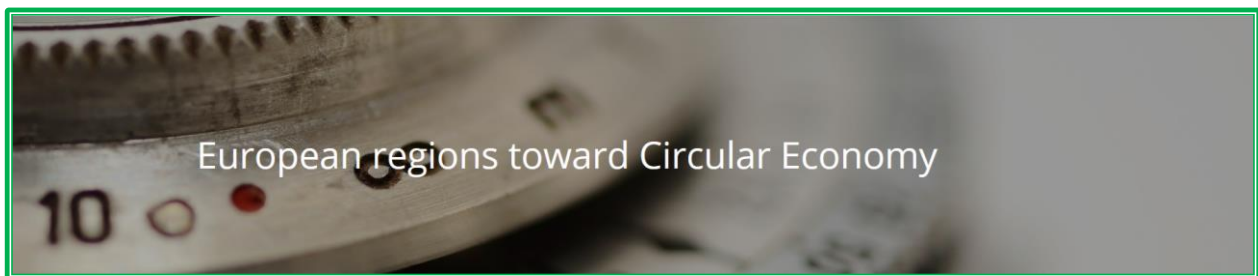


"CircE - European regions toward Circular Economy"

INTERREG Europe Project



Strategic Document for a More Circular Textile Sector

Policy change of the CircE 2021-2022 project
extension (5th call)

Lombardy Region

This document reflects the author's views. The program authorities are not suitable for any use that may be made of the information contained therein.

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1. Introduction

This text is a strategic document that transforms the results of the deepening and exchange of experience gained in the extension of the Circe project (5 ° call), into guidelines to support the implementation of the PRGR (PRGR- the Regional Programme for waste management) for the textile sector, and the 2021-2027 POR ERDF implementation with reference firstly to the specific objective b.vi) promote the transition to a resource-efficient and circular economy and, secondly, to the specific objectives: a.i) develop and strengthen research and innovation capacities and the introduction of advanced technologies, a.ii) Enabling citizens, businesses, research organizations and public authorities to reap the benefits of digitisation, a.iii) strengthening the sustainable growth and SMEs competitiveness and job creation in SMEs, including through productive investment and a.iv) Develop skills for smart specialization, industrial transition and entrepreneurship, for content that is most focused on the productive environment and on research and innovation.

The document first proposes a summary of the current scenario, as defined as a result of the pandemic and the most significant new regulations. The challenges generated by the pandemic are specified, as well as the main trends arising in the socio-economic context.

The strategic lines that can be supported by PR-FESR actions are therefore proposed, as well as a summary of the best practices considered to be of greater strategic relevance and which could be considered as conceptual examples, positioned at different points in the supply chain and on the basis of which to evaluate the content of proposed projects or to model-generalize the type of action to be supported.

2. Scenario

In order to identify trajectories to stimulate the development of the circular economy in the textile sector, it is essential to define the key characteristics of the sector's current situation, which stem from two main *drivers*: the pandemic and the new regulations and policies introduced by the European Union and by the local authorities.

2.1. The pandemic context

2.1.1. Problems created by the pandemic

The World Scale

The main impacts on the textile sector since the beginning of COVID-19 are listed below:

- Decrease in sales
- Change in consumer behaviour
- Supply chains disruptions (i.e., raw materials, transportation, labour, geopolitical risks, energy, etc.)

- Socio-economic and territorial inequalities and the interdependence of global value chains are evident.

The European Scale

The main impacts at continental level can be summarized as follows:

- Difficult to collect during confinement
- Closing or shortening of second-hand shops opening hours
- International re-use and recycling markets have been closed for months
- Large stockpiling in authorized waste managers
- Part of the clothes stored in poor condition
- In some cases, clothes sent directly to landfill or energy recovery.

In Italy

According to a study by Confartigianato (2021), the fashion industry is the manufacturing sector that has suffered the most from the pandemic.

Some data are presented:

- A 21.2% reduction in fashion revenues in 2020 with a loss of turnover from March 2020 to March 2021 of EUR 20.6 billion
- in 2020, household consumption of clothing and footwear fell by EUR 12.6 billion, a decrease in 19.7%
- fashion exports decreased by EUR 11.2 billion in 2020 (-19.5%)
- most critical situation for the luxury sector, which was expected to decline more in 2020 (35%), with an estimated time to return to pre-crisis levels of no less than 2/3 years.

The pandemic, on the one hand, penalised companies that are particularly connected to physical networks, but, on the other hand, strongly encouraged those who operate online, and on various marketplaces.

The pandemic has forced a rethink of retail logic, prompting companies to implement “omnichannel” strategies.

Overall, some of the major impacts generated by the pandemic have been:

- Problems related to the shortage of staff due to the infections.
- Problems related to logistics and therefore to raw materials procurement
- Overproduction of packaging waste from the e-commerce shipments.
- Costs related to the adoption of anti-covid measures and closure of production activities.

Sustainability and Circular Economy

The new consumer paradigms resulting from the Covid-19 crisis have accelerated the process of change in demand preferences. Even before the pandemic, consumers were more likely to buy eco-friendly products.

Overall, industry surveys suggest that companies focus on:

- Encourage a responsible use of products by promoting their reuse or recycling with circular economy business models aimed at reducing waste and reusing textiles to create new products
- Use environmentally friendly materials for which incentives for investment in research and development are necessary
- Develop flexible, demand-driven business models (from the push product-driven model to the pull demand market-driven model) for reducing the unsold merchandise
- Promoting slow fashion models that promote the dissemination of quality products, thereby enhancing local production and the Made in Italy
- Promote the use of a certification for Italian products that meet safety and sustainability criteria.

The above guidance already suggests some policy ideas.

The impact interpretation produced by *the Roadmap for Research and Innovation on circular Economy*

An analysis of the overall impacts of the pandemic has also been carried out in *the Lombardy Roadmap for Research and Innovation on circular Economy*, approved by Decree of the Regional Government no. XI/3098 of 05/05/2020, developed by the Directorate General Education, University, Research, Innovation and Simplification.

The Roadmap was set out as a reference document for 2021-2027 S3.

This document contains specific guidelines for the textile sector, but also reference guidelines on the main problems caused by the pandemic across all sectors of production.

See also table below.

