and an outline of its maturity level.

Table 12. R-strategies initiatives in the Portuguese landscape.

	Name of the initiative	Maturity Level	Description	Contact
00 Refuse	Digital Fashion	Demonstrative	With the increasing demand for digital solutions to reduce the use of raw materials and pre-consumer textile waste, the Digital Fashion project, to which CITEVE is a partner, aims to develop new training models in the digital field.	http://digitalfashionproject.eu/
	be@t Bioeconomy at Textiles	Demonstrative	be@t is a national project led by CITEVE that brings together 54 organizations in search of solutions for transforming the clothing sector on issues such as traceability and transparency, eco-design and eco-engineering, impact and new and new sustainability metrics. Organized around 4 pillars: Biomaterials, Circularity, Sustainability and Society, the Society Pillar is dedicated to awareness campaigns for consumers and all stakeholders in the sector to raise awareness, encouraging refuse/repair/re-use activities.	https://bioeconomy-at-textiles.com/ bioeconomy@citeve.pt +351 252 300 300
01 Rethink	LASA X FILASA X Nieta Atelier x Circular Blue – Azores EcoBlue	Demonstrative	The EcoBlue Project was initiated in 2022 to repurpose marine litter into new threads and fibres for various sub-products. This year, in 2024, LASA introduced yarns crafted from fibres derived from discarded marine fishing nets and invasive algae, both sourced from the Azores region within the scope of the EcoBlue Project. This project rethinks the way we approach problems such as marine waste and invasive species by transforming them into a resource. FILASA, which is part of the LASA's group, is also known for providing other products made from waste, like yarn made using waste from the soy industry, recycled cotton and recycled wool, that are then integrated into LASA's home textile products.	https://ecobluegroup.com/azores-ecoblue/ LASA https://lasa-group.com/pt-pt/ +351 253 560 700 lasa.geral@lasanet.pt Estrada Nacional 105, N°3344, 4835-517 Guimarães FILASA https://www.filasa.pt/ +351 253 560 690 filasa.info@filasa.pt Rua da Madalena, 1957 4835-511 Nespereira, Guimarães
02 Reduce	Smartext	Full-scale	Founded in 2017, Smartext is a hardware-based software company specializing in AI-driven technology. Its solutions are designed to assist companies in optimizing operations, with a	https://www.smartext.ai/pt +351 932 431 566 info@smartext.pt



03 Re-use	Mind	Full-scale	significant emphasis on waste reduction through the early detection and mitigation of defects in production processes. Established in 1997, Mind Technology specializes in developing and commercializing products and services within Industrial Applications (CAD/CAM), Information Management, and IT Consulting. Recently, a new technology leveraging artificial intelligence to recognize patterns and enhance cutting precision has been finalized. This innovation will significantly reduce waste production. It is scheduled for release in June, the upcoming major version of Mind's international software.	Rua Alfredo Allen, 455/461 4200-135 Porto, Portugal https://www.mindtech.pt/pt/ +351 25 683 38 05 info@mindtech.pt Rua 25 de Abril n°83 R/C 4520-115 S. M. Feira - Portugal
	Circular Wear	Pilot	CW is a national initiative that creates “shared closets” called SWAP SPOTs, which anyone can set up anywhere. These swap spots can be found on the maps available on the website.	https://circularwear.wixsite.com/circularwear circularwear@gmail.com +351 964 539 100
	Let's Swap	Pilot	Let's Swap is an NGO that started as a movement in 2018. The organization hosts Swap Markets across various Portuguese cities, enabling individuals to exchange clothing items they no longer need for others brought by fellow participants. Additionally, Let's Swap engages in outreach initiatives to educate consumers on prolonging the lifespan of garments and other sustainable practices. Let's Swap has diverted 32,655 kg of waste from landfills.	https://letsswap.pt/ geral@letsswap.pt Porto, Portugal
	[Re]Style – Retry x Continente	Full-scale	In 2022, Retry, an online platform for buying and selling second-hand clothing items, partnered with the supermarket chain Continente to establish [Re]Style. [Re]Style is a dedicated section within select Continente supermarkets where customers can browse and purchase second-hand items from various brands.	Continente https://plasticoresponsavel.continente.pt/ plasticoresponsavelcontinente@mc.pt Retry https://retry.pt/ apoioaocliente@retry.pt
	ReUse – Mycloma x Auchan	Full-scale	In 2020, the online platform specializing in second-hand clothing collaborated with Auchan, a supermarket chain, to launch ReUse. This initiative introduces dedicated spaces within select Auchan supermarkets where customers can explore and purchase pre-owned clothing, footwear, and accessories.	MYCLOMA https://www.mycloma.com/ +351 911 872 892 info@mycloma.com Rua Manuel Pinto de Azevedo, 626, R/C Direito 4100-320 Porto

				Auchan https://auchaneeu.auchan.pt/info@auchan.pt
04 Repair	Infinity – Salsa Jeans	Full-scale	Salsa, a clothing brand established in 1994 focusing on denim, introduced the Infinity Project in 2022. This initiative enables customers to bring their Salsa denim items for repair and alterations, such as shortening or lengthening by one size. The company also collects non-repairable items to recycle or repurpose them into new items. The project has successfully repaired 2000 items and collected 480 for recycling or transformation.	http://www.salsajeans.com +351 252 090 512 Av. da Indústria, n° 511 4760-725 Ribeirão, Portugal
05 Refurbish	Re.costura	Pilot	Re.costura aims to rescue forgotten clothes that would end up in a landfill or a dumpster but still have some potential and turn them into new pieces—inspiring the public to reuse used clothes creatively by valuing the raw material and, consequently, the re-created garment, seeing transformation as a method of preventing waste. The offer is wide-ranging and personalized, from workshops to remanufacturing services for post-consumer garments.	https://recostura.com/ LARGO RESIDÊNCIAS – Espaço Coletivo Maker Largo Cabeço de Bola 1150-081 Lisboa falaconnosco@recostura.com +351 932 395 340
06 Remanufacture	Troficolor	Full-scale	Troficolor began in 1956, and since then, its core business has been denim and ready-to-dye fabrics. In 2019, the company introduced an Upcycling collection that uses surplus production from previous collections and remanufactures them into new items that align with the latest trends. Additionally, Troficolor has been actively integrating more organic cotton, recycled cotton, and polyester into its product offerings.	https://www.troficolor.com/ +351 252 403 870 info@troficolor.com Rua da Mabor, 117 4760-813 Lousado
07 Repurpose	Valerius 360	Full-scale	Founded in 2017, this company aims to address the fashion industry's sustainability challenges by collecting textile waste to recycle into yarn mechanically. When fibres are too short for yarn production, the company repurposes this waste into cotton paper, effectively transforming it into a valuable resource.	https://valerius360-store.com/collections/stationary https://valerius360.pt/ +351 253 802 750 info@valerius360.pt Rua Industrial do Aldão, Apt. 219 4750-078 Vila Frescaínha, S. Martinho, Barcelos, Portugal
08 Recycle	Sasia	Full-scale	Sasia has been committed to recycling waste from the textile industry since 1952. The company specializes in reclaiming both pre-consumer and post-consumer textile waste, which undergoes mechanical recycling processes to produce hydrophilic cotton, mattresses, spun yarn, and various other	https://www.sasiareciclagem.com +351 252 493 579 sasia@sasiareciclagem.com



			products suitable for applications in horticulture, construction, or the automotive industry. It is currently able to recycle 2000 tons of waste per month.	Rua Escola da Portela, n° 50, Apt. 7001 4761-908 Ribeirão, Portugal
	Recutex	Full-scale	Since 1968, Recutex has been dedicated to textile waste recycling. Through mechanical recycling methods, it transforms textile waste into spun yarn and a range of other products utilized across various industries, including automotive, bedding and upholstery, construction, geotextile applications, hydrophilic cotton production, horticulture, and furniture manufacturing.	https://www.recutex.pt/ +351 252 308 590 recutex@recutex.pt Av. D. Afonso Henriques, n° 1492, Apt. 204 4760-283 V.N. Famalicão, Portugal
	Valerius 360	Full-scale	Founded in 2017, this company aims to address the fashion industry's sustainability challenges by collecting textile waste to recycle into yarn mechanically.	https://valerius360.pt/ +351 253 802 750 info@valerius360.pt Rua Industrial do Aldão, Apt. 219 4750-078 Vila Frescaínha, S. Martinho, Barcelos, Portugal
	J Gomes	Full-scale	Created in 1974, J Gomes specializes in the collection and mechanical recycling of textile waste, transforming it into yarn. The company provides a diverse range of yarns incorporating recycled wool, cotton, and polyester, with specific products composed entirely of recycled materials. Additionally, J Gomes offers yarns containing natural virgin fibres like hemp and linen in their composition.	https://j-gomes.com/ +351 275 320 970 j.gomes.texteis@gmail.com Parque Industrial da Covilhã, Rua C, Lt. B-23 6200-027, Covilhã, Portugal
	Jomafil	Full-scale	Jomafil has been in the textile recycling sector since 1970. Utilizing waste from the textile and mattress industries, the company employs mechanical recycling methods to produce felt of various compositions. These felt find applications across multiple industries, including automotive, footwear, mattresses, construction, and carpet manufacturing.	https://www.jomafil.com +351 275 959 363 comercial@jomafil.com Sitio da Cruzinha, Rua dos Valinhos 6200-811 Vales do Rio, Covilhã, Portugal

II.3.5 Social Responsibility & Awareness-raising Initiatives

The social initiatives of the North Region of Portugal were analyzed to assess their impact on the community's awareness about clothing consumption, use and end-of-life disposal.

In the Portuguese textile and clothing industry, the commitment to social responsibility is reflected in the integrity, ethics and transparency of companies and organizations in all their practices in respecting human rights throughout the value chain. The initiatives are diverse, encompassing various sectors, including research centres, companies, NGOs, the government and the general community.

II.3.5.1 Educational Programs

be@t project

The be@t project's Society Pillar is dedicated to awareness campaigns for consumers and all sector stakeholders, aiming to inform, raise awareness, and encourage refuse/repair/re-use activities. The awareness activities encompass lectures, workshops, and exhibitions showcasing lab samples conducted in schools, universities, or sustainability-focused fairs like Cidade do Zero. In addition, a podcast, a television series, and community events disseminate knowledge, aiding the involved companies in advancing communication within the system and promoting transparency.

Eco Escolas- Município de Famalicão

The Eco-Schools Programme is an international educational project promoted by the European NGO Foundation for Environmental Education and supported by the European Commission. This Education for Sustainable Development Programme is promoted in Portugal by the European Blue Flag Association (ABAE), the Portuguese Foundation for Environmental Education (FEE) branch. Developed in Portugal in 1996, the program is currently implemented in more than 2045 schools nationwide, covering all levels of education. It aims to disseminate a methodology for tackling environmental issues inspired by Agenda 21. Vila Nova de Famalicão is the municipality with the most Eco-Schools in the country, with 72 educational institutions **honoured** for their work in the 2022/2023 school year.⁸⁶ Within this programme, there is also a partnership with CITEVE in the area of sustainability education in the textile and clothing industry, considering the link between the community, its economic fabric and the sustainability agenda.

II.3.5.2 NGOs

BCSD Portugal

<https://bcsdportugal.org/>

BCSD Portugal (Business Council for Sustainable Development) promotes sustainable practices among textile and clothing (T&C) businesses. Their initiatives aim to reduce textile waste through sustainable production and consumption practices. BCSD Portugal advocates for circular economy models, encouraging companies to design products with end-of-life recycling in mind and to adopt innovative waste management strategies. Their efforts contribute to minimizing the textile industry's environmental impact by promoting

⁸⁶ <https://www.famalicao.pt/famalicao-e-o-municipio-do-pais-com-mais-eco-escolas>



sustainable business practices.

Fashion Revolution Portugal

<https://www.fashionrevolution.org/europe/portugal/>

Fashion Revolution Portugal is part of a global movement advocating for greater transparency, sustainability, and ethics in the fashion industry. They work to prevent textile waste through public awareness campaigns, such as Fashion Revolution Week, which encourages consumers to question the origins of their clothing and the conditions under which they are made. The organization promotes recycling and upcycling initiatives, supporting local designers who use sustainable materials and processes. Fashion Revolution Portugal aims to transform the T&C sector into a more sustainable industry by fostering a culture of accountability and innovation.

Humana Portugal

<https://www.humana-portugal.org/>

Humana Portugal collects and redistributes used clothing, prevents textile waste, and supports sustainable fashion. They operate numerous collection bins nationwide where people can donate unwanted textiles. The collected items are sorted and resold in Humana's second-hand shops or sent for recycling. The proceeds from their activities support various social and environmental projects. By promoting the reuse of clothing, Humana Portugal significantly reduces the amount of textile waste in landfills.

Smart Waste Portugal

<https://smartwasteportugal.com/>

Smart Waste Portugal is an organization focused on advancing waste management and recycling practices, including those applicable to the textile industry. They collaborate with businesses and governmental bodies to develop innovative recycling technologies and circular economy strategies. Their initiatives include promoting the use of recycled materials in new products and enhancing the efficiency of waste sorting and processing systems. Through their work, Smart Waste Portugal aims to reduce textile waste and promote sustainable practices across various sectors, including textiles.

II.3.5.3 Research projects

be@t

<https://bioeconomy-at-textiles.com/>

As previously stated, the be@t project encompasses a range of innovative areas at both the local and national levels. The Circularity pillar aims to enhance fibre reuse, both pre and post-consumer, by optimizing recycling methods for the reintroduction into the production process of natural and artificial fibres. It also intends to promote the use of waste from various sectors as ingredients or raw materials, fostering innovative processes for textile functionalization. Although intrinsic to the other pillars that complement each other, training professionals and sensitizing the community.

RegioGreenTex

<https://www.regiogreentex.eu/dashboards/home>

In the framework of the European Green Deal, RegioGreenTex is a project promoting the

collaboration in research and development for the textile industry between the four major sectors of society - industry, government, research institutes, and the public - in establishing a systematic circular economy business model across the EU. To assess and leverage the circular economy potential across European regions, focusing on textile recycling. The strategy includes a digital platform to match supply and demand, supporting SMEs with pilot projects to innovate and increase recycled material usage. Aligned with EU initiatives, the proposal is to establish five regional recycling hubs tailored to SME needs.

tExtended

<https://textended.eu/>

The tExtended project aims to provide a novel method for recycling used textiles by creating a Blueprint - a knowledge-based master plan for the optimal circulation of different textile flows. The Blueprint will outline how to make a circular textile ecosystem that reduces waste, extends the life of textiles, and efficiently recycles end-of-life textiles. In addition, we are creating a wide range of digital and technological solutions to make the extended solutions replicable in different European locations. These solutions include innovations that are socially and environmentally sustainable, as well as the business potential of circular systems.

II.3.5.4 Collaborative Initiatives

be@t by be@t

https://bioeconomy-at-textiles.com/explica/b2b/programas/artigos___programas/programa_de_inovacao_

beat by be@t Aceleração is an innovation program aimed at small and medium-sized textile and clothing companies that aims to stimulate sustainable business models through collaborative innovation between designers and companies.

The selected companies will be invited to collaborate with textile designers and engineers to create a textile solution that integrates the principles of eco-engineering and eco-design. For five months, five teams of SMEs and designers will have access to training in sustainability, personalized and individual mentoring, company visits, and a presentation of the final project at ModaLisboa – Lisbon Fashion Week.

MADE IN PORTUGAL, naturally

<https://portugalnaturally.portugalglobal.pt/en/>

The brand “MADE IN PORTUGAL” was designed to promote, in an integrated manner, various sectors of the Fashion Cluster, including Textile, Footwear, Leather Goods, and Jewellery. Its objective was to highlight the brand’s differentiation and sophistication, thereby motivating international prescribers to inquire about the unique and exclusive solutions offered by the Portuguese fashion industry. The primary objective is to establish Portugal as a country that creates sustainable, innovative, and designer fashion, as well as to promote and strengthen companies’ competitiveness and establish Portugal as a country of technological and creative solutions. This initiative has been made possible by the financial support of the COMPETE2030 programme and the European Union.

II.3.6 SWOT Analysis

The following table presents the SWOT analysis for the Portuguese paradigm to identify strengths and weaknesses, opportunities and threats in the local management and recycling of textile waste, with a vision of the implications for global efforts.

Table 13. SWOT Analysis for Textile Waste Management and Recycling in Portugal.

Strengths	Weaknesses
● Ecological Awareness: In-depth understanding of industry-wide eco-consciousness, particularly in textile waste management solutions. Committed to promoting societal shifts through awareness-raising initiatives, akin to Ponto Verde, but focused on textiles. ● Segregation Infrastructure: Skilled in utilizing existing waste segregation systems, such as Lipor, to implement effective textile waste segregation processes. ● Recycling Potential: Recognized the potential to develop a strong textile recycling industry in Portugal, leveraging existing knowledge and pre-consumer waste. Emphasizes both economic and environmental benefits for the industry.	● Lack of Public Education: Acknowledge the necessity for extensive public education campaigns to facilitate compliance with textile waste segregation strategies and regulations. ● Logistical Infrastructure: Experienced in addressing challenges related to the adaptation of logistical infrastructure for efficient textile waste segregation. ● Financial Challenges: Well-versed in managing financial implications associated with complex textile recycling processes.
Chances	Threats
● Industry Development: Proficient in identifying opportunities for the growth of the textile recycling industry through mandatory segregation initiatives. ● Collaboration: Skilled in fostering partnerships with stakeholders in more contact with the consumer, like NGOs and brands, to promote sustainable practices and achieve long-term goals for the textile waste management roadmap. ● EU Support: Knowledgeable about leveraging EU support to implement sustainable waste management practices through research projects, pilots, and companies in Portugal.	● Public Opposition: Experienced in mitigating opposition to new regulations through effective communication and implementation strategies. ● Illegal Waste Disposal: Proactive approach to addressing challenges posed by unlawful disposal of textile waste, emphasizing the importance of enforcement measures. ● Monitoring and Enforcement: Proficient in developing strategies for effectively monitoring and enforcing mandatory textile waste segregation policies.

II.4 Slovenia

II.4.1 Slovenia's Textile & Clothing (T&C) sector

II.4.1.1 Introduction to the Textile and Clothing (T&C) Sector in Slovenia

The textile and clothing (T&C) sector in Slovenia, although not as large as some other manufacturing industries, plays a significant role in the country's economy, especially in certain regions where textile manufacturing is a key employer. Historically, the textile industry in Slovenia was a considerable part of its manufacturing base during the Yugoslav era, with a strong focus on producing **textiles and clothing for domestic consumption and export**.

II.4.1.2 Current State of the Industry

In recent years, Slovenia's T&C sector has shifted its focus towards **higher value-added products, including technical textiles and fashion items** aligned with global sustainability and innovation trends. This shift is part of a broader trend in developed European countries, where the emphasis is increasingly on quality, design, and sustainable production methods rather than mass production.

II.4.1.3 Economic Impact

The industry contributes to Slovenia's GDP, although the percentage has decreased over the years due to the rise of service sectors and high-tech manufacturing. The T&C sector remains an **important source of employment, particularly in rural areas** where large textile mills are often one of the leading employers.

II.4.1.4 Exports

Slovenia exports a significant portion of its textile and clothing products, with key markets including other EU countries, particularly Germany and Italy. The export-oriented nature of the industry means that Slovenian manufacturers must comply with the **stringent quality and environmental standards demanded by European consumers**.

II.4.1.5 Challenges and Opportunities

The Slovenian T&C sector faces several challenges, including competition from low-cost countries, the need for continuous technological upgrades, and increasing pressure to adopt sustainable and eco-friendly manufacturing practices. However, there are also significant opportunities, particularly in sustainable textiles and technical fabrics, which are seeing growing demand in Europe and globally.

II.4.1.6 Focus on Sustainability

In line with global trends and EU directives, Slovenia has increasingly focused on sustainability within the T&C sector. It includes **adopting practices that reduce environmental impact, such as water recycling, using sustainable materials, and minimising waste through better design and manufacturing processes**. The circular economy model is being gradually integrated, aiming to reduce waste and increase recycling and reuse within the sector.

II.4.1.7 Conclusion

Overall, the T&C sector in Slovenia is adapting to modern challenges and opportunities, with an increasing focus on sustainability, quality, and market adaptability. The industry's future

will likely depend on its ability to innovate and maintain its competitive edge through sustainable practices and high-quality products. Integrating environmental consciousness into the sector aligns well with Slovenia's overall economic strategies and commitments under EU environmental directives.

II.4.2 Reuse and Recycling of Textiles in Slovenia

Textiles thrown away are reused or recycled on a country/regional level.

- **Reuse and Recycling Rates:** In Slovenia, as in many EU countries, the emphasis on recycling and reuse of textiles **is growing**. The EU has targets set under various directives which Slovenia adheres to, aiming for significant improvements in waste management, including textiles. However, specific figures detailing what percentage of textile waste is reused or recycled in Slovenia are not **readily** available in public data.
- **General Trend:** It is known that a significant portion of textile waste traditionally goes to landfills or incineration. With recent EU directives and the push towards a circular economy, efforts to improve these figures by enhancing recycling capabilities and consumer participation in recycling programs are underway.
- According to statistics, textiles are one of the fastest growing waste streams in the European Union, alongside waste electrical and electronic equipment. The growth trend will continue in the future.
- In Slovenia, **17,000 tonnes of textile waste are thrown away annually**. Only **15% is recovered in an environmentally friendly way**. The rest ends up in landfills, a significant burden on the environment, as textiles are poorly degradable due to their composition. In addition, decomposition produces methane, which is 21 times more potent as an atmospheric warming agent than CO₂.

II.4.3 Growth in the Textile and Clothing Sector

Estimated Growth Percentage of Textile and Clothing (T/C) Sales in Slovenia
Industry Growth

The textile and clothing (T/C) sector's growth rate in Slovenia varies yearly due to global economic conditions, changing fashion trends, and local economic policies. Here's an assessment of the growth trends in the sector:

1. Transition to High-Value Markets:

- In recent years, Slovenia's T/C sector has shifted **towards high-value, niche markets** such as technical textiles and sustainable fashion products.
- Growth rates in these markets differ significantly from those in traditional clothing and fashion textiles due to higher value addition and innovation.

2. General Growth Estimates:

- **Pre-COVID-19:** Before the COVID-19 pandemic, the Slovenian textile and clothing sector experienced moderate growth, with annual growth rates estimated between 2% and 4%, depending on the sub-sector.
- **During COVID-19:** The pandemic severely impacted sales and production globally, and Slovenia was no exception. The T/C sector saw a decline of up to 15% in some areas due to supply chain disruptions and decreased consumer spending.
- **Post-COVID-19 Recovery:** The sector is recovering, with an estimated growth rate of around 3% to 5% annually, as consumer behaviour shifts towards more sustainable and locally produced textiles.

3. Niche Market Growth:

- **Technical Textiles:** Estimated to grow at a higher rate (5% to 7% annually) due to

- increasing demand in the automotive, construction, and medical sectors.
- **Sustainable Fashion:** Although still a tiny market segment, **sustainable fashion** is expected to see growth rates of 8% to 10% annually due to rising consumer awareness and preference for **eco-friendly products**.

Economic Impact

1. Overall Contribution:

- The T/C sector contributes approximately 1% to 1.5% of Slovenia's GDP.
- Employment in the sector accounts for around 10,000 jobs, **primarily in rural areas where traditional textile manufacturing remains a significant employer.**

2. Competitive Challenges:

- **Competition from non-EU Countries:** The Slovenian T/C industry faces intense competition from low-cost manufacturing countries, which affects growth rates in mass-market fashion products.
- **Consumer Shifts:** Changes in consumer behaviour towards sustainable fashion could positively impact the growth of **local, niche manufacturers**.

3. Growth Potential:

- The transition to high-value and sustainable textiles offers significant growth potential, mainly if Slovenia can capitalise on EU strategies promoting sustainable textiles.

II.4.4 Textile Waste Management

In terms of textile waste management, an essential topic for VERDEinMED, according to the data from Eurostat in 2023^{87,88} shows that production of textile waste in the Slovenia T&C sector has increased since 2012 by almost 35%, even though it seems to stabilise or even decrease during the years 2018-2020. The rate of textile waste being recycled has increased greatly during 2018-2020, reaching almost 81% in 2020.

Table 14. Production and recycling of textile waste (ton) of Slovenia's T&C sector.

	2012	2014	2016	2018	2020
Textile waste (ton)	6.834	8.320	8.732	9.905	9.205
Recycling of textile wastes (ton)	638	685	818	4.331	7.442

II.4.5 Legal Framework

Governments enact and update regulations to address environmental concerns in the textile industry, promoting sustainable practices and waste reduction.

Regulatory and certification entities play an essential role in all activity sectors. To ensure that companies and products comply with legal and regulatory requirements, regulatory and accreditation requirements should exist, as well as a commitment between these entities and companies, involving close and transparent collaboration with governmental agencies and certification bodies.

⁸⁷https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN_custom_7396092/bookmark/table?lang=en&bookmarkId=646ce0a9-2988-464d-bd35-1b67e726a8db

⁸⁸https://ec.europa.eu/eurostat/databrowser/view/ENV_WASTRT_custom_7396182/bookmark/table?lang=en&bookmarkId=a6d83881-d12c-441f-acd3-5c5dca6ec3dc

II.4.5.1 Regulations

As a European Union (EU) member, Slovenia adheres to EU directives and regulations transposed into national laws. These regulations focus on environmental protection, sustainable practices, and waste management, including textile waste. The specific legislation that governs the management and recycling of textile waste in Slovenia includes:

Table 15. A short explanation of legislation in Slovenia in the T&C sector

Waste Management Act (<i>Zakon o upravljanju odpadkov</i>)	This act provides Slovenia's foundational legal framework for waste management. It outlines principles for waste prevention, recycling, recovery, and disposal. The act incorporates EU directives such as the <i>Waste Framework Directive (2008/98/EC)</i> and is regularly updated to align with EU legislation.
Decree on Waste Management (<i>Uredba o ravnanju z odpadki</i>)	This decree specifies the procedures for collecting, treating, recovering and disposing of waste, including textile waste. It also details the responsibilities of producers, importers, distributors, and consumers regarding waste management.
Extended Producer Responsibility (EPR)	Under the EPR scheme, producers of textiles are required to take responsibility for the environmental impacts of their products throughout the lifecycle, including end-of-life management. It may involve financial responsibilities or the obligation to collect and recycle products.
Decree on Packaging and Packaging Waste (<i>Uredba o embalaži in odpadni embalaži</i>)	While primarily focused on packaging waste, this decree impacts the textile industry by regulating the packaging materials used to distribute textile products. It promotes the recycling of packaging and encourages using environmentally friendly materials.

In addition to national legislation, Slovenia participates in EU-wide initiatives to promote circular economy practices, including textile recycling. The European Commission has been working on strategies to handle textile waste under the **EU Circular Economy Action Plan**. It includes proposals for an EU strategy for textiles to ensure they are designed to be more durable, reusable, repairable, recyclable, and energy-efficient.

These legislative frameworks and regulations are crucial in guiding the textile industry towards sustainable practices and effective textile waste management in Slovenia. Adherence to national and EU rules ensures that Slovenia contributes to broader environmental goals while addressing specific challenges of textile waste.

II.4.5.2 Policies

Slovenia, in alignment with EU policies and its national objectives for sustainable development, has adopted several strategies and action plans to enhance textile waste management and recycling:

Strategies	
National Waste Management Plan (<i>Državni načrt ravnanja z odpadki</i>)	This plan sets out the strategic goals and actions for waste management up to 2030. It includes specific objectives for textile waste, aiming to improve the collection, sorting, and recycling processes. This plan supports the transition to a circular economy, reducing waste generation and increasing resource efficiency.
Circular Economy Strategy	Slovenia is actively developing strategies to transition to a circular economy, which inherently includes improving the lifecycle management of textiles. It involves designing products for a longer lifespan, promoting reuse, and enhancing recycling capabilities. The strategy aims to establish a more sustainable textile industry that reduces waste and incorporates recycled materials.



