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D1.2 Waste stream analysis and recycled textile classification

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EXECUTIVE SUMMARY

The RegioGreenTex project addresses the critical challenge of managing textile waste streams across Europe, focusing on advancing circularity and sustainability in the textile sector. This deliverable outlines the development of a framework for classifying textiles for recycling, which is central to establishing efficient and regionally adaptable waste channelling models.

Within RegioGreenTex, textile waste streams from various regions were systematically analysed, leveraging insights from workshops and stakeholder collaborations. This approach enables the identification of region-specific needs and capabilities, facilitating the alignment of waste channelling practices with local realities. A streamlined decision-making framework has been developed, simplifying sorting parameters based on current capacities and practical applicability.

A key achievement is the integration of these sorting criteria into the RegioGreenTex Digital Tool, an interactive platform designed to support matchmaking among stakeholders. The Waste Solutions Finder, a core feature of this tool, connects textile waste sources with appropriate recycling and reuse opportunities, fostering collaborations and bridging gaps in regional and interregional value chains.

By harmonizing efforts and building upon foundational work from projects like CISUTAC, RegioGreenTex strengthens the potential for scalable, circular practices. The tools and models developed in this project are pivotal for enabling effective textile waste management and establishing Europe as a leader in circular textile innovation.

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1. INTRODUCTION

This public deliverable report will present the work on **Waste stream analysis and recycled textile classification,** a task in WP1 (Work Package 1) of EU I3-funded project, Regions for Green Textiles with acronym **RegioGreenTex** (henceforth used).

In this first chapter the connection to prior research will be described. Additionally, the scope and aims of this task of RegioGreenTex will be presented.

1.1 Background

The textile industry is one of the most resource-intensive sectors, generating significant residual streams throughout its value chain, from production processes to post-consumer disposal. These streams include manufacturing scraps, unused fabrics, defective items, and the growing volume of discarded clothing. Mismanagement of these streams lead to textile waste that contributes to environmental challenges such as resource depletion, greenhouse gas emissions, and pollution, while placing pressure on waste management systems across Europe.

To address these issues, the EU's Circular Economy Action Plan[1] prioritizes the transformation of the textile sector through waste reduction, recycling innovation, and harmonized standards. Furthermore, the well-established Waste Hierarchy[2] outlined in the EU Waste Framework Directive (Directive 2008/98/EC) serves as a cornerstone for waste management regulations and policies. It sets a clear priority order for waste management actions, starting with prevention (reduction), followed by reuse, recycling, energy recovery (i.e., incineration), and, as a last option, disposal (i.e., landfill).

1.1.1 Link to prior work of RegioGreenTex and other projects

Harmonized waste management is essential for a circular economy. Prior work in RegioGreenTex plays a role for this work. Key terminology used throughout this report are marked with bold. The main activities and deliverables that correlate are:

1. *Deliverable 1.1 – Taxonomy*: The **RegioGreenTex Taxonomy** for recycled materials developed by Wageningen University and Research, established a common language i.e. terminology for textile waste streams.
2. *Deliverable 1.2 – RegioGreenTex Digital Tool:* A fully functional digital environment to host SMEs and consortium partners was developed by Ariadne Innovation. The taxonomy has been implemented, when applicable, in the **RegioGreenTex Digital Tool**.
3. *Deliverable 1.3 – Mapping and gap analysis of value chains for sustainable and circular textiles*: The **Gap Analysis** performed by Centexbel provides insights on improvement areas in circular value chains in Europe's regions.

The EU-funded project CISUTAC (101060375), under Horizon Europe, developed a waste channelling decision tree to guide post-consumer textile sorting and prepare for the use of data from digital product passports (DPP).

[1] Circular Economy Action Plan – European Commission
[2] Waste Hierarchy – EUR-Lex – European Union

The decision tree is available as an open access tool and excel sheet[3] on the CISUTAC website. The focus of the decision tree is post-consumer waste and prioritization between data points to ensure informed decisions for sorting textile waste for reuse or recycling.

Building on the foundational decision tree developed by the CISUTAC project, RegioGreenTex adapts and expands these insights to create actionable solutions tailored to regional textile waste challenges. RegioGreenTex will establish a common ground for dealing with post-consumer textile waste in Europe's regions through sorting for circularity.

1.2 Scope

This task aims to develop an operational waste channelling model for circular textiles. RegioGreenTex prioritizes addressing the unique needs of each region, ensuring the waste channelling framework is both practical and regionally adaptable for immediate implementation. The work is centred around prioritizing parameters and how the framework can be supported by the taxonomy developed within the project. Additionally, textile waste streams across regions will be analysed and taken into consideration for implementation of the framework.

1.3 Aims

The aims and actions of this work were to:

- Implement waste channelling models, built on the framework of post-consumer textile waste developed in CISUTAC.
- Connect these models to the gap analysis and the taxonomy of RegioGreenTex.
- Integrate the models to fit the needs of the RegioGreenTex regions.
- To develop one overall model and models for at least three regions of RegioGreenTex to achieve the goals of the project.

1.4 Limitations

The waste channelling models were primarily focused on recycling, in accordance with the objectives of the project. Emphasis on post-consumer textiles stemmed from its central role in the CISUTAC decision tree.

[3] Solution Post Consumer Textile Waste – CISUTAC

2. METHODOLOGY

To develop an operational waste channelling model for circular textiles, the task was divided in two steps:

- Data collection
- Development of the model

Data collection was built upon datapoints for sorting developed within CISUTAC, gaps identified in the gap analysis and new input collected from workshops conducted with six of the project's regions. Collected data points were validated with project partners. **Figure 1** shows a representation of the principle of the methodology.

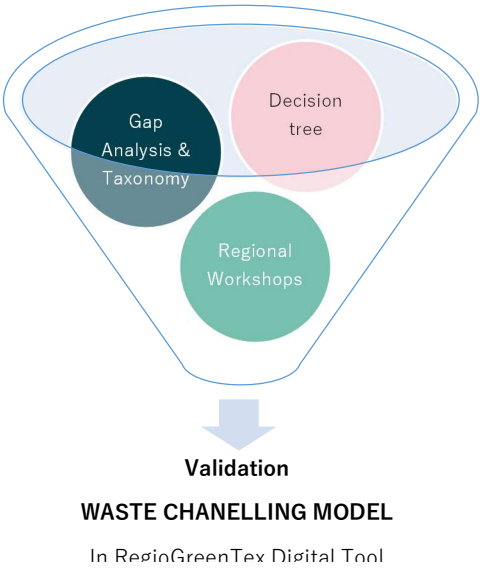


Figure 1 Overview of the methodology principle

The second step was the development of textile waste channelling model as a part of the RegioGreenTex Digital Tool. The taxonomy was integrated throughout the task, when applicable.