Challenge and motivation	Requirements and needs	Innovative solution	Roadmap Circular Economy Priorities
During and after the pandemic, there will be shortage of key resources and primary materials supplied worldwide, or delivered locally, to feed production value-chains. It is of paramount importance to enhance the local eco-system to increase the local supply of secondary materials as well as to increase the flexibility of production systems in accepting both virgin and secondary materials.	Increasing the availability of secondary raw materials in the local eco-systems by dynamically setting up local circular value-chains on-demand. Increasing the robustness, adaptability and flexibility of production systems in order to accept both virgin and secondary raw materials.	Cloud based platform for value-chain integration and local dynamic circular value-chain building.	<ul style="list-style-type: none"> • A.2.2: Re-valorisation of secondary products and by-products through industrial symbiosis • A.3.2: Data storage and sharing • A.5: New Cross-Sectorial Business Models for Circular Economy.
		Cloud-based platform for dynamic cooperation and production capacity sharing.	<ul style="list-style-type: none"> • A.3.2: Data storage and sharing. • A.5: New Cross-Sectorial Business Models for Circular Economy. • B.3: Exploitation of Local Production-Distribution-Consumption Networks. • Ecosystem building
		Co-design of products containing considerable fractions of secondary raw materials whose formulation may be modified over time. Methodologies and processes for fast design and certification of new products.	<ul style="list-style-type: none"> • A.1.1: Product design criteria for Circular Economy. • A.1.2: Design targeted to increase the percentage of secondary raw materials in new products. • A.1.4: Consumer-driven co-design. • A.3.4: Certification of re-usable products, components and materials
		Adaptation and flexibility of production systems and value-chains for accepting both virgin primary materials and increased fraction of re-usable secondary materials.	<ul style="list-style-type: none"> • A.2.2: Enhanced process robustness and flexibility for reusing components and materials from post-use products as production inputs for new products. • A.5: Support to Circular Economy Oriented Production.
During the pandemic diffusion, people is requested to stay home and lockdown strategies are put in place. This poses challenges to distributed waste collection practices as well as opportunities for safe re-use of products.	Increasing the capacity of safely storing waste at collection sites. Improving the door-to-door waste collection capabilities. Improving traceability and safe re-use in local consumption areas.	Design and produce fully recyclable temporary waste storage capacity extension systems.	<ul style="list-style-type: none"> • D.1.2: Waste management protocols. • D.1.1: Proactive "take-back" protocols for re-use.
		Design and demonstrate low-cost, decentralized and small volume, sorting and separation urban plants to be installed in residential building to safely purify re-usable materials.	<ul style="list-style-type: none"> • D.1.2: Waste management protocols. • D.1.3: Safety in the transportation of hazardous products. • Awareness and culture
		Set-up new collection schema supporting re-use and safe resource and product sharing	<ul style="list-style-type: none"> • D.1.1: Proactive "take-back" protocols for re-use. • D.1.2: Waste management protocols. • D.1.3: Safety in the transportation of hazardous products. • Awareness and culture
During the pandemic diffusion, adopted lockdown measures also include the interruption of production activities. However, the municipal waste flows are massive as consumption continues. This would require solutions for a continuous operation of waste treatment facilities in safe environments.	Specific measures for ensuring health of recycling plant employees and automatize waste treatment operations are needed.	Sensor-Based Sorting Systems in waste Processing.	<ul style="list-style-type: none"> • F.1.1: Selective disassembly for high-quality recycling. • F.1.3: In-line material identification through optical systems.
		Robotics enabled collection, disassembly, sorting and processing of the waste.	<ul style="list-style-type: none"> • F.1.4: Robotics for sorting. • F.1.5: New recycling and recovery technologies. • E.1.4: Automation, flexibility, and efficiency in disassembly operation
		Remote control of recycling processes and systems for recycled material quality. Virtual technologies allowing remote operations of plants and minimizing the number of employees for plants operations.	<ul style="list-style-type: none"> • F.1.2: Design of flexible and reconfigurable recycling systems.
During the pandemic diffusion, there is lack of availability of protection equipment, such as masks and gloves. Moreover, all shops except food shops are closed and this causes the lack of specific small products, components and materials for normal life at home, such as glasses, bowls, jars, handles, glasses rods, etc.	Low cost technologies for urban or domestic production, starting from parametric downloadable files adaptable to the consumer needs. Such temporary products should be easy to recycle and re-use after the pandemic period. Solutions for locally producing protection equipment at reduced costs, potentially using secondary resources.	3D printing for urban or direct customer manufacturing of the protection equipment and other house components, with reduced material consumption and avoidance of waste.	<ul style="list-style-type: none"> • A.2.2: Enhanced process robustness and flexibility for reusing components and materials from post-use products as production inputs for new products. • E.1.5: Novel technologies and strategies for Remanufacturing / Repair / Reconditioning. • Education and skills • Awareness and culture
		Local production and distribution of easily recyclable masks and protection equipment made of recycled materials, certified and tested.	<ul style="list-style-type: none"> • B.3: Exploitation of Local Production-Distribution-Consumption Networks. • A.1.2: Design targeted to increase the percentage of secondary raw materials in new products. • A.1.4: Consumer-driven co-design. • A.3.4: Certification of re-usable products, components and materials.
During the pandemic diffusion, huge amount of post-use medical devices and support materials (masks, protective suits, gloves, etc.) made of multi-layer polymeric materials, textile and composites are disposed, which should be safely treated and recycled by specialized process-chains.	Development of safe high-capacity, temporary facilities for the treatment of medical waste, in view of a circular economy compliant material re-use.	Design, development and testing of controlled environment thermal recycling-based process-chains and plants for temporary high-capacity treatment of medical devices for the recovery and re-use of polymeric and fiber fractions.	<ul style="list-style-type: none"> • F.1.2: Design of flexible and reconfigurable recycling systems. • F.1.5: New recycling and recovery technologies.

<p>During the pandemic the road and rail transportation of goods in Europe is not interrupted. However, as many industrial facilities are closed, there is need of spare parts and components for vehicle maintenance.</p>	<p>A continuous supply of high-quality remanufactured components is needed for the aftermarket.</p>	<p>Develop innovative remanufacturing solutions for collecting and regenerating post-use components to match the constant demand for high-quality parts for the European aftermarket, in spite of the temporary lockdown of industrial value-chains.</p>	<ul style="list-style-type: none"> • E.1.1: Artificial Intelligence (AI) for the characterization of the product residual state • E.1.2: Digital technologies for the simulation of remanufacturing processes • E.1.3: Decision support systems for remanufacturing • E.1.4: Automation, flexibility, and efficiency in disassembly operation • E.1.5: Novel technologies and strategies for Remanufacturing / Repair / Reconditioning • E.2: Distributed and Flexible Remanufacturing Networks.
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Table 1

2.1.2. The New Scenario

This paragraph summarizes further aspects of the current scenario, focusing not only on novelty and problems, but also on certain peculiarities or evolutionary lines.

In particular, the current late pandemic scenario has acquired some peculiar features that we will summarize later on, which cannot be attributed to issues directly created by the pandemic, but that can be more generally considered as new variables that have been so configured in the face of the major drivers that are now acting on our socio-economic context.

The pandemic has led to a supply chain crisis.

The sector would have been more resistant and, at the same time, more resilient if it had more autonomy in the global market, both in relation to raw materials and in relation to certain production cycles.

Thus, some solutions that reduce dependence on raw materials and offshore production cycles are positive evolutionary lines and responses to challenges created or revealed by the pandemic.

The following are some thoughts and ideas relating to these aspects:

- *Reshoring* as an important opportunity
- The availability of end-of-waste (EoW) products increases the resilience of downstream sectors
- The use of EoW, or more generally the closure of production cycles and supply chains, ensures greater autonomy for companies, and increases the user undertaking's resilience, by reducing its dependence on virgin raw materials.
- The ability for the company to come full circle by restoring and recycling garments means less dependency on raw materials, increasing the company's resilience.
- The ability to implement technologies to recover and process fibres or other materials in a circular way, on the one hand, improves the resilience of businesses and, on the other hand, can lead to process certifications (e.g., safety and sustainability).
- "Reverse" industrial symbiosis, which allows the exchange of production inputs and outputs between companies operating in different production cycles and supply chains, can effectively resist "shortage" in both procurement and final supply markets.
- Using renewable materials as input to the production cycle from local or territorial availability of biomaterials, especially those derived from waste from agri-food processes, increases the resilience of the user undertakings by producing resources for more accessible production on a local basis and decreases the dependence on virgin raw materials (natural and synthetic), often linked to global supply channels.

- The strategy that prevents the risk of outages by increasing energy resilience is local energy production from renewable sources, as emerges specifically from a study on the relationship between the pandemic crisis and the circularity by W. Stahel, considered one of the fathers of the circular economy.
- In the pandemic crisis, there may be a shortage in terms of the availability of supplies in the markets. Using used and returning end-of-life products to be resold as used ones can prevent this effect and increase resilience. However, a possible problem in this case could be the consumers reluctance to "share" clothes or use second-hand clothes in a situation where there is a risk of infection.
- Extending products useful life is a strategy that positively impacts resilience by improving the durability of products and postponing the time when replacement with new products will be needed, which are in crisis due to a pandemic.

2.2. Regulations and Policies

References to some of the most significant regulatory and policy (strategy) guidelines that also affect the textile sector are set out below.

2.2.1. Introduction

In its COM (2020) 98 final, the European Commission drew up *A new Circular Economy Action Plan For a cleaner and more competitive Europe*, defining a strategic framework for sustainable products, including the implementation of a legislative initiative on sustainable products (based on eco-friendly design).

As part of this legislative initiative, the Commission will examine the possibility of establishing sustainability principles and other appropriate ways of regulating a number of aspects, including the introduction of a ban on the destruction of unsold durable goods.

The complexity of the textile value chain has been highlighted within the plan and, as a result, the Commission has decided to define a comprehensive EU strategy for textiles (see the following paragraphs).

DIRECTIVE (EU) 2018/851 provided for amendments to the waste legislation already contained in Directive 2008/98/EC, providing that by 31 December 2024 the European Commission will carry-out an assessment about the introduction of targets for the reusability of a number of waste categories, including textile waste, and for separate collection to be introduced by the same date.

In Italy Legislative Decree no. 116/2020 amending the Consolidated Environmental Text (*Testo Unico Ambientale* Legislative Decree no 152/2006), and it introduced new provisions on waste management. In particular, the requirement for textiles separate collection has been introduced since 1 January 2022.

The unsold goods management-related issue has been addressed in Italy, by Law no 166/2016, also known as Gadda Law, laying down specific provisions on the donation and distribution of food and pharmaceutical products for the purposes of social solidarity and the reduction of waste.