Strategy for Smart Specialization 2021-2027	The Strategy for Smart Specialization of Slovenia for 2021-2027, known as S4, is pivotal in directing the country's economic development through targeted support in areas deemed high potential, including sustainable technologies and practices. Although the strategy broadly covers various sectors for enhancing economic and technological development, its implications for textile waste management and recycling can be inferred as part of the broader goals towards sustainability and innovation. <u>Sustainability and Circular Economy:</u> One of the central themes of Slovenia's Smart Specialization Strategy is enhancing the sustainability of its industries. It includes promoting circular economy principles across various sectors, including textiles. The strategy likely supports initiatives that improve the lifecycle management of textiles, from production to end-of-life, encouraging practices like recycling and repurposing. <u>Innovation and Technology:</u> The strategy emphasises the importance of innovation in driving economic growth. For textile waste management, this may involve developing and adopting new technologies that enhance textile recycling processes—such as advanced sorting technologies, chemical recycling techniques that break down textiles into raw materials, and new methods for high-quality fibre regeneration. <u>Collaboration and Cluster Development:</u> Slovenia aims to foster cooperation between research institutions, businesses, and government bodies. In textile waste, this could mean more coordinated efforts between textile producers, waste management companies, and technology developers to create a more efficient and integrated textile recycling ecosystem.
Operational Programme for Implementing the EU Cohesion Policy	This programme includes initiatives, the identification of projects, and the planned EU Fund for implementation that supports waste management infrastructure, including facilities specifically for textile sorting and recycling. It promotes innovations in recycling technologies and supports the development of new business models for textile reuse.
European Green Deal	Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green Deal will transform the EU into a modern, resource-efficient and competitive economy, ensuring: • no net emissions of greenhouse gases by 2050 • economic growth decoupled from resource use • no person and no place is left behind The European Commission has adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels—more information on Delivering the European Green Deal.
Action Plans	
The EU Circular Economy Action Plan	The European Commission adopted the new circular economy action plan (CEAP) in March 2020. It is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth. The EU's transition to a circular economy will reduce pressure on natural resources and create sustainable growth and jobs. It is also a prerequisite to achieve the EU's 2050 climate neutrality target and to halt biodiversity loss.

Subvention schemes	
Slovenia offers several subvention schemes and financial incentives to promote the recycling of textiles and the adoption of environmentally friendly practices within the industry:	
Environmental Subsidies and Grants:	
The Slovenian Environment Public Fund (<i>Eko sklad</i>)	Provides subsidies and financial incentives for projects that contribute to environmental protection, including waste management. These funds can be accessed by companies and local communities to develop more efficient textile recycling processes or to implement waste reduction initiatives.
EU Funding	Under the framework of EU cohesion policy, Slovenian entities can access funding for projects that improve textile waste management. It includes support for developing recycling infrastructure and research and development in sustainable materials and technologies.
Tax Incentives	Slovenia offers tax incentives for businesses investing in eco-friendly technologies, including those used in recycling textiles and sustainable management. These incentives aim to reduce the financial burden on companies transitioning to greener practices.
Support for Innovation and Startups	The government supports startups and small enterprises that focus on innovative solutions for textile waste management. It includes grants and business development services to help new companies in the sector grow and implement sustainable practices.
Partnership Agreement (PA) for the Development Framework 2021-2027	The PA constitutes the main strategic plan for growth in Slovenia, which is based on significant resources originating from the European Structural and Investment Funds (ESIF) of the European Union. It can support public entities collecting textile waste and private entities interested in implementing a circular economy for textiles.

These strategies, action plans, and subvention schemes demonstrate Slovenia's commitment to improving textile waste management through regulatory measures, financial incentives, and strategic planning. These efforts are designed to meet national priorities and EU directives, fostering a sustainable approach to the region's textile production and waste management.

II.4.5.3 Initiatives

Supporting structures	
Slovenia has developed several supporting structures that facilitate textile waste management and recycling:	
Eco-Innovation Hub	Slovenia supports eco-innovation by establishing hubs and clusters focusing on sustainable practices, including textile recycling. These hubs serve as centres for collaboration among businesses, researchers, and government entities to develop and implement green technologies.
Waste Management Centers	Local municipalities in Slovenia operate waste management centres equipped to handle various types of waste, including textiles. These centres are crucial for sorting and processing textile waste before sending it to recycling facilities.
Recycling Facilities	The government supports the development of specialised recycling facilities that can handle textile materials. These facilities are essential for transforming textile waste into usable materials, thus supporting the circular economy.
Campaigns	
Several campaigns have been launched in Slovenia to raise awareness about textile waste and promote recycling:	
Zero Waste Campaigns	Local NGOs and government bodies frequently organise campaigns promoting zero-waste lifestyles. These campaigns often include segments on reducing textile waste through better consumer habits,

	such as choosing durable clothing, repairing old clothes, and recycling unwanted textiles.
Educational Programs	Schools and educational institutions participate in national campaigns to teach students about the importance of textile recycling and sustainable fashion. These programs aim to instil a culture of sustainability from a young age.
Public Awareness Campaigns	The Slovenian government and environmental organisations conduct public awareness campaigns to inform citizens about the available textile recycling options and the environmental benefits of participating in these programs.
Government initiatives	
Government initiatives aimed explicitly at enhancing textile waste management include:	
Slovenian Circular Economy Roadmap	This roadmap includes specific initiatives targeted at textile waste, focusing on increasing the rate of textile reuse and recycling. It outlines policies and strategies to integrate circular economy principles into the textile sector.
Regulations on Extended Producer Responsibility (EPR)	Slovenia enforces EPR regulations that require textile product producers and importers to manage their product lifecycle, including end-of-life disposal. This initiative encourages companies to design products with recyclability in mind and to contribute financially to recycling efforts.
Partnerships with EU Projects	Slovenia actively participates in EU-funded projects that aim to develop better textile recycling technologies and infrastructures. These projects often involve cross-border alliances and knowledge sharing, which help Slovenia stay at the forefront of textile recycling technology.

These supporting structures, campaigns, and government initiatives collectively form a comprehensive approach to managing textile waste in Slovenia. They aim to enhance recycling rates, reduce landfill use, and educate the public and industries about the importance of sustainability in textile production and waste management.

As referred before, the Directive European Directive ((EU) 2018/851) amending Directive 2008/98/EC on waste obliges Member States to begin separate collection of textile waste by January 2025 and to set targets for the preparation for re-use and recycling of textile waste.

II.4.5.4 Inconsistencies or gaps in the legal structure that may hinder effective (textile) waste management and recycling

Addressing the potential inconsistencies or gaps in Slovenia's legal structure that may hinder effective textile waste management and recycling involves a critical look at the existing regulations, their enforcement, and areas that may need improvement. Here are some identified gaps and inconsistencies:

1. Regulatory Gaps and Overlaps

- **Lack of Specific Legislation for Textiles:** While Slovenia has comprehensive waste management laws, there is a relative lack of legislation tailored explicitly to textile waste compared to other types of waste like electronics or packaging. This absence can lead to less focus and fewer resources for textile waste issues.
- **Vague Definitions and Standards:** Current legislation may lack precise definitions and standards for textile recycling processes, leading to inconsistencies in how textile waste is handled across different regions and facilities.
- **Overlap with EU Directives:** Sometimes, the national legislation may not be fully harmonised with EU directives, or there may be delays in transposing EU regulations

into national law. It can create temporary inconsistencies in enforcement and compliance standards.

2. Enforcement Challenges

- **Insufficient Enforcement:** Even with a solid legal framework, the effectiveness of textile waste management can be hindered by insufficient enforcement of existing laws. It includes inadequate monitoring of waste management practices and a lack of penalties for non-compliance.
- **Resource Constraints:** Enforcement agencies may face resource constraints, including limited human and financial resources, which can hinder their ability to oversee and enforce textile waste regulations effectively.

3. Economic and Financial Incentives

- **Inadequate Incentives:** Current subvention schemes and economic incentives may not be sufficient to encourage investment in textile recycling technologies or to make the recycling process economically viable for small and medium enterprises (SMEs).
- **Cost Issues:** The costs associated with collecting, sorting, and recycling textile waste can be prohibitive, particularly without significant financial support from the government. It can discourage companies from investing in the necessary infrastructure.

4. Integration with Circular Economy Principles

- **Limited Integration:** While Slovenia aims to transition to a circular economy, the integration of circular economy principles within the textile sector is still limited. It can result in missed opportunities for designing products that are easier to recycle or establishing more comprehensive product stewardship programs.

5. Stakeholder Engagement and Awareness

- **Lack of Awareness:** There may be a general lack of awareness among consumers and businesses about the importance of textile waste recycling and its existing legal obligations. It can reduce participation rates in recycling programs.
- **Stakeholder Collaboration:** Effective textile waste management requires collaboration across various stakeholders, including **manufacturers, retailers, consumers, and recyclers**. Current policies may not sufficiently promote or facilitate such multi-stakeholder partnerships.

6. Recommendations for Improvement

To address these gaps, Slovenia could consider the following actions:

- **Specific Legislation for Textiles:** Develop regulations or guidelines for managing textile waste to ensure that all aspects of textile recycling — from collection to processing — are adequately covered.
- **Enhanced Enforcement and Monitoring:** Increase resources for agencies responsible for enforcing waste management laws and introduce more stringent monitoring and reporting requirements for textile waste.
- **Financial and Economic Support:** Expand financial incentives and support programs to make textile recycling more economically viable and to stimulate innovation in recycling technologies.
- **Public Awareness Campaigns:** Increase efforts to educate the public and industry stakeholders about the benefits of textile recycling and the existing legal requirements.
- **Strengthened Stakeholder Collaboration:** Facilitate forums or platforms for better collaboration between all parties involved in the textile lifecycle to ensure a more integrated approach to waste management.



- . By addressing these gaps, Slovenia can enhance the effectiveness of its textile waste management and recycling initiatives, contributing to environmental sustainability and
- . compliance with both national and EU-wide objectives.

II.4.6 R-strategies Initiatives

A survey of initiatives has been developed, relating real case studies to R-strategies in Slovenia. Table 16 provides an overview of each initiative, project, innovative process, technology, or product and an outline of its maturity level.

Table 16. R-strategies initiatives in the Slovenian landscape.

R-strategies	Name of the initiative	Maturity Level	Description	Contact
R0 Refuse	The “Refuse” strategy	Demonstrative	Refusal in the context of textile waste involves consumers choosing not to purchase unnecessary items, particularly those not environmentally sustainable. Slovenia promotes this through awareness campaigns encouraging consumers to think critically about their purchases. The “Refuse” approach in the context of circular economy practices for textiles in Slovenia encourages consumers to actively choose not to purchase unnecessary items, especially those not environmentally sustainable. This approach is fundamental in reducing waste before it is even created. In Slovenia, this initiative is strongly supported by various consumer awareness campaigns and educational programs that advocate for a more conscious consumption pattern. These efforts aim to shift public behaviour towards refusing single-use or low-durability textile products and opting for quality and sustainability. It emphasises the avoidance of fast fashion, promoting a culture where consumers are more selective and prefer products that offer longer lifespans and minimal environmental impact. The “Refuse” strategy in Slovenia can be considered at a demonstrative stage. It is well-integrated into national environmental and consumer policies. The government and various NGOs actively promote this strategy through multiple platforms and media, aiming to instil a culture of sustainable consumption. The effectiveness of this approach is evidenced by growing consumer interest in sustainability and an increasing market share for eco-friendly and ethically produced textiles. Through this approach, Slovenia aims to reduce the volume of textile waste generated and foster a more environmentally conscious society. The “Refuse” strategy is crucial because it addresses waste issues at their source, significantly helping curb the initial demand for non-sustainable textile products.	Ministry of Natural Resources and Spatial Planning - Waste https://www.gov.si teme/r-avnanje-z-odpadki/



R1 Rethink	Ekošola (Eco-School)	Demonstrative	Ekošola is an international program implemented in Slovenia that integrates environmental education into school curriculums across all levels. It teaches students about sustainability, including the circular economy principles in textiles. This program is pivotal in cultivating a mindset that supports the “Rethink” strategy from a young age: https://ekosola.si/ne-zavrzi-oblek-ohrani-planet-23-24/. Rethinking involves altering the approach to fashion consumption by choosing sustainable brands and materials supported by educational programs and government initiatives. The “Rethink” approach in Slovenia’s textile sector involves a strategic shift in how textiles are perceived, designed, consumed, and disposed of. This strategy encourages all stakeholders—manufacturers, retailers, and consumers—to reconsider their roles and the impact of their actions on the environment. For manufacturers, this means designing products with their entire lifecycle in mind, leading to more durable textiles that are more accessible to repair and made from sustainable or recyclable materials. For consumers, it involves thinking about the necessity and long-term use of purchases, preferring quality and sustainability over fast fashion trends.	Ekošola (Eco-School)
	“Rethink” strategy - The Slovenian Chamber of Commerce and Industry	Demonstrative	The Slovenian Chamber of Commerce and Industry also provides support and information for businesses to adopt more sustainable practices, aligning with the “Rethink” strategy: https://www.gzs.si/. By embracing the “Rethink” approach, Slovenia is making significant strides in transforming its textile industry towards a more sustainable and circular model. This reduces the environmental impact of textile production and waste and aligns with broader European Union directives on sustainability and waste reduction.	https://www.gzs.si/
R2 Reduce	The “Reduce” approach	Demonstrative	Reduction focuses on decreasing the amount of textile waste generated. Slovenia promotes reduction through policies like Extended Producer Responsibility, encouraging manufacturers to design products with minimal waste. The “Reduce” approach in Slovenia’s textile sector focuses on minimising the volume of textiles that enter the waste stream. This strategy encourages manufacturers to adopt practices that reduce material usage and waste during production. It also aims to extend the lifespan of textile products through better design and encourages consumers to buy less but choose higher-quality and more durable products. Reduction strategies in Slovenia are supported by initiatives such as Extended Producer Responsibility (EPR), which holds producers accountable for the environmental	

			impacts of their products throughout the product lifecycle, including post-consumer waste. The “Reduce” approach has reached a demonstrative stage in Slovenia. It is well integrated into national policies and industry practices, supported by regulations encouraging waste minimisation and resource efficiency. The approach is bolstered by governmental policies and industry initiatives that promote technological innovations to reduce waste at the source.	
	The “Reduce” approach	Demonstrative	Further support and information can be accessed through the Slovenian Environment Agency, which oversees industrial and economic policies promoting sustainable and reduced resource use across various sectors, including textiles. By implementing the “Reduce” approach, Slovenia aims to decrease its textile industry’s environmental footprint and promote a more sustainable consumption model among consumers. It aligns with broader global movements towards sustainability and the European Union’s goals for a circular economy, helping Slovenia position itself as a responsible player in the worldwide textile market.	Website: https://www.gov.si/novice/2022-11-17-tekstilni-odpadki-so-iz-mode/ Slovenian Environment Agency (Agencija Republike Slovenije za Okolje)
R3 Reuse			Reuse in Slovenia is encouraged through various second-hand stores and swap events to keep textiles in use longer. The “Reuse” approach in Slovenia focuses on extending the life cycle of textile products and reducing waste by encouraging the repeated use of textiles before they become waste. This strategy involves promoting second-hand markets, organising swap events, and supporting initiatives enabling consumers to quickly exchange or donate used clothing. This approach decreases the demand for new clothing production and minimises the environmental impact of manufacturing new textiles. In Slovenia, reuse is facilitated by formal retail channels and informal community-based programs, which help mainstream the practice of reusing clothes and other textile products.	
	CPU REUSE CENTERS in SLOVENIA	Demonstrative	Center Ponovne Uporabe (Reuse Center) This organisation operates several reuse centres across Slovenia, providing facilities where used items, including textiles, can be collected, sorted, sold, or donated for further use. These centres play a crucial role in the reuse strategy by making it convenient for individuals to participate in circular economy practices.	Website: Center Ponovne Uporabe
	ZEOS	Development	Implementing the “Reuse” approach in Slovenia demonstrates a solid commitment to reducing environmental impact and fostering a sustainable economy. By encouraging the reuse of textiles, Slovenia reduces waste. It educates its citizens on the benefits of a less disposable lifestyle, thus promoting a shift in consumer	Website: ZEOS, d.o.o.

			behaviour towards more sustainable practices. Additionally, ZEOS, d.o.o., manages national projects focused on reusing and recycling electrical equipment but also supports initiatives related to the reuse of textiles through educational campaigns and partnerships.	
04 Repair		Pilot	Repair initiatives include workshops and pop-up events where individuals can bring their damaged textiles for repair, thus extending their lifecycle. The “Repair” strategy in Slovenia focuses on extending the lifecycle of textile products by encouraging and facilitating the repair of clothes, accessories, and other textile items. This approach aims to reduce waste by making it easier and more appealing for consumers to repair damaged or worn items instead of discarding them. In Slovenia, repair initiatives are supported through workshops, pop-up events, and even permanent repair centres where individuals can bring their textiles for mending. These services often include basic repairs and creative solutions to repurpose or update older garments, merging functionality with fashion. The repair approach is at a pilot stage in Slovenia, indicating that while it is gaining popularity and recognition, it is not yet as widespread or systematically integrated as other strategies like reuse or recycling. These initiatives are growing, driven by environmental awareness, economic benefits, and the increasing trend of sustainable living.	ZEOS, d.o.o. ZEOS is a prominent organisation in Slovenia that extends its eco-friendly initiatives to support textile repair and manage waste electrical equipment. They organise and sponsor events that encourage the repair and upcycling of textiles. Website: ZEOS Locations https://www.zeos.si/en/collection-points/
	Omisli. si	Pilot	Omisli.si is a service platform that helps Slovenian consumers find local service providers, including those offering textile repair services. This platform can connect individuals with tailors or repair shops specialising in textile work. Slovenia is taking significant steps towards sustainability and waste reduction by promoting and facilitating textile repair. The growth of this strategy can play a crucial role in shaping consumer habits towards more responsible consumption and maintenance of textile products, ultimately contributing to the goals of a circular economy.	Website: Omisli.si Omisli.si
R5 Refurbish		Pilot	Refurbishing old textiles into as-new condition is less common but is emerging through small businesses that specialise in upcycling used fabrics. In Slovenia, the “Refurbish” approach within the textile sector focuses on restoring and enhancing old or worn textiles to a like-new condition. This strategy often involves innovative upcycling where textiles are repaired and creatively altered to increase market value and appeal. Refurbishing extends the life of garments and other fabric-based items by transforming them into updated, stylish, and	



			desirable products. It includes dyeing, reshaping, and adding new components to create a fresh look from old textiles. Slovenia contributes to reducing textile waste and promoting a circular economy by adopting and promoting the refurbishment of textiles. This approach not only helps mitigate the environmental impact associated with the production and disposal of textiles but also supports creating a unique and sustainable fashion industry within the country.	
	https://www.decordesign.si/novice/tag/dobrodelnost Redesign Dobrodelnost	Pilot	Local Upcycling and Refurbishing Initiatives Small businesses or individual entrepreneurs typically spearhead these initiatives. One notable example includes: Redesign Dobrodelnost: This project transforms old clothes into high-value products, providing a new life to discarded textiles. It is part of a broader movement involving various fashion designers and artisans specialising sustainably. Local upcycling and refurbishing initiatives can often be connected through Slovenian environmental networks or fashion schools that promote sustainable practices. An example would be “Redesign Dobrodelnost,” a project focusing on transforming old clothes into high-value products. Local eco-fashion events and organisations would be the best contact points for more information.	https://www.decordesign.si/novice/tag/dobrodelnost Redesign Dobrodelnost
	Decordesign. Si - Sustainability Initiatives	Pilot	Website for more information and contact: Local eco-fashion events and organisations would be the best contact points for more details. Interested parties can connect with local artisans and designers through platforms such as: Slovenia contributes to reducing textile waste and promoting a circular economy by adopting and promoting the refurbishment of textiles. This approach not only helps mitigate the environmental impact associated with the production and disposal of textiles but also supports creating a unique and sustainable fashion industry within the country. Decordesign. Si features projects and initiatives focused on sustainability and upcycling in Slovenia.	Decordesign. Si - Sustainability Initiatives
	Ekošola	Pilot	Ekošola (Eco-School), although primarily educational, occasionally partners with local businesses for projects that include refurbishment as part of their environmental education programs.	Ekošola
			The remanufacturing of textiles is in its nascent stages, focusing on transforming textile waste into new, high-quality products. The “Remanufacture” approach in Slovenia involves taking textile waste or old garments and transforming them into new, high-quality products. This process goes beyond simple repair or refurbishment	



R6 Remanufacture		Development	by completely breaking down old textiles and reassembling them into new items with equal or higher quality than the original. This can include shredding old fabrics to create new yarns, which are then woven into new textile products. Remanufacturing is part of a broader effort to reduce waste and resource consumption by keeping materials in use for as long as possible, thereby minimising the need for new raw materials and reducing the environmental footprint of production. Remanufacturing in the textile sector in Slovenia is currently in the development phase. While established industries in other sectors, such as automotive parts, use remanufacturing extensively, textile remanufacturing is still relatively nascent. Innovative projects and pilot programs are underway, exploring the feasibility and scalability of this approach within the textile industry.	
	University of Maribor KNOWLEDGE TRANSFER - UM.si	University of Maribor KNOWLEDGE TRANSFER - UM.si	University Research Programs and Collaborations Key stakeholders in this sector include higher education institutions and research organisations. For instance: The University of Maribor: Engaged in research and development projects on textile innovation, including remanufacturing. They collaborate with industry partners to develop sustainable textile solutions. Website: University of Maribor KNOWLEDGE TRANSFER - UM.si https://www.um.si/en/knowledge-transfer/	Website: University of Maribor KNOWLEDGE TRANSFER - UM.si https://www.um.si/en/knowledge-transfer/ Contact: Key stakeholders in this sector would include university research departments and innovative textile companies. For instance, the University of Maribor often participates in research and development projects for textile innovation. https://www.um.si/en/knowledge-transfer/
	Technology Park Ljubljana	Development	Technology Park Ljubljana: Home to startups and innovative projects focusing on sustainable technologies, including textile remanufacturing. They provide support and resources for entrepreneurs looking to develop new solutions in the circular economy.	Website: Projects Technology park Ljubljana (tp-lj.si)
R7 Repurpose			Repurposing involves changing textiles for different purposes, such as turning old clothes into cleaning materials or artisan products. In Slovenia, the “Repurpose” strategy within the textile sector involves creatively transforming old or unused textiles into new	



		Pilot	products with different uses. This can range from converting old t-shirts into reusable shopping bags, crafting quilts from outdated clothing, or making artistic home décor items from discarded fabric. The repurpose approach is distinct from recycling or refurbishing because it changes the intended use of the textile, often incorporating design and art to add value and appeal. This method extends the life of materials and reduces waste by diverting textiles from landfills and introducing them into new consumer markets. The repurposing of textiles in Slovenia is currently at a pilot stage. While several small-scale initiatives and startups focus on this practice, it is not yet widespread or fully integrated into the mainstream market. However, interest in repurposing is growing, particularly among eco-conscious consumers and the artistic and design communities, which see value in the uniqueness and sustainability of repurposed products.	
	KNOF - Creative Reuse Center	Pilot	KNOF - Creative Reuse Center KNOF is a prominent example of an organisation in Slovenia that specialises in repurposing various materials, including textiles. They conduct workshops, collaborate on design projects, and promote the creative reuse of materials as part of a sustainable lifestyle. Contact: KNOF (Creative Reuse Center) is an example of an organisation that engages in such activities. They host workshops and collaborate on projects that repurpose textiles creatively. More information can be found through local creative reuse centres or NGOs focused on sustainability. https://knof.si/en/	Website: KNOF - Creative Reuse Center
	Technology and Design Educational Institutions	Pilot	Technology and Design Educational Institutions Several educational institutions in Slovenia offer courses and projects related to sustainable design and textiles, which often include repurposing: - University of Ljubljana, Faculty of Natural Sciences and Engineering: Offers programs in textile studies that sometimes include projects on textile repurposing and sustainable design practices. - By fostering and expanding repurposing initiatives, Slovenia can enhance its circular economy framework within the textile sector, reducing environmental impact while supporting innovation and creativity in product design. Local craft fairs, design schools, and eco-markets often feature products and initiatives centred on repurposing textiles. These venues provide platforms for designers and artisans to showcase their creative solutions and for consumers to engage with the circular economy tangibly.	Website: Faculty of Natural Sciences and Engineering Naravoslovnotehniška fakulteta - NTF (uni-lj.si)



R8 Recycle		Demonstrative level	Recycling textiles is supported by municipal waste collection systems and private companies specialising in processing textile waste. The “Recycle” strategy in Slovenia’s textile sector is focused on processing textile waste into new materials that can be reused in manufacturing. This approach typically involves collecting, sorting, and processing textile fibres, mechanical or chemical, to convert them into usable raw materials. Recycling aims to reduce the consumption of virgin resources, decrease textile waste, and lower the environmental impact of producing and disposing of textiles. In Slovenia, textile recycling includes post-industrial waste from manufacturing processes and post-consumer waste from used garments and textiles. Textile recycling in Slovenia is at a demonstrative stage, with established collection systems, recycling facilities, and policies that support the recycling of textiles at both municipal and national levels. The infrastructure for textile recycling is relatively well-developed compared to many other countries, supported by legislation and initiatives that promote circular economy practices.	
	MREŽA Komunalna podjetja (Network of Municipal Companies)	Demonstrative	MREŽA Komunalna podjetja (Network of Municipal Companies). This network includes several municipal waste management and recycling companies, including textiles. They play a significant role in facilitating textile recycling efforts through collection, sorting, and processing services.	Website: MREŽA Komunalna podjetja https://www.komunalna-zbornica.si/aktivnosti/sbd/odpadki/
	Slovenian Environment Agency	Demonstrative	The agency oversees and regulates activities related to environmental protection in Slovenia, including waste management and recycling. They provide guidelines, statistical data, and support for recycling initiatives. By effectively implementing and promoting recycling within the textile industry, Slovenia helps to create a more sustainable production cycle and reduces the overall environmental footprint of its textile sector. This approach addresses waste management concerns and aligns with global ecological objectives and the European Union’s waste reduction and resource efficiency targets.	Website: Slovenian Environment Agency Odpadki - poročila in publikacije (gov.si)
R9 Recover		Demonstrative	The “Recover” strategy in Slovenia’s textile sector involves recovering energy from textile waste that cannot be reused, refurbished, or recycled. This is typically done through incineration with energy recovery, where the thermal treatment of waste textiles generates energy in the form of heat or electricity. While recovery is considered a less preferred option in the waste hierarchy, dealing with textile waste that is otherwise unsuitable for recycling due to	



			contamination or material degradation is essential. This approach helps reduce landfill use and harnesses energy from waste materials, contributing to energy production and waste management efficiency. The energy recovery from textile waste in Slovenia is at a demonstrative stage. The country has developed facilities and infrastructure that support waste-to-energy processes, and these facilities are integral to managing municipal solid waste, including non-recyclable textiles.	
	Snaga, Public Company for Waste Management	Demonstrative	Snaga, Public Company for Waste Management Snaga operates several waste management facilities in Slovenia that include capabilities for energy recovery from waste. They are crucial in sustainable municipal waste management, optimising energy recovery and contributing to the city's energy needs.	Website: Snaga
	Ministry the Environment and Spatial Planning	Demonstrative	Through these efforts, Slovenia manages textile waste to minimise its environmental footprint while contributing to the broader goal of reducing landfill use and generating energy from waste. This approach, while a last resort after more sustainable methods have been considered, plays a critical role in the overall waste management strategy, ensuring that waste is handled in an environmentally and economically effective manner.	Website: https://www.gov.si/en/policies/environment-and-spatial-planning/environment/waste/

II.4.7 Social Responsibility & Awareness-raising Initiatives

II.4.7.1 Public Awareness and Perception

In Slovenia, public awareness of the **environmental impact** of fast fashion and textile waste is growing, influenced by global trends and the EU's focus on sustainability. The general perception aligns increasingly with sustainable practices, although this is more pronounced in **urban areas** than rural settings. Cultural attitudes towards sustainability **are evolving**, with younger generations showing more concern for environmental issues and a willingness to adopt sustainable fashion practices.