Data collection, validation and digital development is further described below.

2.1 Data collection

Data collection was done in three steps:

- Adaptation of decision tree and integration with RegioGreenTex taxonomy
- Study of the results of the gap analysis
- Workshops with selected regions

2.1.1 Adaptation of the decision tree

To create a tool operational here and now, a simplification of the CISUTAC parameters for sorting post-consumer textiles was made, based on current sorting capacities. The open-access tool developed by CISUTAC, as published, has limitations in certain parameters, which currently prevent it from being an operational tool. The simplified version of the decision tree, in excel format, was developed in collaboration with CISUTAC representatives. While the full version of the decision tree takes a lot of parameters into account, the simplified version focused on the data that could be more easily handled by sorters, or information that could be given by the supplier of waste materials without the need for a digital product passport to be implemented.

2.1.2 Connection to the Gap Analysis

Gaps identified in the Gap Analysis (see 1.1.1 Link to prior work of RegioGreenTex and other projects) were studied and compared to demands brought up during regional workshops. Gaps of relevance for the development of regional waste channelling models were connected to the digital development. Gaps specific to SMEs were targeted.

2.1.3 Workshops with regions

To gain insights into regional waste management practices, digital workshops were conducted across various regions. Several regions were selected based on availability for a more in-depth analysis through digital

meetings and info sharing. The primary participants were regional cluster leaders. To encourage effective dialogue, some regions included in the in-depth analysis were grouped based on geographical proximity, resulting in five distinct workshop series: East Netherlands and Flanders, Norte Portugal, Piemonte and Tuscany, Valencia, Västra Götaland.

These workshops utilized Mural, a digital collaboration environment, to facilitate discussions and idea generation. Each session began with an introduction, including description of the decision tree. This was followed by a brainstorming segment where ideas were documented either by the facilitators from RISE or by the participants themselves. The brainstorming was supplemented with relevant data, facts, and reports, leading to a summary of each region's textile waste management practices and specific needs.

In addition to developing a general understanding of waste management, the workshops focused on specific data, including waste types, existing circular value chains, companies active in the circular textiles field, and challenges faced.

RegioGreenTex partners engaged in this task were mainly cluster leaders and regional organisations in the research and development, main contributors namely: Ateval, Centexbel, Cieteve, CS-Pointex, Eurofins, NTT, OVAM and RTT. Results were summarized and aligned between regions for integration during the digital development.

2.2 Validation with circular actors

Digital meetings were conducted with selected partners from RegioGreenTex consortium, namely DBT Fibre (mechanical recycling – carding), Hilaturas Arnau (mechanical recycling – yarn spinning), Recycl' elit (chemical recycling), Sasia (mechanical recycling), SaXcell (chemical recycling) and Quest Studio (Reuse and Remanufacturing).

This enabled a validation of the parameters chosen and ensured an understanding on what parameters are relevant to specific businesses.

2.3 Development of digital solutions

The digital implementation of regional waste channelling models was made in close collaboration with Ariadne Innovation, the creator of the **RegioGreenTex Digital Tool**. The idea was to create a more operational and easy-to-use decision tree, available at the tool. The digital solution developed was defined by and limited to the back-end possibilities available at the Digital Tool. Front-end was defined by the project frameworks. The development was based on data collection and validation with recyclers (described in 2.1 and 2.2). Data points were selected according to availability, usability and relevance.

An important focus in implementing these data points, was to ensure a digital solution of practical use for companies or stakeholders.

AI solutions were explored with RISE AI experts to understand how such solutions could improve usability in waste channelling models.

The results of this work, using the methods described above, and the effect of these results on addressing needs of each region in a practical context will be presented in the next chapter, **3 Results and discussion**.

3. RESULTS AND DISCUSSION

Results are presented and discussed according to the data collection steps, as each of these holds valuable information for the understanding of the channelling of textile waste. The different levels of sorting can be used for further development of harmonization efforts such as waste channelling tools. The result of regional waste channelling models implemented on the **RegioGreenTex Digital Tool**, by the development of an operational matchmaking tool called the **Waste Solutions Finder**, will be presented at the end of this section.

3.1 Data collection

3.1.1 Simplified decision tree

A reworked and reduced version of the CISUTAC decision tree data points is presented in **Table 1**. The selection of parameters is explained in both the case of exclusion and inclusion in the simplified version. The simplification is focused on recycling (see 1.4). The selection was made with regards to available sorting capacities of today. Each CISUTAC decision tree parameter, as well as the RegioGreenTex adapted ones, has several sub-categories, which are not shown here. The full CISUTAC Decision Tree can be accessed through the official project website[4]. Definition of CISUTAC specific taxonomy and explanation of categories can be found in **Annex 1**.

Table 1 Simplification of CISUTAC Decision Tree for channelling of post-consumer textile waste

CISUTAC Decision Tree parameters	Simplified Decision Tree	Explanation (inclusion or exclusion)
Condition	Condition	The primary sorting parameter for guidance through the waste hierarchy. Performed manually today and future advancements in AI are expected to improve its efficiency.
Fiber Composition (1 and 2)	Fiber Composition (1 and 2)	The fibre blend in textiles determines their resale value and recycling pathways. This can be identified by reading labels or, to some extent, through manual inspection. In the industry today, NIR (Near-Infrared) spectrometer technology is used and holds potential for further development.
Fabric Colour	Fabric colour	Colour is a key factor for mechanical recyclers, remanufacturers, and reuse markets. Sorting can be done manually or through optical methods.
Product Type	Product type	The type of clothing item is crucial for reuse purposes and can also be significant for recyclers who specialize in certain items better suited to their processes.
Disruptors	Not included	While disruptors (e.g., trims, hard parts) can complicate recycling, they may benefit remanufacturing. However, sorting disruptors requires advanced identification methods, which are not yet operationally feasible, or reliable data from a Digital Product Passport (DPP).
Product Construction	Not included	Product construction details, such as stitching and material layers, are complex to determine manually. A DPP would provide this information more efficiently and accurately.
Multilayer	Not included	Identifying multilayer textiles requires detailed material information, which is not feasible through manual sorting. A DPP is necessary to access this data efficiently.
Chemical Content	Not included	The chemical content of textiles cannot be reliably identified through manual or visual methods. A DPP is needed to provide this data efficiently and accurately.
Recycled Content (Cotton or Polyester)	Not included	Determining recycled content requires precise material tracking, which is currently infeasible without a DPP.
Textile Finishing (1 and 2)	Not included	Information about textile finishing (e.g., coatings, treatments) is not visible or identifiable manually. A DPP would be required for accurate and efficient tracking.
Product Disassembly	Not included	Product disassembly information, such as component separability, requires structured product data. A DPP is necessary for streamlined access to this information.
Production Year	Not included	The production year of textiles is not typically available in current sorting processes. A DPP would be needed to efficiently retrieve this information.