Initially created to limit waste and initially related only to food and pharmaceutical products, this piece of legislation was subsequently amended to provide that the rules contained therein may also apply to different

products (if they are no longer marketed or unfit for sale due to imperfections, alterations, damage or defects that do not alter their fitness for use or for other similar reasons); these also include textiles and clothing.

2.2.2. EU Strategy for Sustainable and Circular Textiles

On 30 March 2022, the European Commission adopted a strategy for sustainable and circular textile products, of which some of the key steps are provided hereinafter.

This strategy focuses on the production and consumption of textile products, and it acknowledges the importance of the sector and in the implementation of the commitments of *the European Green Deal*, the new action plan for the circular economy, and the industrial strategy.

The strategy starts with an awareness that textiles have an increasing impact on the environment. The textile products European consumption accounts, on average, for the fourth highest negative impact on the environment and climate changes, after food, housing, and mobility. It also accounts for the third highest for water and soil use and the fifth for the use of primary raw materials and greenhouse gas emissions.

This strategy presents a new approach to dealing with these issues in a harmonized way, looking at the whole life cycle of textile products and proposing actions to change the way we produce and consume them.

Objectives

The strategy aims to create a greener, more competitive sector that is better able to withstand global crises. The Commission's 2030 vision for textile products provides that:

- All textile products placed on the EU market are long-lived, repairable and recyclable, to a great extent made of recycled fibres, free of hazardous substances and produced in respect of social rights and the environment
- fast fashion is out of fashion, and consumers benefit from longer, high quality and affordable textile products
- economically profitable re-use and repair services are widely available
- In a competitive, resilient, and innovative textiles sector, producers take responsibility for their products along the value chain, driven by sufficient capacity for recycling and by reducing to the minimum incineration and landfilling of textiles.

Actions

The strategy includes a series of actions aimed at the future. The Commission intends to:

- establishing design requirements for textile products that make them more durable and easier to repair and recycle
- introducing clearer information on textile products and a digital product passport
- giving a voice to consumers and to combat so-called '*greenwashing*', that is to say, paying lip service to environmentalism, by ensuring the accuracy of the environmental statements made by companies
- stopping overproduction and overconsumption as well as the destruction of returned or unsold products
- harmonising EU rules on extended producer responsibility for textiles and economic incentives to make products more sustainable

- counteracting the accidental release of microplastics from textile products
- addressing the challenges posed by the export of textile waste and adopting, by 2023, a package of EU instruments to combat counterfeiting
- publishing a transition path by the end of 2022, an action plan to help textile ecosystem actors successfully complete the green and digital transition and increase its resilience.

2.2.3. Pact for Skills

On 16 December 2021, 118 organizations signed [the Pact for skills](#), an initiative promoted by the European Commission and coordinated by EURATEX.

The signatories recognize skills as a central challenge for the textile ecosystem and commit to investing in enhancing and retraining workers' skills, integrating green and digital skills, and improving the sector attractiveness.

The Pact will benefit from the networking, guidance and resources offered by the EC to implement the objectives proposed in the Pact.

The most significant skills needs identified are:

- Design
- Product development
- Production of technical fabrics
- Digitisation
- Sustainability and Circular Economy.

2.2.4. Bat on Textiles

The BAT Conclusions for the textile industry (BATCs TXT) are being approved. The final draft of the BATCs TXT was made available on the website of the European Commission's European IPPC Bureau in March 2022 (<http://eippcb.jrc.ec.europa.eu>).

The text of the new BAT will propose indications consistent with the new European strategy. At the same time, we salute the fact that the text can become an opportunity for textile companies at regional level to be encouraged to pursue sustainability objectives that are peculiar and more challenging for the Lombard context. Therefore, in implementation of the waste plan and in line with this research findings, definition of possible priorities to be achieved in the medium to long term could be proposed, including the contribution of assessments to be carried out in the technical roundtables for the coordinated implementation of the BATCs TXT in Lombardy Region during the Integrated Environmental Authorisation (IEA) review. Examples of this could be sustainability priorities, which increase the circularity of a textile company (technologies for reducing production waste; production lines that can also handle recycled raw material; production of more easily recyclable waste; microplastics reduction; fewer polluting substances).

2.2.5. Regional Policies

An important reference to be considered when working on the textile supply chain and its circularity is its relationship between the most traditionally waste management policies and the policies of economic development and innovation and research.

In this paragraph, we propose an in-depth examination on the Lombardy Regional Strategy for Sustainable Development and the Regional Waste Management Plan. In order to complete the regional policy framework, account must also be taken of what is proposed in the next paragraph 3.1.1, which we do not want to present here to synthesise.

Lombardy Regional Sustainable Development Strategy

The Sustainable Development Strategy identifies fashion and design as drivers of recognised attractiveness within the framework of the sustainable promotion policies of the Lombard territory. The fashion sector is an important attractive factor and enhancing it by making it sustainable is part of the policy of developing measures to support the business system in order to ensure sustainable production and consumption models (to which the strategy devotes a specific section).

The strategy also specifies that individuals and communities play a key role in the transition to sustainability, through their own actions and consumer choices. The strategic objective is to foster effective and lasting changes in behaviour toward lifestyles and consumption with a lower carbon, environmental, but also social and ethical footprint, which in turn can guide the market.

This can be declined in a variety of areas, including “purchasing” (in every commodity sector): citizens need to be aware of the effects of their choices on the local economic fabric, traffic, local and global pollution, and waste generation, depending on whether they shop in neighbourhood shops, commercial centres or online, and the means of transportation which they choose to go the point of sale.

The strategy will therefore support information, formal and informal education and public awareness initiatives for citizens to become more aware and accountable, including, where possible, also about impacts from outside the Lombard regional territory and the whole life cycle of products/services. To support the concrete translation of this awareness, the strategy will support citizens who self-organize to promote and implement critical, aware, and sustainable consumer styles, for example through Ethical Purchasing Groups.

The Regional Waste Management Program (PRGR)

The Regional waste Management Program (approved by Regional Executive Resolution No 6408 of 23/05/2022) not only proposes an in-depth analysis of textile sectors in terms of waste generated, but it also identifies proposals for implementing measures (Chapter 10.5.5.).

Among the measures identified the most significant in relation to the project activities are:

- encourage industrial symbiosis
- communication

- activate a convention between Lombardy Region and the National Italian Consortium of Used Clothing and Accessories (CONAU)
- promotion of eco-design
- promoting the development of innovative recycling technologies
- development of the use of EoWs produced by textile waste recycling operations
- the networking of re-use centres
- the establishment of a good practice portal.

This chapter identifies the results of the Circe project as a source of information for the definition of a more up-to-date scenario with respect to the textile sector and the support of the actions identified.

3. Policy Solutions

Thanks to the chances to discuss with partners and stakeholders and the analysis of good practice, some key issues/conditions in the current sector context, a number of strategic lines to be strengthened to act in tune with this context and a number of more direct and concrete actions were identified which can be taken as steps to pursue and concretise the identified strategic directions.

Hereinafter follows a guideline, which shows for each step the good inspiring practices and the specific context condition that make the suggested solution consistent and correct.

3.1. Strategic Themes

Below are some strategic themes, on which it is essential to work to support circularity in the textile sector.

3.1.1. Dialogue and Alignment with Existing Actions and Initiatives

The good practices gathered in relation to the Italian territory and the discussions with other partners, particularly the Catalan one, have demonstrated on the one hand the importance of involving multiple actors operating on the territory, and on the other hand the importance of stimulating integrated and networking actions

The territory of Lombardy is already a rich context of organizations operating in the sector, such as *Clusters* and research centres, with a wealth of experience.

A fundamental strategic need therefore appeared to be to know and intercept the existing entities, and then to open a dialogue for circularity solutions to be identified and supported.

Existing organizations include:

- the Regional Textile Supply Chain Committee (DG Economic Development)
- Cluster AFIL and ongoing textile initiatives
- Unioncamere and the initiatives carried out and ongoing in this area
- Sistema Moda Italia
- Consozio Retex-Green

- [Textile and Health Association](#);
- The organizations which have subscribed [the Regional Protocol on Sustainable Development](#) and which have taken part in the Forum for Sustainable Development
- [The circular Economy Observatory](#)
- projects in progress.

Dialogue with these realities is essential for defining and implementing circular textile policies.

One of the possible actions to be taken could be to facilitate and develop the dialogue in a way to be defined, for example by formalising a place of exchange with these actors or by holding discussions within the Regional Textile Chain Committee.