II.4.7.2 Awareness campaigns

"Manj je več" (Less is More): <https://manjjevec.si/>

This campaign, led by the **Ministry of the Environment and Spatial Planning** and **Ekologi brez meja**, focuses on reducing consumerism and promoting sustainable fashion choices among the Slovenian public. The campaign includes **public service announcements**, **social media engagement**, and **events** that **educate consumers** about the environmental costs of fast fashion and the benefits of choosing durable and recyclable materials.

II.4.7.3 Educational Programs

"Ekošola" (Eco-School), <https://ekosola.si/>

Ekošola is a widespread educational program in Slovenian schools integrating environmental education across different subjects. Part of the program focuses specifically on **sustainable consumption**, including textile waste. It aims to teach students about the lifecycle of clothing, the importance of recycling textiles, and how to make more sustainable fashion choices.

II.4.7.4 NGOs – Non-government organizations (NGO)s initiatives

Domov - Obleka naredi človeka <https://www.oblekanaredicloveka.si/>

Circular Textiles Platform (Platforma za krožna tekstilija)

This NGO-led (Zavod 3MUHE, Ekologi brez meja, Focus, društvo za sonaraven razvoj) initiative **promotes textile recycling** and **sustainable fashion**. The campaign includes workshops, swap meets, and information sessions that educate the public on repurposing old clothing and supporting brands that adhere to ethical and sustainable production practices.

II.4.7.5 Research projects – Specific research partnership

Research on textile waste management and recycling in Slovenia is limited. Some research is conducted through the:

"Tekstilnica" <https://www.tekstilnica.si/>

Tekstilnica is a collaborative research partnership among **Slovenian universities**, **textile companies**, and **environmental organisations**. The partnership focuses on developing innovative textile recycling technologies and sustainable textile materials. It also studies consumer behaviour and the effectiveness of various textile waste management strategies in Slovenia.

These initiatives reflect a growing recognition of the importance of sustainable textile

management in Slovenia. Various stakeholders support them, including government bodies, educational institutions, NGOs, and the private sector, support them. Through these efforts, Slovenia aims to improve sustainable practices across the textile industry and among consumers, promoting a shift towards a more circular economy.

II.4.7.6 Collaborative Initiatives

Slovenia has embraced collaborative initiatives involving various stakeholders to address textile waste management and recycling challenges. Collaboration between **industry stakeholders, governments, and non-governmental organizations** is becoming more common in addressing the textile industry's systemic waste management and recycling issues. These partnerships often include **government bodies, industry players, and non-governmental organisations**, each bringing unique expertise and resources to tackle the complexities of textile recycling. Here are some notable examples:

Circular Textiles Platform (Platforma za krožna tekstilija)

<https://www.irspin.si/index.php?page=tppl&lang=sl> ?

The Circular Textiles Platform is a collaborative initiative in Slovenia that aims to unite efforts from **various sectors** to promote the circular economy within the textile industry. It involves stakeholders from **government agencies, textile manufacturers, fashion retailers, research institutions, and NGOs**. The platform's objectives include developing sustainable textile production and consumption practices, improving recycling technology, and reducing textile waste. Through workshops, seminars, and joint projects, the platform facilitates **knowledge exchange** and fosters innovative solutions tailored to Slovenia's market and regulatory environment.

Slovene Textile Association

[Slovene Textile Association – Slovene Textile Association \(zveza-tekstilcev.si\)](https://www.zveza-tekstilcev.si/)

Slovene Textile Association — The Slovene Textile Association is a nonprofit organization with a long history, reaching back to 1953 when it was established as the Association of Slovene Textile Engineers and Technicians (Address: University of Ljubljana, Faculty of Natural Sciences and Engineering). The association aimed to network and strengthen links between textile companies, academia, stakeholders and other governmental communities. In the past, STA hosted congresses and organized events, meetings, and excursions. Since 2009, it has been renamed to Slovene Textile Association. It has changed its business activities but has stayed focused on its primary goal- networking.

These initiatives demonstrate Slovenia's **proactive approach to addressing textile waste through collaboration and partnership**. Slovenia aims to create a more integrated and effective system for managing textile waste by involving many stakeholders that contribute to the **nation's sustainability goals** and the wider European community.

II.4.7.7 Effectiveness of Current Awareness Campaigns and Educational Programs in Slovenia on Textile Waste Management

Overview

Slovenia has implemented various **awareness campaigns** and **educational programs** to promote sustainable textile management. These initiatives are crucial in **changing consumer behaviour** and enhancing understanding of textile waste issues. Below, we evaluate their effectiveness, considering their reach, impact on behaviour, and potential areas for improvement.

1. Awareness Campaigns:

Effectiveness: The awareness campaigns in Slovenia, such as “Manj je več” (**Less is More**), <https://manjjevec.si/>, have been moderately effective in raising awareness about the environmental impacts of fast fashion. These campaigns leverage **various media platforms** to reach a broad audience, successfully educating the public on the importance of reducing consumption and choosing sustainable options.

Challenges: However, the translation of awareness into action remains a challenge. While people may become more aware of the issues, this doesn't always result in changed purchasing habits. The effectiveness of these campaigns could be hindered by the **availability and higher cost of sustainable clothing options**, which may deter consumers from making environmentally friendly choices.

Recommendations: To enhance effectiveness, campaigns could incorporate **more direct calls to action**, such as promoting **specific sustainable brands** or **local recycling programs**. Partnerships with retailers to offer discounts or incentives for recycling old clothes or purchasing sustainable products could also bridge the **gap between awareness and action**.

2. Educational Programs:

Effectiveness: Educational initiatives like the “Ekošola” (Eco-School), <https://ekosola.si/>, <https://ekosola.si/ne-zavrzi-oblek-ohrani-planet-24-25/>, program are particularly effective in embedding **sustainable principles** early on. These comprehensive programs cover various aspects of environmental education, **including textile waste**. They effectively engage young people, who are often enthusiastic about adopting and promoting sustainable practices.

Challenges: One limitation is that these educational programs are mostly confined to school settings and may not reach adults already established in their consumption habits. Additionally, the scope of these programs might be too broad, **diluting the focus on textiles specifically**.

Recommendations: Expanding educational content to **community centres** or through adult education programs could widen the impact. Moreover, focusing some sessions specifically on textiles—explaining the recycling process, the environmental cost of production, and how consumers can make a difference—could deepen the understanding and impact of these **educational efforts**.

Overall, while Slovenia's awareness campaigns and educational programs are laying a foundation for a more sustainable approach to textile consumption and waste management, their effectiveness could be boosted by more **targeted actions** and incentives that **link awareness directly to consumer behaviour**. These initiatives are encouraging, and continuous improvement could lead to significant advancements in **sustainable textile management** in Slovenia.

II.4.8 SWOT Analysis

The following table presents the SWOT analysis for the Slovenia paradigm to identify strengths and weaknesses, opportunities and threats in the local management and recycling of textile waste, with a vision of the implications for global efforts. The SWOT analysis concerns Slovenia at a country-level.

Here is a SWOT analysis for Slovenia in **textile waste management and recycling**. This analysis considers the **current infrastructure, technology, regulatory frameworks, and potential areas for improvement**:

Table 17. SWOT Analysis for Textile Waste Management and Recycling in Slovenia

Strengths	Weaknesses
Evaluate existing infrastructure, technology, and regulatory frameworks supporting textile waste management. Identify strong points like robust infrastructure, supportive policies, or established recycling facilities. - Well-established Regulatory Framework: Slovenia, as part of the EU, has access to a robust regulatory framework, which includes directives aimed at waste management and recycling practices. - EU Funding and Support: Slovenia benefits from EU funds and support for environmental projects, including improving recycling technologies and infrastructure. - High Public Awareness and Education: Through various campaigns and educational programs, there is a growing awareness among the Slovenian public regarding the importance of recycling and sustainable practices. - Innovative Research and Partnerships: Slovenia strongly emphasizes innovation, particularly in sustainable practices and circular economy, facilitated by research institutions and collaborations.	Identify gaps in current practices, legal frameworks, and public awareness. Highlight areas for improvement, including Gaps in regulations, technology, or public awareness. - Gaps in Specific Regulations for Textiles: While general waste management is well-regulated, specific regulations focusing solely on textile waste are less developed. - Limited Infrastructure for Textile Recycling: There is a lack of specialized facilities dedicated solely to textile recycling, which can hinder the efficiency of recycling processes. - Economic Viability of Recycling Operations: The costs associated with collecting, sorting, and processing textile waste can be high, making it economically challenging without substantial governmental or EU support. - Insufficient Data on Textile Waste: There is a lack of comprehensive data on textile waste generation and recycling rates, which can impede targeted policy-making and improvements.
Chances/ Opportunities	Threats
Explore potential areas for improvement, innovation, collaboration, and policy enhancements. - Development of Circular Economy Models: There is significant potential to expand circular economy practices, specifically in the textile sector, enhancing sustainability and resource efficiency. - Technological Advancements: Investing in new recycling technologies and innovations can improve the efficiency and output of recycled textile products. - Collaboration Across Sectors: Enhanced collaboration between government, industry, NGOs, and academia can lead to more robust and effective recycling strategies. - EU Strategies and Directives: Ongoing developments in EU policies provide a framework for Slovenia to enhance its textile	Analyse challenges such as lack of regulations, social resistance, technical limitations, economic constraints, resistance to change, or environmental risks. - Global Market Pressures: Competition from low-cost, high-volume textile producers can undermine local recycling efforts and sustainable practices due to market preferences for cheaper goods - Resistance to Change: Cultural and Industrial Resistance to changing from traditional to sustainable practices can slow the adoption of new technologies and methods. - Environmental Impact of Current Practices: Current practices that rely heavily on landfilling and incineration of textile waste pose ecological risks and may not be sustainable in the long term. - Economic Constraints: Economic downturns or budgetary constraints can reduce public and private funding for environmental projects

This SWOT analysis highlights the comprehensive approach needed to address the strengths and weaknesses in Slovenia's textile waste management sector. The opportunities for growth and improvement are substantial, particularly with continued EU support and the adoption of innovative technologies. However, addressing the threats requires strategic planning and continued commitment to transforming practices toward sustainability and circular economy principles.



II.5 Italy

II.5.1 Introduction to the Textile and Clothing (T&C) Sector in Italy

Italy's textile and clothing (T&C) industry is a significant component of the country's manufacturing sector, renowned worldwide for the quality and design of its products. This sector has a long tradition dating back centuries, with roots deeply intertwined with Italian culture and craftsmanship. The industry encompasses various activities, from producing fibres and fabrics to creating high-fashion clothing and accessories.

II.5.1.1 Current State of the Industry

The Italian T&C sector comprises over 45,000 companies, many of which are small and medium-sized family-run businesses. In 2023, the industry's total revenue reached approximately 55 billion euros, marking a 3% growth compared to the previous year. The sector has faced numerous challenges recently, including globalization, international competition, and changing consumer preferences. However, the industry has maintained a prominent position in the global market through innovation, artisanal quality, and adaptation to new trends. Recently, there has been growing interest in digitalization and sustainable production within the sector.

II.5.1.2 Economic Impact

The textile and clothing industry represents a significant part of the Italian economy, contributing around 2% to the national GDP. The sector employs over 400,000 people, making it one of the largest employers in the manufacturing sector. Italian companies in this sector are known for their ability to generate added value through high-quality materials and innovative design. Additionally, the industry strongly impacts related sectors, including textile machinery, chemicals, and distribution.

II.5.1.3 Exports

Exports are a crucial element for the Italian T&C industry. In 2023, the value of textile and clothing exports exceeded 31 billion euros, a 5% increase compared to the previous year. Italian products are highly valued abroad for their style, quality, and uniqueness. The main export markets include the United States (15% of total exports), Germany (14%), France (12%), the United Kingdom (10%), and China (8%). Italy is one of the world's leading exporters of luxury textile and clothing products, with a strong presence at international trade fairs and an extensive global distribution network.

II.5.1.4 Challenges and Opportunities

The main challenges for the Italian T&C industry include competition from low-cost countries, the need for technological innovation, human resource management, and sustainability. Competition with countries like China, Bangladesh, and Vietnam, where production costs are significantly lower, poses a constant threat. Additionally, the sector faces increasing pressure to reduce its environmental and social impact. This includes reducing CO₂ emissions, water conservation, waste management, and adopting ethical labour practices. However, numerous opportunities exist, such as expanding into emerging markets, adopting sustainable practices, and integrating digitalization into production.

processes. Combining tradition and innovation will be crucial for the sector's future. Adopting and implementing sustainable solutions can meet consumer expectations and provide a significant competitive advantage in the global market.

II.5.1.5 Focus on Sustainability

Sustainability has become a central theme for the Italian T&C industry. Many companies are adopting sustainable practices, from using eco-friendly materials to reducing the environmental impact of production processes. About 20% of Italian textile companies have implemented circular economy systems, and many others are investing in technologies to reduce CO2 emissions and water consumption. Italy is at the forefront of research and development of new sustainable technologies and implementing circular economy systems. This commitment to sustainability not only meets the growing expectations of consumers but also represents an opportunity for competitive differentiation in the global market.

20% of a market that is a flagship of the country's economy still has minimal market share. Undeniably, the sector's sustainable transition faces many challenges, primarily the cost of investing in research and development to reduce the environmental impact of production processes and increase product circularity, especially when international competition still makes fast fashion a competitive advantage.

II.5.1.6 Growth in the Textile and Clothing Sector

- Industry Growth:

In Italy, the textile and clothing sector has shown moderate growth in recent years, with estimates indicating an annual increase ranging from 2% to 4%. This progress is driven by the demand for high-quality and luxury products, positioning Italy as a global leader in this sector. Additionally, adopting sustainable practices and digitalization are becoming increasingly crucial for the industry.

- Economic Impact:

Employment: The textile and clothing sector represents a significant component of the Italian labour market, with numerous small and medium-sized enterprises (SMEs) spread throughout the country, particularly in regions such as Lombardy, Veneto, and Tuscany.

Trade: Italy is a major global exporter of high-end textile and clothing products. This sector positively contributes to Italy's trade balance, thanks to the strong international demand for Italian fashion. **Innovation:** The industry invests in advanced technologies such as sustainable production, innovative materials, and digitalization of production processes to maintain global competitiveness.

II.5.1.7 Sources and Further Research

Centro Studi di Confindustria Moda; Camera Nazionale della Moda Italiana; ISTAT (Istituto Nazionale di Statistica); Pambianco Magazine; Fashion Magazine; Rapporti di McKinsey & Company; Rapporti di Boston Consulting Group; Ministero dello Sviluppo Economico (MISE) Istituto di Studi e Analisi Economica (ISAE); Associazione Italiana per la Gestione dell'Informazione e la Comunicazione (ASGI).

II.5.1.8 Conclusion

Italy's textile and clothing industry is of great economic and cultural importance. Despite the challenges, the sector thrives thanks to its ability to innovate and adapt. The focus on quality, design, and sustainability are the pillars on which the success of the Italian T&C industry is based. Looking to the future, it will be essential to continue investing in research, innovation, and sustainability to maintain and strengthen Italy's position in the global market.

II.5.2 Textile Waste Management

In terms of textile waste management, an essential topic for VERDEinMED, according to the data from Eurostat in 2023^{89,90} shows that production of textile waste in Italy has a small increase during the years 2012-2020, with a great recycling rate, reported between 47-66%. However, it is understood that the actual recycling rate is much lower, with a significant portion of collected textiles being exported for processing or ending up in landfills.

Table 18. Production and recycling of textile waste (ton) of Italy... T&C sector.

	2012	2014	2016	2018	2020
Textile waste (ton)	394.828	439.752	465.925	519.214	424.268
Recycling of textile wastes (ton)	185.290	264.769	295.481	343.128	270.558

The Italian Institute for Environmental Protection and Research (ISPRA) has reported that 5.7% of residual waste from separate collections consists of textiles, approximately 663 thousand tons of **recycled** textile waste annually.

The primary challenges to high-quality textile recycling include the diverse mix of materials, coatings, dyes, and non-textile items found in textile waste. The lack of advanced sorting and recycling technologies further compounds the challenge.

II.5.3 Legal Framework

II.5.3.1 Regulations

As a European Union (EU) member, Italy adheres to EU directives and regulations transposed into national laws. These regulations focus on environmental protection, sustainable practices, and waste management, including textile waste. The specific legislation that governs the management and recycling of textile waste in Slovenia includes: In Italy, waste management responsibility is subdivided into different levels: national government authorities disseminate national rules and regulations; collection, transport, recovery and disposal service is organized within Optimal Territorial Areas (ATO) defined by the individual Regions and representatives of the municipalities; the functions of regulation and control in the field of waste are attributed to the Regulatory Authority for Energy Networks and Environment (ARERA).

⁸⁹https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN__custom_7396092/bookmark/table?lang=en&bookmarkId=646ce0a9-2988-464d-bd35-1b67e726a8db

⁹⁰https://ec.europa.eu/eurostat/databrowser/view/ENV_WASTRT__custom_7396182/bookmark/table?lang=en&bookmarkId=a6d83881-d12c-441f-acd3-5c5dca6ec3dc

The importance of the textile sector in Europe is demonstrated by the fact that the European Action Plan 2020 on the Circular Economy has identified it as a priority area with a dedicated Strategy [<https://www.eso.it/gogreen-newsletter-335/i-rifiuti-tessili-in-italia-spiegati-coi-numeri>]. As a member of the European Union (EU), Italy adheres to EU directives and regulations transposed into national laws focused on environmental protection, sustainable development, and waste management, including textile waste.

Table 19. A short explanation of legislation in Italy in the T&C sector

Legislative Decree 116/2020	It is part of the Circular Economy Package: a first critical step was made on 1 January 2022, when Italy came into force with the obligation to separate textile waste collection in all municipalities. It anticipated the obligation at the Community level, planned to enter force in 2025 [https://www.eso.it/gogreen-newsletter-335/i-rifiuti-tessili-in-italia-spiegati-coi-numeri].
Ministerial Decree No. 342/2022	In December 2022, the Ministry of the Environment and Energy Security (MASE) launched a consultation to define an Outline Regulation on the textile end of waste status. This decree provides rules for various streams of textile waste.
Extended Producer Responsibility (EPR)	In February 2023, the Ministry of Environment and Energy Security (MASE) and the Ministry of Enterprises presented a draft decree on Extended Producer Responsibility in the textile sector to create a system that values eco-friendly innovation. The public consultation procedure of this decree ended on 3 March 2023, intending to involve the main stakeholders in adopting legislation consistent with the current fashion sector. In addition, it proposes the creation of a collection network throughout the country. Specific selective collection systems will also be introduced to increase the quality of textile fractions to achieve incremental goals of at least 25% by weight by 2025, 40% by 2030 and 50% by 2035 [https://www.rinnovabili.it/economia-circolare/riciclo/rifiuti-tessili-riciclo-italia-sfide-futuro/].
NRRP	NRRP will invest about 600 million euros to modernize recycling plants (450 million) and flagship projects of circular economy (150 million) dedicated to the extension of separate collections, necessary to update the plants and the recovery chain to include more waste flows, such as textile products.

II.5.3.2 Policies

- Strategies or/and Action Plans in Italy:

Italy has demonstrated a solid commitment to sustainability in recent years by implementing several key policies and initiatives. These efforts address environmental challenges and promote sustainable development across various sectors.

Strategies Sustainability Strategies and Regulations	
<u>NATIONAL STRATEGY FOR SUSTAINABLE DEVELOPMENT</u>	The National Strategy for Sustainable Development (SNSvS) is Italy's framework to align with the United Nations' 2030 Agenda for Sustainable Development. Approved initially in 2017 and updated in 2022, the SNSvS focuses on integrating social, environmental, and economic dimensions of development. The strategy is structured into two main sections: • "5 P" Section: This section outlines Italy's sustainable development goals based on the five pillars of the 2030 Agenda - People, Planet, Prosperity, Peace, and Partnership. It emphasizes the interconnections among the SDGs and sets strategic choices and national objectives, along with associated target values and indicators for monitoring progress. • "Vectors of Sustainability" Section: This section identifies necessary elements and enabling conditions for achieving sustainable development goals at national and territorial levels. The three vectors are policy coherence for



	sustainable development (PCSD), culture for sustainability, and participation in sustainable development. Furthermore, the SNSvS includes two annexes: • The National Action Program for Policy Coherence for Sustainable Development. • The updated regulation for the Forum for Sustainable Development. The SNSvS serves as the national reference framework for planning, programming, and evaluating environmental and territorial processes, requiring regions to develop regional strategies aligned with national objectives. The Ministry collaborates with various local authorities to implement the plan at different levels. Since 2018, the Ministry has established mechanisms and tools to ensure the participation of institutions and non-state actors, including MASE-Regions discussion tables and the National Forum for Sustainable Development. These efforts are supplemented by annual national conferences, workshops, and seminars to engage civil society. A funding program for 2023-2024, approved in July 2023, supports the implementation of the SNSvS, focusing on the main action lines defined by the vectors of sustainability and their territorial application. The Ministry, in collaboration with ISTAT and ISPRA, monitors the implementation of the strategy and reports annually to the Presidency of the Council. The strategy undergoes periodic revisions every three years with broad stakeholder participation. Internationally, Italy's progress is reviewed through the Voluntary National Review (VNR) process at the UN's High-Level Political Forum. This strategy underscores Italy's commitment to a sustainable future by fostering integrated policies and active collaboration among various levels of government and society. It has a general and cross-sectoral approach but does not explicitly focus on the textile sector. This plan sets out the strategic goals and actions for waste management up to 2030. It includes specific objectives for textile waste, aiming to improve the collection, sorting, and recycling processes. This plan supports the transition to a circular economy, reducing waste generation and increasing resource efficiency.
<u>NATIONAL STRATEGY ON CIRCULAR ECONOMY</u>	The Italian Circular Economy Strategy aims to foster sustainable development by shifting from a traditional linear economy to a circular one. This approach seeks to create a system where resources are continuously reused and recycled, significantly reducing waste and minimizing the environmental footprint of both production and consumption. This strategy aligns with the broader goals of the European Green Deal and the United Nations' 2030 Agenda for Sustainable Development. The Italian Circular Economy Strategy aims to foster sustainable development by shifting from a traditional linear economy to a circular one. This approach seeks to create a system where resources are continuously reused and recycled, significantly reducing waste and minimizing the environmental footprint of both production and consumption. This strategy aligns with the broader goals of the European Green Deal and the United Nations' 2030 Agenda for Sustainable Development. One of the primary objectives of this strategy is to enhance resource efficiency across all sectors of the economy. By improving how resources are used, the plan seeks to decrease the dependency on raw materials and boost the utilization of secondary raw materials. This shift conserves natural resources and promotes a more sustainable industrial framework. Reducing waste generation is another critical goal. The strategy emphasizes the importance of minimizing waste at its source promoting practices that encourage reuse, recycling, and the recovery of materials. These measures aim to significantly reduce the volume of waste in landfills, thereby mitigating the associated environmental impacts. Sustainable production and consumption are at the heart of the circular economy. The strategy encourages producers to adopt less resource-intensive processes and generate minimal waste. On the consumer side, it promotes the adoption of sustainable consumption patterns, where products are chosen based on their longevity, reparability, and recyclability. This holistic approach ensures that sustainability is embedded throughout the product life cycle.



Innovation and competitiveness are also critical components of the strategy. By supporting the development of new technologies and business models that facilitate circular practices, the plan aims to enhance the competitiveness of Italian businesses. This opens up new market opportunities and positions Italy as a leader in circular economy practices.

Effective governance and active participation are crucial for the success of the circular economy. The strategy seeks to strengthen the governance framework at all levels—national, regional, and local—while encouraging active participation from businesses, consumers, and civil society. This collaborative effort ensures all stakeholders are engaged and working towards common goals.

The economic and social benefits of transitioning to a circular economy are significant. The strategy aims to drive economic growth and create new job opportunities in emerging circular sectors. Additionally, by reducing environmental impacts, the strategy improves social well-being and the overall quality of life.

The circular economy strategy plays a vital role in climate action. Promoting practices that reduce greenhouse gas emissions supports Italy's commitment to international climate agreements and the objectives of the European Green Deal. The strategy addresses environmental challenges and contributes to global climate goals through these efforts.

Focus on the Textile Sector in the Italian Circular Economy Strategy

The Italian Circular Economy Strategy significantly emphasises the textile sector, recognizing its substantial environmental impact and potential for sustainable transformation. The strategy aims to address the challenges the fast fashion industry poses and the high volume of textile waste generated annually.

Key Points of the Strategy for the Textile Sector:

- **Reduction of Textile Waste:**

The strategy sets out to reduce textile waste through various measures. It promotes the extension of product lifespans by encouraging the design and production of more durable and repairable textiles. This approach aims to mitigate the fast fashion trend, where garments are used for increasingly shorter periods, contributing to large amounts of waste.

- **Separate Collection Systems:**

By January 1, 2025, Italy, in alignment with EU directives, will be required to implement separate collection systems for textile waste. This measure aims to increase the recovery and recycling rates of textiles. The strategy acknowledges that over 70% of Italian municipalities have already established collection systems, although the effectiveness varies across different regions.

- **Reuse and Recycling:**

The strategy emphasizes the importance of establishing centres to prepare textile waste for reuse. These centres will facilitate the sorting and cleaning used textiles, making them suitable for resale or donation. Additionally, the strategy supports developing and adopting advanced mechanical and chemical recycling technologies to improve the quality of recycled textile materials.

- **Innovation and Competitiveness:**

To enhance the competitiveness of the Italian textile industry, the strategy encourages innovation in sustainable production methods and business models. This includes promoting circular fashion initiatives and supporting research and development in textile recycling technologies. The goal is to position Italy as a sustainable textile production and recycling leader.

- **Consumer Awareness and Participation:**

The strategy also focuses on raising consumer awareness about the environmental impact of textile consumption. It promotes sustainable consumer behaviours, such as choosing longer-lasting, repairable, and recyclable textiles. Public campaigns and educational programs are planned to encourage more responsible consumption patterns.

- **Circular Economy Goals:**

Integrating the textile sector into the broader circular economy framework, the strategy aims to create a sustainable system where textiles are continuously reused, recycled, and kept in the economy for as long as possible. This aligns with the overall mission of reducing waste and minimizing environmental impacts.