[4] Solution Post Consumer Textile Waste – CISUTAC

Brand	Not included	Tracking brands is challenging due to the rapidly changing market, inconsistent regional values, and varying trends. AI-based solutions are required to manage this efficiently but are not yet in place.
Price	Not included	Price data is not visible on textiles and cannot be manually determined. A DPP would be required to access this information efficiently and reliably.
Product Gender	Not included	Product gender is of limited relevance for recycling. While it can be manually determined, efficient access would require a DPP.
Repairability	Not included	Evaluating repairability requires detailed product data, such as construction and material durability, which is not feasible without a DPP.
Durability (lowest grading)	Not included	Determining textile durability requires structured testing or prior data. This information is inaccessible without a DPP or other advanced solutions.
Recycle Method	Not included	The recycling method used (in case of recycled content) cannot be determined manually. A DPP is needed.
Fabric Construction	Not included	Information about fabric construction (e.g., knit, woven, nonwoven) is challenging to identify manually with enough efficiency. A DPP is necessary for efficient access to this data.
Textile Fiber Length	Not included	Fiber length is a critical parameter for mechanical recycling but cannot be determined manually. Requires a DPP.
Fabric Weight	Not included	Fabric weight is important for recycling processes, but measuring it manually is impractical. Reliable identification requires a DPP.
Certificate	Not included	A DPP would provide certification data efficiently.

It is important to point out that excluded parameters may be of great importance for circular systems. However, due to the need for DPP to be implemented for an efficient access to the required information, it is not possible yet to prioritize them in a tool which will be implemented here and now. An example of this is **Textile Finishing**. Textile Finishing is related to a product's chemical content and is important for circular initiatives, but this information is rarely possible to get in current sorting setups. As DPP gets implemented or sorting capacities increase, more sorting parameters should be added. Harmonization and regulation will need to keep up with the fast pace of technological advancements.

3.1.2 Gaps related to building digital Waste Channelling Models

Key gaps in the development of waste channelling models, as identified in the Gap Analysis report, are summarized in **Table 1**. From this summary, three primary themes emerged: **data sharing, harmonization**, and **matchmaking**.

The gaps identified often stem from insufficient data and the challenges of sharing it among stakeholders. A lack of harmonization between systems and processes is another critical issue. For example, efforts such as correlating the CISUTAC and RegioGreenTex taxonomies represent initial steps toward addressing harmonization. An important step is using the same parameters in classifying textile waste. Additionally, there is a pressing need for improved matchmaking between partners in the circular value chain, as disconnected systems within regions and the lack of local or regional collaborations exacerbate inefficiencies.

Cultural and knowledge gaps are also significant barriers. A digital waste channelling model could serve as both a training tool for staff and a foundation for developing context-specific models at national or local levels.

A functional waste channelling model at the regional level could also provide a novel method for identifying and addressing gaps. For instance, it could visualize "dead ends" in waste channelling routes, pinpointing areas where solutions are absent and highlighting where financial investments are needed for new sorting, recycling, or repurposing infrastructure.

Table 2 Overview of key identified gaps related to developing a digital waste channelling model

Identified gaps & type of gap	Description of gap from Gap Analysis	Potential benefit with waste channelling models

Data Gaps	Insufficient data on material traceability and lack of accurate sorting data hinders efficient decision-making.	Harmonization of sorting parameters and taxonomies ensures reliable and consistent waste streams.
Process Coordination (Core Function Gaps)	Disconnected systems within regions, lacking awareness and collaboration among stakeholders in the recycling chain.	Matchmaking existing solutions fosters stronger connections and facilitates business-to-business exchanges.
Digital Integration (Support Function Gaps)	Difficult sharing data on materials and production processes among stakeholders, essential for streamlining waste channelling.	Harmonized taxonomies and waste parameters enable systems integration and more efficient waste channelling.
Policy and Regulation Gaps	Lack of harmonized standards for recycled materials across EU regions.	Harmonized taxonomies and parameters can support the development of consistent standards and regulations.
	Insufficient or inconsistent policy support for circular economy practices.	Policy alignment based on harmonized standards can promote better circular economy practices.
Cultural and Knowledge Gaps	Limited knowledge on circular design principles and best practices among SMEs.	A user-friendly model with prioritized sorting parameters can educate businesses on textile waste handling and design improvement.
	Insufficient workforce trained in circular textile processes, including digital tools for waste management.	Models with harmonized sorting parameters and intuitive interfaces can help educate work forces.
Economic and Collaboration Barriers	High costs of energy and logistics for recycling processes.	Harmonizing sorting waste streams optimizes logistics and reduces costs.
	Limited financial incentives for scaling circular initiatives or supporting infrastructure improvements.	Streamlined and harmonized waste streams can enhance infrastructure and support scaling circular initiatives.
	Challenges in forming local and regional collaborations necessary for creating integrated value chains.	A model with regional filters to find partners can strengthen regional and local collaborations.

3.1.3 Regional workshops

Advancing textile recycling and circularity across Europe requires targeted efforts to address key challenges and leverage opportunities in various regions. The regional workshops gave an understanding of the different regions' needs and potential. Even though some specific needs may vary, it was unanimously concluded during the overview of the CISUTAC decision tree that harmonization of data points and an operational framework for circular textiles is needed throughout our textile regions and value chains. With learnings from the workshops, sorting parameters were in some cases added or adapted to fit the regional needs better. Selected parameters are presented and explained in **Table 3** under the section **Summary, data collection.**

It was concluded from the workshops that the most pressing issue is post-consumer waste as well as the need for efficient collection, sorting and harmonization of data points. The focus could therefore be kept aligned with the scope of the CISUTAC decision tree, focusing on post-consumer textiles. Post-industrial textile waste often offers greater clarity regarding its composition and origin compared to post-consumer waste, as it typically arises from controlled manufacturing processes. This waste may also be partially pre-sorted, simplifying initial processing steps. However, post-industrial waste owners can benefit from using the developed tool to identify and connect with tailored waste solutions, enhancing the value recovery potential and fostering circularity. Post-industrial waste is also being considered by project partner Mai Bine and the Romanian region through their work on a marketplace for post-industrial waste.