In this chapter on dialogue, alignment, and integration with existing initiatives, we provide in particular details of ongoing initiatives in Lombardy Region.

Research and Innovation

The Directorate-General for Education, University, Research, Innovation and Simplification is responsible for developing R&I programming. There are two reference texts for the regional context of research and innovation:

- The Lombardy' Smart Specialisation Strategy, the latest version of which was approved by Decree of the Regional Government no XI/5688 of 15/12/2021.
- The Lombardy Roadmap for Research and Innovation on circular Economy, approved by Decree of the Regional Government no XI/3098 of 05/05/2020.

These documents contain some interesting ideas specific to the textile sector, but also some guidance on the main problems generated by the pandemic across all sectors of production (see paragraph 2.1.1).

Ideas from S3

In the Lombardy Region S3, we believe that there are 3 ecosystems that affect the textile sector and offer useful reference content:

- Culture and knowledge's ecosystem
- Sustainability's ecosystem
- Advanced manufacturing ecosystem.

In the section dedicated to the "Culture and knowledge's ecosystem", Lombard S3 first analysed participation in regional, national and European financing measures, in the current programming period (2014-2020), focusing mainly on the following areas:

- Competitive and sustainable textile industry, advanced materials, micro-production technologies and equipment, rapidly configurable production machines and systems, automation and adaptive technologies, methodology and tools for eco-design, innovative technologies for the sustainable use of natural resources and for the recovery of raw materials from textile waste and waste, etc.

- New business models, customer-oriented supply chain management for fully customized products and services in the fashion industry.

Much importance is to be given to development issues that contribute to increasing the competitiveness and environmental sustainability of the textile industry, by intervening in production processes (energy efficiency of machinery and production lines, promotion of circular economic models in the textile sector, etc.), and the organizational and management structure of enterprises.

A number of priorities for the ecosystem are then listed. These are listed below, highlighting in bold the most important ones for the textile sector.

- Developing innovative and sustainable products, processes and services and promoting innovative skills to enhance the Made in Italy with particular regard to fashion and creative design
- Promoting human capital by, for example, encouraging industrial doctorates, high-education apprenticeships and also encouraging *re/up-skilling* to develop strategic technological skills (e.g., digital, green, medical, 4.0 technologies) that will be required in the future for higher and more qualified employment
- Enhancing and promoting industrial culture as a value of Lombard territory and society, promoting the image of the manufacturing sector among young people to train new talents for the industry
- Promotion and development of open innovation models for know-how transfer and exchange between large enterprises, SMEs and start-ups aimed at the growth of the innovation culture, the creation of new professional development paths and the emergence of new business opportunities.

The “Sustainability’s ecosystem” also points to priorities for Lombardy’s transition to a sustainable economy, including:

- Development of industrial, cross-chain and cross-sector symbiosis initiatives that promote interaction between different industrial assets with the objective of maximising resource reuse and CO₂ reduction to facilitate the achievement of carbon neutrality
- Development of mitigation technologies (production processes, transport, agriculture, energy production) in an integrated approach to air quality management and planning and the reduction of GHG and noise emissions with a view to sustainability and the protection of nature and biodiversity
- New technologies for products, by-products, and waste recovery to produce second raw materials and to facilitate the use of recycled and recovered materials in industrial supply chains
- Development of biomaterials, environmentally compatible/biodegradable materials, resulting from circular and bioeconomy economic processes, promoting synergies between different production sectors and sectors
- Development of manufacturing systems methodologies for decision-making support and sustainability and circularity assessment of based on the use of technical-economic, social corporate sustainability, and life cycle assessment analysis of industrial goods and assets.

The “Advanced manufacturing ecosystem” also points out priorities, including:

- Developing innovative technologies, materials and methods for the dynamic products, processes, and systems management, from the design stage, through production to the end of life to increase environmental sustainability and the circular production processes, particularly in heavy industry (steel, cement, chemicals, etc.)

- The adoption of digital technologies and innovative methods for the flexible, proactive, resilient and robust management of supply chains, production systems and industrial supply chains and services, including the tourism and health sectors
- New methods, tools and technologies for industrial design, co-design and end-customer interaction
- Development of industrial systems and solutions for the circular economy from design to end-of-life product (e.g., eco-design, recycling, remanufacturing, sorting, disassembly testing, logistics, exploitation of industrial waste with a view to industrial symbiosis).

In addition, the Research and Innovation work Programs, version 2022-23, Management, and Implementation Tool of the Lombard S3, identify macro-themes, which represent cross-cutting themes and aim to increase the well-being, safety and fair treatment of citizens and the environments in which they live and work.

These include:

- MT11 Climate-neutral, circular, and digitised production. The projects expected in this macro-theme will cover innovative manufacturing processes and their digitisation, new business models, advanced sustainable materials from the design stage and technologies enabling the shift to decarbonization in all major industrial sectors, including green digital technologies. The goal is to compete at national and European level with clean, climate-neutral industrial value chains, a circular applied economy, and climate-neutral digital systems and infrastructure (networks, data centres, etc.).
- MT24 circular economy and sectors of bioeconomy. Since the Macro-thematic and its priorities, it concerns climate-neutral circular and bio-economic transitions in search of integrated territorial and sector-wide circular solutions for product value chains; they cover key sectors of the bioeconomy such as bio-sustainability systems, sustainable forestry, small-scale rural biological solutions, and aquatic value chains. The focus on circularity aims to prolong the life and preserve the value of products and materials, supports an economy of material sharing, reuse, and efficiency, and minimises the unsustainable use of natural resources.

The research and innovation work programs contain a more detailed description of each of the two macro-themes.

In summary

The above are therefore the priority lines on which R&D&I interventions on the circular economy in textiles, probably on the low TRL, can be placed.

Those priorities may suggest ideas for circular economy actions even in specific objectives less related to the R&I context.

They also draw attention to the need to align and act in a way that complements the actions that will be taken here. They therefore stress the dialogue's central role, during the programming period, with the R&I sector, to intercept, exploit and align possible initiatives useful for the circular economy programming activity.

Economic Development

The Lombardy Region Directorate General for Economic Development is implementing a series of initiatives involving the textile supply chain.

Textile Supply Chain Committee

The Directorate General for Economic Development of Lombardy Region has opened a dialogue with the Lombard textile industry, aimed at deepening its characteristics and needs in view of the severe structural and economic crisis under way, mainly due to the pandemic effects, more recently, however, due to the critical moments in the energy market, in order to support the overcoming of the crisis and the sector relaunch of from a sector-specific point of view, given that this sector in Lombardy is a system complete in all its parts.

This Committee was also set up also because to relaunch the sector it is essential for the components of the textile ecosystem to connect and collaborate, at different levels of scale represented in the supply chain, from micro-enterprise to large enterprise.

The Committee also aims to be an opportunity to focus on the most strategic actions that can be supported by regions, in other words to define a strategy for the sector, a vision for development.

Some of the issues addressed are more prominent: Innovation, sustainability, human capital, professions, employment.

The Committee has also focused on certain peculiarities of the textile supply chain:

- it is the second largest industrial sector in Italy
- Lombardy is the European region with the high turnover and exports and the second in terms of employment
- it crosses several sectors (chemical, furniture, automotive, clothing, etc.)
- the size of the European and non-European export market
- the Lombard textile industry triggers activity in other production sectors
- textile industry is as Made in Italy ambassador in the world
- a focus on the circular economy, also to address the shortage of raw materials
- reshoring
- focus on digitisation, traceability
- importance of training with the introduction of new qualifications and professions
- the importance of industrial investment, new incentives, new processes, and services
- increasing importance of sustainability
- energy
- need for certifications
- collaboration with research centres and universities

The experience of the Committee has also shown that SMEs show: attention on sustainability and materials circularity; the need to be accompanied in a certified supply chain; the difficulty of finding qualified labour; the importance of training; the need to invest in renewable energy sources to solve the problem of energy costs.

Expression of Interest in the Development of Industrial Production Chains and Ecosystems.

The Lombardy Region Directorate General Economic Development has also opened an expression of interest also aimed at the textile supply chain, to support projects for the supply chains development and strengthening

In particular, in line with the European Union's industrial strategy, Lombardy Region intends to support the strengthening, resilience and competitiveness of its production and service sectors and industrial ecosystems by developing interconnections between enterprises, including in collaboration with research and training institutes, financial intermediaries, foundations and other strategic actors in economic and territorial development. All this with the idea of supporting:

- innovation and production autonomy
- green and digital transition
- upgrading and retraining of the workforce
- internationalisation and attractiveness, including through the exploitation of the peculiarities of each territory and each sector
- reshoring
- the strengthening of assets.