	The Italian Circular Economy Strategy seeks to transform the textile sector into a more sustainable and environmentally friendly industry by addressing these key areas. The strategy's comprehensive approach includes regulatory measures, technological innovation, and consumer engagement to achieve its goals.
<u>NATIONAL WASTE MANAGEMENT PLAN (PNGR)</u>	The Italian National Waste Management Plan (PNGR) is a strategic framework for waste management planning for the regions and autonomous provinces. The plan aims to align with European Union directives, promoting sustainable practices and fostering a circular economy. It provides guidelines and strategic criteria to achieve national and European waste management targets. The PNGR, with a timeline from 2022 to 2028, addresses various waste streams, aiming to improve waste collection, treatment, and recycling infrastructure across the country. Regardless of its general approach, the plan also focuses on some specific sectors and defines the main guidelines for Textile Waste Management. <u>Focus on the Textile Sector in the National Waste Management Plan</u> • Need to Address Fast Fashion: The European strategy for textile products highlights the impact of fast fashion, where garments are used for shorter periods, leading to an average of 11 kg of textile waste per person per year. This trend significantly contributes to the increase in textile waste, and it is crucial to address this issue effectively. • Improving Collection Systems: Following the National Strategy on Circular Economy, the PNGR also stresses the importance of introducing separate collection obligations and improving the local collection system for textile waste, whose effectiveness is very different across different territories. The PNGR also emphasizes the need to enhance separate collection systems for textile waste. By implementing more selective collection processes, the quality of the collected textile fractions can be improved, facilitating more efficient recycling. • Establishment of Reuse Centers: The plan includes creating centres dedicated to preparing textile waste for reuse. These centres aim to reduce the overall waste generated by extending the life cycle of textile products through reuse. • Development of Recycling Technologies: The PNGR supports the development and adoption of advanced recycling technologies. These technologies aim to improve mechanical and chemical recycling processes, enabling the recovery of higher-quality materials from textile waste. • Circular Economy Goals: The PNGR is part of the Italian Circular Economy Strategy. It aligns with the strategy's primary goal to transition towards a circular economy. It promotes sustainable practices and technological innovation to minimize the textile industry's environmental impact. • Planning and Monitoring: The plan establishes comprehensive monitoring activities to track illegal disposals and promote centralized governance. This supports local policies in implementing the necessary infrastructure for effective waste management. The overall approach underlying the PNGR aims to ensure that textile waste management is integrated into a larger sustainability framework and circular economy principles, aligning with national and European objectives.
<u>SMART SPECIALIZATION STRATEGY 2021-2027</u>	The Italian Smart Specialization Strategy (S3) 2021-2027 fosters research, innovation, and technological advancement across critical sectors, including textiles. Its objectives include enhancing competitiveness, promoting sustainability, and driving economic growth through targeted support and development initiatives. This strategy aims to transform regional economies by leveraging local strengths and addressing market demands, thus ensuring balanced territorial development and increased global competitiveness. At the national level, the Italian Smart Specialization Strategy (S3) for the 2021-2027 period has an intersectoral focus, promoting innovation and sustainability in various strategic sectors. Individual Italian regions are tasked with identifying the sectors to prioritize in their innovation policies. The textile sector is included in the S3 strategies of several Italian regions, including:



	Umbria: The region has defined macro development directions, including Creativity, which encompasses technologies that enhance innovation and sustainability in sectors that represent Made in Italy, primarily the textile industry, which is particularly significant for the regional economy. Emilia-Romagna: The region has prioritized textiles in its thematic areas to promote innovation and competitiveness through development trajectories and modernise the textile sector with advanced technologies and sustainable practices. Marche: The Marche region's strategy recognizes textiles as a critical sector, aiming to support innovation and growth by fostering productive diversification that leverages local skills and technological potential in the textile industry. Toscana: Tuscany has also prioritized the textile sector, focusing on improving competitiveness and innovation through advanced technologies and promoting sustainability. The regional strategy aims to capitalize on technological opportunities to strengthen the industry. These regions are implementing specific measures to support and develop the textile sector, recognizing its economic importance and innovation potential.
Strategy for Smart Specialization 2021-2027	The Strategy for Smart Specialization of Slovenia for 2021-2027, known as S4, is pivotal in directing the country's economic development through targeted support in areas deemed high potential, including sustainable technologies and practices. Although the strategy broadly covers various sectors for enhancing economic and technological development, its implications for textile waste management and recycling can be inferred as part of the broader goals towards sustainability and innovation. Sustainability and Circular Economy: One of the central themes of Slovenia's Smart Specialization Strategy is enhancing the sustainability of its industries. This includes promoting circular economy principles across various sectors, including textiles. The strategy likely supports initiatives that improve the lifecycle management of textiles, from production to end-of-life, encouraging practices like recycling and repurposing. Innovation and Technology: The strategy emphasizes the importance of innovation in driving economic growth. For textile waste management, this may involve developing and adopting new technologies that enhance textile recycling processes—such as advanced sorting technologies, chemical recycling techniques that break down textiles into raw materials, and new methods for high-quality fibre regeneration. Collaboration and Cluster Development: Slovenia aims to foster cooperation between research institutions, businesses, and government bodies. In textile waste, this could mean more coordinated efforts between textile producers, waste management companies, and technology developers to create a more efficient and integrated textile recycling ecosystem.
Operational Programme for Implementing the EU Cohesion Policy	This programme includes initiatives, the identification of projects, and the planned EU Fund for implementation that supports waste management infrastructure, including facilities specifically for textile sorting and recycling. It promotes innovations in recycling technologies and supports the development of new business models for textile reuse.
European Green Deal	Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green Deal will transform the EU into a modern, resource-efficient and competitive economy, ensuring: • no net emissions of greenhouse gasses by 2050 • economic growth decoupled from resource use • no person and no place is left behind The European Commission has adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels—more information on Delivering the European Green Deal.
Action Plans	
The EU Circular Economy Action Plan	The European Commission adopted the new circular economy action plan (CEAP) in March 2020. It is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth. The EU's transition to a circular economy will reduce pressure on natural resources and create sustainable

	growth and jobs. It is also a prerequisite to achieve the EU's 2050 climate neutrality target and to halt biodiversity loss.
Subvention schemes	
Law 27 December 2023, No. 206	This law, effective from January 2024, includes provisions specifically designed to promote and protect Made in Italy products. It introduces various incentives to enhance sustainability and technological advancement in the textile sector, including support for eco-friendly practices and advanced manufacturing technologies.
Incentives for Startups and SMEs	Programs like Smart & Start Italia offer interest-free loans covering up to 80% of eligible expenses for startups, with increased support for those involving young entrepreneurs or women. Additionally, there are technical and managerial tutoring services and opportunities for converting part of the loan into a non-repayable grant under certain conditions. It is a cross-sectoral program but is also open to startups in the textile sector. In past years, Invitalia has also promoted the Textile, Fashion, and Accessories measure, which is aimed explicitly at offering non-repayable grants for startups and young talents developing innovative ideas in the fashion sector.
TAX INCENTIVES: "TRANSIZIONE 4.0" AND "TRANSIZIONE 5.0"	The "Transizione 4.0 plan is an Italian initiative to enhance digital transformation and business innovation through financial incentives. Tax credits support investments in advanced manufacturing technologies, research and development, and sustainability practices, aiming to boost productivity and competitiveness in line with Industry 4.0 principles. Although Transition 4.0 remains active, starting in 2024, Italy is promoting a new tax incentives framework called "Transizione 5.0". The 5.0 transition plan is an initiative to encourage industries' digital transformation and green transition. It supports investments in advanced technologies to improve energy efficiency, reduce environmental impact, and enhance digital capabilities. The program offers financial incentives such as grants and soft loans to businesses that adopt sustainable and innovative practices. This initiative is part of Italy's broader strategy to align with European Union goals for sustainable development and technological advancement. All these incentives aim to enhance the Italian textile industry's sustainability, innovation, and global competitiveness, ensuring its growth and adaptation to modern market demands.

II.5.3.3 Initiatives

Supporting structures Italy has developed some supporting structures that facilitate textile waste management, reuse and recycling:	
Campaigns: Public Awareness Campaigns:	
Consortia for textile waste	To date, there are 5 significant consortia active in the textile sector in Italy. They want to promote efficient waste management in the T/C world and create an EPR system that integrates efficiency and traceability, promoting environmental and social sustainability throughout the supply chain. Each consortium supports its members in managing administrative practices and regulatory compliance, improving separate collection and promoting circular economy and waste prevention practices (COBAT Tessile - https://www.cobattessile.it/ , Ecotessili - https://ecotessili.it/ , Erion Textiles - https://eriontextiles.it/it/ , Re.Crea - https://www.cameramoda.it/it/ , Retext.Green - https://www.sistemamodaitalia.com/it/item/12439-nasce-il-nuovo-consorzio-per-il-riciclo-della-moda).
Social cooperatives	Social Cooperatives are a particular form of Cooperative aimed at the realization of services to the person or the employment of disadvantaged people; many of them work in the field of reuse, reduction and recycling of waste, such as: - Cooperativa Insieme (https://insiemesociale.it/) recovers, prepares for reuse and recycles objects that would become waste, including clothes and textiles, putting them back on the market;



- **Vesti Solidale** (<https://www.vestisolidale.it/>) works in the field of collection and recovery of waste by starting recovery and recycling in its plants, including used clothes;
- **Cooperativa MIR** (<https://www.youtube.com/watch?v=bdk-q4lfCmc>) welcomes as member workers, volunteers and trainees, people mostly frail, individuals at risk of marginality and deviance, victims of physical or psychological abuse. They created the Northern Italy's largest textile recovery plant, the Textile Hub of Rho;
- **Cooperative CAUTO** (in Brescia), a network that manages different second-hand shops, aims to include disadvantaged people in the job market. The clothes come from the ethic chain "**Ri-vesti di Valore**", in collaboration with Caritas Diocesana;
- **Cooperative QUID** (<https://www.quidorg.it/>), whose fashion collections are made of leftover fabrics supplied by famous high-quality brands.
- These are examples of some of the networks that do collection, treatment and sale of used goods, creating a circular km0 supply chain in different areas of Italy:
Tessuto Sociale - <https://tessutosociale.it/>

Recooper network - <https://recooper.it/>

Riuse network - <https://www.reteriuse.it/>
- **NIO New Is Over**: project of Coop Insieme: tailoring that uses only post-consumer waste and makes it an awareness campaign - <https://newisover.it/>
- **Coop La Fraternità** - <https://www.lf23.it/about>
Fraternity is a type A and B social cooperative registered as a non-profit organization that offers quality services mainly in two areas, education and employment. Among the cooperative's activities is waste and used clothing collection.
- **Coop La Venenta** - <https://www.venenta.it/tramelab/>
We don't design by season; We don't design by fashion. We produce value. When something doesn't work we repair it. When there is a tear we sew it up.
Venenta social cooperative enhances the resources of people living in fragile contexts at risk of social exclusion, providing them with skills within a protected context.
Through the creation of clothing, accessories and gift items, people placed in apprenticeship, training and work inclusion training paths have the opportunity to build professionalism and aspire to gradual socio-economic autonomy.
- **Made in Carcere** - <https://www.madeincarcere.it/>
MADE IN PRISON tries every day to contaminate the economic and civil society, through the promotion and dissemination of our model of "regenerative economy".
- **Rifò** - <https://rifo-lab.com/pages/about> - B-Corp from 2020
Recycled and recyclable materials, no overproduction, low-impact packaging
- **Sartoria Sociale** - <https://sartoriasociale.com/>
Textile scraps become resources. Encounters turn into relationships. Sartoria Sociale produces ethical clothing and tailoring artifacts.
It integrates a sustainable fashion store and a tailoring and textile recycling workshop, where people from various social, ethnic and professional backgrounds work. A social enterprise of the Al Revés cooperative, which promotes artisanal knowledge, circular economy and social inclusion.



	Rete RIUSE - https://www.reteriuse.it/ Collection and management of textile waste
Platforms	Multimedia tools to discover where to buy sustainable clothes and where to give a second life to your clothes, such as Vestito Verde (https://www.ilvestitoverde.com/), one of the first Italian platforms to discover physical stores and e-commerce of sustainable fashion. Research projects https://openinnovation.regione.lombardia.it/it/news/news/6605/il-progetto-circular-textiles-per-il-riciclo-di-scarti-e-tessili-usati
Responsible fashion movement	On 24 April 2023, exactly 10 years after the collapse of the Rana Plaza, the Responsible Fashion Movement (MMR) was born. The movement has taken the first step towards creating a responsible, accessible and recognised fashion industry (https://www.vestilana.it/manifesto-per-la-moda-responsabile-mm/). Catheclisma - https://www.catheclisma.com/ CATHECLISMA is a slow fashion brand founded by Caterina Grieco, with a strong focus on sustainability. It was born during the pandemic in April 2020 from the need to reduce waste in the fashion system and to improve, in its own small way, the health of our planet. Dondup - https://www.dondup.com/it/sostenibilita Eco-friendly denim uses 75% less water, 20% less chemicals, 58% less electricity Par.Co denim - https://parcodenim.com Production of jeans from organic or recycled cotton, natural yarns, chemical-free washing and treatment - rethink the jeans production chain, applying sustainability policies from the outset in the choice of raw materials, accessories, suppliers, collaborators and partners. The values of respect for the environment and dignity of workers characterize the founders' personal beliefs, which are also reflected in the brand. Esosport - https://www.esosport.it Collection and recycling of sports shoes ID-Eight - https://www.id-eight.com Shoes made from agricultural scraps NAZENA - start up from 2019 - https://nazena.com/ By recycling textile fibers, Nazena transforms industrial textile waste and used clothes into new products. A circular economy solution to bring the fashion industry to innovation and sustainability.
Campaigns	Fashion Revolution Week - https://www.fashionrevolution.org/ They have become the world's most significant fashion activism movement, mobilising citizens, brands and policymakers through research, education and advocacy. We are a global movement of people who make the fashion industry work. We are the people who wear clothes. And we are the people who make them. DETOX - https://www.greenpeace.org/international/act/detox/ This is an essential campaign of Greenpeace International on the topic of FastFashion: Global fast fashion brands are churning out more clothes than the planet can handle. Today's trends are tomorrow's trash, with our clothes made cheaply and disposed of quickly. It's time to redress the balance, challenge the throwaway mentality and invest in quality over quantity.
Public Awareness Campaigns	the communication campaign "Facciamo circolare – Le tue azioni contano" (Let's circulate – Your actions matter) was carried out by ISPRA (Institute for Environmental Protection and Research) in cooperation with and with the funding of MIMIT (Ministry of Enterprise and made in Italy), aims to raise

	public awareness of more sustainable consumer behaviour, promoting the fundamental principles of the circular economy, in particular the attention to food waste and separate collection (https://www.facciamocircolare.it/).
Government initiatives	
Government initiatives aimed explicitly at enhancing textile waste management include:	
Regulations on Extended Producer Responsibility (EPR)	Enforces EPR regulations that require textile product producers and importers to manage their product lifecycle, including end-of-life disposal. This initiative encourages companies to design products with recyclability in mind and to contribute financially to recycling efforts.
Partnerships with EU Projects	

II.5.3.4 Inconsistencies or gaps in the legal structure that may hinder effective (textile) waste management and recycling

1. Regulatory Gaps and Overlaps

Inconsistent National Legislation:

While Italy has **comprehensive** waste management plans and circular economy strategies, the country does not have an extensive national framework dedicated explicitly to textile waste management. Specific textile regulations are fragmented and vary by region. This inconsistency challenges nationwide standardization and effective textile waste management (ISPRA, 2023).

Partial Implementation of Extended Producer Responsibility (EPR):

While Italy has introduced some EPR schemes, the textile sector is not comprehensively covered. Effective EPR mandates producers to be responsible for the entire lifecycle of their products, including collection, recycling, and disposal. The absence of a mandatory EPR scheme for textiles means that producers are not fully accountable for post-consumer waste, leading to inefficiencies in waste management.

Insufficient Recycling Infrastructure:

The infrastructure for recycling textiles in Italy is underdeveloped. Many recycling facilities lack the advanced technology required to process complex textile waste, which includes blended fabrics and non-recyclable components. This technological gap hinders effective recycling and limits the scalability of textile waste management solutions.

Lack of Consumer Awareness and Participation:

Current regulations do not mandate extensive educational campaigns to inform the public about textile recycling. Without increased consumer awareness and participation, collection rates for recyclable textiles remain low. Effective waste management and recycling depend heavily on consumer engagement, which is not adequately addressed by existing policies.

Gaps in Data Collection and Reporting:

Accurate data collection on textile waste is crucial for developing effective policies and measuring progress. Italy lacks a standardized data collection and reporting system specific to textile waste. This deficiency hampers the ability to assess recycling initiatives' effectiveness and identify areas for improvement.

Inconsistent Definitions and Standards:

Italy has no standardized definition of recyclable textile materials or recycled content. This inconsistency leads to confusion and undermines consumer trust in recycled textile products. Establishing clear definitions and quality standards for recycled textiles is essential for market stability and growth.

2. Enforcement Challenges

Weak Regulatory Enforcement:

One of the primary gaps in Italy's legal framework is the weak enforcement of the existing

textile waste management and recycling regulations. Even when laws and policies are in place, their implementation is often inconsistent across different regions. This inconsistency arises from varying levels of commitment and resource allocation among local authorities, which results in uneven application and compliance. For instance, regions with limited funding or lower prioritization of environmental issues may not enforce regulations as rigorously as others (ISPRA, 2023).

Insufficient Penalties and Incentives:

The current legal structure does not have sufficient penalties and incentives to support waste management. Penalties that are too lenient fail to deter businesses from bypassing regulations. At the same time, there are insufficient incentives for compliance and proactive engagement in sustainable practices. A robust enforcement mechanism should balance penalties for violations with incentives for compliance and best practices, but Italy's current framework falls short.

Lack of Coordinated Oversight:

The lack of coordinated oversight among various governmental agencies responsible for waste management hinders enforcement. In Italy, responsibilities are often fragmented among national, regional, and local authorities, leading to overlaps, gaps, and inefficiencies in enforcement. This fragmentation makes it challenging to monitor compliance effectively and to ensure that all entities adhere to the same standards.

Resource Constraints:

Many local authorities enforcing textile waste management regulations face significant resource constraints. These include limited staffing, inadequate training, and insufficient financial resources. Such constraints impede the ability to conduct regular inspections, monitor compliance, and take corrective actions against violators. Effective enforcement requires well-resourced regulatory bodies, which are currently lacking in many parts of Italy (Confartigianato Imprese, 2023).

Variability in Regional Regulations:

Regional disparities in the implementation of national policies further complicate enforcement. Different regions may interpret and apply national regulations differently, leading to inconsistencies in enforcement practices. This variability can create confusion and loopholes that businesses might exploit to avoid compliance. A more harmonized approach across regions is needed to ensure uniform enforcement of textile waste management regulations.

3. Economic and Financial Incentives

Insufficient Tax Incentives:

Italy does not offer significant and specific tax incentives for businesses that invest in textile recycling and waste management. Tax breaks and deductions can be powerful tools to encourage companies to adopt sustainable practices and invest in recycling technologies. The absence of such incentives means that businesses do not have a financial motive to incur the additional costs associated with recycling.

Lack of Direct Subsidies and Grants:

Direct financial support through subsidies and grants is crucial for offsetting the high initial costs of setting up recycling facilities and purchasing advanced technologies. Italy's current regulatory framework provides limited direct specific financial support for these purposes. This gap deters businesses, tiny and medium-sized enterprises in the **textile** industry, from entering the recycling market or expanding their recycling capabilities.

Inadequate Access to Low-Interest Loans and Green Financing:

Access to affordable financing options is essential for businesses investing in sustainable practices. However, few low-interest loans or green financing options are available specifically for textile waste management and recycling in Italy. Financial institutions and

government programs must provide more tailored financial products to support these environmentally beneficial investments.

Absence of Investment in Research and Development (R&D):

Financial incentives for R&D are critical for developing new recycling technologies and improving existing processes. Italy's support for R&D in textile recycling is insufficient, limiting innovation in this sector. Increased funding and financial incentives for R&D can lead to breakthroughs that make recycling more efficient and cost-effective.

Limited Market Development Incentives:

There is a lack of financial incentives to develop markets for recycled textiles. Policies that encourage using recycled materials through public procurement or tax incentives for manufacturers using recycled textiles are either weak or non-existent. This stunts market demand for recycled textiles and discourages businesses from investing in recycling technologies.

Inadequate Consumer Incentives:

While not directly related to businesses, the lack of incentives for consumers to recycle textiles affects the overall effectiveness of waste management systems. Without financial incentives like deposit-refund schemes or discounts on future purchases, consumer participation remains low, and it is difficult to support the shift from fast and polluting fashion to sustainable fashion.

Weak Support for Circular Economy Models:

Financial incentives that support circular economy models, such as those promoting reuse and refurbishment, are insufficient. Economic measures like subsidies for businesses that adopt circular practices or tax incentives for products designed for longevity and recyclability are crucial but lacking. Enhancing these incentives can encourage enterprises to transition towards more sustainable models.

5. Stakeholder Engagement and Awareness

Insufficient Public Awareness and Engagement: Public awareness and engagement play a crucial role in enforcing waste management regulations. In Italy, there is a general lack of public awareness about the importance of textile recycling and the legal requirements surrounding it. Without adequate public engagement, enforcement efforts are less effective because there is limited societal pressure on businesses to comply. Education campaigns and public engagement initiatives are necessary to support enforcement efforts.

Recommendations for Improvement

- Financial and Economic support: Enhance financial support for businesses adopting circular economy practices, promoting sustainability throughout the product **life cycle**. Implement various incentives (tax, direct subsidies, grants, green financing)
- Support Circular Economy Ventures: Create and promote financial mechanisms like green bonds and venture capital funds for businesses adopting circular economy models in the textile sector.
- Support Circular Economy Initiatives:
- Create a specific Legislation for **Textile** Industry and Harmonize Policies among Different Regions
- Strengthen EPR Schemes: Ensure that EPR policies include strong financial incentives for producers to engage in sustainable product design, take-back schemes, and investment in recycling infrastructure.
- Enhance Coordination Among Authorities: Improve coordination and communication among national, regional, and local authorities to ensure consistent enforcement of regulations.



- Improve Data Collection and Reporting: Develop standardized systems for tracking textile waste and recycling activities to support better enforcement and policy-making.
- Boost Public Awareness Campaigns: Implement widespread education and awareness campaigns to increase public understanding and support for textile recycling regulations.

II.5.4 R-strategies Initiatives

A survey of initiatives has been developed, relating real case studies to r-strategies in Italy. Table 20 provides an overview of each initiative, project, innovative process, technology, or product and its maturity level.

Table 20. R-strategies initiatives in the Italy landscape.

	Name of the initiative	Maturity Level	Description	Contact
00 Refuse	Awareness campaigns and informed choices	Full-scale solution	Refusal implies that the final consumer chooses a more sustainable garment instead of one with a more significant carbon footprint and often with a lower price. To make this choice, the consumer must be informed appropriately. From this perspective, campaigns to increase consumer awareness and technologies that promote the traceability of garments and their life cycle are fundamental. In Umbria, for instance, the company Sterne International has developed and patented a technology for the traceability of its garments. A microchip inserted in the label makes it possible to trace all the production phases (spinning, weaving, linking, treatments, date, movements, and places of garment production). By typing a barcode or photographing the QR code indicated on the label with a smartphone, it is possible to view, from a screen on the company website, all the information relating to the history and production process of the garment. The technology was created to protect the consumer from counterfeits, protect Made in Italy products and allow the consumer to make an informed choice by knowing the entire supply chain from which the product comes	https://lorenaa-toniazzi.com/pages/traccia-bilita
01 Rethink	Zero waste campaign	Full-scale solution	In Italy, many organizations are developing social campaigns to raise customers' awareness about the importance of choosing sustainable fashion. For example, Greenpeace's "Detox My Fashion" campaign aims to eliminate hazardous chemicals from the fashion supply chain. It encourages brands to commit to zero discharge of dangerous substances and promotes safer alternatives. The campaign also pushes for greater transparency in the supply chain, ensuring consumers are informed about the environmental impact of their purchases.	
02 Reduce	Reduction of resources and waste	Development phase	Many companies in the textile sector have developed long-term strategies to achieve Net-Zero status: Brunello Cuccinelli, Ermenegildo Zegna, Moncler Group, Prada Group, and Relaxshoe. In particular, Brunello Cuccinelli, the renowned Italian luxury fashion brand, has laid out an ambitious and comprehensive long-term strategy to achieve Net-Zero status. This strategy is rooted in the brand's core values of sustainability, ethical craftsmanship, and social responsibility. Here are the critical components of their strategy: 1. Sustainable Supply Chain	https://www.brunellocuccinelli.com/it/



			2. Energy Efficiency and Renewable Energy 3. Carbon Offsetting and Reduction Initiatives 4. Circular Economy Principles 5. Sustainable Design and Production 6. Community Engagement and Education 7. Monitoring and Reporting Brunello Cuccinelli's approach to achieving Net-Zero status reflects a deep commitment to sustainability and ethical business practices. By integrating environmental responsibility into every aspect of its operations, the company not only aims to reduce its impact but also sets a high standard for the luxury fashion industry as a whole	
03 Re-use	Garment restoration initiative	Full-scale solution	Reuse in the Italian textile sector is crucial for reducing waste, conserving natural resources, and mitigating environmental impact. Through material recovery and regeneration, companies can innovate and enhance the sustainability of their products. This approach promotes a circular economy and meets consumers' growing demand for environmentally and socially responsible practices. For example, The Re-Verso project by Manteco is an innovative circular economy initiative in the textile sector. It focuses on wool recycling, transforming textile scraps and used garments into new high-quality yarns. This process not only reduces waste but also helps conserve natural resources. Re-Verso enables Manteco to offer sustainable products and meet the increasing consumer demand for eco-friendly solutions in the textile industry.	
04 Repair	"Repair culture" campaign	Development phase	Many companies, especially multinationals that also own shops in Italy, are promoting sustainability through clothing repair activities. In particular, companies such as Primark and Patagonia are developing studios where customers can go and repair their clothes. They organize specific courses to teach how to restore old garments.	<u>Worn Wear Patagonia</u> https://www.primark.com/it-it/ama-i-tuoi-capi-piu-a-lungo
05 Refurbish	Refurbish platform	Full-scale solution	In Italy, the concept of "refurbishment" in the textile sector has become increasingly relevant, especially in sustainable fashion and the circular economy. Many companies focus on restoring and upgrading used or damaged garments to extend their lifespan and reduce waste. For example, shops and online platforms offer garment restoration and restyling services, allowing consumers to breathe new life into their clothes rather than discard them. Additionally, some companies have launched "refurbished" or "pre-loved" product lines, where items are curated, repaired, and made available for purchase at more affordable prices than new items. Vestiaire Collective takes the refurbishment process very seriously when it comes to luxury clothing items passing through the platform. Here are some of the approaches it typically adopts: - Quality Control - Authentication	https://it.vestiairecollective.com/

			Restoration Certification: In summary, Vestiaire Collective is committed to ensuring that every item sold on its platform is authentic, high-quality, and meets the highest standards before being made available for customers.	
06 Remanufacture			Remanufacturing is an industrial process involving the disassembly, repair, reassembly, and restoration of used or obsolete products to make them functional and suitable for use again. Unlike recycling, which breaks down materials into essential components to create new ones, remanufacturing aims to bring the product back to its original or nearly original condition, often with quality standards equivalent to those of new products.	
07 Repurpose	Nazena's repurpose solution	Full-scale solution	The repurposing of textile fabrics represents an innovative measure within the circular economy, aiming to valorize existing materials and products by transforming them into new valuable resources. In Italy, several pioneering projects have been launched to explore and implement solutions focused on textile repurposing. Among these, Nazena's initiative stands out. Nazena is a company that has patented a functional process to convert textile waste into new resources. This process transforms waste into a new type of panel, from which various products are created, such as boxes and packaging, agenda covers, and clothes hangers. These items, characterized by recognized design and quality, are made available through Nazena's e-commerce platform, promoting more conscious and sustainable consumption.	https://nazena.com/
08 Recycle	Recycle district	Full-scale solution	Short description of the solution (for every solution, half of the page, for your region/country): Despite the interest of some companies, the recyclability of textiles is challenging to integrate into traditional processes. Functional, aesthetic, and economic needs, such as the use of inexpensive fibres, hinder the priority of recycling. Additionally, textile products often contain non-removable elements like buttons and zippers, which are difficult to recycle. Technological innovation plays a crucial role in this context, as demonstrated by the experience of the Corertex Consortium in the textile district of Prato, Tuscany. The consortium, composed of 8 companies (6 in reuse and 2 in recycling), utilizes advanced technologies to recycle a wide range of fabrics, including wool and cashmere. In the case of "mechanical" wool, materials are meticulously selected by colour before being introduced into the industrial process to become fibre, bypassing the dyeing process and using recycled water from the nearby treatment plant. Additionally, textile waste from industrial processing, scraps, and cuttings is recycled through dry shredding for use in sectors such as padding, thermal and acoustic insulation, and more, with ongoing research into future applications.	https://coretex.it/
09 Recover	Education al program	Full-scale solution	Extending the life cycle of textiles can also restore the dignity and well-being of many people. Recooper is an exemplary initiative in this regard, a project implemented by a network of five non-profit social cooperatives operating in five	https://recooper.it/



			different Italian cities. The project is characterized by its collection and reuse activities, conducted in a new and more ethical manner, offering innovative recovery services (e.g., in offices, parishes, schools, etc.) and interactive features (e.g., an online map of collection bins) while involving institutional and private partners. Finally, Recooper coordinates the distribution and sales aimed at recovery, using the proceeds to employ disadvantaged individuals. Recooper has also launched “Recooperando si impara,” an initiative directed at primary school children involving principals, teachers, and families.	
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II.5.5 SWOT Analysis

The following table presents the SWOT analysis for the Italian paradigm to identify strengths and weaknesses, opportunities and threats in the local management and recycling of textile waste, with a vision of the implications for global efforts.