The parameter **Product Category** with data points Apparel; Denim; Home Textiles; Other; Shoes; Technical Textiles; Workwear, was added to meet the needs and capacities of RegioGreenTex partners.

The filter option **Regions** was added to facilitate regional and interregional collaborations, according to the project goals and to meet identified gaps.

The parameter **Value Chain Activities** was added. Thorough analysis of the sub data points to be added here showed the benefit of integrating CISUTAC taxonomy (**Incineration** and **Reuse** was added) and aligning with RegioGreenTex taxonomy (using the **Remanufacturing** – not included in CISUTAC). This meant enabling solutions coupled with the waste hierarchy and meeting the regional needs and capacities that was highlighted during the workshops.

3.1.4 Validation of waste channelling data points

To validate the simplified decision tree and the selection of waste channelling categories after the regional workshops, online sessions with project partners within textile waste management industries was carried out. The needs varied, depending on whether the intended decision route is mechanical recycling, chemical recycling or remanufacturing.

An example where needs differ between different stakeholders is the category **Disruptors**. CISUTAC describes Disruptors as hard parts or trims on products, e.g. buttons, zippers. For chemical or mechanical recycling this might add an extra preparation step for removal of these parts before the actual recycling. However, for remanufacturing actors namely designers, these parts might be a desirable element of the design and therefore the terminology becomes misguiding. The exclusion of Disruptors is further discussed in the upcoming section, **Development of digital solutions**. Another example of a parameter excluded is **Recycled Content**, which can have an impact on different circularity pathways. When it comes to mechanical recycling, recycled content can have a negative impact as fibres are getting shorter during the process and the number of recycling cycles is therefore limited. For reuse, on the other hand, **Recycled Content** may be beneficial for a resale value. However, since information on recycled content materials is currently neither broadly and efficiently available in sorting settings nor available in larger volumes, this parameter was not prioritized. Due to the complexity described above, this parameter was excluded in the present operational model.

Other parameters were excluded due to the need for simplification, namely **Product Construction**, **Multilayer,** and **Product Disassembly**. As described in the result section 3.1.1, these are not irrelevant but would benefit from the implementation of DPP to provide enough data to be relevant to stakeholders.

3.1.5 Summary, data collection

The concluded channelling points are presented in **Table 3**.

Table 3 Summary of overview of Waste Channelling parameters, explanation for inclusion and filters (data points)

Parameters	Explanation	Filters (in alphabetical order)
1. Condition	Condition levels according to CISUTAC definition. Important parameter to prioritize higher condition materials to the highest step in waste hierarchy.	High; Low; Medium; Premium; Very Low
2. Main fiber	Main Fiber and Fiber %, replace Fiber composition 1 (CISUTAC definition) for user-friendliness.	Acrylic; Cotton; Elastane; High-Performance Fibers; Lyocell; Polyamide (Nylon); Polyester; Polypropylene; Silk; Viscose; Wool
3. Main fiber %	Main Fiber and Fiber %, replace Fiber composition 1 (CISUTAC definition) for user-friendliness.	100%; Min. 50%; Min. 75%; Min. 80%; Min. 85%; Min. 90%; Min. 95%; Min. 97%
4. Fabric Colour	More defined colour sorting is needed for remanufacturing and mechanical recycling. Added the most common colours to the existing CISUTAC data points.	Blacks; Blues; Bright; Dark; Greens; Greys; Light; Reds; Whites; Yellows
5. Product Category	Adapted to RegioGreenTex by adding categories beyond apparel. Denim moved from Product Type.	Apparel; Denim; Home Textiles; Other; Shoes; Technical Textiles; Workwear
6. Product Type	Product types from CISUTAC definition.	Activewear; Apparel Accessories; Dress; Jacket, Coat; Leggings, Stocking, Tights, Socks; Shirt, Blouse; Short, Skirt; Suit; Sweater, Midlayer; T-shirt; Tracksuit; Trouser; Underwear, Swimwear
Regions	Added as part of the RegioGreenTex scope to facilitate for regional and interregional collaborations.	Auvergne Rhône-Alpes (FR); Catalunya (ES); East Netherlands (NL); Flanders (BE); Hauts-de-France (FR); Norte Portugal (PT); North East Romania (RO); Piedmont (IT); Tuscany (IT); Valencia (ES); Västra Götaland (SE)
Value Chain Activities	Integration with RegioGreenTex taxonomy adding certain CISUTAC definitions e.g. Incineration.	Assembling; Chemical Recycling; Consulting & Professional Services; Design; Disassembly and Preparation; Education & Training; Embroidery & Quilting; Environmental Services; Fabric Dyeing & Finishing; Fabric Printing; Felting; Fibers & Pulps; Incineration; Knitting; Logistics & Distribution; Machinery; Manufacturing; Marketing & Communication Services; Mechanical Recycling; Packaging; Remanufacturing; Repair; Reuse; Services; Sorting; Spinning; Thermomechanical Recycling; Traceability; Waste Collection; Weaving; Yarn Dyeing & Finishing
Actor Category	Integration with RegioGreenTex taxonomy and RegioGreenTex Digital Tool.	Academia; Association; Cluster; Designer; Event; Expert; Fabric; Federation; Fiber; Finished Product; Finishing; Guide; Incubator/Accelerator; Individual; Innovation; Investment Firm/Fund; Knowledge/Research Institute; Machine; Manufacturer; Marketplace; Museum; NGO; Non-Profit; Online Platform; Project Team; Public Agency; Publication; Publisher; Regional Development Agency; Research Project; Retailer; Service; Service Provider; SME Member; Social Enterprise; Technology Provider; Textile Processor; Training; Use case; Yarn

These final waste channelling data points were used as filters in the digital tool developed. This tool, **Waste Solutions Finder** – the outcome of the data collection and digital development, will be presented in the following sections.

3.2 Operational waste channelling model – Waste Solutions Finder

3.2.1 Matchmaking filtering tool

A matchmaking filtering tool has been developed using the **RegioGreenTex Digital Tool** backbone and parameters from the simplified decision tree, validated by circular actors. This filtering tool, called **Waste Solutions Finder** enables stakeholders to filter on material data points and be matched with companies or stakeholders that can process the waste.

3.2.2 Development of the tool

Harmonization and user friendliness were key when developing the tool to move faster towards textile recycling and circularity. Datapoints are based on broadly established CISUTAC sorting points, regional integration and selection of parameters for an easy overview in the tool. It was an important focus to keep the tool simple enough to use also for users with a relatively low knowledge regarding textile recycling so that a broader range of waste streams can be assembled.