The thematic areas of the Lombard supply chain and/or ecosystem projects on which the Lombard supply chain projects p and ecosystem should focus are:

- sustainability and circularity
- innovation and technology transfer, digitisation, research, and intellectual property
- training, human capital, employment, and safety at work
- internationalisation
- credit and capitalisation.

Tourism, Territorial Marketing and Fashion

The Directorate for Tourism, Territorial Marketing and Fashion is developing activities aimed at applying the concept of sustainability to the textile supply chain and in particular to the fashion supply chain.

Since 2019, the Directorate has developed and managed the "Fashiontech - Research and Development Projects for Sustainable Fashion" call.

The aim of this measure is to support research and development projects aimed at innovation in the "Textile, Fashion and Accessories sector", in accordance with the principle of sustainability, from an environmental, economic, and social point of view.

The call was approved by decree no. 5044 of 10 April 2019, by the Lombardy Region's Directorate-General for Tourism, Territorial Marketing and Fashion in implementation of Decision No. XI/1217 of 04/02/2019.

The call preliminary development resulted in grants totalling €9.4 million. The beneficiaries were No. 57, grouped under no. 16 Partnerships, each consisting of at least three enterprises, of which at least two SMEs (up to a maximum of 6 entities). In addition to SMEs, large companies, public and private research bodies/universities were also able to join the partnerships.

The facility consists of a non-returnable grant equal to 40% of the expenditure incurred both for investment in industrial Research and for investment in Experimental Development, with a minimum project investment of €1,000,000. The maximum contribution to be paid per project (and therefore per partnership) is €1,600,000.

The funded projects are still being finalized and/or reported.

During the project development, a direct approach was chosen with the beneficiaries to pursue forms of active cooperation through the exchange and sharing of information, including through the administration of a questionnaire addressed to the beneficiary companies, to outline their overall propensity for sustainability.

Given that all companies confirm their attention to the subject, the perception is that for now, the surveyed businesses do not have the immediate possibility / intention to invest further and that what could be done to reduce the consumption of materials, the reuse of secondary raw materials, the reduction in waste and water and energy consumption has already been done with the means available, and the conditions of market prices.

There is a fundamental focus and consideration on environmental aspects, and it is no coincidence that more than 30% of companies say that they are already committed to the optimization of their internal environmental management systems, that they are interested in sustainability-oriented co-design projects, in synergy with suppliers or to develop awareness-raising actions on sustainability issues.

It is significant, however, that 45% of companies would never have developed the project without public participation in project costs, confirming the regional role of stimulating innovation and business collaboration. Employment and awareness-raising impacts are also positive: 62% of companies indicate that they have engaged/collaborated with new people and/or job profiles for the development of the project, of which 55% will become stable/continuous even after its conclusion, and 79% of companies say they have trained staff already employed.

Some of the experiences supported through the call may become reference examples, pilot activities, replicable and indicative of sustainability pathways for the sector; four projects were presented at the 2th Regional Forum for Sustainable Development, which represents a significant opportunity for discussion on the implementation of the strategy for sustainable development undertaken by the Lombardy Region.

Cluster AFIL and ongoing textile initiatives

AFIL, *Associazione Fabbrica Intelligente Lombardia*, is the Lombard Technology Cluster on Smart Factory and represents the area of specialization of advanced manufacturing in Lombardy. The Cluster has more than 140 members among companies - large and small -, universities, research centres and associations to define, the priorities of the Lombard manufacturing sector according to a regional chain approach and to work together to implement the necessary strategic projects and initiatives with the support of the Regional Government.

In line with one of its objectives, namely, to increase the competitiveness of Lombard manufacturing companies with a view to regional innovation, AFIL promotes networking, the development of collaboration and the identification of priorities for advanced manufacturing through Strategic Communities, which are thematic working groups focusing on the main Lombard interests and specializations. Among these within

the Community dedicated to the circular Economy, textile industry has taken on significant importance and has given rise to many related initiatives. In order to promote awareness and inclusion, to share regional know-how and best practices and to support R&I by seizing the many opportunities, several events have been organised that have enabled mapping trends, complementary and innovative experiences, and skills in the region. The comparison between the actors in the territory thus made it possible to define the supply chain priorities, with a view to integrating large, medium-sized, and small enterprises not only materials/components/products producers for the textile industry but also suppliers of machinery and digital technologies. The identified priorities are:

- recycling technologies, mainly dedicated to sorting and chemical processing of textile waste
- sustainable products and processes
- digitisation
- eco-design, that is, intelligent and modular design for the circular economy enabling the useful life of the product to be increased
- new business models
- regulations and certifications
- training.

The input gathered within the Strategic Community enabled AFIL to engage in dialog with regional institutions, acting as Lombardy Region's reference entity for the Advanced Manufacturing sector within the framework of the previously mentioned Sustainable Development Strategy. The needs, challenges and barriers identified, indeed, supported the definition of regional programs and were incorporated into strategic documents, such as the Roadmap Research and Innovation on circular Economy, adopted by the Regional Government in 2020, and the Roadmap Artificial Intelligence, which is currently being worked on. In both documents the textile sector has been specifically involved and reported as a regional specialisation with potential in terms of sustainability and digitalisation. AFIL has also signed the *Regional Protocol on Sustainable Development* and actively participates in the *Textile Supply Chain Committee* promoted by the Directorate for Economic Development. Since AFIL is a multidisciplinary technological cluster of the Advanced Manufacturing industry, it also allows the promotion of contamination and cross-sectoriality of the textile supply chain, allowing for an opening to new business models and opportunities for the entire territory of Lombardy.

Finally, AFIL supports the positioning of Lombard Manufacturing sector in Italy, Europe, and the world. At the national level, AFIL is designated by Lombardy Region to represent the themes of the Smart Factory within the technological National Cluster *Fabbrica Intelligente* (CFI) and collaborates assiduously with Sistema Moda Italia. In Europe, AFIL is co-coordinator of the *Vanguard initiative's* Pilot "Efficient and Sustainable Manufacturing" and the *S3 Partnerships* promoted by the European Commission. In particular, in the demo-case "De- and Remanufacturing for circular Economy" there is a specific use-case on the circular economy in textiles, coordinated by Slovenia. In this regard, AFIL promoted a matchmaking with Slovenia and co-organized an event dedicated to mapping European textile expertise in which the Lombard team shared its activities and priorities with the regions of Catalonia, Friuli Venezia Giulia, Norte, Wallonia, and Lower Austria. Several projects (H2020, HE, I3, etc.) were born from these international networks. They enhance inter-regional partnerships and enable Lombard actors to invest in R&D&I. activities Among these, *the H2020 DigiPrime project* <https://www.digiprime.eu/project/>, coordinated by the Politecnico di Milano, has a pilot dedicated to textiles aimed at facilitating a circular approach by adopting a digital platform for the circular economy that develops and makes vertical and horizontal services available for the consolidation of the

supply chain. Globally, AFIL coordinates the Lombardy *Advanced Manufacturing HUBS* within the *World Economic Forum*. This activity makes it possible to give visibility at national and international level, connecting to the most important innovation chains. In addition, AFIL participates in *THE COSME ADMANTEX2i* project <https://admantex2i.eu/> with the aim of promoting non-European cooperation between clusters and their members, in particular SMEs, in the manufacturing and advanced textiles sectors for circular, cross-sector and industry 4.0 applications. The project is based on cooperation and synergy between partners through sharing existing networks, supporting SMEs on the internationalisation path, and organizing business missions in three target States, i.e., the USA (California), Japan (Tokyo) and Canada (Quebec).

Currently, in collaboration with Sistema Moda Italia, AFIL is supporting the participation of regional actors in the textile chain *in the Expression of interest for the development of productive industrial sectors and ecosystems* promoted by the Directorate for Economic Development.

Consorzio RETEX-GREEN

The newly formed Consorzio RETEX.GREEN, made up exclusively by Italian producers, was set up to stimulate recycling in the fashion sector, with the aim of developing a collective extended producer responsibility (EPR) system for the management of textile, clothing, footwear, and leather goods waste.

This Consortium is a non-profit organization, of Italian producers in the fashion supply chain, sponsored by SMI – Sistema Moda Italia and the *Fondazione del Tessile Italiano*.