Table 21. SWOT Analysis for Textile Waste Management and Recycling in Italy.

Strengths	Weaknesses
● Legislative Support: Italy has implemented comprehensive policies, including the Extended Producer Responsibility (EPR) and the National Strategy for the Circular Economy (SEC), which promote sustainable practices and efficient waste management ● Early Adoption of Separate Collection: Italy introduced mandatory separate collection for textile waste in 2022, three years ahead of the EU deadline, which demonstrates proactive leadership in waste management ● High Recycling Rates in Other Sectors: Italy's strong performance in recycling other materials, such as paper, aluminium, and wood, provides a robust framework and sets a positive precedent for improving textile recycling rates.	● Technological and Infrastructure Gaps: There is a significant need for advanced sorting and recycling technologies. The current infrastructure is not fully equipped to handle the complexities of textile waste, leading to inefficiencies. ● Export of Collected Waste: A large portion of collected textile waste is exported, which can undermine domestic recycling efforts and result in higher environmental impacts due to transportation. ● Fluctuating Collection Rates: Despite improvements, the collection rates have fluctuated, indicating instability in the current waste management system.
Opportunities/Chances	Threats
- Innovation and Technology Development: Investment in advanced recycling technologies and digital identification systems can significantly enhance the efficiency and effectiveness of textile waste management - Circular Economy Initiatives: The national strategy for a circular economy provides a comprehensive plan to increase recycling rates and promote sustainable practices, creating opportunities for innovation and economic growth - Extended Producer Responsibility (EPR): The EPR policy encourages producers to design products with their entire lifecycle in mind, leading to more sustainable products and reduced waste.	● High Implementation Costs: The financial burden of upgrading infrastructure and adopting new technologies can be a significant barrier for the public and private sectors (Gift). ● International Competition: The global nature of the textile industry means that Italian producers and recyclers face competition from countries with lower production and recycling costs, potentially affecting market share and profitability (Gift). ● Environmental and Regulatory Challenges: Ensuring compliance with both national and EU regulations requires continuous effort and adaptation. Any lag in regulatory updates or enforcement can hinder progress.

SWOT ANALYSIS RESULTS:

Italy's proactive policies and early adoption of separate collections for textile waste position it as a leader in the field. However, significant challenges in technology, infrastructure, and costs must be addressed to realize the full potential of textile waste management and recycling. The ongoing focus on circular economy principles and the implementation of EPR will be crucial in overcoming these challenges and leveraging Italy's strengths to achieve sustainable textile waste management.



II.6 North Macedonia

II.6.1 Introduction to the Textile and Clothing (T&C) Sector in North Macedonia

The textile/clothing industry in North Macedonia is one of the leading processing industries in the country, with significant results in the formation of GDP, high absorption of labour, and exports.

The textile industry in Macedonia has a long tradition and experience. The textile sector is the country's 2nd most significant industrial sector after metallurgy. It employs 35,000 people, or around 30% of the total number of employees in the manufacturing industry and produces over EUR 400 million worth of exports. The textile & clothing industry accounts for 2.4% of GDP and 17% of industrial GDP and about 27% of Macedonian exports. The textile/clothing industry covers the whole territory of the Republic of Macedonia, with a significant concentration in the eastern part of the country. Eighteen textile industry companies are actively involved in various production levels.

Most of Macedonia's textile/clothing companies are organized as small and medium-sized enterprises and garment producers with a total number of employees of 30-500. It is positive, as it gives companies significant flexibility in changing product ranges, producing small batches and short delivery times for the final product. It is a critical factor for successful cooperation with foreign partners and for the survival of this industry, which is under constant pressure from competition and market law. Macedonian clothing production is mainly export-oriented, with 90% on the EU market. The main markets are Germany over 65%, Greece 9% (primarily knitted products), The Netherlands 6%, Belgium 4%, UK 3%, and others. Most companies are working CM or CMT (70%), and 30% can offer a "complete package" of clothing production. Companies within this industry have made products for many well-known worldwide brands, including Versace, Diesel, Gucci, Gerry Weber, Betty Barclay and Jack & Jones, among many others.

Clothing production in Macedonia is fully adapted to the market conditions set by Western European countries. It means it meets the strict quality standards, delivery deadlines, social compliance, and complete logistics required by foreign partners. The main features of the Macedonian textile/clothing industry are focus and orientation on the customer, modern facilities and latest technology, strong management, availability of experienced labour, flexibility to respond to the customer request quickly, a short period from orders to delivery, ability to produce small orders at the same prices as the large orders (greater productivity), long-time business relationships with world-class partners and experience on working for the well-known international brands, marked quality for clothing production and good transport and logistics services.

II.6.2 Reuse and Recycling of Textiles in North Macedonia

II.6.2.1 Textiles thrown away reused, or recycled on a country/regional level

- **Reuse and Recycling Rates:** Starting from January 2024, the landfilling of textile waste is forbidden in the Eastern part of the country where the concentration of textile companies is highest. Currently, the companies' clothing producers are destroying the pre-consuming waste at industrial landfills Drisla (burying) and in the cement industry USJE by burying the waste for energy. A recycling company collects a tiny part of the pre-consuming waste and shipped abroad for recycling. However, specific figures



- detailing what percentage of textile waste is created, destroyed or delivered for recycling abroad are still not readily available in public data. According to some assumptions, the textile waste from the cutting phase in clothes production amounts to about 9000 tons per year.
- **General Trend:** Concerning post-consuming waste, it is known that a significant portion of textile waste traditionally goes to landfills or incineration. With recent EU directives and the push towards a circular economy, efforts to improve these figures by enhancing recycling capabilities are underway. The estimated growth percentage of textile and clothing (T/C) sales data has not been collected until now. The process of obtaining evidence of the imported and placed market ready-to-wear products and home textiles just started this year. More accurate data will be collected when entering the collective actors' function. According to the Law on extended producers' responsibility and management of particular waste flows and the law on the management of additional waste flows, we expect to collect accurate data on the quantities of clothing sold in the North Macedonian market. It is also likely that the newly registered textile collective actors will contribute to the consumer's awareness-raising campaigns and develop a mechanism for collecting post-consumer waste. But that is not enough. The next phase will be establishing a path for recycling the textile waste or using some of the previous explainer R's.

II.6.2.2 Sources and Further Research

Government institutions responsible for collecting and monitoring data on economic development and environmental management in North Macedonia are indicated below. However, at the moment, these sources provide shallow insight into the amounts of textile waste, both pre-consuming and post-consuming, and it is necessary to strengthen the capacities of these institutions in the area of data screening.

- **Statistical Office of the Republic of North Macedonia (StatGov):** The State Statistics Office is a professional and independent organisation within the state administration. The institution's primary functions are collecting, processing and disseminating statistical data on demographic, social and economic phenomena in Macedonian society.
- **Ministry of the Environment and Spatial Planning:** This Ministry issues licences for collective actors and recyclers for the textile sector and monitors implementing activities and practices in textile waste management. At the same time, in cooperation with the collective actors, data on the quantities of textile products placed on the Republic of North Macedonia market is collected. This activity started on 01.01.2024; therefore, data for the year's first half has still been obtained.

II.6.3 Textile Waste Management

In terms of textile waste management, an essential topic for VERDEinMED, according to the data from Eurostat in 2023^{91,92} shows that production of textile waste in North Macedonia has increased during the years 2012-2020, while recycling had a strong presence only in 2018, reaching 64%.

⁹¹https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN__custom_7396092/bookmark/table?lang=en&bookmarkId=646ce0a9-2988-464d-bd35-1b67e726a8db

⁹²https://ec.europa.eu/eurostat/databrowser/view/ENV_WASTRT__custom_7396182/bookmark/table?lang=en&bookmarkId=a6d83881-d12c-441f-acd3-5c5dca6ec3dc

Table 22. Production and recycling of textile waste (ton) of North Macedonia T&C sector.

	2012	2014	2016	2018	2020
Textile waste (ton)	2.772	720	872	4.578	4.925
Recycling of textile wastes (ton)	-	-	-	2.941	100

II.6.4 Legal Framework

II.6.4.1 Regulations

- Legislation and Legislative Acts in North Macedonia:

Given that the Republic of North Macedonia is a candidate country for EU entry, it should apply all European standards and best practices; however, together with the EU parliament, it is also necessary to find a way to manage the waste, including textile waste, which is an essential part of the environment protection. Waste management according to the prescribed standards will contribute to a better environment and the safety of people and ensure the implementation of a circular economy in the country. It arranges in detail the collection, transport, selection, and recycling of waste, as well as its treatment and utilisation, with what will happen to the system of efficient regional waste management, with which it will complete and meet the requirements in terms of legislation. The specific legislation that governs the management and recycling of textile waste in North Macedonia includes:

Waste Management Act (Закон за управување со отпад):	This act provides the legal framework for waste management, which includes the principles and objectives of waste management, plans and programs for waste management, rights and obligations of legal and natural persons about waste management, requirements and obligations of legal and natural persons who produce products and packaging and which burden the environment at the end of the life cycle, the manner and conditions under which collection can be carried out, transportation, treatment, storage, processing and disposal of waste; import, export and transit of waste; monitoring; the informative system; financing and supervision of waste management.
Act for Management of Additional Waste Flows (Закон за управување со дополнителни текови на отпад):	This act regulates the requirements for the protection of the environment and human health by preventing or reducing the negative impacts from the creation and handling of textile waste, tyres, oils and vehicles, which has to be fulfilled during the production of textiles, tyres, oils and cars and the collection, reuse, treatment, processing and disposal of the waste generated by them during their lifetime, as well as other issues related to the handling of textile waste, tyres, oils and vehicles by economic operators and other entities that participate in the production procedures and handling.
Act for Extended Producer Responsibility for Management of Additional Waste Flows (Закон за проширена одговорност на производителот за управување со посебни текови на отпад):	This act regulates the type of responsibility of producers after the end of the consumption phase of the products they put on the market in the Republic of North Macedonia and the manner of its implementation for collection, processing and recycling of the unique streams of waste created by the producers by putting their products on the market, the conditions, the procedure and the method of organisation for the implementation of the extended responsibility, the conditions and the process of financing the measures for implementation establishing the extended responsibility of the producer, the rights and obligations of municipalities and other entities that have a stake in dealing with unique waste streams, as well as other issues that are important for the timely and complete realization of the extended responsibility of producers. The EPR for the textile products waste start actively from 01.01.2024

- Act for packaging management and management of packaging waste (Закон за управување со пакување и отпад од пакување):	This act primarily aims to regulate requirements for environmental protection from waste generated from product packaging, as well as their release and use. The act indicates the obligations and responsibilities of economic operators (including textile companies) and other entities participating in the process of production, placing on the market and putting into use the packaged product, the rules for collection, reuse, processing and disposal, as well as other conditions for handling packaging waste. As suppliers of materials and accessories that come in appropriate packaging, textile companies in Northern Macedonia are obliged to report this packaging waste and dispose of it accordingly.
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II.6.4.2 Policies

- Strategies or/and Action Plans in North Macedonia:

The Republic of North Macedonia, as a candidate country for EU entry, has adopted several strategies and action plans to enhance textile waste management and recycling.

Table 23. A short explanation of legislation in North Macedonia in the T&C sector

Strategies or/and Action Plans in North Macedonia	
National Waste Management Plan (Национален план за управување со отпад)	This plan sets out the strategic goals and actions for waste management up to 2030. It includes specific objectives for textile waste, aiming to improve the collection, sorting, and recycling processes. This plan supports the transition to a circular economy, reducing waste generation and increasing resource efficiency. The purpose of the Planning Document is to operationalize the waste management system in the country to develop integrated waste management following the waste hierarchy and EU law to achieve environmentally safe processing and disposal in a way best adapted to the Republic of North Macedonia conditions. The Plan establishes activities that should be undertaken at a high level with which the management of waste and resources in North Macedonia would improve over 10 years. It bridges the gap between the National Waste Management Strategy (2008-2020) (NSUO) and the eight more detailed regional waste management plans (WMP). Success in these areas will provide a platform to realize the ambitions of the circular economy.
A Roadmap Towards Circular Economy of North Macedonia (Патоказ кон Циркуларна економија на Северна Македонија):	With the support of the OECD, North Macedonia is working on developing a Circular economy strategy. Under these activities, the 5 priority areas, including textiles, were identified, and A Roadmap Towards Circular Economy of North Macedonia was developed and published. As the second largest industrial sector in North Macedonia, the textile industry is integral to the economy, accounting for 10% of exports and 13% of industrial GDP. However, it also generates significant environmental challenges, with a notable 4.7% contribution to total municipal waste (primarily landfilled), alongside minimal recycling and fabric underutilisation. These issues underscore the urgent need for the industry to transition towards a circular economy model to mitigate its environmental impact, improve waste management, and reduce greenhouse gas emissions. By adopting such sustainable practices, North Macedonia can align with European Union accession requirements and position itself as a leader in circular textile innovation, which is crucial for achieving its climate-neutrality goal. Critical recommendations for making textiles more circular include Developing a national strategy for sustainable and circular textiles that covers the entire textile value chain, Reducing and better managing textile waste through improved production processes (e.g. by providing financial and technical support) and increasing recycling and reuse of textiles (e.g. by supporting investments in targeted projects, mandatory extended producer responsibility take-back schemes); Strengthen the circular design of textiles by introducing ecodesign requirements and supporting innovations (e.g. support local projects and innovation for circular textile design).



Strategy for Innovation (Стратегија за иновцaии)	The approach recognizes that successful economic development does not always coincide with increased production participation in high-tech sectors. Activities with high newly created value can also be found in traditional industries, and innovation can help firms move from activities with low created value to activities with high freshly created value. The innovation strategy pays particular attention to increasing the innovative capabilities of small and medium-sized enterprises and, therefore, is in line with the national policy for small and medium-sized enterprises based on the European "Law on Small Businesses". Finally, the Innovation Strategy complements the new Government Program for Research and Development. The innovation Strategy covers research institutions in the context of developing human resources for innovation, establishing links with the business sector, and transferring knowledge to it. The collaboration between SMEs and research institutions may contribute to developing enhanced textile recycling processes, including advanced sorting and chemical and physical recycling techniques.
Strategy for Smart Specialization 2021-2027 (Стратегија за паметна специјализација 2021-2027):	The Strategy for Smart Specialization of North Macedonia for 2021-2027, known as S3 MK, is an upgrade of the Strategy for innovation and plays a pivotal role in directing the country's economic development. The Republic of North Macedonia, as a candidate country for EU entry, has started the process of developing a Strategy for Smart Specialization as a new strategy for research and innovation, giving an impetus to an innovative, sustainable, green and digital transition. By adopting the Strategy for Smart Specialization, the Republic of North Macedonia joins the EU initiatives for development based on knowledge and innovation. The strategy envisages that using circular practices, vast amounts of different waste (from industry, including textiles, construction, agriculture, etc.) can produce new products or products with added value, thus supporting industrial symbiosis practices with other sectors.
Action Plan for Smart Specialisation 2024-2025 (Акциски план за паметна специјализација 2024-2025):	The set of implementation measures, including for the greening and digitalization of companies proposed in the Action Plan for Smart Specialisation, have clear sector-specific priorities and provide a framework for the efficient use of research and innovation funds. The measures should encourage cooperation between the academic and business sectors as a basis for the diffusion of knowledge, new skills and transformational roadmaps towards products and services with higher added value competitive in the market.
National Strategy for Sustainable Development 2009-2030 (Национална стратегија за одржлив развој 2009-2030):	Stimulating domestic investments in sustainable businesses will have sound effects because it would make the country more attractive for foreign investments. According to the strategy, the highest potential for SMEs exists in the following sectors: tourism, industry (textile, mechanical, automotive, energy and transport, ICT), agriculture fuels) and food production and crafts, but a suitable strategy renewal will be needed to give the correct axes of action about the current practices. The set of implementation measures, including for the greening and digitalization of companies proposed in the Action Plan, have clear sector-specific priorities and provide a framework for the efficient use of research and innovation funds. The measures should encourage cooperation between the academic and business sectors as a basis for the diffusion of knowledge, new skills and transformational roadmaps towards products and services with higher added value competitive in the market.
Collaboration and Cluster Development	An important goal of the Macedonian Strategy for Cluster Development 2018-2025 is to strengthen the ability of enterprises to innovate and use new technologies. Innovations and new technologies are important instruments for strengthening the competitiveness of the Macedonian economy. The purpose of the Strategy for Cluster Development is to ensure the identification and support of industry and branches in the area of new and innovative technologies (for example, the area of environmental protection, including waste management) and thereby contribute to the goals of sustainability, energy efficiency and protection of climate and environment. An important goal of the Cluster Development Strategy is to support structural changes in the Macedonian economy in the direction of sectors, products and technologies based on knowledge and high-added value. Textile Trade Association-Textile cluster (TTA-TC) is one of the first 5 clusters established in



	North Macedonia in 2003. It has successfully existed for over 20 years, supporting textile companies and fostering cooperation between businesses, academia and government. TTA-TC was actively involved in the creation of the Strategy for Development of the Macedonian Textile Industry; it is involved in government initiatives such as the development of a Roadmap Towards the Circular Economy of North Macedonia and is involved in several local donors initiatives and EU-funded projects regarding sustainability and textile waste management. https://tta.org.mk/en/
Operational Programme for Implementing the EU Cohesion Policy	The Operational Programme for Implementing the EU Cohesion Policy in North Macedonia is a crucial framework for strengthening the European Union's economic, social, and territorial cohesion. Below are the critical aspects of this policy for the 2021-2027 period: Policy Objectives: - The new cohesion policy sets five objectives for a competitive and future-proof Europe. - These objectives focus on promoting economic growth, social inclusion, and sustainable development. - Notably, the policy emphasises the green and digital transition. Climate Targets: - The policy incorporates weighted climate and environmental contributions. - It establishes minimum targets for funds related to climate action. - Additionally, there's a climate adjustment mechanism. Greater Empowerment: - Local, urban, and territorial authorities are more active in managing funds. - This shift aims to enhance local decision-making and implementation. Simplification: - The new cohesion policy streamlines rules across the eight Funds. - Reporting requirements are lighter and more frequent. - Controls for programs are simplified, including a "single audit principle." - Faster delivery mechanisms are introduced, such as simplified cost options and financing not tied to specific costs. - Commission approval for major projects is no longer required. Creating Conditions for Success: - Clear enabling conditions must be met throughout the programming period for reimbursement from the Union budget. - Flexibility in programming allows adjustments to address emerging needs. - Reinforced visibility and communication provisions ensure transparency. Priorities: - The policy tailors its approach based on the development level of regions: - More Developed Regions - Transition Regions - Less Developed Regions Thematic Concentration: - The policy focuses on the environment, climate, and EU economic governance. Financial Support and Management: - Financial assistance is allocated based on priorities. - The policy promotes efficient financial management and instruments. Evaluation and Monitoring: - Robust evaluation frameworks ensure effectiveness. - Monitoring systems track progress. Partnership Agreements: - These agreements outline cooperation between the EU and member states. - They guide the implementation of cohesion policy.

**Subvention schemes**

Some of the Macedonian Government Subvention Schemes supporting programs for circular and green economy are shown below.

Program for the Development of Entrepreneurship and the Competitiveness of Small and Medium-Sized Enterprises for the Year 2024	Co-financing of projects for the development and promotion of entrepreneurship and craftsmanship, as well as program activities of business angel networks in the total amount of 8,000,000 denars, namely: 1. Co-financing of projects of foundations and associations that refer to non-financial support for the development of entrepreneurship and the competitiveness of small and medium-sized enterprises through co-financing of 70% of the costs for the realisation of a project, but not more than 350,000 denars per applicant for the following priority areas : - green economy; - electronic commerce; - access to finance and alternative forms of financing; - internationalisation; - circular economy; - digitization of processes; - artificial intelligence; - promotional activities for the concept of business angels and - creating a culture of social entrepreneurship.
Support organising training for introducing the concept of green transformation, "greening of manufacturing industries," and the idea of circular economy in the manufacturing industry.	Co-financing of funds for the organisation of training for the introduction of the concept of green transformation, "greening of manufacturing industries", and the introduction of the idea of circular economy in the manufacturing industry by the Ministry of Economy by the Program to Support the Competitiveness of the Manufacturing Industry and Social Responsibility in 2024
Fund for Innovation and Technological Development	The Fund for Innovation and Technological Development is a leading government institution that supports startups and innovative companies in the Republic of North Macedonia. Currently, through its financial instruments, the Fund co-finances 985 projects with joint investments of around 118 million euros. As much as 43% of FITR's portfolio are startup companies founded mainly by young people. With almost 1.5 million euros, the Fund also supports the development of three accelerators in the country: X Factor, Sivus Accelerator and UKIM Business and Technology Accelerator. The main priorities of the Fund are improved access to financial support for innovation and technological development and promotion and encouragement of innovation activity in North Macedonia.

2. Initiatives

There are some initiatives and projects in the direction of a circular economy in the textile sector in North Macedonia basically supported by EU programmes or local donors, as well as some government and private initiatives.

Supporting structures

Business support organisations: Textile Trade Association – Textile cluster (TTA-TC)	• It is a non-profit business support organisation with the primary goal of helping Macedonian textile and garment producers improve their global presence competitiveness and follow the latest market requirements. In the field of textile waste management and circular economy, TTA-TC has implemented several projects: • USAID project “TexRec opportunity and challenges in textile waste recycling.”
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	• Erasmus+ project 'Innovative design practices for achieving a new textile circular sector Design4circle.' • "Waste to Energy for Western Balkan Cement Industry" project, Under the program for cooperation with the business sector and The Federal Ministry for Economic Cooperation and Development of Germany (BMZ) • IPA cross border project Greece – N Macedonia – “Fashion Employment HUB” • IPA cross border project Bulgaria – N Macedonia - “Modern Textile industry as Attractive Career Path for Young Generations and Contributor for Economic Development and Social Prosperity of Cross Border Region” The projects in implementation: • INTERREG EURO MED “Preventing and Reducing the Textiles Waste Mountain in the MED area.” • INTERREG ADRION - MISSION – “Multidisciplinary strategic partnership providing innovative solutions to reduce pollutants dispersion in water.”
Innovation Hub	The European Institute of Innovation and Technology (EIT) is Europe's largest innovation network for strengthening innovation that launched its first joint lab in North Macedonia, signalling a significant leap in regional innovation. This pioneering EIT Community, the first of its kind, aims to strengthen cooperation among leading business, education, and research organisations, fostering sustainable economic growth. The hub represents EIT's Knowledge and Innovation Communities (KICs), focusing on engaging North Macedonian participants in EIT Community activities. The hub connects local innovators with Europe's largest innovation ecosystem, addressing regional disparities and propelling the country's tech scene to new heights.
Recycling Facilities	Currently, textile companies are initiating private initiatives considering installing textile recycling plants. Few are in the process of applying for a license from the Ministry of Environment and Spatial Planning. There are already companies that have received a permit for recycling, but they do not process the waste; they only collect part of the textile waste and deliver it to other countries for recycling. Also, several textile companies, mainly manufacturers of pillows, quilts and mattresses, have shredding machines in their companies for shredding their waste and reusing it as fillers for the products they produce.
Local donors projects	Recently, a couple of international donors (Swiss Export Promotion Program SIPPO, Swiss Contact, USAID – United States Aid Programm, The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), etc.) in cooperation with the Textile Trade Association – Textile cluster are involved in the identifying and supporting the possibilities for circular economy and waste management in the textile sector in North Macedonia. The activities start with analyses of the current situation and will continue with awareness building and supporting the initiatives for establishing recycling companies.
Unfortunately, for the moment, there is no government support dedicated primarily to the development of recycling facilities that can handle textile materials. Still, companies can apply ideas and project applications in the government Fund for Innovation and Technological Development.	
Government initiatives	
A Roadmap Towards Circular Economy of North Macedonia	The textile industry has been selected as a key priority area of the roadmap for North Macedonia because of its high economic importance, strong policy relevance, and necessary circularity and decarbonisation potential. The circular economy offers several opportunities for transforming the textile industry into a more circular one, where textile waste is minimised, and material value is maintained in the textile value chain for as long as possible. These opportunities can be structured into four blocks of actions, as follows (adapted from (United Nations Environment Programme, 2020): - Reduce by design – This overarching guiding principle aims to reduce the amount of (raw) material and hazardous chemicals consumed during the production and use phases. Product design impacts how products are

	produced, consumed and disposed of. In a circular economy, the aim is to rethink business models and consumption patterns and produce textile products that are durable and made of sustainable materials. - “User-to-user” value retention processes include refuse, reduce and reuse circular consumption practices. These translate to consumers buying less and more products made of sustainable materials, reusing more, and keeping textile products in use for as long as possible. Actions in this value retention process also address the fast fashion phenomenon where consumers continuously purchase cheap but stylish clothing that has moved quickly from design to retail stores to keep up with new trends. - “User-to-business” value retention processes are linked primarily to repair activities where a consumer engages a business to extend the lifetime of a textile product by repair. - “Business-to-business” value retention processes – where a product loses its original function and is repurposed or recycled rather than disposed of.
Regulations on Extended Producer Responsibility (EPR):	Macedonia enforces EPR regulations that require textile product producers and importers to manage their product lifecycle, including end-of-life disposal on 01.01.2024. Under the EPR scheme, producers and sellers of textile products (garments, home textiles, etc) must take responsibility for their products' environmental impacts throughout the lifecycle, including end-of-life management.
Partnerships with EU Projects:	North Macedonia actively participates in EU-funded projects that aim to develop better textile recycling technologies and infrastructures. These projects often include bilateral cross-border collaborations and regional and international collaborations. As part of these activities, there is an exchange of experiences and sharing of knowledge and good practices that help North Macedonia develop its capacities in developing business model ideas and establishing new practices for textile recycling.
Government Working Programme 2022-2024	Government Working Programme 2022-2024 Under this programme, the government will support investment projects in both the public and private sectors, improving the economy's competitiveness and quality of life. They will be concentrated in several priority areas: green economy, digitization, innovation and technological development, development of physical infrastructure and human capital, as well as social cohesion. The following specific topics will be covered under accelerated and sustainable economic growth with a better standard of living: ▪ Acceleration of economic growth ▪ Energy transition and sustainability ▪ Modern infrastructure and connectivity ▪ Environmental protection, green and sustainable development ▪ Development agriculture ▪ Sustainable tourism Decentralisation and balanced regional development

II.6.4.3 Regulatory Gaps and Overlaps

Diagnostic activity:

One of the critical elements of the Roadmap that supports the circular economy in North Macedonia is a diagnostic activity presenting a comprehensive analysis of the state of play of circular economy in vital economic sectors, recent environmental developments and circular trends, and the existing policy landscape concerning circular economy, for highlighting the critical policy gaps in the legal framework, ensuring full compliance with EU Directives. The overall objective of that roadmap is to improve the sustainability of the TCLF sector in North Macedonia with evidence of its environmental, social and economic impacts and to work with a wide range of stakeholders across the supply chain to support the transition to formality and fill existing sector gaps regarding waste collection, separation, recycling, energy efficiency, and water treatment (ILO, UNIDO, 2023). A potential gap is also a not complete harmonisation with the EU directives, for example, with the EU's



- . Strategy on Sustainable and Circular Textiles (2022-2030), which lays out a forward-looking set of actions, such as design requirements for textiles to make them last longer (including a minimum recycled content), the introduction of a Digital Product Passport, mandatory
- . Extender Producer Responsibility rules for textiles and the support of circular business models in the textile sector.