This first version of the **Waste Solutions Finder** gives insights to the complexity of circular textile value chains and the need for effective matchmaking, of waste streams and companies. In this version the tool is built on simple yes/no answers in a filtering system that in the end brings the user to a match with companies providing a solution to the user's textile waste.

3.2.3 Visual representation of the tool

The **Waste Solutions Finder** is one tool among others developed for the benefit of SMEs in the RegioGreenTex project, see **Figure 2.** It can be found on the **RegioGreenTex Digital Tool** in two versions, one limited version for external visitors and one for project partners with full access. The difference between the two versions is that the version for external stakeholders is limited to showing RegioGreenTex partners that provide waste solutions. The full access **Waste Solutions Finder** is showing an expanded network of added companies and stakeholders that can offer solutions for post-consumer textile waste.

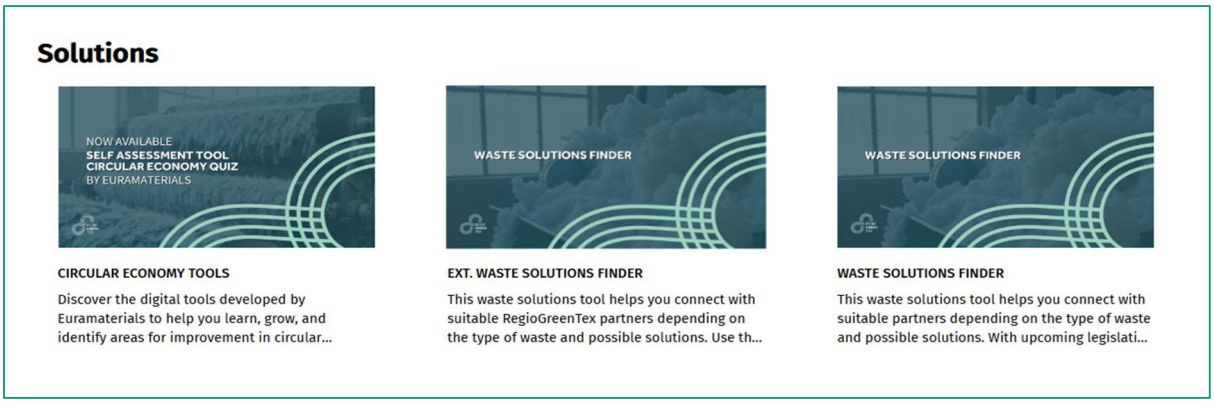


Figure 2 Waste Solutions Finder can be found on the RegioGreenTex digital tool among other solution tool developed within the project.

A visual of the tool's design can be seen **in Figure 3**.

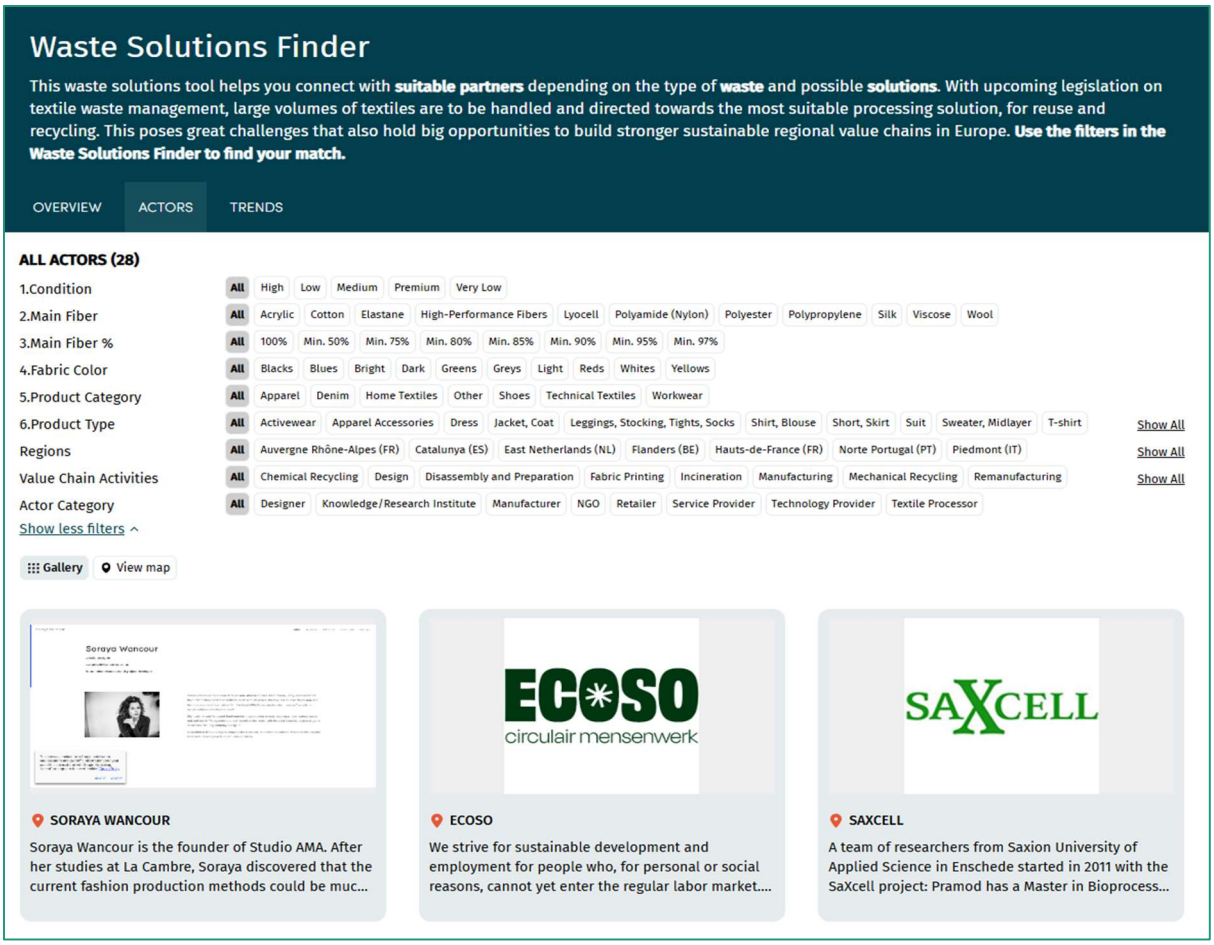
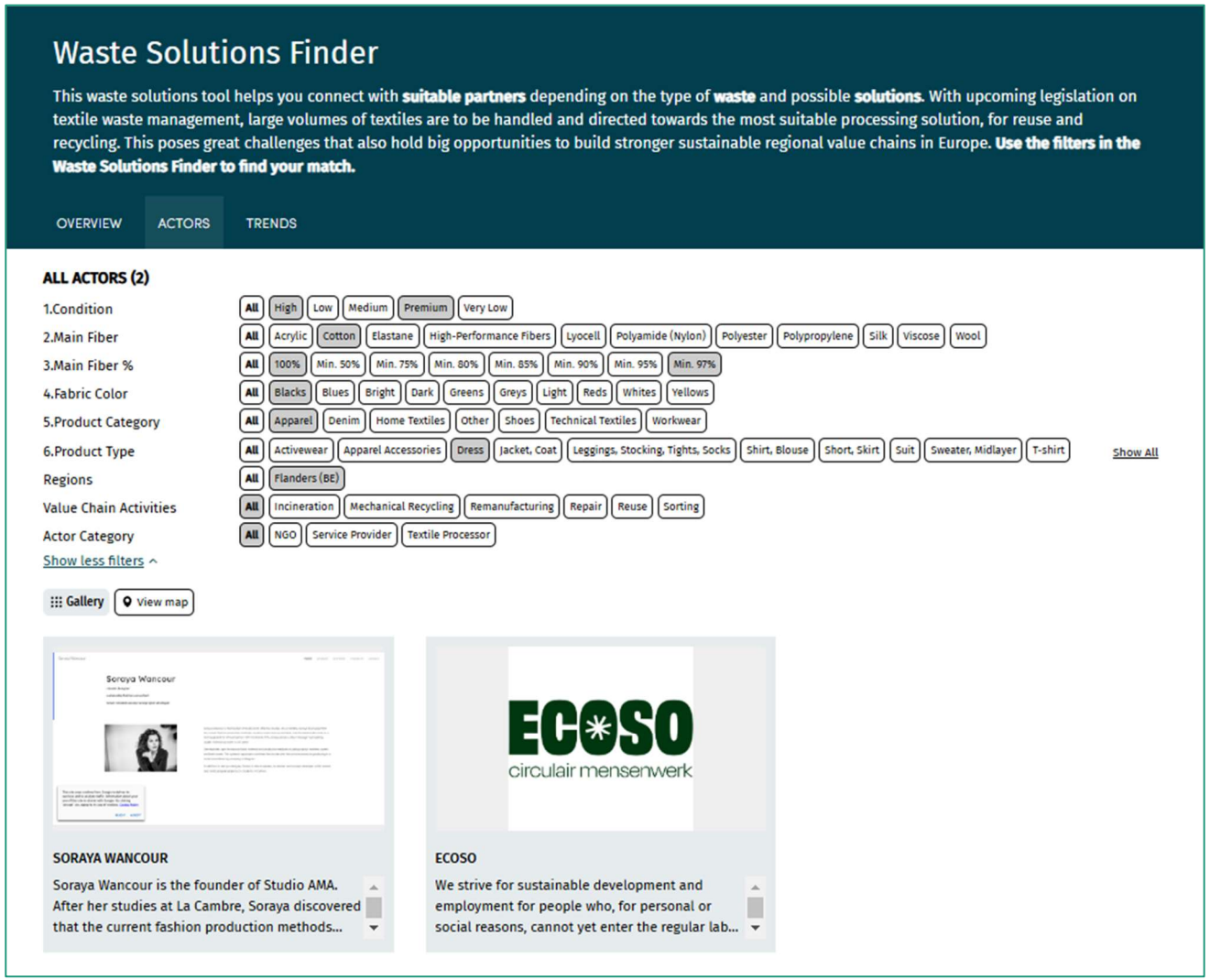