The Consortium main mission is the optimised management of waste from the fashion world, anticipating regulatory decisions on the recycling of fashion products and providing a concrete tool for implementing industrial activity in all segments of the entire supply chain with a view to active environmental sustainability.

The CIRCULAR TEXTILES Project

Amongst the projects under way, it is important to keep under way what is being developed in the project *CIRCULAR TEXTILES - C-Tex- Filiera tessile per il riciclo di rifiuti industriali e tessili usati*, financed by the 2014-2020 POR-ERDF, which covers the entire textile supply chain, by proactively involving partners to help create a system of industrial symbiosis between districts.

C-TEX is promoted by 5 businesses, some of whom *are stakeholders* of the Circe project. They are making major investments in R&D in the territory with the aim of serving as a demonstration case in the field of the circular economy by studying an overall approach to textile materials recycling through representative pilot cases - for the Textile -Fashion sector.

The project covers the textile supply chain by proactively involving partners in the various aspects of industrial symbiosis and in the various forms of social and environmental sustainability.

Project objectives:

- analysing the quantities and types of textile materials
- studying a sampling and test methodology that can sufficiently characterize materials and assess the risk related to material variability and the degree of uncertainty corresponding to the test results
- assessing the selection technologies currently available

- studying and define a process for the selection of collected material, including on the basis of the planned characterization tests and selection technologies currently available
- developing material batches to be recycled and appropriately selected with a view to obtaining new textile material (fibres, yarns, fabrics) suitable for the production of new products for both clothing and other sectors/applications
- assessing the environmental, social, and economic impacts of the redesign, collection and recycling of the textile materials studied
- producing guidelines, as a result of design experience, on opportunities, technical aspects, and methods for recycling textile materials, providing considerations and possible suggestions to public decision-makers for future policy choices.

Sistema Moda Italia's Experience ¹

Sistema Moda Italia (SMI), a member of *Confindustria* and founding partner of *Confindustria Moda*, is the Category Association representing approximately 45 thousand enterprises and 400 thousand employees in the Italian textile and clothing sector, whose aggregate pre-Covid-19 turnover was 56 billion, of which 32.8 billion was exported.

Second in terms of the number of employees employed only to mechanics, the sector is historically a key and very representative sector of Italy, not only for its tangible contribution to GDP and exports, for its ability to become 'ambassador' of the "Made in Italy", but also because of its pivotal role in activating several other parts of our production system, as well as providing advanced technology solutions in many other sectors through technical textiles (protective clothing, medical, transportation...) and smart textiles (composites and new materials).

Covid-19 crisis scale and complexity poses a real threat to the businesses wealth and skills in the textile industry. In fact, the econometric analysis carried out by LIUC - Università Cattaneo on the development of the sector foreshadows, in the next 3 years, in the absence of intervention, a loss of turnover compared to the 2019 figures of some EUR 9 billion, the closure of some 6,500 companies (15%) and the loss of around 70 thousand jobs (17.8%) - a true economic and social tsunami.

In the light of this evidence, SMI developed a comprehensive strategy for relaunching the sector in March 2021, based on three operational levels and with total investment of around €8 billion:

- emergency actions, to be implemented immediately, aimed at safeguarding professions and facilitating restructuring processes, enabling both the sensitive social theme of exits from work and the intake of new professionals to be addressed

¹ The first part of the contribution is taken up and partially adapted from the document "Percorso per il Rilancio della filiera italiana del tessile & abbigliamento"'s executive summary, published in March 2021 by Sistema Moda Italia.

- strategic interventions effects, with a “real” and macroeconomic focus, are tested over a three-year time, covering the key areas of circularity, creative innovation, digitalisation, and the recovery of sectorial competitiveness
- strategic measures with a longer scope, strengthening and supplementing the measures provided for in the previous intervention level, which are mainly structural, in the areas of the promotion, training and retraining of human resources.

Simulations carried out using the SMI-LIUC macro-econometric model confirm the strategy effectiveness, which at the end of 2023 is estimated to generate an additional annual turnover of more than EUR 11 billion, a similar impact on exports and almost 70,000 more employees.

Sistema Moda Italia takes part from the Lombardy Region DG Economic Development Textile Supply Chain Committee and in this context stressed the importance of the circular economy within the macro-area of sustainability, which, for SMI, is as follows:

- a conversion of the production fabric
- the creation of new professions
- the use of new materials and business models.

3.1.2. Agreements and Infrastructure to Support the Textile Sector

The Catalan Textile Pact, which is laying the foundations for a more resilient, circular and reshored system in Catalonia, the experience of GIST in the province of Gelderland, design hub in *the Dutch circular Textile Valley*, and other Italian examples developed to stimulate networking, including on-site, necessary for the circular economy, and define two possible important strategic elements:

- The importance of defining a textile agreement (which in the Lombard case could be defined from or by reference to the Convention with CONAU);
- The usefulness and importance of identifying a regional textile HUB or several hubs, in order to facilitate the symbiosis of the sector and the incubation of start-ups, by stimulating the development of a circular chain.

We would like to go into more detail on one of the mentioned case studies , that of Italy's Tuscany Region, referring for details on the Catalan case to the good practice presented, to the documents of the Circe project and available in [the Internet database](#) of good practice INTERREG Europe.

In the Textiles Pact of the Tuscany region, the division between municipal waste and special waste was overcome, as it represented a limit on investment.

The pact, which is a memorandum of understanding, contains some concrete proposals put forward by the Region, including the provision for textile waste in the Prato district, a platform to deal (once the complex authorization phase has been completed) with collection from businesses, the characterization and first processing with a view to subsequent dispatch to recovery or disposal facilities.

In the Italian context an important issue to support and make this type of initiative effective is the need to demonstrate that the conditions laid down by law for the use of by-products are fulfilled through contractual documentation (with appropriate content) between the by-product manufacturer and the user.

Among the concrete actions put in place, which are given here as a basis for implementing *the policy*, are:

- The establishment of guidelines on by-products
- a first study on the characterization of textile waste, which showed that where there is a strong presence of polyester fibres, there are problems with compliance with antimony limits in transfer tests and, consequently, with the access of such waste to landfills, thus the need for other solutions
- updating the list of bulk goods listed by the Chamber of Commerce's Wholesale Products Commission, which now includes all by-products identified in the guidelines.

The Tuscan ecosystem is actively working with the Ministry to “reformulate” legislation on by-products and textile waste.

This type of initiative could be replicated at different scales in different parts of the Lombard territory, by providing for and stimulating specific actions of different types to enhance by-products.

In the above-mentioned experience, for example, there was a regional leadership role in supporting the territory to identify and set up dedicated areas to facilitate the circular transformation of the district.

The policy maker may support the establishment and strengthening of partnerships between enterprises (in unrelated sectors) linked to the belonging of the same territorial area, aimed at supporting strategic projects and/or the transfer of raw materials.

In addition to these types of initiatives, it is necessary to develop a training package for enterprises, as is clear from the contribution made by the project stakeholders and by specific research carried out by *IUSS Pavia*.

Initiatives and projects to stimulate the emergence and development of start-ups can also be promoted.

3.1.3. Eco-design

It is clear from the analyses carried out in the project and from the dialogue with the participating stakeholders that the textile product is very often designed and produced in a non-circular manner. The first step in recycling certain products is to rethink them from the design.

First of all, we must encourage the development of eco-design measures to ensure that textiles are fit for circularity, by ensuring the use of secondary raw materials and by limiting the presence of hazardous chemicals.

The best practices identified have identified design examples to promote both repairability and recovery and recycling. These examples can be used as a reference to define support actions or to understand how to structure and evaluate design proposals which go in this direction.

In order to support eco-design, it is essential to foster the strengthening of links between business, universities, and research to promote horizontal, supply chain and territorial technology transfer.

In addition, public procurement supporting promising and scalable circular business models could be recommended. They would help to kick-start these models and stimulate their wider market adoption. In addition, specific public procurement policies could lead to an increase in demand for recycled raw material. In addition, the region could include measures for temporary acquisition of specialist services (similar to the

concept of consultancy) to accompany design innovation to enable the integration of technologies into the enterprise.

In order to encourage companies to rethink their products in a circular way, it is advisable to give importance to the possession of certificates in public notices, with the provision of reward criteria.

An important analysis showing an excellent picture of design's role in this sector was developed by the European Agency for Environment. The study can be found [here](#).