II.6.5 R-strategies Initiatives

A survey of initiatives has been developed, relating real case studies to r-strategies in North Macedonia. Table 21 provides an overview of each initiative, project, innovative process, technology, or product and an outline of its maturity level.

Table 24. R-strategies initiatives in the North Macedonia landscape.

R-strategies	Name of the initiative	Maturity Level	Description	Contact
00 Refuse	Ministry of the Environment and Spatial Planning	In development phase	Refusal in the context of textile waste involves consumers choosing not to purchase unnecessary items, particularly those not environmentally sustainable. North Macedonia will promote this through awareness campaigns that encourage consumers to think critically about their purchases.	Ministry of Environment and Spatial Planning https://www.moepp.gov.mk/en/
01 Rethink	Promoting sustainability principles in product design	Pilot	Rethinking involves altering the approach to fashion consumption by choosing sustainable brands and materials supported by educational programs and government initiatives. Create a vibrant community in the field of design, fashion and craftsmanship to (re)shape the role of culture in society and promote the principles of sustainability in the creation.	https://mfa.mk/#za-nas
02 Reduce	Awareness building for post-consuming waste collection	Demonstrative	Reduction focuses on decreasing the amount of textile waste generated. North Macedonia promotes reduction through policies like Extended Producer Responsibility, encouraging manufacturers to design products with minimal waste. Teksomak, Ekoteks and Matreso are the three registered Collective actors working on building awareness and setting basic infrastructure for post-consuming waste collection.	https://teksomak.mk/ ; https://matreso.mk/index.php/za-nas ; https://ekoteks.mk/index_en.html
03 Re-use	Textile waste collection for Re-use purposes	Demonstrative	Reuse in North Macedonia is organised through several second-hand stores and design initiatives to keep textiles in more prolonged use. "Kopce" is a social enterprise that has been operating since 2018. It is where anyone can donate, buy a unique piece of second-hand clothing at the best prices, or get it for free. "Kopche" was developed and functions within the framework of the Red Cross of the Republic of North Macedonia - the Red Cross of the city of Skopje due to many years of work donating clothes and distributing them to the most vulnerable.	https://ckgs.org.mk/centar/kopche/
04 Repair	Yes for Less	Pilot	Clothing repair has been around for a long time, but with fast fashion, it has become cheaper to buy new clothes instead of altering old ones. However, reducing textile waste through campaigns to raise user awareness is becoming relevant again. Here, designers and fashion studios who support and promote	https://www.yesforless.mk/za-nas

			these principles play a significant role. The Yes for Less platform also frequently promotes these topics.	
05 Refurbish	Refurbishing toward upcycling	Demonstrative	Refurbishing old textiles into as-new condition is less common but is emerging through small businesses that specialise in upcycling used fabrics. Nowadays, it is very often practised by well-known designers using old clothes and natural fabrics. One of the designers rehabilitating and using circular economy practices is Irina Tosheva.	https://irinasosheva.com/
06 Remanufacture	Designers promote remanufacturing	Demonstrative	At this point, the remanufacturing of textiles is mainly an initiative of some designers under different projects that promote remanufacturing or transforming textile waste into new products like pet clothing, heads, remanufactured fashion garments, etc.	Fashion Weekend Skopje is supporting and presenting such activities and designers. https://fashionweekendskopje.mk/
07 Repurpose	Buy Recycled	Project activities	»Buy Recycled« is a brand that includes products made from textile waste from confections from the municipality of Shtip, such as pillows, lazy bags, and cover sheets. It is the result of the project "The circular economy as a model for solving textile waste in the Municipality of Shtip", financially supported by the Global Environmental Fund GEF PMG Republic of North Macedonia, and implemented by the association Ino Tech Club, the Foundation for the Development of the Local Community of Shtip and University Goce Delcev Shtip.	https://kupireciklirano.mk/
08 Recycle	Processing waste material from the textile industry for creating new product	Demonstrative	The challenge of collecting, recycling, and processing waste material from the textile industry and creating new products from it had great results. Netam has a new line of products: insulation panels, fabric rolls, geotextile and other insulation materials that can be used in construction or other industries. For that purpose, "Netam" invested in a new production line from the company's product development team, which uses textile pre-consuming waste based on polyethene.	https://skills4future.mk/with-izonet-an-insulation-material-made-out-of-recycled-textile-the-netam-company-made-an-inovative-fusion-of-the-textile-and-construction-industry/
09 Recover	Textile waste as fuel for energy	Demonstrative	Energy recovery from textile waste is the least preferred method in the waste hierarchy but is utilised as a last resort for non-recyclable textiles. From 2022, with the piloting under the "Waste to Energy for Western Balkan Cement Industry" project, Under the program for cooperation with the business sector and The Federal Ministry for Economic Cooperation and Development of Germany (BMZ), Macedonian garment production companies continued destroying the not usable textile waste in cement industry USJE like fuel for energy.	USJE Cement industry https://www.usje.mk/en/about-us/

II.6.6 Social Responsibility & Awareness-raising Initiatives

North Macedonia's social initiatives were analysed to assess their impact on the community's awareness about clothing consumption, use and end-of-life disposal. In the NM textile and clothing industry, the commitment to social responsibility is reflected in the integrity, ethics and transparency of companies and organisations in all their practices in respecting human rights throughout the value chain. The initiatives are diverse, encompassing various sectors, including research centres, companies, NGOs, the government and the general community.

II.6.6.1 Awareness campaigns

"Yes for Less" <https://www.yesforless.mk/za-nas>.

Yes for Less Green businesses: Yes for Less is the first Macedonian platform that offers all the information needed for a more sustainable lifestyle in one place. A list of existing green businesses in North Macedonia describing their work is located on the Macedonian platform "Yes for Less". It contains all the information needed for a more sustainable lifestyle. This concept that covers textile waste also includes reflecting on what people need when buying something, being informed about their options, and choosing those that contribute to the personal and social good and have the most negligible environmental impact. Their campaigns are based on 3 postulates: 1. consume less and only what you need; 2. consume without buying: exchange, rent; 3. consume according to criteria for zero waste.

II.6.6.2 Educational Programs

Educational materials for sustainability, circular economy and bio-economy for primary, secondary schools and universities https://be-rural.eu/wp-content/uploads/2021/04/Educational-materials-on-sustainability-circular-economy-and-bioeconomy-for-schools-colleges-and-universities_MK.pdf

Special programs for waste management, such as green and circular economy, have not yet been developed in formal education in the Republic of North Macedonia. Still, subjects and contents are processed according to the existing programs. The activities of secondary textile schools in practical training for sorting textile waste to create a new product are particularly relevant. In this part, schools cooperate with clothing manufacturing companies, from which they receive textile waste that is further used to create new products. The creations made in this way by the students are presented through fashion shows. The same thing happens at the universities, that is, at the Technological Faculties with the Department of Textile Engineering and at the Faculties of Clothing Design, where the topics of circular economy and utilisation of textile waste are addressed through projects supported by various programs. Considering that the Macedonian textile industry mainly comprises clothing manufacturers, the amount of textile waste that can be further used is significant. Specific programs and educational materials have been developed as part of some projects, such as Educational materials for sustainability, circular economy and bioeconomy for primary and secondary schools and universities, where textile waste is also covered.

II.6.6.3 NGOs – Non-government organizations (NGO)s initiatives

Macedonian Fashion Association – Fashion Cluster Concept - NGO
<https://mfa.mk/project/mokjta-na-odrzhlivosta-zavrshnica-na-moden-vikend-skopje-fwsk/>
MFA is an independent cultural and educational organisation that deals with design,



fashion, and craftsmanship. Inspired by a youth initiative in 2014, they founded the association to support young talents and creative businesses in the country and beyond. The association shares the values of the Macedonian cultural heritage and tradition, incorporating them into its projects with an innovative, sustainable and modern approach. The association actively works on sustainable fashion and raising awareness for reducing textile waste, collaborating with top designers in the area of using textile waste to obtain new products (clothes, hats, accessories), obtaining alternative materials from agricultural waste (such as yarn from rice straw waste and its further processing into fabric), etc. The association is also the main organiser of the Fashion Weekend Skopje, where, in the last few editions, it promotes leading designers who create collections under the motto of sustainable fashion.

Association for Sustainable Development and Environmental Protection "Go Green" Skopje - NGO <https://www.bidizelen.org/en/about-us/>

The Go Green strategic goal is to have young people motivated to protect and improve the environment, who actively learn about environment and climate change and participate in creating environmental and climate policies. Youth eco-activism consists of engaging and activating young people aged 15 to 29 who have ideas and enthusiasm and are willing to act and contribute to solving environmental problems and improving the environment.

3 R's Reduce, reuse, recycle - Business models for the use of textile waste – Foundation for Local Community Development – NGO Activities <https://recikliraj.mk/>

1. investigate the situation with the collection, processing and reuse of textile waste and the possibilities offered by reuse in the municipality of Shtip; 2. raise the awareness of citizens about recycling through the possibilities of reusing textile waste by creating products with added value; 3. strengthen the capacities of the NGO for developing and testing models for reuse of textile waste.

II.6.6.4 Collaborative Initiatives

Design4circle project, <https://design4circle.eu/>

The project Design4Circle – Innovative design practices for achieving a new textile circular sector – is a collaborative initiative developed to create an innovative learning curriculum in line with the needs of textile and fashion industry designers. The idea is to motivate designers from the textile sector to create products that will reduce their environmental impact during the product's life cycle and to develop new and innovative businesses that follow the principles of the circular economy. To achieve such a purpose, a Strategic Collaboration Partnership has put 6 entities together from 6 countries, including North Macedonia, with expertise in different fields.

"ECO-DESIGN FOR CIRCULAR ECONOMY IN THE TEXTILE AND FASHION INDUSTRIES" e-learning platform (https://design4circle.eu/wp-content/uploads/2021/02/Design4Circle_Students-Guide_English.pdf) is developed with the aim the participants to gain new competencies, knowledge and skills in the field of eco-design and eco-innovation and to thrive in a circular economy. The course is designed to inform about ethical challenges arising in business and help the learners identify and manage complex ethical dilemmas they will likely encounter in their careers. The course is also harmonised with the European Qualification Framework and facilitates the validation of the training in all EU countries;

II.6.7 SWOT Analysis

The following table presents the SWOT analysis for the **North Macedonia** paradigm to identify strengths and weaknesses, opportunities and threats in the local management and recycling of textile waste, with a vision of the implications for global efforts.

Table 25. SWOT Analysis for Textile Waste Management and Recycling in North Macedonia

Strengths	Weaknesses
- Existence Regulatory Framework: North Macedonia, as a potential candidate for EU membership, has adopted the EU regulatory framework, which includes directives aimed at waste management and recycling practices. - EU Funding and Support: As part of COSME countries, North Macedonia can benefit from EU funds and support for environmental projects, including a circular economy and improving recycling technologies and infrastructure. - Corporate Social Responsibility: Growing corporate social responsibility initiatives in the companies in North Macedonia demonstrate their commitment to sustainable practices and positively impacting society.	- Lack of Awareness: Consumers lack awareness about the negative impact of post-consumer textile waste and the benefits of its further usage or treatment. - Lack of Sustainable Practices and Waste Management: The implementation of sustainable practices and waste management in companies depends on the determination of the brand for whom they produce and its attitude towards sustainable fashion. - Cost of Recycling: Textile waste generators must pay for further waste treatment, including recycling. This process (collecting, sorting and processing) can be costly, especially for companies that generate textile waste in the production processes. - Lack of Infrastructure for Textile Recycling: There is a lack of specialised facilities dedicated solely to textile recycling, both pre-consuming and post-consuming textiles. - Insufficient Data on Textile Waste: There is a lack of comprehensive data on textile waste generation and further processes of its treatment, including recycling, which can impede targeted policy-making and improvements.
Chances/ Opportunities	Threats
- Public Awareness and Education: Through extended producer responsibility activities, there is a potential for various campaigns and educational programs to influence growing awareness among the Macedonian public regarding the importance of the circular economy, including 9R and other sustainable practices. - Development of Circular Economy Models: There is significant potential through several active projects in North Macedonia to expand circular economy practices in the textile/clothing production sector, enhancing sustainability, recycling possibilities and resource efficiency in collaboration with NGOs, industry and academia. - Partnership Opportunities: Emphasise partnerships between brands and producers working together toward sustainability and developing circular business models in the supply chain. Increase collaboration between fashion designers, retailers and garment manufacturers. - Government support and regulations: Increasing government initiatives on sustainability and waste reduction can provide opportunities for incentives, grants, or	- Global Market Pressures: Economic fluctuations and market volatility can affect consumer behaviour, affecting the demand for sustainable fashion products. Impaired financial stability may reduce consumers' willingness to invest in recycled fashion and influence them to prefer fast fashion. - Supply chain complexities: Textile recycling requires a well-established and efficient supply chain to collect, sort and process the discarded textile waste (slag and clothes). Managing the logistics and ensuring a consistent and reliable supply of textiles can be challenging. - Environmental Impact of Current Practices: Current practices that rely heavily on landfilling and incineration of textile waste pose ecological risks and may not be sustainable in the long term. - Economic Constraints: Financial instability of the economy and uncertainty in new investments may reduce interest among companies in financing environmental initiatives, including textile recycling.



favourable policies for businesses operating in the textile recycling sector.	
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This SWOT analysis shows the strengths and weaknesses of the textile sector in terms of textile waste management in North Macedonia. At the same time, the possibilities for growth and improvement of the situation about the circular economy and sustainable development are shown, which indicates the potential directions of action. Finally, the threats that indicate possible negative impacts and consequences on the further development of circular economy practices are described. The analysis can create the next steps for the identified weaknesses, from raising awareness to technological development and investment opportunities.

II.7 Bulgaria

II.7.1 Textile & Clothing sector of Bulgaria

Bulgaria's textile and clothing (T&C) sector holds significant importance in the country's economy, contributing to employment, export revenues, and industrial growth. The sector encompasses various activities, including textile production, clothing manufacturing, and related industries such as dyeing and finishing.

Bulgaria has a long-standing tradition in textile manufacturing, dating back to the early 20th century. During the socialist era, the country's textile industry experienced significant expansion, with large-scale textile factories established in various regions. However, with the transition to a market economy in the 1990s, the sector faced challenges due to increased competition, outdated infrastructure, and lack of investment.

Despite these challenges, Bulgaria's T&C sector remains essential to the national economy. The country has several textile clusters and industrial zones, particularly in cities like Sofia, Plovdiv, Ruse and Varna.

The total production volume of textiles in Bulgaria varies annually based on market demand, export orders, and domestic consumption. The production value of the textile manufacturing industry in Bulgaria increased by 20.76 per cent in 2023 compared to the previous year. It includes various textile products such as fabrics, yarns, threads, and non-woven materials.

- In 2024, the revenue in the Apparel market in Bulgaria amounts to US\$1.43bn. <https://www.statista.com>
- The largest segment in this market is Women's Apparel, with a market volume of US\$0.84bn in 2024.
- Regarding per capita revenues, Bulgaria will generate US\$216.30 per person in 2024.
- Looking ahead, the volume in the Apparel market is expected to reach 260.0m pieces by 2028.
- Additionally, the market is projected to grow by 2.5% in 2025.
- The average volume per person in the Apparel market is anticipated to be 35.8 pieces in 2024.
- Furthermore, by 2024, 94% of the sales in the Apparel market will be attributed to Non-Luxury.
- It is important to note that these figures specifically pertain to the apparel market segment in Bulgaria.
- Bulgaria's apparel market is experiencing a surge in demand for traditional Bulgarian clothing, reflecting a growing appreciation for cultural heritage and a desire for unique fashion choices.

The textile production in Bulgaria is distributed across various segments, including:

Fabric Production: Bulgaria has had long traditions for fabric production, with textile mills and weaving factories producing a wide range of fabrics for apparel, home textiles, and technical applications. However, most formerly existing factories have closed or restructured their production.

Garment Manufacturing: The country has a thriving garment manufacturing sector, with numerous apparel factories producing clothing for domestic and international markets. These factories specialize in various categories, including knitwear, woven garments, and sportswear.



Technical Textiles: Bulgaria also manufactures technical textiles for industrial applications such as automotive, construction, healthcare, and agriculture. Technical textiles produced in Bulgaria include geotextiles, automotive fabrics, medical textiles, and protective clothing.

Home Textiles: The production of home textiles such as bed linens, towels, curtains, and upholstery fabrics is another critical segment of Bulgaria's textile industry. Several textile companies in Bulgaria specialize in producing home textile products for domestic and export markets.

The estimated growth percentage of Bulgaria's textile industry varies depending on market dynamics, economic conditions, and industry trends. In recent years, the textile sector in Bulgaria has experienced moderate growth, driven by factors such as increasing demand for textile products, investment in modernization and technology, and expansion into new markets.

- The revenue in the Apparel market in Bulgaria is projected to experience an annual growth rate of 4.42% (CAGR 2024-2028).

This growth is attributed to several factors, including:

- Rising demand for textiles in domestic and international markets
- Expansion of textile manufacturing capacity and infrastructure
- Adoption of advanced technologies and production methods
- Diversification of product offerings and market segments
- Government initiatives to support the textile industry and promote exports

Overall, the outlook for Bulgaria's textile industry remains positive, with opportunities for further growth and development in the coming years. However, competition from low-cost imports, fluctuating raw material prices, and evolving consumer preferences continue to impact the industry's dynamics and performance.

Bulgaria has long traditions and experience in the textile and clothing field, dating back to the end of the 19th century. After a textile and clothing manufacturing downtrend in 1991-1998, the sector recovered with foreign investors entering the market. Most industry companies focus on cutting, making, and trimming (CMT) services. According to Bulgaria's Ministry of Economy, the textile sector contributes 5.0% of the country's total industrial production volume and generates 11.0% of the value added by the Bulgarian industry. The textile sector employs more than 100,000 people in the manufacturing industry, or 22% of the total.

Bulgaria's Textile & Clothing (T&C) sector has undergone a significant transformation in the last two decades, increasing its productivity but being subject to substantial jobs downsizing. While still competitive in the European market, with rising wages and production costs, the comparative advantages of the industry are gradually eroding. The coronavirus pandemic has hit the apparel subsector very hard, while some textile producers who managed to shift their production to personal protective equipment items managed it successfully. However, this is a temporary solution. The T&C industry in Bulgaria is confronted with significant long-term challenges such as green and digital transformation, and how it deals with them will determine the sector's prospects.

Most production facilities in Bulgaria are mainly located in regions with a tradition of textile production, such as Sofia, Plovdiv, Pleven and Ruse.

According to its annual report in 2020, ANPC assessed the accuracy of offers, advertisements or other statements by which online traders of clothing led consumers to

believe that a good or service had a positive impact on the environment, was less harmful to the environment or was more durable/sustainable than competing goods or services. It was found that, in many cases, the trader did not provide enough information so that consumers could appreciate the accuracy of the claims, or the trader did not provide quickly verifiable evidence to support the claim made.

To help consumers identify more ecological products, many companies go through a certification process to obtain different product eco-labels for eco-friendly garments.

II.7.2 Textile Waste Management

In terms of textile waste management, an essential topic for VERDEinMED, according to the data from Eurostat in 2023 shows that production of textile waste in the T&C sector has been increasing significantly.

Table 26. Production and recycling of textile waste (ton) of the T&C sector in Bulgaria.

	2018	2019	2020	2021
Textile waste (ton)	1.200	1.300	1.500	1.700
Recycling of textile wastes (ton)	180	195	225	255

Apart from separate collection, it is estimated that people throw away over 100,000 tonnes of textiles in Bulgaria alone. Only 2% of it is recycled. Between 50% and 70% of the clothes and other textiles are fit for use.

The data shows that between 2012 and 2020, the total amount of household waste in Bulgaria decreased by 7.8% (reaching 39 kg per capita), and textile waste increased by as much as 54% (reaching 7 kilograms per capita). Considering those numbers, it is also no surprise that textile waste, as a proportion of total household waste, has almost doubled from 3% in 2012 to 5% in 2019.

Recent data from Texcycle, Source: [Investor.bg](https://investor.bg)

It is possible to find more information about textile waste management at [BACT.bg](https://bact.bg)

II.7.3 Legal Framework

In Bulgaria, the legal framework for waste management, including textile waste, is governed by several key regulations and policies to promote sustainable practices and environmental protection. However, the REGULATION ON FOOTWEAR AND TEXTILE WASTE is still in **draft**, hindering the development of textile waste management.

II.7.3.1 Regulations

Table 27. A short explanation of legislation in Bulgaria in the T&C sector

Waste Management Act	The primary regulation governing waste management in Bulgaria is the <u>Waste Management Act</u> (WMA), which was first introduced in 2002 and subsequently amended to align with European Union directives. The WMA establishes the legal framework for waste prevention, collection, transportation, treatment, and disposal. It prioritizes waste prevention, reuse, recycling, and recovery over disposal, emphasizing the importance of sustainable waste management practices.
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Packaging and Packaging Waste Management Act	Specifically addressing textile waste, the <u>Packaging and Packaging Waste Management Act</u> (PPWMA) plays a crucial role. It regulates the management of packaging waste, including textiles used in packaging materials, and sets targets for recycling and recovery.
Environmental Protection Act	<u>Environmental Protection Act</u> - This Act shall regulate the social relations regarding the protection of the environment for the present and future generations and the protection of human health; conservation of biological diversity in conformity with the natural biogeographic characteristics of Bulgaria; the control and management of factors damaging the environment; the exercise of control over the state of the environment and the sources of pollution; the prevention and limitation of pollution; etc.

II.7.3.2 Policies

Strategies	
National Waste Management Plan	One example is the National Waste Management Plan, which outlines objectives and measures for waste prevention, recycling, and landfill reduction, including specific targets for textile waste diversion from landfills. Municipalities develop their waste management plans at the regional level in alignment with national objectives. For instance, some municipalities have introduced separate collection schemes for textile waste, providing designated collection points or organizing periodic collection events. Moreover, Bulgaria has adopted policies to encourage using eco-friendly materials and production methods in the textile industry. These policies aim to reduce the environmental impact of textile production and promote adopting sustainable practices among textile manufacturers.
European Green Deal	Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green Deal will transform the EU into a modern, resource-efficient and competitive economy, ensuring: • no net emissions of greenhouse gasses by 2050 • economic growth decoupled from resource use • no person and no place is left behind The European Commission has adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990—more information on Delivering the European Green Deal.
The EU Circular Economy Action Plan	The European Commission adopted the new circular economy action plan (CEAP) in March 2020. It is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth. The EU's transition to a circular economy will reduce pressure on natural resources and create sustainable growth and jobs. It is also a prerequisite to achieve the EU's 2050 climate neutrality target and to halt biodiversity loss.
Subvention schemes	
Support for the transition to a circular economy in enterprises	Acquisition of new technologies for the introduction of circular models in enterprises, necessarily in one or more of the following directions: 1) Reducing the generation of waste 2) Limiting the use of single-use plastic products 3) Use of resources of biological origin 4) Improvement of standards for environmental compatibility of products 5) Improving the energy efficiency of products 6) Introduction of other circular economy models
Measures to build, expand and upgrade municipal/regional systems for separate collection and recycling of biodegradable waste	Contribution to reducing the amount of landfilled household waste and increasing the share of separately collected and recycled waste to support the transition to a circular economy.



II.7.3.3 Initiatives

Supporting structures

Several initiatives have been launched in Bulgaria to address textile waste management and promote recycling efforts. For instance, the Ministry of Environment and Water collaborates with local authorities, NGOs, and industry stakeholders to raise awareness about textile waste and implement recycling programs.

Municipalities and NGOs often organize textile waste collection events or awareness campaigns to encourage citizens to recycle unwanted textiles properly. These initiatives help divert textile waste from landfills and promote a circular economy approach to production and consumption.

As a member state of the European Union, Bulgaria must establish a separate textile collection system by the beginning of 2025. Currently, the mechanism for implementing such a system in the country is not fully regulated. Currently, the separate collection and treatment of textile waste in Bulgaria is carried out by private organizations on a fully market-based principle. Most of these private organizations are members of the Bulgarian Association of Circular Textiles (BACT). The activities carried out by BACT make the foundation upon which a functioning and efficient system for separate collection of textile waste can be built, thus meeting EU requirements.

In 2018, the company [Texcycle](#) and the Swiss [Texaid](#) placed the first containers for textile waste in Bulgaria to introduce a separate textile collection system at the national level. It is ahead of the legal requirements, according to which a separate collection system for textiles, similar to other waste streams - plastics, glass, paper, etc. - must be introduced in every EU member state by 2025. Texcycle started with 20 containers in 2018, and now they have 320. [M-Texx](#) is another company with 400 containers across the country. There are over 720 specialized containers for separate collections of textiles from households across Bulgaria. Collected textiles are recovered and prepared for recycling or reuse.

Bulgaria's legal framework, policies, and initiatives demonstrate a commitment to addressing textile waste management challenges and promoting sustainable practices within the textile industry. However, further efforts are needed to strengthen enforcement mechanisms, improve waste infrastructure, and increase public participation in recycling initiatives.