Figure 3 Visual of the Waste Solutions Finder, showing main categories and sub-categories to filter for matchmaking with registered companies providing solutions for textile waste

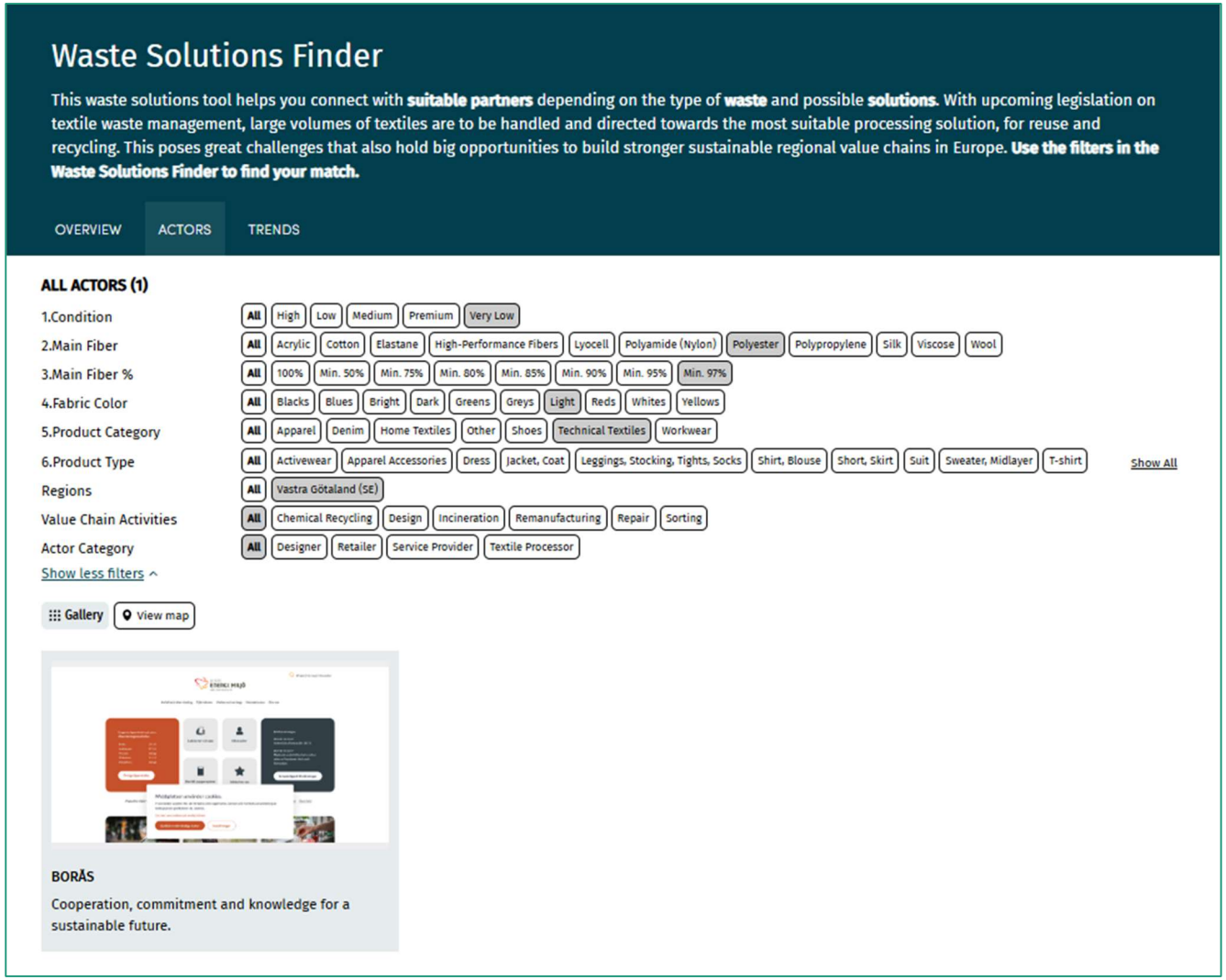
3.2.4 Working examples

Following are three examples of filtering pathways, leading to matches with solution providers for a specific type of textile waste.



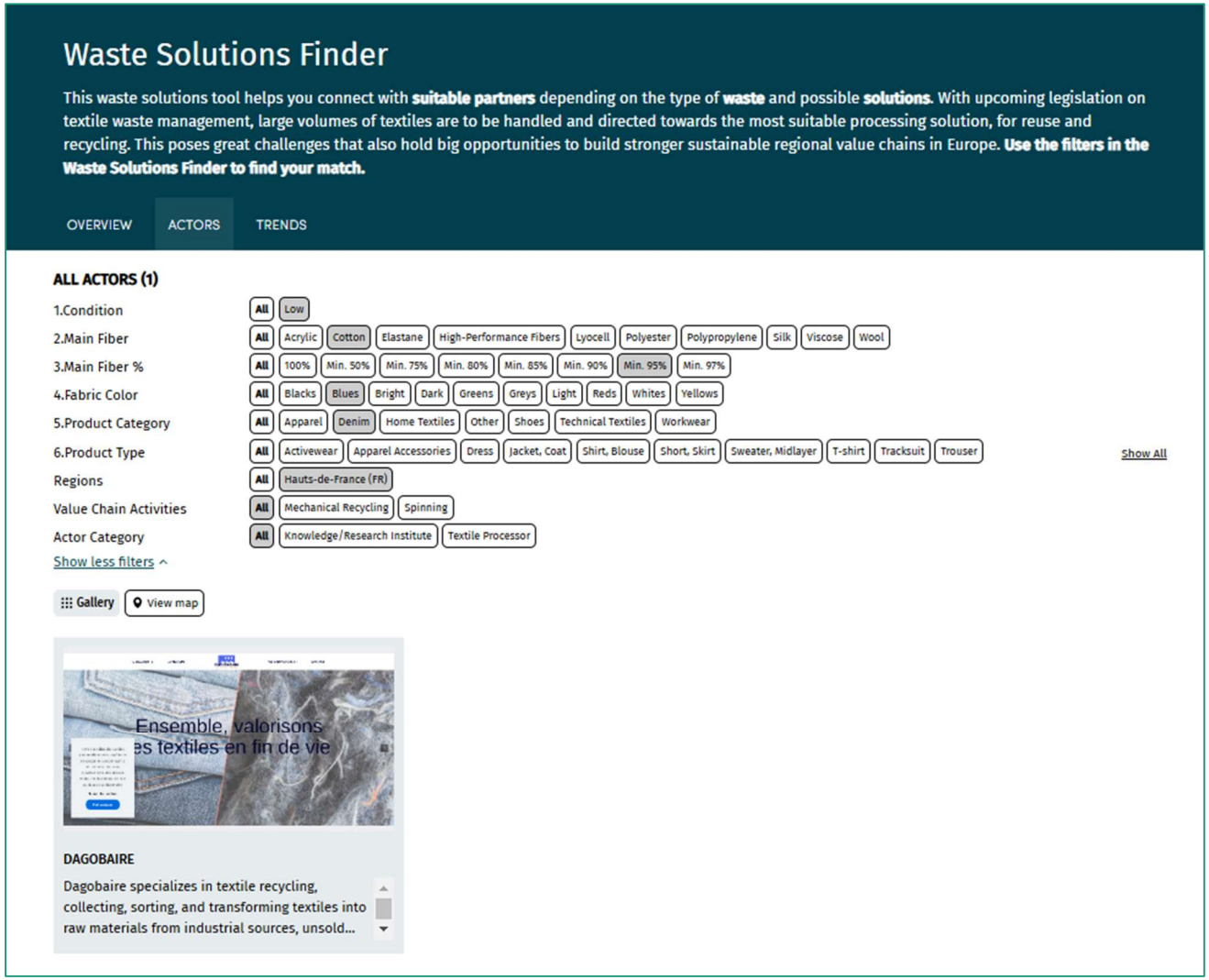
In the first example, waste of high and premium condition, 100% cotton, black dresses, in **Flanders (BE)** provides matchmaking with a remanufacturing company, Soraya Wancour (high condition), and a reuse company Ecoso (premium condition).

When getting a match, by cliquing the image, the user is directed to the company's contact information.



In the second example, waste of very low condition of polyester, min. 97%, light, technical textiles sector in **Västra Götaland (SE)** region provides matchmaking with a waste management company and an incineration destiny.

In accordance with waste criteria lined with CISUTAC definitions, very low condition is not suitable for recycling methods due to e.g. contamination of the fabric, risking interrupting recycling processes. Therefore, this material category will be directed towards incineration.



The third example, waste of low condition cotton min. 95%, blue colour denim, in **Hauts–de–France (FR)** region provides matchmaking with a mechanical recycler Dagobaire.

Low condition textiles are suitable for different recycling techniques such as mechanical recycling or chemical recycling. The colour of the textile might be of importance to keep consistent flows and allow for upscale and efficient production of the recycled materials.

3.2.5 Limitations

Further development of such a tool will be continuously required. For example, as the tool is currently built, it offers to find a solution for residual textile materials. Ideally, a tool would also be able to matchmake the other way around, where a recycler could also search for a specific type of material or provider. Another area for further work is the category **Disruptors**, where this filter is not feasible to include in the current version of the tool. Disruptors might need a separate step, performed by a separate company, before the textile is ready for recycling. This type of multistep process cannot fully be facilitated in the tool version at this stage. How to build a matchmaking between several companies and services needs further attention in future work for better guidance for circularity.