3.1.4. The Supply Chains Development

The supply chains development is a key step in increasing the sector's circularity and it is therefore important to support it.

A number of possible actions are proposed:

- promoting horizontal, sector and territorial technology transfer by strengthening links between universities, businesses, and research centres
- launch calls for start-ups and partnerships
- launch calls for equipment and technology modernisation
- set measures to support and promote re-use and preparation for re-use, including through the development of dedicated networks, such as: calls to encourage and encourage companies to invest in initiatives such as the development of hardware, software, platforms and services to ensure that citizens have access to cloths-sharing services; the promotion and development of exclusive after-sales services that help consumers to extend the life of their cloths; the promotion of communication campaigns and public awareness of forms of circular consumption;
- create policies that encourage raw materials and products transfer within the same territorial basin, such as: notices favouring businesses using the supply of secondary raw materials (from the same territorial area where applicable); the provision of rewarding criteria within CAM, within the framework of the GPP, for businesses using the supply of secondary raw materials (from the same territorial area where appropriate); the provision of notices or engagement in cooperation actions with other entities/operators in the territory for the development of platforms promoting industrial symbiosis and the exchange of secondary raw materials;
- accompany enterprises toward partnerships establishment and strengthening (including from different sectors), linked by belonging to the same territory, aimed at promoting strategic and circular projects.

A central theme, from the point of view of the supply chain, is the services sharing (within industrial symbiosis, the sharing of infrastructure and services is a key component). In this respect, actions to encourage the deployment of integrated energy distribution networks (smart grids) and support for the creation of energy communities (ECs) could be promoted.

Supply Chains Analysis and Implementation of Results

The idea is to support companies in the application of tools to analyse and assess products and processes circularity and to stimulate and support supply chain analysis to identify key issues in terms of inefficient use

of the subject and to facilitate the implementation of solutions, including cross-sectoral solutions, to improve circularity.

The main, but not only instrument, is LCA which can stimulate, supporting, enhancing the application of *life cycle-based* tools to make the supply chains more sustainable and identifying opportunities for industrial symbiosis.

Both the creation of PEF-PCR/Made Green in Italy schemes and the businesses participation to existing schemes can be supported, for example through the provision of necessary contributions to cover the costs of analyses.

In addition, business support could be translated into encouraging and helping the installations and technologies modernisation. In this respect, incentives for the development and adaptation of sustainable buildings could be used to support companies in the adoption of certification. Measures for the implementation of upgrading and renovation measures, possibly combined with the use of renewable energy and possible energy recovery, and/or energy efficiency and emissive improvement of buildings, should be encouraged.

Business Models

Flexible Demand Driven

Another strategic action is to stimulate demand-driven business models to reduce the number of unsold products.

Later, the supply chains can be supported in developing the identified solutions (the designed business models).

Slow-fashion and Made in Italy

Another important role is the promotion of slow fashion business models, which promote the dissemination of quality products, thereby enhancing local productions and the Made in Italy.

Waste Reduction

Encourage circular economy business models aimed at reducing waste and reusing textiles for the creation of new products and the use of eco-friendly materials.

Sharing platforms

In order to help consumers, make responsible choices, services, such as regional-based, garment-sharing platforms, could be implemented. At the same time, companies could be encouraged to invest in innovation, in terms of software/hardware development, to stimulate this type of business model.

3.1.5. Training

Training plays a key role in the development of the circular economy, both at company level, as well as at the level of citizens and administrations.

The following lists some of the actions or elements considered to be priorities in the field of training:

- measures to support the inclusion of qualified R&D personnel within companies (with appropriate training on the circular sector)
- Presence of figures such as Sustainability Manager who relate to retailer buyers
- presence of experts on waste management
- presence of personnel to manage the created recovery hubs
- foster the building of stable relations between the world of research and innovation
- measures to ensure the development of the skills of textile entrepreneurs and managers to help them transition their business model.

3.2. Positioning and guidance for known policy actions

3.2.1. EPR

Extended producer responsibility is not considered to be a possible subject of actions directly supported by Lombardy Region through notices or local policy initiatives, as the basic steps to set this system must be taken at central level.

What the region will be able to do once a roadmap for the implementation of the EPR on textiles has been established is to support the implementation of the EPR on the basis of the rules defined and to facilitate the planning and choices of the sector that will lead to a reduction in the products that will fall under extended responsibility under the law.

In any case, in this paragraph we are giving some thoughts on the key role that EPR will play in the textile sector, referring to the reflections in the paper “Rifiuti tessili: occorrono strategia e strumenti economici”, published on *Laboratorio SPL Collana Ambiente, Rifiuti* n.193, November 2021.

On textiles “[...] to date, there has been no strategy capable of enhancing textile fractions, despite the fact it is an obligatory step to reduce the ecological footprint of the sector.

In the absence of a fundamental strategy, the re-use market has given encouraging signals, driven by a kind of entrepreneurial spontaneity, in some cases also with an international vocation, which has managed, despite policy gaps and regulatory contradictions, to intercept the most valuable fractions and gaining margins. Where no such initiatives have been taken, textile waste has been dealt with among unsorted waste, for which disposal remains the main final destination.

With the introduction of the separate collection obligation, the real leap in quality in the coming years will be measured in the ability to channel these flows toward recycling paths, i.e., material recovery.

One of the most promising ways on which the EU Commission is working on, and hence the Italian Ministry of Ecological transition (Mite), is to introduce extended producer responsibility (EPR) obligations. Producers will have to pay an environmental contribution, passed on in the products purchase prices, which will be aimed at financing a supply chain collection to respect the waste hierarchy, thereby prioritizing reuse, supporting preparation for re-use and recycling.

The EPR embodies the European “polluter pays” principle and encourages research and development by directing production and consumption to increasingly sustainable forms that discourage fast fashion. At the same time, the EPR should serve to finance research and development activities, focusing on process and product innovation, targeting technologies that address key challenges in recovery, for example, by promoting eco-design and discouraging the use of hard-to-recover textile fibres.”

The following section provides a more in-depth analysis of the characteristics that a textile good EPR system should have.

3.2.2. End of Waste (EoW)

With the cooperation of the regional ecosystem (companies, research centres, trade associations, chambers of commerce, consortia, etc.) you can identify:

- The main flows that could easily be included in EoW
- The priorities included in the EoW regime
- Potential flows which, after certain changes in production processes, could easily take over the EoW or by-products scheme and then support actions to implement those changes to the companies; this scouting of possible EoW or *by-products* can also be implemented across sectors.

Particular attention may be paid to the relationship with *the Best Available Technologies* on textiles.

The new version of BAT on textiles is being approved. Given that it is possible to specify a BAT at regional level, in accordance with the general criteria laid down in it and given that Lombardy comprises one of the most important textile districts in Europe, it is possible to add circularity-related content to BAT, and supporting the application of technologies that favour the circular economy, including in terms of access to EoW schemes, use of by-products, and less waste generation.

Training on EoW legislation and the opportunities arising from the application of EoW can also be supported.

Finally, strategies to support companies for the development of end-of-waste Decrees and/or possible by-products Dossiers could be initiated, as was done, for example, with the regional guidelines on steel waste, which defined both the criteria according to which the Provinces can authorize EoWs on a case-by-case basis pending community or national criteria and the criteria according to which producers can manage residues as by-products.

3.2.3. Databases

Since there are already data bases for by-products, for example that of the Chamber of Commerce, their population and use could be stimulated.

Article 10 of Ministerial Decree No 264 of 13 October 2016, laying down indicative criteria to facilitate the demonstration of the fulfilment of requirements for the qualification of production residues as by-products and not as waste, provides that, in order to facilitate the exchange and disposal of by-products, the territorially competent Chambers of Commerce shall establish a dedicated list listing, without charge, producers and users of by-products, which shall be made public and available on a dedicated section of the Chamber of Commerce's website or on a website indicated by the Chamber of Commerce.

While these lists seem to be an excellent starting point for the development of circular economy practices, experience has shown that these data bases are almost unknown and, as a result, little use is made of them.

Therefore, specific actions could be implemented to stimulate their knowledge and use, such as, but not limited to:

1. promotion of such databases within the training pathways organized by Chambers of Commerce
2. promotion of such databases within the regional circular economy or, more specifically, of industrial symbiosis notices (e.g., making the registration of the company on the Chamber's list a rewarding requirement for participation in such notices)
3. with reference to the above mentioned in paragraph 3.2.2 – legislation training actions – such initiatives could be useful times to encourage companies to use such lists
4. by encouraging green public procurement through measures, policymakers could stimulate demand and encourage the use of by-products and, consequently, develop a greater interest in finding platforms/databases useful for this purpose. It is to be hoped that this will encourage a greater influx of users to register in these databases.