Bulgarian Association of Circular Textiles (BACT)	The Bulgarian Association of Circular Textiles (BACT) unites companies' experts in the separate collection and utilization of textile waste, its preparation for reuse, and its entry into the second-hand clothing market. The association comprises about 50 Bulgarian and international companies with years of experience in the sector.
Association for Textile Recycling	Association for textile recycling : Supporting and facilitating the development of textile and footwear waste management activities. Please participate in the procedures for issuing or coordinating regulations governing textile or footwear waste management activities, lobbying to introduce legislative amendments to waste rules, and other areas of interest to our members.
Textile Recycling AD	Textile Recycling AD is an organization for the recovery of shoe and textile waste (STW) within the meaning of the Waste Management Act. "Textile recycling" ensures that the objectives for collecting, recovering and recycling STWs and reducing landfilled waste are met by maintaining adequate footwear and textile waste management systems. It contributes to a cleaner environment and facilitates the activities of our members.
TexCycle	TexCycle - the company has 320 specialized containers for collecting clothes, shoes, accessories, plush toys and household textiles across Bulgaria. The company also gathers fabric scraps/textile scraps from garment factories with licensed transport. After the textiles are collected in our containers, they go through a detailed sorting process. The reusable ones are sorted by type and quality and are sold in other markets. The separated part, unsuitable for reuse, is transferred to recycling, sorted by cotton and polyester material and by colour. At the end of last year, TexCycle installed a mechanical recycling line. The capacity of the installation is up to 1500 kg per hour. The machine can automatically remove both zippers and buttons. The fabric is defibered, after which they get recycled fibres, which, depending on their composition, can be used to produce new clothes or for various non-woven textile products. They have a wide application and are used to make multiple fillings in the furniture



	industry, insulating wool, producing cars, washing machines, dryers, floor mats, etc.
M-texx textile recycling	M-texx textile recycling - Textile recycling company with 406 textile containers in different Bulgarian countries
Ecotex collect	Their priority is implementing an automated line for textile waste sorting based on various criteria adapted to the needs of our recycling process. Sorting is a complicated and labour-intensive activity which requires active human participation and judgment. Reliable sorting, steady throughput, and process accuracy are necessary for successful recycling programmes. Simultaneously, they are building a fibre-to-fibre recycling line, enabling them to deliver recycled fibres ready for inclusion in manufacturing new yarns, fabrics, and various textile applications.
M Holding	Closing the loop - Behind the most popular brand in the Bulgarian second-hand clothing market - Mania, there are nearly three decades of history and a holding that manages several companies. M Holding brings together companies engaged in collecting, sorting and selling second-hand clothing and outlet products, thus completely "closing the loop" for textile recovery.
Remix	Circular fashion is at the heart of the business model of Remix Global EAD (Remix), which operates in 9 EU markets and since 2021 has been part of thredUP Inc. - the owner of one of the world's most oversized clothing, footwear and accessories resale platforms. Remix was created in response to the fashion industry's harmful environmental impact and is dedicated to inspiring a new generation of consumers who choose to reuse. With the innovative "Sell on Remix" service, users create a circular wardrobe and extend the life of their clothes by selling their reserved garments, shoes, and accessories quickly and conveniently. With this, they shop without compromise, with care for their budget and the environment.
Humana: clothes with a cause	Humana People to People Bulgaria is part of the global Humana family, dedicated to improving people's lives in the poorest countries by providing access to knowledge and education, vocational skills and farming practices. In 2021, Humana organizations in 45 countries have supported and implemented 1,261 projects that have improved the quality of life for 9.6 million people.
Texaid	Texaid Bulgaria is a subsidiary of Texaid Switzerland, a company with over 40 years of tradition in textile waste collection and branches in Germany, Austria, Bulgaria, Hungary, and the USA. With its subsidiaries, Texaid collects about 80,000 tons of textiles annually for reuse and recycling, mainly in Switzerland, Germany and, more recently, Bulgaria (Sofia). In its textile sorting eco-centre in Kostinbrod, around 500 tonnes per month are processed, and the reusable textiles are carefully graded and packaged. It is available wholesale to traders in the local market (preferential) and those in Europe, Africa, and Asia.

II.7.3.4 Inconsistencies or gaps in the legal structure that may hinder effective (textile) waste management and recycling

In Bulgaria, the companies mentioned above continuously strive to expand their activities in the country. It is happening entirely on a market basis, without state legislative, financial or functional support. Planning future measures for the effective operation of textile waste management is challenging. It is further hampered by the lack of official data on quantities of textile products placed on the market and waste generated. For 2021, the separately collected textile waste in Bulgaria is close to 2% of the total estimated amount of textiles placed on the market.

II.7.4 R-strategies Initiatives

A survey of initiatives has been developed, relating real case studies to r-strategies in Bulgaria. Table 28 provides an overview of each initiative, project, innovative process, technology, or product and an outline of its maturity level.

Table 28. R-strategies initiatives in the Bulgarian landscape.

R-strategies	Name of the initiative	Maturity Level	Description	Contact
00 Refuse	"HUMANA - Clothes with a cause"	Full-scale solution	Refusal in the context of textile waste involves consumers choosing not to purchase unnecessary items, especially those not environmentally sustainable. In Bulgaria, awareness campaigns encourage consumers to think critically about their purchases. "HUMANA - Clothes with a Cause" is an information campaign of HUMANA Bulgaria, which aims to direct the public's attention to the problems resulting from fast fashion and the consumer lifestyle. They suggest small steps to contribute to a better, greener future.	https://www.humana-bulgaria.org
	bTV	Full-scale solution	One of the significant televisions in Bulgaria bTV had a campaign called "Green Week" – a campaign for responsible behaviour towards the environment from 5th to 10th June 2023, on the air, on btvnovinite.bg, on social networks and on radio stations. They provided helpful information about what we can do together daily to reduce our carbon footprint.	https://btvnovinite.bg
01 Rethink			Rethink refers to making a product use-intensive through sharing products, and in the context of fashion, it is seen in offering clothes for rent. In Bulgaria, some companies offer clothes for rent, like Ritika, Radapola, Dress Rent and Odeta Fashion.	
	Ritika	Full-scale solution	Ritika offers dresses for rent. RITIKA allows you not to overload yourself with things, to save and, simultaneously, to look dazzling when you want or need.	https://ritika.bg/
	Radapola	Full-scale solution	Radapola offers dresses for rent	https://radapola.bg/
	DressRent	Full-scale solution	By renting out dresses, they are helping more and more ladies take advantage of designer fashion. Dress Rent provides an extraordinary and luxurious experience by offering the most beautiful and sought-after clothes for every event. The models are elegant and feminine, and the various colours, fabrics and sizes will satisfy all style requirements.	https://dressrent.eu
	Odeta Fashion	Full-scale solution	Many designers who create unique formal clothes for weddings and cocktails offer some for rent. One of them is Odeta Fashion.	https://odetafashion.com



02 Reduce	New power generation capacities from renewable sources	Full-scale solution	Reducing the consumption of natural resources and increasing the efficiency of product manufacturing is a popular strategy among clothing producers in Bulgaria. Many installed new power generation capacities from renewable sources to reduce their electricity consumption.	
03 Reuse	TexCycle	Full-scale solution	320 specialized containers for collecting textiles, sorting, reusing and mechanical textile recycling line	https://texcycle.bg/
	M-texx textile recycling	Full-scale solution	Textile recycling company with 406 textile containers	https://m-texx.com
	M Holding	Full-scale solution	Collection, sorting and sale of second-hand clothing	https://mholding.bg/en/
	Remix	Full-scale solution	Innovative "Sell on Remix" service, users create a circular wardrobe and extend the life of clothes by selling their reserved garments, shoes and accessories	https://remixshop.com
	Texaid	Full-scale solution	Textile waste collection, textile sorting eco-centre in the town of Kostinbrod	https://texaidbg.texaid.com/en/nachalo.html
04 Repair	Repair ateliers	Full-scale solution	There are many repair ateliers for clothing and shoes in Bulgaria where people can get their garments and shoes mended and repaired. These services are popular in Bulgaria and contribute to increasing clothing and shoe life. The tailoring ateliers also offer custom clothes production, a strategy for reducing waste because they produce only what the customers order, and there are no unsold goods. For example, Zakurpi me atelier offers the following types of tailoring services: Shortening jeans, skirts, pants, etc., Corrections of clothes made of knitted fabrics, Clothes mending, Patches on knees, stitching on pockets, etc.	https://www.zakurpime.com/
05 Refurbish	Revive Apparel	Full-scale solution	REVIVE apparel and accessories are made from 95% recycled materials and clothing. They use old jeans fabrics to create new models of clothing.	E-mail: contact@reviveapparel.bg https://reviveapparel.bg
	Reflet	Full-scale solution	The brand combines dead stock fabrics with typical sports and vintage remains of exciting and quality materials. They are found in Bulgarian warehouses and workshops. Their primary role is to recycle as much as possible. They want to enjoy the details, embroidery, knitting, hand-sewed sequins, buttons and industry leftovers.	http://reflet.bg



06 Remanufacture	Mechanical recycling of textile	In the development phase	Remanufacturing involves integrating product components that are still perfectly intact into new products with the same function. The remanufacturing of textiles in Bulgaria is in its nascent stages, focusing on transforming textile waste into new, high-quality products. In Bulgaria, there is mechanical recycling of textiles. The fabric is defibered, after which they get recycled fibres, which, depending on their composition, are used to produce new clothes or for various non-woven textile products. They have a wide application and are used to make multiple fillings in the furniture industry, insulating wool, producing cars, washing machines, dryers, floor mats, etc.	
07 Repurpose	Knit with a T-Shirt	Full-scale solution	The "Knit with a T-Shirt" campaign was born in response to the depressing statistics that the textile industry is the second most polluting in the world. However, consumers can significantly reduce the damage from this production if they extend the life of the products or recycle them. Mariya Yurukova from Bulgaria goes in this direction and uses waste materials to produce new products - she knits beautiful objects for the home and office with strips of old T-shirts.	https://www.facebook.com/recyclecltshirt
08 Recycle	TexCycle	Full-scale solution	At the end of 2023, TexCycle installed a textile mechanical recycling line. The capacity of the installation is up to 1500 kg per hour. The machine can automatically remove both zippers and buttons. The fabric is defibered, after which they get recycled fibres, which, depending on their composition, can be used to produce new clothes or for various non-woven textile products. They have a wide application and are used to make multiple fillings in the furniture industry, insulating wool, producing cars, washing machines, dryers, floor mats, etc.	https://texcycle.bg/
09 Recover	Sofia Waste to Energy Power Plant	In the development phase	There are no waste-to-energy plants in Bulgaria yet. Sofia Waste to Energy Power Plant is in the development phase - an 18MW biopower project. It is planned in Sofia, Bulgaria. According to GlobalData, which tracks and profiles over 170,000 power plants worldwide, the project is currently at the permitting stage. It will be developed in a single phase. The project construction will likely commence in 2025 and is expected to enter into commercial operation in 2026.	

II.7.5 Social Responsibility & Awareness-raising Initiatives

Bulgaria's social initiatives were analyzed to assess their impact on the community's awareness of clothing consumption, use and end-of-life disposal.

In the Bulgaria textile and clothing industry, the commitment to social responsibility is reflected in the integrity, ethics and transparency of companies and organizations in all their practices in respecting human rights throughout the value chain. The initiatives are diverse, encompassing various sectors, including research centres, companies, NGOs, the government and the general community.

II.7.5.1 Awareness campaigns

Awareness campaigns are crucial in informing the public about the environmental impact of textile waste and promoting sustainable consumption habits. Various organizations and government agencies have launched campaigns in Bulgaria to raise awareness about textile waste management.

Green Textiles

One notable initiative is the "Green Textiles" campaign, supported by the Ministry of Environment and Water and implemented by environmental NGOs such as Green Balkans. This campaign aims to educate consumers about the ecological consequences of textile waste and encourage them to choose eco-friendly textile products. Through social media, television advertisements, and public events, the campaign reaches a broad audience and encourages individuals to consider the environmental footprint of their clothing choices.

Recycle Your Textiles

Another example is the "Recycle Your Textiles" campaign organized by local municipalities in partnership with recycling companies. This campaign promotes textile recycling by providing collection bins in public areas and organizing community events to raise awareness about recycling textile waste. By making textile recycling more accessible to the public, this initiative encourages citizens to dispose of their unwanted textiles responsibly.

EcoAcademy

Texcycle's [EcoAcademy](#) is dedicated to educating and inspiring people of all ages to embrace the principles of sustainable consumption - reduce, reuse and recycle. An important activity is their contribution to school projects and educating young people.

Donate clothes and textiles in Textile containers

Description: The Mall, Texlife, and the Bulgarian Red Cross join forces to support the cause of the separate collection and donation of textiles. For every kilogram in the two dedicated containers in The Mall's outdoor car park, funds will be generated for an accident, disaster and crisis support fund. Part of the donated textiles in the containers will also be set aside for an additional crisis reserve at the BRC for future assistance to people in need.

II.7.5.2 Educational Programs

Educational programs are essential for instilling sustainability values and promoting responsible waste management practices among the younger generation. In Bulgaria, educational programs on textile waste management are integrated into school curricula and extracurricular activities.



For example, the Ministry of Education collaborates with environmental organizations to develop educational materials on textile waste management for primary and secondary school students. These materials include interactive lessons, educational videos, and hands-on activities that teach students about textile waste's environmental impact and recycling's importance.

In addition to formal education, there are also community-based educational programs that target children and youth. For instance, environmental NGOs such as the Bulgarian Society for the Protection of Birds organize workshops and outdoor activities where participants learn about textile recycling through practical demonstrations and interactive games.

II.7.5.3 NGOs – Non-government organizations (NGO)s initiatives

NGOs play a significant role in promoting textile waste management and recycling in Bulgaria. These organizations work tirelessly to raise awareness, advocate for policy changes, and implement practical solutions to address the challenges of textile waste.

Green Balkans

One prominent NGO involved in textile waste management is [Green Balkans](#). This organization focuses on environmental conservation and sustainable development, with specific initiatives targeting textile waste. Green Balkans collaborates with local communities, businesses, and government agencies to promote textile recycling, organize clean-up events, and advocate for policies that support sustainable textile production.

Bulgarian Society for the Protection of Birds

Another notable NGO is the [Bulgarian Society for the Protection of Birds](#) (BSPB), which addresses textile waste as part of its broader environmental conservation efforts. BSPB engages in public outreach activities, such as educational workshops and awareness campaigns, to highlight the importance of textile recycling and encourage individuals to take action.

Eco Champions

Ecochampions - an initiative involving 34 schools and over 16,000 students from grades 1 to 12 in the 5 municipalities- aims to engage students and their families to collect their waste separately. The campaign is organized by the largest organization for the recovery of packaging waste in the country, [ECOPACK Bulgaria](#), in close partnership with the Municipality of Plovdiv, the Municipality of Haskovo, the Municipality of Vratsa, the Municipality of Dupnitsa and the Municipality of Varshets.

Where the old clothes go: Art atelier and info booth of Stara Zagora municipality

The Municipality of Stara Zagora promoted the separate collection of unnecessary clothes and home textiles with an Art workshop and an Information stand for children and adults. The joint initiative was held with the TEXTCYCLE brand, which specialized in collecting, sorting, distributing and recycling used clothing, footwear and other textiles.

TEXTILES – BETWEEN FASHION, REUSE, AND TEXTILE RECOVERY?

An online webinar for fashion entrepreneurs focused on sustainable fashion, minimizing and utilising textile waste, organized by [Bulgarian Fashion Association](#).



"Door-to -Sorting centre" - textile waste collection service on demand

- In Sofia, Bulgaria, Textile waste collection company [Texaid Ltd](#) introduced a "Door-to -Sorting centre" textile collection service during the COVID-19 outbreak: the service included the collection of disposable clothes in large quantities (min. 10 - 20 shopping bags) from the addresses of persons who have previously requested this service. The textile waste was collected in front/outside of the apartment/household premises, from where it was taken by a team member of the waste collection company Texaid Ltd and transported to the „Sorting centre “.

II.7.5.4 Research projects – Specific research partnership

Research on textile waste management and recycling in Bulgaria is limited. Some research is conducted through the:

Promoter: National High School in Finance and Business

[TexCycle](#) was a partner of the National High School in Finance and Business in the project "I recycle - for a cleaner and more sustainable future of our city", funded by the Sofia Municipality under the "Sofia - a city of young and active people" program. As part of the project, students from 5 schools became ambassadors for the cause of zero textile waste and trained their peers on textile pollution and how to address it.

The project's results:

- Nearly 900 kg of textiles were collected for recycling
- 14,922 kg of carbon emissions were saved
- 1,563,080 litres of water were saved

Another example of a research partnership focused on textile waste management is the collaboration between the Bulgarian Academy of Sciences and local textile manufacturers. This partnership aims to develop sustainable textile production methods and explore new recycling technologies that minimize environmental impact.

Another collaborative initiative is the partnership between Sofia University and international research organizations. Together, they research textile waste characterization, recycling technologies, and life cycle assessments to identify opportunities for improving textile waste management practices in Bulgaria.

II.7.5.5 Collaborative Initiatives

Collaboration between industry stakeholders, governments, and non-governmental organizations is becoming more common in addressing the textile industry's systemic waste management and recycling issues.

The European Institute Foundation and the Bulgarian Industrial Association are implementing a project, *Citizens and Business - Partners in Textile and Footwear Waste Management*, which seeks to increase citizens 'and businesses' involvement and engagement in formulating change in the policy of mass distribution of waste.

One of the project's main focuses was the study and analysis of practices for collecting and recovering textile and footwear wastes. The results of the study were summarized in a report and presented at a round table with the participation of business representatives (manufacturers and importers of textiles and footwear), industry organizations, processing and recycling companies, landfills, municipal and state structures and others. During the

roundtable, participants exploited the shortcomings in the existing separate collection systems and shared practices of different municipalities in Bulgaria, gave ideas for the involvement of citizens and businesses in the waste recovery process, as well as some possible solutions for the implementation of separate collection of textile and footwear waste, which Member States need to introduce by 1 January 2025. There is an urge for citizens and businesses to join forces and, together with the authorities, to become a part trainer in the development of mass waste management policies to raise public concern, encourage civic participation in policy formulation, implementation and monitoring, and encourage businesses to build working systems for separate collection.

II.7.6 SWOT Analysis

The following table presents the SWOT analysis for the Bulgaria paradigm to identify strengths and weaknesses, opportunities and threats in the local management and recycling of textile waste, with a vision of the implications for global efforts. The SWOT analysis concerns the country level Bulgaria.

Table 29. SWOT Analysis for Textile Waste Management and Recycling in Bulgaria

Strengths	Weaknesses
● Growing Awareness: There is an increasing awareness among the Bulgarian population about environmental issues, including the importance of textile waste management and recycling. ● Government Support: The Bulgarian government has committed to promoting sustainable practices, as evidenced by its implementation of policies and regulations supporting textile waste management initiatives. ● NGO Involvement: Non-governmental organizations (NGOs) play a significant role in raising awareness, organizing clean-up campaigns, and advocating for policy changes to improve textile waste management practices. ● Local Innovation: Bulgaria has the potential for local innovation in textile recycling technologies, with research partnerships and initiatives focused on developing sustainable solutions.	● Limited Infrastructure: Bulgaria faces challenges related to limited infrastructure for textile waste collection, sorting, and recycling, hindering efficient waste management practices. ● Low Public Participation: Despite growing awareness, public participation in textile recycling programs remains low, indicating a need for targeted education and engagement efforts. ● Financial Constraints: Insufficient funding for research and development in recycling technologies and infrastructure poses a significant barrier to advancing textile waste management in Bulgaria. ● Regulatory Gaps: There may be gaps in the regulatory framework governing textile waste management, leading to inconsistencies in enforcement and compliance.
Chances/ Opportunities	Threats
● Market Growth: The increasing demand for sustainable products and materials presents an opportunity for growth in the textile recycling industry, with potential for new markets and revenue streams. ● International Collaboration: Bulgaria can benefit from collaboration with international partners to exchange best practices, access funding opportunities, and leverage textile waste management and recycling expertise. ● Circular Economy Integration: The integration of circular economy principles into textile production and consumption patterns can create opportunities for innovation and sustainable growth in the textile industry. ● Innovative Solutions: Bulgaria has the potential to develop and implement creative solutions for	● Competition: The Bulgarian textile industry faces competition from low-cost imports, which may hinder market demand for locally recycled textile products. ● Regulatory and political challenges: Regulatory challenges, such as inconsistent enforcement and compliance, could impede the effective implementation of textile waste management policies and initiatives. In addition, due to the currently unstable political situation, some governmental initiatives may be hindered or delayed. ● Technological Barriers: Limited access to advanced recycling technologies and infrastructure may hinder Bulgaria's textile recycling efforts' scalability and efficiency.



textile waste management, including advanced recycling technologies and eco-friendly production methods.

- Market Demand: The limited demand for recycled textile products may threaten the economic viability of textile recycling initiatives in Bulgaria.

While Bulgaria has strengths such as growing awareness and government support for textile waste management, addressing weaknesses such as limited infrastructure and low public participation will be crucial for maximizing opportunities and mitigating threats in the textile recycling sector.

III. Conclusions

III.1 Joint SWOT analysis

The consortium of seven VERDEinMED partner regions—Greece, Spain, Portugal, Slovenia, Italy, North Macedonia, and Bulgaria—exhibits a complex variety of strengths, vulnerabilities, prospects, and hazards on the subject of circular and sustainable textiles due to their diverse characteristics on the sector, varied technological backgrounds and uneven rhythm of regulatory adoption and implementation.

The following table presents the pivotal elements of this cooperative landscape through a consolidated SWOT analysis.

Table 30. Joint SWOT Analysis for Textile Waste Management and Recycling in the VERDEinMED collaborating regions and countries

Strengths	Weaknesses
- Regulation and policies supporting circular economy, recycling of textiles and adoption of sustainable industry practices. - A separate collection of textile waste has been established in most regions. - Many active NGOs are working towards these goals and raising awareness. - Italy, Spain and Portugal have great experience in textile recycling, both mechanical and chemical. - Innovation and sustainability are common goals for many textile brands in the partner areas. - An educated workforce with expertise in textile and recycling technologies is essential. - The availability of grants, subsidies, and financial incentives from both public and private sectors encourages investment in recycling infrastructure and technology, boosting overall efficiency and effectiveness. - Ongoing research and development in textile recycling techniques and materials innovation contribute to continuous improvement and expansion of recycling capabilities.	- Insufficient Data on Textile Waste: There is a lack of comprehensive data on textile waste generation and recycling rates, which can impede targeted policymaking and improvements (Greece, Slovenia & North Macedonia). - Greece, Spain, Slovenia, and Bulgaria report policy gaps or complexities on textile waste characterization, management, and regulation. Others (Italy) are focusing on ensuring compliance with the rules. - Some partner areas (Greece and North Macedonia) lack recycling facilities, while others (Slovenia and Bulgaria) are developing an essential recycling capacity. Therefore, large amounts of textiles need to be exported. - There is still a lack of awareness among consumers and industries on these issues. - Reuse is not widespread and needs to be supported in all regions. - Insufficient financial resources and investment in textile recycling infrastructure and technologies restrict the scalability and effectiveness of recycling efforts in many regions. - Inadequate logistics infrastructure and transportation networks in certain regions complicate the collection, sorting, and distribution processes necessary for effective textile waste management and recycling. - Reliance on export markets for textile waste disposal from regions without adequate recycling facilities can lead to environmental and economic inefficiencies and potential ethical concerns regarding waste management practices. - Shortages in skilled personnel and trained workforce specializing in textile recycling technologies and processes hinder the development and expansion of sustainable practices.
Chances/ Opportunities	Threats
- Large quantities of textile waste need to be managed innovatively and circularly. - We are leveraging funding opportunities within the country and at the EU level. - Development of new businesses based upon Circular Economy models - Market growth on new sustainable consumption paths.	- Global Market Pressures: Competition from low-cost, poor-quality and high-volume textile producers can undermine local recycling efforts and sustainable practices due to market preferences for cheaper goods - Resistance to Change: both Cultural (concerning consumer behaviour) and Industrial - Economic Constraints: Economic downturns or budgetary constraints can reduce public and private funding necessary to support systemic and industrial investments



- | | |
|---|---|
| <ul style="list-style-type: none"> • Vast international networks allow for collaboration in these sectors. • Increasing consumer awareness and demand for sustainable products can drive market growth for textiles produced from recycled materials, encouraging more businesses to adopt environmentally friendly practices. • International Market Expansion: Leveraging expertise and capabilities in textile recycling can position VERDEinMED countries as leaders in sustainable textile production, attracting international partnerships and markets for recycled textiles and products. • Initiatives aimed at educating and training stakeholders, including designers, manufacturers, and consumers, on sustainable textile practices can foster a culture of responsible consumption and waste reduction. • Integrating textile waste management into local economic development strategies can spur job creation in recycling and related industries, contributing to regional economic resilience and sustainability. | <ul style="list-style-type: none"> • Supply chain complexities: Textile recycling requires a well-established and efficient supply chain to collect, sort and process the discarded textile waste. Managing the logistics and ensuring a consistent and reliable supply of textiles can be challenging. • Insufficient investment in research and development for innovative textile recycling technologies and processes may limit progress towards achieving higher recycling rates and sustainability goals. • Legal challenges related to liability for environmental impacts or product safety concerns associated with recycled textile products can create uncertainty and deter investment in recycling initiatives. • Occupational health risks associated with handling and processing textile waste, including exposure to hazardous chemicals or airborne particles, can pose regulatory and operational challenges. • Negative perceptions or scepticism among consumers regarding the quality and durability of recycled textiles compared to new products may limit adoption and demand for recycled textile products. • Unintended environmental consequences of textile recycling processes, such as emissions, wastewater discharge, and chemical usage, could lead to regulatory scrutiny or public backlash, affecting operational viability. |
|---|---|

Despite the differences between the regions, many common themes emerge from the SWOT analysis.

Separate collection of textile waste

Separate textile waste collection has started in all geographical areas with varying maturity levels and is critical to the collection and proper management.

In this regard, Greece is reporting a robust textile waste collection infrastructure, as specific collection/reuse/recycling bins for textile waste have been established in many areas. However, an EPR scheme has not yet been established, even though it is foreseen in the current legislation.

Spain faces significant uncertainties in its textile waste collection processes. Fundamental questions remain about where textile waste will be collected and how textiles will be separated. Many municipalities lack comprehensive waste management planning, effective information collection systems, and communication with other administrative bodies and citizens. The separate collection and subsequent treatment of new waste fractions are particularly challenging. A proposed solution involves expanding the producer's responsibility (EPR) to encompass these waste flows, ensuring more accountable and efficient management.

Portugal excels in utilizing its existing waste segregation systems, demonstrating skill in implementing effective textile waste segregation processes. This infrastructure enables the country to manage textile waste efficiently, setting a standard for other regions.

Italy experiences fluctuating textile waste collection rates, reflecting instability in its current waste management system. Despite ongoing improvements, these inconsistencies pose challenges to sustainable waste management. Additionally, the Extended Producer Responsibility (EPR) policy in Italy is pending, and it might also encourage producers to



design products considering their entire lifecycle. This approach leads to more sustainable products and reduced waste, aligning with broader environmental goals.

Awareness raising

Consumers and the industry have started to pay attention to sustainability and circularity due to regulatory application, implementation and active NGOs in these fields.

In particular, there are dedicated textile NGOs in Greece with experience in the subject and many emerging sustainable and circular fashion brands. On the other hand, large-scale awareness campaigns for behavioural change dedicated to textile waste and its management should be transmitted among citizens to battle better consumers' resistance to change. Frequent repair cafes, workshops, or events fostering consumer engagement and awareness could help achieve this goal.

Spain grapples with a lack of innovation in encouraging the public to embrace second-hand clothing. Comprehensive information and training programs for citizens, businesses, and industries are crucial to achieving active collaboration in new waste management habits and behaviours. These educational initiatives are essential to foster the necessary shift towards sustainable practices.

Portugal profoundly understands industry-wide ecological consciousness, particularly in textile waste management. The country is committed to promoting societal shifts through awareness-raising initiatives. However, it might not be enough, as there is still a recognized need for extensive public education campaigns to ensure compliance with textile waste segregation strategies and regulations.

Through various campaigns and educational programs, Slovenia has achieved high public awareness and education regarding recycling and sustainable practices. This growing awareness is crucial in driving the country's efforts towards better waste management.

North Macedonia has a burgeoning focus on corporate social responsibility (CSR) initiatives. Companies are increasingly demonstrating their commitment to sustainable practices and positively impacting society. However, there remains a lack of consumer awareness about the adverse effects of post-consumer textile waste and the benefits of its further usage or treatment.

Non-governmental organizations (NGOs) in Bulgaria are significant in raising awareness, organizing clean-up campaigns, and advocating for policy changes to improve textile waste management practices. There is a growing awareness among the Bulgarian population about environmental issues, including the importance of textile waste management and recycling. Despite this, public participation in textile recycling programs remains low, indicating a need for targeted education and engagement efforts.

Global Market pressure

Competition from low-cost, poor-quality and high-volume textile producers drives textile goods prices and quality down, leading to unfair competition with SMEs trying to implement more sustainable practices.

Greece faces significant challenges due to the large importation of textile products and consumer purchases from international sellers. This influx has flooded the market with lower-quality textiles more than ever before, undermining efforts to promote sustainable practices.



- Italian textile producers and recyclers contend with intense global competition from countries with lower production and recycling costs. This international competition risks their market share and profitability, complicating the transition towards more sustainable operations.

Global market pressures, including economic fluctuations and volatility, affect North Macedonia. These factors influence consumer behaviour, often reducing the demand for sustainable fashion products. Financial instability can deter consumers from investing in recycled fashion, perpetuating a preference for fast fashion alternatives.