Condition is a very important channelling step for textile sorting. However, there are limitations to the current sub-categories. The condition level **Premium** is defined as having the hang tag still on, implicating the item has not been used or worn. However, this does not represent premium level for certain brands, for example low quality items from ultra-fast fashion. This limitation of the definition of sorting parameters thus automatically becomes a limitation for the tool. **Brand** is a category which could help sort and select high value items for reuse. However, trends can shift fast and differ between regions. This is therefore a difficult category to harmonize and keep staff educated in an up-to-date pace.

To reach further, a more advanced set-up will be required, where higher complexity can be handled. For this AI solutions were considered. AI integration in a digital development comes with possibilities and challenges as well as costs in e.g. large language models. Further AI integration will be explored in further work in RegioGreenTex in 2025 where different digital solutions from the project are being integrated, building upon the learnings from the Waste Solution Finder.

3.3 How does the Waste Solution Finder meet the aims?

Collaborative partnerships between regions, industry players, and fashion brands can drive innovation and best practice sharing, necessary for a circular textile chain. In all these cases, collaboration and finding your partners is key – thus there is a pressing need for matchmaking between companies.

Educating consumers is critical to increasing awareness of buying behaviour and proper textile disposal and the impact of fast fashion, with public campaigns planned in regions like Västra Götaland, Flanders and East Netherlands. Enhanced collection systems are also needed to reduce contamination and scale up operations, supported by alternative routes and infrastructure upgrades. Harmonization will have to be addressed as early as possible to ensure functional textile waste pathways. In the long run, clearer regulations and incentives are required to streamline waste management and encourage sustainable practices. The waste parameters presented at different levels in this report can be a reference to such guidelines. Continuous investment in sustainable solutions and funding for smaller initiatives and digital solutions are crucial to making circular practices financially viable.

A digital solution dedicated to channelling textile waste has the potential to address identified gaps. By facilitating the redistribution and reuse of textile resources, such a platform can streamline feedstock sourcing, and create pathways for collaborative production and waste management across various partners in the textile value chain.

In particular, a waste channelling solution have the potential to:

- Harmonize waste sorting, allowing lower volumes to be identified and clustered
- Facilitate matchmaking and business opportunities

- Create links between different parts of the textile value chain by outlining partners active in the recycling and repurposing of textiles
- Bridge innovation and technologies between regions by visualizing solutions across Europe
- Highlight needs of investment in regions where there is a lack of solutions

In this task the aims were met with the implementation of a digital waste channelling model, **Waste Solutions Finder**, to address the needs of the RegioGreenTex regions.

3.3.1 Key benefits of the Waste Solution Finder

Key benefits of the Waste Solution Finder are that it is built on parameters that are relevant here and now. It has an easy overview, with a user–friendly interface that helps guide a broad range of users, also without extensive prior knowledge to waste channelling and methods to handle textile waste. It offers matchmaking to relevant partners and is streamlining business to business exchanges.

4. CONCLUSIONS

The closing of circular value chains in Europe demands a unified and collaborative approach that acknowledges regional strengths and challenges. Through consistent policies, investments in technology, and cross-regional collaboration, Europe can transform textile waste into a valuable resource, paving the way for a sustainable and circular textile future. An important first step is to connect companies and initiatives already in place to enhance exchange of business and potential for upscale of circular businesses. In this task the implementation of a waste channelling model, built on the framework of post-consumer textile waste developed in CISUTAC, connected to the gap analysis and the taxonomy of RegioGreenTex, and integrated to fit the needs of the RegioGreenTex regions was developed. The **Waste Solution Finder** is a tool that offers matchmaking for textile waste solutions, facilitating business to business exchange and a way to start harmonizing channelling of textile waste at present. At the same time, potentially new business opportunities can be identified where matches are currently not available.

In the long run, clearer regulations and incentives are required to streamline waste management and encourage sustainable practices, throughout the textile value chain. The waste parameters presented in this report can be a reference to such guidelines and harmonization.

5. NEXT STEPS

The development of the **Waste Solution Finder** is bridging to work package 2, and the activity *T1.1 Build-up of the Circular textile ecosystem through the Digital Tool*. Different digital solutions from the project are being integrated, building upon the learnings from the work presented in this deliverable. AI integration will be explored in a pre-study of the State-of-the-Art in AI modelling using technology experts within this field.

5.1 Textile Waste Channelling Guide

As a support to the developed digital solution, a document in form of a guide is being developed. The **Textile Waste Channelling Guide** is a handbook with the aim to further facilitate learnings and harmonization for stakeholders working with textile circularity. The handbook is built up from the input of the regional workshops, broad data and input from research projects and challenges mentioned in the Gap Analysis are given special attention.

The Textile Waste Channelling Guide is also linked to work package 2 as a contribution to *T2.3 Training material on "green textiles" and design for circularity.*

ANNEX 1

Data points	Description	Minimum requirement today
Condition	Setting the quality levels for the post-consumer textile waste	**X**
Product construction (mono material and multi material)	Describes if it is one or more materials in the product, 2 options, mono or multi	**X**
Multilayer	Describes if it is a coated or laminated material	**X**
Chemical content	Yes or No option with focus on SVHC substances	**X**
Production year	Relevant for reuse, trend and chemical legislation	
Product type	14 different types of products that follows the code system from import data	
Brand	Important for 2nd hand and durability as well as trend	
Price	Relevant for the 2nd hand market, focus on recommended market price	
Product gender	Relevant for the 2nd hand market, we used women, men, unisex, junior and kids	
Repairability	Information on how to repair and if it is possible on certain products	
Durability	Relevant and measurable data on pilling, abrasion and tearing	
Fiber composition (1 and 2)	The blend of fibers in the fabric, the tool focus on 2 main fabrics	**X**
Recycle content	Percentage of recycle fiber in the yarn, focus on cotton and polyester	**X**
Recycle method	Type of recycle method that is used for the fiber	
Textile finishing	All treatments of the textile such as dyeing, chemicals for function, finishing or look	**X**
Fabric construction	Construction of the fabric that indicates the surface that can affect recycling	
Fabric colour	4 type of groups such as bright, dark, light and multi	**X**
Textile fiber	Construction of the fiber such as length and fineness	
Fabric weight	Weight in gsm, useful data for some recycle methods	
Disruptors	Yes or No option for hardparts or trims on product	**X**
Product disassembly	Indicates if the product can be taken apart or have an easy way to take away trims	**X**
Certificate	Different levels of verified certifications to be used for traceability	