In this respect, it may therefore be appropriate to develop a dialogue with the Chamber of Commerce, which is also an important partner with whom to engage in dialogue to develop actions on textiles (paragraph 3.1.1).

3.2.4. Other Important Aspects to Complete the Framework

Traceability

Traceability is a key requirement that must be supported in development.

A crucial step in this direction will be the choices made at EU level.

Apart from taking inspiration from its role, it will be a question of how the regional level can positively support its development.

GPP

The GPP, as with any other sector, can help kick-start and stimulate the emergence of circular models and can lead to an increase in demand for recycled raw material. In the light of the key role played by the GPP, some actions to support may be foreshadow:

- develop guidelines or forms of accompaniment to the use of the different CAM relating to the textile sector
- Supporting SMEs in the production of goods consistent with the sector's CAM
- Support promising and scalable circular business models with GPP.

For the sake of completeness, a framework is provided for the approved or in-process CAM(s) involving the textile industry.

Effective CAM:

- Supplies and rental of [textile products](#), including filter masks, medical devices and personal protective equipment (approved by [DM 30 June 2021](#), in G.U.R.I. n. 167 of 14 July 2021);
- [Entrustment of the service of industrial washing and rental of textiles and materials](#) (approved by [DM 9 December 2020](#) in GURI No. 2 of 4/01/2021)
- [Provision, rental service and extension of the useful life of indoor furniture](#) (approved with [DM 23 June 2022 no.254](#), GURI No. 184 of 8 August 2022)

Cam being defined and programmed:

- Supply and rental of textile products (Revision DM 30 June 2021)

Communication

In addition to the company-level training support already mentioned, communication campaigns, including towards consumers, can play a key role.

A central theme is to increase citizens' awareness of new forms of sustainable consumption (e.g. the use of rental and usage services).

Unsold products

To manage the textile material produced, but not sold, ideas to support/develop may include for example:

- assess the feasibility of establishing a penalty system for the start-up by landfill or incinerator of unused and defect-free clothes.
- involvement of solidarity networks ensuring distribution and use of the unsold.

3.2.5. In Summary

For all the cases set out in the previous paragraphs, one action that could significantly help businesses move toward transition could be the construction of clear and binding policies, defined as roadmaps, to ensure a path to follow when coordinating infrastructure development and, above all, in planning the investments for years to come.

3.3. Good practice for Pointing out Virtuous Paths

The previous paragraphs and chapters represent a reworking of what is proposed in the good practice documentation.

However, the wealth of information produced is such that, for sure, further suggestions for guiding regional actions can still be collected.

Therefore, in this concluding paragraph we propose a summary of the most interesting, good practices or the key aspects touched on by some good practices, which add content, so to speak, vertically, compared to what has already been developed in the previous pages.

For best practice details, please see the attached excel file.

Such content can serve as benchmarks for projects proposed in calls or as ideas for understanding to which types of projects to open calls.

3.3.1. Tools for Consumers

It is very useful to have tools and support structures available to stimulate reuse.

In this sense, supporting hardware, software, and services projects that provide citizens with access to clothes-sharing or return services can be an activity that should be implemented.

Good practice:

- GUCCI - *the Real Real* - *Second Hand Platform*
- GREEN CHIC (ARMADIO VERDE) - Used clothing sales system (via online platform) where it is easy for customer to deliver clothes at the end of their life
- Policy Good Practice: Digital vouchers - Caserta Chamber of Commerce (Campania) The aim is to promote the spread of digital culture and practice in micro, small and medium-sized enterprises, in all economic sectors, through economic support for digitisation initiatives, also aimed at green-oriented approaches for the productive fabric. They are beneficiaries of the call for micro, small and medium-sized enterprises based in the territory of the Caserta Chamber of Commerce. Benefits will be provided in the form of vouchers. Vouchers will have a maximum unit amount of € 6,000.00. The tool funded interventions related to, for example, the internet of things and machines; technology solutions for immersive, interactive, and participated navigation (augmented reality, virtual reality, and 3D; big data and analytics; additive manufacturing and printing 3D; artificial intelligence;

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blockchain; digital supply chain technology solutions for supply chain optimization. It can also fund solutions to support citizens.

3.3.2. Clothing Rental and Subsequent Recycling

The idea here is to shift supply from possession to use. This step encourages people to return the product for recycling or reuse.

Good practice: a recycled denim brand that meets the criteria of the circular economy. In 2013, MUD launched the concept of 'Lease A Jeans': it transformed its business model by renting jeans to its customers. This enables the company to extend the life of jeans and drastically reduce waste generation as the jeans are recovered by *Mud Jeans* at the end of their life and sent for remanufacturing, ready to be rented back to their base customer.

Good practice: *YouKoala* sends home a clothing kit, composed according to the child age and the season in which they receive it. The garments can be used and washed regularly as we always do in our daily lives. When your clothes get too tight, *YouKoala* delivers a new kit of a more suitable size to your home. At the same time, it collects the previous kit.

3.3.3. Materials

The good business practices identified presented a number of examples on some specific aspects of circularity:

- use of natural/renewable raw materials
- use of circular raw materials (recovered/recycled)
- use of waste from different supply chain (industrial symbiosis)
- repair and life cycle extension
- *take-back service*
- *upcycling*.

These examples can be used as a reference to define support actions or to understand how to structure and assess design proposals which go these directions.

With regard to examples, as a general methodological consideration on the value of the assumptions made in good practice and of possible further circular design solutions, the life cycle approach, specifically the life cycle assessment tool, has a central role to play, as it is a key tool for assessing the sustainability of choices and solutions.

With regard to the production with recovered materials, a case particularly related to the pandemic theme is the good practice of sustainable masks produced in Catalonia, produced with post-consumer R-PET, which save 99% CO₂ compared to a FFP2 mask (Oeko-tex Standard 100 Class I).

3.3.4. Product quality

The reference qualities that can be promoted in relation to this subject are as follows:

- promoting the dissemination of quality products
- enhancing local production and the Made in Italy (Made Green in Italy)
- ensuring garments safety

In this respect, certifications gain value. It may be interesting to understand how to standardise existing certifications in place for safety and sustainability and drive their development.

In this respect, the theme of recycled fabrics brands also becomes an important one.

3.3.5. Collection

The issue of textile collection is a central issue, partly because of the described new objectives of national Italian and European legislation.

In the following we propose a summary of 3 best practices relating to the City of Sofia, which illustrate how the Municipality of Sofia is taking charge of this issue.

An important issue to be considered when reading good practice on the subject of collection is the need to clarify the possibility of a private person to collect used clothes outside the public service on a private area (see example HM). It is particularly useful for the Italian national lawmaker to clarify this aspect definitively by revising the relevant part of Legislative Decree no 152/06.

Good practice - Door-to-Sorting Centre.

In Sofia (Bulgaria), the "Door-to-Sorting Centre" textile waste collection service was introduced on request: TEXAID Ltd introduced the "Door-to-Sorting Centre" textiles collection service during COVID-19 epidemics: Collection of garments in large quantities (min. 10 - 20 shopping bags) from the addresses of the persons who have previously requested this service. Textile waste is collected in/out of the apartment/house, from where it is collected by a member of the waste collection company team and transported to the "Sorting Centre". There is no direct contact between the waste generator and the support team of the textile waste company

Good practice At school.

In Sofia (Bulgaria), textile collection in schools: Promote the separate collection, waste reduction and preparation for reuse and recycling of generated textile clothing waste. In a school yard (seasonal) or in special containers next to primary/high schools (all year round), the clothes of the students/parents are collected and donated to people in need in Pakistan, African countries, etc.

Good practice: Deposit Retention System for Returning Used Clothes in Store.

H&M stores in Sofia, Bulgaria set up an in-store deposit system for used clothing; H&M shops in Sofia introduced the collection of textile waste from clothing for reuse or recycling linked to the store loyalty discount program. Part of H&M Group's broader sustainability campaign on Re-wear: clothing that can be worn is available worldwide as second-hand dresses. Rework: if the clothes or fabrics are no longer usable, they are transformed into other products, such as cleaning towels. Recycling: All other garments and fabrics are converted into textile fibres and used for the production, for example, of insulating materials. This activity is carried out at international level and therefore also in Italy.