Resistance to change

Resistance to change is a pervasive threat across all regions. Cultural and industrial inertia, supported by the advertising industry, creates significant barriers. Small awareness-raising campaigns struggle to compete with the relentless allure of fashion marketing, which constantly promotes new trends and discourages sustainable choices.

The financial implications associated with complex textile recycling processes further hinder progress. High costs and intricate procedures discourage producers and consumers from adopting sustainable practices.

Effective communication and implementation strategies are essential in mitigating public opposition to new regulations. Regions must focus on transparent dialogue and clear benefits to gain public support for sustainable initiatives.

Technology & Infrastructure gaps

Circular economy implementation needs new infrastructure, which can be expensive and need funding and financial incentives. Apart from Italy, Spain, and Portugal, leading experts in the textile recycling sector, all the rest of the partner countries report a lack of recycling facilities and the need to establish complicated supply chains for circular solutions.

Even Spain faces significant challenges in establishing the necessary infrastructure. Many expensive facilities must be built to manage the massive amounts of waste produced, posing a considerable financial burden to the country. It involves upgrading existing systems and investing in new technologies to streamline waste management processes.

Greece has established a robust network of separate collection bins for textile waste. However, this network is not supported by adequate sorting and recycling facilities, which are still at a pilot scale. Consequently, collectors often have no choice but to export the collected textile waste, highlighting a critical gap in the local recycling infrastructure.

Slovenia lacks specialized facilities dedicated solely to textile recycling, hindering the efficiency of recycling processes. Investing in new recycling technologies and innovations can improve the efficiency and output of recycled textile products.

Italy faces significant technological and infrastructure gaps in its textile waste management system. There is a pressing need for advanced sorting and recycling technologies to handle the complexities of textile waste. Investing in innovation and technology development, such as advanced recycling technologies and digital identification systems, can significantly enhance efficiency and effectiveness. However, high implementation costs pose a considerable barrier.

North Macedonia suffers from a lack of specialised facilities dedicated to textile recycling, both pre-consumer and post-consumer. Addressing these infrastructure deficiencies is crucial for improving waste management practices.

Bulgaria faces limited infrastructure for textile waste collection, sorting, and recycling. Insufficient funding for research and development in recycling technologies and infrastructure poses a significant barrier. Additionally, limited access to advanced recycling technologies hinders the scalability and efficiency of Bulgaria's textile recycling efforts.

Emerging new opportunities

New businesses can be established, taking advantage of the increased quantities of textile waste foreseen due to the EU-wide mandatory separate collection of textile waste as of 2025, such as new circular economy business models and the need for reuse, repair, remanufacture and refurbishment services.

Greece's lack of sorting and recycling facilities can also allow new businesses to emerge, focusing on reuse, repair, refurbishment, remanufacturing, and recycling services. The vast quantities of textile waste and the shift towards circular economy business models create favourable conditions for entrepreneurial ventures in the sector.

Portugal is proficient in identifying opportunities for the growth of the textile recycling industry through mandatory segregation initiatives. This strategic approach encourages the development of new businesses and services to enhance sustainability in textile waste management.

Active projects in North Macedonia are paving the way for the development of circular economy practices in the textile and clothing production sector. Collaborative efforts involving NGOs, industry stakeholders, and academia are crucial in expanding recycling possibilities and improving resource efficiency. Partnership opportunities between brands, producers, and stakeholders can further accelerate the adoption of circular business models across the supply chain.

The increasing demand for sustainable products and materials presents a growth opportunity for Bulgaria's textile recycling industry. **Integrating circular economy principles into textile production and consumption patterns can stimulate innovation and sustainable growth in the sector.** However, addressing the limited market demand for recycled textile products remains a challenge that requires strategic interventions to ensure economic viability.

Increasing government initiatives on sustainability and waste reduction can provide opportunities for **incentives, grants, or favourable policies for businesses operating in the textile recycling sector.** These supportive measures are essential in overcoming financial barriers and fostering innovation in sustainable textile waste management practices across VERDEinMED partner regions.

Also, it is essential to highlight that each partner region has delineated distinctive attributes in their respective SWOT analyses:

GREECE

In Western Macedonia, approximately 24 tons of textile waste have been diverted from landfills thanks to the establishment of Re-use centres. Expanding these centres beyond Western Macedonia is imperative for the country. However, minimal regulations govern the



import and export of textiles within the country, which increases the difficulty of establishing an effective EPR scheme.

SPAIN

Spain leads the textile industry, boasting companies that have adopted global market integration. Yet, the landscape of textile waste, locally and globally, is changing. In this respect, Spain plans to prohibit excess production burning soon, according to the approved EU ban on destroying unsold clothing. Some firms will need authorization to manage waste, necessitating cost adjustments and ensuring viability.

Spain has extensive expertise in recycling technologies for textile waste. Moreover, advanced chemical methods, like polyester recycling, are prominent in Spain's textile recycling endeavours.

PORTUGAL

Portugal holds significant promise in advancing its textile recycling sector by leveraging existing expertise in managing pre-consumer waste, yielding economic and environmental advantages. Moreover, the nation aims to take proactive steps to combat the challenges posed by the illegal disposal of textile waste, emphasising stringent enforcement measures. Practical strategies for monitoring and enforcing mandatory policies on textile waste segregation would further enhance these efforts.

Portuguese entities excel in fostering collaborations with stakeholders, including NGOs and brands, to promote sustainable practices and achieve long-term objectives outlined in the textile waste management roadmap. Additionally, Portugal's experience in leveraging EU support for implementing sustainable waste management practices through research projects, pilots, and corporate initiatives underscores the potential success of such endeavours.

SLOVENIA

Slovenia prioritizes innovation, particularly in sustainable practices and the circular economy, bolstered by research institutions and collaborative efforts. Strengthened partnerships among government, industry, NGOs, and academia could enhance recycling strategies significantly. Nonetheless, economic limitations associated with recycling operations, including the substantial costs of gathering, sorting, and processing textile waste, pose challenges without substantial governmental or EU backing. Additionally, inadequate data on textile waste generation and recycling rates impedes targeted policy development and advancements.

ITALY

Italy demonstrates proactive leadership in waste management through its early adoption of Separate Collection, mandating the separation of textile waste in 2022, three years ahead of the EU deadline. This initiative underscores Italy's commitment to environmental stewardship. The country also excels in recycling other materials such as paper, aluminium, and wood, establishing a robust framework and serving as a positive example for enhancing textile recycling rates.

Furthermore, Italy's national strategy for a circular economy outlines a comprehensive plan aimed at increasing recycling rates and promoting sustainable practices. This strategy fosters innovation and stimulates economic growth within the sector.

However, a significant challenge to domestic recycling efforts lies in the exportation of large



quantities of textile waste, which escalates environmental impact through increased transportation emissions. Moreover, ensuring compliance with national and EU regulations demands ongoing diligence and adaptation. Any delay in updating or enforcing regulations can impede progress toward sustainability goals.

NORTH MACEDONIA

North Macedonia faces significant challenges in implementing sustainable practices and waste management in its textile industry. Companies' adoption of sustainable practices and waste management strategies largely hinges on the commitment of the brands they serve and their stance on sustainable fashion.

Engaging in Extended Producer Responsibility initiatives presents opportunities for launching diverse campaigns and educational programs to raise awareness among the Macedonian population about the crucial benefits of a circular economy, including practices like the 9Rs (Reduce, Reuse, Recycle, etc.).

Moreover, the financial burden of recycling is considerable: Textile waste generators bear the costs associated with subsequent waste treatment and recycling processes. This economic strain is particularly daunting for companies involved in textile production, where waste generation is inherent in the manufacturing process.

Presently, North Macedonia relies heavily on landfilling and incineration to manage textile waste, practices that are environmentally unsustainable and carry inherent ecological risks. Despite these challenges, there is a noticeable increase in awareness among the Macedonian public regarding the importance of embracing a circular economy and adopting sustainable practices, including the principles of the 9Rs.

BULGARIA

The Bulgarian government has demonstrated steadfast dedication to advancing sustainable practices, underscored by its implementation of policies and regulations that support initiatives for managing textile waste. Furthermore, Bulgaria stands poised for local innovation in textile recycling technologies, bolstered by research collaborations aimed at pioneering creative, sustainable, and advanced recycling methods alongside eco-friendly production techniques.

However, regulatory and political obstacles pose significant challenges. Inconsistent enforcement and compliance with regulations could hinder the effective execution of textile waste management policies and initiatives within the country. Moreover, the volatile political landscape may impede or delay governmental initiatives addressing these challenges.

To conclude, the complexities of the T&C market extend beyond regional or national borders. However, this also presents opportunities for sharing knowledge and financial support, particularly within the EU context. Essential initiatives, collaborative networks, and projects like VERDEinMED can serve as tools to expedite policy, market, and consumer changes needed to promote sustainable and circular practices in the sector. This report addresses the sector's specific needs, status, and cutting-edge developments, marking a significant step towards the necessary changes in critical areas.



IV. Glossary of terms

A

Apparel

A term used in the industry covers all types of soft clothing items, including womenswear, menswear, childrenswear, sleepwear, lingerie, etc.

B

Biodegradable

Biodegradable refers to any material that can be broken down by microorganisms (bacteria and fungi) and assimilated into the natural environment through a naturally occurring process. When an object “biodegrades”, its original composition degrades into simple components like biomass, carbon dioxide, and water. Used in industry terms, products can only be labelled “biodegradable” if it has been tested; the time of degradation depends on both the chemical composition of the object and the way that it's stored, i.e. landfill is neither hot enough for the bacteria involved in anaerobic digestion to thrive, nor with enough oxygen for aerobic digestion to thrive, so degradation will not occur quickly.

C

Chemical recycling

An industrial process that uses solvents to break down the textile waste back into its polymers, i.e. depolymerise the molecular structure of materials. The current infrastructure does not allow the separation of synthetic and natural fibres, so while chemical recycling can be used on naturally derived textiles such as cotton to create a regenerated fibre, producing a valuable yarn from cotton-polyester blended textiles is difficult. *Chemical recycling* is most helpful in converting synthetic textiles into recycled fibre as their physical properties tend to be as strong as virgin fibre.

Circular economy

The circular economy is founded on three principles: eliminate waste and pollution, circulate products and materials, and regenerate nature. Charity Ellen MacArthur Foundation defines the circular economy as “a transition to renewable energy and materials. A circular economy decouples economic activity from the consumption of finite resources.”

Circularity

Compared to a circular economy, *circularity* removes economic production from the equation. Circularity relates to all cycles where a cyclical motion is preferential or already in place over a linear motion. As with all cycles, there are waste streams: the circular economy addresses solutions to use these waste streams by being cyclical rather than linear; however, circularity addresses solutions to use these waste streams without necessarily any monetary consideration. Think about the composting system of nature: trees shed leaves > bacteria decompose leaves > organic matter provides nutrients for new seeds > and new trees grow. If this is transferred to a circular economy way of thinking, the outputs can be converted into economic resources, such as bioenergy, from the human-driven composting system. Both are circular, yet one has an instant economic value.

Compostable

Used to describe a product that can biodegrade into non-toxic, natural elements, *compostable* refers to *residential composting* as well as *commercial composting*, i.e. human-driven circumstances. Compostable products under a



biodegradation process require microorganisms, humidity, and heat to yield a finished “compost” product, preferably organic matter that can be cycled into an existing system. Products legally need to be labelled with the correct type of composting required for the materials to break down successfully.

Cut-Make-Trim

Also known as *CMT*, *cut-make-and-trim* production is where an apparel factory produces your designs in three stages. It is usually done under a single factory for control and inspection purposes. *Cut* refers to laying fabric and cutting to size following graded paper patterns. *Make* refers to manufacturing items, such as clothing or leather goods, from fabric pieces to finished products. *Trim* refers to the final touches of a product, including overall quality control that covers trimming threads, repairing damage and packing up/labelling the item for distribution.

Cutting room floor waste

Also known as *cutting floor waste*, this is precisely the thread, yarn and fabric offcuts or damages discarded during production. They are generally small and irregularly shaped.

D

Deadstock

Any textile item (yarn, fabric or finished goods) that the production unit, retailer or maker cannot sell. It has been purchased with an agreement from the manufacturer to the brand but has not been sold to an end consumer. *Deadstock* can be textile items that remain with the factory (and generally have been purchased but not collected by the brand) or found at designer studios or retail stores.

Downcycling

Any work done to reduce textile waste's value is classed as downcycling and primarily relates to the stepping down of a material's function, i.e., clothing to rags.

E

End-of-roll

End-of-roll is a term that determines origin; this is where a textile (fabric or trims) has been ordered and used, but a small amount remains on the roll. It can be because the cut-make-trim was resource-efficient, fewer products were bought and subsequently made, or the producer included additional yardage. It can also be because it was over-ordered in the first place.

F

Fabric

A fabric is a pliable and cuttable material created by converting yarns and sometimes fibres. Fabrics are produced by interlacing fibres or yarns using weaving or knitting construction methods, though some are made as non-woven to create a sheet material.

Factory, Production unit, Production facility, Manufacturer

Denotes any facility that manufactures textile products for sale. These terms generally refer to the production of finished goods rather than textile inputs upstream, i.e. yarns and fabrics.

Fibre

A raw material of natural or artificial origin that can be converted into yarns and fabrics, usually of a shorter [staple](#) and not continuous in length.



Filament

In textiles, filament refers to a continuous length of fibre, either synthetic or natural origin, such as silk, instead of a [stable](#).

G

Greenhouse effect

The *greenhouse effect* happens when certain gases - known as greenhouse gases - collect in Earth's atmosphere. These gases, naturally occurring in the atmosphere, include carbon dioxide, methane, nitrogen oxide, and fluorinated gases, sometimes known as chlorofluorocarbons (CFCs). Greenhouse gases let the sun's light shine onto the Earth's surface but trap the heat that reflects into the atmosphere. In this way, they act like the insulating glass walls of a greenhouse. While the greenhouse effect is necessary to sustain a liveable climate, increasing harmful human activities adds greenhouse gases to the atmosphere, trapping unprecedented amounts of heat and contributing to global warming.

I

Incineration

Unlike landfills, where materials are disposed of and left to rot, *incineration* is a more managed waste treatment process that burns waste materials, explicitly using "controlled-flame combustion" or "calcination", destroying the organic constituents in waste materials. Most incinerators nowadays - known as "waste-to-energy plants" - will capture the broken-down organic constituents such as ash, gas, and heat to convert them into energy. As with landfills, harmful substances can still be emitted as pollutants in the air and water.

Industrial Textile Waste

Used interchangeably with pre-consumer waste, this is any textile waste that is found within a production facility and can be collected from the fibre to the finished goods stage.

K

Knitted, Knitting

Knitting is a method of construction that loops yarn in a row, either flat or round (tubular knitting). Unlike woven fabrics, knitted fabrics have a natural elasticity due to this looped construction. Knitting can be done by hand or machine.

L

Landfill

A disposal site for waste materials, usually in a pit or as a mound.

M

Manufactured fibre

Classified generally as synthetically obtained, manufactured fibres come from a laboratory rather than natural plant or animal sources. The term manufactured can crop up when a natural fibre has been converted via chemical processes, such as with "regenerated cellulosic", including lyocell.

Manufactured cellulosic fiber

It very often consists of natural cellulose-rich raw materials like wood. Examples of MMCF include viscose, rayon and modal.

Material

In contrast to the characteristic of malleability that fabric requires, a material concerns



anything that can be used to make something, whether soft or hard, e.g., fabric concrete or plastic.

Mechanical recycling

It is an industrial process that uses a machine with teeth and knives to shred textiles. The short-[staple](#) fibre that results from this *mechanical shredding* needs to be responsible for being used as yarn for fabric production. It is known as a “*cottonised*” yarn because it is short, like cotton fibres. The shredded textiles can also be broken down using solvents and spread into a pulp-like paper to create a non-woven textile sheet. It is classed as a *regenerated fibre*.

Mill

A fibre or fabric production facility would be called a mill, though it may also be referred to as a fabric or yarn manufacturer. You may come across a *spinning mill* during the yarn production stage and a *fabric mill* during the fabric production stage.

N

Natural fibre

Natural fibre comes directly from nature and is split into a few categories: *vegetable fibres* (cellulose), *animal fibres* (protein) and *mineral fibres*. These categories are then further divided into *bast fibres* (ramie or nettle, hemp, flax and jute), *leaf fibres* (sisal, pineapple, abaca/banana) and *seed hair fibres* (cotton, kapok). *Animal fibres* include wool (sheep, alpaca, camel, vicuña, angora, mohair, cashmere) and silk. *Mineral fibres* cover glass, asbestos and heavy metals, meaning they are less likely to be a part of textile production. Apart from silk, natural fibres are classified as [staple](#) fibres. As animal skins and hides do not have a fibrous structure, while you would class any hair from these skins as fibre - as with the case of wool - the skin itself is technically non-woven. Therefore, leather, exotic skins and fur are natural materials, but they are processed as a non-woven rather than a fibre, i.e. they are not spun into yarn and woven or knitted.

Non-woven

Non-woven fabrics are denoted as having no organised geometrical structure. Unlike woven or knitted fabrics, they are created by interlocking or bonding fibres. Usually, you would not use yarns for this construction method. Many other non-woven materials, such as plastic sheeting, but as this does not require fibre input, it would be classed as a material.

O

Overstock

In contrast to [deadstock](#), *overstock* explains why the textile item (yarn, fabric or finished goods) cannot be sold: it describes a situation wherein the stock was deliberately over-purchased by the brand to the manufacturer (or by the manufacturer from a subcontractor). Over-purchasing can be done to ensure a lower cost-per-item, to ensure no delays in production by having items to hand, or to cover any potential damages that may occur.

Offcut

An offcut or off-cut is material left over after a workpiece is cut or processed. In the fashion industry, 10-20% of all fabric is offcuts.

P

Post-Consumer Waste

Textiles are any textile waste from the consumer that has already passed through the producer and retailer to the public. Post-consumer waste can refer to any textile as long as it comes from the end consumer.



· Post-Industrial Waste, Post-Industrial Consumer Waste

They cover waste textiles after the production facility has sold them onto the next stage, including [deadstock](#), [overstock](#), [surplus](#) and post-consumer discard.

Pre-Consumer Waste

About textiles, pre-consumer waste is any textile waste found within a production facility that cannot or was not used for its intended purpose. It encompasses the above terms of [surplus](#), [deadstock](#) and [overstock](#). Additionally, it includes cutting floor (or cutting room floor) waste, such as offcuts from the cut stage, threads from the trim stage and any damages. It may also cover raw fibre inputs that did not pass quality control.

R

Recycle, Recycling, Textile recycling

The “re” in recycling denotes how a material is being processed to be turned back into itself or something else. Generally, with recycling, we anticipate the same value inherent in the material when it comes out as when it went in. *Textile recycling* might also be a form of upcycling or downcycling. For example, cutting room floor waste has no other function, so collecting and spinning it as a “recycled yarn” gives it a higher value. On the other hand, clothing discarding has inherent energy and value by being a finished good; therefore, shredding it to create a new fibre lowers its value.

Re-use

Generally speaking, re-use is utilising the textiles in the same or very similar way as initially intended.

Regenerated fibre

Regenerated fibres tend to be also classified as [man-made fibres](#) or regenerated cellulose, simply because whether your raw ingredient is from a natural or a synthetic source, regenerating one ingredient into another requires artificial processes. For example, a recycled cotton fibre will be broken down using solvents to create a pulp that can then be extruded as a new fibre known under the lyocell fibre. It is no longer cotton, but it is also not fully synthetic.

Repurpose

It is taking the textile waste to utilise it in a way other than its intended purpose. Repurposing can add value by [upcycling](#) (for example, using bike inner tubes to create accessories) or decrease value by [downcycling](#) (by, for instance, cutting up a shirt to be rags), even without deliberate effort.

S

Sample

Production factories make samples - usually the CMT - so that brands can address a textile item's fit, finish, colour and style.

Staple

In textiles, *staple* refers to the length of a raw fibre in contrast to the continuous length of a [filament](#).

Surplus

Regarding textiles, surplus is anything left over at the production factory or with the retailer once purchases (yarn, fabric or finished goods) are completed. The term can be used



interchangeably with deadstock or overstock, though it usually covers items produced accidentally or as surplus to the purchasing agreement. Surplus can also refer to textile items ordered by brands to the manufacturer yet not purchased or collected, as these have been produced without need and remain with the production factory.

Synthetic fibre

Synthetic fibre is produced using polymers obtained when fossil fuels (specifically by-products of petroleum oil and natural gas) are transformed in chemical processes into a filament, known as polymerization. The filament is directly used in spinning – known as extrusion – to create a yarn or otherwise convert it into pellets for later use.

T

Textile export

A waste stream for textile discard where textile waste is exported to another country and is witnessed as significant wrapped bales. It is rare to have textile imports in developed Western countries.

Textile discard, Clothing discard

A term generally reflects unwanted textiles discarded from homes, production factories, or retailers into charity shops, collection banks, and residual bin waste. *Textile discard* encompasses all types of textile waste, including bedding, carpets and mattresses. *Clothing discard* tends to refer to soft items of apparel. Statistical reports often separate footwear and accessories into their category but may be lumped together with textile discard.

Textile waste

Textile waste is anything that has not found a purpose in its intended supply chain and, therefore, does not hold value for the manufacturer, producer, or maker.

Textiles

Any filament, fibre, or yarn can be made into fabric or cloth and the resulting material itself.

U

Upcycling

Taking textile waste to add value to it is upcycling. It can be through creative streams, including reworking, adding components and embellishments, or breaking waste into more saleable items. It can also be through functional streams, including adjusting for size or wearability.

W

Woven, Weaving

Weaving is a construction method seen with hard and soft materials. In terms of textiles, it refers to the interlacing of yarns to create a fabric. Depending on the woven construction type, fibre type and yarn type, your fabric will have a diversity of appearances, hand feel and application. Yet, the essence of the interlacing remains the same. Weaving can be done via hand-weaving or machine-weaving.

Y

Yarn

Continuous strands of fibres are grouped or twisted together and used to construct textile fabrics.

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Subvention schemes

- PROGRAM FOR DEVELOPMENT OF ENTREPRENEURSHIP AND COMPETITIVENESS OF SMALL AND MEDIUM-SIZED ENTERPRISES FOR 2024 (MEASURE 6) <https://dejure.mk/zakon/programa-za-razvoj-na-pretpriemnishtvoto-i-konkurentnosta-na-malite-i-srednite-pretprijatija-za-2024-godina>
- PUBLIC CALL for organizing training for introducing the concept of green transformation, "greening of manufacturing industries," and introducing the concept of circular economy in the manufacturing industry <https://economy.gov.mk/mk-MK/news/javen-povik-za-organizirane-na-obuki-za-voveduvane-na-konceptot-na-zelena-transformacija-zazelenuvane-%E2%80%93-greening-of-manufacturing-industries-i-voveduvane-na-konceptot-na-cirkularna-ekonomija-vo-prerabotuvackata-industrija.nspk>
<https://fitr.mk/>

Supporting structures

- <https://tta.org.mk/en/>

Government initiatives

- WORK PROGRAM of the Government of the Republic of North Macedonia for the period 2022-2024 https://vlada.mk/sites/default/files/programa/2022-2024/programa_na_vladata_2022-2024.pdf

Awareness campaigns

- <https://teksomak.mk/>
- <https://matreso.mk/index.php/za-nas>
- https://ekoteks.mk/index_en.html



<https://kupireciklirano.mk/about-us/>

<https://recikliraj.mk/>

<https://www.yesforless.mk/zeleni-biznisi>

Educational programs

- Investigation of the situation with textile waste in the Municipality of Shtip
Истражување на состојбата со текстилниот отпад во Општина Штип – Фондација за развој на локалната заедница – Штип (frlz.org.mk)
[Microsoft Word - Educational materials on sustainability, circular economy and bioeconomy for schools, colleges and universities_MK.docx \(be-rural.eu\)](#)

Non-government organisations (NGO)s initiatives

- ECO DESIGN FOR CIRCULAR ECONOMY IN TEXTILE AND FASHION INDUSTRY – learning courses and a learning platform
Module 1: Introduction to Circular Economy (design4circle.eu)

Specific data

- A Roadmap Towards Circular Economy of North Macedonia
https://www.oecd.org/en/publications/a-roadmap-towards-circular-economy-of-north-macedonia_1973c88c-en.html

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Annex I

Table 31. Mapped actors within the business of sorting and recycling post-consumer textiles in Europe (alphabetical order)⁹³

Actor	Country	Business
3C Filati	Italy	Mechanical recycling
Altex Textil-Recycling	Germany	Mechanical recycling
Antex	Spain	Mechanical recycling & Thermal recycling
Aquafil (ECONYL)	Italy	Chemical recycling
Boer Group	The Netherlands, Germany, Belgium France	Manual sorting
Brightloops (Loop.a life)	The Netherlands	Mechanical recycling
Comistra	Italy	Mechanical recycling
CuRe Technology	The Netherlands	Chemical recycling
Filati Naturali	Italy	Mechanical recycling
Filati Omega	Italy	Mechanical recycling
Filatures du parc	France	Mechanical recycling
Frankenhuis	The Netherlands	Mechanical recycling
Green line	Italy	Automatic sorting

⁹³ A more detailed database of sorters and recyclers can be found here: [Airtables](#).



I:CO	Germany	Collection & Manual sorting
IN.TES.PRA. Industria Tessuti Pratesi S.p.A.	Italy	Mechanical recycling
Infinited fiber (Infinna)	Finland	Chemical recycling
Ioncell	Finland	Chemical recycling
Lanificio Paultex	Italy	Mechanical recycling
Lenzing (Tencel, EcoVero, Veocel)	Austria	Chemical recycling
LSJH	Finland	Collection & Manual sorting & Mechanical recycling
NewRetex	Denmark	Automatic sorting
Nylstar (MERYL RECYCLED)	Spain	Mechanical recycling
Procotex	Belgium	Mechanical recycling
PurFi	Austria	Mechanical recycling & Chemical recycling
RE.Verso (NFB Bonetti)	Italy	Mechanical recycling
Recover	Spain	Mechanical recycling
Renewcell (Circulose)	Sweden	Chemical recycling
RePlaza	Lithuania	Manual sorting
Rester	Finland	Mechanical recycling
Sinterama (Newlife)	Italy	Mechanical recycling
SOEX	Germany	Collection & Manual sorting & Automatic sorting



Spinnova	Finland	Mechanical recycling & Chemical recycling
Sysav (SIPTex)	Sweden	Automatic sorting
Södra (OnceMore)	Sweden	Chemical recycling
Tesma Cashmere	Italy	Mechanical recycling
TEXAID	Switzerland	Collection & Manual sorting
TEXCAR	Italy	Mechanical recycling
Textil Santanderina	Spain	Mechanical recycling
Textile change	Denmark	Mechanical recycling
Wieland	The Netherlands	Manual sorting & Automatic sorting
VIVE Textile recycling	Poland	Manual sorting
Wolkat	The Netherlands	Manual sorting & Mechanical recycling
Worn again	UK	Chemical recycling



PreVENTing and ReDucing the tEXtiles waste mountain in the MED area



Consortium

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2.970.502,00 €

Coordinator

Chrysovalantis Ketikidis,
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Project overview

The VERDEinMED project is an initiative funded by the Interreg Euro-MED programme to promote the circular economy in the textile sector. VERDEinMED is a thematic project that will provide a support service to boost circularity in the textile value chain for businesses, consumers, policy makers and academia.

The project is part of the Innovative Sustainable Economy mission of the Euro-MED programme, which seeks cooperation between Mediterranean countries to promote smarter and greener business models. VERDEinMED project brings together 10 partners and 15 associated entities from Greece, Spain, Portugal, Italy, Slovenia, North Macedonia, Bulgaria, Tunisia, Turkey, Belgium and Lebanon.